

Review of Operations of Ground Emergency Medical Services in Alberta

In Accordance with Section 15 (1) of the *Health Quality Council of Alberta Act*

January 2013

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Foreword

When a medical emergency occurs and a 911 call is placed, Albertans expect and deserve a response that is appropriate, effective, efficient and reliable. None of us expect or anticipate a medical emergency, but knowing urgent medical care is available when and where we need it provides great comfort. Emergency medical services (EMS) are an essential element of our province's healthcare system.

This review examined the implications for quality and patient safety with respect to ground emergency medical services in Alberta. Our research and analysis identified important issues leading us to five recommendations and sixteen required actions that we believe are essential to improving the quality and safety of this critical service for Albertans. Establishing a province-wide EMS system is a very complex undertaking, however, the continued integration of EMS with the provincial healthcare system will provide substantial benefits to patients requiring urgent medical care.

The HQCA will collaborate with Alberta Health and other stakeholders in their review of this report, and is committed to following the progress of the accepted recommendations.

Many people contributed their time and expertise to this review. Thank you to the members of the review team who dedicated many months to ensure the quality and integrity of the review. On behalf of the team, I would also like to thank the individuals who participated in interviews, responded to questionnaires, and were readily available to answer questions and provide background information. Every individual involved in the review demonstrated a great passion for improving the EMS system in Alberta, and a commitment to do what is best for all Albertans.

Dr. John Cowell, Chief Executive Officer, HQCA
Calgary, Alberta
January 31, 2013

EXECUTIVE SUMMARY

In February 2012, the Minister of Alberta Health and Wellness (now Alberta Health) directed the Health Quality Council of Alberta (HQCA) to conduct an independent review of the operations of ground emergency medical services (EMS) in Alberta. Throughout this report whenever the term EMS is used it refers to ground EMS. Air ambulance services were not within the scope of this review.

Under section 9 of the *Alberta Evidence Act*, the HQCA appointed a quality assurance committee (QAC) to review the implications for quality and patient safety with respect to ground EMS including:

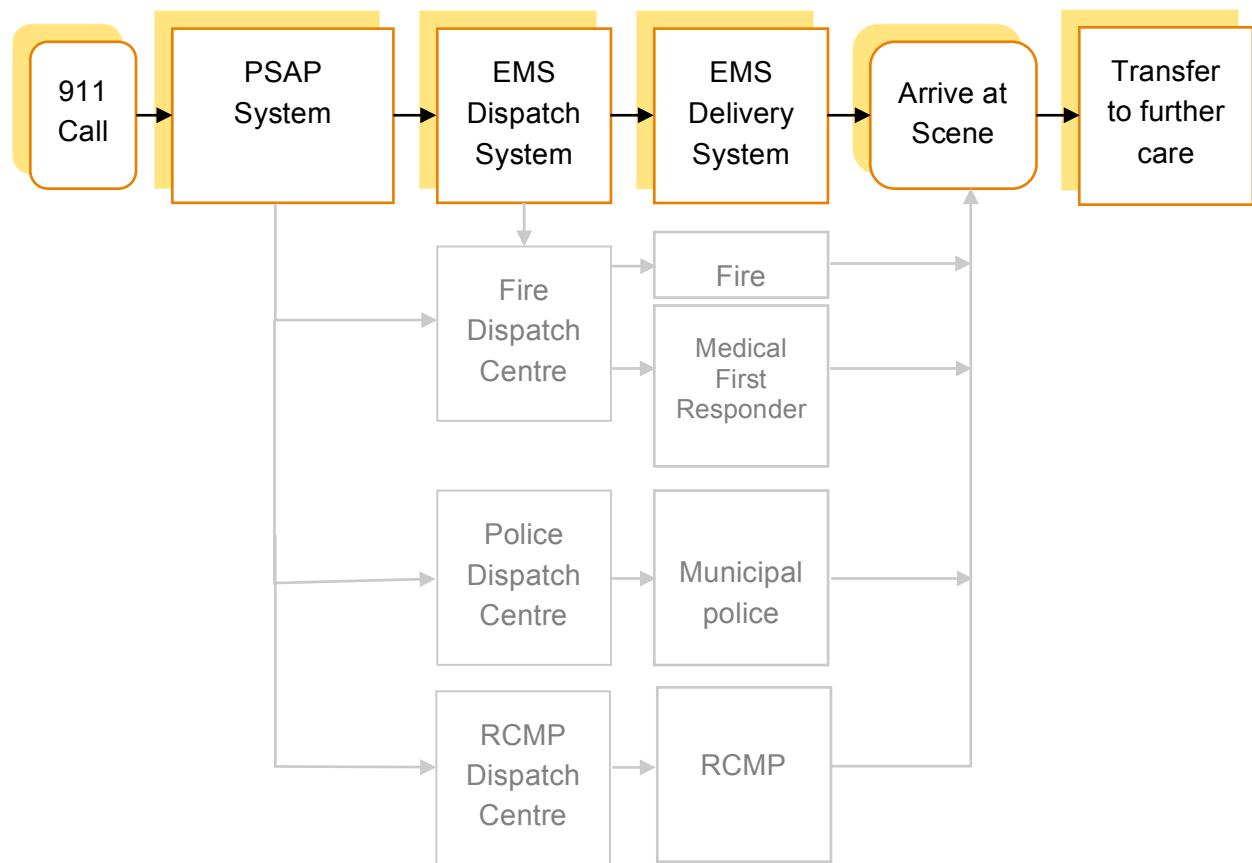
1. Transition issues related to the transfer of governance and funding of ground EMS from municipalities to Alberta Health Services (AHS).
2. The consolidation of ground EMS dispatch services under AHS.
3. Challenges specific to integrated fire/EMS service providers.
4. Challenges specific to urban, rural, and remote areas of the province.
5. Availability and adequacy of EMS data.

EMS in Alberta

Background

The term EMS describes a system of ambulance services and trained practitioners that provides pre-hospital care to the sick and injured in a variety of settings, and which often includes the transfer of patients to a hospital or between healthcare facilities (see Appendix I for a glossary of terms). The EMS system is supported by a complex communication system linking dispatch centres and EMS providers. The EMS system must also link with other public safety agencies, such as police, fire and other ‘medical first responders’. The EMS process is triggered by a 911 call from someone needing help in a medical emergency. The 911 call is handled by the public safety answering point (PSAP) system and then transferred to an EMS dispatch centre. The following diagram illustrates the ground EMS critical path beginning with a 911 call through to a transfer from EMS to further care.

The Ground EMS Critical Path



In the 2004/2005 budget speech, the Government of Alberta announced transfer of governance and funding of ground EMS from municipalities to Alberta Health and Wellness. With this transfer, a process of restructuring began, with a view to create a ‘borderless’, provincial EMS system. This meant that the EMS system would be embedded in the healthcare system and that both ground and air ambulance service would be managed at a provincial level and that EMS equipment and procedures would be standardized across the province. It would also mean that EMS resources could be efficiently and effectively coordinated so that the closest, most appropriate ambulance to an emergency would be deployed where previously it might not have been because of jurisdictional borders.

Since 2009, the operation of the EMS system, including EMS dispatch and service delivery, has been the responsibility of Alberta Health Services. After assuming responsibility, AHS began the process of consolidating EMS dispatch across the province. However, in 2010 the Minister of Health and Wellness at the time, halted the consolidation of EMS dispatch, due to concerns raised by some EMS stakeholders and municipalities. Since then a variety of EMS dispatch centres and services that are either owned and operated by AHS (direct delivery) or are operated by providers under contract to AHS have operated in Alberta.

The main concerns and criticisms brought forward by some EMS stakeholders and municipalities were that the evolving ‘borderless’ provincial ambulance system was leaving some communities with

insufficient ambulance coverage and that some ambulances were tied up with long wait times at emergency departments in urban hospitals.

Prior to the consolidation of ground EMS into AHS, and continuing as a consequence of the partial consolidation, the province has been left with an EMS dispatch system that is a web of EMS dispatch centres, services, and communication systems that is very complex and inefficient. Questions were also raised about the availability and adequacy of EMS data at a provincial level to effectively measure and manage the performance of the EMS system.

Review approach and methodology

Different methods were used to gather information and ensure a wide variety of perspectives were heard:

- Semi-structured interviews with key stakeholders in the field of EMS.
- Semi-structured phone interviews with EMS practitioners and medical first responders.
- Open-ended questionnaires to municipalities, dispatch centres, and contracted EMS providers.
- On-site observation of PSAP centres that answer 911 calls and centres that dispatch EMS ambulances and crews and other public safety agencies such as fire and police.
- Review of available administrative EMS data and performance indicators.
- Documentation review.
- Interviews with other EMS organizations.
- A systematic review of the EMS literature.

A model of the healthcare system was used to ensure the entire system was taken into consideration during the review process. The model is made up of the five major components of the health system: patients, personnel, equipment/environment, organization(s), and regulatory agencies. The model also considers the quality assurance fundamentals of structure, process, and outcome.

Findings

1. Transition of the ground EMS system from municipalities to AHS

A wide range of perspectives were heard concerning the transition of EMS from municipalities to the Ministry of Health. In general, most identified EMS as healthcare and as such recognized the benefits of having EMS as part of the healthcare system. The EMS system transition was occurring at the same time the entire health system in Alberta was being restructured and many reported that communication, consultation, and stakeholder engagement during the transition was poor.

Benefits of the transition described included standardized province-wide medical care protocols, staff training, the availability of online medical consultation, standardization of ambulances and equipment, innovations in advanced care, and a broader use of paramedic services in the community. Most frontline EMS providers who were interviewed said a key benefit of the transition to AHS was an improved ability to provide high-quality and consistent patient care across the province.

Some of the criticisms of the transition included a loss of local community knowledge, a culture of mistrust, a perceived lack of adequate EMS resources to meet system needs and the challenge for staff adjusting to a new organizational culture.

Beyond Alberta, other provinces are transitioning to a provincial-level EMS system. National and international experts within the EMS field reported many benefits to creating a provincial EMS system, as well as aligning EMS under the health ministry. For example, it was recognized that in a provincial EMS system: (1) evidence-based care, medical oversight and auditing can be standardized; (2) resources can be more efficiently and effectively managed, and (3) data can be better managed, reported on, and used to support quality management. With the EMS system being part of the provincial healthcare system, EMS practitioners can also take on community paramedicine roles to help fill gaps in the broader healthcare system.

2. Consolidation of ground EMS dispatch services under AHS

When the consolidation of the EMS dispatch system was put on hold by the Minister of Health and Wellness in March 2010, the consequence was a patchwork of EMS dispatch services that included a combination of three AHS dispatch centres (two AHS owned and operated and one contracted) and numerous municipal dispatch centres, some with multiple dispatch roles.

Currently, the structure and processes for the EMS dispatch system varies considerably across the province. Some dispatch centres combine PSAP (911) and dispatch functions, while other centres only perform one of these functions. For those centres that provide dispatch services, some centres dispatch all emergency services (EMS, fire, and police) while others dispatch two of these services or only one. The structure and responsibility for EMS dispatch centres varies, as does the resourcing and activities related to quality and safety. There are significant differences in communication equipment and the variety of radio and telecommunication systems in use throughout the province resulting in radio interoperability and communication challenges.

Many municipalities reported that the partial consolidation of EMS dispatch has adversely affected ambulance response times in their community. Contributing factors cited were ambulances being out of the local community performing transfers or dispatched to other communities, inaccurate information from the AHS dispatchers to the local ambulance, and a lack of local community knowledge on how to direct an ambulance to the required location.

Reported benefits of the consolidation of the EMS dispatch system included the standardization of EMS dispatch processes and the use of consistent technology across the province. Additional benefits cited included the ability to track and monitor ambulances across the province and dispatch the closest ambulance to the scene through the use of AHS' system status management (SSM) approach. EMS experts reported these advantages can be better realized when EMS dispatch is managed within the healthcare system as opposed to within the public safety model.

In the partially consolidated system, the benefits and efficiencies of a borderless EMS system cannot be fully realized. For example, not all EMS dispatch centres are supported by SSM. These dispatch centres can only identify and track the ambulances they deploy, as opposed to a fully operational SSM where all ambulances can be tracked in real time for the most effective deployment.

Financial concerns were frequently raised. When responsibility for EMS dispatch was transferred to AHS in 2009, dispatch centres which had previously been fully funded by their municipalities for all forms of dispatch, were now contracted and paid by AHS to dispatch EMS. Many of these dispatch centres were dispatching multiple services (EMS, fire, police) and when the EMS dispatch component in these centres

was consolidated into the AHS dispatch system, they no longer received funding from AHS because they were no longer dispatching ambulances. Consequently, some of the municipalities are now concerned about the financial viability of their dispatch centres.

3. Challenges specific to integrated fire/EMS service providers

Integrated fire/EMS systems are traditionally led by a fire chief, and thus, decisions regarding the deployment of resources (including ambulances and EMS crews) are made by the fire chief. This creates many challenges with EMS now being part of the provincial health system, as sometimes the fire chief's vision and plan for using EMS resources are not congruent with that of AHS. For example, many integrated fire/EMS systems do not want to provide inter-facility transfers (IFTs) because IFTs are not seen as a core activity and 'tie up' staff, making them unavailable to respond to fire calls and other emergencies. Also, there is often little support for EMS practitioners to take on community paramedicine roles, as these are not considered public safety activities.

Those who had worked in an integrated system were strong advocates for its value. The rationale supporting the model is primarily financial. When municipalities were responsible for funding and providing both fire and EMS, efficiencies could be gained through an integrated service because of the hiring and cross-training of staff and the operational management of fire and EMS resources at a scene. Historically, many medium-sized cities found the integrated fire/EMS model to be cost effective; larger cities, because of their size and call volume, often did not.

One of the challenges that integrated fire/EMS systems face is related to contracts. Maintaining the required level of EMS resources stipulated in the contract with AHS is a challenge for integrated fire/EMS services because the integrated model is based on the concept of having staff dually trained and able to provide both EMS and fire duties as required. Some communities with integrated fire/EMS systems have chosen to increase their staffing to ensure they are meeting the requirements of the AHS contract and are now voicing concerns about increased costs since the transition.

Another challenge is determining the actual costs associated with providing EMS when it is part of an integrated fire/EMS model. Separating the costs specific to EMS from the costs for fire-related services that the municipality is responsible for is difficult. It was reported that AHS' costs for providing EMS are higher in integrated fire/EMS systems than in EMS-only (non-integrated) systems. In order for the Ministry of Health to effectively fund the EMS system, and for AHS to effectively manage EMS operations, it is important to understand the actual costs of the service.

4. Challenges specific to urban, rural, and remote areas of the province

Rural and remote challenges

Due to the expanse and the realities of rural and remote areas of the province there are longer ambulance response times. Some have commented that response times have lengthened since the transition. It has been reported that the transition has led to more medical first response calls for volunteer fire services in smaller communities (medical first response refers to the arrival of the first trained responder on the scene, ranging from basic first aid training to a physician level respondent). It was suggested that the increased use of medical first response by volunteer fire services is because the 'local' ambulance is transporting a patient to a larger centre or is providing ambulance coverage in another community.

Municipalities in rural communities commented that they are providing EMS through their fire departments, in the form of medical first response, but are not being compensated by the provincial government for doing so.

There is also a perception that the level of ambulance service has changed from advanced life support (ALS) to basic life support (BLS) in rural communities, especially for those areas that are serviced by contract providers. The primary difference between BLS and ALS ambulances is that an ALS ambulance has at least one EMS practitioner at the EMT-P level who can provide more advanced care. Some commented that an inequity now exists because urban centres are primarily served by ALS ambulances. Determining the appropriate level of training in rural and remote areas is complex and represents a trade-off. Call volumes are lower in rural settings and it is more difficult for EMS personnel to maintain all of their skills, especially for high-acuity/low-opportunity procedures. Some believe it makes sense for rural areas to have BLS-level service. Others would argue that because response times are longer, less support is available, and the distance to tertiary care is longer, more – not fewer – advanced skills are required. It was recognized that strategies are needed to ensure EMS practitioners in rural and remote areas maintain their skills. This can be achieved by rotating EMS personnel occasionally into urban centres, a benefit gained through a provincial model.

The systematic literature review also identified unique challenges for EMS delivery in rural areas that are related to geographic barriers, diverse terrains, poor communication due to a lack of cellular or radio coverage, and difficulty recruiting and retaining qualified personnel. Studies have also supported what many interviewees and questionnaire respondents said: the mean transfer and transport times (pre-hospital times) are longer in rural and remote areas. As well, in these areas, patients who are suffering from traumatic injuries and those who have suffered a cardiac arrest are at higher risk of death. The literature review also identified that it is more difficult for rural areas to recruit and retain EMS practitioners than for urban centres.

Urban challenges

Some EMS providers identified challenges experienced in urban centres, including longer wait times for EMS crews to ‘hand over’ the patient in the emergency department.

There is a strong sense that, in the cities, the support areas within EMS have been disadvantaged since the transition. Historically, the urban centres were adequately resourced for staff training, data analysis and quality and safety management. With the transition these resources are now being spread farther to support the entire province. As contracted EMS service providers move to AHS EMS direct delivery, the number of AHS frontline staff increases but there is not always a corresponding increase in support staff that provide staff training, data analysis and quality and safety management. The result has been a reduction in resources and support in the cities, while the rural and remote areas are receiving more than they had before the transition.

EMS provincial service delivery model – urban, rural and remote areas

Many participants identified that different delivery models are required to address the unique needs and realities of urban, rural, and remote settings. As stated by more than one participant, “One size does not fit all”. This was echoed in the interviews with other EMS organizations, where participants identified unique approaches to community paramedicine that are used in different settings to meet differing needs.

However, it was not apparent that definitions for urban, rural, and remote areas (considering geography, population, and distance to tertiary care facilities) had been articulated for EMS delivery across the province.

5. Availability and adequacy of EMS data

Currently Alberta lacks a reliable, comprehensive source of provincial EMS data. There are two provincial EMS data sets, one administered by AH (called AAIMS) and the other by AHS. AAIMS data are incomplete due to poor data submission compliance and insufficient data quality checks. AAIMS collects only ‘traditional ambulance call’ EMS events and has limited patient care data that would enable EMS clinical processes and patient outcomes to be measured. The AHS EMS data are satisfactory in some respects; however, there is still wide variability in the quality of data across the system, incompatible EMS dispatch data sets, and poor data submission compliance from some contracted operators.

The provincial EMS data are not currently adequate to be used for comprehensive performance and quality and safety management. AHS has started to develop a provincial EMS data system and has taken an important first step in publicly reporting some EMS data on its website. However, AHS data are not readily accessible for operational decision-making and users of the EMS system (i.e., municipalities, the public, and patients) have limited objective information about the quality and performance of the EMS system in the province.

The systematic literature review and experts in the EMS field emphasized the importance of having quality data and appropriate measures on which to base financial and operational decisions and as a necessity for quality management. In the interviews with other EMS organizations it was determined that organizations considered to be leaders in EMS had robust data management systems.

Because of the significant limitations in provincial EMS data some of the important questions that this review was asked to address could not be answered. For example, the time-stamp data within AAIMS are not considered sufficiently valid and there are insufficient historical data from across the province. Consequently the central question for the review concerning the impact of the transition on the provision of EMS could not be quantitatively answered.

RECOMMENDATIONS AND REQUIRED ACTIONS

The full discussion of the Issues, Analysis, Recommendations and Required Actions can be found starting on page 73.

The review identified four key areas, with five associated recommendations and sixteen required actions that offer opportunities to improve the quality and safety of the provincial EMS system.

1. The 911 - Public Safety Answering Point (PSAP) System

Recommendation #1

The Government of Alberta develop and implement legislation, operational standards and an accountability framework for the Public Safety Answering Point system in the province.

Required Actions:

- The Government of Alberta conduct a review of the PSAP system and PSAP centres operations to inform the development and implementation of legislation, regulations, operational standards and an accountability framework.
- The Government of Alberta conduct an analysis to determine the appropriate number of PSAP centres to maximize the efficiency and reliability of this system.

2. EMS Dispatch System

Recommendation #2

Alberta Health immediately reverse its decision to suspend the consolidation of the EMS dispatch system into Alberta Health Services, and Alberta Health Services proceed with establishing a province-wide, consolidated EMS dispatch system.

Required Actions:

- Alberta Health Services establish two (2) EMS dispatch centres to ensure a safe and reliable ‘borderless’ EMS dispatch system with adequate backup.
- Alberta Health Services develop an improved change management plan to engage municipalities, EMS service providers, and the public in the process of establishing and implementing the consolidated EMS dispatch system within the provincial EMS system.
- The Government of Alberta ensure there is one source of valid GIS data for the province (e.g., a provincial spatial data infrastructure).
- The Government of Alberta ensure a communication infrastructure exists to enable communication within and between different public safety agencies across the province including the ability for EMS to transmit data.

3. EMS Delivery System

Recommendation #3

Alberta Health Services articulate a vision and plan for the EMS delivery system and incorporate an EMS delivery model that standardizes care across the province recognizing the unique realities and requirements for urban, rural, and remote areas.

Required Actions:

- Establish definitions for urban, rural, and remote areas taking into consideration geography, population demographics, frequency of time-sensitive calls, and distance to tertiary care facilities.
- Ensure the most efficient and effective ambulance locations are determined based on validated EMS data, geography, population demographics, frequency of time-sensitive calls, and distance to tertiary care facilities.
- Determine the role, required training and qualifications, for medical first responders within the EMS delivery model.
- Define the range of healthcare services to be provided by EMS practitioners, including community paramedicine.
- Ensure the minimum standard across the province is a Basic Life Support ambulance.
- Determine the resources required for inter-facility transfers (IFTs) that considers provider scope of practice, vehicle type and equipment based on patient need.

4. Informing and Managing the Quality and Safety of the EMS System

Recommendation #4

Alberta Health and Alberta Health Services collaborate to establish a comprehensive, single source of valid EMS system data that encompasses the EMS dispatch and delivery systems to be used for operational decision-making as well as quality and safety management.

Required Actions:

- Alberta Health Services identify key patient outcome, process, and cost-effectiveness measures for emergency and non-emergency activities (e.g., inter-facility transfers, community referral programs, community paramedicine) and for specific patient populations (e.g., major trauma, ST segment elevation myocardial infarction, stroke) and design the collection of provincial EMS data to support the reporting of these measures. Consider national and international sources in their development.
- Alberta Health and Alberta Health Services ensure that the EMS data source can be linked with other healthcare databases to ensure the ability to report on patient outcomes and patient level costing.
- AHS ensure contracted EMS providers meet AHS EMS reporting and data standards.

Recommendation #5

Alberta Health Services specify a quality and safety management approach that is an integral component of the AHS EMS planning and performance documents.

Required Actions:

- Develop and implement a comprehensive quality and safety management approach that includes the following components:
 - Valid data to identify areas for quality improvement.
 - A single repository of information that contains results of EMS quality assurance reviews, audits, EMS incidents reported to the AHS reporting and learning system, and other safety inputs.
 - Mechanism for the prioritization of quality and safety improvement initiatives.
 - The quality improvement methods to be used.
 - Resources to support training of EMS practitioners and administrators in the principles and practices of quality and safety management.
 - Policies and procedures for managing both the risk of harm and the occurrence of harm to patients.
 - Accreditation of EMS dispatch centres and EMS delivery using standards specific to EMS.

PROJECT OVERVIEW

Background and Purpose

On February 28, 2012, pursuant to Section 15 (1) of the *Health Quality Council of Alberta Act*, the Minister of Alberta Health and Wellness (now Alberta Health) directed the Health Quality Council of Alberta (HQCA) to conduct a review of operations of emergency medical services (EMS) in Alberta to address concerns that had been expressed across the province about EMS response times and emergency department wait times (see Appendix II). Throughout this report whenever the term EMS is used it refers to ground EMS. Air ambulance services were not within the scope of this review.

Objective

The objective was to review the implications for quality and patient safety with respect to ground EMS including:

1. Transition issues related to the transfer of governance and funding of ground EMS from municipalities to Alberta Health Services (AHS).
2. The consolidation of ground EMS dispatch services under AHS.
3. Challenges specific to integrated fire/EMS service providers.
4. Challenges specific to urban, rural, and remote areas of the province.
5. Availability and adequacy of EMS data.

Recommendations and required actions

To improve the quality and safety of EMS in Alberta and based on the findings and analysis of the investigation, the HQCA made recommendations and required actions for system-level improvements for the delivery of ground EMS in Alberta.

Scope

Inclusion

Operations of ground EMS services in Alberta (including all five AHS zones – North, Edmonton, Central, Calgary, and South).

Exclusion

- An examination of the decision of the Government of Alberta to transfer governance and funding of EMS from municipalities to the regional health authorities.
- The time period before 2003, at which point nine regional health authorities were formed.

PROJECT GOVERNANCE

Responsibility for this review lies with Dr. John Cowell, Chief Executive Officer (CEO) of the Health Quality Council of Alberta (HQCA) and Project Sponsor.

The review was conducted under the HQCA's Quality Assurance Committee (QAC) in accordance with Section 9 of the *Alberta Evidence Act*.

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ⁱ Was a review team member initially, but was not involved for a portion of the review, including conducting the analysis, determining the findings and recommendations.

ⁱⁱ Was the HQCA administrative lead for the review initially, but was not involved for a portion of the review, including conducting the analysis, determining the findings and recommendations.

INTRODUCTION TO EMS

There are a number of complex terms used in the field of emergency medical services (EMS). For a better understanding of the following, please refer to the glossary of terms in Appendix I.

EMS is a term commonly used to identify a system of ambulance services and trained EMS practitioners. This system provides emergency care to the sick and injured and transports the sick and injured in an environment that was historically outside the bricks and mortar of hospital and medical clinical care facilities. It has evolved, however, to include patient care in a variety of settings.

The history of ambulance service can be traced as far back as 1500 BC to the action of good Samaritans.¹ Over the ensuing centuries the provision of first aid to injured soldiers on the battlefield evolved into rapid response and evacuation of the wounded by trained medics. Skills and knowledge acquired on the battlefield eventually transferred into the civilian environment.

In 1966 the seminal paper “Accidental Death and Disability: The Neglected Disease of Modern Society” was released by the National Academy of Sciences-National Research Council in the United States.² This paper brought to the forefront the high rates of death due to injury in the United States and the poor state of ambulances in that country that were ill-prepared to deal with the injuries.² Subsequently the *Highway Safety Act* was established the same year in the United States,¹ which included the provision of funding to train emergency care providers.

Historically the term ‘ambulance’ was used to identify a vehicle, and later to describe a system used to provide first aid to the sick and injured in the out-of-hospital environment. In the early 1970s, the terms ‘pre-hospital’ and ‘out-of-hospital’ emerged in the literature in reference to clinical treatments provided by ambulance staff in the out-of-hospital environment. Over the years, references to an ambulance service have been replaced by the now more common names of emergency medical services, EMS,ⁱⁱⁱ or paramedic service. The terms for the staff working in the ambulance have also evolved; since the 1970s the terms ‘emergency medical technician’ (or EMT) and ‘paramedic’ have replaced the name of ‘ambulance driver or attendant’ to denote an EMS practitioner, signifying their more advanced and formalized training. There has since been a slow transition for EMS to adopt titles more synonymous with paramedics and, now, paramedicine. For example in November 2012 the EMS Chiefs of Canada changed its name to Paramedic Chiefs of Canada.

The traditional role of EMS has evolved over the years to include more than just response to the sick and injured and transportation to a medical facility.

EMS has rapidly progressed toward adopting an evidence-based approach to practice. Advancements in research, system design, continuous quality improvement, and leadership development complement EMS’

ⁱⁱⁱ An online search using the medical research search engine PubMed (2012) identified 6,596 published articles using the term ‘pre-hospital’ from 1970 to 2012. The term ‘out-of-hospital’ was identified in 4,612 articles from 1973 to 2012. The term ‘emergency medical services’ was identified in articles referencing ambulances as far back as 1946 (PubMed, 2012).

ability to deliver “quality healthcare, through mobile infrastructure and ability to link traditional institutional health services with community care that is at the heart of EMS.”³ The traditional role of EMS has also evolved over the years to include more than just response to the sick and injured and transportation to a medical facility. EMS may now include a public safety role for emergency response and preparedness, preventative medicine such as administering vaccinations, public education such as cardiopulmonary resuscitation (CPR) training and first aid training, in-hospital emergency support, and community paramedicine activities such as an augmented role in long-term care.

A brief history of EMS in Canada

Ambulance services in Canada can be traced back to the 1800s when St. John’s Ambulance brought first aid training to Quebec.⁴ The first municipally based service was established in Toronto in 1883 and the first recorded ambulance was operated by the Toronto Police Force in 1888.⁵ The Ontario Ministry of Health established ambulance regulations and standards in 1968, and the first paramedic program began in Kingston, Ontario in 1971, but paramedics did not officially operate until 1981 in Toronto. The Southern Alberta Institute of Technology in Calgary implemented the first publicly funded paramedic program in Canada in 1972.⁶

Currently the structure, governance, and delivery of EMS varies widely from province to province. The delivery of EMS may occur through private contractors, municipalities, and/or provincial or regional health authorities. Medical (physician) direction also varies across the country, ranging from an advisory role to direct oversight of EMS clinical operations.³ There does, however, appear to be a shift towards more centralized governance and oversight of EMS across the country, as is the case in British Columbia, Alberta, Nova Scotia, Prince Edward Island, and New Brunswick.

EMS in Alberta

In 1901 Alberta saw its first organized ambulance service established in Lethbridge; a horse-drawn carriage was used to run to the hospital and pick up a physician to transport him to the location of an emergency.⁷ Plumbtree also describes ambulance services in Edmonton in the early 1900s.⁸

From the early 1900s until 1981, ambulance services in Edmonton were privately owned and operated. Services evolved from what was originally funeral home operators with added ambulance services to ambulance services operating in a competitive market.⁸ By 1972 Smith’s Ambulance had become “the sole provider of ambulance services for the City of Edmonton” with the City giving Smith’s exclusive rights to the 911 number.⁸ Smith’s Ambulance and its owner were convicted of fraud in 1981 and withdrew from providing ambulance services in Edmonton. On July 1, 1981 Edmonton had its first municipal ambulance service with the creation of the Edmonton Ambulance Authority.

Ambulance services in Calgary before 1971 were also privately owned and operated but suffered the same challenges of a competitive market as did services in Edmonton. The beginnings of a Calgary municipal ambulance service are described on the City of Calgary website:

Ambulance service became a branch of the Calgary Fire Department (CFD) in 1971, with 51 men and eight ambulances stationed at No. 1, No. 7 and No. 16 fire stations. Prior to this year, private firms transported injured and sick Calgarians to hospital, but an ambulance strike during Stampede week in 1970 caused a public outcry that heralded the end of private service.

Ambulance workers hired by the department were civilians with basic first-aid skills. They were later trained as emergency medical technicians (EMTs), and eventually called paramedics.

By Jan. 31, 1971, 29 trained ambulance responders were put into service under the command of District Chief Bill Phillips.⁹

Labour issues in 1983 resulted in the City of Calgary Fire Department Ambulance Services becoming a separate department within the City called the City of Calgary Emergency Medical Services.

In the early 1970s the Alberta Ambulance Operators Association was founded and it lobbied for improved ambulance standards. In 1973 the Alberta Medical Association (AMA), after identifying problems with ambulance services in Alberta, struck a committee to investigate concerns and subsequently published a report with recommendations in the *Alberta Medical Bulletin*.^{10,11,8} One recommendation in the report was to upgrade the standard of training from the 16-hour St. John's Ambulance course to the 104-hour course offered by the Southern Alberta Institute of Technology.^{10,8} In 1976 a recommendation from an AMA special committee was made for the development of a provincial ambulance service for Alberta,¹¹ and in 1980 the provincial government formed the Ambulance Services Advisory Committee that subsequently drafted the Ground Ambulance Strategy – Ambulance Program and Standards.¹¹

In 1982 Bill 205, the *Ambulance Services Act*, was introduced into the Alberta legislature but did not proceed past second reading.¹² The *Public Ambulance Act*, introduced in 1983, also did not receive a second reading.¹¹ In 1984 EMS practitioners were legislated to practise under the *Health Disciplines Act*. The terms 'advanced life support' (ALS) and 'basic life support' (BLS) were defined in the *Health Disciplines Act*, and in 1985 the Act was amended to include EMT and emergency medical technologist-paramedic (EMT-P) terminology and definitions.¹¹ In 1994, the *Ambulance Services Act* was proclaimed, which was followed by the *Emergency Health Services Act* in 2008.

In June 2005 the Alberta government initiated two 'Discovery Projects' in the Palliser and Peace Country health regions. In this pilot project the governance and funding of ground ambulance services was transferred from the municipalities to the health authorities, thus establishing two regional EMS systems integrated with the regional health system.

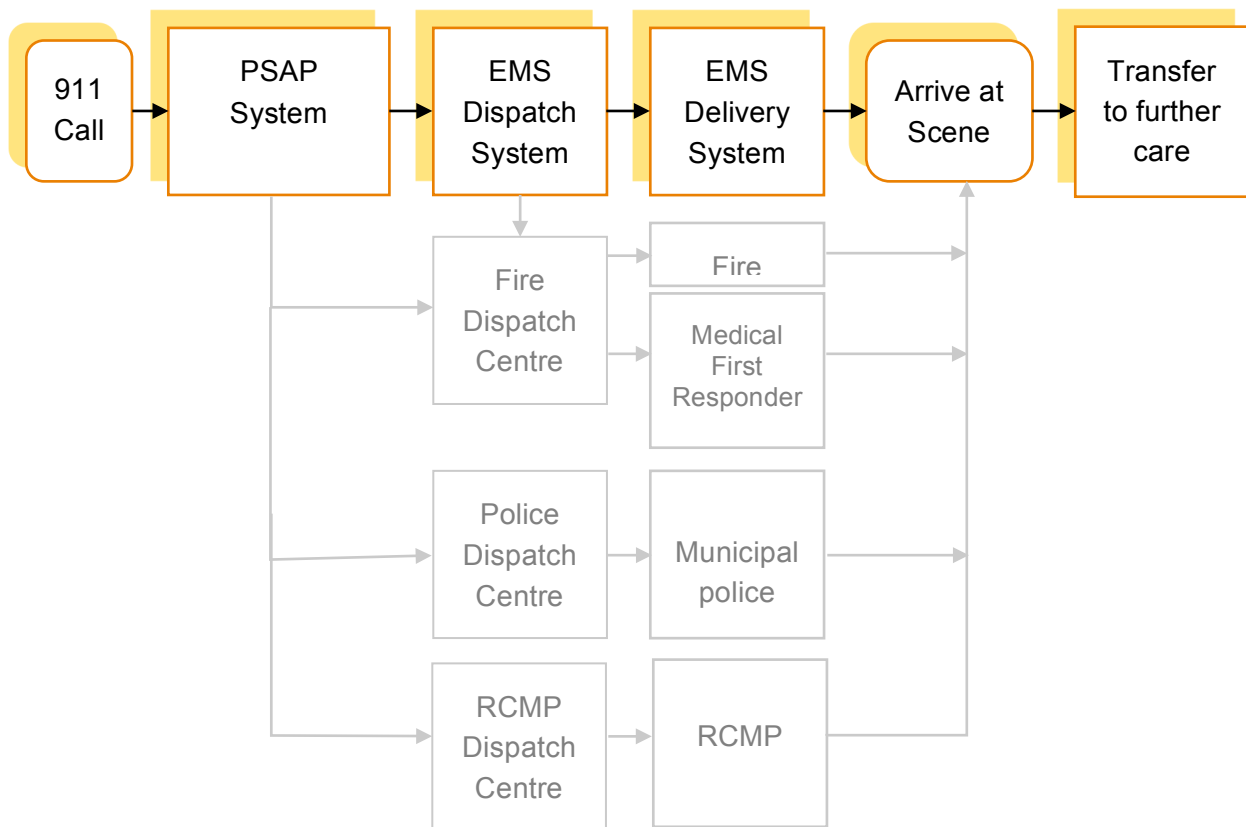
The *Emergency Health Services Act*¹³ outlines governance and responsibility for the delivery of emergency health services in the province. It states that a regional health authority (RHA) shall provide emergency health services in accordance with the Act and per an emergency health services plan that is developed by the RHA and provided to the minister. According to the Act, the minister may approve dispatch centres, and the RHA shall use one or more dispatch centres in accordance with the regulations and the RHA's emergency health services plan. The minister can make regulations for dispatch centres, including the requirements and standards for communication systems and equipment, staffing, and operations. The minister may provide for or arrange for emergency health services in any area of Alberta, regardless of whether services are also being provided in that area by any other government, person, or authority. The minister may also make regulations respecting staffing, equipment, supplies, and vehicles related to the provision of emergency health services. The regulations in the Act require RHAs to use medical directors to provide direction and establish medical protocols for providing emergency health services. The minister may appoint a registrar for the purposes of the Act who shall issue and renew operators' licences and maintain a register of all licensed ambulance operators. The lieutenant-governor in council may make regulations about the definition and use of 'first response operations', including

regulations requiring operators of first response operations to register with the registrar and to comply with directions given by a dispatcher.

The process of EMS delivery in Alberta

When the first 911 system was introduced in Canada in 1969,¹⁴ access to all emergency services – police, fire, and EMS – became possible by placing a single, three-digit call. The single phone call makes access to emergency services appear to be a simple process; however, reliably coordinating several combinations of providers from different agencies across Alberta is in fact complex. Figure 1 shows the critical path for ground EMS.

Figure 1: The ground EMS critical path



911 call

A 911 call can be placed from a landline, cellular phone, or computer (voice-over-Internet protocol, commonly referred to as VoIP). The trunked 911 system, which in Alberta is supplied and maintained by the phone company Telus, automatically routes the call to a ‘public safety answering point’¹⁵ (PSAP).

PSAP centre / EMS dispatch centre

In Alberta, municipalities are responsible for PSAPs. There are two models: a PSAP may operate as a standalone centre; or, it may work within an emergency dispatch centre. An emergency dispatch centre may include a single agency (i.e., police, fire, or ambulance), two of these agencies, or all three.

In a standalone PSAP, the call-taker answers the 911 call, asking the caller whether he needs police, fire, or ambulance. Then the call-taker transfers the call to the appropriate agency’s dispatch centre, located in another building or another community.

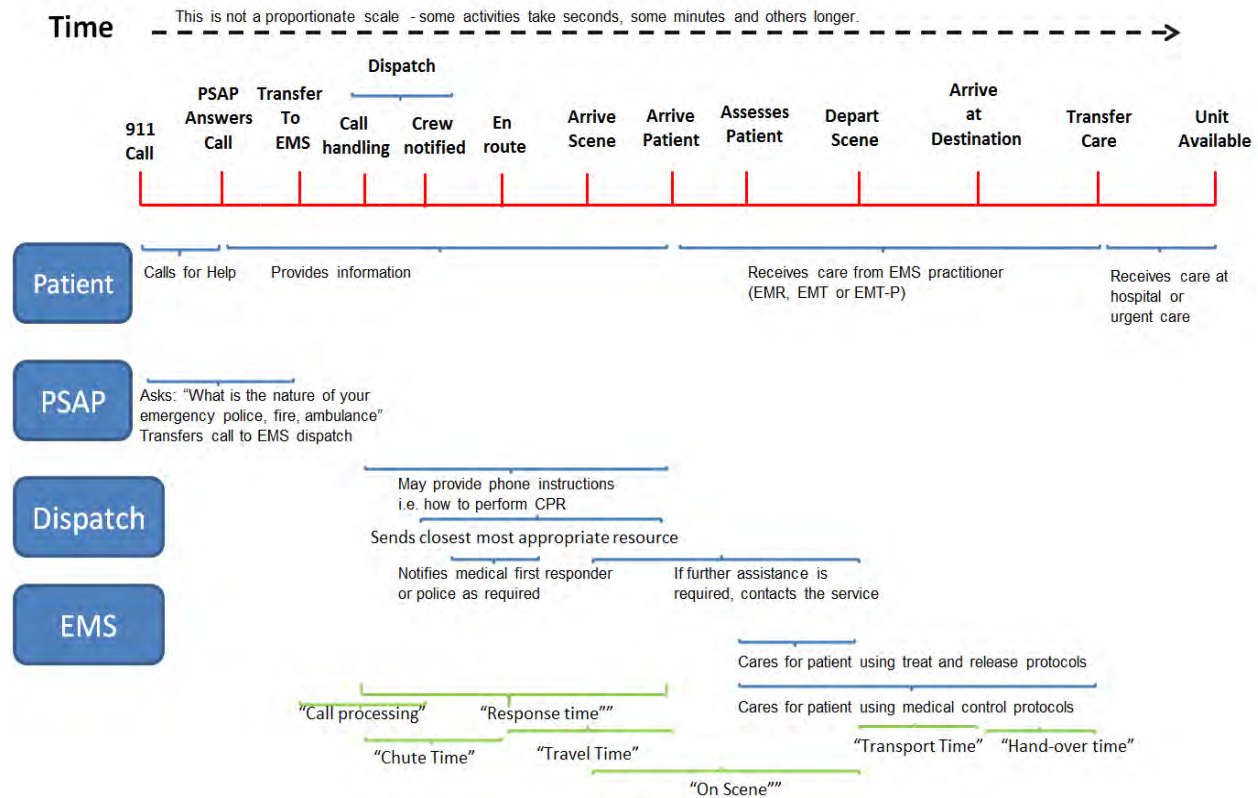
When a PSAP is located within an emergency dispatch centre, what happens to the 911 call will vary depending on the dispatch centre. For example, in some centres the call-taker will transfer the call to a dispatcher working in the same office or building. In other centres, the call-taker is also the dispatcher. In either case, the dispatcher confirms the caller’s location and gathers information about the emergency. This information is entered into a computer system and then the dispatcher dispatches the ambulance.

The information-gathering process is typically done following established medical guidelines, such as the standardized guidelines in the Medical Priority Dispatch System (MPDS). The MPDS tells the dispatcher how to categorize the call, what resources are needed, and in what priority. The guidelines will also trigger what to tell the caller to do until the ambulance arrives.

If police or fire are needed (e.g., fire may be required as a medical first responder), an EMS-only dispatch centre will notify the police or fire dispatch centres, which may be located in the same building or in a different community.

Figure 2 shows the EMS event process described above.

Figure 2: EMS event process map



EMS deployment

The time period from when the EMS crew (usually two practitioners) is notified to when it is en route (driving) is called the ‘chute time’. The time from when the ambulance is en route to when it arrives on scene is considered the ‘travel time’.

Once they reach the patient, the EMS crew follows medical control protocols (MCPs). These are patient assessment and treatment procedures that are standardized and evidence-based and are used to guide EMS crews during a medical emergency. EMS crews may also contact a physician for advice or direction at certain points. Some MCPs allow the EMS crews to treat and then release or refer the patient to another health service resource, like home care services, for example, instead of transporting the patient to the hospital.

For other patients, the next step in the process is the EMS crew transports them to an appropriate healthcare facility, monitoring and providing treatment to the patient en route. At the healthcare facility, be it a hospital or other care facility, a hand-over report is given and the EMS crew ‘transfers’ care of the patient; the time it takes to do this is the ‘hand-over time’.

Finally, the EMS crew restocks supplies and equipment, and cleans the equipment and interior of the ambulance if necessary. At this point, the ambulance is once again available for the next call.

Ambulances are also used to transfer patients between healthcare facilities. These ‘inter-facility transfers’ (IFTs) are initiated through a different process. Some via an online request system and others through a phone request process. In Calgary and Edmonton, there are ambulances and EMS crews dedicated to IFTs. Elsewhere in the province the IFTs and emergency calls are handled by the same EMS practitioners in the same ambulances.

The structure and operations of EMS in Alberta

The EMS system in Alberta is a provincial model. Governance and responsibilities for EMS have been outlined by Alberta Health (AH), previously Alberta Health and Wellness:

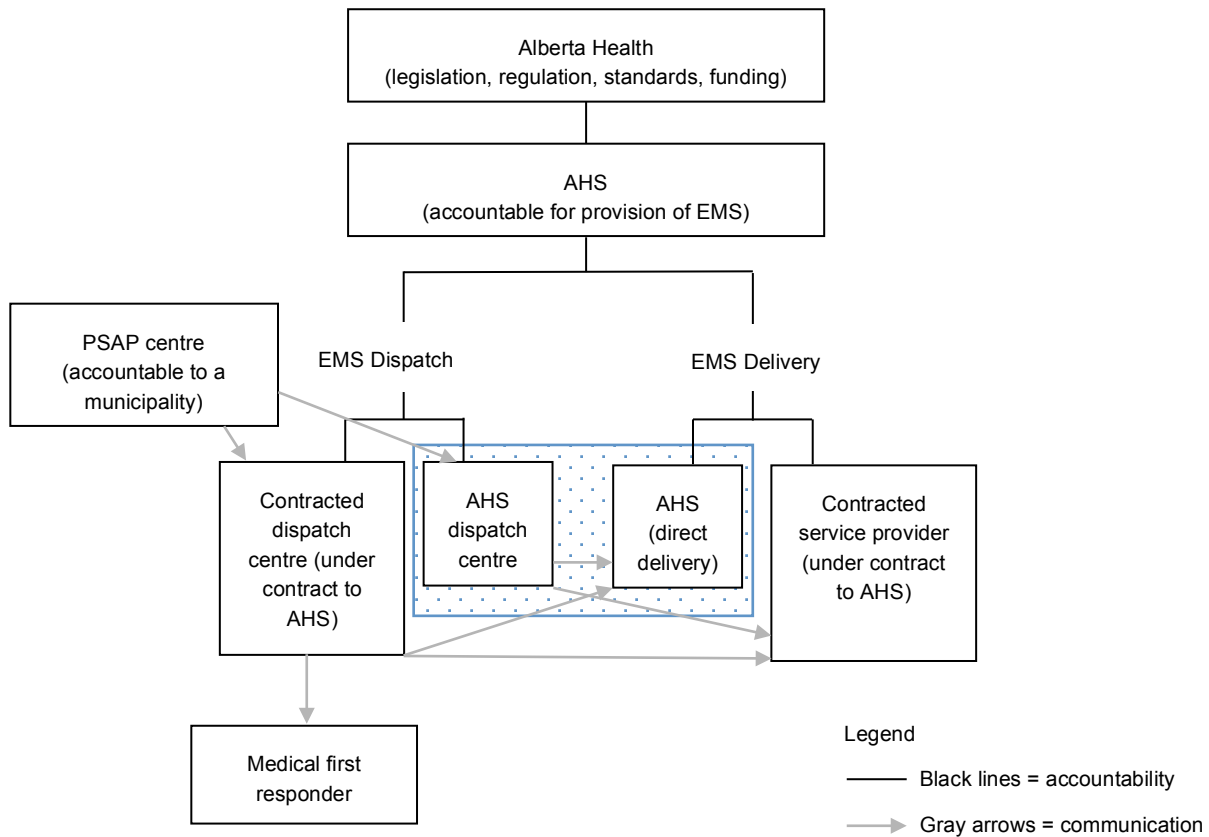
- “System governance of EMS refers to the provincial government’s responsibility to provide all Albertans with access to quality ground and air ambulance services.” AH legislates, regulates, sets provincial standards, and funds EMS.
- Operational governance of ground EMS, which “refers to the health system’s responsibility for the provision of ground EMS in their jurisdictions”, is the responsibility of the health authority (AHS). AHS is accountable to AH.
- AHS is responsible for operational delivery. “Operational delivery of ground EMS refers to front-line EMS design, decision-making, delivery and service performance... whether directly or through third party delivery agents.”¹⁶

Figure 3 illustrates the governance and operational responsibilities for the EMS system in Alberta. It also illustrates communication among the various organizations and services.

During the course of this review there was a change in the organizational structure responsible for the EMS system within AHS. Currently the provincial EMS ‘portfolio’ has an administrative and medical leadership dyad (a senior vice-president and a senior medical director) responsible for EMS dispatch, provincial air ambulance and inter-facility transfers, Health Link (the nurse telephone advice line), and

the support areas within EMS such as staff training, clinical compliance, and standards. The administrative and medical leadership dyad for each of the five zones (North, Edmonton, Central, Calgary, and South) is responsible for the operational delivery of EMS within their respective zones.

Figure 3: Governance and operations of the EMS system in Alberta



There are two main functions within the EMS system: (1) the communication system, meaning the dispatch centres and radio equipment, and (2) the operational delivery of EMS, meaning the EMS crews and vehicles.

How these functions are organized and how they interact with each other is complex. There are two models: (1) AHS owned and operated and (2) contracted service providers. Their responsibilities are shown Table 1.

Table 1: Description of the EMS system’s main functions

	AHS owned and operated	Contracted providers
EMS dispatch system (centres and radio equipment)	<ul style="list-style-type: none"> • Infrastructure paid for by AHS • Staff are AHS employees • Policies and protocols set by AHS 	<ul style="list-style-type: none"> • Responsible for the purchase, maintenance, and management of infrastructure • Staff are not AHS employees • Under contract to AHS
EMS delivery system (EMS crews and ambulances)	<ul style="list-style-type: none"> • Direct delivery by AHS • Staff are AHS employees • Ambulances and other equipment are purchased, maintained, and managed by AHS 	<ul style="list-style-type: none"> • Under contract to AHS • Responsible for the purchase, maintenance, and management of infrastructure, ambulances and equipment • May be a municipality, a not-for-profit entity, or a for-profit business

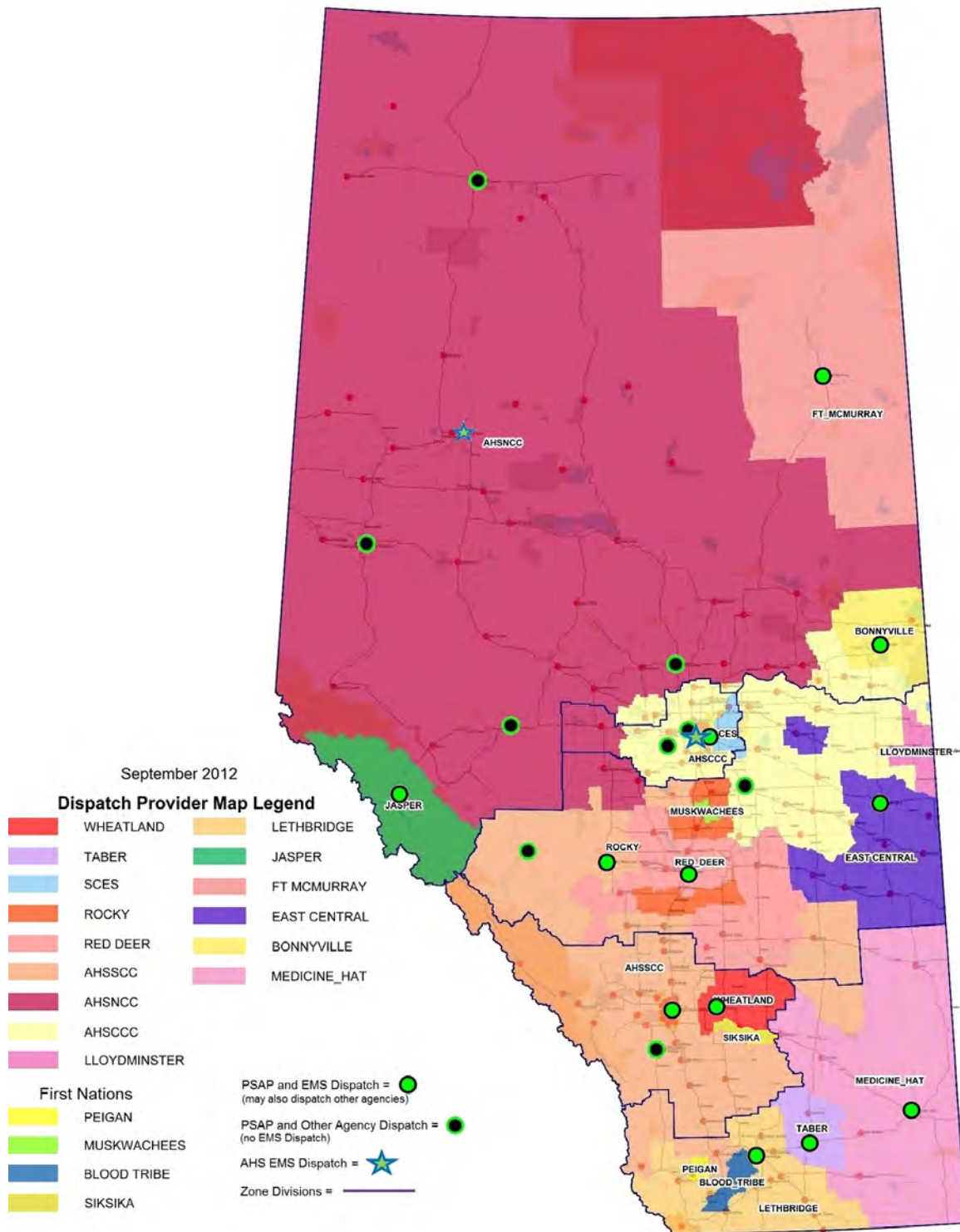
Thus, AHS can own and operate an EMS dispatch centre or delivery service, or it can contract either of these services. Through the contract AHS manages performance of the contracted service provider by establishing clear service delivery and performance expectations. Whether direct delivery or contracted, AHS is accountable for the EMS system. One exception to this is industrial sites (e.g., an oil field site) where the private company provides its own on-site medical coverage and has no formal relationship with AHS.¹⁷ Other exceptions are those First Nations who operate their own ambulance service and do not have a contract with AHS. The ambulance operators on First Nations who have not signed a contract with AHS are legislated under the *Ambulance Services Act*, while all other providers who have a contract with AHS fall under the *Emergency Health Services Act* and regulations.

Currently, the contracted EMS dispatch centres can only ‘see’ the ambulances in the area they dispatch for. AHS EMS dispatch centres can see their direct delivery ambulances and the contracted provider ambulances that are in their dispatch area. No one can see the whole picture. This has created so-called ‘borders’ in what is meant to be a borderless provincial EMS system.

Figure 4 illustrates where the PSAP and dispatch centres are located in Alberta, the areas they cover, as well as the different types of services provided. First Nations who have their own EMS dispatch centre and deploy their own ambulances are also noted in figure 4.

Figure 5 shows where EMS is provided by direct delivery (owned and operated by AHS) or by another organization through a contractual arrangement with AHS.

Figure 4: PSAP, EMS and other dispatch agencies locations



The map was provided by AHS and modified to show the locations of PSAPs and EMS dispatch centres.

The acronyms used in the map are:

SCES - Strathcona County Emergency Services

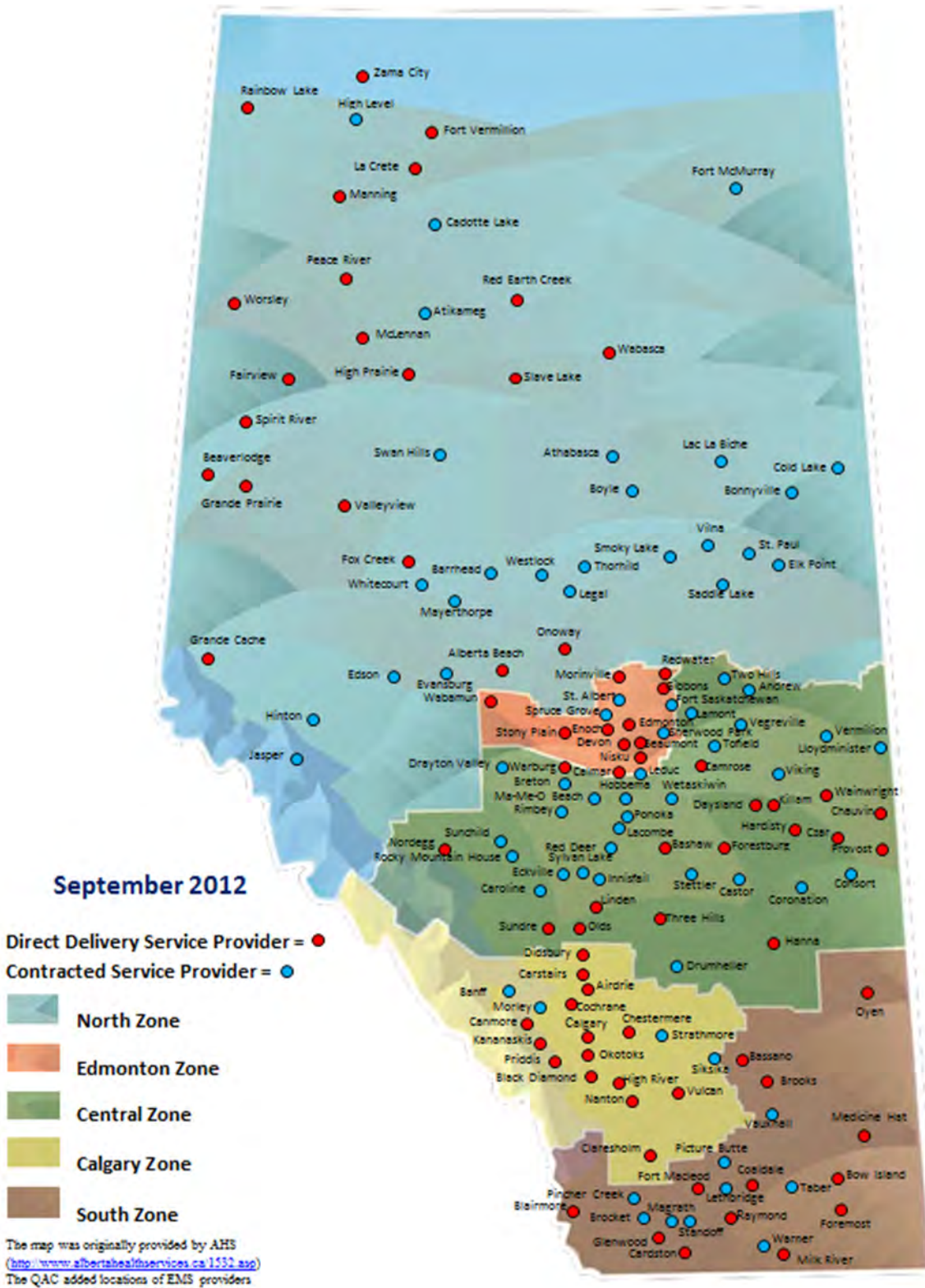
AHSSCC - Alberta Health Services South Communication Centre

AHSNCC - Alberta Health Services North Communication Centre

AHSCCC - Alberta Health Services Central Communication Centre

Rocky - Rocky Mountain House

Figure 5: Direct delivery and contracted EMS providers by AHS zone



The organizations that are contracted by AHS to provide EMS delivery use one of two models – stand-alone EMS or EMS integrated with fire services. The integrated fire/EMS service model existed before the formation of AHS, when municipalities were responsible for the delivery of EMS. It was a model sometimes used by medium-sized cities, such as Red Deer, because it was seen to be an economical way to provide both fire services and EMS. Integrated service models are not all alike across the province. Some are fully integrated, meaning that the staff are dually trained as firefighters and EMS practitioners (certified at an EMR, EMT, or EMT-P level), can be assigned to either a fire truck or an ambulance, and, depending on call volume and needs, could perform either firefighting or EMS duties within a given shift. In other integrated models, staff are trained as both but are assigned either to firefighting or EMS duties for their shift. For other organizations, an integrated EMS and fire system simply means an integrated administrative structure; EMS and fire are under one department with a common management structure and budget, but the operational delivery of EMS and fire services are separate.

Lethbridge Fire and Emergency Services, the City of Red Deer Emergency Services, and the Regional Municipality of Wood Buffalo Regional Emergency Services (Fort McMurray) are examples of municipalities that have evolved from municipally based fire departments that provided EMS to municipally based emergency service departments delivering fire, EMS, and emergency management services under a public safety delivery model. These centres provide EMS through a contractual agreement with AHS.

In addition to the services provided by EMS practitioners, some municipalities may also use support provided by ‘medical first responders’ (see Appendix IV for a discussion of terms related to medical first response). Medical first response strategies were implemented to provide support to patients while waiting for an ambulance to arrive. The rationale for medical first response has been primarily based on a 1979 study of cardiac arrest patients, which showed that in witnessed pre-hospital cardiac arrest patients, survival rates improved if the time from cardiac arrest to the start of CPR was four minutes, and if the time from cardiac arrest to defibrillation was eight minutes. This eight minute response time has been applied in many communities to *any* potentially life-threatening event.

Some municipalities have historically supported medical first response in communities through local fire departments or volunteers. Currently in Alberta, the types of medical events that are responded to by medical first responders and who qualifies as a medical first responder varies widely. In those municipalities that have a medical first response system, it is most often provided by the fire department. Fire departments may be staffed with paid firefighters, as is the case in most urban centres, or with volunteers.

In more recent years, life-saving devices, such as automatic external defibrillators (AEDs), have been purchased by municipalities or other local organizations and strategically placed within communities so that people can receive immediate urgent care while an ambulance is en route. Cardiac arrest research supports early access to defibrillation, even if this means defibrillation is performed by an untrained, at-the-scene bystander using an AED. AHS EMS has recently developed a program to increase public access to potentially life-saving AEDs. Along with the Alberta Heart and Stroke Foundation, AHS EMS has acquired 120 AEDs for placement in communities across Alberta, and a provincial registry has been developed allowing AHS dispatchers to guide callers to the location of an AED in cases of suspected cardiac arrest.¹⁸

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EMS health professionals

Legislation to regulate health professions in Alberta was passed in the Alberta legislature in May 1999 as the *Health Professions Act*.¹⁹ The Alberta College of Paramedics (ACP), as of January 2013, has not been proclaimed into the *Health Professions Act* and as such, EMS practitioners in Alberta remain legislated for practice under the *Emergency Medical Technicians Regulation* of the *Health Disciplines Act* (HDA), *Alberta Regulation 48/93*.²⁰ Governance of the regulation under the HDA remains with the Health Disciplines Board (HDB).

The ACP is the regulatory body for EMS practitioners in the province, and “as the regulatory body for the profession, works to establish, maintain and enforce regulatory, competence and practice standards to ensure every registered practitioner provides safe and ethical patient care”.²¹ The ACP reports to the HDB for approvals regarding paramedicine education programs. The College is actively working to meet the requirements for proclamation into the *Health Professions Act*.

All EMR, EMT, and EMT-P practitioners in Alberta must be registered with the ACP to practise within their designated scopes of practice in Alberta. They must have successfully completed paramedicine education or training as legislated by the *Private Vocational Training Act*²² or the *Post Secondary Learning Act/Programs of Study Regulation*.²³ Paramedicine programs in Alberta must be approved by the ACP and the HDB per legislation in the *Health Disciplines Act* and the *Emergency Medical Technicians Regulation*. In addition, EMT and EMT-P programs in Alberta are accredited by the Canadian Medical Association (CMA); EMR programs are not required to be accredited.

Once an individual successfully completes an approved program of study, he or she may apply for registration with the ACP. Registration requires passing the ACP’s knowledge and skills testing process. Annual registration is attained by completing continuing education requirements defined by the ACP using the Alberta Occupational Competency Profile and described in the *Emergency Medical Technician Regulation* of the *Health Disciplines Act*. Under the *Emergency Medical Technicians Regulation* three registered member designations are identified with defined scopes of practice:

- Emergency Medical Responder (EMR)
- Emergency Medical Technician – Ambulance (EMT-A)
- Emergency Medical Technologist – Paramedics (EMT-P)²¹

Currently in Alberta the practitioner designation of EMT-A is not used by the ACP; the shortened version of ‘EMT’ is used instead.

The designations of EMR, EMT, and EMT-P are the terms used in Alberta to describe EMS practitioners but are not the terms used nationally. The Alberta College of Paramedics’ designations of EMT and EMT-P are different but equivalent to national paramedicine titles of Primary Care Paramedic and Advanced Care Paramedic, as defined by the Paramedic Association of Canada²⁴ and the CMA.²⁵ The Paramedic Association of Canada also defines the Critical Care Paramedic (CCP) scope,²⁴ but Alberta

does not have an approved CCP education program. Most provinces are adopting the Paramedic Association of Canada generic terminology of paramedic in reference to any level of paramedic training.²⁴

EMR training programs are designed for people who want to enter the pre-hospital care field or who already provide basic emergency services (e.g., firefighters, police officers). The EMR course of study varies but may take up to six weeks to complete. No practicum or hands-on training is required. It is important to note that the CMA does not require educational institutions providing EMR programs to be accredited. Graduates of an EMR program are eligible for registration with the ACP upon successful completion of the ACP EMR registration exam.²⁶ EMRs have the smallest scope of practice of the three groups, and may, for example, administer medications orally but not by other routes.

EMTs are the middle tier of Alberta's three-tiered system of EMS personnel. The course of study for EMTs may be up to one year long depending on the education program and on part-time or full-time enrolment; practicums are required for EMT students. Graduates of an EMT program are then eligible for registration with the ACP once they pass the ACP EMT registration exam.²⁶

EMT-Ps in Alberta are typically called paramedics. They have the largest scope of practice and provide pre-hospital emergency care at the advanced life support level. The course of study for an EMT-P program may be up to two years, depending on the education program, and includes hands-on training. Graduates of an EMT-P program are then eligible for registration with the ACP once they pass the ACP EMT-P registration exam.²⁶

Table 2 of the systematic literature review (found in Appendix V) outlines some of the differences in the scopes of practice for EMRs, EMTs, and EMT-Ps in Alberta.

With EMS practitioners being legislated to practise under the *Health Disciplines Act*, they practise under a doctor's (the medical director's) medical licence. This means that two important structures and processes need to be in place. First, medical directors provide oversight and direction for EMS practitioners in the form of medical control protocols or guidelines.²⁷ AHS uses the medical control protocols (MCPs) approved by AHS' EMS Medical Directors and Leadership Council and by Alberta Health. All EMS practitioners – direct delivery and contract – are required to complete the AHS EMS Medical Control Protocol Certification process as a requirement for practice and must re-certify every three years. Second, quality assurance activities, such as internal audits, are conducted to assess clinical competency and to ensure that the EMS practitioners are following the MCPs appropriately.

APPROACH AND METHODOLOGY

Five questions, which align with the objectives in the Terms of Reference (see Appendix III), were developed to guide the review:

1. What effect has the transfer of governance and funding of ground emergency medical services (EMS) from municipalities to Alberta Health Services (AHS) had on:
 - Response times of EMS?
 - EMS hand-off times in urban emergency departments?
2. What effect has dispatch consolidation had on the:
 - Operation of a seamless dispatch system?
 - Rural Public Safety Answering Point (PSAP) and fire dispatch centres?
 - Role of local knowledge in effective dispatch services?
3. What are the challenges specific to integrated fire/EMS service providers:
 - In their ability to maintain an integrated fire/EMS operational model?
 - What funding issues may impact the quality of EMS?
4. What are the challenges specific to urban, rural, and remote areas of the province with:
 - The use and availability of first responders?
 - The use and availability of EMS resources?
 - EMS performance measures and benchmarks?
5. Are there data about EMS, what are they, and are they available and adequate with respect to:
 - EMS quality and safety measures?
 - Current administrative EMS data (which would determine ability to report on key EMS quality and safety measures)?

This review was conducted using the *Systematic Systems Analysis: A Practical Approach to Patient Safety Reviews*²⁸ as a guide. The methodology encourages a systemic view of the healthcare system; that is, “how all parts of the healthcare system play a role”, rather than a focus on “only one particular factor in isolation”.²⁹ A model of the healthcare system was used, which is made up of the five major components of the health system: patients, personnel, equipment/environment, organization(s), and regulatory agencies.^{29,30} The model also considers the quality assurance fundamentals of structure, process, and outcome.³¹

The following describes the approach taken to collect and analyze information and to develop recommendations and required actions.

Collection of information

The QAC gathered information from a number of sources:

- **Semi-structured interviews with key stakeholders** to discuss quality and patient safety issues with respect to transition of governance, operations, and funding; dispatch consolidation to date; challenges to integrated fire/EMS providers; challenges to urban, rural, and remote areas of the province; and collection, use, and availability of EMS data.

People from various stakeholder groups that were affected by or involved in the EMS transition to AHS and/or experts in the field of EMS were identified as potential interviewees. Stakeholder groups included AHS, contracted EMS providers, agencies providing medical first response, Public Safety Answering Points (PSAPs), EMS dispatch centres, a number of ministries within the Government of Alberta and numerous other associations and organizations. Individuals were identified who were likely to have the greatest knowledge based on experience and current position. Potential interviewees were then contacted and asked to participate in an interview. If they agreed to participate, the participants were provided with details about the EMS review and the general questions to be asked, and the interview was scheduled.

Interviews were conducted in person or on rare occasion by teleconference. Although some interviews were attended by more than one participant, recorders identified responses as coming from only one participating organization (or respondent). At the start of each interview, Section 9 of the *Alberta Evidence Act* was reviewed; it was explained that neither documents nor interview notes produced by the QAC can be used in a legal action, and assurances were given that the list of interviewees would be kept confidential. Seven questions were asked, with five of the questions directly aligned with the objectives of the review. Data from the interviews were coded only for questions two through seven. (Please see Appendix VII for the questions.) Interviewees' responses were transcribed by hand to paper or computer. Interviewers then reviewed and consolidated responses after each interview into one electronic document, which was then used to develop an Excel data spreadsheet for analysis.

Some individuals were interviewed more than once when additional information or clarification was needed. The responses from these interviewees were also transcribed; however, they did not undergo the same type of thematic analysis as the other interviews because they were not part of the standard set of questions.

- **Open-ended questionnaire of municipalities,^{iv} PSAPs/dispatch centres, and contracted EMS providers** to explore quality and patient safety issues with respect to transition of governance, operations and funding; EMS dispatch consolidation to date; challenges to integrated fire/EMS providers; challenges to urban, rural, and remote areas of the province; and collection, use, and availability of EMS data.

Three questionnaires that aligned with the objectives of the review were developed (see Appendix VI). In order to gather as many perspectives as possible from those considered to be closely connected to EMS in Alberta and to ensure an adequate opportunity to be heard, the questionnaire was sent to three distinct groups:

1. Municipalities which included municipalities, counties, cities, towns, villages, summer villages, improvement districts, special areas, and Métis settlements in the province using the contact

^{iv} For the purposes of this report, our terminology of “municipality” refers to the geographic area of the municipality and all the cities, counties, towns, villages, summer villages, improvement districts, special areas, and Métis settlements within the area.

information compiled from the Alberta Municipal Affairs website. Letters were addressed to either the mayor and council or to the reeve and council (n = 357).

2. All PSAP/dispatch centres, based on a contact list provided by the Government of Alberta. Three of these on the list were RCMP dispatch centres (n = 28).
3. All ground EMS providers contracted to AHS, based on a contact list provided by AHS (n = 41).

A total of 426 questionnaires were sent out. In cases where the same contact person was listed for two of these groups (for example, the same main contact at a PSAP centre and a contracted ground EMS provider), only one questionnaire was sent to that person. To encourage a higher response rate for the municipality sample, the deadline was extended and two reminder emails were sent.

- **Semi-structured phone interviews of EMS practitioners and medical first responders** to discuss quality and patient safety issues with respect to transition of governance, operations, and funding; EMS dispatch consolidation to date; challenges to integrated fire/EMS providers; challenges to urban, rural, and remote areas of the province; and collection, use, and availability of EMS data.

A stratified sample was established using three sources. One was a confidential list of ‘frontline’ EMS practitioners and their contact information (n= 5,152 or 53.4 per cent of registered EMS providers in Alberta), including both direct delivery and contracted service providers. This list was cross-matched based on first and last name with the registration information exported from the Alberta College of Paramedics (ACP) website (9,651 registrants in Alberta at that time) to categorize by EMS discipline (i.e., emergency medical responder (EMR), emergency medical technician (EMT), or emergency medical technician-paramedic (EMT-P)). Next, using information provided by AHS together with geographic information about Alberta, a categorization of *urban*, *rural*, or *remote* was approximated for each person.

The QAC developed its geographic classification of urban, rural, and remote from Alberta Health (AH) data. AH has designated six broad geographic categories: Metro, Moderate Metro Influence, Moderate Urban Influence, Rural, Rural Centre Area, Rural Remote, and Urban, which are based on considerations of existing boundaries and consultation with AH stakeholders. Using AH recommendations and the assessment of data, three large geographic groupings of urban, rural, and remote were established. *Urban* comprised Metro, Moderate Metro Influence, Moderate Urban Influence, and Urban classifications. *Rural* comprised Rural and Rural Centre Areas, while *remote* was based on the Rural Remote classification. The AHS frontline provider data were aggregated into the three larger groupings (urban, rural, and remote). Finally, through the use of a random number generation process, a stratified sample based on discipline (EMR, EMT, EMT-P), work description (direct delivery, contracted service), and geographic categorization (urban, rural, remote) was established.

The second source was a list of frontline practitioners who responded to a request sent out by the HQCA for volunteers to participate in an interview. These respondents (n = 264) were also categorized into the three EMS disciplines and the geographic area in which they worked based on the information they provided. A random process was used to draw a sample for each of the three EMS disciplines and geographic areas.

The third source of names was a confidential list of fire-based medical first responders from the Alberta Fire Chiefs Association (n = 678). Individuals were assigned into one of the three

geographical categories (i.e., urban, rural, and remote) from the addresses supplied. Through random number generation, a sample of fire medical first responders based on geographic category was established.

The intent was to conduct 40 interviews with an equal representation of EMRs, EMTs, EMT-Ps, and medical first responders in urban, rural, and remote areas of the province. An irregularity of randomization – the way in which urban workers were identified and of the self-selection of interviewees to participate in an interview – resulted in most of the initial group of ‘urban’ interviewees being from locations other than Edmonton and Calgary. To rectify this, the sample was augmented with four extra interviews from Calgary and four from Edmonton. Two additional interviews with rural providers were conducted to compensate for the fact that some interviewees were new to their jobs and had limited knowledge of the transition to AHS. This resulted in a total of 50 interviews being conducted. The intention was to capture a broad range of perspectives across Alberta, not to have a provincially representative sample. Table 2 depicts the number of interviews conducted based on the stratification explained above.

Table 2: Number of interviews conducted based on stratification process

Area Categorization	Discipline	Number of Interviews	Running Total
AHS List - Urban	EMR	1	1
	EMT	2	4
	EMT-P	6	9
	Medical first responder	4	13
AHS List - Rural	EMR	6	19
	EMT	5	24
	EMT-P	6	30
	Medical first responder	5	35
AHS List - Remote	EMR	3	38
	EMT	2	40
	EMT-P	2	42
	Medical first responder	4	46
Self-selected GROUP	EMR	1	47
	EMT	1	48
	EMT-P	1	49
	Medical first responder	1	50

As with the stakeholder interviews, a semi-structured interview process was used, with a core set of questions that aligned with the objectives of the review (see Appendix VII). Three consultants conducted all 50 of the interviews over the phone. Notes were taken by the interviewers. Audio recordings were made of the interviews unless participants objected.

- **On-site observations of PSAPs and dispatch centres** to gain an understanding of current EMS dispatch processes, equipment functionality, and perspectives on the benefits and challenges that have occurred as a result of the transition. These observations were carried out by members of the QAC and included observing the call-takers/dispatchers at work as well as meeting with individual(s) in leadership positions at the centre.
- **Review of current administrative EMS data and performance indicators** to evaluate the availability, accuracy, and adequacy of EMS data and metrics, with consideration given to how the data and indicators support operational decision-making as well as quality and safety management.

- **Documentation review** (in addition to the systematic review of the literature) included those supplied by interviewees as well as other documents acquired through Internet searches. Documents were collected from AH, AHS, the ACP, Health Sciences Association of Alberta, Canadian Patient Safety Institute, Paramedic Chiefs of Canada, and from other relevant organizations in Alberta, other Canadian provinces, and beyond.
- **Interviews with other EMS organizations** to gather information about EMS leading practices. Individuals from different EMS organizations – nationally and internationally – were interviewed by phone. Organizations were selected based on recommendations from experts in the EMS field. Semi-structured questions that aligned with the objectives of the review were used to guide the interview and notes of the interview were taken. Later, a summary of the key findings was sent to the interviewees for verification.
- **A systematic review of the healthcare literature** (including grey literature) was conducted to gather evidence for effective strategies for EMS operations (e.g., governance, dispatch, integrated fire/EMS, rural and remote operations, collection and use of EMS data).

The literature review focused on (1) quality indicators and performance measures, (2) EMS system components (e.g., environment, equipment, personnel), (3) specific aspects of EMS care, and (4) EMS system safety. A detailed description of the methods used for the literature review is included in Appendix V.

Analytical approach

- **Semi-structured interviews with key stakeholders**

A thematic analysis using qualitative research methods was undertaken to systematically analyze the information from the interviews.

Forty-seven interviews of key stakeholders were conducted. The data were integrated into Excel spreadsheets and then analyzed. One reviewer coded and analyzed question two: ‘What effects have occurred as a result of the transition of funding and governance for ground ambulance from municipalities to AHS?’ Data were first grouped into common ideas and thoughts, then further categorized into identifying codes and finally through the use of an ‘axial’ or relational coding process, combined into common emerging themes.

Interviews were first sorted into respondent organizations: first responder, AHS, PSAP, municipality, association, government agency, or regulatory body. Primary analysis of question two resulted in the identification of 63 possible data categories. Secondary analysis yielded 25 categories, which were further refined to 12 primary response codes. To establish inter-rater reliability, responses provided for question three were coded by two separate reviewers concurrently, using the codes identified from question two. The two reviewers then compared notes, further defined the codes, consolidated two of the codes, and identified a new code. These 10 identified codes were subsequently used to help frame the response coding for the other questions, with the reviewers being open to the possibility that other response codes could emerge from the analysis of the data. The 10 codes reflected the common ideas expressed by respondents.

1. **Funding and resources** – Responses related to funding, allocation of funding, purchasing, infrastructure, and/or resources required or purchased.
2. **Medical direction/oversight and patient care** – Responses related to patient care as they pertained to medical direction or oversight, medical control protocols, standardized medical care, and online medical control (OLMC). This code also included responses related to ambulance dispatching/deployment perceived to affect patient care.
3. **Quality assurance** – Responses related to quality or safety issues/incidents and activities related to those issues about EMS performance and patient care, EMS response times, data about EMS performance measures, patient-safety-related issues, electronic patient care reports and data collected and reported from ePCRs (electronic patient care records), and any EMS-related qualitative and/or quantitative data.
4. **EMS governance and administration** – Responses related to the AHS EMS Senior Operating Team, AHS EMS Leadership Council, zone or provincial reporting structures for AHS EMS, decision-making for AHS EMS, the role of stakeholder agencies and their relationship to AHS EMS leadership, 911 oversight, the role of EMS as health and/or public safety, and the influence of politics and political representatives on the governance and administration of EMS.
5. **EMS dispatch** – Responses related to EMS dispatch and or fire dispatch, including the dispatch model, best practices in dispatch, past and current practices in Alberta, dispatch operations for AHS EMS, computer assisted dispatch (CAD) systems and other technologies related to dispatch, and the advantages and disadvantages of a consolidated EMS dispatch system.
6. **EMS service delivery model** – Responses related to integration of services such as fire and EMS, deployment of ambulances and strategies to address deployment, air ambulance and the relationship to ground ambulance, mass casualty incidents, hospital wait times and issues related to the effect of hospital relationships with EMS.
7. **Impact of transition** – Responses related to the effect of EMS transition on the system today, which could include statements about the culture of EMS, information supporting the transition such as the Discovery Projects in the former Peace County and Palliser health regions, EMS policies or standard operating procedures, comments made about the degradation in service, and the overall EMS system as it was perceived to be or as at the time of interview.
8. **Human resources** – Responses related to staffing, hiring and resources associated with these, experience of staff including training and competency, supervision of staff and related issues such as staff attitudes and performance, and scope of practice for practitioners as defined by the regulatory body and applied by the employer.
9. **Rural EMS** – Responses related to rural emergency needs, rural geographic familiarization for responders and dispatchers, contracts for service provision in rural areas, First Nations and issues about response and coverage, and medical first responders including volunteers.
10. **Inter-facility transfers (IFTs)** – Responses related to any aspect of IFTs.

Further analysis of the data resulted in the emergence of four key themes: (1) data management, (2) EMS dispatch and communications, (3) medical first responders in rural settings, and (4) EMS delivery model (including IFTs). A fifth theme, medical direction and patient care, emerged only as a secondary theme because the frequency of responses related to this theme was low.

- **Open-ended questionnaire of municipalities, PSAPs/dispatch centres, and contracted EMS service providers**

Similar to the key stakeholder interviews, a thematic analysis was undertaken to systematically analyze the information from the questionnaires.

Questionnaires from these three groups were analyzed separately. The analyses of the municipality questionnaires and PSAP/dispatch centre questionnaires resulted in the emergence of the same four key themes found in the stakeholder interviews (data management, EMS dispatch and communications, medical first responders in rural settings, and EMS delivery model). The responses from the questionnaire from contracted EMS providers were much more targeted; the general themes emerging were ambulance coverage within contract service areas and the contract itself.

A total of 139 responses were received however five responses were received after the deadline and were not included in the analysis. A total of 134 questionnaires were analyzed (134/426; 31.5%), including 15 questionnaires from PSAPs/dispatch centres (15/28; 53.6%), 18 from contracted EMS service providers (18/41; 43.9%), and 101 from municipalities^v (101/357; 28.2%). For the municipality questionnaire, responses were received from a variety of positions, including chief administrative officer, assistant chief administrative officer, fire chief, reeve, mayor, deputy mayor, town manager, councillor, emergency manager, director, administrator, and board member.

- **Semi-structured phone interviews of EMS practitioners and medical first responders**

Fifty interviews were similarly analyzed for common themes and repetition of ideas, using qualitative research methods. The data were coded and analyzed as they were collected. While data was coded independently, emerging themes were frequently discussed. When a majority of the interviews were completed, the data and coding schemes were shared. The coding showed some variations based on different groups of people interviewed (e.g., rural versus urban perspectives) but key themes were remarkably consistent. In the final phase of the analysis, themes emerging from the interviews with frontline EMS practitioners and medical first responders were compared with those identified in the stakeholder interviews and questionnaires. While the themes were titled differently, it was found that the frontline EMS practitioner and medical first responder data could be easily connected to the broader themes generated through the stakeholder interviews and questionnaires.

- **On-site observations of PSAPs and dispatch centres**

Information gathered from these observations was analyzed using the five objectives that framed the review.

^v For the purposes of this report, our terminology of “municipality” refers to the geographic area of the municipality and all the cities, counties, towns, villages, summer villages, improvement districts, special areas, and Métis settlements within the area. Note that some ‘municipalities’

- **Review of current EMS administrative data and performance indicators**

Individuals from AH, AHS, and the University of Alberta's Centre for Excellence in Operations were interviewed. The interviews focused on obtaining information related to the current state of EMS data across the province. Questions were asked to determine (1) what data currently exist, (2) what data have been tracked over time, (3) what the limitations of the data are for analytical purposes (e.g., are the data consistently collected within and across providers, are there data standards for data collection across providers, is there a process to ensure that the standards are being met), and (4) for what purposes are the data used. In addition, internal and public documents obtained from AH, AHS, and the University of Alberta's Centre for Excellence in Operations regarding EMS data in Alberta were reviewed and analyzed.

Information gathered from these interviews and the documentation provided the basis for a meta-analysis of EMS data throughout the province. Subsequently, the QAC worked independently with a limited data set from AH's Alberta Ambulance Information Management System (AAIMS) data, which is the only provincial source of historical data, to help confirm and validate the meta-analysis. The limited data set included date and time stamps, provider and ambulance identifiers, and destination codes. The reliability and accuracy of data collected by individual EMS providers throughout the province were not independently validated.

In addition to the analysis of the EMS administrative data, AHS' EMS performance indicators were also reviewed. A comparison was made between AHS' indicators and those from a recognized national organization – the EMS Chiefs of Canada's *Data Dictionary*.³²

- **Documentation review**

Documents were reviewed while considering the five objectives that framed the review.

- **Interviews with other EMS organizations**

Information gathered from the semi-structured interviews were grouped into 12 descriptive categories: (1) PSAP, (2) dispatch centres, (3) dispatch services, (4) dispatch standardization, (5) personnel – education, (6) personnel – regulation, (7) paramedicine programs, (8) First Nations, (9) accreditation, (10) medical first responders, (11) IFTs, and (12) data. Two more categories were used to provide context on geography and population served.

Interviewees were asked to verify the information that had been grouped into the 12 descriptive categories.

- **A systematic review of the healthcare literature (including grey literature)**

Analysis was conducted by the University of Calgary's Ward of the 21st Century. A three-round process was used to select published studies for the report, with articles specifically sought that addressed four broad areas: (1) quality indicators and performance measures, (2) EMS system components (e.g., environment, equipment, personnel), (3) specific aspects of EMS care, and (4) EMS system safety. The first round of analysis included a broad title review and, where required, a review of the abstract by a reviewer. The second round consisted of a title and abstract review of the studies retained in round one by the project lead. The third round included a full text review of retained studies from round two by a reviewer. Articles were excluded if, after a full review of the text, they did not meet selection criteria or did not relate to the aspects of EMS under review.

Simple strategies were developed to extract data from the systematic review and individual studies. For the areas of specialization where there was a pre-existing and recent systematic review, findings of the review were summarized. For the areas where there was no systematic review, narrative summaries were provided to describe what was learned about the field.

Presentation of the findings

Findings from the review are presented in this report according to the methods used to collect the information. The following section includes a summary of the findings, based on the five objectives that framed the review.

The names of individuals invited to participate and whether or not they participated have been, and will be, kept confidential. No patient names or identifiers have been, nor will be, disclosed.

Development of recommendations and required actions

Recommendations for system-level improvements for the delivery of ground EMS in Alberta were developed. They are described in this report using the format of ‘issues, analysis, recommendations and required actions’.

FINDINGS

Before 2005 municipalities were responsible for providing emergency medical services (EMS) dispatch and operations. Funding came from municipalities (tax base), provincial government programs (e.g., seniors), federal government (First Nations) and user fees paid by the patient. The Government of Alberta had planned to transfer EMS from the municipalities to the regional health authorities in 2005, but the process was halted a month before the transition was to occur. As the municipalities had already altered their budgets based on this decision, the provincial government provided grant funding to the municipalities to cover some of the cost of providing EMS up to March 31, 2009. The exceptions to this were the Palliser and Peace Country Health Regions. They were to proceed with the transfer of governance and funding of ground ambulance service as pilot projects to regionalize EMS and align EMS with the health system. These pilots were called the ‘Discovery Projects’.

As of April 1, 2009 Alberta Health assumed the responsibility for governing and funding EMS in Alberta, and AHS became responsible for the provision of ground EMS.

While this change occurred in 2009, the groundwork began almost a decade earlier. Numerous committees and reviews studied and made recommendations on the EMS system in Alberta. To provide the historical backdrop necessary to understand current events, a chronology of key activities and changes in EMS legislation and governance in Alberta is outlined in Table 3.

Table 3: Chronology of key events regarding EMS in Alberta

Year	Month	Day	Event
1976			Alberta Medical Association Special Committee made recommendations for the development of the Provincial Ambulance Service for Alberta including a province-wide 24-hour ground ambulance system with air evacuation support, planned, organized, and coordinated at a provincial level.
1984	April	1	<i>Canada Health Act</i> received Royal Assent. The federal government became responsible for delivering health services to groups that fall under its jurisdiction, such as Aboriginal Peoples, the Canadian forces, veterans, and inmates in federal penitentiaries. Provincial governments became responsible for administering the public healthcare insurance plan in their own provinces.
			EMS practitioners were legislated to practise under the <i>Health Disciplines Act</i> .
1985			<i>Health Disciplines Act</i> was amended to include EMT-A and EMT-P. Minister of Health stated that ambulances were a municipal responsibility and the government would not impose standards and funding.
1987			A report by the Policy Advisory Committee on Hospitals and Medical Care, ‘New Dimensions in Emergency Health Services: an Alberta Solution’ was provided to the Minister of Health. This report had 41 recommendations covering legislation, jurisdiction, standards, personnel and training, communications, revenues and costs, inter-hospital and interprovincial transfers and air ambulance. <ul style="list-style-type: none"> ♦ <u>Recommendation 1</u>: That an <i>Emergency Health Services Act</i> be established, covering all aspects of ambulance services. ♦ <u>Recommendation 14</u>: That a provincial system of emergency medical protocols be established and maintained with the assistance of medical advisors.
1994	March	1	<i>Ambulance Services Act</i> was proclaimed
			<i>Regional Health Authorities Act</i> was enacted, which abolished nearly 200 existing local hospital and public health boards and replaced them with 17 regional health authorities.
2001			Review of ground ambulance services in Alberta conducted by an MLA review committee. <ul style="list-style-type: none"> ♦ <i>Recommendation: governance and funding of ground ambulance service be transferred from municipalities to health regions.</i>
2003	Dec.		The 17 regional health authorities in Alberta were reduced to nine geographically based health regions (Chinook, Palliser, Calgary, David Thompson, East Central, Capital, Aspen Regional, Peace Country, and Northern Lights) and three provincial entities (Alberta Mental Health Board, Alberta Alcohol and Drug Abuse Commission and Alberta Cancer Board).

Year	Month	Day	Event
2004	March		In the 2004/05 budget speech, the Government of Alberta announced transfer of governance and funding of ground EMS from municipalities to Alberta Health and Wellness (AHW), to be effective April 2005.
	June	22	AHW released the ‘Ground Ambulance Planning Guidelines: Transfer of Governance and Funding’, which outlined planning activities for the transition of EMS to the provincial health ministry, as well as principles to guide the transition.
2005	March		Planned transfer of EMS from municipalities to regional health authorities was halted except for the Palliser Health Region and Peace Country Health Region, which were to proceed with the transfer of governance and funding of ground ambulance service as ‘Discovery Projects’.
	June		Discovery Projects were initiated with the Palliser and Peace Country Health Regions.
2006	Jan.		Peace Country Health Region initiated its regional EMS system. Palliser Health Region included Oyen in its regional EMS system.
	March		The Ambulance Governance Advisory Council released its report to the Minister of AHW. The report assessed the progress of the Discovery Projects as of February 2006.
	Oct.		Report by consultants GDI Associates contracted by AHW to evaluate the success of the two Discovery Projects stated “It is the opinion of GDI Associates and the many stakeholders interviewed that EMS has finally found its rightful home within the health system.” Three of the key recommendations: 1. That the Discovery Projects in the Palliser and Peace Country health regions be considered a ‘success’ and that the discovery/pilot phase be terminated. 2. That a more robust evaluation plan be developed (with appropriate measures) to evaluate the impact of the two and any subsequent implementations. 3. That the regionalized ground ambulance services model is the right model for use in the province. This provides increased focus with patient care rather than the municipal services considerations (e.g., police, fire, and garbage collection) or private operator considerations (e.g., profit margins) driving the delivery of service.
2007			Provincial EMS Medical Directors Advisory Committee (PEMDAC) formed. Composed of provincial medical directors representing AHW, AHS, fire departments, STARS air ambulance, and the University of Alberta, the committee’s mandate is to provide recommendations on a provincial framework for medical direction of EMS in Alberta.
2008	May		AHW released ‘A Renewed Model for Patient- Centred and Coordinated EMS – Transition Handbook’. Key points included: ♦ The development of a contemporary, patient-centred, and coordinated EMS system that is aligned to the delivery of healthcare has been a recurring view and recommendation expressed in multiple studies and public consultation processes sponsored by AHW. ♦ In response to these recommendations, and the positive outcomes arising from the Discovery Projects, a provincial policy decision was made to transfer the governance and funding for ground EMS operations to Alberta Health Services on April 1, 2009.
2009	April	1	<i>Emergency Health Services Act</i> proclaimed, which stated: A regional health authority shall provide emergency health services in the health region in accordance with (a) this Act and the regulations, and (b) an emergency health services plan for the health region. AHS was established Ground ambulance services were transferred from municipalities to AHS
	Dec.	16	<i>Emergency Medical Aid Act</i> (current) Protection from action when rendering medical services or first aid assistance at an accident or other emergency.
2010	March		Minister of AHW put a hold on provincial EMS dispatch consolidation.
	Dec.	2	<i>Alberta Health Act</i> received royal assent – not proclaimed.
2012	March	16	HQCA review announced, titled ‘An independent review of the operations of ground emergency medical services (EMS) in Alberta’.

The changes that have occurred, since April 2009, in service provider divestment and consolidation of EMS dispatch are illustrated in Tables 4 and 5.

Table 4: Service provider divestments

Year	Month	Day	Service Provider Divestment	
			EMS Service Provider	Service Divested To
2009	April	1	City of Calgary EMS	AHS – Direct Delivery
			City of Edmonton EMS	AHS – Direct Delivery
			Parkland Ambulance Authority	AHS – Direct Delivery
			Flagstaff County EMS	AHS – Direct Delivery
			Camrose EMS	AHS – Direct Delivery
			Milk River	AHS – Direct Delivery
			Mackenzie County Emergency Services	AHS – Direct Delivery
	May	1	Medicare Ambulance	AHS – Direct Delivery
	June	1	Bon Accord/Gibbons Ambulance	AHS – Direct Delivery
	July	1	Wainwright Ambulance	AHS – Direct Delivery
			Big Stone Ambulance	AHS – Direct Delivery
August	1	Rainbow Lake Ambulance	AHS – Direct Delivery	
December	1	Nordegg (Clearwater County)	AHS – Direct Delivery	
2010	January	1	Interhospital Ambulance	AHS – Direct Delivery
	April	1	Mountain View Regional EMS	AHS – Direct Delivery
			Foothills Regional EMS	AHS – Direct Delivery
			Cochrane EMS	AHS – Direct Delivery
			Bashaw Ambulance	AHS – Direct Delivery
		15	Peace River Fire Department	AHS – Direct Delivery
	July	1	City of Airdrie EMS	AHS – Direct Delivery
	October	1	Crownest Pass EMS	AHS – Direct Delivery
Coaldale Fire Department			AHS – Direct Delivery	
December	1	Kneehill Ambulance Society	AHS – Direct Delivery	
2011	August	1	Rimbey EMS	Associated Ambulance
	December	1	Provost Ambulance Society	AHS – Direct Delivery
2012	January	1	Cardston EMS	AHS – Direct Delivery
	February	1	Chinook EMS	AHS – Direct Delivery
	April	1	Barrhead EMS	Associated Ambulance
			Canmore EMS	AHS – Direct Delivery
			Edson EMS (Western)	Associated Ambulance
			Elk Point EMS	Prairie EMS Ltd.
			Hinton EMS (Western)	Associated Ambulance
			Lakeside EMS	Associated Ambulance
			Specialty Medical Services	Associated Ambulance
			Westlock Ambulance	Associated Ambulance
	June	1	Fort McLeod EMS	AHS – Direct Delivery
September	1	Hanna EMS	AHS – Direct Delivery	
October	1	Lacombe EMS	AHS – Direct Delivery	

Table 5: Consolidation of EMS dispatch

Year	Month	Day	Dispatch Consolidation		
			Service	AHS Consolidated Centre	
2009	April	1	Leduc	SCES	
			Lacombe	Red Deer	
			Slave Lake	NCC	
			30	Grande Prairie	NCC
	June		30	Camrose	SCES
	July		31	High Level	NCC
	August		15	Medicare (Redwater)	SCES & NCC
			30	Swan Hills	NCC
			31	Parkland	SCES & NCC
	October		21	Kyotech (Westlock)	NCC
		29	Foothills Regional Banff Canmore Claresholm Crowsnest Pass Fort Macleod Kananaskis	SCC	
November		26	Mountain View	SCC	
2010	January		1	Inter-Hospital Ambulance Service (IHAS) IFT	CCC
	February		8	St. Albert	SCES
			26	Calgary Interfacility Transfer (IFT)	SCC
	March		2	Yellowhead (Hinton/Edson)	NCC
	November		15	Intercon Dispatch (Associated; Drayton/Breton/Evansburg)	NCC
December		7	CAD Go-Live at CCC		
			Edmonton IFT	CCC	
2011	March		22	Edmonton Metro	CCC
	September		15	St. Albert (SCES)	CCC
			05	Parkland (SCES)	CCC
	October		25	Hanna	SCC
2012	January		24	Flagstaff, Camrose (SCES)	CCC
	March		15	Beaver (SCES)	CCC
			22	Legal (SCES)	CCC
	April		01	Rocky Mountain House - portion	SCC
	May		24	Ft Saskatchewan (SCES)	CCC
	June		13	St Paul (SCES)	CCC
			28	City of Leduc (SCES)	CCC
August		23	Spruce Grove (SCES)	CCC	

SCES - Strathcona County Emergency Services

SCC - Alberta Health Services South Communication Centre

NCC - North Communication Centre

CCC - Alberta Health Services Central Communication Centre

Semi-structured interviews with key stakeholders

The detailed findings from the key stakeholder interviewees are contained in Appendix VII.

What follows is a high-level summary of the many perspectives, perceptions, and opinions expressed by the key stakeholders who were interviewed.

Some overarching messages about the impact of the transition included:

- EMS governance best fits under the provincial health ministry. The benefits of the transition cited include standardized equipment and protocols, practitioner training, and the consolidation of EMS dispatch services.
- Negative aspects to the transition were a now fractured system, a culture of mistrust, poor ambulance coverage in rural areas, and dissenting opinions about consolidation of EMS dispatch.
- Poor change management during the transition to AHS, ‘change fatigue’ due to ongoing organizational changes within AHS, poor communication, and a lack of engagement by AHS when dealing with key stakeholders.

An over-arching message heard throughout the interviews was that of poor change management during the transition to AHS, ‘change fatigue’ due to ongoing organizational changes within AHS, poor communication, and a lack of engagement by AHS when dealing with key stakeholders.

The analysis of the stakeholder interviews resulted in the emergence of four key themes:

- Data management
- EMS dispatch and communications
- Medical first responders in rural settings
- EMS delivery model (including inter-facility transfers)

A fifth theme was identified as ‘medical direction and patient care’; however, because there were not as many responses related to the topic in comparison to the key themes, it was considered secondary.

Data management

- There was considerable variability across the province in data collection, analysis, and reporting before the transition.
- The Alberta Ambulance Information Management System (AAIMS) is considered outdated and lacking usable data. Data are not submitted consistently or correctly by all users.
- Need for a single provincial EMS database.
- Many interviewees assert they are not getting the data they need from AHS and there are no patient outcome data available. Others stated that EMS performance data are being collected, with some data reported on the AHS website.
- Many anecdotal “horror stories” of poor response times were provided, but interviewees were unable to provide specific information or evidence to support these assertions.

- Interviewees were consistent in their opinions regarding EMS response times, suggesting the current evidence does not support rapid response times as an indicator of positive patient outcomes.

EMS dispatch and communications

- Consolidating EMS dispatch is seen to be an effective way to manage and allocate EMS resources; however, some interviewees felt that ambulance services in rural areas have been depleted and until this is resolved there will be resistance to dispatch consolidation.
- EMS dispatch needs to be adequately resourced in regards to equipment and technology (e.g., computer-assisted dispatch (CAD), global positioning system (GPS), and radios) for interoperability between EMS and other emergency response agencies such as fire and police departments.
- EMS dispatch consolidation was seen to have transitioned too quickly and was not well thought out.
- Some interviewees stated there is a need for local knowledge by dispatchers in order for EMS crews to locate addresses; this was countered by other interviewees claiming technology (e.g., GPS) and mapping can be used.
- Regional dispatch centres reported they are more efficient in dispatching ambulances within their own areas than a consolidated model.
- Removal of funding to the local PSAP centres when EMS dispatch transitioned to AHS has threatened the operational viability of some centres.
- The health minister's decision to put a halt to EMS dispatch consolidation was felt to be political interference in operational decision-making and was considered by some interviewees to be the result of political lobbying.

Rural medical first responders

- The terminology used to describe medical first responders is not well defined or standardized.
- Response by medical first responders was not considered in the transition plan.
- Response by medical first responders in rural settings is integral to the EMS response model but it is not supported financially or operationally by AHS.
- The concept of using medical first responders is supported by medical directors, but concerns exist with the current model regarding the lack of standards, absence of protocols, and minimal medical oversight.
- The sustainability of community medical first responders is threatened. It is difficult for volunteers and municipally funded medical first responders in fire departments to meet contract requirements and for staff and volunteers to meet training and certification requirements. Staff, in particular volunteers, are at risk of burnout.
- Communication challenges exist between EMS and allied response agencies such as police and fire because of a lack of connectivity and interoperability of the communication equipment.

EMS delivery model

- AHS EMS service contracts are inflexible. Examples include: the criteria in the contract required to maintain service levels, facilitate transfers, ensure certification of staff, respond out of the service area, and that no compensation is available when more resources are required.
- Opinions regarding an integrated fire/EMS service model were split.
- Some interviewees were of the opinion an integrated fire/EMS model is more expensive for AHS, while others identified that municipalities achieved financial and operational efficiencies with an integrated model.

As identified by the interviewees, an EMS delivery model needs to be:

- Patient-centric and patient-focused, and established on evidence-based practice.
- Comprehensive in nature and differentiated enough to address provincial and local needs (urban, rural, and remote) and include all modes of response and transport including air, ground, non-emergency, inter-facility transfers, and rural medical first response.
- Measureable and focused on patient outcomes.
- Inclusive of First Nations and Métis.
- Based in the healthcare system yet strategically aligned with allied emergency responders (fire and police).
- Predictive, in that by using data, resources within a changing environment can be best managed.
- Clearly defined and articulated to all stakeholders – the public, provincial communities, and municipalities including First Nations and Métis settlements.

Medical direction/oversight and patient care

Interviewees consistently attributed benefits to patient care as a result of the direction given by medical directors, the consistent province-wide medical control protocols, provincial online medical control, as well as direction and oversight from a medical director. Other comments included that EMS in Alberta is part of the patient care continuum now because it is under the governance of the provincial health ministry. Patient care was perceived to be better, but it was recognized that measuring patient outcomes is difficult.

Questionnaire to municipalities, PSAP centres, dispatch centres, and contracted EMS service providers

The detailed findings from the questionnaire results are presented in Appendix VII.

What follows is a high-level summary of the many perspectives, perceptions, and opinions expressed by the three different groups that were asked to respond to the questionnaires: municipalities, PSAP centres, dispatch centres, and contracted EMS service providers.

Municipalities

The impact of transition

There were mixed reviews from municipalities about the decision to move EMS from municipal governance and funding to the provincial health ministry. Several municipalities indicated they were unaware of any changes, or stated the transition resulted in no significant changes to EMS operations or funding in their municipalities.

Benefits resulting from the transition included:

- Integration into the healthcare system resulting in stability and continuity of patient care.
- More support and better coordination at the scene of an accident.
- Provincial funding of EMS and the resulting ability of municipalities to reallocate funds previously designated for EMS or provide some funding relief for taxpayers.

Criticisms of the transition included:

- EMS was best left to local governance as this was all part of community-based public safety, and municipalities were better able to coordinate EMS, fire, and community/volunteer-based first response services more cost effectively and efficiently.
- Some municipalities deem the AHS contract negotiation process to be lengthy, restrictive, and challenging to meet.
- Perceptions that ambulances are responding from greater distances, communities are being left without local coverage, there are fewer ambulances in an area, and rural communities that previously had advanced life support (ALS) now have basic life support (BLS) services.
- “Net negative funding”, a term coined by one questionnaire respondent, refers to the perceived need of municipalities to fund response by local medical first responders to ensure a community is not left without emergency medical response when an ambulance is not in the area to respond. The municipality therefore runs a funding deficit that is not compensated for by AHS.

Data management

While some municipalities did not comment on the data section of the questionnaire or considered it not applicable to their community, the key issues identified from those that did respond include:

- Difficulty accessing performance measures from AHS.
- The variability that still exists in EMS data collection and data management by municipalities across the province.
- No standards for response times in the AHS service delivery contracts for EMS.
- The absence of data or performance indicators to support claims of longer response times since the transition.

EMS dispatch and communications

Municipalities gave mixed reviews of the impact of the transition of EMS and consolidation of EMS dispatch. A number of municipalities stated that dispatching of EMS needs to be managed locally by

those who have local knowledge and the ability to coordinate emergency response between police, ambulance, and fire/medical first response.

Key issues brought forward regarding dispatch included:

- The halt in the consolidation of EMS dispatch has created unique problems, particularly that of poor communication between the dispatch centres.
- Perceptions that where EMS dispatch has been consolidated the communication between EMS and fire occurs through a time-consuming process of relaying information between the two dispatch centres. This makes it difficult to coordinate EMS and medical first responders.
- Radio interoperability among all emergency services is required. While the Alberta First Responder Radio Communications System (AFRRCS) project was cited as a positive initiative, respondents felt it needs to be implemented quickly.
- Perceptions that dispatch consolidation has affected response times.
- Perceptions that rural communities have fewer ambulances than urban centres.
- Perceptions that rural communities have BLS providers compared to urban centres that have ALS providers.
- Increased response times due to ambulances responding from other communities with crews who are unfamiliar with the local geography.
- The need to have revenue from 911 fees charged by cellular phone companies go to PSAPs, as it does for 911 fees charged on landlines.
- Inter-facility transfers drain community resources by taking emergency response units out of a community for a non-emergency transfer, leaving the community without emergency ambulance coverage.

Benefits resulting from the consolidation of dispatch were also cited, including better use of resources and using the closest ambulance in a borderless system. Some respondents also stated that the technology being used, such as GPS and mapping, provides a better understanding of geography for dispatchers and EMS crews when responding to calls in unfamiliar areas.

Rural medical first responders

Key points made by municipalities related to rural medical first response include:

- The role of a medical first responder within EMS was not defined nor acknowledged in the transition.
- Dispatching of medical first responders and EMS is not simultaneous.
- Radio interoperability does not exist between emergency response agencies (i.e., EMS, fire, and police).
- Municipalities are bearing the cost of first responders for calls that are medical and are not being compensated.
- Medical first responders require standardized medical emergency training and medical oversight to ensure consistent patient care is provided.

- Perceptions that AHS EMS relies on local medical first responders while waiting for an ambulance if it is being deployed from another community.

EMS delivery model

Key points identified from the municipalities' questionnaire responses include:

- Reduced ambulance coverage because of increased inter-hospital transfers and system status management that removes an ambulance from its base community. (System status management refers to sharing resources and balancing needs and services across jurisdictions in a borderless system.)
- Volunteer services delivering EMS have difficulty meeting the AHS contract requirements and may be challenged to sustain this type of service. The main difficulty for volunteers was stated as maintaining the level of training required to do the job, as continuing education and re-certifications are often done on the volunteer's own time and without pay.
- Perception that there is a decreased level of service in rural communities from ALS to BLS ambulances.
- Lack of AHS long-term vision and goals for EMS.
- Poor communication and engagement with communities by AHS EMS management.
- Resource planning is based on metro/urban resource models and doesn't consider rural or remote EMS needs.
- The role of medical first responders and the issue of their funding/support needs to be addressed.
- A climate of mistrust exists between AHS and integrated fire/EMS services, with one respondent stating this was due to concerns such as cost, training, and supplies.
- There is weak support for an integrated fire/EMS model from municipalities that do not have this operational model. However, municipalities that currently have an integrated fire/EMS system said financial and operational efficiencies can be gained with an integrated fire/EMS model.
- There is a need for a well-defined, well-resourced, and provincially focused inter-facility patient transfer model.

Municipalities that are satisfied with the transition of EMS to AHS gave reasons such as improved flow of patient care, as well as being relieved of the challenges of funding ambulances and administering EMS. A borderless system was seen as more efficient in that there was "better utilization of resources across the region" and "increased transfer efficiencies by reducing 'empty' return trips".

Medical direction/oversight and patient care

The questionnaire responses suggest that the implementation of Emergency Medical Dispatch Protocols and medical direction to determine the level of response to the emergency has resulted in consistent and effective dispatching of ambulances.

It was also stated that EMS medical care in rural areas is different from (and less than) care in urban areas in regards to response times and level of training (i.e., a minimum of BLS for rural communities and ALS in urban centres).

PSAP and dispatch centres

Key points identified by the PSAP and dispatch centre respondents were as follows:

- PSAP centres commented that communication with AHS EMS was poor, municipalities were funding medical first responders, and there was decreased ambulance coverage in rural areas.
- Many respondents stated the alignment of EMS with the provincial health system makes sense, but that EMS still needs to be part of public safety. Other comments included the benefits of system status management and the ability to deploy the closest ambulance, as well as the centralized systemic model that allows for future planning and growth without the bias or influence of regional interests.

Data management

- There is a challenge in comparing data between service providers because data are not submitted consistently or correctly into AAIMS.
- AAIMS may be a solution for EMS data management, but currently it is ineffective. AAIMS data are incomplete due to poor data submission compliance and there are insufficient checks and edits to ensure accuracy of data. This means that accurate statistical data to support operational decision-making are not available.
- There are no data or indicators to support or refute the perception that response times have increased in rural municipalities.

EMS dispatch and communications

- For those centres that provide PSAP and dispatch functions, the financial viability of the PSAP centres is at risk if funding for EMS dispatch is removed. EMS dispatch accounts for the majority of the workload for these PSAP centres.
- Perceptions that dispatch times have increased resulting in delays in response.

Medical first responders in a rural setting

- Perceptions that there is decreased ambulance coverage in rural and remote areas of the province and that increased use of medical first responders is required to fill the time gap caused by delayed response from ambulances farther away.
- The AHS EMS contract needs to reflect the existence of an integrated fire/EMS model.
- Improved radio interoperability is required for medical first responders.

EMS delivery model

- Responses from the questionnaire suggest the AHS transition plan was good in theory but the perception of respondents is that the anticipated efficiencies have not materialized and there continue to be delays in dispatching ambulances and an increase in EMS response times around the province.
- Those EMS providers who work on private industrial sites need to be considered in a provincial EMS model.

Medical direction/oversight and patient care

There were only a few responses related to patient care submitted by PSAP and dispatch centres.

Contracted service providers

Whereas four key themes (data management, dispatch/communications, rural medical first response, and EMS service delivery model) emerged from the analysis of stakeholder interviews and PSAP questionnaires, the general themes emerging from the analysis of the contracted service provider responses were ambulance coverage within contract service areas and the contract itself.

Ambulance coverage

- EMS hand-off times in the hospital are acceptable in the rural service areas but are longer in urban centres.
- Perceptions that there is decreased availability of ambulances in the service area, which leads to longer response times and use of medical first responders. Some municipalities suggest this means they are subsidizing EMS by funding medical first response in their communities when an ambulance isn't immediately available.
- Inter-facility transfers were felt to be an inappropriate deployment of an ambulance because it reduces the EMS resources in the service area and is difficult for the contracted service provider to manage.
- Perception that dispatching an ambulance is taking longer, thereby delaying response.
- Overwhelming support for a more regionalized EMS dispatch model instead of a provincially consolidated model, because municipalities would have more control over the dispatching of local ambulances.
- In a regionalized EMS dispatch model, dispatchers would have the local knowledge they believe is required for EMS crews to find a patient's location accurately and get to the patient quickly.

Service contract

- The current AHS contract does not reflect actual resource requirements because it does not compensate for the added resources (staff and ambulances) that have been needed to handle inter-facility transfers out of the contract provider's service area and the use of medical first responders.
- The contract needs to reflect the role of medical first responders and address the issue of their funding and support.
- Urban, rural, and remote areas need to be defined, with service expectations for these to then be determined.
- The funding defined in the service contract is generally considered inadequate to cover expenses and fails to consider the need for medical first responders within rural and remote communities where ambulance response times may be long.

Semi-structured phone interviews with EMS practitioners and medical first responders

Fifty semi-structured telephone interviews were conducted with EMS practitioners (EMRs, EMTs, EMT-Ps) and medical first responders from urban, rural, and remote locations across Alberta. The interviews were intended to elicit frontline perspectives about the effects on the quality and safety of patient care of transitioning EMS services to AHS. The interviews represent a broad range of perspectives rather than a provincially representative point of view.

What follows is a high-level summary of the many perspectives, perceptions, and opinions expressed by those interviewed (detailed findings are included in Appendix VIII).

Benefits of transition to AHS

Most interviewees said an improved ability to provide high-quality and consistent patient care across the province was a key benefit of the transition to AHS. In particular, they valued:

- Province-wide medical care protocols (MCPs), which now allow for consistent EMS care throughout the province.
- The availability of online medical consultation 24 hours a day, seven days a week and the fact that the medical directors know the MCPs and EMS practitioner's scope of practice.
- Innovations in advanced care (i.e., the Vital Heart Study) and the expanded use of paramedics in healthcare services such as community paramedicine.
- New, better, and standardized equipment and supplies that are almost universal across the province.

Benefits to EMS practitioners, including equalized and higher salaries, job portability, and training, were also noted as important.

The transition process: communication and relationships with other EMS stakeholders

Interviewees commented specifically on communication and consultation with key stakeholders. This included communication issues related to the transition, such as the lack of clarity, consistency, and relevance of communication from AHS. The management of the change process was perceived to be inadequate, with an autocratic change management style. Interviewees commented on a general lack of communication, slow responses to questions or requests, and mixed or contradictory messages. There were specific concerns regarding the lack of consultation with municipalities and communities about their needs and current ways of delivering service, as well as the lack of consultation between AHS and contracted services or employees. Others said the transition process was satisfactory and acknowledged that some confusion and misunderstanding was to be expected. Some wondered what the role of fire services will be in relation to EMS in the coming years.

Interviewees also commented on the relationships between medical first responders and EMS. The impact of the transition on these relationships appears to be related to the extent of the change to previous arrangements between fire and EMS. Where fire and EMS continued as separate services, little impact was reported. Several interviewees thought that tension between the services developed when EMS

personnel were separated from fire services and moved to AHS during the transition. Those from large urban centres noted little change in relationships between fire and EMS, and in some instances respondents reported that relationships improved.

Impact on service delivery

Interviewees described a variety of issues related to EMS service delivery. Some key points include:

- **Dispatch** – Across the province there is a patchwork of EMS dispatching systems including consolidated dispatch centres and numerous local and municipal dispatching services. Further complicating this, some centres dispatch all emergency services (police, fire, and EMS) while other centres dispatch only one or two. Concerns about consolidated dispatch centred on the use of dispatchers who lack medical training, practical experience, and local geographical knowledge. Other concerns related to the dispatch model included the coexistence of consolidated and non-consolidated dispatch, separate dispatch of fire and EMS, and the different radio and telecommunication systems in use for EMS throughout the province, some of which are incompatible.
- **Deployment** – Several issues related to deployment of ambulances were identified including system status management (sometimes referred to as ‘flexing’ by interviewees) and sending the closest ambulance to a call, leaving a community with a reduced level of service; fewer ambulances as a result of transition and long hand-off times in urban emergency rooms; staff shortages and high turnover rates; downgrading of services from ALS to BLS in some communities; and increased call volumes for volunteer fire services when their local ambulances are moving patients to larger centres or are taking longer to respond because they have been positioned farther away as part of the province’s system status management.
- **An integrated model** – A number of interviewees talked about the benefits of an integrated fire/EMS model. While some interviewees didn’t support this integrated approach, those who had worked in it were strong advocates for its value. This model was noted to have worked very successfully in some urban centres. Reasons for supporting the model cited by interviewees included that it is more cost effective for the municipality (both in infrastructure and emergency response), provides better client service, and enhances the quality of work life.
- **Data pertaining to service delivery** – While some interviewees said they did not have time to review EMS data, many more spoke about the value of data for assessing performance, planning services, and being accountable to municipalities. They spoke primarily about ‘chute times’ and response times but mentioned other forms of data as well. Access to EMS data varied but the number of respondents not having the desired access outnumbered those who did; a pattern was noted in which front line providers recalled receiving regular reports of response times and related data prior to the transition to AHS, but such reports were sparse or absent afterward.
- **Perceived impacts on patient safety and quality of care** – Interviewees expressed mixed opinions about whether patient safety and quality of care have suffered since the transition. As noted above, many spoke of improved quality of care arising from the medical care protocols and other factors. While interviewees had much to say about the impact of the transition to AHS, only a handful stated they thought the quality of patient care had deteriorated. Many more, however, speculated that

patient care is potentially compromised by longer response times resulting from system status management and fewer ambulances.

Impact on frontline EMS workers

As mentioned previously, interviewees appreciated online medical protocols and consultations, increased scope of practice, and new equipment. Yet, they also described frozen wages and loss of benefits in some areas; high rates of staff turnover; difficult work schedules in some rural areas; intense workloads, particularly in urban areas; safety issues (i.e., police not securing a volatile scene prior to EMS entering); and poor morale in some locations.

While a number of issues were raised, many interviewees acknowledged that any change creates some degree of turmoil; they noted progress has been made and expressed optimism for the future of EMS in Alberta.

On-site observations of PSAP and dispatch centres

The QAC made on-site visits to some of the PSAP and dispatch centres in the province to gain an understanding of current EMS dispatch processes, equipment functionality, and perspectives on the benefits and challenges that have occurred as a result of the transition. These visits were another method of gathering information from the PSAP and dispatch centres. While much of the information that had been gathered by the questionnaires was confirmed during the visits, on-site observations also yielded additional, complementary information.

Considerable differences were noted between the centres in several areas:

- **Function of the centre** – The two dispatch centres that are operated by AHS – North Communication Centre (NCC) in Peace River and Central Communication Centre (CCC) in Edmonton – only dispatch EMS. This means that the staff, aided by the Medical Priority Dispatch System (MPDS), take the required information from the caller, deploy an ambulance, and provide the caller with pre-arrival instructions. Similar to RCMP dispatch centres that do not answer the 911 calls, but only dispatch RCMP officers.

All the other observed centres have combined PSAP and dispatching functions; in these centres, the 911 calls are answered, information is gathered and entered into the dispatch system, ambulances and crews are deployed and pre-arrival instructions are given to the caller. Along with EMS, these combined PSAP and dispatch centres dispatch other public safety agencies (fire and sometimes police). For the dispatch centres that dispatch all three public safety agencies, all but one centre have dedicated police dispatchers, the reason being that the EMS and fire dispatchers are not given access to the police dispatch information system.

- **Governance and reporting structure** – Some centres, especially those that were part of an integrated fire/EMS system, are fire based, meaning they report to the fire chief. In contrast, other centres are governed by an operational leader within the municipal organizational structure. In AHS EMS dispatch centres report through the AHS EMS organizational structure.
- **Geography** – The areas served by these centres also varies significantly. Centres that dispatch emergency services within their municipal boundaries only have substantially smaller geographic

areas. Centres that also have contracts to dispatch fire in other areas of the province, outside of their local municipality, may cover a large geographic area, for example, three fire dispatch centres dispatch for a combined area of 285,000km², almost half of Alberta's 661,848 km².

- **Staff** – Differences exist in the certification held by dispatchers. In some centres staff are trained and certified as dispatchers for a specific agency (EMS, fire, or police). In other centres they are trained and certified for both fire and EMS, and rarely are staff trained and certified for all three.
- **Equipment** – There are many differences in the equipment used. Only Calgary and Edmonton have access to Regional Emergency Patient Access and Coordination (REPAC), which provides access to real-time data on emergency department wait times, and is used by dispatchers to direct ambulances to the most appropriate hospital. In addition, not all centres use automatic vehicle location (AVLs); the centres that do not, cannot 'see' on a computer screen in real time the location of their ambulances and rely on other mechanisms to track their ambulances. Another equipment difference is the use of mobile data terminals (MDTs); all the AHS EMS dispatch centres and some of the contracted EMS dispatch centres have MDTs. Those without MDTs must rely on verbal communication with AHS EMS dispatch centres.
- **Dispatching medical first responders** – Some centres listen in on the 911 call once it has been transferred to the AHS EMS dispatch centre, other centres pre-alert or dispatch fire immediately when they receive a 911 call requesting an ambulance, some centres become aware that the fire department is required as a medical first responder by an MDT, while other centres wait to be notified by phone from AHS EMS dispatch. These different processes contribute to wide variability in the time periods between dispatching EMS and medical first response. As well, differences exist within individual fire departments for medical first response, predominantly in rural and remote areas, based on the day of week or time of day of medical calls. This variability is difficult to manage, especially because it usually requires manual processes for dispatchers. There are also significant differences in the types of calls where a medical first response is dispatched; in one city the fire department does not respond to medical emergencies unless specifically requested by an EMS crew (such as to assist with lifting a heavy patient), in some municipalities the fire department is dispatched to all medical emergency calls, while in other municipalities the fire department attends only some of the calls. This variability exists because the medical first response standards for fire departments are set by the individual municipalities.

There are also significant differences in the types of calls where a medical first responder is dispatched; this variability exists because the medical first response standards for fire departments are set by the individual municipalities.

- **Communication** – The degree of radio interoperability varies across the centres, as do the mechanisms to deal with this variability. Some dispatch centres routinely use cross-patching and are satisfied with this as a mechanism to allow direct communication between EMS crews and other public safety agencies; other dispatch centres state they never cross-patch; while some reported cross-patching occasionally. Those centres that rarely or never cross-patch cited a lack of spare channels and the inability of dispatchers to monitor both active talk groups as reasons for avoiding this practice.

- **Quality and safety resources** – Some dispatch centres stated they had staff dedicated to quality and safety activities, such as auditing to determine compliance with the Medical Priority Dispatch System (MPDS). In centres without a dedicated person, auditing and other quality and safety activities were done by staff when workload permitted. The result is that there are differences across the centres in the extent of quality and safety activities that are undertaken. Centres with dedicated resources are able to provide regular, individualized feedback to their staff on compliance with the protocols. Graphs and quality improvement information is posted in one centre for all staff to see. One dispatch centre, however, admitted to not performing the number of audits that are required by contract.
- **Accreditation** – Another indicator of the focus on quality and safety is accreditation. Some centres displayed their accreditation certificates, while other centres stated they had not participated in an accreditation process. Of those accredited, different accrediting organizations were used.

One of the goals of the consolidation of EMS dispatch is to establish a ‘borderless’ EMS system which “allows EMS resources to be called in from neighbouring communities when required and also ensures the closest ambulance is sent to emergency calls. Previously, ambulances were restricted as to where they could respond based on municipal borders.”³³

The QAC observed the process of call-taking and dispatching while at the PSAP and dispatch centres. One problem noted was the time-consuming and manual dispatch process that was required when ambulances beyond a dispatch centre’s ‘border’ had to be dispatched to a call. Because EMS dispatch has not been completely consolidated under AHS, AHS is not able to ‘see’ the current location of all the ambulances in the province. To deal with this issue, ‘rules’ have been put into the CAD system to help AHS dispatchers identify when an ambulance in another community may be closer to respond to an emergency call. When this happens, an AHS dispatcher is required to place a call to a dispatcher at another centre to inquire if the ambulance is indeed in the community and available to respond. Because this process requires additional steps, it takes substantially longer to dispatch an ambulance.

There are areas of the province that are receiving EMS that is not direct delivery or contracted by AHS (e.g., some First Nations communities and private industrial sites). Ambulances in these areas would not respond to a medical emergency outside of their designated area, even if they were the closest available ambulance.

Deploying an ambulance to a location requires reliable and accurate location identification (addresses) and detailed maps. One of the issues that AHS dispatch needed to address early on was that there was no single source of mapping for the province.

The QAC’s on-site visits also provided the staff in the PSAP and dispatch centres an opportunity to share their views on the opportunities and challenges with the current EMS system. While most issues had already been identified in the questionnaire, the concern about radio interoperability, and in particular AFRRCS (Alberta First Responder Radio Communication System), was noted during the visits. Some centres expressed frustration with AFRRCS, stating that implementation has been delayed. Others were also doubtful that AFRRCS would address the radio interoperability problem in Alberta. Many speculated that some agencies, in particular fire departments in smaller municipalities that are volunteer based or rely

on fundraising to pay for operations, will opt out of AFRRCS because participation is voluntary and there is a cost (i.e., buying the radios), and thus the ability of AFRRCS to connect all first responder agencies in the province will be limited. Others stated that AFRRCS will only support voice and not data transmission, and thus the system will not address all the needs of EMS communications.

Deploying an ambulance to a location requires reliable and accurate location identification (addresses) and detailed maps. One of the issues that AHS dispatch needed to address early on was that there was no single source of mapping for the province. By investing significant time and resources, and working with various stakeholders to collect and integrate the information, AHS has created and uses, within their CAD system, the single most comprehensive map of the province.

Another opportunity raised during the PSAP and dispatch centre observations concerns the system for inter-facility transfers (IFTs). Currently, different resources are used for IFTs in the province. For example, only Edmonton and Calgary have ambulances and EMS crews dedicated to IFTs. Elsewhere in the province IFTs are done by the same ambulances and crews handling emergency calls. In addition, some areas have begun to use non-ambulance transport (NAT) units, when medically appropriate, to transport stable patients, thus freeing up an ambulance and EMS crew for emergency calls. AHS has developed a ‘Transfer Matrix’ to assist in deciding the appropriate mode for an IFT; however, the matrix has not been fully implemented and not everybody is aware of it.

The process of requesting an IFT also varies. The two EMS dispatch centres owned and directly operated by AHS (NCC in Peace River and the CCC in Edmonton) use an on-line process; staff at the requesting location initiate an IFT through AHS’ internal web, which links and populates the electronic request with information in the patient care information system. However, a different process is used at the AHS EMS dispatch centre in Calgary (the SCC). Because the SCC is contracted and not directly operated by AHS, the IT firewalls and privacy considerations have prevented the use of a similar online system. Currently, at the SCC and in the remainder of the province, IFTs are requested by phone or fax.

During the on-site visits, it was learned that AHS has implemented the first Internet protocol (IP)-based phone solution in public safety in Canada. This means that once the 911 system is upgraded by the telecommunications provider, PSAP centres will be able to receive 911 requests by other methods such as texting.

Review of EMS data

Across the province, EMS data exist in numerous EMS dispatch centres and within data systems owned by the various EMS providers. Because current EMS data are collected by multiple providers using different processes, without provincially enforced standards or guidelines, each data set has its own format and quality issues. There are two provincial EMS data sets, one administered by AH and the other by AHS.

Alberta Health data

AH collects EMS data through its Alberta Ambulance Information Management System (AAIMS). AAIMS is a web-based application that has been collecting data from EMS providers since 2005. This was phased in over several years. The initial launch involved the collection of ambulance licensing and vehicle inspection data but limited patient care record (PCR) data. The data are submitted to AAIMS via

an online function or a batch submission process. AAIMS comprises two sources of EMS data that are submitted by EMS providers: (1) EMS dispatch data such as time and location of calls and (2) PCR data such as patient demographics and EMS assessment and treatment data. The data elements that are collected within AAIMS are included in Appendix IX.

Although AAIMS collects a specified set of data elements from most EMS events, there are considerable limitations to the data. Based on information gathered from stakeholders, documentation provided by AH,^{34,35,36,37,38} and analysis using a limited data set from AAIMS, the following issues were noted:

- Compliance with reporting data to AAIMS has been a challenge because of providers' differing interpretations of which data fields are optional and which are compulsory. To date, AH has not focused on the enforcement of data standards and as a result the data are inconsistent.
- Although AAIMS includes checks and rules to flag or reject errors, they are insufficient to ensure accuracy of PCR data. For example, data fields are incomplete or contain incorrect information. The data submitted by each individual provider are accepted 'as is' into the AIMSS database.
- AAIMS event data are limited to 'traditional ambulance calls' (when two registered practitioners staffing an ambulance respond) and do not include EMS data for single-person response units, bicycle response, clinics, or service provided on private industrial sites (i.e., under occupation health and safety requirements).
- Data that are collected can address some EMS operational issues, such as ambulance mileage and maintenance, but for the most part they are inadequate for quality management; limited patient care data are collected that would enable EMS clinical processes and patient outcomes to be measured.

Alberta Health Services data

Based on information gathered from stakeholders and documentation provided by AHS,^{39,40,41,42,43,44,45,46,47,48,49} the QAC reviewed the current state of EMS data collected by AHS.

Before the transition of EMS to AHS, EMS dispatch data were stored in more than 30 different systems throughout Alberta, and ranged from sophisticated computer-aided dispatch (CAD) systems to basic paper operations. In most instances, the data sets were incompatible with one another and the quality of the information was questionable (i.e., data collection and recording standards were not universally applied). During the transition, providers were required to submit monthly activity reports to AHS. There were issues with improper calculations and compliance – meaning data were not being submitted 100 per cent of the time. Since the transition of EMS to AHS and the partial consolidation of EMS dispatch, AHS has worked with contracted dispatch centres to define common data fields; however, the quality of the data is still dependent on the systems used for data collection.

In the current environment, the quality and usefulness of AHS' EMS dispatch information varies greatly. Some of the electronic CAD data are detailed enough for basic calculations (e.g., means and averages of time intervals), but there are still data quality issues. CAD data elements may be available only in aggregated tables or counts. Currently, 20 to 30 per cent of the EMS dispatch information and data collected by AHS are not reliable or accurate enough to be used for operational decision-making.³⁹

All direct delivery providers use the AHS electronic patient care record system (ePCR) and AHS is developing an ePCR for air ambulance, with an expected rollout in 2013. However, contracted ground EMS providers are not integrated into the AHS ePCR. AHS does get some clinical information from

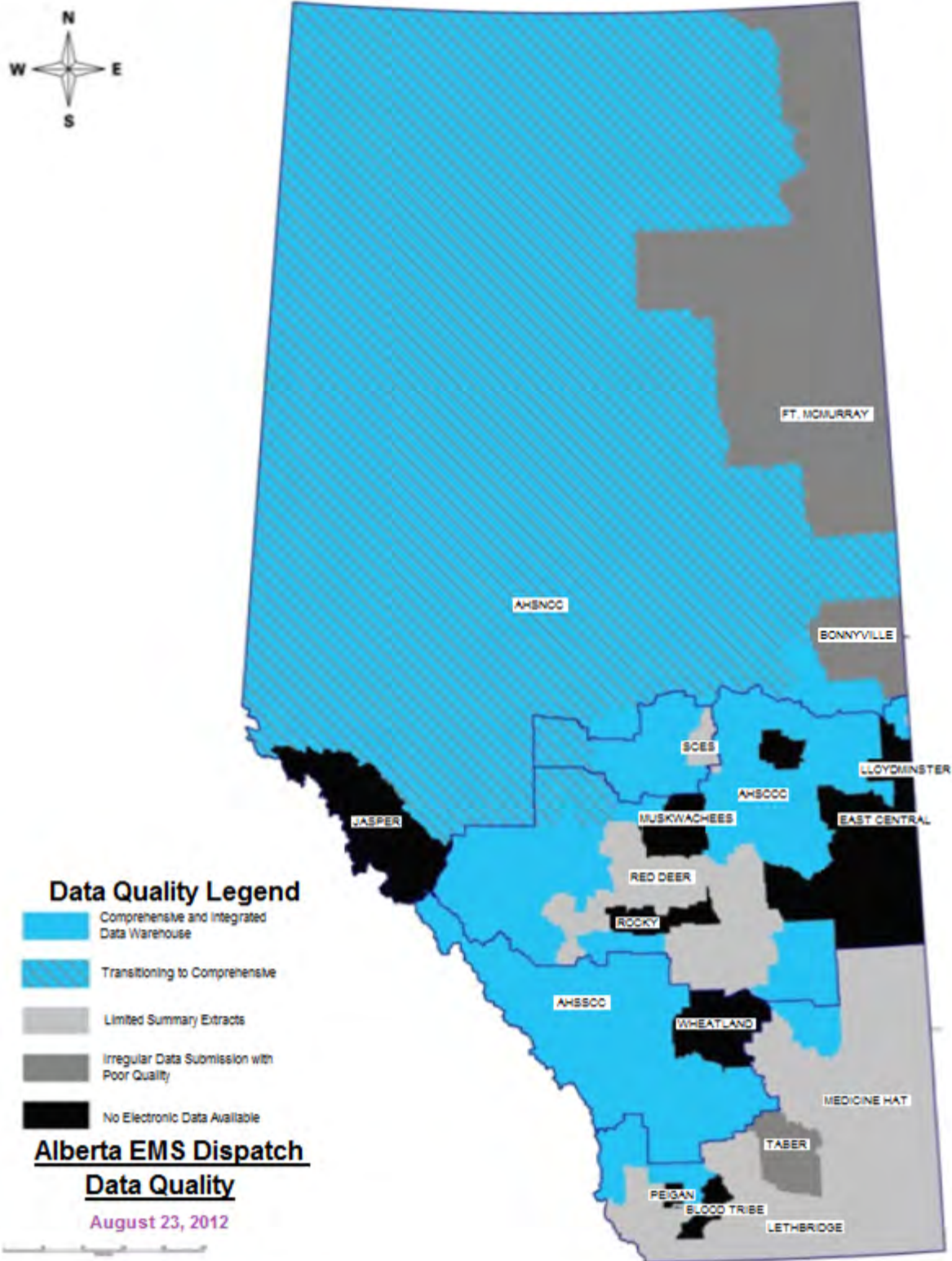
contracted service providers; however, this information has limited value for integration within the province-wide data set due to the lack of universally applied data reporting standards.

Overall, the data in the AHS direct delivery ePCR is considered to be satisfactory because the quality and accessibility of the data allows for the generation of reports. However, there are issues with missing data elements and ‘mandatory fields’ that are overridden by the practitioner completing the ePCR. The ePCR was implemented as a clinical documentation tool and not necessarily as a quality management tool that would support clinical audits, provide quality measures, or evaluate performance; thus, limitations in the use of the information beyond clinical documentation exist.

An EMS ‘data quality’ map produced by AHS; provides a telling pictorial summary of the data issue realities as AHS strives for more valid and reliable EMS data province-wide (see Figure 6). The solid blue areas indicate where comprehensive and integrated data exist. The data conform to a consistent provincial standard and include the most detailed ambulance tracking and event reporting available, which enables AHS to develop robust measures and calculations. Overall, the data permits regular reporting of EMS measures (which allows for the monitoring of trends and performance issues) for a good portion of the EMS activity in the province. In addition, expanded data capabilities regarding inter-facility transfer activity allow for better performance measurement. The blue-striped areas are in the process of transitioning to this level of data quality and regular submission, which should be complete by early 2013.

The light grey areas are locations where only limited summary data extracts are available. AHS receives event-record-level CAD extracts from the light grey areas; however these extracts are monthly (not real-time) and do not include all the data fields that the AHS CAD system contains (i.e., unit status, availability, automatic vehicle location, etc.). The darker grey areas are where there is either irregular data submission and/or poor data quality that do not conform to provincial data standards. There remain some locations (black areas) where no electronic data are available and, as a result, activity levels and system performance measurement in these areas are not well established. Although paper-based records exist in these locations, producing reports from these data is extremely resource intensive.

Figure 6: EMS data map



AHS stated it has improved the data quality issues by establishing definitions for required data elements for its direct delivery providers. AHS has also recognized the need for technology that supports EMS processes and data collection (e.g., GPS provides an ability to monitor and track ambulance movements and CAD systems capture important time fields), and is building its information system capabilities by linking CAD systems to ePCRs.

Relatively recently, AHS has begun to publish some EMS data on its website, providing the public a means to view this information. This includes EMS response times for a number of communities within the five AHS zones. The time spent at emergency departments transferring patients to the hospital (hand-over time) is also available online for Edmonton and Calgary.

Analysis of EMS data

The information gathered from AH and AHS provided an understanding of the limitations and availability of EMS data across the province. To determine if response times were affected by the transition of ground EMS operations from municipalities to AHS, a set of data elements from the AAIMS database were reviewed. As the focus was to examine data pre- and post-transition, AHS data could not be used effectively because they only contained post-transition information.

To further inform the analysis, EMS data issues were explored with the Centre for Excellence in Operations at the University of Alberta, which had extensive experience working with the former Calgary and Capital health regions and with AHS EMS on issues of EMS operations management. In their operations research, experts from the Centre for Excellence in Operations spent considerable time and resources ‘cleaning’ provincial EMS data, a process that involved, but was not limited to, standardizing the available data so formats were consistent within the different data sets; validating time stamps; using advanced forecasting methods to fill in missing data; and entering geographic coordinates for emergency calls where these data were not provided. Despite their considerable work, there remained limited historical data across the province. For much of Alberta there were either no EMS data, only summary information, or very limited information (data for a historical time period of a year or less). Valid EMS data spanning a historical time period of more than one year were available for only a few municipalities.

AAIMS data was analyzed by year, which confirmed the limited amount of historical EMS data. Table 6 shows the frequency of EMS events reported in AAIMS, by the year in which the service event took place. Service events were first captured in AAIMS starting in 2005; however, because of a phased approach, most provincial EMS events were not captured until 2009, the year of transitioning EMS operations from municipalities to AHS. As Table 6 illustrates, reporting in AAIMS has improved over time; however, it is still not a complete data set as there are approximately 400,000 EMS events per year in Alberta.³³ Therefore, historical comparisons pre- and post-transition on a province-wide basis is extremely difficult, if not impossible.

Table 6: Frequency of EMS events captured in AAIMS, by year

Year	Number of Events
2005	677
2006	24,580
2007	45,420
2008	38,006
2009	264,074
2010	261,748
2011	202,457

Note: ‘EMS events’ in AAIMS include ‘traditional ambulance calls’ (when two registered providers staffing an ambulance respond). It does not include single-person response units, bicycle response, clinics, or service provided on private industrial sites.

There are limited historical data (predating 2009) submitted by a small number of EMS providers (fewer than 20 per cent) that were reliable and could be analyzed. Each provider had relatively similar numbers of EMS events from 2007 to 2011 (compared to themselves, year over year). The count of EMS events across the years was consistent or similar enough to imply reliability. As for the other providers, the EMS count data that were available varied extensively across the time periods; some providers had only a single time period of data in the AAIMS data; others had data only from before or after 2009. Of note, for all providers the 2008 data was felt to be incomplete and unreliable.

Of this limited historical event data that was felt to be reliable, EMS response times were examined pre- and post-transition; considerable variability in the time intervals (i.e., mean, median, percentiles) was noted. The stakeholder consultations confirmed the QAC’s own examination of the data and time stamps and it was decided that a robust and sound examination of time intervals could not be accomplished. Therefore, no conclusions could be drawn regarding the effect of the transition of EMS from municipalities to AHS (e.g., response times, number of IFTs, call volumes, etc.) because of the poor quality and limited historical data.

Additionally, there are no data in AAIMS that could be used for thorough quality or safety management purposes. For example, no reports of patient outcomes (e.g., mortality, morbidity, or important functional states) can be generated. Although some process data (e.g., response times) are captured, they are of questionable validity.

The AHS *EMS Performance Measurement Framework*⁴⁰ and the *Alberta Health Services EMS KPI Report (June 12)*⁴¹ were compared to a national organization, the *EMS Chiefs of Canada’s Data Dictionary*.³² Only some of the measures defined in the *EMS Chiefs of Canada’s Data Dictionary* are included in the AHS framework.

Therefore, no conclusions could be drawn regarding the effect of the transition of EMS operations from municipalities to AHS because of the poor quality and limited historical data.

Documentation review

In addition to documents already referenced in this report, other documents were reviewed and summarized below.

Rural community first responders: RED.doc

‘RED’ is an acronym to denote “rural EMS direction”. The ‘RED.doc’ documents reviewed include presentations and supporting documents that were compiled by a consultant and a University of Calgary researcher for the ‘RED Committee of the Provincial Partnership to Support Community First Response’. The authors note this is a “growing network of rural mayors and emergency service providers, with representation of AUMA,^{vi} AAMDC,^{vii} [and] Fire Chiefs of Alberta and includes the input of health care resources, researchers and concerned citizens”.⁵⁰ A meeting in 2010 and a conference in 2011 were held to gather information on rural communities’ concerns about medical first response and the transition of EMS to AHS and to encourage collaboration between members. Key points from the RED.doc documents are presented below.

RED describes its call to action as “communicate, research, learn about, work together, and become politically active to recognize, protect and advance a Rural EMS Direction” (RED), which includes three key principles:

- “Ensure community capacity for first response in medical emergencies
- Ensure coordinated provincial 911 Network that includes rural call and dispatch centres
- Accountability of costs, services and outcomes”.⁵⁰

The “goal is to achieve consensus among all parties that a rural strategy is needed and the best way forward”.⁵¹

The documents describe some of the challenges faced by rural EMS as well as the issues of first response in rural areas primarily related to training and support. In “moving to a centralized integrated system”, AHS “failed to engage or understand the fundamentals of rural emergency response and has lost the trust of many rural and remote communities”.⁵¹ One document also describes social capital within rural EMS: “local knowledge of locations, family health history and networks, and informal resources are the social capital of health when institutionalized healthcare is far away”.⁵⁰ The RED committee states that “[w]hile municipalities have the authority to maintain a community first response, we agree that rural call and dispatch needs to be coordinated and integrated as part of an integrated EMS plan”.⁵¹

^{vi} AUMA stands for Alberta Urban Municipalities Association

^{vii} AAMDC stands for Alberta Association of Municipal Districts and Counties

AHS: plans for EMS quality of care and patient safety

AHS EMS has created four documents that relate to the services that are provided to Albertans: (1) *EMS Five Year Plan (2010-2015)*,⁴⁷ (2) *Immediate & Ongoing Management of Clinically Serious Adverse Events*,⁵² (3) *EMS Performance Measurement Framework*,⁴¹ and (4) *AHS EMS Audit Process*.⁴⁹ A brief summary of these documents is provided below.

EMS Five Year Plan (2010–15)

In addition to the mission and goals, the EMS Five Year Plan lists eight areas of focus and highlights 19 key initiatives. The key initiatives are summarized as:

1. Establish medical oversight, online medical consultation, and provincial care protocols.
2. Establish a common communication system, provincial deployment plan, and a coordinated provincial EMS dispatch system.
3. Maintain and enhance communication mechanisms with other public safety agencies.
4. Implement a strategy to engage and appropriately use medical first responders.
5. Develop a comprehensive education plan for EMS practitioners.
6. Develop a comprehensive performance measurement framework.
7. Promote and strengthen patient, public, and practitioner safety.
8. Enhance the role of EMS through development of treat-and-refer protocols, referral processes, and alternative transport destinations.
9. Integrate EMS with health services across the continuum.
10. Develop a performance-based and metric-driven contracting process, and where possible base contracts on broader geographic areas.
11. Use the accreditation process to embed these standards into the provincial EMS system.
12. Collaborate with others to advance EMS practice.
13. Work with communities to enhance access to automatic external defibrillators (AEDs) and to broaden first aid and CPR training.
14. Transition provincial air ambulance from AH to AHS and develop a plan to integrate air and ground ambulance.
15. Develop an integrated model for inter-facility patient transfers.
16. Develop a coordinated plan of response for EMS as part of the overall AHS Emergency Preparedness Plan.
17. Implement a provincial electronic patient care record for all EMS services.
18. Develop a comprehensive 10-year EMS facility plan identifying appropriate station locations across the province.
19. Ensure the minimum level of service is BLS, with appropriate and timely access to ALS care.

Directive – Immediate & Ongoing Management of Clinically Serious Adverse Events

This directive issued by AHS EMS outlines an approach for managing situations when patients have suffered harm (unintended injuries or complications arising from healthcare management). It outlines steps to be taken to manage such a situation immediately following the occurrence of harm (immediate management) such as care for the patient, appropriate notification, ensuring a safe environment, securing equipment and supplies that were involved, providing support for patients (and family) and healthcare providers, acknowledging the situation to the patient (including making an apology), and reporting the situation to AHS via the reporting and learning system. The document also outlines the ongoing management of the situation until all issues have been resolved, such as appropriate accountability, ongoing support for the patient (including a formal process for disclosure), the evaluation of the event to uncover possible system deficiencies, informing others in the healthcare system about important safety issues that may have become known as a result of the system review carried out, and if required conducting an accountability review of one or more healthcare providers.

EMS Performance Measurement Framework

The EMS Performance Measurement Framework outlines a plan to measure 25 ‘key’ performance indicators. This initiative is a move towards a provincial EMS reporting system, an important step towards understanding how the EMS system is performing.

These 25 indicators are based on priority and data availability. The framework describes an accountability model so that each measure has an ‘operational owner’, that is an accountable individual who would take responsibility for improvement if required. Of the 25 indicators outlined in the framework there are several process and financial indicators but only one that could be considered an ‘outcome’ measure (patient experience or satisfaction).

AHS EMS Audit Process

The AHS EMS Audit Process outlines three audit approaches for measuring and managing the quality of care:

- Clinical surveillance (CS) in this document refers to an approach for tracking several sources of information about the safety of some aspects of care delivery. CS includes tracking and reviewing ‘high-acuity, low-occurrence (HALO) events’; regular review of the use of and compliance with medical care protocols; and tracking learning from peer review, from quality assurance reviews, and from reports generated through the AHS reporting and learning system.
- Peer review in this document refers to ‘post hoc’ reviews of care (quality assurance assessments after events have taken place) to evaluate compliance with an appropriate ‘standard of care’ and appropriate documentation of that care.

Saskatchewan Emergency Medical Services (EMS) Review – Final Report October 2009

In May 2008, Saskatchewan’s Minister of Health requested a review of pre-hospital and inter-hospital EMS in the province.⁵³ The review committee was led by an expert in strategic management and organization transformation services. At the time of the review there were five dispatch centres and four PSAP centres in Saskatchewan. The Ministry of Corrections, Public Safety, and Policing managed the Sask911 system.

The committee noted that there was a need to set a clear vision for EMS in Saskatchewan. This vision was to have patient care as the central theme and broad support among EMS stakeholders. Though EMS was a willing partner to fire, police, and other emergency service providers, the work of EMS involves providing medical services to patients within the healthcare system.

The committee also identified that given Saskatchewan’s expanse, its relatively low population densities, and the lack of road infrastructure in some parts, a range of response time targets is required, with different response time standards for urban, rural, and remote service areas. There is great variability in the staffing models and the qualifications of staff providing services to patients. Services with low call volumes and limited staffing represent an opportunity for the consolidation of EMS to into a broader-based health service integrated into the existing healthcare system.

The locating of services occurred not through strategic design, but through a historical evolution and often through strong community development efforts of volunteers and community entrepreneurs. The placement of these services is often a factor in the timeliness of responses, especially in rural communities.

There were concerns with the lack of capacity to gather and analyze data for system planning and change over the longer term.

Many first responders were registered with the Saskatchewan College of Paramedics. If not registered with the College, they were registered with the Ministry of Health and their training was considered consistent with the classification of ‘first responder’. In order to effectively respond to the needs of rural patients, the existing first responder programs must be standardized, have better resources, and be integrated more effectively into the healthcare system. Typically EMRs and first responders are trained by the health regions or their contracted agents through approved training programs.

Agreements between the governments of Canada and Saskatchewan and the Federation of Saskatchewan Indian Nations had been signed but issues remained with the funding of EMS for First Nations.

In the report, “issues that appear to prevent the EMS system from delivering optimum patient care” were identified and grouped into “four sections as follows:

1. Issues related to the need for system-wide change and renewed direction
2. Immediate issues that act as barriers to designing a collaborative Mobile Health System
3. Infrastructure and resource issues relating to the development of a collaborative Mobile Health Services System
4. Operational changes designed to develop a collaborative MHS system.”⁵³

The committee made nineteen recommendations. (see Appendix X.)

Interviews with other EMS organizations

Semi-structured interviews were conducted with individuals from other EMS organizations nationally and internationally. Seven jurisdictions were identified and interviewed, including two Canadian provinces (British Columbia and Nova Scotia), two Canadian cities (Ottawa and Montreal/Laval), two American states (North Carolina and Maryland), and Australia.

The information gathered through the interviews was categorized into broad areas to mirror the objectives of the review: governance of EMS; dispatch; service providers; medical first responders; practice settings of urban, rural, and remote locations; and data. Information was also gathered on the population and geographic areas served for comparison and to provide context. Some of the key learnings include:

- A centralized model allows for standardization and consistent medical control protocols. British Columbia is a reasonable comparator in that it is governed and funded by the provincial government.
- British Columbia and Australia have many remote and rural locations as well as urban areas. These different settings bring unique challenges and thus creativity and customization have been employed to design the structures and processes to deliver EMS in these settings; EMS does not look the same in urban centres as it does in rural and remote areas.
- Standardization and consolidation of dispatch centre(s) is key to overall management of EMS. Fewer EMS dispatch centres is ideal. Centres need to have the responsibility for deploying all ambulances, aircraft, and transfer vehicles.
- Integration between ground and air ambulance services is ideal. The integration allows for the best transport mode and staff to meet the needs of the patient, and these can be modified when needs change. For example, if a trauma patient is airlifted from a scene but the aircraft is then grounded due to poor weather conditions en route, a seamless dispatch can coordinate a transport team to meet at the site and the air crew can move with the patient into the ground ambulance to continue providing seamless care.
- Dispatch centres are accredited by an independent organization using standards specific to EMS dispatch and communication.
- Community paramedicine is integrated into the overall EMS delivery model. Benefits of community paramedicine cited include the opportunity for practitioners to work to their maximum scope of practice (e.g., working with palliative programs), integration of EMS practitioners into the community (e.g., home visits with early discharge patients), and a mechanism for practitioners in rural and remote areas to maintain their skills (e.g., embedding EMS practitioners in rural emergency departments).
- The use of first response is determined according to what best serves the patient. First responders are used according to ‘activation agreements’ (agreement between EMS, fire and police agencies regarding what calls each responds to), and proper oversight is provided to ensure care is appropriate.
- In a robust EMS structure, operational and management decisions are made based on data, and data are used to support quality management.
- Realistic performance measurement targets are set for different practice settings (urban, rural, and remote).

Systematic literature review about EMS

The literature review addressed a number of diverse EMS topics including quality indicators, EMS system components (including equipment and environment), personnel, specific aspects of EMS care, and safety of both patients and providers. The complete systematic literature review can be found in Appendix V; a summary of the key issues that directly relate to the objectives of the review are presented below:

- **Quality indicators** – Research suggests quality indicators (QIs) as a method of performance measurement allow for the measurement, monitoring, and comparison of performance. This measurement in turn enables the identification of areas where improvements can be made. Although some quality indicators for EMS exist, the research examining evidence-based measures of performance within the pre-hospital setting is lacking and inconclusive as to their effectiveness in overall system improvement. In addition, complexities such as difficulty in implementation, uptake, and variations in service delivery both at a national and international level, result in difficulties in standardization and cross-setting comparison. Although efforts to bring QIs to the forefront in the Canadian context are increasing (e.g., through the establishment of national standards and performance metrics), these measures will require ongoing analysis and review to ensure their relevance and confirm their reliability and validity to improve EMS within the country.³²
- **EMS system components** – Research identified that EMS systems require efficient allocation of resources, continual evaluation to identify areas for improvement, and quality personnel in leadership positions and pre-hospital crews. EMS systems are highly organized and many similarities exist across jurisdictions internationally. Differences appear to exist with regard to education and training levels; response times in remote, rural, and urban areas; and patient outcomes between physician-based and paramedic-only pre-hospital crews.
- **Dispatch** – Research suggests that decisions made at the time of dispatch affect patient care and outcomes, as well as EMS response rates and times. Being coded with a diagnosis (e.g., cardiac arrest), rather than by symptoms, may shorten the time to life-saving interventions and improve survival rates, while inappropriate dispatch decisions can delay the needed care. Furthermore, new dispatch protocols may be effective in determining which patients require EMS response and which are low priority, thereby reducing unnecessary dispatches while still ensuring patient safety. It is necessary to carefully examine the protocols and adapt them to the region where they are being applied, however. Finally, response times can be improved by implementing a system where the closest ambulance is dispatched to the scene.
- **Dispatch consolidation** – Research suggests that dispatch consolidation may have several potential benefits in terms of costs, efficiency, standardization, performance, and safety; however, concerns about its feasibility include collaboration, staffing, and geographic familiarity. There was limited research identified in this literature review, with only one study that made comparisons before and after consolidation. Future research should continue to evaluate the impact of dispatch consolidation to determine its impact.
- **Remote, rural, and urban EMS** – Research suggests there are several significant challenges to providing quality EMS care in rural areas. For example, response times, scene times, transit times and distance, and overall pre-hospital times are significantly longer in rural areas than in urban centres. The literature also documents a variety of ways to improve the efficiency and effectiveness

of rural EMS (e.g., GPS units, repositioning rural EMS stations, early linkages to community-based medical and social services).

- **Response times** – Research suggests that the eight-minute EMS response time ‘standard’ might not have a bearing on mortality in a general patient population, even among the highest priority calls at the time of the 911 call. Moreover, even in cardiac arrest patients, a response time of eight minutes may not improve survival rates. In addition, frequency of crucial procedural interventions does not significantly differ with faster response times. However, faster response times have been associated with higher rates of CPR and return of spontaneous circulation in cardiac arrest patients. Further research is necessary to explore what the best response time is, which patients may benefit from rapid EMS response, and whether these patients can be identified at the time of the 911 call.
- **ALS and BLS^{viii}** – Research suggests that receiving ALS before arriving at the hospital does not provide significant benefit to trauma patients, and possibly cardiac arrest patients, compared to BLS. In respiratory distress patients, however, pre-hospital ALS appears to decrease mortality compared to BLS. Mortality rates in children may not be influenced by pre-hospital ALS, though the skills of medical providers appear to improve with pediatric ALS training. Pre-hospital ALS is more expensive to start and maintain when compared to BLS.
- **Technology and communications during crisis response** – Information and communication technologies have proved helpful in crises and should become a central part of crisis management, according to research.
- **EMS communication and technology system designs** – Research suggests that standards for electronic health records are currently being developed to enable patient information to be communicated across multiple departments, devices, software, and even entire countries. Several uses of these standardized and open data formats have already proven efficient and effective in improving patient care.
- **Staffing** – Research suggests that patient outcomes may be worse when there are an increased number of paramedics on site as well as when physicians are part of pre-hospital ALS teams, but further research is required to explain this phenomenon. The literature also suggests that there are fewer opportunities for EMS personnel to practise high-risk skills, but that the learning associated with this practice translates into better performance. Furthermore, it appears that recruitment and retention of EMS staff is problematic, especially in rural areas. The costs associated with employee turnover can be high, and turnover rates are higher for volunteer staff, despite reports that volunteerism rates have been relatively stable.
- **Cardiac arrest** – Care of cardiac arrest patients appears to be one of the most well-researched topics in EMS. Research identified in this literature review suggests that predictors of out-of-hospital

^{viii} The terms ALS and BLS are defined differently in the systematic literature review than in the glossary.

cardiac arrest survival include ventricular fibrillation/ventricular tachycardia and return of spontaneous circulation, whereas the presence of a pre-hospital physician does not influence survival rates. Insufficient evidence exists regarding the benefit or harm of mechanical chest compressions during cardiopulmonary resuscitation (CPR). Other strategies that include telephone instructions for CPR, improving access to AEDs, training of individuals outside the EMS system to respond to cardiac arrest, and bypassing local hospitals for specialist cardiac arrest centres may contribute to process improvements that increase survival. Other studies have shown that the development and implementation of reperfusion therapy guidelines improve a number of time intervals between dispatch and reperfusion for patient with ST-elevation myocardial infarction (a type of heart attack).

- **Stroke** – Research suggests that pre-hospital performance measures are available for pre-hospital care of stroke patients along with toolkits to improve pre-hospital care. There may be a lack of awareness of stroke symptoms by the general public and EMS providers. A number of methods have been developed to enable the rapid and accurate diagnosis of stroke. These include the Medical Priority Dispatch System (MPDS) and the Cincinnati Pre-hospital Stroke Scale. Of these, MPDS is reportedly more effective. Researchers have also shown that a ‘relay system’ between EMS and the stroke centre benefits patients by shortening transfer time and door-to-care time.
- **Safety culture** – It appears from the research that safety culture of the workplace impacts adherence to safety practices and policies as well as safety outcomes. However, the evidence is limited by a small number of studies and by survey data.
- **Patient safety** – Research suggests that available evidence concerning patient safety in the EMS setting falls into one of six themes: clinical decision-making, medication errors and other adverse events, ground vehicle safety, aircraft safety, intubation, and inter-facility transportation. While a range of themes is covered, the evidence is limited by a small number of high-quality research studies as only two randomized controlled trials were identified. There remain many areas of patient safety in EMS that have not been addressed by research.

A key challenge for the systematic literature review was the availability and quality of data (published articles). Systematic reviews were available for very few of the topics explored and the overall methodological rigour of the studies included was low. Moreover, the generalizability of the research findings from other countries, and other parts of Canada, to Alberta is challenging given the diverse nature of EMS systems. Further research, including research specific to Alberta, is needed in a number of the topics covered in the review.

Summary of findings

As discussed in the Project Overview the implications for quality and patient safety with respect to ground emergency medical services was reviewed, including:

1. Transition issues related to the transfer of governance and funding of ground EMS from municipalities to Alberta Health Services (AHS).
2. The consolidation of ground EMS dispatch services under AHS.
3. Challenges specific to integrated fire/EMS service providers.
4. Challenges specific to urban, rural, and remote areas of the province.

5. Availability and adequacy of EMS data

Based on the analysis of interviews, questionnaire responses, on-site observations, EMS data review, documentation review, and literature review the findings are summarized below based on these five objectives.

Transition of the ground EMS system from municipalities to AHS

A wide range of perspectives was heard concerning the transition of EMS from municipalities to the Ministry of Health. In general, most identified EMS as healthcare, and as such recognized the benefits of having EMS as part of the healthcare system. Yet, it was also recognized that EMS is an important part of the public safety model. There were some municipalities that were relieved because the governance and funding were no longer their responsibility. However, a number of municipalities felt local governance of EMS allowed for better coordination of local emergency services as part of a public safety model. There was general agreement by most participants that the EMS system throughout Alberta before the transition to AHS was inconsistent, disjointed, disconnected, not standardized, local in focus, and inequitably funded across the province. It was generally understood that it takes time to build an effective and reliable system, however, many felt that communication, consultation, and stakeholder engagement during the transition were poor. The EMS transition occurred at the same time the entire health system in Alberta was being restructured and it was felt that decisions were being made without a solid foundational structure.

There was general agreement by most participants that the EMS system throughout Alberta before the transition to AHS was inconsistent, disjointed, disconnected, not standardized, local in focus, and inequitably funded across the province.

Benefits of the transition described included standardized province-wide medical care protocols, training, the availability of online medical consultation, standardization of fleet and equipment, innovations in advanced care, and greater use of paramedics in the community. Most frontline EMS providers who were interviewed said a key benefit of the transition to AHS was an improved ability to provide high-quality and consistent patient care across the province.

Some of the criticisms of the transition included a loss of local community knowledge, a culture of mistrust, a perceived lack of adequate resources to meet system needs, and the challenge of staff adjusting to a new organizational culture.

Participants expressed a wide range of opinions about the personal and financial impact the transition had on EMS practitioners. Some EMS practitioners identified improved and equalized salaries, better training, and job portability; however, other practitioners spoke of frozen wages and loss of benefits in some areas, high rates of staff turnover, difficult work schedules (in some rural areas), intense workloads (particularly in urban areas), safety issues, and poor morale in some areas.

Beyond Alberta, other provinces are transitioning to a provincial-level EMS system. National and international experts within the EMS field reported many benefits to creating a provincial EMS system, as well as aligning EMS under the health ministry. For example, it was recognized that in a provincial EMS system: (1) evidence-based care, medical oversight and auditing can be standardized; (2) resources can be

more efficiently and effectively managed, and (3) data can be better managed, reported on, and used to support quality management. With the EMS system being part of the provincial healthcare system, EMS practitioners can also take on community paramedicine roles, as has occurred in Nova Scotia, to help fill gaps in the broader healthcare system. This broader role also gives EMS practitioners the ability to work in different settings (such as emergency departments) and to work to their full scope of practice.

In provincial systems, evidence-based care can be standardized; resources can be more efficiently and effectively managed; medical oversight and auditing can be consistent; and data can be better managed, reported on, and used to better support quality management.

Consolidation of ground EMS dispatch services under AHS

When the consolidation of the EMS dispatch system was put on hold by the Minister of Health and Wellness in March 2010, the consequence was a patchwork of EMS dispatch services that included a combination of three AHS dispatch centres (two AHS owned and operated and one contracted) and numerous municipal dispatch centres, some with multiple dispatch roles.

Currently, the structure and processes for EMS dispatching vary considerably across the province. Some centres combine PSAP (911) and dispatch functions, while other centres perform only one of these functions. For those centres that provide dispatch services, some centres dispatch all emergency services (EMS, fire, and police) while others dispatch two of these services, or only one. The structure and responsibility for EMS dispatch centres varies, as do the resourcing and activities related to quality and safety. There are significant differences in equipment, and the variety of radio and telecommunication systems in use throughout the province has resulted in radio interoperability and communication challenges.

Many municipalities reported that the partial consolidation of EMS dispatch has adversely affected ambulance response times in their communities. Contributing factors cited include the transfer of calls between dispatch centres that wasn't previously required when many of the centres did both PSAP and dispatch centre functions, ambulances being out of the community performing transfers or dispatched to other communities, inaccurate information from the AHS dispatchers, and a lack of local community knowledge on how to direct an ambulance to the required location. Countering this argument, some participants contended that consistency in technology, mapping, and GPS units on all ambulances would address the need for local knowledge.

The use of system status management (SSM), the AHS process to send the closest ambulance to a call, and a view that 'local' ambulances were transporting patients to larger centres, led many to believe that ambulance coverage in rural areas had decreased and call volumes for volunteer fire services (medical first responders) had increased. SSM is defined as "the process of preparing the system for the best possible response to the next EMS call. SSM's primary purpose is to create and maintain the closest practical match between EMS demand and EMS supply".⁵⁴ While it may look like an ambulance is not in the area, with the use of SSM, EMS coverage may be available from another location that is not necessarily visible to the general public. SSM has been used in larger urban centres for several years, and research has shown it is an effective way to deploy ambulances and improve response times. The use of SSM was new to some areas of Alberta, such as rural and remote areas, that used a more traditional fire

department 'static deployment model'. In this model, staff respond from a fire station usually to a defined area and then return to their station.

Financial concerns were frequently raised. When responsibility for EMS dispatch was transferred to AHS in 2009, dispatch centres which had been fully funded by their municipalities for all forms of dispatch, were now contracted and paid by AHS to dispatch EMS. Many of these dispatch centres were dispatching multiple services (EMS, fire, police) and when the EMS dispatch component in these centres was consolidated into the AHS dispatch system, they no longer received funding from AHS because they were no longer dispatching ambulances. Consequently, some of the municipalities are now concerned about the financial viability of their dispatch centres.

In Alberta, 911 surcharges are not collected from voice-over-Internet protocol (VoIP) users. As well, 911 surcharges collected from cellphone users are not directed to PSAP centres. Other provinces have effectively dealt with this issue through legislation (Saskatchewan,⁵⁵ Nova Scotia,⁵⁶ New Brunswick,⁵⁷ and Prince Edward Island⁵⁸). PSAP centres also identified that revenue from landline 911 surcharges is decreasing, as more people opt out of traditional land-based phone lines in favour of cellular and VoIP services, raising concerns about the overall financial viability of PSAP centres.

In Alberta, 911 surcharges are not collected from voice-over-Internet protocol (VoIP) users. As well, it was identified that 911 surcharges collected from cellphone users are not directed to PSAP centres. Other provinces have effectively dealt with this issue through legislation.

As has been noted, most respondents believe the consolidation of EMS dispatch has many benefits. Advantages include the ability to track and monitor ambulances across the province and dispatch the closest ambulance to an event, standardization of dispatch processes including staff training and operating procedures, and using consistent technology across the province. Those interviewed from other EMS organizations outside of Alberta reported realizing these advantages when EMS dispatch was managed within the healthcare system as opposed to within the public safety model.

The QAC could not quantitatively determine if any positive or negative outcomes have resulted in those areas that have transitioned EMS dispatch to AHS, again because of the poor quality and availability of EMS data. Similarly, limited research on dispatch consolidation was identified in the systematic literature review. Research suggests that dispatch consolidation may have several benefits in terms of costs, efficiency, standardization, performance, and safety. Concerns include the need for collaboration, staffing, and geographic familiarity.

Challenges specific to integrated fire/EMS service providers

Challenges specific to integrated fire/EMS service providers were gathered through interviews and questionnaires. Many chose not to comment on the model specifically and for those who did comment, their opinions of its merit often depended on whether they came from an integrated system or not.

Frontline providers who had worked in an integrated fire/EMS system were strong advocates for its value. The communities with integrated systems were often passionate about keeping them. The rationale for the model is primarily financial; when municipalities were responsible for funding and providing both fire and EMS, efficiencies could be gained through an integrated service because of the hiring and cross-

training of staff and the operational management of fire and EMS resources at a scene. Historically, many medium-sized cities found integrated models to be cost effective; larger cities, because of their size and call volume, often did not.

In municipalities integrated fire/EMS systems are traditionally led by a fire chief. Thus, decisions regarding the deployment of resources (including ambulances and EMS crews) are made by the fire chief. This creates many challenges with EMS now being part of the provincial health system, as sometimes the chief's vision and plans for using EMS resources are not congruent with that of AHS. For example, in integrated systems there is often little support for EMS practitioners to take on community paramedicine and other tasks that expand the scope of their work, as these are not considered public safety activities and go beyond the traditional EMS role. As well, some of the integrated systems do not want to provide IFTs because they are not seen as a core activity and 'tie up' staff with patient transfers making them unavailable to respond to fire calls and other emergencies.

One of the challenges that AHS and integrated fire/EMS systems face is related to contracts. All organizations contracted to provide EMS services must abide by the AHS contract, providing a specified level of service and required activities such as transports. Maintaining the required level of EMS resources at all times is a challenge for integrated fire/EMS systems because the integrated model is based on the concept of having staff dually trained and able to provide EMS and fire duties as required. Some municipalities that have adopted the National Fire Protection Association (NFPA) standard of five firefighters on a 'pumper truck'⁵⁹ when responding to a call, have found it difficult to meet this standard and the requirements in the AHS contract. Before transition, some communities with an integrated fire/EMS system would meet the NFPA standard by sending the fire truck out with three staff and dispatching an ambulance with two staff. This took an ambulance and its crew out of service, unable to respond to EMS calls; if this same process was followed now, the municipality would fall short of its contractual obligations to AHS. Some communities with integrated models have chosen to increase their staffing to ensure they are meeting the requirements of the AHS contract and are now voicing concerns about increased costs since the transition.

Another challenge is understanding the actual costs associated with providing EMS when it is part of an integrated fire/EMS system. Separating the costs specific to EMS from the fire-related services that the municipality is responsible for funding, is difficult. It was reported that AHS' costs for providing EMS are higher in integrated fire/EMS systems than in EMS-only (non-integrated) systems. In order for the Ministry of Health to effectively govern and fund EMS, and for AHS to effectively manage EMS operations, it is important to understand the actual costs of the service.

Finally, challenges specific to integrated fire/EMS systems could not be learned through the systematic literature review nor the interviews with other EMS organizations. The systematic literature review did not find any research specific to integrated fire/EMS systems, and those stakeholders interviewed from other EMS organizations were not part of an integrated fire/EMS model.

Challenges specific to urban, rural, and remote areas of the province

It is widely recognized by those who participated in interviews or completed questionnaires that there are needs and challenges unique to urban, rural, and remote settings within the province.

Rural and remote challenges

Frontline providers who were interviewed commented that the transition to AHS has led to more EMS-related calls for volunteer fire services in smaller communities, and it was suggested that this is because the ‘local’ ambulance is transporting patients to larger centres or is ‘tied up’ because of system status management. Municipalities feel they are providing EMS through their fire departments (in the form of medical first response), but are not being compensated by the provincial government for doing so. While there may be longer response times if an ambulance has been repositioned to provide coverage as part of system status management, the benefit of a provincial model is that the ‘system’ is aware when communities are without an ambulance and ambulances from neighbouring communities are brought closer. Before the transition, this type of proactive coverage did not occur and agreements to provide assistance to neighbouring communities did not always exist. Concerning medical first response, the interviews and PSAP and dispatch centre tours showed that currently the types of medical calls that fire departments respond to vary greatly, and thus there is an opportunity to standardize when fire departments provide medical first response as well as the training of medical first responders.

It was also recognized that due to their expanse, rural and remote areas of the province have longer response times. As some participants remarked, much of the ‘golden hour’ can be used in just getting to the patient. The term ‘golden hour’ describes “the first hour after the onset of out-of-hospital traumatic injury”⁶⁰ and although experts suggest that “there is little evidence to directly support the relationship between a reduction in time to definitive care and improved injury outcomes”, a belief in this relationship is considered a “basic premise of trauma systems and emergency medical services”.⁶⁰

There is also a perception that the level of service has changed from advanced life support (ALS) to basic life support (BLS) in rural communities, especially for those areas that are serviced by contracted providers. Some commented that an inequity exists because urban centres are mostly served by ALS ambulances. The EMS review done in Saskatchewan also identified differences in the level of training of EMS practitioners between urban and rural areas of the province.⁵³ Determining the appropriate level of training in rural and remote areas is complex and represents a trade-off. Since call volume is lower in rural settings, it is more difficult for EMS personnel to maintain all of their skills, especially for high-acuity/low-opportunity procedures. Some believe it makes sense for rural areas to have BLS-level service. Others believe that because response times are longer in rural and remote areas, less support is available, and the distance to tertiary care is longer, more – not fewer – advanced skills are required. Therefore, strategies are needed to ensure staff in rural and remote areas maintain their skills and this can be achieved by rotating occasionally into urban centres, a benefit gained through a borderless, provincial model.

The systematic literature review also identified unique challenges for EMS delivery in rural areas that are related to geographic barriers, diverse terrains, poor communication due to a lack of cellular or radio coverage, and difficulty recruiting and retaining qualified personnel. Studies have also supported what many interviewees and questionnaire respondents said: the mean transfer and transport times (pre-hospital times) are longer in rural and remote areas. As well, in these areas, patients who are suffering from traumatic injuries and those who have suffered a cardiac arrest are at higher risk of death. The literature review also identified that it is more difficult for rural areas to recruit and retain EMS practitioners than for urban centres.

Urban challenges

Some EMS providers identified challenges they experience in urban centres. This includes longer wait times for EMS crews to ‘hand over’ the patient in the emergency department.

There is a strong sense that in the cities the support areas within EMS have been disadvantaged since the transition. Historically, the urban centres were adequately resourced for staff training, data analysis and quality and safety management. With the transition these resources are now being spread farther to support the entire province. As more contracted service providers divest to AHS direct delivery, the number of AHS frontline staff increases but there is not always a corresponding increase in support staff that provide staff training, data analysis and quality and safety management. The result has been a reduction in resources and support in the cities, while the rural and remote areas are receiving more than they had before the transition.

EMS provincial model – urban, rural and remote areas

Many participants identified that different delivery models are required to address the unique needs of urban, rural, and remote settings. As stated by more than one participant, “One size does not fit all”. This was echoed in the interviews with other EMS organizations, where participants identified unique approaches to community paramedicine that are used in different settings to meet differing needs. However, one of the strengths of a provincial model is standardization of care, especially in terms of medical control protocols.

Availability and adequacy of EMS data

There are two provincial EMS data sets, one administered by AH (called AAIMS) and the other by AHS. Currently Alberta lacks a reliable, comprehensive source of provincial EMS data. AAIMS data are incomplete due to poor compliance and have insufficient data quality checks. AAIMS collects only ‘traditional ambulance call’ EMS events and has limited patient care data that would enable EMS clinical processes and patient outcomes to be measured. The AHS EMS data are satisfactory in some respects; however, there is still wide variability in the quality of data across the system, incompatible dispatch data sets, and poor data submission compliance from some contracted operators.

Because of the significant limitations in EMS data some of the important questions that this review was asked to address cannot be answered quantitatively, such as the question concerning the impact of the transition to AHS on the provision of EMS. In the opinion of data experts, including the HQCA’s analysts, the time-stamp data within AAIMS are not considered valid enough and historically there are insufficient data from all areas of the province.

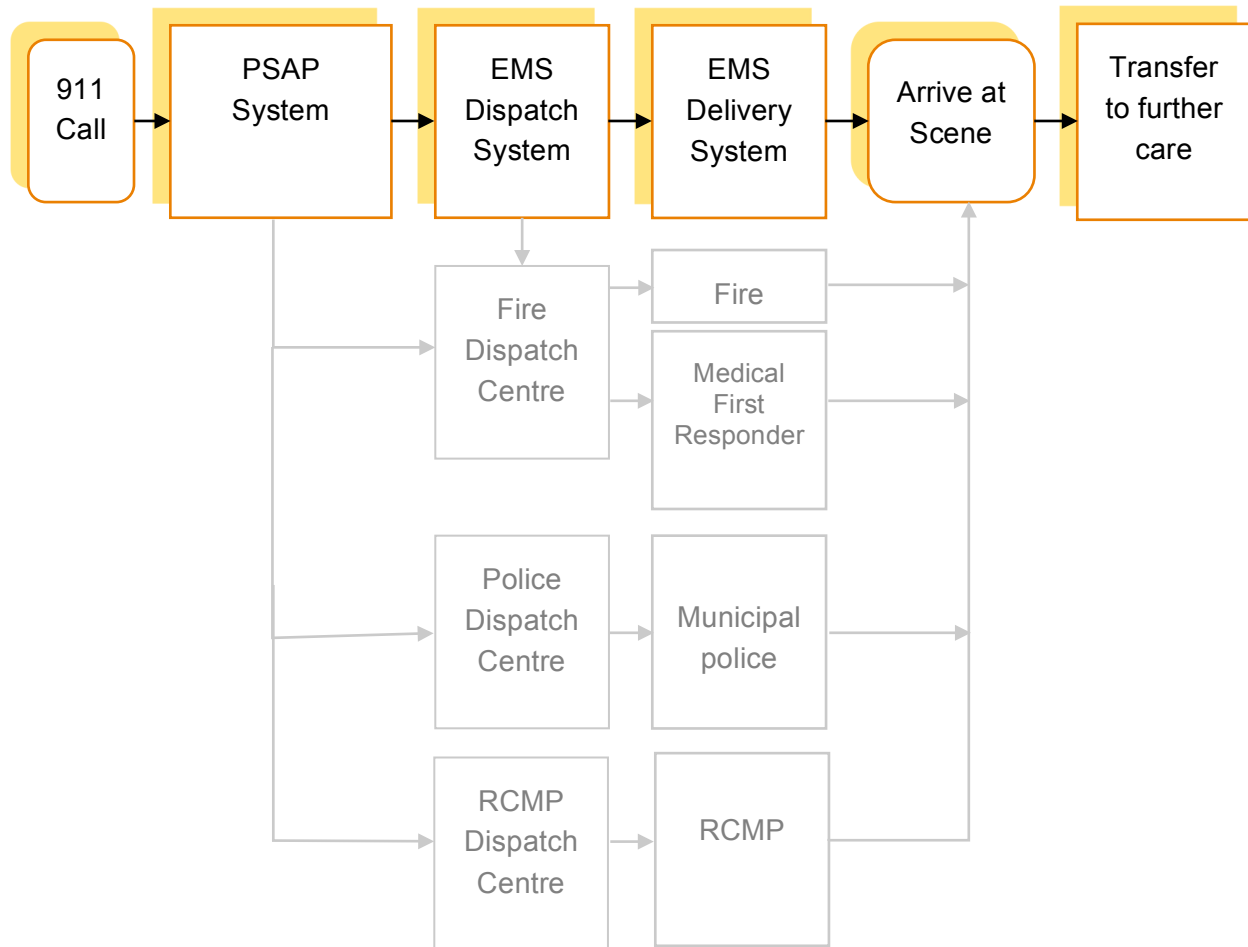
The systematic literature review and experts in the EMS field emphasized the importance of having quality data and appropriate measures on which to base financial and operational decisions and as a necessity for quality management. In the interviews with other EMS organizations it was determined that organizations considered to be leaders in EMS had robust data management systems that were used to support quality management.

The current reality, however, is that the data in AAIMS are not adequate to be used for comprehensive performance and quality and safety management. AHS has started to develop a provincial data system and has taken an important first step in publicly reporting some EMS data on its website. However, AHS data

are not readily accessible for operational decision-making and users of the EMS system (i.e., municipalities, the public, and patients) have limited objective information about the quality of the EMS system in the province.

ISSUES, ANALYSES, RECOMMENDATIONS AND REQUIRED ACTIONS

The Ground EMS System Critical Path



The review identified four key areas, with five associated recommendations and sixteen required actions that offer opportunities to improve the quality and safety of the provincial EMS system.

The 911 - Public Safety Answering Point (PSAP) System

Issue

The reliability of the 911 - PSAP system in Alberta, the critical first point of contact for the EMS system, is at risk due to the variability in operations and an absence of provincial legislation and operational standards.

Analysis

As the PSAP system was not within the scope of the EMS review, the HQCA did not conduct an in-depth analysis of the function and operation of the PSAP system in Alberta. However, as it is the critical

starting point for accessing the EMS system, the HQCA needed to understand the function of the PSAP system in relation to the EMS system.

PSAPs provide an essential function in the public safety system as they are the first point of contact for emergency support. Therefore, 911 calls must reliably connect to the appropriate dispatch centre capable of deploying EMS crews and ambulances.

Currently, there are more than 20 PSAP centres operating in the province. The provincial government does not currently legislate, regulate, or set standards for the PSAP centres. Municipalities are responsible for operating PSAP centres within their own jurisdictions. Among the municipalities the reporting and accountability structures for PSAP centres vary. There is variability in PSAP centre operations, data collection, analysis and reporting procedures and quality assurance methods used.

Adequate back-up systems are essential to ensure the PSAP centre's key function, call answering and transferring, does not fail. For example, if the communication system stops functioning in one area of the province or if a PSAP centre is overwhelmed by a surge of calls that is beyond its capacity to manage, a backup system must be in place.

Legislation and standards must be established to support the purposeful design of a reliable PSAP system. Legislating, setting standards and establishing an accountability framework for the PSAP system is complex because the PSAP centres interact with services controlled by three levels of government - municipal (fire departments and some police services), federal (RCMP), and provincial. Within the provincial government, several ministries have a stake in the role of the PSAP system (Health for EMS, Justice and Solicitor General for police, and the Alberta Emergency Management Agency within Municipal Affairs for disasters and emergencies).

1. RECOMMENDATION

The Government of Alberta develop and implement legislation, operational standards and an accountability framework for the Public Safety Answering Point system in the province.

REQUIRED ACTIONS

- The Government of Alberta conduct a review of the PSAP system and PSAP centres operations to inform the development and implementation of legislation, regulations, operational standards and an accountability framework.
- The Government of Alberta conduct an analysis to determine the appropriate number of PSAP centres to maximize the efficiency and reliability of this system.

EMS Dispatch System

Issue

The partial consolidation of the EMS dispatch system into Alberta Health Services has had a negative impact on the efficiency, effectiveness and safety of the EMS system.

Analysis

When accountability for EMS was transferred from municipalities to the Ministry of Health, a policy decision was made to reduce the number of EMS dispatch centres through a consolidation process⁶¹ over a two-year period.⁴⁷ At the time there were 35 dispatch centres capable of dispatching EMS crews and ambulances. The rationale was that the consolidation of EMS dispatch was essential for the effective coordination and efficient deployment of EMS resources across the province.⁴⁷

AHS was given responsibility for the ground EMS system in April 2009 and then began to consolidate EMS dispatch. However, the process was put on hold by the provincial government in March 2010, because of concerns raised by some municipalities that their multi-functional dispatch centres would no longer be responsible for dispatching EMS crews and ambulances.

Concerns and beliefs expressed by some municipalities:

- Communication/radio interoperability – while enroute to an event that required both EMS and fire services, fire crews experienced difficulty communicating with AHS EMS crews. A lack of radio interoperability also prevented AHS EMS crews and contracted EMS crews to speak directly to each other.
- Ambulance availability – ambulances are being deployed to areas outside of the local community resulting in ambulances no longer being available to respond to local calls.
- Coordination of EMS and fire services – delays in dispatching fire for medical first response is occurring, especially for those centres that had an integrated fire/EMS system. Dispatching medical first responders is taking longer because of a change in the call sequencing process. For example, AHS would first dispatch an ambulance and then notify fire dispatch that a medical first response was required.
- Financial – when the operational responsibility for the EMS system was transferred to AHS in 2009 municipal dispatch centres that had been fully funded by their municipalities, were now contracted and paid by AHS to temporarily continue to dispatch EMS crews and ambulances. As some of the EMS dispatching services became consolidated into the AHS dispatch system, these centres were no longer required to dispatch EMS crews and ambulances and thus lost the AHS funding. The loss of this revenue may result in these centres no longer being financially viable.
- Loss of ‘local knowledge’ – dispatchers living in the area can provide better directions to EMS crews trying to find a specific location.

Geographic information

Dispatching an ambulance to a location requires reliable and accurate location identification (addresses) and detailed maps. When AHS assumed responsibility for the EMS system a provincial repository of

quality geographic information system (GIS) data did not exist. AHS had to invest significant time and resources to work with various stakeholders including municipalities to collect and integrate detailed geographic information into a comprehensive computer assisted dispatch (CAD) map.

Ambulance deployment

In the past and at the present time, in the partially consolidated EMS dispatch system, dispatch centres can only identify and track the ambulances they deploy. This can result in ambulances not being deployed in the most effective and efficient manner.

A borderless EMS system (sometimes referred to as ‘borderless ambulance’) allows for repositioning of ambulances and their crews when required. In order to support the repositioning of ambulances and crews, AHS adopted a Systems Status Management (SSM) approach. This approach aims to achieve a balance between ambulance demand and ambulance supply.⁵⁴ The benefit of the use of SSM in a consolidated EMS dispatch model is that the ‘system’ is aware when communities are without an ambulance and ambulances from neighbouring communities can then be brought into a more appropriate location. Currently, those ambulances that are owned, operated and dispatched by AHS are supported by SSM. Other contracted EMS dispatch and contracted ambulance service providers may not be supported by SSM and therefore cannot be repositioned through the use of this approach.

Until EMS dispatch is fully consolidated into AHS and SSM is fully implemented across the province the benefits of this approach cannot be fully realized.

Communication

As EMS dispatch is consolidated under AHS, ambulances and EMS crews are supplied with AHS radios, phones, and other equipment (i.e., Mobile Data Terminals) to enable them to communicate with AHS EMS dispatch. This not only allows these ambulances and crews to communicate with AHS EMS dispatch but also allows for the ambulance to be identified and tracked in real time. EMS dispatch centres that have not been consolidated do not have equipment that communicates directly with AHS EMS crews. In addition, AHS EMS crews cannot easily communicate with fire crews that may also be responding to a call. Dispatch centres have sometimes relied on ‘cross-patching’ as a means to connect EMS and fire crews who are using different communication equipment and channels; however, some dispatch centres reported that cross-patching is rarely done at their centres because they have a limited number of channels and cross-patching would tie up one channel. To address these communication challenges workarounds such as cell phones have been used.

One solution for the radio-interoperability issue that has been proposed is the implementation of the Alberta First Responders Radio Communication System (AFRRCS). The Government of Alberta has committed to build the basic infrastructure of the system; end-users who choose to participate will be responsible for buying and maintaining the compatible radios. While AHS EMS has committed to joining AFRRCS, not all emergency response agencies have; therefore communication challenges between AHS EMS and those agencies will persist. Furthermore, it was identified that AFRCCS will be ‘voice only’ and will not include the ability to transmit data. This could be an issue for EMS as the transmission of clinical data is essential for quality and safe patient care.

EMS dispatch data

Another issue from the former unconsolidated EMS dispatch system, and with the current partially consolidated system, is the inability to collect and analyze system-wide data including a lack of data standards to effectively manage overall EMS performance. For example, it is not possible to confidently report on ambulance response times across the province because there are no universally applied standardized definitions for time-based measures, nor has it been specified how these data will be captured, stored electronically and analyzed (see recommendation #4).

Change management

The controversy over EMS dispatch consolidation into AHS has been compounded by the absence of an effective change management process. Contracted dispatch centres felt that it often takes too long to get answers from AHS and many were unsure of who within AHS they could contact to discuss issues. Interviewees commented that decisions and policy changes were seldom communicated in a clear way, and as a result implementation of changes were made more difficult.

2. RECOMMENDATION

Alberta Health immediately reverse its decision to suspend the consolidation of the EMS dispatch system into Alberta Health Services, and Alberta Health Services proceed with establishing a province-wide, consolidated EMS dispatch system.

REQUIRED ACTIONS

- Alberta Health Services establish two (2) EMS dispatch centres to ensure a safe and reliable ‘borderless’ EMS dispatch system with adequate backup.
- Alberta Health Services develop an improved change management plan to engage municipalities, EMS service providers, and the public in the process of establishing and implementing the consolidated EMS dispatch system within the provincial EMS system.
- The Government of Alberta ensure there is one source of valid GIS data for the province (e.g., a provincial spatial data infrastructure).
- The Government of Alberta ensure a communication infrastructure exists to enable communication within and between different public safety agencies across the province including the ability for EMS to transmit data.

EMS Delivery System

Issue

AHS requires a clearly articulated vision, plan and service delivery model for the province-wide EMS system that acknowledges the unique realities and requirements for urban, rural, and remote areas in the province.

Analysis

At the present time there are significant differences across the province in the range of EMS care delivered to patients, the types of EMS personnel delivering those services, the training that EMS personnel undergo, and the relationships between EMS personnel and other emergency responders (in particular, fire personnel in their role as medical first responders). While there will always be differences in how EMS is delivered in rural, remote, and urban settings across the province, there is a requirement within a well-articulated EMS system, to develop standardized models of care delivery to ensure equity in the types and the quality of services provided.

AHS has undertaken a number of important steps to standardize the care provided by both contracted and AHS employed EMS practitioners. The AHS Five Year Plan (2010–15), contains 19 “key” initiatives staged into short, mid, and long term,⁴⁷ and work is underway on each of these initiatives. However, it is not evident that the plan has a clearly articulated vision for EMS delivery across the province.

AHS has developed a comprehensive set of evidence-based Medical Control Protocols (MCPs) that all EMS practitioners (AHS and contracted) must follow when performing assessments and providing care to patients. Medical director oversight is now consistent across the province, and a robust physician on-call system has been established so that EMS practitioners can get direction and support quickly while caring for a patient.

Geographical differences

Within similar geographic areas, whether urban, rural, or remote, differences continue to exist across the province related to the types of care delivered. Where there are similar care (treat and release) protocols, they are not always followed or applied in the same way.

Community paramedicine programs extend the range of services that EMS practitioners provide to include non-emergency public health service, and in some locations acute care services. However, the existence of these programs and how they are delivered differ across the province. For example, in some rural areas, paramedics work in emergency departments when they are not staffed with a doctor, but this does not occur in other rural areas of the province. In one large urban centre, paramedics have an augmented role in long-term-care facilities; however, this role has not been created in many other places in the province.

Medical first response

Medical first response is a term specific to the arrival of the first trained responder on the scene. Medical first responders (MFRs) may be emergency professionals such as fire department personnel, police officers, first aid agencies such as the Red Cross or St. Johns Ambulance, the Canadian Ski Patrol, or

industrial-site first aid attendants. Training for medical first responders may range from basic first aid to a physician-level response.

In most of the province fire departments provide medical first response, but there is considerable variability in how MFRs are used across the province. There are no standard province-wide protocols that define the relationship between EMS and fire departments and under which circumstances MFRs should be used.

How to best deploy MFRs should be part of developing a standardized EMS care delivery model for the province that is based on research and reliable data (such as geographic location, response times, types and frequencies of medical emergencies). The goal should be to use MFRs only when evidence and data support better patient outcomes. Studies have shown that the life-threatening and time-sensitive calls for which an MFR would be appropriate represent approximately one to two per cent of EMS call volumes.⁶² A study commissioned by the Association of Municipal Emergency Medical Services of Ontario found that fire department responses to medical calls could be reduced by 83 per cent without having a negative impact on patient outcomes.⁶³ While it is recognized that there are certain conditions when medical first response is beneficial to patients, such as in a remote location where it might take a long time for an ambulance to arrive, using two separate responders (EMS and fire) when it is not clearly required has potential consequences beyond the obvious financial implications. Every emergency vehicle responding with ‘lights and sirens’ is at risk for a collision,⁶⁴ as are other drivers as they try to get out of the way of the emergency vehicle, a phenomenon referred to as ‘wake effect’.⁶⁵

EMS personnel

To achieve the goal of a standardized EMS delivery model for the province, the appropriate skills and training of EMS personnel are required. Currently there are three levels of training for EMS practitioners in Alberta: Emergency medical responder (EMR), Emergency medical technician (EMT), and Emergency medical technologist-paramedic (EMT-P), with scopes of practice defined for each level.

There are considerable differences between the training programs and in how the training programs are accredited. For example, training programs for EMRs are significantly shorter in length, do not require clinical hands-on training, and are not required to be accredited, as is the case for the EMT and EMT-P training programs.

In its five-year plan, AHS articulates a longer-term initiative (2014–15) to “undertake activities to ensure the minimum level of service is Basic Life Support (BLS), ensuring there is appropriate and timely Advanced Life Support (ALS) available through other ground or air ambulance resources or at a nearby health facility.”⁴⁸ AHS distinguishes BLS and ALS capable ambulances by the EMS practitioners in the ambulance and the equipment that is available:

BLS ambulances are staffed with Emergency Medical Technicians (EMT) or Emergency Medical Responders (EMR) with a standard level of equipment to provide essential medical care for patients. Personnel have 100 to 400 hours of formal education. They provide basic patient assessment and treatment including obtaining vital signs, administering oxygen and splinting extremities. ALS ambulances are able to respond to more complex medical situations with a staff of at least one paramedic with expanded training and scope of practice and more life-saving equipment on board. Personnel have a 2 year college diploma and are trained in all

the skills of EMR's and EMT's (BLS) but also have training in treatment including advanced airway management and medication administration.³³

Because EMRs have less skills and training compared to EMTs and EMT-Ps, the scope of patient care they can provide is narrower. For example, EMRs cannot perform cardiac monitoring, start an intravenous, nor administer medications in any route other than oral.

Inter-facility transfers (IFTs)

Some areas within the province are using non-ambulance transport (NAT) units for IFTs for medically appropriate, stable patients (those who do not require monitoring or care by EMS practitioners), freeing up an ambulance and EMS crews for emergency calls. The use of NATs across the province is currently conducted in a non-standardized way. Another difference is that in Calgary and Edmonton, IFTs are carried out by dedicated ambulances and EMS providers, but this does not occur elsewhere. AHS has developed a 'Transfer Matrix' to assist in deciding the appropriate mode for an IFT; however, the matrix has not been fully implemented and not everybody is aware of it. Policies and protocols need to be implemented that specify the appropriate personnel, vehicle, and equipment needed to ensure IFTs are performed safely, including the use of NATs where appropriate.

3. RECOMMENDATION

Alberta Health Services articulate a vision and plan for the EMS delivery system and incorporate an EMS delivery model that standardizes care across the province recognizing the unique realities and requirements for urban, rural, and remote areas.

REQUIRED ACTIONS

- Establish definitions for urban, rural, and remote areas taking into consideration geography, population demographics, frequency of time-sensitive calls, and distance to tertiary care facilities.
- Ensure the most efficient and effective ambulance locations are determined based on validated EMS data, geography, population demographics, frequency of time-sensitive calls, and distance to tertiary care facilities.
- Determine the role, required training and qualifications, for medical first responders within the EMS delivery model.
- Define the range of healthcare services to be provided by EMS practitioners, including community paramedicine.
- Ensure the minimum standard across the province is a Basic Life Support ambulance.
- Determine the resources required for inter-facility transfers (IFTs) that considers provider scope of practice, vehicle type and equipment based on patient need.

Informing and Managing the Quality and Safety of the EMS System

Issue

Provincial EMS system data are lacking in availability, adequacy, and usefulness to inform performance measurement, operational decision-making, and quality management.

Analysis

Despite there being two provincial EMS data sets, one administered by Alberta Health (AH) – called AAIMS – and one by AHS, there is no adequate or reliable source of provincial EMS system data currently available. AAIMS data are incomplete due to poor compliance with data submission and data quality checks by some EMS practitioners and contracted providers. The value of the AAIMS data is also limited because the data elements are only collected for ‘traditional ambulance calls’ and there is limited patient care data that would allow for EMS clinical processes and patient outcomes to be measured. There is considerable variability in the quality of AHS EMS data because of incompatible dispatch data sets and poor compliance in data submission from some contracted providers.

The lack of reliable data has contributed to the change management problems that AHS has faced with the transition. Those opposed to or in favour of the change are left to rely on their perceptions about the quality of dispatch and EMS service delivery since objective data, pre- and post-transition, are not available.

AHS has taken steps to improve data quality by establishing definitions for required data elements for its direct delivery providers. As well, AHS recognizes the need for technology that supports EMS processes and data collection and is building its information system capabilities by linking the computer-assisted dispatch (CAD) systems to the electronic patient care record (ePCR); an ePCR for air ambulance is expected to be implemented in 2013. Relatively recently, AHS began reporting some EMS performance indicators on its website. This is an important first step towards transparency and accountability.

As planning proceeds, it will be important for AHS and AH to maintain a clear focus on how data will be used for performance management, accountability, and to support quality and safety management. A key element of the measurement framework should be to define the patient outcomes that the EMS system can impact and develop a plan for how to measure and report those outcomes. Reporting these outcomes will require the ability to link EMS patient-specific data with other health databases in the province. One of the major benefits of transitioning EMS to AHS is the ability to link data across the healthcare continuum and to take a systems approach to measurement.

4. RECOMMENDATION

Alberta Health and Alberta Health Services collaborate to establish a comprehensive, single source of valid EMS system data that encompasses the EMS dispatch and delivery systems to be used for operational decision-making as well as quality and safety management.

REQUIRED ACTIONS

- Alberta Health Services identify key patient outcome, process, and cost-effectiveness measures for emergency and non-emergency activities (e.g., inter-facility transfers, community referral)

programs, community paramedicine) and for specific patient populations (e.g., major trauma, ST segment elevation myocardial infarction, stroke) and design the collection of provincial EMS data to support the reporting of these measures. Consider national and international sources in their development.

- Alberta Health and Alberta Health Services ensure that the EMS data source can be linked with other healthcare databases to ensure the ability to report on patient outcomes and patient level costing.
- AHS ensure contracted EMS providers meet AHS EMS reporting and data standards.

Issue

AHS is limited in its ability to manage the quality and safety of the EMS system because a quality and safety management approach has not been clearly articulated nor integrated within existing AHS EMS planning and performance documents.

Analysis

Quality management begins with identifying important outcomes for the patient populations that the EMS system serves and the data elements that are required to measure performance. Of equal importance is the identification of the key processes that are understood to ‘drive’ important patient outcomes. Key process and outcome measures create the basis for quality management. Two fundamental preconditions for quality improvement are the presence of valid data (see recommendation # 4) and a standard process of care (see recommendation # 3) to which improvement methods can be applied.

Safety management is closely related to quality management but the focus is on managing harm that patients have experienced and managing the risk of harm occurring. Managing the risk of harm focuses on identifying hazards and hazardous conditions, prioritizing interventions designed to mitigate harm, and implementing those interventions along with a strategy to evaluate the effectiveness of the approach. A safety management plan specifies the ways in which important safety-related information will be gathered, categorized, and stored in a safety information system; how the most important hazards/hazardous situations are identified and prioritized; how improvement plans that specifically address risk-mitigation strategies are developed, tested, and implemented; and, finally, how an evaluation strategy is used to determine if such strategies are having the intended effect and not causing unintended consequences.

The AHS EMS Five Year Plan (2010 – 2015)⁴⁷ includes several initiatives that will impact the quality of EMS delivery; however, the plan does not address specific initiatives on quality or safety management.

The AHS EMS Performance Measurement Framework includes a proposed list of 25 ‘key performance indicators’. Although the framework names ‘key performance indicators’ it fails to identify key *process* measures (a key process is one that has been shown to contribute in an important way to an essential outcome for a defined population of patients) and few of them focus on clinically relevant care processes. For example, a measure that describes the time to defibrillation for patients suffering from ventricular fibrillation would be an important process measure for this time-sensitive condition. Some key process measures are defined in national documents from Canada⁴⁰ and the United States⁶⁶ but are not included in the AHS EMS document. At this time the framework specifies only a single outcome measure (patient

satisfaction). With the integration of the EMS system into the health system, there is an opportunity to adopt ‘system as a whole’ morbidity and mortality outcome measures (e.g., mortality rates at point of discharge from hospital for patients who accessed the health system through a 911 call requesting an ambulance) and capture patient-level cost information.

AHS EMS has specified the beginning elements of a safety management system in its AHS EMS Audit Process document. The document outlines a plan for what is best defined as quality assurance and that includes surveillance of some high-hazard procedures. Although using a formal quality assurance review process and using the AHS reporting and learning system are mentioned in the document, exactly how this information would be used to manage patient safety is not described. There is currently a heavy reliance on monitoring the compliance of EMS practitioners with the medical control protocols. While monitoring compliance is one approach for monitoring quality, it is primarily based on an intermittent audit process rather than continuous measurement of key process measures. Another element of safety management has been captured in the AHS EMS directive, the Immediate and Ongoing Management for Clinically Serious Adverse Events, which describes how AHS EMS will respond to a situation where a patient suffers harm as a result of the EMS care that was provided.

Historically the large urban centres, such as Calgary and Edmonton, were adequately resourced for staff training, data analysis and quality and safety management. With AHS having overall EMS system responsibility its resources are now being spread farther to support the entire province. As contracted EMS service providers move to AHS EMS direct delivery, the number of AHS frontline staff increases but there is not always a corresponding increase in support staff that provide staff training, data analysis and quality and safety management. The results has been a reduction in resources and support for the cities, however, the rural and remote areas are now receiving more support than they had before the transition.

AHS EMS documents (AHS EMS Five Year Plan, AHS EMS Performance Measurement Framework, AHS EMS Audit Process and the Immediate and Ongoing Management for Clinically Serious Adverse Events in EMS directive) demonstrate some of the required components of quality and safety management but a comprehensive approach for AHS EMS was not clearly articulated in a single document.

5. RECOMMENDATION

Alberta Health Services specify a quality and safety management approach that is an integral component of the AHS EMS planning and performance documents.

REQUIRED ACTION

- Develop and implement a comprehensive quality and safety management approach that includes the following components:
 - Valid data to identify areas for quality improvement.
 - A single repository of information that contains results of EMS quality assurance reviews, audits, EMS incidents reported to the AHS reporting and learning system, and other safety inputs.
 - Mechanism for the prioritization of quality and safety improvement initiatives.

- The quality improvement methods to be used.
- Resources to support training of EMS practitioners and administrators in the principles and practices of quality and safety management.
- Policies and procedures for managing both the risk of harm and the occurrence of harm to patients.
- Accreditation of EMS dispatch centres and EMS delivery using standards specific to EMS.

APPENDICES

Appendix I: Glossary

- **AAIMS** – Alberta Ambulance Information Management System is a web-based application used by Alberta Health (formerly Alberta Health and Wellness) since 2005 to collect data from EMS operators in Alberta. This data includes patient care reporting, and information from ground ambulance operators, medical crew providers and air service providers.
- **AED** – Automatic External Defibrillator. A portable electronic device used to treat sudden cardiac arrest. The device is designed to be used by trained and untrained lay persons and directs the provider through the process of using of the device, identification of life-threatening cardiac arrhythmias, and automatic defibrillation of a life-threatening cardiac arrhythmia.
- **AFRRCS** – Alberta First Responder Radio Communications System. AFRRCS is a project currently underway in the Ministry of Justice and Solicitor General to develop “a province-wide two-way radio network for public safety first responder agencies, including police, fire, and ambulance. AFRRCS will provide these agencies with a common radio network to communicate with one another, and improve the coordination between different agencies.”⁶⁷
- **Alberta Occupational Competency Profiles (AOCPs)** - lists the scope of practice for practitioners at each designation level. The AOCPs specify exactly what EMRs, EMTs, and EMT-Ps can do in their work practice. Practitioners cannot perform skills not listed in their AOCP.²⁵
- **ALS ambulance** – an ambulance meets the requirements necessary to provide ambulance services at the Advanced Life Support level if: (a) it is staffed with at least two ambulance attendants, one of whom is an Emergency Medical Technologist – paramedic or registered nurse equivalent (EMT-P), and one of whom is an Emergency Medical Technician – Ambulance or registered nurse equivalent (EMT-A) and, (b) it is equipped with the equipment and supplies specified for that level in the Standards of Ambulance Equipment and Supplies.⁶⁸
- **AVL** – Automatic Vehicle Location. - an electronic means to register and track a vehicle’s location using satellite or geographical positioning systems. EMS dispatch systems, in particular Alberta Health Services, will use AVL to monitor ambulance location and travel throughout the province.
- **BLS ambulance** – an ambulance meets the requirements necessary to provide ambulance services at the Basic Life Support level if: (a) it is staffed with at least two ambulance attendants, one of whom is an Emergency Level Technician – ambulance or registered nurse equivalent (EMT-A), and one of whom is an Emergency Medical Responder or registered nurse equivalent (EMR) and (b) is equipped with the equipment and supplies specified for that level in the *Standards of Ambulance Equipment and Supplies*.⁶⁹
- **CAD** – (computer-assisted dispatch/ computer-aided dispatch) - is a system used to dispatch ambulances using computer-assisted technology, radio systems, and mobile data terminals located in an ambulance.
- **Chute Time** - the time period from when the EMS crew is dispatched to when it is en route (driving).

- **Community Paramedicine** –“model of care whereby paramedics apply their training and skills in “non-traditional” community based environments, often outside the usual emergency response and transportation model. The community paramedic practices within an “expanded scope”, which includes the application of specialized skills and protocols beyond the base paramedic training. The community paramedic engages in an “expanded role” working in non-traditional roles using existing skills.”⁷⁰
- **Cross-patch (or Patch)** - a method to connect two parties who require communications who otherwise cannot communicate directly. Common EMS usage refers to an ambulance being "patched" by a CMED to one or more hospitals. Cross-channel patching refers to the connecting of one radio channel to a separate radio channel.⁷¹
- **Dispatch** – The process of receiving a call through a centralized contact centre or dispatch centre and the subsequent deployment of the appropriate service vehicle to where it is needed. In the case of EMS, an emergency call is placed to 911, the receiver transfers the caller to an EMS dispatch centre or dispatcher, and, once the nature of the call is understood, the dispatcher contacts an EMS crew to go to the location of the emergency.
- **Emergency Medical Responder (EMR)** – A registrant regulated in the Emergency Medical Responder category of practice, under the *Emergency Medical Technicians Regulation* and under the *Paramedic Profession Regulation*. (Registrants of the Alberta College of Paramedics in all three categories are often referred to as “paramedics” or “practitioners”).⁷²
- **Emergency Medical Services (EMS)** – Emergency medical services dedicated to providing pre-hospital acute medical care and/or transportation to definitive care. It also includes transportation between healthcare facilities.⁷²
- **EMS Chiefs of Canada** - Under the leadership of Chief Steve Rapanos (Edmonton EMS), the Emergency Medical Service Chiefs of Canada (EMSCC) was incorporated in 2002 as a national forum for information gathering, policy development, and coordinated action by the leadership of Canada’s EMS systems.⁷³
- **Emergency Medical Technician (EMT)** – A registrant regulated in the Emergency Medical Technician-Ambulance area of practice, under the *Emergency Medical Technicians Regulation* and under the *Paramedic Profession Regulation*. (Registrants of the Alberta College of Paramedics in all three categories are often referred to as “paramedics” or “practitioners”).⁷²
- **Emergency Medical Technologist-Paramedic (EMT-P)** – A registrant regulated in the Emergency Medical Technologist-Paramedic area of practice, under the *Emergency Medical Technicians Regulation* and under the *Paramedic Profession Regulation*.⁷²
- **Medical First Responder** – See Appendix IV of this report – Definitions and Descriptions of First Response Terms used in Alberta.
- **GIS** (Geographic Information System) - integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. It allows us to view, understand, question, interpret, and visualize data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts.⁷⁴

- **GPS** – Global Positioning System. - “An electronic system that uses...satellites to determine the position of a vehicle, person, etc.”⁷⁵
- **iDEN** – (integrated Digital Enhanced Network) - is a digital trunked radio developed by Motorola which provides its users the benefits of a trunked radio and cellular-like telephone services. It was first introduced in 1994. The technology supports multiple services in single devices. The four-in-one service allows business users to take advantage of advanced wireless technologies with one pocket-sized digital handset that combines: two-way digital radio; digital wireless phone; short message services; and data capabilities leveraging internet access technology.⁷⁶
- **IFT** – (inter-facility transfers) - the emergency or non-emergency transfer of patients from one medical facility to another.
- **MCP** – Medical Control Protocols. A set of standardized evidence-based patient assessment and treatment procedures to direct EMS practitioners during a medical emergency and/or patient encounter. The Alberta Emergency Services Act (2008) requires health authorities in the province to employ or engage a medical director to provide direction and establish medical protocols for the provision of emergency health services in the health region.⁶⁹
- **MDT** – Mobile Data Terminal. A computerized device, usually a tablet located in EMS vehicles and used to communicate with central dispatch centres. MDTs receive and transmit the pertinent information required by EMS crews to respond to an EMS call and acquire relevant patient information from the dispatcher in addition to providing mapping and navigation tools.
- **MPDS** – Medical Priority Dispatch System – is a medically-approved, unified system used to dispatch appropriate aid to medical emergencies including systemized caller interrogation and pre-arrival instructions.⁷⁷
- **National Occupational Competency Profile (NOCP)** – competency profiles for different categories of practitioners, developed and approved by the Paramedic Association of Canada.²⁴
- **Paramedic** – The term used to describe the three categories of registrants with the Alberta College of Paramedics i.e. Emergency Medical Responder, Emergency Medical Technician and Emergency Medical Technologist – Paramedic.
- **Paramedic Chiefs of Canada** – Formerly named the EMS Chiefs of Canada or Emergency Medical Services Chiefs of Canada (EMSCC).⁷⁸
- **Paramedicine** – The unique domain of practice that represents the intersection of emergency medical services, healthcare, public health, and public safety. The mission statement of the Alberta College of Paramedics notes that the College “governs and regulates the practice of paramedicine in the public interest”.⁷⁹
- **Pre-hospital Care** – Emergency medical services provided to patients before and during transfer to an acute care hospital. While historically connected with paramedicine, this term is becoming obsolete due to the versatility and continuum of employment practice settings.
- **PSAP** – Public Safety Answering Point. Sometimes called a Public Safety Access Point or Enhanced 911 (E911) Centre. When someone calls 911 the call is routed to a PSAP centre where it is answered by a call-taker who asks the caller which service he requires: police, fire, or

ambulance. The call-taker then transfers the call to the appropriate emergency service.

- **REPAC (Regional Emergency Patient Access and Coordination)** - REPAC monitors the current status of patient volumes, incoming EMS volumes and severity of patient conditions in the Calgary/Edmonton hospitals and urgent care centres. This information is used to generate a real time representation of the overall capacity and patient volumes.⁸⁰
- **System Status Management (SSM)** – “...the process of preparing the system for the best possible response to the next EMS call. SSM’s primary purpose (but not its only purpose) is to create and maintain the closest practical match between EMS demand and EMS supply.”⁵⁴

Appendix II: Ministerial Request and Extension Letter



AR 96497

February 28, 2012

Dr. Lorne Tyrrell, Chair
Health Quality Council of Alberta
210, 811 - 14 Street, NW
Calgary, Alberta
T2N 2A4

Dear Dr. Tyrrell:

Further to our recent discussion, concerns have been expressed across the province with respect to emergency medical services (EMS) response times and emergency department (ED) wait times.

Pursuant to Section 15(1) of the *Health Quality Council of Alberta Act*, I hereby direct the Health Quality Council of Alberta (the Council) to conduct a Review of operations of emergency medical services in Alberta.

The Review shall include but is not limited to implications for quality and patient safety with respect to:

- transition issues related to the transfer of governance and funding of ground EMS from municipalities to the former regional health authorities and Alberta Health Services;
- dispatch consolidation;
- challenges specific to integrated fire/EMS service providers;
- challenges specific to rural and remote areas of the province; and
- availability and adequacy of data on EMS.

The Review will not examine the decision of the Government of Alberta to transfer governance and funding of EMS from municipalities to the regional health authorities. The review team will include nationally, and may include internationally credible, recognized experts in EMS and emergency medicine.



Alberta

.../2

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Dr. Lorne Tyrrell
Page 2

The Council, in consultation with Alberta Health and Wellness and Alberta Health Services, will establish Terms of Reference for this Review in accordance with the general parameters described above.

The Council's report and recommendations are due to me on October 31, 2012, and shall be made public by the Council.

Please forward the Terms of Reference to me as soon as possible. Thank you for undertaking this very important work.

Sincerely,

A handwritten signature in black ink that reads "Fred Horne".

Fred Horne
Minister of Health and Wellness
Deputy Government House Leader

cc: Honourable Alison Redford, QC
Premier

Dr. John Cowell, MD
CEO, Health Quality Council of Alberta



ALBERTA
HEALTH

*Office of the Minister
MLA, Edmonton-Rutherford*

DEC 03 2012

AR 103028

Dr. A.L.A. (Tony) Fields
Chair
Health Quality Council of Alberta
210, 811 - 14 Street NW
Calgary, Alberta
T2N 2A4

Dear Dr. Fields:

Thank you for your letters of October 3, 2012, and November 20, 2012, requesting approval of a deadline extension for the Health Quality Council of Alberta's (HQCA) report on its review of emergency medical services (EMS) in Alberta. I appreciate the opportunity to respond.

The implementation of policy changes for EMS following comprehensive review of the system is a top priority for the Government of Alberta; however, I also recognize that extra time is required to ensure the research and recommendations can be fully developed. As such, I will approve an extension to allow the HQCA additional time to complete its analysis and recommendations.

Please provide me with a finalized report of the HQCA's review of the EMS system by no later than January 31, 2013. The contract will be amended to reflect this change, and a copy will be forwarded to you in the near future.

Thank you again for writing.

Sincerely,



Fred Horne
Minister of Health

cc: Dr. John Cowell
Chief Executive Officer, Health Quality Council of Alberta

Appendix III: Terms of Reference



Promoting and improving patient safety and health service quality across Alberta

Review of the Operations of Emergency Medical Services in Alberta

Terms of Reference

Purpose

Pursuant to section 15 (1) of the *Health Quality Council of Alberta Act*, the HQCA will conduct an independent review of the operations of ground emergency medical services (EMS) in Alberta.

Objectives

The HQCA will conduct a review of the implications for quality and patient safety with respect to ground emergency medical services that includes but is not limited to:

- Transition issues related to the transfer of governance and funding of ground EMS from municipalities to Alberta Health Services
- Dispatch consolidation
- Challenges specific to integrated fire / EMS service providers
- Challenges specific to urban, rural and remote areas of the province
- Availability and adequacy of data on EMS.

This review will not include the examination of the decision of the Government of Alberta to transfer governance and funding of EMS from municipalities to the regional health authorities.

In order to ensure the quality and safety of emergency medical services in Alberta and based on the findings and analysis of the investigation the HQCA will make recommendations about the implications for quality and patient safety with respect to the above.

Stakeholders

Stakeholders that may be engaged in the review process include but are not limited to:

- Alberta Health Services
 - Emergency Medical Services
 - Emergency Medicine
- Contracted EMS providers (for profit, not for profit/municipal)
- Government of Alberta - Alberta Health and Wellness
 - Emergency Health Services
- Government of Alberta - Municipal Affairs
 - Provincial Fire Commissioners Office
- Alberta Municipalities
- Public Safety Answering Points (PSAPs or E911 centres)
- Alberta College of Paramedics (EMT, EMR and EMT-P)

- Health Sciences Association of Alberta
- Fire Fighters Association
- Association of Alberta Chiefs of Police
- Alberta Urban Municipalities Association
- Alberta Association of Municipal Districts and Councils
- Agencies providing first response services

Review Sponsor

John W. F. Cowell M.Sc., MD, CCFP, FRCP, CEO of the HQCA

Deliverables and Timelines

Bi-monthly progress updates provided to the Deputy Minister of Alberta Health and Wellness. A full report of the findings and recommendations will be presented to the Minister of Health and Wellness and will be made public on October 31, 2012.

Approved by the Board of the Health Quality Council of Alberta:


D. Lorne J. Tyrrell, OC, AOE, MD/PhD, FRCP
Chair of the Board

March 16, 2012
Date

Appendix IV: Definitions and Descriptions of First Response Terms used in Alberta

First Responder

Any support to an emergency occurring in a community an untrained bystander support to support provided by specifically trained personnel. An individual responding first would be considered a first responder but this term has been used by agencies such as fire departments to describe their personnel acting as medical first responders. Alberta Justice and Solicitor General includes police, fire and ambulance agencies as first responders on the Alberta First Responder Radio Communication System website.⁸¹

Medical First Responder

Medical first response is specific to the arrival of the first medically trained person on the scene, usually someone with a first aid responsibility but may also apply to other emergency professionals such as fire department personnel, police officers, first aid agencies such as the Red Cross or St. Johns Ambulance, the Canadian Ski Patrol, or industrial site first aid attendants. Training may range from basic first aid to a physician level respondent.

Nova Scotia Emergency Health Services (EHS) describes their Medical First Response Program on their website:⁸²

The EHS Medical First Response (MFR) program is largely a rural-based program that serves to enhance pre-hospital patient care provided by the EHS system. Beyond the lifesaving instructions provided by the EHS Medical Communications Officer, a Medical First Responder is often the first physical contact that the patient has with an individual who can offer some form of medical assistance. This assistance can range anywhere from a person who knows First Aid and CPR to an organization that is certified as a Medical First Response agency.

Medical First Responders are individuals throughout the province trained to provide advanced medical First Aid to the residents of their communities. In addition to this, some agencies also have defibrillators so that they can provide early defibrillation before the Paramedics arrive on scene.

The Medical First Response term is proposed by AHS as a system model of medical first responder stakeholders registered with AHS and complying with defined standards of care.

Medical Co-Responder (MCR)

This term was coined by rural EMS and fire agencies in Alberta prior to the EMS transition to AHS. In Alberta the two EMS discovery projects in Palliser and Peace County provided medical training support to rural community fire based personnel and volunteers to provide medical trained first response personnel for medical emergencies in small communities until an ambulance arrived. The training provided was based on EMR content but participants did not receive an EMR certificate if they did not register with the Alberta College of Paramedics.

Fire Medical Responder (FMR)

Fire medical first response programs and fire medical first responders were developed and supported by municipal fire departments as programs to support medical first response in their community response areas. Programs were modeled after EMR or advanced first aid programs but did not receive approval from the Alberta College of Paramedics as basic level training programs for registration with the College as practitioners.

Appendix V: Systematic Literature Review

Review of Operations of Emergency Medical Services in Alberta:



Report for the Health Quality Council of Alberta

Broad Overview of the Research Informing Aspects of Emergency Medical Services

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Executive Summary

Introduction:

- Emergency medical services (EMS) encompass a wide range of care, often spanning from an initial 911 call until the care of the patient has been transferred to the hospital.

Methods:

- This broad overview of research involved a comprehensive search of relevant electronic databases on a range of dimensions of the EMS System. The objective was this search was to explore the literature in a number of broad areas including: 1) quality indicators and performance measures, 2) EMS system components (e.g., environment, equipment, personnel), 3) specific aspects of EMS care, and 4) EMS system safety.

Results:

- The dimensions examined in this review include:
 - Quality indicators and performance measures
 - EMS System Components, including:
 - EMS Process and organization
 - Environment, including:
 - Dispatch
 - Dispatch consolidation
 - Regionalization of trauma services
 - Rural and urban EMS
 - Response times
 - Adverse events
 - Equipment, including:
 - Advanced life support and basic life support
 - Helicopter EMS
 - Communications and data services
 - Personnel, including:
 - Training: national standards, curriculum and framework
 - Staffing
 - Pre-hospital care physicians/emergency care practitioners
 - Team composition and collaboration
 - Specific aspects of EMS care, including:
 - Field triage

- Cardiac arrest
- Stroke
- EMS System Safety, including:
 - EMS Personnel
 - Patient Safety

Conclusions:

- While some areas of the EMS literature had a great deal of research, others were more limited. The limited amount of available research underscores the importance of further EMS research in general as well as for Alberta focused research specifically.
- Nevertheless, this review provides a catalogue of some of the existing evidence that can help inform the regional planning of EMS services.

Abbreviations

AAIMS	Alberta ambulance information management system
ACS	Acute coronary syndrome
ACV	Ambulance care volume
AE	Adverse events
AED	Automated external defibrillator
ALS	Advanced life support
ANSI	American National Standard Institute
BIOPOD	Biological points of distribution
BLS	Basic life support
CA	Cardiac arrest
CAEP	Canadian Association of Emergency Physicians
CCL	Cardiac catheterization lab
CCS	Canadian Cardiovascular Society
CDC	Centre for Disease Control and Prevention
CFQ	Chalder Fatigue Questionnaire
CI	Confidence interval
CIHI	Canadian Institute for Health Information
CINAHL	Cumulative Index of Nursing and Allied Health
CPR	Cardiopulmonary resuscitation
CSS	Cincinnati Pre-hospital Stroke Scale
CT	Computerized tomography
D2B	Door to balloon time
ECG	Electrocardiogram
ECP	Emergency care practitioner
ED	Emergency department
EMS	Emergency medical services
EMT	Emergency medical technician
e-PCR	Electronic – patient care report/record
ETI	Endotracheal intubation
FFR	Firefighter first responder
FMC	First medical contact

FTE	Full time equivalent
GCS	Glasgow coma scale
GPS	Global positioning system
HEMS	Helicopter EMS
IQR	Inter-quartile range
ISS	Injury severity score
IT	Information technology
IV	Intravenous
LTC	Long term care
MAP	Mechanism, anatomy, physiology
MPDS	Medical Priority Dispatch System
MRI	Magnetic resonance imaging
MVC	Motor vehicle collision
NAEMSP	National Association of EMS Physicians
NEISS-work	National Electronic Injury Surveillance System – Occupation Supplement
NEMSIS	National EMS Information System
OHCA	Out of hospital cardiac arrest
OPALS	Ontario pre-hospital ALS
OR	Odds ratio
PALS	Pediatric ALS
PHL	Pre-hospital thrombolytic
PPCI	Primary percutaneous coronary intervention
PPV	Positive predictive value
PSQI	Pittsburg Sleep Quality Index
PTSS	Posttraumatic stress syndrome
QI	Quality indicators
RCT	Randomized controlled trial
RLS	Red lights and sirens
ROSC	Return of spontaneous circulation
RR	Relative risk
RTS	Revised trauma score
SAQ	Safety attitudes questionnaire

SSM	Systems status management
STEMI	ST-elevation myocardial infarction
T-CPR	Telephone – cardiopulmonary resuscitation
TIA	Transient ischemic attack
TOR	Termination of resuscitation
tPA	Thrombolytic therapy
TR	Targeted response strategy
UFR	Unavailable for response
UR	Uniform response strategy
VF	Ventricular fibrillation
VT	Ventricular tachycardia

Definitions

Advanced Life Support – pre-hospital care that involves techniques such as endotracheal intubation, intravenous access, administration of medications and fluid therapy. Tend to have the ability to provide advanced care either on-scene or en route to the hospital¹.

Adverse Events – “an adverse event in EMS is a harmful or potentially harmful event occurring during the continuum of EMS care that is potentially preventable and thus independent of the progression of the patient’s condition”².

Basic Life Support – pre-hospital care that involves techniques such as external hemorrhage control, extrication, providing artificial respiration and circulation. Tend to be relatively easy to perform and require little added on-scene time¹.

Dispatch – system of prioritizing 911 calls and optimizing resource allocation³.

Dispatch Consolidation – typically involves the consolidation of municipality dispatch systems (e.g., process own 911 calls, dispatch their own police, fire and EMS) into a larger city or provincial system⁴.

Emergency Medical Services - encompass a wide range of care, often spanning from an initial 911 call until the care of the patient has been transferred to the hospital.

Field Triage – identification by EMS providers of those patients who are at greatest risk for severe injury and determining which facility is most appropriate for their care. Can also involve referring those at the scene to alternative means of treatment if they do not require EMS transportation.

Hospital Turnaround Time – the time interval between an ambulance’s arrival at the hospital and it’s availability to respond to other calls.

Injury Severity Scoring System – system providing an overall score for patients with multiple injuries ranging from 0 to 75⁵. A score ≥ 16 is considered a polytrauma.

National EMS Standards – a standardized system of training and registration for pre-hospital providers.

Quality Indicators – measure of performance that allows for comparison between actual care provided against ideal criteria. Used for quality measurement, benchmarking and identifying potential areas for improvement^{6,7}.

Regionalization of Trauma Services – involves organizing trauma services into a single comprehensive system where all hospitals in the region are classified by the level of trauma care they provide. Regionalization involves centralized coordination of EMS, a system for EMS assessment and treatment, and standardized triage transport protocols which outline that major trauma patients should be transported to Level I centres⁸.

Response Times – often defined as the length of time between the receipt of a 911 call and the arrival of the first EMS unit on the scene⁹.

Telemedicine/Teleconsultation – “the use of electronic information and communications technologies to provide and support care, when distance separates the participants”¹⁰.

Introduction

Emergency medical services (EMS) encompass a wide range of care, often spanning from an initial 911 call until the care of the patient has been transferred to the hospital. In the past, EMS was often focused specifically on emergency transport and inter-facility transfers in both emergency and non-emergency situations¹¹. However, EMS has become increasingly complex and EMS personnel are becoming involved in a broader spectrum of care. EMS has moved from a “scoop and run approach” to enabling EMS providers to provide a broad range of care at the scene. More specially, EMS providers have begun assessing, treating and even referring patients rather than just immediately transporting them to the hospital¹². However, despite the increasingly complex care provided by EMS providers, a unified national plan to “enable research, ensure efficient use of research resources, guide funding decisions and build capacity in EMS research” does not exist¹³. The objective of this review is to explore the current state of research within EMS, providing a summary of the available literature in a number of dimensions of the EMS system. Specifically, we sought to compile an overview of literature addressing four broad areas: 1) quality indicators and performance measures, 2) EMS system components (e.g., environment, equipment, personnel), 3) specific aspects of EMS care, and 4) EMS system safety.

Project Methods

The review team followed a protocol that had been developed *a priori* to establish the search strategy and study selection criteria.

Searches of electronic databases:

In May and June 2012, the review team carried out a comprehensive search of relevant electronic databases including PubMed, EMBASE, CINAHL, Bandolier and SCOPUS using combinations of keywords and thesaurus terms related to EMS (see Appendix A for the search criteria used).

Selection Criteria:

- a) **Study Design:** systematic reviews and meta-analyses, randomized controlled trials (RCTs), quasi-randomized trials, cohort studies, case-control studies, before-and-after studies and interrupted time series were all included as the preferred study design. Articles outside of these study designs such as qualitative studies, case studies, editorials and review articles were included in the summaries to supplement the information where possible.
- b) **Domain:** studies had to involve the EMS system or some aspect of it.
- c) **Time Period:** the search period ranged from 2008 to present. However, in some instances, key articles identified through searching or references published prior to 2008 were included.

Selection Method:

A three round process was used to select studies for the report. The first round included a broad title, and where required, an abstract review by a reviewer. The second round consisted of a title and abstract review of the retained studies from round 1 by the project lead. The third round consisted of a full text review of the retained studies from round 2 by a reviewer. Any articles that were deemed to not meet selection criteria, or were not applicable to the dimension of EMS under consideration upon full text review were not included. We were specifically seeking articles addressing four broad areas: 1) quality indicators and performance measures, 2) EMS system components, 3) specific aspects of EMS care, and 4) EMS system safety. Within EMS system components we sought

articles in the sub-themes of EMS process/organization, environment (e.g., dispatch, dispatch consolidation, regionalization of trauma services, rural and urban EMS, response times, adverse events), equipment (e.g., ALS and BLS, helicopter EMS, communications and data services), and personnel (e.g., training, staffing, pre-hospital care physicians and team composition/collaboration). Within the specific aspects of EMS care, we sought articles in the sub-themes of field triage, cardiac arrest, and stroke. Within EMS system safety, we sought articles in the sub-themes of EMS personnel safety as well as patient safety.

Data Extraction and Presentation Strategies:

Simple strategies were developed to extract from systematic reviews and individual studies. For the domains where there was a preexisting and recent systematic review, findings of the review have been summarized in the text. For the domains where there was no systematic review, narrative summaries have been provided to describe what was found on the dimension.

Results

Using the methods described above, the following evidence summaries are provided for the dimensions of Emergency Medical Services we have identified. The results of the literature review will be presented in the following sections: 1) quality indicators and performance measures, 2) EMS system components (including the environment, equipment and personnel), 3) specific aspects of EMS care (including field triage, cardiac arrest and stroke), and 4) EMS system safety (including both EMS personnel safety along with patient safety).

Quality Indicators and Performance Measures

A variety of literature including two^{19,20} systematic reviews, eight^{7,15,16,17,21,23-25} published papers and four^{6,14,18,22} reports were identified on quality indicators and performance measures. Quality indicators (QIs) are a measure of performance that allow for comparison between actual care provided against ideal care. This comparison in turn allows for quality measurement, benchmarking, and the identification of areas for improvement^{7,14}. Quality indicators are considered a type of performance measurement and can be classified into structure, process, and outcome indicators. Within the EMS system, structure indicators examine characteristics of the various components within the system, process indicators refer to those that evaluate the steps of care provided between the pre-hospital provider and the patient, and lastly, outcome indicators evaluate change in health outcomes as a result of care received¹⁵.

Most QIs have been designed to examine the safety, effectiveness, efficiency, and timeliness of pre-hospital processes and outcomes rather than structure of care⁸. The most commonly used process QI within the pre-hospital setting is that of emergency vehicle response time^{15,16}. However, despite its consistent and widespread utilization, the usefulness of this measure in improving care remains uncertain^{15,17}. In terms of common outcome QIs, the most commonly used indicator is that of out-of-hospital cardiac arrest survival, however cardiac arrest patients constitute only 1-2% of all EMS responses^{15,16}. Further detail and discussion regarding these and other specific QIs can be found within their respective sections throughout this report.

Although many QIs for pre-hospital care exist, with some more extensively used than others (e.g., response time), there is large variation in the use of QIs with few centres utilizing the same measures⁸. Therefore, there remains a need for the development of a core group of broadly applicable QIs, which in turn will permit benchmarking and thus cross-setting comparability of performance⁸. This need for standardized QIs that are generalizable across the country provides support in the work of the EMS Chiefs of Canada attempt to do just that.

Within Canada, the EMS Chiefs of Canada (now called the Paramedic Chiefs of Canada) launched the Performance Measures Sub-Committee to develop national, evidence-based performance measures to be utilized in order to systematically improve EMS delivery throughout the country¹⁸. Prior to the efforts of this committee, practices in Canada involved the use of several local performance measure frameworks. From this variability in practice came the realization that what was needed were new measures and definitions to establish a national benchmarking initiative that would allow for generalizability to all service delivery models, community demographics or geographies across Canada. In addition, this initiative would ensure standardization and consistency in care across the country. Through a national survey and international review of current performance measures, the sub-committee developed a data dictionary consisting of 12 broad performance measure categories (response times, volumes/call patterns, finance/funding, utilization, system design, community programs, customer satisfaction, fleet maintenance, carbon emissions, occupational health and safety, staffing/human resources, and quality assurance/compliance), which are comprised of a total of 67 specific measures, all of which have been piloted with data since 2007.

Although the EMS Chiefs of Canada have developed a data dictionary indicating several performance measures to be utilized in EMS service delivery across the country, a recent systematic review by Stelfox et al.¹⁹ examined the evidence (reliability, validity, and outcomes) supporting QIs for trauma care (amongst this includes QIs for pre-hospital care). The findings from Stelfox and colleagues suggest that although there are numerous indicators available, the strength of research methodology supporting them are weak (i.e., small sample sizes, limited risk adjustment, concerns of selection bias, and limited details about the QIs and patient population, with the majority of QIs having a single measurement

domain evaluated (i.e., only reliability or validity evaluated, not both)). This is also a conclusion drawn by a review from El Sayed¹⁵, who suggests that although there are several sets of comprehensive QIs for EMS, the validity and practical application of those indicators requires further research. These findings were similar to a previous review by Stelfox et al.²⁰ examining QIs for evaluating pediatric trauma care. The findings from these reviews suggest the need for evidenced-based measures rather than expert opinion-based quality assurance. Furthermore, Myers et al.¹⁶ call for a more comprehensive model of EMS system performance measurement that moves beyond the traditional focus of cardiac arrest survival rates and response time performance to encompass the documentation of clinical care for ST-segment elevation myocardial infarction, pulmonary edema, bronchospasm, seizure, and trauma patients, again all requiring the need for further research.

Based upon the variation in practice and lack of research supporting the evidence of available QIs, Santana and Stelfox⁷ with an international panel of injury and quality of care experts, utilized a modified RAND/UCLA Appropriateness Method to identify revisions to existing QIs and propose new QIs for injury care. The intent is to complement current practices (e.g., accreditation processes) and provide users with a dynamic tool that requires ongoing modifications as the evidence base expands. Through the international panel, a total of eight QIs for pre-hospital care were identified. These included: time to first medical contact, acute pain management, protocol for field triage, field triage rate, protocol for patient transfer, protocol for monitoring diversion from trauma centre, time to definitive trauma centre, and invasive pre-hospital procedure documentation rate.

Not only is there a lack of strong evidence-based QIs and standardized practices, another barrier faced is the difficulty in implementation of QIs²¹. One potential mechanism to ensure proper implementation and uptake of performance measures such as QIs, is the use of knowledge translation strategies, however once again, further research is required in order to determine if utilization of such techniques are beneficial in overcoming the barriers associated with implementation²¹.

Another means to increase implementation and uptake of QIs is through the process of accreditation, which utilizes such performance measures to determine whether a given standard has been met. Being accredited provides a concrete and tangible means to

promote one's commitment to quality and safety and overall system improvement, thereby providing an incentive to engage in such a process¹².

In 2009, through feedback and guidance from EMS supervisors, frontline workers, academics and government, Accreditation Canada developed the first set of standards for EMS^{22,23}. These standards are part of a broader set of Emergency Health Services standards, which consist of emergency departments, trauma, and emergency medical services²². The EMS standards are divided into broad subsections (establishing partnerships and community awareness; improving service quality; building a high-performing team; preventing infection and reduce risk; operating vehicles and equipment safely; maintaining user-friendly and effective clinical information systems; and monitoring quality and achieving positive outcomes) and are intended to address the needs of various types of organizations (e.g., large, urban, rural, remote). Through uptake of these standards, organizations are provided with increased opportunity to engage in quality improvement initiatives, in turn promoting patient safety, improving health outcomes, and contributing to the overall effectiveness of the EMS system^{23,24}. However, as this is a recently developed initiative, ongoing efforts to determine its effectiveness are required.

The development of quality indicators and performance standards is not unique to Canada. The United Kingdom is piloting a national trial of clinical performance indicators throughout their ambulance services²⁵. A series of indicators were developed involving a partnership with clinicians and service users that were consistent with available best evidence and were linked to the national structure for evidence, knowledge, research and development. Indicators were developed in five areas: 1) acute myocardial infarction, 2) cardiac arrest, 3) stroke (include TIA), 4) asthma, and 5) hypoglycemia. The authors hope that the pilot will be able to inform further development of indicators and allow for benchmarking of performance along with the implementation of specific evidence-based interventions. As part of the process, a national performance improvement registry is being developed that will allow stakeholders to share and evaluate effective improvement methods.

Summary: Research identified in this report would suggest that quality indicators as a method of performance measurement allows for the measurement, monitoring and comparison of performance. This measurement in turn enables understanding and the

identification of where improvements can be made. Although some quality indicators for EMS exist, the research examining evidence-based measures of performance within the pre-hospital setting is lacking and inconclusive to their effectiveness to overall system improvement. In addition, associated complexities such as difficulty in implementation, uptake, and variations in service delivery both at a national and international level result in difficulties in standardization and cross-setting comparison. Although efforts to bring QIs to the forefront in the Canadian context are increasing (e.g., through the establishment of national standards and performance metrics), these measures will require ongoing analysis and review to ensure their relevance and confirm their reliability and validity to improve EMS within the country¹⁸.

EMS System Components

EMS Process/Organization – While different aspects of EMS process and organization are described in further detail below, a systematic review was not located discussing EMS process and organization from a broad perspective, however six²⁶⁻³¹ key articles were identified. In general, EMS performance depends on the availability of resources such as personnel and supporting equipment or facilities as well as optimal station location and size²⁶. Similarly, an Alberta study suggests that EMS process/organization is impacted by three particular factors: regionalization, station location, and System Status Management (SSM)²⁷. For example, population-based funding structures used for the organization of regionalized EMS could lead to regional variation in access since these funding structures overlook important factors related to costs and effective operation. Strategic station location is also fundamental to system organization, and EMS must continually examine the need to add or remove stations depending on anticipated changes in demand to ensure quality care. Finally, SSM impacts EMS organization through the repositioning of ambulances to maintain coverage but this involves a tradeoff between crew fatigue and response times. In fact, it is estimated that eliminating SSM would reduce the calls reached within 9 minutes from 87% to 81% and would require eight additional units in order to match current performance under SSM.

Quality leadership is also important to EMS organization. In particular, the medical directors and lead agencies overseeing EMS have a significant impact on the systems as a whole as well as on patient outcomes, and therefore, determining who should fill such roles is a critical decision²⁸. Similarly, an Australian article showed that service advisory committees can provide valuable coordination and leadership with the potential to improve EMS services and ensure high quality outcomes²⁹.

The remaining two studies compared EMS organizations in various countries. The first of these examined four systems in Germany, Spain, UK, and US and found that they all had a high level of organization that included computer-aided dispatch, digital radio systems, etc³⁰. The biggest difference between systems was the education level of EMS personnel, and in turn, advanced life support (ALS) staff education, qualifications, and training were positively related to outcomes for patients with cardiac arrest. Within all four systems, in rural areas fewer patients were reached within 8 minutes than in urban areas. In regions with physician based EMS there were significantly more intubations, drug therapies for tachycardia were more effective, patients were more likely to survive until they reached the hospital, and patients were more like to have a return of spontaneous circulation. The research also suggested that advanced medical priority dispatch systems improved the efficient and rational deployment of resources but that there was a lack of accuracy in these systems. Finally, a study comparing systems in Finland, Sweden, Denmark, and Norway demonstrated that the organization and education were essentially the same across nations, but that consistent, detailed medical documentation was often lacking³¹.

Summary: Research identified in this report would suggest that EMS systems require efficient allocation of resources, continual evaluation in order to identify areas for improvement, and quality personnel in both leadership positions and pre-hospital crews. EMS systems are highly organized and many similarities exist across nations. Differences do appear to exist with regard to education and training levels, response times in rural and urban areas, and patient outcomes between physician based and paramedic only pre-hospital crews. A number of these concepts will be explored in greater detail below.

Environment

Dispatch - Dispatch of EMS can have a significant impact on patient outcomes. While a systematic review on this topic was not identified, nine^{3,32-39} key studies were reviewed to explore the efficiency and effectiveness of dispatch; five^{3,32-35} of these looked specifically at the outcomes of dispatch decisions. For example, a Swedish study found that only 20% of cardiac arrest (CA) patients were coded with a diagnosis of CA, but these patients received CPR earlier (median 2 vs. 10 minutes; $p < 0.0001$) and had a better chance of survival (14% vs. 6.5%; $p < 0.1$) than those who were coded by their symptoms³². A French study examined the delays resulting from inappropriate dispatch for ST-elevation myocardial infarction (STEMI) and found that 30% of the decisions were incorrect³³. These inappropriate decisions delayed reperfusion for patients receiving fibrinolysis (median 95 vs. 53 minutes, $p < 0.001$) and those receiving primarily percutaneous coronary interventions (median 170 vs. 107 minutes, $p < 0.001$) although hospital mortality was not increased as a result. Similarly, a US study demonstrated that the Medical Priority Dispatch System (MPDS) was highly sensitive in detecting cardiac arrests, but that rates of over-triage remained low as indicated by low numbers of emergency dispatches per cardiac arrest³. Another study showed that calls coded as low-priority were less likely to receive pre-hospital interventions, while being coded as high-priority was not predictive of receiving these interventions³⁴. Being coded as low-priority decreased ALS, ALS-Stat, and ALS-Critical interventions by 48%, 45%, and 80%, respectively, while being coded as high-priority increased these interventions by only 22%, 20%, and 32%. In line with this, a study testing various MPDS protocols found that a new dispatch protocol reduced hospital admissions from 30.7% to 27.0% by correctly identifying patients as low-acuity³⁵.

Three articles examined dispatch decisions and EMS response rates. The first study found that the implementation of MPDS dispatch protocols for determining the type of response reduced EMS responses by about half (84.3% to 39.1% of calls) and reduced the number of runs from 5.65 to 3.17 per day ($p < 0.001$) compared to the previous system of automatic red lights and sirens (RLS) dispatch regardless of patient severity³⁶. Furthermore, this new protocol screened out only 0.55% of patients who may have benefitted from an EMS response, although no adverse outcomes resulted. Another study examining a new three-step dispatch rule determined that the rule could reduce RLS response by one-third while being $>90\%$ sensitive and $>32\%$ specific in determining the

need for trauma care³⁷. Similarly, a study examining priority dispatch and RLS transport from the scene found that as the determinant level increased, there was an absolute and proportional increase in the use of RLS transport with the three lowest determinant levels being low risk for RLS and the three highest determinant levels having a significant risk for RLS^{ix,38}.

The final study found that a protocol for dispatching the closest ambulance would improve response times over systems where dispatchers must guess what unit to send³⁹.

Summary: Research identified in this report would suggest that dispatch decisions impact patient interventions and outcomes, as well as EMS response rates/times. Being coded with a diagnosis, rather than by symptoms, may shorten the time to life saving interventions and improve survival rates, while inappropriate dispatch decisions can delay necessary interventions. Furthermore, new dispatch protocols may be effective in determining which patients require EMS response and which are low-priority, thereby reducing unnecessary dispatches, while still ensuring patient safety. However, it is necessary to carefully examine the protocols and adapt them to the region they are being applied to. Finally, response times could be improved by implementing a system where the closest ambulance is dispatched to the scene.

Dispatch Consolidation - While a systematic review was not identified, three studies were identified, one⁴⁰ comparing outcomes before and after dispatch consolidation and two^{4,41} case studies on the feasibility of dispatch consolidation. A Finnish study showed that consolidation decreased the number of calls being answered within 10 seconds from 92.2% to 82.8% ($p < 0.0001$), that the time to dispatch a fire truck increased from 98 seconds to

^a Determinant levels are a matrix within the MPDS that indicate the type of EMS response that is required (e.g., non-emergency or emergency) and the type of ambulance resources that should be dispatched to the scene (e.g., Basic Life Support unit, Advanced Life Support unit, or multiple units). While this system does not specifically indicate patient severity, higher determinant codes are assigned to patients in need of quicker response times and advanced life support units or multiple responders. The determinant levels range from Alpha (non-life threatening, non-emergency, Basic Life Support unit) to Echo (life status questionable, emergency, closest units available, multiple responders).

113 seconds ($p < 0.0001$), that the time to dispatch advanced life support units increased from 73 seconds to 84 seconds ($p < 0.0001$), and that the number of unnecessary RLS responses increased ($p < 0.0001$)⁴⁰.

Two case studies examining the feasibility of dispatch consolidation were also identified. The first of these showed that consolidation would likely improve safety, reduce costs, improve performance, and allow for new technologies and quicker implementation⁴. On the other hand, concerns exist over perceived differences in quality of service, questions of adequate staffing, and geographic familiarity. The second case study reported similar findings. That is, it reported potential improvements in efficiency, coordination, integration, professionalism, service standardization, financial efficiency, opportunities to implement modern communication technologies, flexibility, and expansion/specialization of services⁴¹. Concerns related to personnel and collaboration in determining the procedures of the consolidated dispatch services.

Summary: Research identified in this report would suggest that dispatch consolidation may have several potential benefits in terms of costs, efficiency, standardization, performance and safety; however, concerns for its feasibility include collaboration, staffing and geographic familiarity. There was limited research identified in this review, with only one study that made comparisons before and after consolidation. Future research should continue to evaluate the impact of dispatch consolidation to determine its impact.

Regionalization of Trauma Services - There has been limited research on the regionalization of trauma services, and a systematic review was not identified. However, our search identified several^{8,42,43} studies examining the regionalization of trauma services, specifically in Quebec. The first of these was conducted before regionalizing began, but offered support for it since regionalization was predicted to provide high-level trauma care and decrease pre-hospital time⁴². Treatment at a level 1 trauma centre was associated with a 38% lower odds of mortality compared to treatment at a level 3 centre ($p < 0.10$), while pre-hospital time over 60 minutes increased the odds of mortality by approximately three times ($p < 0.05$).

The other two studies provided a comparison of mortality rates, pre-hospital times, and admission times before, during, and after regionalization. Overall, both studies

indicated improvement. The mortality rate for patients with severe injuries declined from 52% to 18% ($p < 0.001$), with steady decreases every year, although this decline was only significant for patients with an Injury Severity Score (ISS) between 12 and 49^{42,43}. Pre-hospital time also decreased from 62 minutes to 44 minutes ($p < 0.001$), and admission time decreased from 151 minutes to 128 minutes ($p < 0.001$)^{8,43}. Furthermore, patients receiving direct transport to a level 1 trauma centre had lower mortality rates than those who were transferred (4.8% vs 8.9%; $p < 0.001$), and the risk of mortality in level 1 centres was 54% and 75% lower than in secondary and primary centres, respectively ($p < 0.001$)^{8,43}.

Summary: Research identified in this report would suggest support for the regionalization of trauma services. Regionalization appears to decrease mortality rates as a result of reduced pre-hospital and admission times, treatment in a level 1 trauma centre rather than a secondary or primary centre, and direct transportation to level 1 trauma centres. Future research should continue to evaluate the effectiveness of regionalized trauma care to determine whether similar results are obtained in other regions.

Rural and Urban EMS – While a systematic review was not identified, fourteen^{9,44-56} articles were retrieved in regards to urban and rural EMS. Three of these focused on urban centres. For example, a study of New York City showed that EMS call volumes rose by an average of 1.71% per year, which is represented by an overall increase of 14.46% between 1999 and 2007⁴⁴. There was, however, variation in the call trends for various medical or trauma emergencies such that there were substantial annual increases in medical/surgical, environmental, generalized illness, and psychiatric/drug related calls but substantial decreases in respiratory and asthma related calls. In other words, the overall utilization rate as measured by the number of EMS calls per 1000 people in the population per year increased from 129.5 calls/1000 people/year in 1999 to 141.9 calls/1000 people/year in 2007⁴⁴. A second study based in Calgary found that in adult patients that were categorized as a Delta or Echo level emergency by MPDS, the first vehicle reached the scene to 76% of patients within 8 minutes⁹. In addition, the median combined scene and transport interval in these patients was 36.7 minutes (IQR 14.7). While all units in Calgary are ALS equipped and staffed, and these patients were deemed to be the highest priority patients for response, approximately half of the patients in this study were administered ALS level

interventions⁹. More detail on this study can be found in the Response Times section below. The third urban study showed that hospital turnaround time (time from hospital arrival to when vehicle the was available for the next call -HTAT) was longer in hospitals with greater transport volumes as well as for high acuity patients (58.5 minutes) compared to moderate (42.0 minutes) and low acuity patients (32.5 minutes) such that each level of acuity increased HTAT by 9.9 minutes ($p < 0.001$)⁴⁵.

Six articles focused on rural centres which face unique challenges related to geographic barriers, diverse terrains (e.g., mountains), poor communication due to a lack of cell or radio coverage, and difficulty recruiting and retaining qualified personnel⁴⁶. In fact, a study of trauma patient transport in rural Australia showed that the mean transfer time was 11.6 hours and that for every 1000 km a patient was flown the risk of mortality increased by 87%⁴⁷. Furthermore, the odds of dying increased with remoteness such that patients in outer regions, remote areas, and very remote areas were 2.25, 4.03, and 4.69 times more likely to die, respectively, than those in less rural areas.

Despite these challenges, several possible improvements for rural services have been suggested. For example, GPS units were shown to decrease response times from an average of 8.5 to 7.6 minutes ($p < 0.0001$) when they were programmed for the quickest route⁴⁸. Similarly, repositioning rural EMS stations to areas with more motor vehicle crashes (MVCs) reduced the mean travel distance from 10.7 to 8.6 miles ($p < 0.05$) and decreased the mean response time from 9.5 to 8.0 minutes ($p < 0.05$)⁴⁹. It was also shown that more than 90% of rural trauma patients could be treated in rural hospitals, rather than being transported to urban centres which would decrease pre-hospital times⁵⁰. The last rural EMS article reported that screening for common geriatric concerns and referring patients to community-based medical and social services may facilitate important linkages between vulnerable rural seniors and needed services, providing intervention to these populations, prior to EMS being required⁵¹.

The remaining three articles compared urban and rural EMS. The first study showed that MVC mortality was greater in rural areas compared to urban areas (1.78% vs. 0.90%, $p < 0.0001$)⁵². Moreover, when a death occurred, the response times (10.7 vs. 6.5 minutes, $p < 0.0001$), mean scene times (18.9 vs. 10.8 minutes, $p < 0.0001$), mean transport times (12.5 vs. 7.4 minutes, $p < 0.0001$), and overall pre-hospital times (42.0 vs. 24.8

minutes, $p < 0.0001$) were longer in rural areas compared to urban. Similarly, the overall survival rate after cardiac arrest was 15.3%, however the survival rate was 9% in rural areas, 14% in suburban areas, and 23% in urban areas ($p < 0.01$)⁵³. No significant differences were observed with regard to the time until receiving bystander CPR, but BLS response times and transit times were shortest in suburban areas and longest in rural areas ($p < 0.001$ and $p < 0.0001$, respectively). Looking specifically at pediatric trauma, similar results were shown: scene times, transport times, and total mileage were significantly longer for rural patients ($p < 0.05$)⁵⁴.

Finally, with regard to urban and rural EMS personnel, it was shown that those working in urban areas were younger, less likely to be volunteers, more educated, and less likely to report burnout than those working in rural areas⁵⁵. On the other hand, urban and rural personnel were equally likely to report limited experience with pediatric transports, not being comfortable caring for pediatric patients, not receiving pediatric training, and wanting the opportunity for more pediatric training⁵⁶. Distance to quality training was identified as a significant barrier, particularly for rural EMS personnel (25% vs. 7%, $p < 0.01$).

Summary: Research identified in this report would suggest that there are several significant challenges to providing quality EMS care in rural areas. For example, response times, scene times, transit times and distance, and overall pre-hospital time are significantly longer in rural areas than in urban centres. The literature also documents a variety of ways to successfully improve the efficiency and effectiveness of rural EMS. Future research should continue to evaluate these programs to determine whether they improve patient outcomes and should also explore additional opportunities.

Response times- While a systematic review could not be identified, 11^{9,45,57-65} articles pertaining to response time are reported. A rapid EMS response has been suggested to be an important factor influencing survival rates of patients. To that end, many EMS systems have adopted a standard response time of ≤ 8 minutes based on a 1979 study of cardiac arrest patients^{57,58}. This study suggested that in witnessed pre-hospital cardiac arrest patients of a medical origin, survival was maximized if the time from arrest to CPR and to defibrillation was 4 and 8 minutes respectively⁵⁷. Some authors suggest that it was from this study that the 8 minute ALS standard was derived and applied to all emergency calls,

not only cardiac arrest^{58,59}. In a 2012, Canadian study by Blanchard et al. (previously reported in the rural and urban EMS section)⁹, a retrospective cohort study was conducted to explore whether the 8 minute EMS response time was associated with mortality in a heterogeneous sample of patients. The study analyzed the response time-mortality association of adults that were assessed to have a life-threatening condition at the time of the 911 call (MPDS Delta or Echo level response). Response time in this study used a common industry definition of time from 911 call to first EMS unit arrival on-scene. Of the 7,760 unit responses that met the study criteria, 1,865 (24%) were ≥ 8 minutes. For patients with a response time of ≥ 8 minutes, 7.1% died, compared with 6.4% for patients with a response time of ≤ 7 minutes 59 seconds (risk difference 0.7%; 95% confidence interval [CI]: -0.5%-2.0%). While no significant association was found between 8 minute response time and mortality for all patients, an exploratory analysis suggested there may be a small beneficial effect of a response time of ≤ 7 minutes 59 seconds for those who survived to become an inpatient (adjusted odds ratio = 1.30; 95% CI: 1.00-1.69).

Blackwell and colleagues also investigated whether patient outcomes differ with rapid response time⁶⁰. Blackwell et al. defined response time as time the dispatcher obtains the patient's address or 30 seconds after the 911 call, whichever is shortest, to the time the transporting unit arrives on scene. The survival rate with ALS response time of $\geq 10:59$ was 80% compared to 82% of ALS response time of $\leq 10:59$. In addition, there was not a significant increase in the number of ALS interventions performed in patients who received a response time $\geq 10:59$ ⁶⁰. A 2005 study by Pons et al.⁵⁹ also studied a general population of patients using the same response time definition reported by Blanchard et al. and concluded that the 8 minute response time was not associated with survival (OR 1.06; 95% CI: 0.80-1.42). When a dichotomous four minute response time was assessed a significant association with response time was detected (OR 0.70; 95% CI: 0.52-0.92). A Canadian study from Ontario that assessed the association between response time and mortality for cardiac arrest patients⁶¹. The authors conclude that 8 minutes is not the optimal response time to maximize survival from cardiac arrest. For example a 90th percentile response time of 5 minutes would improve survival by 12% compared to a 90th percentile of 8 minutes, and would result in a further 86 lives saved in the 21 communities involved in the study. Furthermore, a 2011 German study illustrated that rapid response time influences CPR

incidence and resuscitation success⁶². This study collected data from seven German EMS centres and found that two of the centres reached patients within 8 minutes in 62.0% and 65.6% of the time, respectively⁶². While the rest of the EMS centres reached patients within 8 minutes in 70.4% to 95.5% of the time⁶². The study further determined that EMS response time of 8 minutes or less resulted in significantly higher rates of CPR (1.589, 99% CI: 1.38-1.82) and return of spontaneous circulation (1.57, 99% CI: 1.27-1.94)⁶².

While there is a small evidence base supporting an 8 minutes response time policy, studies around the globe have explored if their systems meet the 8 minute EMS response time standard. In 2009, Zhang and colleagues investigated whether the Beijing EMS system achieves the ≤ 8 minute response time criterion⁶³. Of the 51,918 EMS cases investigated, a proportion of 2.28%, 9.64% and 18.04% were associated with a mean response time of less than 5 min, 8 min and 10 min, respectively⁶³. A 2010 Iranian study investigating a number of time intervals in the pre-hospital setting found that of the 227 analyzed road traffic incidents, 72.5% of responses were under 8 minutes⁶⁴. When comparing urban versus interurban roads, mean transport time from scene-to-hospital was significantly longer for interurban events (17.1 vs. 6.3 minutes, $p < 0.001$)⁶⁴.

Given the potential impact of rapid response time on patient outcomes, it is important to understand why the delays in EMS response are occurring. A 2010 Korean study investigated whether a relationship is apparent between ambulance call volume (ACV), the unavailable-for-response (UFR) interval and ambulance response delays for out-of-hospital cardiac arrest (OHCA)⁶⁵. The UFR interval involves road distance from EMS centre to the scene, road distance from scene to hospital and transfer of patient to the emergency department. Of the 255,961 calls investigated, 22.6% of response times were 4 minutes or less, yielding optimal response. Suboptimal response was mainly due to the ACV and UFR of the EMS centres⁶⁵. The odds ratio of suboptimal response was 1.407 (95% CI: 1.14-1.73) with a median ACV of 7 or more, while an odds ratio of 1.77 (95% CI: 1.35-2.33) was seen with a mean UFR interval of 55 minutes or more⁶⁵. Another factor influencing response time is the ability of ambulances to respond to calls after having transported patients to the hospital⁴⁵. This ability is referred to as ambulance turnaround time by a 2011 American study⁶³. This study determined whether a relationship exists between EMS turnaround times and patient acuity, destination hospital and time of day⁴⁵. Vandeventer

and colleagues determined a mean turnaround time of 52.5 minutes for high-acuity calls and a mean turnaround time of 42.0 and 32.5 minutes for moderate and low-acuity calls, respectively. The longest turnaround times were occurred between 0600 and 1500 hours⁴⁵.

Summary: Research identified in this report would suggest that the 8 minute ALS EMS response time standard might not be associated with mortality in a general patient population, even when the population is restricted to the highest priority calls at the time of the 911 call. Moreover, in cardiac arrest patients 8 minute response time may not optimize survival. In addition, frequency of crucial procedural interventions does not significantly differ with shorter ALS response times. However, shorter response times have been associated with higher rates of CPR and return of spontaneous circulation in cardiac arrest patients. Further research is necessary to explore what the optimum response time is, which patients may benefit from rapid EMS response and whether these patients can be identified at the time of the 911 call.

Adverse Events- A number of definitions regarding adverse events (AE) have been developed for hospital settings. However, it is not clear whether AE definitions can be applied to pre-hospital settings. Patterson and colleagues developed a valid AE definition and severity scale (1-7) for pre-hospital settings with the collaboration of five EMS physicians². The Patterson and colleagues definition of AE is: “an adverse event in EMS is a harmful or potentially harmful event occurring during the continuum of EMS care that is potentially preventable and thus independent of the progression of the patient’s condition”².

Little research has explored AEs within the pre-hospital setting and a systematic review could not be identified. In an attempt to learn more about pre-hospital AEs, Hoyle and colleagues⁶⁶ retrospectively analyzed drug administration in children age eleven or younger. A dosing error was defined as a $\geq 20\%$ deviation from the weight-appropriate dose. Of the 306 drug administrations, dosing errors occurred in 125 cases (34.7%; 95% CI: 30.0-39.8). More specifically, dosing error rate regarding albuterol was 23.3 % (95% CI: 18.4-29.1), 48.8% for atropine (95% CI: 34.3-63.5), and 60.9% for epinephrine (95% CI: 49.9-73.9)⁶⁶.

Other researchers have investigated rates of hazardous acts and communication errors of EMS providers through simulated events⁶⁷. Zimmer and colleagues exposed EMS providers to 40 scenarios, where the unsafe act rate per scenario was seven (7.4 ± 3.8). More specifically, unsafe acts were seen in all four types of scenario including, advanced life support (6.8 ± 3.9), bronchial asthma (8.1 ± 3.9) pulmonary embolism (4.0 ± 1.6), and multiple trauma (9.3 ± 3.2). Unsafe acts were defined as “non-indicated or incorrect measure and as an omission of necessary measure”⁶⁷. In regards to bad communication events, 3.9 ± 1.6 errors were detected per scenario⁶⁷. A 2009 Canadian study⁶⁸ also investigated communication errors, though in the field of transport medicine. A random selection of 98 calls between medical centres and the corresponding air medical transport system were analyzed. The study found 42% of calls contained at least one error. The most frequent major errors were incorrect recording of allergies ($n = 4$), incorrect diagnosis ($n = 2$) and failure to indicate intubated patients or requirement for mechanical ventilation ($n = 2$ each)⁶⁸.

While an understanding of rates of adverse events within the pre-hospital setting is important, understanding the causes of such errors is of greater importance. A 2012 American study investigated medication errors of nine EMS systems⁶⁹. Overall, 38 issues regarding medication safety were isolated that could potentially lead to a medication error. Of the 38 issues, 16 were high risk, 14 were moderate risk, and eight were low risk in regards to patient safety. Medication safety issues included “expired medications, container-labeling issues, different medications stored in look-alike vials or prefilled syringes in the same compartment”³⁸. Another American study of pre-hospital errors found that supplemental oxygen was delayed because of two differing automaticity errors^x and failure to use an oropharyngeal airway (OPA) in 54% of the cases⁷⁰. Error rates regarding diazepam and midazolam dosing were found to be 47% and 60%, respectively. Causes for

^x Automaticity occurs when frequent repetition of actions with successful results in actions being performed more smoothly and rapidly with less conscious attention⁷². An automaticity error can occur when the easily performed action results in an error. For example, an oxygen tank is not brought to the scene in some situations because it was on the cot and the cot was not brought to scene and in other situations because the EMS crew thought the first responders had brought the oxygen, but no first responders were part of the scenario.

incorrect dosage of medication were mistaken estimates of weight, faulty use of the Broselow pediatric emergency tape, mistakes in the conversion of a mg/kg dose to mg and of mg to ml, inappropriate use of prefilled syringes and lack of verification of dosages with partners⁷⁰.

With the increasing knowledge of adverse events in the pre-hospital setting, an understanding of perceptions of near-misses and adverse events by EMS providers is important⁷¹. A 2008 American study conducted focus groups, interviews and analyzed event reporting in order to gain a better understanding of the perception of EMS providers regarding near-misses and adverse events. This study found that sharing of AE and near-misses is culturally discouraged. EMS providers tended to focus on the errors committed by others, especially errors committed by ED staff. EMS providers also described deviation from protocols due to lack of training as a common reason for the occurrence of errors⁷¹.

Summary- The literature in terms of pre-hospital adverse events has only begun to expand in recent years and as a result, the available evidence is limited. However, research identified in this report would suggest that errors occur in a number of pre-hospital settings, including air medial transport systems, patient care within EMS and when relay of information is required between EMS providers and ED physicians. What is more concerning is that EMS providers tend focus on errors committed by others and are culturally discouraged to share errors or near-misses. Further research needs to explore error rates and the root causes of errors to get a better understanding of how they can be prevented.

Equipment

Advanced Life Support and Basic Life Support – Much debate has been centred on whether to use advanced life support (ALS) or basic life support (BLS) techniques within the pre-hospital setting. A 2000 Canadian literature review and meta-analysis isolated 49 articles to investigate the benefits of pre-hospital ALS and BLS on trauma patients¹. Each study was assigned scores based on quality of methodology and study design¹. Six studies were deemed to be methodologically average (5 supporting BLS and 1 supporting ALS), two studies were deemed methodologically good (1 supporting BLS and 1 supporting ALS)

and seven studies were deemed methodologically excellent (6 supporting BLS and 1 supporting ALS)¹. In regards to study design, ten studies were scored as average (6 supporting BLS and 4 supporting ALS) and seven studies were scored good (6 supporting BLS and 1 supporting ALS)¹. Calculated weighted odds ratio indicated that trauma patients receiving ALS were 2.59 times more likely to die compared to patients receiving BLS. In terms of scene and total pre-hospital durations, times associated with BLS compared to ALS trauma patients were lower at 13.5 ± 2.4 minutes and 18.5 ± 3.8 minutes, respectively¹. This finding is also supported by Liberman and colleagues who found that the overall mortality rate was 18% for patients receiving BLS and 29% for patients receiving ALS⁷³. In addition, a 2010 study by Laudermitch and colleagues determined that the likelihood of mortality between BLS combined with ALS and ALS only services for trauma patients were similar (OR 1.04; 95% CI: 0.51-2.15)⁷⁴.

A number of predictors of mortality in the pre-hospital setting have been identified. A 2009 retrospective study conducted in the United Kingdom examined whether a difference in mortality exists when patients with life-threatening injury are treated prior to arriving at a trauma centre in comparison to patients being treated in trauma centres⁷⁵. The logistic regression analysis illustrated that characteristics such as being female, older age, having a penetrating type of trauma, higher injury severity scores, and higher physiological severity (revised trauma score - RTS) were associated with an increase in mortality when the traumatic injury was treated in a trauma centre⁷⁵. This suggests that pre-hospital ALS has a positive effect on patient mortality⁷⁵. Predictors of survival of those who suffer from cardiac arrest were also determined by Markel and colleagues in 2010, where there was a 4% decrease in survival for every minute that ALS providers were delayed after the arrival of BLS providers⁷⁶. Additional predictors of survival found by this study were occurrence of cardiac arrest in public (OR 1.48; 95% CI: 1.19-1.85) and administration of CPR by a layperson (OR 1.34; 95% CI: 1.07-1.68)⁷⁵. The Ontario pre-hospital ALS (OPALS) study found that pre-hospital ALS has no effect on patient mortality of those who suffer cardiac arrest⁷⁶. Another dimension of the OPALS study examined 5,637 trauma patients in 20 communities across Ontario comparing patient outcomes before and after implementation of an ALS program⁷⁷. The two groups were compared across age, blunt and penetrating injury, ISS and Glasgow Coma Scale (GCS). In addition to

no improvement in patient mortality, likelihood of survival decreased in patients with a GCS less than 9 after the implementation of pre-hospital ALS (50.9% versus 60.0%; $p=0.02$)⁷⁷.

Despite the lack of improvement in cardiac arrest and trauma patients, an additional dimension of the OPALS study looking at out-of-hospital respiratory distress found a decrease in mortality with the use of ALS interventions⁷⁸. There were 8,138 patients evaluated in two phases of the study, first when no patients were treated by ALS trained paramedics, followed by 56.6% of the patients being treated by ALS paramedics in the second phase. The mortality rate among all patients decreased significantly from 14.3% to 12.4% (95% CI: 0.4-3.4; $p=0.01$) from the BLS phase to the ALS phase. The authors⁷⁸ conclude that these data may not be sufficient in justifying an ALS system implementation and that further research needs to target populations and evaluate optimal treatment methods.

Economic analysis of pre-hospital life support illustrates that pre-hospital ALS is expensive to implement and maintain as calculated by the OPALS study⁷⁷. A median cost of \$9,900 per additional quality-adjusted life years is associated with BLS and a median cost of \$112,500 per additional quality-adjusted life year for BLS with defibrillation has been reported⁷⁷. This is in contrast to a median cost of \$122,300 per additional quality-adjusted life year for ALS. In addition, the start-up cost for an ALS program is approximately \$48,000 per 100,000 residents and \$70,000 per life saved. In order to maintain the ALS program an estimated \$3,000 per 100,000 residents and \$3,500 per life saved is required⁷⁷.

Studies have also examined patient outcomes in regards to pediatric ALS. In 2009 Baker and colleagues⁷⁹ retrospectively examined the effect of pediatric ALS (PALS) training within pre-hospital settings. Of the 183 records that were reviewed, the PALS trained group were more likely to successfully intubate (85% vs. 48%; $p < 0.001$) and find vascular access in shock/arrest instances (100% vs. 70%; $p < 0.001$) in comparison with non-PALS trained group⁷⁹. However, rate of mortality did not differ between the two groups⁷⁹.

Others have studied the ambulance deployment strategy of ALS and BLS in regard to patient outcome. A 2003 American study compared survival rates between a uniform and targeted deployment strategy⁸⁰. Uniform response (UR) strategy was defined as a system where all emergency calls received paramedics trained in ALS. Targeted response (TR)

strategy was defined as a system where ALS or BLS providers are dispatched depending on the nature of the emergency. Shorter response (7.67min vs. 9.0min) intervals, return of spontaneous circulation (55.8% vs. 33.3%), survival to discharge (23.9% vs. 4.2%) and survival to 1 year (15% vs. 0%) were better when comparing TR with UR, respectively⁸⁰.

Summary: Research identified in this report would suggest the use of pre-hospital ALS does not provide significant benefit over the sole utilization of pre-hospital BLS for trauma patients and possibly cardiac arrest patients. However in respiratory distress patients, pre-hospital ALS appears to decrease mortality compared to BLS. Mortality rates in children may not be influenced by pre-hospital ALS, though the procedural skills of medical providers appear to improve with pediatric ALS training. Pre-hospital ALS is more expensive to start and maintain when compared to BLS. Further study is required to determine conditions that may benefit from pre-hospital ALS and the effectiveness of pre-hospital ALS on a variety of outcome measure.

Helicopter EMS - There is no consensus in the current literature regarding the effect of Helicopter Emergency Medical Service (HEMS) transport on patient mortality. This was a key finding of the systematic review conducted in the UK in 2010⁸¹. Part of the challenge in showing the impact of HEMS on the mortality of trauma patients is the logistical and ethical barriers preventing a randomized controlled trial comparing it to ground transport. The systematic review found 23 eligible studies across seven countries⁸¹. Significant improvement in patient mortality was seen in 14 of the 23 studies when the patient was transported with HEMS, however in four there was no significant benefit⁸¹. It was also determined that HEMS transport provides an increased opportunity for the transportation of trauma trained personnel to the scene⁸¹. This allows for certain advanced skills such as endotracheal intubation (ETI) to be available at the scene⁸¹. Two articles show improved outcomes when trauma physicians are present and a third article showed no significant difference⁸¹. Another benefit associated with air transport has been the ability to transport the patient to a facility where trauma specific care will be delivered⁸². In 2004, Biewener et al. found patients transferred to a regional hospital compared to a university hospital had double the mortality rate (41.2 vs. 22.1%, $p=0.002$)⁸².

HEMS has been shown to be beneficial for patients, however, concerns regarding the safety of HEMS has been raised in the literature [Hinkelbein, Schwalbe, 2011]. In Germany, a retrospective study analyzed 99 HEMS accidents that had occurred between 1970 and 2009. There was a mean of 2.4 ± 1.7 accidents per year. Per 10,000 missions, the accident rate was 0.57 and the fatal accident rate was 0.1. Most accidents occurred during the landing phase of the flight (44.4%). Of the accidents analyzed, 43.4% were the result of a collision with an obstacle during landing, take-off or hovering⁸³. Most fatal crashes have been associated with the UH-1D, Bell 212, and Bell 412 models⁸⁴. In Canada, in order to maintain helicopter access and reduce the risk of accidents, helipads have been built that are designated for HEMS only⁸⁵. The authors of a 2010 study suggest that new helipads should be built using historical call data to improve HEMS access as well as mitigate risk of landing in a non-designated zone⁸⁵.

To gain a better understanding of the economic cost of HEMS, a 2010 systematic review was performed. Fifteen studies were included in the final review. The annual cost of HEMS ranged from \$115,777 to \$5,571,578⁸⁶. Five studies have shown that HEMS is a more expensive alternative to ground transport with no added benefit⁸⁶. Alternatively, eight studies provided cost-effectiveness ratios including “\$3292 and \$2227 per life year saved for trauma \$3258 per life saved and \$7138 and \$12,022 per quality adjusted life year for non-trauma and \$30,365 and \$91,478 per beneficial mission for non-specific patient populations”⁸⁶. While HEMS tended to be generally more expensive when compared to ground transport, a number of studies showed that it was cost effective. Despite these values, the authors conclude that it is not possible to adequately assess the cost-effectiveness of HEMS due to variation in intervention design, context of the study and the variety of study methods. The authors suggest that future research needs to take into account the local factors when evaluating HEMS.

While there may be potential benefits associated with HEMS transport, the overuse of this service is of concern. In order to facilitate proper use of HEMS, triage protocols have been developed⁸⁷. A systematic review of HEMS dispatch criteria identified 34 articles, with 5 articles discussing the accuracy of HEMS dispatch criteria⁸⁷. A positive predictive value of 27% was seen with criteria based on Mechanism of Injury (MOI)⁸⁷. A sensitivity of 93-98% and specificity of 85-96% was associated with the criterion of ‘loss of

consciousness', while criterion based on age and comorbidity illustrate poor specificity and sensitivity⁸⁷. Other criteria used in Europe include "fall from height", "lengthy extrication and significant injury" and "multiple causality incidents"⁸⁸. A number of studies have identified pre-hospital factors cited as the most common reasons for utilizing air transport. Such pre-hospital factors included motor vehicle crash (MVC) with a high-risk mechanism, MVC at speed greater than 20 mph, distance, loss of consciousness greater than 5 minutes, a Glasgow Coma Scale score (GCS) less than 14, and pulse oximetry reading $\leq 89\%$ ^{89,90,91}.

Summary: Research identified in this report would suggest that there are benefits associated with the use of HEMS in regards to patient outcome, however, no consensus exists. Benefits have been associated with transportation of physicians, intubation rate, time at scene and time/distance of transfer. Economic evaluation suggests that HEMS utilization is potentially justified; however it is not possible to fully evaluate the cost-effectiveness. Furthermore, much variability exists in dispatch protocols used by HEMS systems, raising concerns of overuse. Health systems need to take into account local factors when using and evaluating the HEMS system.

Communications and Data Services – The recent proliferation of technologies that could potentially assist in EMS, ED, and crisis response situations has resulted in a variety of research and explorations around the world. While, in many cases, the technology has been found to be deficient, the general outcome is clear: technology can benefit these areas if applied in such a way that considers and involves the end users of the technology. The National Highway Traffic Safety Administration in the US published the *EMS Agenda for the Future* in 1996, wherein the crises of Katrina and the 9/11 attacks illustrated the need for pre-hospital EMS and hospital ED departments to work closely together and described an ideal EMS design that would address those needs⁹². This need is echoed in the Institute of Medicine's 2007 report *Emergency Medicine at the Crossroads*⁹³. A summary of various high and low-technology approaches that have been tried and results of those explorations are summarized below.

Telemedicine and teleconsultation –In Germany, a research team evaluated an EMS telemedicine system⁹⁴. The system, which included real-time vital signs transmission and a

12-lead-ECG data application, was used in 157 EMS missions with an 80% success rate. Most of the problems encountered were in the quality of the image and video transmissions. They determined that while the idea was sound and the applicability high, technicalities have to be resolved before these technologies can be adopted for regular use. In a follow up study investigating the impact of telemedical assistance in EMS, the same researchers set up a controlled simulation study with 29 EMS teams who went through standardized scenarios on high-fidelity patient simulators⁹⁵. The researchers found that the telemedical assistant was able to improve treatment and safety while causing no significant impact of performance.

Summary: Research identified in this report would suggest that technology that facilitates tele-consultations has benefits but needs technical advancement before it can be included in standard practice.

EMS data loss – Patient information during an emergency encounter is often not adequately transmitted to the patient’s health records, resulting in data loss. A retrospective quantitative study of EMS documentation in Norway found that there is significant loss of data from EMS documentation⁹⁶. A qualitative study of paramedic and hospital receiving staff perceptions about the causes of data loss in handovers in Australia cited (among other things) fragmenting communication⁹⁷. A number of groups have tried to improve this issue. In 2010, an Australian research group conducted qualitative interviews with paramedics and trauma team members to identify what data points, attributes, and data presentation would be most effective for clinical handover⁹⁸. A research group in San Diego, California conducted a simulated mass-casualty exercise to examine the role of wireless, electronic, medical records, and communications technologies on patient document quality by emergency field responders⁹⁹. They found that documentation and tracking of victim status was significantly better and of higher quality when using a wireless, field electronic medical record system. A further study in Connecticut in 2009¹⁰⁰ derived a set of 16 pre-hospital data points (pre-hospital hypotension, GCS score, patient age, end tidal CO₂ volume, pulse rate, respiratory rate, oxygen saturation, blood loss in the field (quantity), death of an occupant in the same compartment, mechanism of injury, intrusion, extrication time, estimated crash speed,

anatomic location of injury, preexisting disease, pre-hospital intubation) from a literature review that are known to have an impact on patient outcomes. They used this set of data points to identify how much data is lost in EMS transfers¹⁰⁰. They found that only 72.9% of the key pre-hospital data points that were being transmitted by EMS personnel were being documented by the receiving hospital staff. An observational study was conducted with 18 video-recorded trauma resuscitations that focused on how EMS crews report information from the field and what information they include. The study found that problems tended to occur when reports lack structure, continuity, and complete treatment descriptions¹⁰¹.

Summary: Research identified in this report would suggest that EMS data is currently not being transferred properly. A potential solution to this issue may be the use of wireless EMR technologies.

Technology and communications during crisis response – Various national and international research agencies (e.g., Institute of Medicine “Crossroads” report⁹³) have identified the usefulness and importance of communication and integrated technology during crisis response situations and disasters¹⁰². Important pieces of information that need to be tracked include elements related to a specific patient (e.g., history and in-progress emergency care treatments). In a pilot study of the effectiveness of a web-based community-based resource database, researchers found a variety of benefits to individuals (i.e., providing 24-hour access to information, data about appropriate, local resources), organizations (i.e., strengthening volunteer recruitment and retention, encouraging community involvement), and society (i.e., increasing civic engagement, increased opportunities for networking among stakeholders) as reported by users of the system. The awareness of the need for effective, efficient, and accurate communication technology and information access especially during crisis situations is echoed across the world, as far as Iran¹⁰³.

Summary: Research identified in this report would suggest that information and communication technologies have been shown to assist in crisis situations and should become an integral part of crisis situation management.

Attitudes towards IT in EMS / ED – While the potential health care delivery benefits of wirelessly-connected electronic EMS information technology is becoming clear, past and current implementations have resulted in feedback for how these initiatives should be approached and implemented. A qualitative interview-based study was conducted with participants from 20 EMS agencies from the United States and Canada, 14 of which were currently using e-PCR (electronic – patient care report) systems¹⁰⁴. The three core themes around strategies for improving e-PCR system adoption and implementation were: 1) identify creative funding sources; 2) leverage regional health information organizations; and 3) build internal information technology capacity. Participants also identified four key challenges to adoption, including financial (i.e., high start-up costs and lack of financial resources); organizational (i.e., lack of leadership and complex organizational structures); technical (i.e., poor user interface design and unreliable vendors); and privacy. Finally, they reported that study respondents expressed concern that e-PCR completion would take longer than paper-based records, which is especially critical in the time-sensitive context of emergency medical care.

In contrast to the perceived benefit of electronic EMS information, in a qualitative focus group study exploring the role, ease of use, usefulness and actual usage of IT at the ED of Hershey Medical Centre, one research group found that physicians and residents and emergency medical service personnel were unsure what the role of IT in crisis situations might be¹⁰⁵. Currently, the EMS personnel do not have on-board access to electronic medical records or resources, and do not see IT tools (i.e., computers, electronic health records) as being particularly important to their information management needs during a disaster scenario. There was even speculation that, in a crisis, they would revert back to paper-based operations to save time. Further, they reported that they would also prefer paper, expecting computer systems to become overwhelmed in a disaster situation. During a simulated exercise, focus group participants did use electronic communication tools though, including pagers, cell phones, walkie-talkies, and radios. This research concluded with design and strategy recommendations for integrating IT into ED and EMS, stressing 1) the need for technologies that can automatically convert unstructured (i.e., free-flow text paragraphs) into structured information (i.e., forms with distinct data fields), 2) development of technologies that follow an information “push” model to increase

efficiency (i.e., new information is automatically downloaded to the device), and 3) clear training and awareness of the tools and the roles the tools are to play¹⁰⁵.

Summary: Research identified in this report would suggest that information and communication technologies can enhance emergency medical care, but their introduction and inclusion needs to be meaningfully implemented and supported so that barriers and negative attitudes towards these technologies can be mitigated and even eliminated.

EMS System Design – The importance of an integrated communications and technology system for EMS / ED and the rest of the health care system has become clear. In response, various organizations in North America have been working towards data format standards and integrated system designs. In an attempt to create a standardized and cross-platform data format to enable this goal of interoperability, the National EMS Information System Project (NEMSIS) was created (www.nemsis.org)¹⁰⁶. NEMSIS is quickly becoming a standard in the United States¹⁰⁶. Health Level Seven (HL7, <http://www.hl7.org/>) is a not-for-profit organization that is developing American National Standards Institute (ANSI) accredited frameworks and standards for the exchange, integration, sharing, and retrieval of electronic health information. It is expected that an HL7-compliant version of NEMSIS will be available in e-PCR products in 2013¹⁰⁷. In Alberta, the Alberta Ambulance Information Management System (AAIMS) is working on their own e-PCR accreditation initiatives¹⁰⁹. The differences and compatibility of the AAIMS efforts with the NEMSIS project (to support health record internationalization and an awareness of the level of detail required to create standards) warrant further investigation, as we were unable to identify any primary studies.

In terms of published literature, several papers describing the architecture, design process, and outcomes of EMS data systems were found. These studies also illustrate the global interest in these types of initiatives. In 2010, a fully integrated, statewide EMS data system was developed in North Carolina¹⁰⁸. The success of the model, approach, and components of this system are seen through the adoption of the state-wide system into other states in the US¹⁰⁸. It uses an XML/web-based mechanism as well as a state-wide mandated business model to ensure consistency among the variety of commercial software alternatives. In another study, a Yale University research team highlighted the importance

of open, interoperable, and scalable (i.e., capable of handling both small and large systems) data and communications technologies to integrating EMS and ED aspects of health care with the rest of the system¹¹⁰. Cloud-based EMS systems are also being explored in Greece, where a research team designed and developed a prototype that shows promise of being a feasible solution¹¹¹. Meanwhile, in San Diego, a fully-integrated and web-based system has been developed and successfully deployed by a collaborating group of hospitals and technology systems¹¹². In Indiana, the EMS electronic record was integrated into the operational statewide health information exchange (HIE)¹¹³. EMS personnel used tablet computers with wireless connections to access the information. After a study of six months, 58 medics were surveyed, most of whom felt that the information that was gained by the integration was important for delivering quality patient care, especially when the patient was unable to give critical information themselves.

Summary: Research identified in this report would suggest that standards for electronic health records are currently being developed to facilitate communication of patient information across multiple departments, devices, software, and even across entire countries. Several implementations of these standardized and open data formats have already proven their efficiency and effectiveness in improving perceived patient care.

Personnel

Training: National Standards, Curriculum, and Framework – There has been limited research on national standards and curriculum for emergency medical care. While a systematic review was not identified, five key articles were located. For example, an Australian study emphasized the importance of national registration and regulation of EMS personnel¹¹⁴. At the time of publication there were a variety of terms used to identify pre-hospital care providers (e.g., first responder, advanced responder, EMT, EMT-paramedic, paramedic, etc.) as well as an increase in private, unregulated companies providing pre-hospital care. Under Australian law, a clear distinction did not exist in terms of the qualifications and training needed for a person to label themselves as one of the previous identifiers. Implementing a system of registration and regulation would standardize quality care, ensure that patients could identify qualified providers and ensure consistency in the training levels for pre-hospital care providers.

Curriculum for EMS physicians was explored in the remaining four articles. In Canada, there is a lack of formal training for undergraduate medical students and post-graduate trainees of EMS concepts. As a result, few Canadian physicians had completed any formal training before practicing as an EMS physician¹¹⁵. In an attempt to alleviate these issues, the development of standardized EMS training for physicians is occurring in Canada. Using a modified Delphi approach, a framework and objectives has been developed by an expert working group. The proposed comprehensive list of training objectives include 16 categories: 1) EMS history (i.e., development of EMS), 2) EMS System Design (i.e., different design options of EMS system, local, provincial and federal regulations), 3) EMS Personnel (i.e., patient care capabilities for different certification levels), 4) EMS Equipment (i.e., equipment and medications available, different options of vehicles), 5) Communications (i.e., dispatch system, communication equipment), 6) receiving facilities (i.e., guidelines for transport to specialty centres), 7) medical control (i.e., on scene versus remote medical control), 8) patient care (i.e., concerns and controversies of pre-hospital management of a number of conditions), 9) air medical (i.e., indications, advantages and disadvantages of aeromedical transport), 10) legal considerations (i.e., protocols for dealing with high-risk situations), 11) mass gathering and disaster management (i.e., familiarity with local disaster plan), 12) community involvement (i.e., public education programs), 13) education (i.e., training, continuing education and evaluation), 14) administrative aspects of EMS (i.e., funding, operations management), 15) research (i.e., steps involved in conducting a research study), 16) experiential activities (i.e., rideouts)¹¹⁵.

Similar to Canada, there are no standard training requirements for physicians wishing to be primary ALS or BLS members in the United States¹¹⁶. For example, 73% of states do not require any additional training, 68% of states do not require pre-hospital certification, and only 9% of states require skill examinations to be certified at the BLS level compared to 82% of states for the ALS level. Standardization is gradually beginning to occur, however. In 2010, the American Board of Medical Specialties approved EMS as a subspecialty of emergency medicine in the hopes of standardizing physician training and qualifications for EMS practice, improving patient care and safety within both the pre-hospital and hospital setting, and facilitating the integration of pre-hospital and continued hospital care¹¹⁷. Similarly, another study discussed the development of a framework

consisting of various content categories, core competencies, and performance objectives to ensure that physicians are prepared to treat patients of catastrophic events¹¹⁸.

Training standards for EMRs, EMTs, and paramedics within Alberta and Canada are more standardized. According to the Alberta College of Paramedics Competency Profile, there are 11 domains in which Emergency Medical Responders (EMRs)¹¹⁹, Emergency Medical Technicians (EMTs)¹²⁰, and paramedics (EMT-P)¹²¹ must display competence. Each of these domains also includes several specific competencies.

EMRs, EMTs, and paramedics are expected to display competencies in the following domains: core knowledge, safety, communications and interpersonal skills, patient assessment, ability to perform patient systems assessment, clinical decision making, patient transport, and professionalism. Examples of the competencies in each of these domains are outlined in Table 1, although this list is not comprehensive.

Table 1: Competencies that do not differ between EMRs, EMTs, and Paramedics. (Adapted from 119-121)

Domain	Examples of Competencies
Core Knowledge	-Knowledge of medical terminology, anatomy and physiology, pathophysiology, and pharmacology
Safety	-Ability to operate a vehicle and to assess scene safety -Knowledge of basic extrication principles and personal protection equipment
Communications and Interpersonal Skills	-Knowledge of medical dispatch and cultural diversity -Awareness of patients special needs
Patient Assessment	-Ability to perform primary and secondary surveys -Gathering patient history
Ability to Perform Patient Systems Assessment	-Perform neurological, respiratory, cardiovascular, gastrointestinal, integumentary, and musculoskeletal assessments
Clinical Decision Making	-Determine care of various patient groups -Effective decision making and multiple casualty incidents
Patient Transport	-Understand ground, fixed wing, rotor wing, and marine transport
Professionalism	-Knowledge of standards of practice and code of ethics -Demonstrate leadership skills

There are also a number of domains where the competencies differ between EMRs, EMTs, and paramedics. These domains include performing and interpreting diagnostic testing, administering medication, and patient management skills as outlined in Table 2. The competencies listed in this table build on one another such that EMTs must also be competent in the skills listed for EMRs and paramedics must be competent in the skills listed for both EMRs and EMTs.

Table 2: Examples of Alberta competencies that differ between EMRs, EMTs, and Paramedic (Adapted from 119,120,121).

Competency	Emergency Medical Responder	Emergency Medical Technician	Paramedic
Perform and Interpret Diagnostic Testing	-Vital signs -Oximetry testing -Glucometric testing	-Cardiac monitoring -End-tidal carbon dioxide monitoring and capnography	-Venous blood sample -Knowledge of arterial blood sample via radial puncture -Knowledge and interpretation of laboratory and diagnostic imaging results -Invasive core temperature -Knowledge of arterial line and central venous pressure monitoring -Knowledge of arterial blood sample via arterial line access -Knowledge of pulmonary artery catheter and intra-aortic balloon pump monitoring
Medication Administration	-Administration via oral route -Assist patients with administration via inhalation and intramuscular routes	-Administration via inhalation, intramuscular, sublingual, subcutaneous, topical, and intravenous routes	-Administration via endotracheal, intraosseus, umbilical vein, rectal, intralingual, intradermal, and infusion pump routes
Patient Management Skills	-Perform airway management, oxygen therapy, patient ventilation, cardiopulmonary resuscitation, automated defibrillation, external	-Perform intravenous therapy -Apply pneumatic anti-shock garment	-Perform cardioversion, cardiac pacing, intraosseous infusions, urinary catheterization, oro- and naso-gastric tube insertion, thoracentesis, pericardiocentesis, and ostomy care

hemorrhage control, bandaging and wound care, spinal motion restriction, and splinting	-Monitor chest tubes -Initiate, monitor, and maintain blood and blood product transfusions
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Note: This table is not comprehensive.

The National Occupational Competency Profile (NOCP)¹²² also describes standards for the four accepted levels of training in Canada. The four levels of training are Emergency Medical Responder (EMR), Primary Care Paramedic (PCPs), Advanced Care Paramedic (ACPs), and Critical Care Paramedic (CCPs). The domains include airway management, breathing, cardiac management, circulation, drug administration, and wound management as outlined in Table 3. Similar to Table 2, the competencies listed in this table build on one another such that ACPs must also be competent in the skills listed for PCPs while CCPs must be competent in the skills listed for both PCPS and ACPs.

Table 3: Examples of Canadian national competencies that differ between Primary Care Paramedics, Advanced Care Paramedics, and Critical Care Paramedics (Adapted from 122).

Treatment Issue	Primary Care Paramedic (PCP) Skills	Advanced Care Paramedic (ACP) Skills	Critical Care Paramedic (CCP) Skills
Airway Management	<ul style="list-style-type: none"> -Manual repositioning to maintain airway patency -Manual removal of obstructions -Oropharyngeal suctioning -Utilize oro- and nasopharyngeal airways 	<ul style="list-style-type: none"> -Endotracheal intubation -Removal of obstructions using forceps -Suctioning beyond the oropharynx -Percutaneous and surgical cricothyroidotomy 	
Breathing	<ul style="list-style-type: none"> -Evaluate respiratory rate, effort, excursion, symmetry, and skin condition -Conduct pulse oximetry testing -Operate portable oxygen delivery systems -Administer oxygen using nasal cannula, low concentration mask, high concentration mask, and pocket mask -Perform ventilation using manual positive pressure devices 	<ul style="list-style-type: none"> -End-tidal carbon dioxide monitoring -Use mechanical ventilators 	<ul style="list-style-type: none"> -Use pressure support, pressure control, manometry, respirometry and arterial blood gas for analysis
Cardiac Management	<ul style="list-style-type: none"> -Cardiopulmonary resuscitation -Operate automated external defibrillator -Conduct 3-lead and 12-lead electrocardiogram 	<ul style="list-style-type: none"> -Operate a manual defibrillator -Conduct cardioversion and transcutaneous pacing with sedatives and analgesic therapies as needed -Needle thoracostomy 	<ul style="list-style-type: none"> -Transvenous pacing

Table 3 continued: Examples of Canadian national competencies that differ between Primary Care Paramedics, Advanced Care Paramedics, and Critical Care Paramedics (Adapted from 122).

Treatment Issue	Primary Care Paramedic (PCP) Skills	Advanced Care Paramedic (ACP) Skills	Critical Care Paramedic (CCP) Skills
Circulation	<ul style="list-style-type: none"> -Assess pulse rate, rhythm and quality -Assess blood pressure by auscultation, palpation, and non-invasive monitor -Perform hemorrhage control using direct pressure and positioning of the patient 	<ul style="list-style-type: none"> -Collection of venous blood specimens -Administration of fluid to expand volume -Insertion of intraosseous needles 	<ul style="list-style-type: none"> -Collection of blood specimen by radial artery puncture and arterial line -Pulmonary artery catheter and central venous pressure management -Arterial line management -Administer blood and blood products
Drug Administration	<ul style="list-style-type: none"> -Conduct peripheral intravenous cannulation -Subcutaneous, intramuscular, sublingual, buccal, oral, inhalation, and intranasal administration 	<ul style="list-style-type: none"> -Intravenous, intraosseous, endotracheal, and topical administration 	
Wound Management	<ul style="list-style-type: none"> -Apply dressings, bandages, and immobilization for soft tissue injuries, burns, eye injuries, penetration wounds, and other wounds 		
Other	<ul style="list-style-type: none"> -Assess patient consciousness using “Alert Verbal Pain Unresponsive” scale and “Glasgow Coma Scale” -Routine care of patients with urinary catheters 	<ul style="list-style-type: none"> -Obtain and interpret urinalysis samples -Routine care of patients with ostomy or chest drainage systems -Insertion of urinary catheters -Insertion of oral and nasal gastric tubes 	<ul style="list-style-type: none"> -Measurement of core temperature using invasive methods

Summary: Research identified in this report would suggest that there has been a lack of registration and regulation of EMS personnel as well as inconsistencies in EMS physician training in some countries. However, in Canada several initiatives to develop national standards and core competencies for both physicians and paramedics now exist with the intention of ensuring high quality patient care, identification of qualified personnel, and standardization of training or qualifications. In addition, Alberta has a self-regulated college for pre-hospital care providers.

Staffing – We were unable to identify a systematic review about EMS staffing in the literature, however eight^{42,123-129} key articles were identified. The first of these examined the impact of staffing patterns on patient outcomes and found that the number of paramedics at the scene of a cardiac arrest was not related to the return of spontaneous circulation¹²³. This study also found that survival rates were 9% when 2 or 3 paramedics were present, 8% when 4 or more were present, and that the odds of surviving actually decreased when there were 3 paramedics (OR=0.83, p<0.05) or 4 or more paramedics (OR=0.66, p<0.01) on site. Similarly, two other studies showed that pre-hospital care by a physician as part of an ALS team did not significantly reduce the odds of mortality of severely injured patients⁴² and that it may actually increase mortality rates of trauma patients because it extends pre-hospital time⁴².

Two studies looked at EMS provider experience and training. These studies showed that there were decreased opportunities for performing high-risk skills such as intubations, IV starts, treating cardiac arrests and treating pediatric patients than in the past¹²⁴. The study suggested that a multifaceted approach needs to be considered for maintaining provider competency. Similarly, the second study concluded that providers learned by doing and this learning was related to improved performance¹²⁵.

The remaining four articles examined EMS recruitment, retention, turnover rates and costs, and volunteerism. Reports from a national survey of United States EMS directors indicated that 50% of all EMS organizations had unfilled positions, 37% always experienced problems with recruitment, and 55% sometimes had problems with retention¹²⁶. Problems with recruitment and retention were shown to be more evident in rural areas, largely because rural EMS relies more heavily on volunteers, there is less support from community employers, there are high levels of burnout, and there are

increased difficulties in accessing training. Additionally, a study of turnover rates indicated that the mean annual turnover rate was 10.7% with a median cost of \$71,613.75 and a median cost per termination of \$6,871.51¹²⁷. The turnover rate for volunteers was, however, higher at 12.4%. Despite this, a longitudinal study showed that volunteerism has remained relatively stable in the US at 31% for EMT-basics and 2.7% for paramedics¹²⁸. Overall volunteerism rates did drop from 35% to 29% in 2001, but have increased since that time. Finally, a study from Israel examining the supply and demand of EMS staff found that if graduation rates remained constant there would be a surplus of 180 paramedics, but that if all ambulances were converted to ALS units there would be a shortage of 400-900 crew members by 2010¹²⁹.

Summary: Research identified in this report would suggest that patient outcomes may be worse when there are an increased number of paramedics on site as well as when physicians are part of pre-hospital ALS teams, but further research is required to explain this phenomenon. The literature also suggests that there are fewer opportunities for EMS personnel to practice high-risk skills, but that the learning associated with this practice translates into better performance. Furthermore, it appears that recruitment and retention of EMS staff is problematic, especially in rural areas. The costs associated with employee turnover can be substantial, and turnover rates are higher for volunteer staff, despite reports that volunteerism rates have been relatively stable.

Pre-hospital care physicians/ emergency care practitioners – A systematic review was not identified, however five¹³⁰⁻¹³⁵ articles on pre-hospital care physicians were located. Over the last 30 years, there has been a gradual transition from non-peer reviewed to peer-reviewed literature defining the physician role in the leadership, clinical development, and practice of EMS¹³⁰. These studies have examined the difference in care and competencies between physicians and paramedics or ambulance nurses. For instance, a German study conducted in 2008 determined whether EMS physicians, particularly anesthesiologists are able to provide the best medical care¹³¹. This study found better patient outcomes for those being treated by EMS physicians when patients require invasive procedures such as cardiopulmonary resuscitation, advanced airway management, fluid management, pharmacotherapy and rapid diagnostic-based decisions¹³¹. Furthermore, in the

Netherlands, a descriptive study was conducted utilizing a quantitative inventory of competencies based on analysis of protocols, registration systems, and ambulance equipment to compare competencies of ambulance nurses and EMS physicians¹³². The study found 438 competencies of the ambulance nurse and 62 additional physician specific competencies. Of the 62 additional physician specific competencies, 71% were therapeutic competencies¹³².

In order to assess the quality and safety of care provided by emergency care practitioners (ECPs) a UK study was conducted in 2012¹³³. A retrospective patient case note review was conducted comparing quality and safety of care provided by emergency care practitioners (highly trained paramedics and nurses) with that provided by paramedics and nurse practitioners with basic training (non-ECPs)¹³³. The care provided by ECPs was rated significantly higher when compared with non-ECPs in the areas of quality and safety of care, assessment and quality of documentation¹³³. Interestingly, a German study conducted in 2011 found documentation quality within physician staffed EMS required improvement in the areas of medication and major trauma¹³⁴. However, comparing across research studies is difficult given the lack of standardization in documenting pre-hospital activities¹³⁴. Given this difficulty, a 2011 Norwegian study developed 45 core variables for documentation and reporting of pre-hospital physician activities in Europe¹³⁵. The core data set provides standardization of reporting time variables, complaints, and diagnostic and therapeutic procedures¹³⁵. The results of this study aim to enable standardized reporting and facilitate sharing of future research in the field of pre-hospital care¹³⁵.

Summary: Research identified in this report would suggest that there may be a difference of care between physicians and paramedics or ambulance nurses in the field of pre-hospital care. In addition, documentation quality within physician staffed EMS requires improvement in the areas of medication and major trauma. Furthermore, 45 identified core variables by a Norwegian study can facilitate standardized reporting and sharing of future research, allowing for a more accurate documentation analysis.

Team Composition and Collaboration – A systematic review about team composition was not located, but four¹³⁶⁻¹³⁹ key studies examining team composition and collaboration

among various emergency service providers were identified. Paramedics, EMTs, and first responders frequently work together on scene, but in many cases they are from different organizations and rarely have opportunities to train together¹³⁶. The authors suggest that it is essential for these various providers to train together. If teams train together, the authors suggest they can improve their preparedness and skills as well as develop a smooth, automatic response.

EMS personnel also work with other emergency providers such as firefighters, and two studies looked specifically at this collaboration. The first study found that a dispatch protocol including BLS firefighter first responders (FFR) may lead to successful resuscitations as a result of short response times and trained personnel to perform early defibrillation¹³⁷. For example, this study showed that the median response time of BLS FFR was 3.5 minutes, and that in 73% of cases they arrived on scene before EMS. Moreover, in many cases they diagnosed cardiac arrest, attached AEDs, and performed defibrillation that resulted in detection of a shockable rhythm, return of spontaneous circulation, and survival beyond 30 days. Despite this effectiveness, the second study showed that efficiency of FFR responses could be improved. FFR red lights and siren responses could be reduced by 83%, 63% of incidents could be downgraded to nonemergency responses, and 20% could be eliminated with a new protocol that confined FFR responses to 27 of the 509 dispatch determinants¹³⁸.

Finally, one qualitative study examining the collaboration between EMS personnel and athletic trainers found that EMS personnel were often unaware of the role and training of athletic trainers due to a lack of familiarity with them¹³⁹. Improved communication between these groups was cited as the main way to facilitate effective collaboration, development of policies, and optimal patient care.

Summary: Research identified in this report would suggest that various emergency service providers can work together effectively to ensure quality patient care and successful outcomes. Enabling multidisciplinary teams to train together, developing protocols for various teams of providers, and facilitating communication between groups of providers may be effective ways of improving service provision.

Specific Aspects of EMS Care

Field Triage – We identified one systematic review and meta-analysis¹⁴⁰ exploring paramedic determinations of medical necessity. The review aimed to evaluate studies reporting the ability of US paramedics to determine medical necessity of ambulance transport. The review identified 9,752 titles, of which 214 abstracts were evaluated, with 61 studies fully reviewed. Five studies met the inclusion criteria. The authors suggest that there were few studies that evaluated the ability of paramedics to determine medical necessity and the results of those studies included varied greatly. The authors conclude that there is at present insufficient evidence to support paramedics making decisions in regards to medical necessity in the field.

Three studies¹⁴¹⁻¹⁴³ that were not included in the aforementioned systematic review were also identified evaluating the effectiveness of field triage in identifying patients in need of transport to the hospital and two examining the reliability of assessments between EMS and medical centre staff. The first study demonstrated that using a MAP (mechanism, anatomy, and physiology) triage protocol without consultation from the base hospital identified trauma patients' need for transport with > 90% accuracy¹⁴¹. The use of a physiological-social scoring system was also shown to have correctly identified patients presenting with breathing-related complaints as evidenced by the fact that 65% of those transported to the hospital were subsequently admitted or received physiologically stabilizing treatments in the ED¹⁴².

A Canadian study also indicates that the additional assessment of time-independent variables such as age and comorbidity may improve pre-hospital identification of major trauma patients (area under the ROC Curve: 0.76 vs. 0.66, $p < .05$)¹⁴³. In line with this, the Centres for Disease Control and Prevention (CDC) recommend the assessment of the following components: physiological criteria (systolic blood pressure, respiratory rate, etc.), anatomy of injury (penetrating injuries, crushed or mangled extremities, paralysis, etc.), mechanisms of injury (falls, automobile-related injuries, etc.), and special considerations (age, bleeding disorders, pregnancy, etc.)¹⁴⁴.

Despite these studies suggesting the effectiveness of field triage, it is important to note that in some cases there were discrepancies observed between the assessment of EMS and medical centre staff^{145,146}.

Summary: Research identified in this report would suggest that there is presently insufficient evidence to support paramedics determining medical necessity in the field. Some studies suggest field triage can be effective in identifying patients in need of transport to the hospital, although there are also cases where discrepancies exist between EMS and medical centre staff. The literature further suggests that the effectiveness of field triage could be improved by including not only physiological, anatomical, and mechanism components, but also time-independent and special considerations such as age and comorbidities.

Cardiac arrest – Out-of-hospital cardiac arrests (OHCA) are an important patient subset resulting in significant morbidity and mortality. The relationship between predictor variables and survival from OHCA has been identified by an American study conducted in 2011¹⁴⁷. This study showed that the presence of rhythm of ventricular fibrillation/tachycardia (VF/VT) and return of spontaneous circulation (ROSC) within the pre-hospital field are significant predictors of survival (survival of 54% of such cases). Furthermore, response time, public location, witness, and age are also variables influencing the likelihood of joint occurrence of VF/VT and ROSC¹⁴⁷. A study conducted by Gold and Eisenberg in 2010 found that individuals who were initially in VF after an EMS witnessed arrest had the highest rate of survival (59%)¹⁴⁸. The influence of pre-hospital physician on patient outcome has also been investigated. Interestingly, Olasveengen et al. in 2009 found that the presence of physicians did not impact survival rate when compared to no physician ambulances, with ROSC achieved in 34% vs. 33% ($p=0.74$) and discharge was seen in 13% vs. 11% ($p=0.28$), respectively¹⁴⁹.

Controversy exists regarding the effectiveness of mechanical chest compression compared to manual chest compressions in respect to patient outcome of cardiac arrests¹⁵⁰. A systematic review of randomized controlled trials was conducted in 2010 comparing mechanical to manual chest compression in CA patients. Of the four studies included in this review, only one established that mechanical chest compressions reduce survival to discharge with good neurological function when compared with manual chest compressions (RR 0.41, 95% CI: 0.21-0.79). Relative risk for having ROSC (RR 2.81, 95% CI: 0.96-8.22) was assessed by two studies and the final study calculated survival to hospital

admission (RR 4.13, 95% CI: 0.19-88.71). The authors conclude that there is insufficient evidence from randomized control trials to make definitive conclusions regarding the benefit or harm of mechanical chest compressions during cardiopulmonary resuscitation (CPR)¹⁵⁰.

In order to raise the quality of bystander CPR rates, a 2010 Swiss study, implemented telephone-CPR (T-CPR) within the medical dispatch centre¹⁵¹. Of the 294 eligible cases for T-CPR over an 8-week period, dispatchers proposed T-CPR on 202 instances, with 17 cases of proposed T-CPR determined to be erroneous¹⁵¹. A 2012 Japanese study specifically investigated the impact of T-CPR on pediatric OHCA¹⁵². Of the 1,780 witnessed pediatric pre-hospital CA, 28.4% received T-CPR. With the assistance of T-CPR, bystanders were 6.04 times more likely (95% CI: 4.72-7.72) to conduct chest compressions and 3.10 times more likely (95% CI: 2.44-3.95) to perform mouth-to-mouth ventilation¹⁵².

In order to increase survival of OHCA, automated external defibrillators (AEDs) have been placed in locations where bystanders can access and utilize the devices before the arrival of EMS¹⁵³. In order to facilitate the access of AEDs, a 2011 American study paired the emergency dispatcher with mapping technology identifying the closest AED to the scene. This study suggests that AED access and utilization could potentially be involved in 11% of all arrests and 17% of VF arrests¹⁵³. Another method of improving survival rate reported in Stockholm, Sweden involves training fire-fighters and security officers with proper utilization of AEDs as a parallel resource to EMS organization¹⁵⁴. Significant reduction in response times and survival of witnessed OHCA has been seen¹⁵⁴. An additional method of potentially increasing survival of OHCA involves transporting the patient to a CA centre, bypassing non-CA centres that may be closer¹⁵⁵. A 2009 American study found that the median transport interval between survivors and non-survivors was very similar (4.0 versus 4.2 minutes, respectively)¹⁵⁵. Furthermore, no association was found between transport time and survival in regards to ROSC. Given the above results the authors suggested that the local hospital could potentially be bypassed for CA centres, however clinical trials would need to be conducted to fully assess the effectiveness and safety of this¹⁵⁵.

Concern for appropriate utilization of EMS services has resulted in a 2009 American study investigating the reasons why EMS is activated when death is expected or when signs of irreversible death are seen¹⁵⁶. In most instances, bystanders indicated that EMS services were utilized because of “not knowing what to do”. The most common reasons presented by family members were that they “did not know what else to do”, “it is the law,” and “confirmation of death”¹⁵⁶. Standardized pre-hospital termination-of-resuscitation (TOR) protocols have been developed to facilitate the appropriate utilization of EMS [Obrien, Hendricks, Cone, 2008]. A 2008 American study found that within the traumatic OHCA group, there was a 63% protocol violation rate¹⁵⁷. All of the transported patients within this group died in the ED (27/27). Within the non-traumatic OHCA group, 54% of all cases met the requirements of TOR but were transported to the ED. All of the transported patients within this group died as well (104/104)¹⁵⁷.

A 2010 secondary cohort analysis study¹⁵⁸ confirms the accuracy of TOR protocols. The study sought to validate two pre-hospital termination of resuscitation rules: 1) those for paramedics providing advanced life support care (ALS), and 2) defibrillation only EMTs providing basic life support (BLS) care. The study used rules that were developed by investigators from the University of Toronto. For ALS paramedics, resuscitation could be terminated if: 1) there was no ROSC prior to transport, 2) a shock was not given, 3) there were no witnesses (EMS personnel or bystanders) to the arrest, and 4) bystanders did not attempt CPR¹⁵⁸. For defibrillation-only EMTs, resuscitation could be terminated if: 1) there was no ROSC prior to transport, 2) shock was not given, 3) EMS personnel did not witness the arrest¹⁵⁸. The study analyzed data from 2415 patients with cardiac arrest. The ALS rule of TOR was recommended for 743 patients and the BLS rule of TOR was recommended for 1,302 patients. There were no survivors in either the ALS or BLS TOR recommended groups. The authors concluded that the BLS rule could be implemented as a universal termination rule and would result in a lower overall transport rate without missing any potential survivors¹⁵⁸.

Given the significant impact of ischemia/infarction, reperfusion therapy guidelines have been developed to improve patient outcome. More specifically, reperfusion therapy guidelines for ST-segment elevation myocardial infarction (STEMI) approved by the Canadian Cardiovascular Society (CCS) have been developed¹⁵⁹. A 2012 Canadian study

investigated a model of pre-hospital thrombolytic (PHL) therapy versus primary percutaneous coronary intervention (PPCI) to determine which results in the most rapid reperfusion¹⁵⁹. The median time between first medical contact (FMC) and reperfusion with the activation of PPCI was 76 minutes (IQR, 64-93), compared to CCS recommendation of < 90 minutes. The median time between FMC and reperfusion with the utilization of PHL was 32 minutes (IQR, 29-39) compared to CCS recommendation of < 30 minutes¹⁵⁹. An American study in 2011 conducted a before-and-after cohort study investigating the impact of the use of the cardiac catheterization laboratory (CCL) for pre-hospital recognized STEMI¹⁶⁰. The authors found a significant reduction of 18.2 minutes (95% CI: 7.69-28.71) of mean door to balloon time (D2B). A significant reduction of 20.7 minutes in mean dispatch to reperfusion time (95% CI: 9.1-32.3) was also seen¹⁶⁰. Interestingly, gender bias in the field of acute coronary syndrome (ACS) has been described¹⁶¹. Aguilar et al. further investigated this gender bias in the execution of pre-hospital ECG stratified by STEMI and no STEMI¹⁶¹. When men and women were compared within the category of STEMI, significant reduction in average scene time (17:27min vs. 20:29min) and total scene-to-arrival-at-hospital time (30:30min vs. 34:25min) were seen, respectively¹⁶¹.

A 2007 Canadian study¹⁶² evaluated a program designed to treat STEMI within the recommended D2B time. The program involved an expedited pre-hospital diagnosis including 12-lead ECG recording and interpretation by EMS personnel on site, an early alert and transfer of the patient to the nearest ED and a direct transfer of the patient to the catheterization laboratory once the diagnosis was confirmed by the ED physician. Of the 358 patients in the study, a D2B time within 60 minutes was achieved for 48.9% of the patients and the currently recommended D2B time of 90 minutes was achieved with 78.8% of the patients. The authors concluded that the implementation of the program was feasible and resulted in the majority of patients receiving intervention within the suggested 90 minute D2B time¹⁶².

An additional Canadian study¹⁶³ also explored strategies to reduce time for treatment of a myocardial infarction. In 2007, a cross-sectional survey was conducted with ground EMS operators across Canada¹⁶³. The focus of the survey was on the use of 4 pre-hospital strategies for reperfusion therapy: 1) 12-lead ECG, 2) routine expedited ED transfer of STEMI patients, 3) pre-hospital bypass from a local ED to a specialty centre and

4) pre-hospital fibrinolysis. Of 97 ambulance operators surveyed, 68% (95% CI: 59-77%) had ambulances equipped with 12-lead ECGs, only 18% (95% CI: 10-25%) had pre-hospital bypass protocols, and 45% (95% CI: 35-55%) had expedited ED transfer protocols. Pre-hospital fibrinolysis was only available in Alberta. The authors¹⁶³ concluded that there is provincial variation in implementation of recommended STEMI therapies. Further, the existing technologies, such as pre-hospital ECGs, were reportedly underused.

Summary: Cardiac arrest patient care appears to be one of the most well researched topics in EMS. Research identified in this report would suggest that predictors of OHCA survival include VF/VT and ROSC, while the presence of a pre-hospital physician does not influence survival rates. Insufficient evidence exists regarding the benefit or harm of mechanical chest compressions during cardiopulmonary resuscitation. Other strategies that include telephone CPR, improving access to AEDs, training of individuals outside of the EMS system to respond to cardiac arrest, and bypassing local hospitals for specialist CA centres may contribute to process improvements that increase survival. Other studies have shown that the development and implementation of reperfusion therapy guidelines improve a number of time intervals between dispatch and reperfusion for STEMI patients.

Stroke - In 2008, a performance measurement manual was developed in order to monitor and evaluate stroke services in Canada¹⁶⁴. An advisory group developed a set of evidence-based performance measures based on best practice recommendations to evaluate the quality of stroke care in the pre-hospital, acute care, rehabilitation, and community settings. This set of performance measures was developed through a comprehensive literature review and modified-Delphi consensus process, which identified existing measures in addition to validating proposed measures. This manual describes a core set of 19 performance measures, with validated benchmarks where applicable. The 19 core performance measures are further categorized into overall stroke incidence, public awareness and primary stroke prevention, pre-hospital and emergency stroke care, in-hospital stroke care, stroke rehabilitation, secondary stroke prevention and community stroke care and re-engagement. The measures within pre-hospital and emergency stroke care include: 1) proportion of acute stroke patients who arrive at hospital within 2.5 hours of stroke symptom onset, 2) proportion of all ischemic stroke patients who receive acute

thrombolytic therapy (tPA), and 3) proportion of transient ischemic stroke (TIA) patients who receive tPA within one hour of hospital arrival¹⁶⁴.

A performance improvement toolkit has been developed and implemented in the state of North Carolina to improve the quality of the EMS system. This toolkit provides tools to measure and analyze EMS service delivery and stroke care interventions¹⁶⁵. It also facilitates collaboration within the areas of “public education, regional stroke planning with hospitals, EMS service configuration, EMS staffing patterns, EMS education, and timely care delivery”¹⁶⁵. Each EMS system is able to compare results generated from the toolkit with the state’s results and evaluate the effect of an intervention across time. North Carolina has also been able to link EMS data with hospital data in order to provide an opportunity to evaluate the quality of care provided from initial contact with medical providers to discharge from hospital. Failure to link EMS with hospital data of each individual patient was frequently due to incorrect documentation of the EMS arrival time¹⁶⁵.

Rapid recognition of stroke symptoms and notification of EMS facilitates positive prognosis¹⁶⁶. A 2012 Italian study investigated medical provider’s awareness of stroke symptoms among patients suffering from TIA and stroke¹⁶⁶. With a sample size of 578 patients, 60% of patients arrived at the emergency department with EMS, while 40% chose to not utilize EMS service, indicating underestimation of stroke symptoms by patients. The “stroke code” dispatch was only associated with 13% of EMS arrivals with recurrent stroke, suggesting a lack of awareness of stroke symptoms among medical providers¹⁶⁶.

In order to facilitate rapid and accurate diagnosis of stroke, various protocols have been developed¹⁶⁷. A 2008 American study assessed the precision of stroke identification in emergency medical dispatchers utilizing the Medical Priority Dispatch System (MPDS) and EMS providers using the Cincinnati Pre-hospital Stroke Scale (CSS)¹⁶⁷. This study found that of the 882 patients diagnosed with stroke through the MPDS, 367 were discharged with a diagnosis of stroke. This illustrates a sensitivity of 83% and a positive predictive value (PPV) of 42%. Of the 447 patients diagnosed with stroke by EMS providers utilizing CCS, 193 were discharged with a diagnosis of stroke. This illustrates a sensitivity of 44% and PPV of 40%¹⁶⁷.

It has been suggested that acute stroke patients would benefit from a relay system between the stroke centre and the EMS system. A 2010 Korean study retrospectively

investigated transfer and intra-hospital processing times of acute ischemic stroke patients when hospitals are notified by EMS of a requirement for intravenous t-PA¹⁶⁸. This study found that the transfer time of patients with EMS t-PA call (47.7 ± 23.1 min vs. 56.3 ± 32.4 min, $p=0.004$) and door-to-CT time (17.8 ± 11.0 min vs. 26.9 ± 11.5 min, $p=0.01$) was significantly faster when compared to no EMS call¹⁶⁸. The above findings were also supported by Abdullah et al.¹⁶⁹ who found a significant reduction in door-to-CT time (40 vs. 47 min, $p = 0.01$) and double the occurrence of thrombolysis (41% vs. 21%, $p=0.04$) within the pre-hospital notification group¹⁶⁹.

Summary: Research identified in this report would suggest that pre-hospital performance measures are available relating to pre-hospital care of stroke patients along with toolkits to improve pre-hospital stroke care. There may be a lack of awareness of stroke symptoms by the general public and EMS providers. A number of methods have been developed to facilitate the rapid and accurate diagnosis of stroke. Such methods include the MPDS and the CCS, of which MPDS is reportedly more effective. Researchers have also shown that a relay system between the EMS and the stroke centre and benefits patients through reductions in transfer time and reduced door-to-CT time.

EMS System Safety

EMS Personnel

A systematic review on EMS personnel safety could not be identified. However, other published literature has covered several areas pertaining to EMS provider well-being and safety as well as related risks. These areas are summarized below.

Overall health status – Only one study could be located, a cross-sectional study that examined the overall health status of EMS providers¹⁷⁰. The findings from this study indicate that EMS professionals are less healthy than the general population. The authors analyzed 2007 data collected from a questionnaire included in biennial recertification packets that related to health and wellness. Of the 19,960 returned questionnaires, 23.5% respondents reported at least one existing health condition. With regards to the top health indicators, nearly three-quarters of the respondents were overweight/obese, and 75.3% of respondents did not meet Centres for Disease Control and Prevention recommendations

for physical activity. Women represented a relatively large proportion of the 17% of respondents who reported being current smokers¹⁷⁰.

Summary: To date, there appears to be minimal evidence on the overall health status of EMS providers. Research identified in this report would suggest that EMS workers are relatively unhealthy. In addition to characterizing the health status of EMS providers, future research should focus on the potential impact of work conditions on overall health.

Impact of Shiftwork on Sleep and Fatigue - A literature review on the effects of shift work on sleep was published in Australia in 2012¹⁷¹. The authors search of electronic databases resulted in 226 articles; however, only nine met the inclusion criteria along with three articles identified in references in the retrieved articles. Three of the studies¹⁷²⁻¹⁷⁴ which used questionnaires found that sleeping difficulties were significantly associated with psychological aspects of the job, including post-traumatic stress reactions and burn-out. One study¹⁷⁵ in Japan using questionnaires found that modified night shifts that allowed for lengthy naps improved subjective fatigue and physiological function during the shift. One study where records were reviewed¹⁷⁶ and another survey study¹⁷⁷ both did not find that shift work had a negative impact on performance. Four studies¹⁷⁸⁻¹⁸¹ which utilized a range of methods, including questionnaires, diary entries, and focus group/interviews, to examine occupational stress reached similar conclusions. It was generally found that EMS providers experienced more unhappiness, stress, low job satisfaction, and feeling futile and unable to have an impact on management. In one study, shift work was also found to have a significant impact on the family system in a qualitative interview study with family members of EMS providers¹⁸². One case series study¹⁸³ reported accounts of fatigue-related errors and motor vehicle accidents. The authors concluded that further research is needed on the extent of fatigue and issues related to sleep quality, including depression. It was further recommended that research examine the impact of sleep deprivation and fatigue on quality of care and patient safety.

The literature search retrieved additional articles on quality of sleep and fatigue among EMS providers and associated health and safety risks. One cross-sectional survey study used the Pittsburgh Sleep Quality Index (PSQI), the Chalder Fatigue Questionnaire (CFQ), and a demographic survey to describe the association between sleep quality and

fatigue¹⁸⁴. A total of 119 surveys were completed by a convenience sample of EMS providers. More than a third of the respondents (35.4%) worked eight-hour shifts. A majority of respondents were found to be overweight (41.9%) or obese (42.7%), and more than half (59.6%) were diagnosed with one or more health conditions. The mean (\pm standard deviation) PSQI score of 9.2 (\pm 3.7) indicated poor sleep quality among the respondents, as the threshold for poor sleep quality was a score >5 . Nearly half (44.5%) of the respondents obtained a CFQ score ≥ 4 , indicating severe mental and physical fatigue. A higher mean PSQI score was found in respondents who reported severe fatigue (11.3 ± 3.2) than those who did not report fatigue (7.5 ± 3.0 , $p < 0.0001$)¹⁸⁴. Another cross-sectional study that used the PSQI, CFQ, and the EMS Safety Inventory (EMS-SI) found an association between sleep quality, fatigue and safety outcomes¹⁸⁵. A 35.6% mean agency response rate was achieved based on the 547 completed surveys from 30 EMS agencies. The mean PSQI score was 6.9 (95% CI: 6.6-7.2), and 55% (95% CI: 50.7-59.3) were considered fatigued as they scored ≥ 4 on the CFQ. An injury was reported by 17.8% (95% CI: 13.5-22.1) of the respondents, a medical error or AE was reported by 41% (41.1%, 95% CI: 36.8-45.4), and a behavior compromising safety was reported by 90% (89.6%, 95% CI: 87-92). Compared to respondents who did not report fatigue, fatigued respondents were at 1.9 greater odds of injury (95% CI: 1.1-3.3), 2.2 greater odds of medical error or AE (95% CI: 1.4-3.3), and 3.6 greater odds of safety-compromising behavior (95% CI: 1.5-8.3)¹⁸⁵.

Summary: Research identified in this report would suggest that EMS workers are physically and mentally fatigued from poor sleep, and that this may lead to increased risk of injury, AEs, and safety-compromising behavior. Future research should further examine how lack of quality sleep and fatigue impacts EMS safety and performance, as well as the effects of interventions designed to improve sleep quality and reduce fatigue, especially in the local setting.

Mental health and well-being – While no systematic review as identified, a number of studies examined the prevalence of work-related stress in EMS providers¹⁸⁶⁻¹⁸⁹. A study where 1,633 paramedics completed an Internet-based survey found that alcohol use, and chronic and critical incident stressors were risk factors for posttraumatic stress symptomatology (PTSS)¹⁸⁶. Higher rates of PTSS were associated with interactions

between high levels of chronic operational stress and alcohol use, or high levels of critical incident stress. Exposure to certain personally disturbing incidents (i.e., death of a child, care of family/friend, care of disaster victims, care of crime victims and care of burn victims) was also found to be factor associated with traumatic stress symptomatology¹⁸⁷. A 2011 study reported the prevalence of mild (n=16, 27%) to moderate (n=6, 10%) depression among paramedics in Australia¹⁸⁹.

Summary: Research identified in this report would suggest that EMS providers are at risk for various types of stress stemming from the nature of their work. While one study provided limited evidence on the prevalence of depression among these healthcare workers further research is required to determine if they are a greater risk for depression and to fully understand the relationship between this risk and EMS work.

Nonfatal and fatal injuries – While a systematic review was not identified, several descriptive studies have examined the type, severity and rate of incidence of nonfatal and fatal injuries sustained by EMS while performing work. In one cross-sectional survey study with 659 respondents, nearly 30% reported at least one injury within the past 12 months, of which 64% reported multiple injuries within the same timeframe¹⁹⁰. Overall, paid providers were twice as likely to experience an injury than volunteer providers, and also more likely to experience back injury as well as physical assault perpetrated by patients, most of which were reported occurring when patients were under the influence of alcohol or drugs. A slip, trip or fall was the most commonly reported injury for both types of providers¹⁹⁰.

One retrospective study of a statewide EMS incident reporting system analyzed 229 reports filed between 2003 and 2010¹⁹¹. Of the 229 reports, there were 237 incidents which were categorized as actions/behavior (32%), vehicle/transportation (16%), staffing or ambulance availability (13%), communications (8%), medical equipment (9%), multiple patients/agencies/units and level-of-care issues (7%), medical procedure (6%), medication (5%), accident scene management/scene safety (3%), and protocol (1%). The authors suggested that the use of an anonymous reporting system such as the one examined in this study could improve reporting behaviours among EMS providers, and promote a culture of safety¹⁹¹.

In the United States, two studies that analyzed data from the National Electronic Injury Surveillance System-Occupational Supplement (NEISS-Work) to gather information on work-related injuries for emergency responders found that sprains and strains, mostly in the lower half of the body, were the most common injury, accounting for 33% of nonfatal injuries^{192,193}. According to a study of compensation data for emergency responders, musculoskeletal strains were most commonly cited reason for missed work¹⁹⁴. Back injuries are attributed to patient care tasks such as lifting, carrying equipment, reaching, and horizontal stretching^{195,196}. The authors of one ergonomic study recommended raising awareness of associated risks among EMS providers to reduce rates of injury, as well as the design/redesign of mechanical and technical devices for lifting and moving patients¹⁹⁶. One pre- and post-intervention study examined the impact of hydraulic stretchers on rates of provider injury¹⁹⁷. In the post-intervention period, the injury incidence rate decreased from 61.1 to 28.8 per 100 FTE, and a rate ratio of 0.47 (95% CI: 0.33–0.55). Stretcher-related injuries demonstrated the largest rate reduction, recording the lowest rate ratio of 0.33 (95% CI: 0.17–0.52)¹⁹⁷.

In addition to NEISS-Work, Reichard et al.¹⁹³ also analyzed data from the Bureau of Labor Statistics Census of Fatal Occupational Injuries from 2003 to 2007, and reported that the rate of fatal injuries among EMS professionals was 6.3 per 100,000 FTEs in the United States. Fatalities were mostly attributable to motor vehicle and aircraft collisions¹⁹³. Similarly, motor vehicle accidents were also identified as a cause of injury, leading to a loss of 31 or more work days among 20% of cases in a study of national data¹⁹⁸. Motor vehicle crashes occurred more often at night, during patient transport, and when lights and sirens were active¹⁹⁰. Lack of seatbelt use, icy/poor roads as well as failure of another vehicle to yield, were also cited as factors associated with ground ambulance crashes¹⁹³. Factors that contributed to aircraft crashes include adverse weather conditions and mountainous terrain¹⁹³. In their narrative review, Slattery and Silver¹⁹⁹ identified three main categories of factors that contribute to the safety risks of ambulance transport: 1) risks inherent to driving/riding an ambulance, 2) poor ambulance safety standards and design, and 3) increased provider vulnerability to injury when providing patient care while the vehicle is in motion.

One paper was identified that reported on the proceedings from the National Association of EMS Physicians Ambulance Safety Conference in Phoenix, Arizona in 2010²⁰⁰. The Haddon Matrix was employed to classify factors contributing to ambulance safety risks and potential solutions identified by the attendees. Various host factors were considered, including fitness level, driver's sleepiness, and driving skills, education, knowledge, and capabilities. Agent factors pertained to the ambulance itself and the equipment within it. Driving speed, and weather and road conditions were all identified as physical environment factors that contribute to ambulance collisions. Social environment factors were related to safety culture and fell into one of three categories: vehicle use, personnel management, and behavioural response. Vehicle use referred to response times, the use of lights and sirens, and call prioritization. Personnel management included seatbelt usage and driver training while behavioural response included prioritization of speed, individual accountability, ability to recognize error, and self-reporting²⁰⁰.

Summary: Research identified in this report would suggest that EMS workers are at a high risk for sustaining injuries in the course of their work, particularly musculoskeletal strains from lifting patients and equipment, and stretching while providing patient care. The majority of fatal injuries were caused by motor vehicle and aircraft collisions. Intervention studies such as the one that examined the impact of hydraulic stretchers could provide a further understanding of how to improve work conditions to reduce rates and severity of injuries. Multiple ambulance safety risks and potential solutions have been reported.

Exposures –While a systematic review was not identified, the literature search yielded one study²⁰¹ on infectious exposures and five studies on blood exposure. Exposure reports filed between January 2007 and December 31, 2009 were reviewed in one study²⁰¹. Within this period, 397 exposure incidents were reported, which resulted in an exposure rate of 1.2 per 1,000 incidents. The four most common types of reported exposures were meningitis (n=131, 32.9%), tuberculosis (n=68, 17.1%), viral respiratory infections (n=61, 15.4%), and body fluid splashes to skin or mucous membranes (n=56, 14.1%). Exposures resulting from needle sticks were the least common, with only six incidents reported

within this time period. Based on trend analyses, the authors concluded that exposures to viral respiratory illnesses are increasing²⁰¹.

Five studies²⁰²⁻²⁰⁶ on blood exposure drew on data collected by the National Study to Prevent Blood Exposure in Paramedics. A mail survey was conducted among a nationally representative sample of licensed paramedics in the US during 2002-2003, obtaining a response rate of 55% (2664/4844). Results for California were analyzed with the national results, and separately as it was the first state to enact legislation mandating the use of safety devices to prevent needle stick injuries. One study reported the incidence rates among this national sample²⁰². The total blood exposure rate was 465/1,000 employee-years (95% CI: 293-637), with the rate of non-intact skin exposures being the highest at 230/1,000 employee years (95% CI: 130-329). The rate for needle/lancet stick incidents was 100/1,000 employee years (95% CI: 40-159) among the national sample and 26/1,000 employee years (95% CI: 15-38) for the California sample²⁰².

The survey also collected data on the conditions under which exposure incidents occurred. One study reported that 80% of injuries related to needle/lancet sticks occurred in the absence of safety devices²⁰⁵. However, using safety devices did not always prevent exposures; a third of mucous membrane exposures occurred when the paramedic was wearing eye or face protection and 83% of non-intact skin exposures occurred when the paramedic was wearing disposable gloves. Incidents of mucous membrane exposure were caused by patient vomiting, spitting, or coughing up blood. In a third of mucous membrane and 40% of non-intact exposures, the patient was being uncooperative and combative. The authors concluded that increased use of safety devices, improved design, increased compliance with established precautions and development of techniques to avoid blood exposure while treating uncooperative or combative patients could reduce blood exposure among paramedics²⁰⁵.

Two studies^{204,205} which examined the correlation between blood exposures and use of safety equipment reached a similar conclusion. One study examined the provision and use of safety and protective equipment among paramedics and their attitudes towards this equipment²⁰⁴. The authors found that safety devices were provided more often to paramedics in California than paramedics in the United States as a whole. There was at least a 40% increase in use for each type of device when they were always provided rather

than when they were not always provided. While 84% of respondents thought that the use of safety needles would reduce blood exposure, a quarter to a third of them also thought that the use of safety needles, eye protection, and masks interfere with their ability to perform select procedures. Nearly one-fifth of the respondents expressed a need for more training in the use of such equipment. The authors concluded that the higher rates of provision and use of safety and protective equipment in California may be attributed to the state legislation on needle safety, while the lack of access to such equipment was a significant barrier to their use in states with lower rates. While another study also found that the provision of safety devices reduced the risk of needle stick incidents, managerial support and emphasis on safe work practices was more effective as a protective mechanism²⁰⁵. It was concluded that increasing access to safety equipment as well as interventions aimed at promoting managerial support for an embedded culture of safety could greatly reduce the risk of needle stick incidents.

A fifth study examined exposure reporting to employers and found that it was related to the paramedic's personal assessment of the risk of transmission²⁰⁶. Paramedics were more likely to report deep or moderate needle sticks and mucous membrane exposures than cuts from sharp objects containing blood or exposures to blood on non-intact skin. Less than half (49%) of all exposures to blood, and less than three-fourths (72%) of needle sticks were reported to employers. Under-reporting was more common among male paramedics and paramedics who perceived exposures were due to circumstances under their own control. Paramedics whose employers do not promote a culture of safety and who do not believe that reporting increases the ability of management to protect workers from future exposures were also more likely to under-report²⁰⁶.

Summary: Research identified in this report would suggest that, while there is substantial evidence on exposure rates and the use of safety and protective equipment, it is limited to data drawn from one sample. The data indicates that exposure is a concern and that safety and protective equipment should always be provided to EMS workers to encourage their use. Studies also reported that an embedded culture of safety supported by management could improve safety practices, including exposure reporting. While the National Study to Prevent Blood Exposure in Paramedics provides representative

information of EMS providers in the United States, there is no known comparable study in Canada.

Vaccinations – While a systematic review could not be identified, three studies have examined vaccination among first responders and emergency medical services professionals. One cross-sectional survey study examined influenza vaccination rates among EMS professionals in North Carolina and the predictors of vaccination uptake²⁰⁷. Among the 601 respondents, 47.9% reported receiving the vaccination; however, there was variation among rural, suburban, and urban respondents. Vaccinated and unvaccinated groups exhibited notable differences with regards to employer vaccine recommendation (OR=3.6, $p<0.01$), employer-offered influenza training (OR=1.5, $p<0.01$), employer-offered vaccination (OR=3.3, $p<0.01$), as well as belief in vaccination safety (OR=27.5, $p<0.01$) and effectiveness (OR=9.5, $p<0.01$). Only 9.1% of respondents supported mandatory vaccination, even though most believed that they were highly susceptible to contracting influenza, that the risks of vaccinations were generally safe and effective, and the potential of adverse reactions was outweighed by the benefits. Reasons against vaccination included confidence in their personal health, doubts in the effectiveness of vaccinations, and the absence of mandatory enforcement by employer. Vaccination was associated with being previously diagnosed with influenza, perception of being at a greater risk than the general population, belief in vaccination effectiveness and of favourable risk benefit ratio, employer recommendation for vaccination, and age²⁰⁷.

One case study of H1N1 vaccination among first responders in Florida identified that an “emergency approval pathway” is required to successfully implement a vaccination program in a pandemic situation²⁰⁸. Another study assessed the H1N1 vaccination rates in approximately 14,000 first responders in New York²⁰⁹. Biologic points of distribution (BIOPOD) were established to distribute vaccinations in the event of a biological disaster. While only 34.4% ($p=0.0001$) of responders accepted vaccination during regular monitoring and treatment, 57.2% accepted during BIOPOD intervention, resulting in an overall rate of 55% acceptance. Responders were four times more likely to accept the vaccination if they have received prior influenza vaccinations. Another predictor of acceptance was vaccination in a group setting such as BIOPOD. Based on these findings, the

authors concluded that voluntary programs also require additional strategies to increase the uptake of vaccination among first responders²⁰⁹.

Summary: Research identified in this report would suggest that vaccination uptake among EMS providers varies from 48% to 57%. The decision to receive vaccination is affected by various factors, including employer support for vaccination, perception of personal health and susceptibility of infection, and vaccination effectiveness. Further studies should examine interventions and strategies that encourage the uptake of vaccination such as the BIOPOD.

Perception of Risk – While a systematic review was not identified, two studies were identified from the literature search. One survey study explored risk perception among physicians, nurses, and paramedics and in comparison with non-medical workers²¹⁰. A response rate of 39% was obtained with 2,495 returned questionnaires, of which 36.2% were from paramedics. In comparison to physicians and nurses, paramedics rated the risk of getting a cold and the annual influenza lower. Paramedics also perceived risk for pandemic influenza, cancer, heart attack, and food poisoning lower than nurses, but higher than physicians²¹⁰.

Another study investigated paramedics' risk perception and inclination to work during non-conventional disasters (e.g., chemical, biological, radiological and nuclear events) through multiple focus groups with paramedics in Victoria, Australia²¹¹. As non-conventional disasters are generally not visible or localized and consequently more difficult to assess, the perception of risk increases, which corresponds with decreased willingness to work. The main perceived risks identified were exposure, infection, illness, and death to themselves, colleagues, and family. In addition to these perceived risks, paramedics expressed concerns related to communication with other professionals and family, access to current and reliable information, and provision of suitable and timely education and training. While the safety of themselves, colleagues and family were of primary concern, the respondents also recognized their professional obligations as emergency healthcare workers. It was reported that willingness to work during non-conventional events would increase with provision of adequate safety measures,

equipment and training, as well as access to childcare and eldercare and ability to communicate with family²¹¹.

Summary: There is not a great deal of evidence on EMS perception of risk in the literature. Research identified in this report is limited to specific conditions and to the relationship between risk perception and willingness to work in the event of a non-conventional disaster.

Safety Culture – While a systematic review was not identified, the literature search identified four studies pertaining to workplace safety culture. The Safety Attitudes Questionnaire (SAQ), a validated safety culture instrument, was adopted for use in three EMS agencies in one metropolitan area in the United States²¹². Safety culture was characterized across six domains in the EMS-SAQ: safety climate, teamwork climate, perceptions of management, job satisfaction, working conditions, and stress recognition. A high response rate, acceptable internal consistency, and model fit validity confirmed that the EMS-SAQ is a feasible instrument for assessing safety culture in EMS²¹². The EMS-SAQ was administered to a national sample of emergency medical services agencies in a subsequent study to describe perceptions of safety culture²¹³. A mean agency response rate of 47% was achieved with 1,715 completed surveys from 61 advanced life support EMS agencies in both the United States and Canada. The results reflected variation in workplace safety culture between the agencies. The scores [mean (minimum, maximum)], ranging from 0 to 100, with 100 being agree strongly and 0 being disagree strongly, were: safety climate 74.5 (49.9, 89.7), teamwork climate 71.2 (45.1, 90.1), perceptions of management 67.2 (31.1, 92.2), job satisfaction 75.4 (47.5, 93.8), working conditions 66.9 (36.6, 91.4), and stress recognition 55.1 (31.3, 70.6). Air medical EMS generally scored higher across all domains, while agencies with increased annual patient contacts tended to score lower²¹³.

Another survey study examined the relationship between perceived safety culture and adherence to safety procedures among EMS professionals in an urban EMS system that processes less than 100,000 calls per year²¹⁴. The survey consisted of a 20-item instrument to assess safety climate and a nine-item list of safety practices. Of 221 EMS providers, 196 completed the survey, achieving a response rate of 89%. The majority (65%) of respondents reported strict compliance with safety procedures. Feedback and training on

safety was most strongly associated with adherence to safety practices (OR=2.14, 95% CI: 1.01-4.51). The results indicated that perception of high safety culture was associated with twice greater odds of the level of compliance with safety procedures²¹⁴.

Workplace safety culture scores have been investigated in relation to patient and provider safety outcomes. The EMS-SQ and the EMS Safety Inventory, which captures self-reported safety outcomes from providers, were completed by 416 providers from 21 agencies, with response rates ranging from 5.3% to 81.3% and a mean agency response rate of 42.1%²¹⁵. One-sixth (16%) of respondents reported an injury in the past three months, 40% reported an adverse event and 89% reported behaviours that compromise safety. With regards to EMS-SAQ results, respondents who reported sustaining an injury or safety compromising behavior scored lower on five domains, and those who reported an error or adverse event scored lower on four of the domains. The authors concluded that individual provider perception of workplace safety culture is associated with composite measures of patient and provider safety outcomes²¹⁵.

Summary: Research identified in this report would suggest that perception of high workplace safety culture impacts adherence to safety practices and policies and safety outcomes. However, the evidence is limited by a small number of studies and by survey data.

Patient Safety - A systematic review published in 2011 examined patient safety in pre-hospital emergency care as well as interventions to address associated risks^{216,217}. The review was the first of a three-phase project funded by the EMS Chiefs of Canada and the Calgary EMS Foundation in partnership with the Canadian Patient Safety Institute to explore current patient safety issues in emergency medical services. From 4,274 potentially relevant studies dating back to 1999, 69 were selected for the review in addition to two articles nominated by the reviewers for inclusion. Of the 71 articles reviewed, only two were randomized controlled trials (RCT) and the remainder were prospective observational studies, retrospective database/chart reviews, surveys, qualitative interviews, or systematic reviews. Existing literature was categorized into six themes: 1) clinical judgment, 2) medication incidents and other adverse events, 3) ground vehicle safety, 4) aircraft safety, 5) field intubation, and 6) inter-facility transportation. The

authors reported the use of a wide variation in outcome measures, including physiologic variables, malfunction rates, perceived barriers to self-reporting adverse events, patient discourse, information exchange, and technical skill accuracy^{216,217}. Of the two RCTs identified in the systemic review, one²¹⁸ compared the safety outcomes of patients greater than 59 years of age responded to by standard paramedics and transported/treated in the ED to those treated in the field by paramedics with advanced training and not transported to the ED in the management of low-acuity conditions. The study suggests those with advanced training are equally as safe as standard EMS transfer and treatment within the ED. In a simulated-RCT²¹⁹, the ability of experienced paramedics to calculate drug doses was compared before and after a drug reference card was implemented. The use of the drug reference card enabled more accurate calculations compared to those without access to the card.

The 2012 systematic review also identified several studies that highlighted four areas of clinical decision-making among EMS providers^{216,217}. One area pertains to the ability of EMS providers to correctly identify when a patient should be transported to an emergency department. In one study²²⁰, paramedics were asked “could this patient have been safely transported by a non-medical transport service” and physicians and paramedics reached agreement 53% of the time (kappa 0.47)²²⁰. Another study²²¹ which involved patient interviews found that EMS refusal to transport patients accounted for a third (34%) of non-transports, of which more than half (56.2%) sought medical care within 7 days, and 9.5% were admitted to hospital with no deaths. Over half (55.1%) of patients who refused transport sought medical care within 7 days, and 7.3% were admitted (no p value reported)²²¹. Two studies^{222,223} reported that the inappropriate application of non-transport guidelines ranged from 2.4 to 4.3%, indicating that paramedics could apply the guidelines correctly overall. Another area of EMS clinical decision-making is determining whether a patient needs advanced life support. One retrospective review²²⁴ found that of 69 cases where BLS responders cancelled ALS response, 77% were incorrect cancellations. ALS was provided upon arrival at a hospital in 87% of these inappropriately cancelled cases. Whether trained paramedics can provide extended services beyond conventional services was identified as the third area of EMS decision-making²²⁵. As part of a cluster-randomized controlled trial, a total of 3000 patients over the age of 59 who requested EMS

response were randomized to either a standard paramedic (assess and transfer to ED) or a paramedic with advanced training. No differences were found with regards to physician-rated suboptimal care, unplanned visits to the ED, or 28 day mortality. Patients who received care from a paramedic practitioner were less likely to be admitted within 28 days (RR 0.87, 95% CI: 0.81-0.94), less likely to be transported to the ED (RR 0.72, 95% CI: 0.68-0.75), and more likely to report high satisfaction (RR 1.6, 95% CI: 1.09-1.23) compared to those treated by a standard paramedic²²⁵. Whether response levels can be determined by paramedics in dispatch centres was the fourth area of decision-making identified in the literature²²⁶. It was found in one prospective observational study that a tool could be used by ALS paramedics in dispatch centres to determine the need for immediate versus delayed EMS response; only 1.7% (4/239) of the cases were judged to be incorrectly classified as not in need of immediate response²²⁶.

Several studies in the systematic review examined the type and causes of adverse events. An examination of tort claims made against EMS revealed that vehicle collisions accounted for 37% of adverse events while the remaining were attributed to patient handling (36%), clinical management (12%), and delayed responses (8%)²²⁷. Two studies revealed that such events are caused by lack of available resources, communication problems, prolonged response times, difficulties with resuscitation and other treatment problems, issues related to patient management and clinical care, as well as equipment problems^{228,229}. The lack of standardization between EMS agencies, adversarial interrelationships between EMS providers, allied staff and hospital staff, leading to miscommunication, were also identified as causes of adverse events⁷¹. Studies of medication incidents found that the presence of a stressor such as a panicked bystander, inadequate training, and minimal experience contributed to the occurrence of adverse events^{71,230}. Two studies demonstrated that the implementation of pediatric dosing cards reduced dosing errors and miscalculations of endotracheal tube size^{219,231}. While survey studies have shown that EMS providers with more experience were more likely to report errors than novice providers²³²⁻²³⁴, providers in another study identified a non-punitive reporting system as necessary to foster a culture of self-reporting⁷¹.

The systematic review^{216,217} also identified numerous studies that examined how ground transportation can contribute to patient safety risks. One study reported that

transport-related incidents occurred at a rate of one per 1,000 and a rate of 0.546 injuries per 1,000 transports²³⁵. Two studies of traffic data over an eleven-year period showed that there were approximately 340 ambulance crashes resulting in 405 deaths and over 800 injuries among various types of ambulance passengers (e.g., providers, patients, family members, etc.)^{236,237}. Over three-quarters (77%) of the crashes occurred during clear weather and 60% involved the use of lights and sirens²³⁷. While crashes in rural areas were more common on unlit roadways at night and during poor weather conditions, urban crashes were more likely to occur at intersections and to involve other vehicles²³⁸. With regards to pediatric transports, EMS providers reported receiving minimal training as well as having minimal knowledge and experience with how to safely secure or restrain this patient population^{239,240}. Two studies found that receiving feedback on risky driving behaviours such as speeding and forceful breaking improved patient safety risk^{241,242}.

Two studies identified in the systematic review examined the incidence rate of aeromedical crashes, one of which reported that the majority of which were caused by pilot error^{243,244}. Respondents of survey studies reported that training in resource management, flight simulators, access to night vision goggles, as well as improved communication and diligence, could contribute to safety²⁴⁵⁻²⁴⁷. A competitive culture and a cultural norm of flying despite poor weather conditions were also identified as contributing factors to helicopter collisions.

A common theme found in the literature is the associated patient safety risks of pre-hospital endotracheal intubation. Two studies in the systematic review that examined endotracheal tube cuff pressure in intubated patients found that pressures were higher than recommended in the majority of patients^{248,249}. Five studies examined successful placement and misplacement rates. Rates of misplacement ranged from 0% in 32 patients intubated by paramedics with BLS skills to 12% in 109 patients intubated by paramedics with BLS skills²⁴⁹⁻²⁵³. One study reported that the misplacement of nasal tubes is twice as likely as oral tubes (5% vs. 10.7%, p value not reported)²⁵². Three studies reported varying rates of successful endotracheal tube insertion²⁵⁴⁻²⁵⁶. The studies cited several contributing factors to misplacement of endotracheal tubes as assessed by the ED physician, including insufficient relaxation, inability to open patient's mouth, inability to pass through cords, gag reflex, increased weight and poor visualization²⁵⁴⁻²⁵⁶. Failure rates were higher for

services with more patient contact, and lower for services that performed more endotracheal intubations per year. Two studies examined the use of rapid sequence induction in endotracheal intubation by ALS paramedics and physicians, respectively^{257,258}. Success of insertion by paramedics was found to increase with each attempt, from 70% on the first attempt, to 89% on the second attempt, and to 96% on the third attempt²⁵⁷. In the second study, placement by physicians resulted in hypoxemia in 18% of the patients and hypotension in 13% of the patients²⁵⁸. The literature search retrieved a 2012 comprehensive meta-analysis of 58 studies on intubation success rates that was not included in this systematic review²⁵⁹. ETI success rates were reported by 64% of services without physician direction and 54% of services manned by physicians. The median success rate was 91% (95% CI: 0.491-1.000). Physician providers were associated with significantly higher success rates regardless of whether non-physician providers used muscle paralytics or traditional rapid sequence induction²⁵⁹.

The majority of the literature identified in the systematic review^{216,217} on inter-facility transportation was found to focus on patient outcomes at either the sending or receiving facility rather than in-transit care. The authors concluded that the literature does not address patient safety in EMS inter-facility transportation specifically, rather safety in the sending or receiving facility^{216,217}. A range of adverse events during inter-facility transportation were documented in several studies, including hemodynamic instability, equipment failure, medication error, IV or endotracheal tube dislodgement, and vehicle-related complications²⁶⁰⁻²⁶⁵. Studies that have characterized incidence rates of these events reported varying rates from 25% to 36% and low rates of death occurring from the transport²⁶⁴⁻²⁶⁸. Interventional studies on how to improve patient safety during inter-facility transport could not be found.

The authors concluded that there is a paucity of scientific literature exploring patient safety in EMS. In addition, many facets of patient safety in EMS have yet to be addressed by the literature^{216,217}.

In 2010, the second phase of the project to explore patient safety risks in EMS involved interviews with 16 informants from Canada (N=14), the United States (N=1), and Europe (N=1)^{217,269}. Interviews were conducted with highly experienced EMS practitioners, educators, administrators, physicians, researchers, and a parent of a child whose health

frequently required EMS. The first key theme identified by the majority of participants was clinical judgment. Factors identified as challenges within clinical judgment included an increase in the complexity of patient situations, the limits to protocol based care (critical thinking skills needed to know when to apply protocols), overcrowding in the ED resulting in long patient hand-over to ED staff (have to provide continuing care when they were never trained to do so), a short training and evaluation cycle exists for EMS staff and there is insufficient opportunity to practice with supervision. The second key theme involved the focused relationship between EMS and the health care system. The authors concluded that while there are a number of smaller initiatives towards improving patient safety, some of the major issues are system-wide and need to be addressed through policy change from health regions and the government^{217,269}.

The findings from the systematic review and the interviews were presented at the Patient Safety in EMS Roundtable held in 2009 in Niagara Falls, Ontario attended by 52 patient safety, EMS and research experts from Canada and the United States^{216,217,269,270}. In addition to identifying nine strategic priorities to improve patient safety in EMS, further high-quality research and emphasis on graduate training was also recognized as a need. These priorities include: 1) making patient safety a strategic priority within the organization, 2) including patient safety domains in paramedic curriculums and in ongoing continuing medical education, 3) creating a web-based reporting and learning system, recording adverse events and close calls for the pre-hospital setting, 4) supporting more EMS research in patient safety through funding and research infrastructure, 5) creating/contributing to developing standardized patient safety definitions, indicators and outcomes, 6) supporting paramedics as part of a healthcare team, capable of decision making and judgment, 7) examining literature from other disciplines for interventions with similarities in EMS patient care that can be applied or modified to the pre-hospital setting, 8) increasing human resource capacity in EMS research, education and patient safety, and 9) promoting identification and reporting of high-risk activities and encourage culture of sharing and openness without fear of discipline or dismissal²⁷⁰.

Summary: Research identified in this report would suggest that available evidence pertaining to patient safety in the EMS setting falls into one of six themes: clinical decision-making, medication errors and other adverse events, ground vehicle safety, aircraft safety,

intubation, and inter-facility transportation. While there is a range of themes covered, the evidence is limited by a small number of high quality research studies as only two RCTs were identified. There remain many areas of patient safety in EMS that have not been addressed by research.

Discussion

Emergency medical services are an essential part of our health care system. EMS providers are often the first point of contact for many patients entering the system and compared with many health providers, pre-hospital care practitioners have a unique opportunity to view patients in their home environment. While role, scope of practice and complexity of EMS systems has developed tremendously over the last four decades, the science underlying these changes has not kept pace. The objective of this review was to explore the current state of research within EMS, providing a summary of the available literature in a number of aspects of the EMS system. The review explored a number of diverse dimensions including quality indicators, EMS system components (including equipment and environment), personnel, specific aspects of EMS care along with safety of both patients and the providers. A key challenge for this review was the availability and quality of data. Systematic reviews were available for very few of the dimensions explored and the overall methodological rigor of the included studies was low. Moreover, the generalizability of the research findings from other countries, and also other parts of Canada, to Alberta is challenging given the diverse nature of EMS system characteristics. Further research is needed in a number of the dimensions covered in this report and more Alberta specific research is required.

The discussion around the necessity of research within EMS is not new. In 2006, the Emergency Medical Chiefs of Canada released a white paper on the future of EMS in Canada¹¹. In examining the current state of the system at that time, it was suggested that EMS did not have an adequate research base or the data collection capability required to “systematically evaluate and provide guidance for the improvement of overall levels of care”¹¹. More recently, Jensen et al. developed a research protocol for the development of a Canadian national EMS research agenda¹³. The Canadian National EMS Research Agenda has four key objectives: 1) exploring the barriers that currently exist to EMS research, 2) identifying areas of strength and opportunity that currently exist that may benefit and advance EMS research, 3) making recommendations in order to surpass barriers and make the most of opportunities, and 4) identifying national research priorities for EMS. Findings from the first stage of this project were recently presented at the NAEMSP 2012 Annual Meeting⁹. Qualitative interviews with 13 stakeholders were conducted and a number of key

themes were identified. These themes included: 1) the lack of research methodology training available for EMS staff and management, 2) the importance of a cross-Canada infrastructure to support national research collaboration, 3) the necessity in addressing the complexity of having frontline paramedics involved in research, and 4) the necessity of the research agenda to consider the geographic and political diversity of EMS in Canada⁹. The results from the facilitated roundtable session and Delphi consensus survey are planned to be released in late 2012 (personal communication, Ian Blanchard).

In addition to building research capacity within EMS, groups have identified key goals to develop EMS. In the 2006 white paper, the EMS Chiefs of Canada developed a vision of EMS as a mobile health care service, encompassing injury prevention and control, emergency medical response, community health, training and research, public education and emergency preparedness¹¹. To achieve this vision, the chiefs suggested six key strategic directions including: 1) defining and embracing a clear core identify of EMS, 2) ensuring the existence of stable financial foundations for EMS, 3) ensuring accountability and embracing systematic improvement, 4) ensuring adequate and robust training and education to enable the “paramedic of the future”, 5) develop EMS leadership capacity and 6) ensuring that the EMS system is prepared for the complexities of the health care system in the future. Similarly, in 2010, Accreditation Canada published “The future of emergency medical services in Canada” in their *Qmentum Quarterly*. Dr. Francescutti of the University of Alberta identified the need to re-energize EMS. He suggests doing this by empowering EMS practitioners to practice within a full scope of practice. That is, he said it is necessary to “empower EMS practitioners with a new set of skills to allow them to safely assess, treat, and refer patients as they see fit according to well-researched, proven and reproducible guidelines...”²⁷¹. He also suggested that EMS care needed to shift from an emphasis on trauma and acute cardiac care to a more holistic, preventative approach²⁷¹.

While there is national action to strengthen the Canadian EMS research enterprise and to continue to develop the role and scope of Canadian EMS systems, what may be most important for Albertans is how this information is translated into the local context. The transition of ground and air ambulance systems to AHS provides an unprecedented opportunity to standardize EMS operations and data in Alberta. This will be essential in

developing EMS research to inform the practice of pre-hospital care in Alberta and to locally develop the role of EMS in the larger health care system.

Limitations

There are several limitations to this report that require commentary:

Search strategy: While comprehensive strategies were adopted to search for the available evidence on each of the listed dimensions of EMS, non-indexed, unpublished or non-English literature may not have been captured. A comprehensive search of the grey literature was not conducted. However, targeted areas of the grey literature (e.g., provincial quality council reports on EMS, CIHI, provincial paramedic associations, Paramedic Association of Canada, Accreditation Canada, Calgary EMS Foundation, EMS Chiefs of Canada along with the National Association of EMS Physicians (NAEMSP)) were searched. Searches were limited to studies published after 2008, which may introduce a bias as seminal articles published prior to 2008 were not located by the search. **Given these limitations, search results should not be interpreted as an exhaustive list of all research on the given dimension.**

Study selection: While a standardized approach was consistently applied to select studies for inclusion into the report, the use of two independent reviewers was beyond the scope of this project.

Methods/design: The methodological rigor of the studies varied considerably. While RCTs and meta-analyses generally provide strong evidence, many of the studies included in this report used less rigorous study design and **caution should be exercised in translating this knowledge into practice.**

Detailed quality assessment of the individual studies was beyond the scope of this rapid review. **It is possible that included studies may have not appropriately controlled for random error or systematic bias.**

Generalizability of findings: Many of the research studies included in this report were not conducted in Alberta. **Interpretive caution is required when generalizing results from one EMS system to another given the unique constellation of factors that comprise pre-hospital care.** Characteristics between EMS systems, such as dispatch

processes, provider training, on-going education and experience, clinical scope of practice, medical control, vehicle design, equipment and supplies, operational policies, broader health care system characteristics, population and setting, and data definitions, validity and reliability may limit the external validity of EMS research studies. Moreover, it is important to recognize that there likely remains some heterogeneity of these same system characteristics within the Alberta EMS system, that further challenge the generalization of study findings from other jurisdictions to Alberta as a whole.

Paucity of data: Overall, while the evidence in this field is growing, there are a limited number of high quality and rigorously designed studies. Moreover, there are a limited number of study outcomes reported in each topic area. Like many aspects of health research, there is likely publication bias in the EMS literature, where there is limited publication of negative results or studies that do not have “significant” findings. Publication bias may distort the general belief about associations or efficacy, effectiveness, and efficiency of interventions.

Conclusions

EMS systems around the world have been and likely will continue to be in a state of change. While this review identifies a number of key aspects of EMS services along with summaries of the most recent available literature, further research is necessary to gain a better understanding of the effectiveness and efficiency of EMS systems on a variety of outcome measures. While national strategies are underway to increase the research enterprise in EMS and to further develop the role of EMS systems, this information must be translated into the local Alberta context. With transition of EMS into the provincial health care system, there is an unprecedented opportunity to develop EMS in Alberta using an evidence based approach. This catalogue of literature provides a resource that can be drawn upon in this process.

Conflicts of Interest

Dr. William Ghali is a practicing internist within AHS, but is not paid directly by AHS. Ian Blanchard is a Senior Performance Strategist with AHS EMS and is paid directly by AHS in this capacity. All other authors declare no conflicts of interest.

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Appendix A: Search Terms

In each database – combined the following terms with OR

- Emergency medical services/
- Emergency medical service*.tw
- Exp ambulances/
- Ambulance*.tw
- Emergency medical technicians/
- Emergency medical technician*.tw
- Prehospital*.tw
- Out of hospital*.tw
- Paramedic*.tw
- Exp patient transport/
- Exp rescue personnel/
- EMT
- EHS
- EMTS
- First responder

Then combine with EMS topic search with AND. Topic searches included:

- Paramedic safety
- Safety
- EMS safety
- EMS dispatch
- Dispatch
- Dispatch consolidation
- Basic life support
- Advanced life support
- Benchmarks
- Best practices
- Funding models
- Communication
- Urban
- Rural
- Remote
- Operational models
- Fire

Appendix VI: Questionnaires

Municipalities



Review of the Operations of Emergency Medical Services in Alberta

Semi-structured Interview Questions

On February 28, 2012, pursuant to section 15 (1) of the *Health Quality Council of Alberta Act*, the Minister of Alberta Health and Wellness (AHW) requested that the Health Quality Council of Alberta (HQCA) conduct a review of operations of emergency medical services (EMS) in Alberta. This Review will be conducted under the Quality Assurance provisions of Section 9 of the *Alberta Evidence Act*

The following semi-structured interview questions will be used to identify quality and patient safety issues with respect to transition issues of governance and funding; dispatch consolidation; challenges to integrated fire/EMS service providers; challenges to rural and remote areas of the province and collection, use and availability of data on EMS.

1. Contact Information

Please supply your contact information should we require further follow-up or clarification. Your individual answers will be kept strictly confidential. For reporting purposes, this information will be de-identified and used in aggregate form only.

<p>Name</p> <input type="text"/>	<p>Current Position/ Title</p> <input type="text"/>
<p>Phone Number</p> <input type="text"/>	<p>Organization</p> <input type="text"/>
<p>Email</p> <input type="text"/>	

Please identify the municipality you represent:

- City, please specify:
- Town, please specify:
- Village, please specify:
- Summer Village, please specify:
- Hamlet, please specify:
- Municipal District, please specify:
- County, please specify:
- Other, please explain:



2. Transition of Funding and Governance

From your perspective, what effects have occurred as a result of the transition of funding and governance for ground ambulance services from municipalities to Alberta Health Services (AHS).

- a. Positive, negative effects or no change (benefits/ issues/ no change)?

- b. From your perspective, has there been a change in response times in your municipality? (If possible, please define how response times are measured (e.g., time from call to patient side; time from call to scene etc.). Also, please provide additional information to support the change you have identified.

- c. From your perspective, has there been a change in hand-off times for EMS crews in the Emergency Departments? (If possible, please provide additional information to support the change you have identified.)



3. Dispatch Consolidation

From your perspective, have there been any changes related to dispatch consolidation since the transition? If no, please skip to question 4.

- a. If there have been any changes, please describe how this has impacted patient care (both positive and negative).

- b. Have the dispatch consolidation changes had any impact to rural E911 & dispatch centers?



4. Integrated Fire/ EMS Operational Model

Do you have any knowledge about an integrated fire/ EMS operational model? If no, please skip to Question 5.

- a. From your perspective, what impact has the transition to AHS governance had on an integrated Fire/ EMS operational model in your municipality (if applicable)?

- b. From your perspective, what impact has the transition to AHS governance had on integrated Fire/ EMS service providers?

- c. Has the transition to AHS governance created funding issues that may impact the quality of EMS? Please define what quality EMS means to you.



5. Challenges and Opportunities for EMS

What are the challenges and opportunities for EMS since the transition in April 2009 specific to:

- a. Urban areas of the province (e.g., use and availability of first responders and EMS resources)? Please define what urban areas mean to you.

- b. Rural/ remote areas of the province (e.g., use and availability of first responders and EMS resources)? Please define what rural/ remote areas mean to you.



6. Data Collection & Analysis

Do you have any knowledge about EMS data collection & analysis? If no, please skip to question 7.

a. What information/ data is collected about EMS services in your municipality?

b. What data/ performance measures are tracked, how often and to whom are they reported?



7. Closing

- a. Is there anything else you wish to tell us about ground EMS in your municipality?

- b. Is there a specific role/ person or area (department) within the province that you think is important for us to consider speaking to? Why?

- c. Do you have any suggestions or recommendations that the review team should consider?

If you have any questions, please contact: Charlene Blair, Project Lead at charlene.blair@hqca.ca or by phone at 780-429-3008

If you would prefer an in-person interview, please contact: Kim Trufyn, Program Assistant at kim.trufyn@hqca.ca or by phone at 780-429-3008.

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Thank you for taking the time to complete these questions. We appreciate your input.

PSAPs



Review of the Operations of Emergency Medical Services in Alberta Semi-structured Interview Questions

On February 28, 2012, pursuant to section 15 (1) of the *Health Quality Council of Alberta Act*, the Minister of Alberta Health and Wellness (AHW) requested that the Health Quality Council of Alberta (HQCA) conduct a review of operations of emergency medical services (EMS) in Alberta. This Review will be conducted under the Quality Assurance provisions of Section 9 of the *Alberta Evidence Act*

The following semi-structured interview questions will be used to identify quality and patient safety issues with respect to transition issues of governance and funding; dispatch consolidation; challenges to integrated fire/EMS service providers; challenges to rural and remote areas of the province and collection, use and availability of data on EMS.

1. Contact Information

Please supply your contact information should we require further follow-up or clarification. Your individual answers will be kept strictly confidential. For reporting purposes, this information will be de-identified and used in aggregate form only.

Name

Current Position/ Title

Phone Number

Organization

Email

Website

You have been identified as a Public Safety Answering Point (PSAP). What area(s) are you responsible for (municipality, community, etc.)?



Which type of agencies do you dispatch?

Ambulance, please specify which providers:

Police, please specify which division:

Fire, please indicate if you dispatch Medical First Responders and for which fire stations:



2. Transition of Funding and Governance

From your perspective, what effects have occurred as a result of the transition of funding and governance for ground ambulance services from municipalities to Alberta Health Services (AHS).

- a. Positive, negative effects or no change (benefits/ issues/ no change)?

- b. From your perspective, has there been a change in response times in your municipality? (If possible, please define how response times are measured (e.g., time from call to patient side; time from call to scene etc.). Also, please provide additional information to support the change you have identified.

- c. From your perspective, has there been a change in hand-off times for EMS crews in the Emergency Departments? (If possible, please provide additional information to support the change you have identified.)



3. Dispatch Consolidation

From your perspective, have there been any changes related to dispatch consolidation since the transition? If no, please skip to question 4.

- a. If there have been any changes, please describe how this has impacted patient care (both positive and negative).

- b. Have the dispatch consolidation changes had any impact to rural E911 & dispatch centers?



4. Integrated Fire/ EMS Operational Model

Do you have any knowledge about an integrated fire/ EMS operational model? If no, please skip to Question 5.

- a. From your perspective, what impact has the transition to AHS governance had on an integrated Fire/ EMS operational model in your municipality (if applicable)?

- b. From your perspective, what impact has the transition to AHS governance had on integrated Fire/ EMS service providers?

- c. Has the transition to AHS governance created funding issues that may impact the quality of EMS? Please define what quality EMS means to you.



5. Challenges and Opportunities for EMS

What are the challenges and opportunities for EMS since the transition in April 2009 specific to:

- a. Urban areas of the province (e.g., use and availability of first responders and EMS resources)? Please define what urban areas mean to you.

- b. Rural/ remote areas of the province (e.g., use and availability of first responders and EMS resources)? Please define what rural/ remote areas mean to you.



6. Data Collection & Analysis

Do you have any knowledge about EMS data collection & analysis? If no, please skip to question 7.

a. What information/ data is collected about EMS services in your municipality?

b. What data/ performance measures are tracked, how often and to whom are they reported?



7. Closing

- a. Is there anything else you wish to tell us about ground EMS in your municipality?

- b. Is there a specific role/ person or area (department) within the province that you think is important for us to consider speaking to? Why?

- c. Do you have any suggestions or recommendations that the review team should consider?

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Thank you for taking the time to complete these questions. We appreciate your input.

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Contracted Service Providers



Review of the Operations of Emergency Medical Services in Alberta Semi-structured Interview Questions

On February 28, 2012, pursuant to section 15 (1) of the *Health Quality Council of Alberta Act*, the Minister of Alberta Health and Wellness (AHW) requested that the Health Quality Council of Alberta (HQCA) conduct a review of operations of emergency medical services (EMS) in Alberta. This Review will be conducted under the Quality Assurance provisions of Section 9 of the *Alberta Evidence Act*

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1. Contact Information

Please supply your contact information should we require further follow-up or clarification. Your individual answers will be kept strictly confidential. For reporting purposes, this information will be de-identified and used in aggregate form only.

Name

Current Position/ Title

Phone Number

Organization

Email

Please identify the municipalities you serve:



2. Transition of Funding and Governance

From your perspective, what effects have occurred as a result of the transition of funding and governance for ground ambulance services from municipalities to Alberta Health Services (AHS).

- a. Positive, negative effects or no change (benefits/ issues/ no change)?

- b. From your perspective, has there been a change in response times in your municipality? (If possible, please define how response times are measured (e.g., time from call to patient side; time from call to scene etc.). Also, please provide additional information to support the change you have identified.

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- b. From your perspective, what impact has the transition to AHS governance had on integrated Fire/ EMS service providers?

- c. Has the transition to AHS governance created funding issues that may impact the quality of EMS? Please define what quality EMS means to you.



5. Challenges and Opportunities for EMS

What are the challenges and opportunities for EMS since the transition in April 2009 specific to:

- a. Urban areas of the province (e.g., use and availability of first responders and EMS resources)? Please define what urban areas mean to you.

- b. Rural/ remote areas of the province (e.g., use and availability of first responders and EMS resources)? Please define what rural/ remote areas mean to you.



6. Data Collection & Analysis

Do you have any knowledge about EMS data collection & analysis? If no, please skip to question 7.

a. What information/ data is collected about EMS services in your municipality?

b. What data/ performance measures are tracked, how often and to whom are they reported?



7. Closing

- a. Is there anything else you wish to tell us about ground EMS in your municipality?

- b. Is there a specific role/ person or area (department) within the province that you think is important for us to consider speaking to? Why?

- c. Do you have any suggestions or recommendations that the review team should consider?

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Appendix VII: Stakeholder Interview and Questionnaire Thematic Analyses

Purpose

Four components of the review process included:

1. Interviewing key stakeholders affected by or involved in the transition of governance and funding of EMS in Alberta to Alberta Health Services (AHS) or perceived to be an expert in the field;
2. Distribution of questionnaires to Public Safety Answering Point (PSAP) centres and dispatch centres in Alberta;
3. Distribution of questionnaires to municipalities in the Province of Alberta; and,
4. Distribution of questionnaires to contracted ground EMS service providers in the Province of Alberta.

Stakeholder Interview Thematic Analysis

Interviewee sample group

A list of potential interviewees was developed by the Quality Assurance Committee (QAC) based on identification as a key stakeholder affected by or involved in the EMS transition to AHS or perceived to be an expert in the field. A purposive and targeted selection process was then conducted by the QAC to select candidates based on their potential to have the most in-depth knowledge of the subject based on experience and current position. Potential candidates were then contacted by an HQCA representative with a request to participate in an interview. Once an agreement to participate was established the participant was presented with a history and explanation of the EMS review and the general questions being asked and a time and date was scheduled for the interview. An opportunity was given to the interviewee to suggest other contacts.

A total of 47 interviews integrated into Excel spreadsheets were analyzed. Each organization participating in the interview process was considered a respondent. However, it is important to note some interviews consisted of more than one participant. Despite the number of participants in the interview, recorders only identified the responses as those from one participating organization.

Interview questions

Interview questions were designed and developed by members of the QAC based on the terms of reference for the review. Questions were then vetted through the review team and approved for application. Seven questions were used for the stakeholder interviews:

1. *Please tell us about yourself.*
 - *What is your current position/role?*
 - *What is your background?*
 - *Where in the province do you live/work?*
2. *From your perspective, what effects have occurred as a result of the transition of funding and governance for ground ambulance from municipalities to AHS?*
 - *Positive effects (benefits)*
 - *Negative effects (issues)*
 - *Possible prompt: From your perspective, has there been a change (positive or negative) in response times and hand-off in ED times?*
3. *From your perspective, what changes have occurred related to dispatch consolidation?*
 - *Positive effects (benefits)*
 - *Negative effects (issues)*
 - *Prompts: How has this impacted patient care?*
 - *Has this had an effect on the operation of a seamless dispatch system?*
 - *Any specific impact to rural E911 & dispatch centres?*
 - *Any specific impact to local knowledge in effective dispatch services?*
4. *What is your opinion of an integrated fire/EMS operational model?*
From your perspective, what effect has the transition had on:
 - *An integrated Fire/EMS operational model?*
 - *Integrated Fire/EMS service providers?*
 - *Has the transition created funding issues that may impact quality of EMS?*
5. *What are the challenges and opportunities for EMS specific to:*
 - *Urban areas of the province*
 - *Rural areas of the province*
 - *Remote areas of the province*
 - *Prompts: Use and availability of first responders*
 - *Use and availability of EMS resources*
6. *Do you have any knowledge about EMS data collection & analysis?*
 - *Prompts: Is information (data) available?*
 - *What type of data?*
 - *Who sees and uses the data? (administration, frontline, public)?*
 - *Are there measures specific to quality and safety?*
7. *Closing: Is there anything else you wish to tell us?*

- *Is there a specific role/person or area (department) within the province that you think is important for us to consider speaking to?*
- *Do you have any suggestions that the review team should consider?*

Interview question one was used as an ice-breaker to initiate free flowing dialogue. Answers to question one were therefore not recorded as the information for each respondent was collected prior to the interview. Any references to specific individuals identified in the interviews were not included in the final analysis to maintain anonymity.

Interview process

Stakeholder interviews for the review were conducted primarily at an HQCA office in Edmonton or Calgary unless another location was requested by the interviewee. Interviews were conducted by members of the QAC. Interviews were conducted in-person, or on the rare occasion, in-person with some interviewers on teleconference.

At the beginning of each interview, introductions were conducted, the purpose of the review was explained, and Section 9 of the *Alberta Evidence Act* was reviewed for clarification and understanding. Agreement to voluntarily participate was then sought and if granted, the interview began. All interviewees agreed to participate in the interview.

Interviewee responses were recorded on computer or paper by interviewers during the interview. Sessions were not audio recorded. Interviewers debriefed after the interview and consolidated responses into one electronic document. Interviewers reviewed the information documented to achieve consensus. Summaries were developed into storyboards. Concern that the storyboards did not provide enough detailed information to effectively analyze the data in any detail resulted in a process change to eliminate the development of storyboards and use interviewer consensus at the end of the interviews for placement into a data spreadsheet for thematic analysis.

Methodology

A thematic analysis using qualitative research methodology was undertaken to systematically analyze the information from the interviews. Data was first categorized into common ideas and thoughts, then further categorized into identifying codes and finally through the implementation of an axial or relational coding process, consolidated into common emerging themes.

Question two of the stakeholder interviews was analyzed and coded by one primary QAC member. Interviews were sorted into the following respondent organizations without identifying names.

- Municipality
- AHS (includes Medical Directors)
- Medical first responder
- Association
- Government agency
- Regulatory body

The primary analysis for question two resulted in the identification of 63 possible data categories. The secondary analysis resulted in 25 categories that were further refined under 12 primary codes. To establish inter-rater reliability, responses provided for interview question three were coded by two

separate individuals concurrently using the codes identified from question two. Once completed the two reviewers compared notes, further defined the identified codes, consolidated three of the codes and identified a new code: Inter-facility transfers. This resulted in a total of 10 identified codes emerging from the data that were subsequently used to code questions four, five, six and seven.

Coding

Preliminary analysis and categorization of responses from interview questions two and three resulted in the identification and defining of 10 primary codes:

Funding and resources – responses related to funding, allocation of funding, purchasing, infrastructure, and/or resources required or purchased.

Medical direction/oversight and patient care – responses related to patient care as they pertain to medical direction or oversight, medical control protocols, standardized medical care, and online medical control (OLMC). May include responses related to ambulance dispatch/deployment that are perceived to impact patient care.

Quality assurance – responses pertaining to: issues or incidents reported and responses to those issues regarding EMS performance and patient care, EMS response times, data regarding EMS performance measures, patient safety related issues, electronic patient care reports and data collected and reported from ePCRs, and any EMS related qualitative and/or quantitative data.

EMS governance and administration – governance and administration for EMS is captured from responses addressing the EMS Senior Operating Team, EMS Leadership Council, zone or provincial reporting structures for EMS, decision making for EMS, the role of stakeholder agencies and their relationship to EMS leadership, 911 governance, the role of EMS as health and/or public safety, and the influence or politics and political representatives on the governance and administration of EMS.

EMS dispatch – although question two of the interviews related specifically to dispatch, it emerged as a separate code from question two and as such was retained as a separate code for the remaining questions. Responses pertaining directly to EMS dispatch and or fire dispatch were captured in this code including: the dispatch model, best practices in dispatch, past and current practices in Alberta, dispatch operations for AHS EMS, computer-assisted dispatch (CAD) systems and other technologies related to dispatch, and the advantages and disadvantages of a consolidated dispatch system for EMS.

EMS delivery model – responses related to the EMS delivery model were placed under this code including responses related to: integration of services such as fire and EMS, the deployment of ambulances and strategies to address deployment, air ambulance and the relationship to ground ambulance, mass casualty incidents (MCI), hospital wait times and issues related to the impact of hospital relationships with EMS.

Impact of transition – responses related to the impact of the EMS transition on the system today and may include statements regarding: the culture of EMS, information supporting the transition such as the discovery projects in the former health regions of Peace County and Palliser, EMS policies or standard operating procedures, comments made regarding the degradation in service, and the overall EMS system as it was perceived to be or as it is today.

Human resources – responses related to staffing and hiring and resources associated with these, experience of staff including training and competency, supervision of staff and related issues such as staff

attitudes and performance, and scope of practice for practitioners as defined by the regulatory body and applied by the employer.

Rural EMS – issues surrounding EMS in rural areas of the province emerged as a key code during the primary analysis and include: rural emergency needs, rural geographic familiarization for responders and dispatchers, contracts for service provision in rural areas, First Nations and issues regarding response and coverage, and medical first responders including volunteers.

Inter-facility transfers (IFT) – IFT emerged as a separate code as a result of the number of responses directed in this area. Any IFT related responses were coded in this area.

Analysis

The 10 codes used throughout the analysis of the interview responses resulted in the emergence of four key themes:

- Data management
- EMS dispatch and communications
- Rural medical first responders
- EMS delivery model (including IFT)

A fifth theme, medical direction and patient care, only emerged as a minor/secondary theme because the frequency of responses related to this theme was low.

Impact of transition

There was general consensus the interviewees that it was the right action to move EMS into health away from municipal governance and funding even though some communities claim there is degradation in service or the service remains status quo. There is understanding that to build a great system it takes time and AHS is working on it. Staff have gone through a huge culture shift that has perceived positives and negatives but will eventually provide more diverse employment opportunities for EMS practitioners in the future. It is a huge transition that won't happen overnight and it isn't going to fix everything.

According to one respondent, EMS was a broken system prior to the transition where the cost of EMS was variable across the province. Prior to the transition the management of EMS across the province occurred in silos and was disjointed and disconnected with a lack of consistency in medical direction and treatment protocols. There were examples of poor quality service and issues of non-registered practitioners practicing. Municipalities didn't know if their EMS service was good or bad and relied on the reporting from the service provider. AHS interviewees articulated that not everyone embraced the new EMS model initially and some municipalities still don't see the benefit. They also cited the challenge of transitioning EMS over to AHS in such a short timeframe. As a result, decisions were being made quickly by a small team without any real formal foundational structure.

Responses from municipalities, AHS, and government agencies cite positive impacts from the transition with respect to provincial standardization and consistency in a number of areas: fleet, equipment, medical direction/oversight, evidence based medical control protocols, education and training, dispatch consolidation, quality assurance/audits, and standard of patient care. AHS interviewees are of the opinion that there is better resource allocation and that as one system EMS has the opportunity to work through

the issues and solutions. Much work has been done in the last six months and systems are working well and efficiently with some positive outcomes. Patient care has improved, training is high quality and provincially accessible through the internal AHS website, ahsems.com, and provincial trainers and municipalities actually know more than they did before.

The negative issues cited regarding the transition of EMS were quite varied and emerged from all interviewees. The negatives associated with the transition as reported by interviewees include: the loss of community connection – municipalities should have been a partner in the transition, a culture of mistrust without collaborative relationships, a level of cynicism about the just and trusting culture AHS EMS is purporting, a fractured system, a global decline in service in both quality and quantity, resources spread too thin and most people (rural cited) don't have enough coverage, public perception that there are less ambulances, budget cuts limiting AHS EMS's ability to react, loss of practitioner identity through the transition, and patient transfers affecting rural response times. One interviewee claimed service providers weren't honest with municipalities and they didn't know how much they were exposed (from a presumed legal standpoint). Municipal interviewees commented on the implied high standard of EMS, particularly in the major cities, prior to the transition but acknowledged the same high standards were lacking provincially. AHS interviewees felt there are still some cultural challenges and labour costs have now increased. Many challenges still exist including governance and health instability. AHS interviewees feel this will be better managed under the new zone operations reporting structure for EMS.

Stakeholder engagement and communication regarding the transition is where the disparity of responses is most evident. Where AHS interviewees generally feel engagement with staff and stakeholders was and continues to be good, comments from stakeholders such as municipalities and non-AHS agencies and associations paint a different picture. Comments from these groups convey a lack of transparency, unfavourable experiences, no identifiable AHS EMS contact and/or the difficulty in finding one, and a lack of connection with communities served. Non-AHS agencies stated the challenge of accessing the proper health officials and felt blocked by AHS EMS administration. They commented on poor communication by AHS, slowness to engage medical first-responders, lack of feedback and information, and the disregard and disrespect for fire from AHS senior management. Comments with respect to the frontline staff suggested AHS hasn't engaged the staff enough to re-focus the employees after the transition to instill a sense of pride, engagement and ownership in EMS.

The transition of EMS in the metro centres was discussed by one interviewee as a relatively quiet transition because each municipality was very cooperative and willing to hand-off EMS departments into more appropriate health related oversight and relieve themselves of the financial burden of EMS. Control was not a big issue for these cities but was in smaller communities where Councils were more 'hyper-protective' and council members and citizens were more personally involved and vested in EMS.

One interviewee was of the opinion the transition itself has not made a significant impact nor is it the cause of reported issues. The transition may have created an environment whereby issues are brought forward more readily and there is now an opportunity to deal with the issues. The Health Sciences Association of Alberta (HSAA) survey of EMS staff was commented on by interviewees who feel the issues identified in the HSAA survey existed prior to the transition. One opinion expressed that the transition has actually provided the opportunity for people to speak out. Interviewees generally feel the transition of AHS to EMS was the right thing to do but there are still challenges.

Data management

Prior to the transition performance measures and benchmarks varied considerably with each service across the province and when EMS governance was transitioned into AHS there was no consistency in performance measurement and no standardization of processes. A municipal interviewee reported that data collected was collected by cities prior to the transition and was published regularly.

Alberta Health's Alberta Ambulance Information Management Systems (AAIMS) data base was discussed by a number of interviewees. The general consensus from respondents is the data base was and continues to be used primarily for operational service provider compliance to submit data to meet legislation requirements. Alberta Health attempts to ensure data is submitted in a timely fashion but the requirement is not strictly enforced. One interviewee commented the database is old and outdated and provides no usable data. AHS interviewee(s) articulated they are working on ensuring they are submitting the required information. Some clinical data does exist but is not usually reported.

A government interviewee commented that all of EMS needs to either be on the same database or at least be able to interface with all operational databases in the province to collect and analyze data. AAIMS may be one option but if not AAIMS then a system that is selected and consistent across the province would work.

Comments on the negative side suggested there were more measurements and resources prior to the transition than after, specifically in the metro centres. One interviewee was of the opinion "lots of people" were working on data collection and management but nothing has happened in a long time. It was acknowledged by the interviewee that AHS is just starting to see some HALO (high acuity, low outcome) data. A number of interviewees indicated EMS patient outcome data is very difficult to measure and requires access and integration to hospital data. Confusion exists as to what data is being collected by AHS EMS.

Other interviewees also cited negative comments related to the impact of transition on quality assurance: no easy access to reporting information, no apparent quality control, an increase in "nightmare stories", no responses from AHS on questions, AHS not compiling statistics like the 'City', longer response times, no AHS response standard established, no benchmark for AHS EMS, and historical data that has been lost.

Some interviewees claim they don't normally receive data; the data they do receive is not accurate or incomplete, and AHS is not sharing their information and/or resistant to provide the information upon request. They also don't feel the right people are collecting and analyzing the data. They are of the general opinion data collected by services and municipalities prior to the transition was more robust and accurate. They also stated performance reporting is not available and AHS is using bad data to make deployment model decisions. From a qualitative perspective, anecdotal claims of lack of data, poor response times, and lack of availability of ambulances were made but will require further investigation to substantiate these claims.

Conversely AHS interviewees cited primarily positive benefits and impacts related to quality assurance as a result of the EMS transition: more consistency, a more uniform process for auditing protocols and province wide reporting of incidents. Government interviewees stated complaints are down and the standard of care through Medical Control Protocols (MCP) links medical oversight to quality. AHS claims they have a new Quality Assurance (QA) culture that is addressing issues and respondents cited a

number of quantitative ‘performance measures’ currently implemented including: the reporting of ambulance collisions, the evaluation of 3% of dispatch calls for protocol compliance, practitioner QA, and response times. AHS commented on the implementation of the Real-time Emergency Department Patient Access and Coordination (REPAC) system which is designed to get the fastest service by the best qualified person for the call. However, the challenge cited by one non AHS interviewee is the lack of consideration for travel time when making deployment decisions.

AHS stated they are trying to be leaders in quality assurance by looking at patient outcomes versus just response times. The challenge of this articulated by one interviewee related to the expectations of government to meet response time expectations of rural mayors; response times based on standards not necessarily supported by current evidence.

AHS claims they are light years ahead of where they were prior to transition and are collecting primarily direct delivery data and some contractor data. They also claim they are better able to demonstrate the level of service to communities. Data are collected through the CAD system and are now being collected through the ePCR system for direct delivery only. They are developing a data dashboard, have developed key performance indicator reporting standards for 20-25 different levels of reporting and have tabled a report to measure HALO (high acuity low opportunity) outcomes. Data that are collected are reported to the Executive Director team. They are also working on a medical control protocol audit process to measure practitioner compliance with the protocols and eventually report on patient outcomes.

Interviewees did concede it is difficult to benchmark EMS at a provincial level and they don't have all the data they need to be cognizant of comparing apples to apples.

The issue of response times was brought up by a number of interviewees, including AHS, as a variable parameter inconsistently defined and measured within the EMS system. Interviewees questioned whether a hot response (lights and siren) actually impacted patient outcomes and one interviewee suggested contacting trauma services to obtain data to support some of these claims.

Response times are typically measured from initial call to arrival of the crew on scene. Interviewees commented on the need to define what actually a response time is and generally felt that rather than measuring from initial call to on-scene time it should be recorded from time of initial call into AHS to the time the crew arrives at the patient's side. Comments also reflected the need for AHS to define the terms urban, rural and remote and the need for AHS to define and standardize response time criteria for EMS in the defined urban, rural and remote regions of the province. Recommendations to look at best practices in countries such as Australia and the United Kingdom (UK) were suggested and for AHS to look at the evidence suggesting quick response times are not necessarily an indicator of patient outcomes. Crew configuration was also cited as a method of sending the right resources to the right emergency based on a strong dispatch system to filter the calls.

From a clinical perspective one interviewee suggested the need for AHS to look at reaching performance standards differently. A small subset of calls require response time standards. For certain calls there is evidence to support the benefit of a 4-5 minute response time and anything after that doesn't help. According to one interviewee this is impossible to build through ambulance stations but can be built through the placement of Automatic External Defibrillators (AED) with allied service providers within the community such as police or fire departments and public access to AEDs. Ambulances shouldn't be located or staffed at hospitals or across from police stations where AEDs may be available suggesting the system could be filled in with AEDs that can be identified by location by dispatch to inform the caller as

to the location of the AED. The interviewee suggest investigating EMS service delivery in remote parts of Australia where specialized medical first response kits provide equipment for the responder including a radio for direct access to a dispatcher. Trust needs to be placed in the dispatch system to have the ability to pick out those 4-5% of the calls requiring a short response time and dispatch the right vehicle with the right people to the right call. The interviewee was of the opinion AHS would end up with a different look than what it has today. Alberta Health Services has launched their public AED program “where they put in the exact location and dispatch will know where the closest AED is located. That is not possible with dispatch centres that do not have the same technology.”

One interviewee also discussed response times as a public service measure and public expectation and not necessarily something that impacts patient care and another interviewee stated health care isn’t about patient outcomes but about patient perception and it will be difficult to abandon response times because of public perceptions. Another interviewee stated in order to rectify public expectations of response times public education needs to take place by AHS.

AHS participants cited Seattle, Iceland (before the economic downturn), Maryland and Australia as models of best practice worth investigating, particularly Australia where response distances are long. Interviewees also identified the need to look at response times with respect to actual need and take into consideration accident rates related to lights and siren response and the risk to the public and practitioners.

Interviewees are consistent in their opinions regarding EMS response times suggesting the current evidence does not support rapid response times as an indicator of positive patient outcomes. A recent study done in Alberta was referred to by one interviewee as to whether response times impact patient care. The study reported no impact of rapid response times on patient morbidity.

Acquiring accurate or any quality reports from integrated services appears to be an issue emerging from the interviews. One claim from an AHS interviewee stated fire refused to participate in a Quality Assurance Review. From another AHS interviewee, if AHS is responsible for quality measures and outcomes then agents of EMS are to be held accountable for reporting.

One medical first responder interviewee also discussed the need for accurate data to monitor the changing demographics of local small communities and the increasing incidence of high risk diabetes in Métis and aboriginal settlements.

AHS interviewees expressed concern over the lack of resources available to perform the work required to collect and audit data. Those resources only existed in the metro centres prior to the transition and since the transition those same resources have been extended to complete work in all areas of the province.

One interviewee provided information pertaining to the collection and ‘cleaning’ of EMS data prior to the transition, specifically data from the metro centres but also provincially, and strongly recommended contacting the Centre for Excellence in Operations at the University of Alberta, to access the data or at least the process used to collect and clean the data. They were also in the process of conducting a study for EMS operations as well as dispatch regarding the availability of data including AAIMS data. Another interviewee also referred to the Centre for Excellence at the U of A and commented on how they cleaned up a lot of data from services prior to the transition and have the capability to clean up AAIMS data.

EMS dispatch and communications

The topic of dispatch generated many comments related to the impact of the transition. Many positive examples were given supporting the concept of dispatch consolidation but negative examples, or challenges were also cited resulting in a ‘he said, she said’ discourse and opposing opinions regarding the consolidation of dispatch. AHS, and government interviewees are in favour of consolidation whereas municipality and PSAP centre interviewees were critical of consolidation with recommendations to leave the system alone and just put standards in place for agencies to adhere to.

The PSAP centre interviewees were particularly opposed citing patient safety is better when left to local dispatching with respect to the need for local knowledge by local dispatchers and their level of expertise. Dispatch is better managed locally. PSAP centre interviewee(s) proposed a five centre dispatch model for southern Alberta that could be applied to northern Alberta. Interviewees believe the technology is available to achieve the goal of a borderless EMS system in Alberta.

There is general consensus that a consolidated EMS dispatch system has many advantages for a large provincial EMS system but until the issues of resource depletion in rural environments, or the perception of depletion are resolved, resistance to consolidation will remain. Interviewees generally agree that if AHS is to consolidate EMS dispatch for the province it has to be funded appropriately to ensure up to date technology is acquired and functional including the installation of Global Positioning System (GPS) in all ambulances. All services that transfer over to AHS need to be provided with AHS technology and functional GPS equipment and data collection and analysis systems.

For some AHS interviewees the primary issue based on comments appears to be the consolidation of EMS dispatch and the need to allow dispatch centres to communicate with each other and to dispatch resources more efficiently. Without EMS dispatch consolidation it is difficult to determine where ambulances are located at a point in time. While the halt in dispatch consolidation by the government has created some logistical challenges it has allowed for learning and some existing issues to be fixed. Currently each centre is coordinating their own resources – CADs don’t talk and they don’t use phones. Consolidation would also help with dispatching fixed wing resources.

The advantages for a consolidated dispatch system for AHS EMS revolve around the ability to track and coordinate resources around the province in an effective and efficient manner, particularly for mass casualty incidents where responding ambulances can be backfilled using available ambulances from other regions. In the past with multiple dispatch centres there was often duplication of service and efforts when responding to such incidents. The ability to track and monitor ambulances provincially and deploy ambulances more effectively and efficiently will lead to better coordination of resources within the system provincially, including air and inter-facility transfers (IFT.) From one interviewee’s perspective there were problems with past EMS dispatch systems where instead of dispatching the closest ambulance they were dispatching the closest ambulance only within the region.

Some interviewees articulated the CAD systems of some dispatch centres have not been transitioned into AHS and cannot communicate with other CADs. AHS interviewees indicated MDTs were installed into some of the contracted dispatch centre’s CAD systems allowing the two dispatch centres to communicate with each other. For example, the metro centres are currently not on the same CAD system.

The inability to communicate with all dispatch centres and allied emergency responders was cited as a major problem impacting EMS response times and a major challenge for rural stakeholders. Some

municipalities have invested in building a radio system to facilitate communication between dispatch centres and ambulances. Non-transitioned ambulances cannot communicate with other dispatch centres so it makes it difficult to know where all the ambulances in their area are.

One municipal interviewee felt that infrastructure such as a provincial CAD system, a records management system, and a data management system should be put in place before a contract is offered. As one interviewee put it “you can’t be responsible for response times if you do not have control of your dispatch”.

One interviewee pointed out there are a number of dispatch centres whose primary role is not to dispatch EMS and suggested there are quality issues within these centres. Consolidated EMS dispatch would be focused on health and quality versus the past models where dispatch centres were dispatching EMS secondary to their primary roles of fire dispatch. A municipal interviewee believes you can contract dispatch with a municipality as long as you put quality assurance metrics in place.

Interviewees articulated the challenge of transitioning EMS dispatch in too short a timeframe. AHS had to collect data and financial information from municipalities and establish a baseline for service provision and finances for approximately 80 service agreements. The swift, aggressive transition resulted in some challenges such as the readiness of the technology and the negative relationships that resulted with municipalities that didn’t anticipate the loss of revenue when EMS dispatch was transferred to AHS. An AHS interviewee commented that there are still a number of contracted dispatch centres that are not communicating consistently and tend to dispatch more regionally than provincially. Another interviewee felt the transition happened too fast, too quickly and didn’t think problems were thought about or the technology was ready.

Those in favour of the consolidation of EMS dispatch were not in agreement as to the number of dispatch centres needed. One AHS interviewee commented on the number of dispatch centres required and suggested two centres would be more manageable than three taking into consideration the more centres there are the higher the chance they may become more zone focused. EMS response could be more zone oriented but deployment should be provincially focused. While three centres was often cited as the number being consolidated to, there doesn’t appear from the interviewees to be a strong evidence based rationale as to why the number three was selected. If three centres are to be established they need to be resourced appropriately. The ability to communicate with all centres and responders, including medical first responders, is required. Interviewees suggested looking at best practices in dispatch for EMS such as Nova Scotia, British Columbia (BC), and the United States (US). Consideration should also be given to considering the Royal Canadian Mounted Police (RCMP) centralized dispatch in Alberta because they have worked under a consolidated dispatch model.

AHS interviewees articulated the consolidation of EMS dispatch has resulted in some standardization of data, the utilization of evidence based protocols, and the opportunity to link EMS standards with other AHS standards such as those used in Health Link.

One interviewee suggested there is some disagreement between EMS and Health Link as to the applicability of each agency’s protocols for the other. An AHS interviewee’s recommendation is to set up an independent call centre and link it to Health Link by putting Health Link staff into dispatch and vice versa to divert what the interviewee indicated were over 30,000 calls per year that would not require an

ambulance. A study was prepared for Health Link but the interviewee is not sure if it was finished or in progress.

A medical first responder interviewee cited two instances where ambulances dispatched got lost on the way to life-threatening medical emergencies and in other instances the challenges of responding to calls and issues with crossing the Alberta, Saskatchewan border.

The loss of local knowledge was cited as a drawback by non-EMS interviewees that generally considered local knowledge a requirement for dispatchers. However, some interviewees felt the need for local knowledge would result in multiple dispatch centres that hired only local residents with local knowledge who would not have a provincial perspective. AHS interviewees consider local knowledge only one tool that may aid to finding an address expediently and felt enhanced technology like new CADs and GPS in all ambulances, better mapping, good communication systems between practitioners and dispatch centres, and a good orientation process for dispatchers may solve this issue. With respect to mapping, it was considered the responsibility of municipalities to ensure rural addressing is established for their communities. It was recommended by one interviewee that EMS consider undertaking a human factors study for dispatchers like one currently underway for a metro Fire Department.

From an AHS perspective, interviewees described how patient safety is addressed through appropriate call evaluation and how calls are dispatched using medical priority dispatch system (MPDS). Address verification and location is achieved using mapping strategies built by AHS and the implementation of technology such as MDT and GPS. The deployment of ambulances using system status management (SSM) was also articulated.

One interviewee questioned whether municipalities actually have emergency preparedness plans detailing how their dispatch service is organized as per requirements under the *Emergency Management Act* and the *Municipalities Act*.

Some interviewees believe dispatchers don't have an appreciation for what frontline staff are facing on the streets. A litany of negative statements were made by non-AHS interviewees that dispatchers: don't understand algorithms, over-categorize calls to a higher response level putting staff and public at risk, provide inappropriate back-up from police (meaning no back-up requested), and put the safety of staff at risk. Additional claims made include: a lack of coordination, lack of local knowledge and geographic familiarity, information given to crews isn't pertinent, no maps for contracted service areas, reporting of incidents to dispatch is met with resistance or disrespect, and the lack of knowledge as to how to dispatch air (different from ground). Concerns over lack of training and general inexperience of staff were made.

A key claim was brought forward by municipality and PSAP interviewees suggesting the primary issue for PSAP centres not supporting EMS dispatch consolidation is the removal of EMS funding for dispatching EMS which has threatened the sustainability of PSAPS that have lost the EMS revenue and now run the risk of maintaining a viable system that is now only required to dispatch fire responders. EMS calls make up the majority of fire dispatched calls. Municipalities were affected in two ways when they lost their funding for EMS. Since EMS has the highest call volume, they may have lost 60% of their revenue for their dispatch centre. They were still left with the need to maintain their 911 dispatch which handles calls for fire and/or sends calls on to police dispatch centres. With this significant loss of revenue some of these centres may no longer be financially viable. This claim was also articulated by a

government interviewee stating the issue for municipalities and PSAPs is one of revenue for service and if EMS is removed from the revenue stream then the PSAPs are no longer viable.

The issue brought forward for fire dispatch identified that fire gets zero compensation for dispatching and responding to medical calls and some municipalities are opting out of the business of medical first response. One AHS interviewee felt funding of medical first responders should be the responsibility of municipalities and another interviewee is of the opinion that fire departments consume a large amount of money for very few calls but run their vehicles to increase the number of calls they respond to where the majority do not warrant their response. A regulatory body respondent suggested health dollars should stay in health and the fire/EMS component requires further investigation.

Non-AHS interviewees, particularly those from PSAP centres, provided more negative responses to the issue of the transition of EMS dispatch and were generally not in favour of the transition and consolidation. An interviewee from a PSAP centre acknowledged that AHS had struck a Municipal Partnership group to address areas of concern for their group and viewed this as a positive method to ensure the voices of residents are heard. However claims of poor attitude, arrogance, and dismissive statements to their concerns by the contracted dispatch service for their zone were presented as issues prohibiting resolution to concerns. From the responses there appears to be some discrepancy in the concerns expressed by non-AHS interviewees and the perception by interviewees that AHS is either ignoring or marginalizing their concerns. For example, where a PSAP centre interviewee cited issues around poor response and substandard dispatch operations for a rural area with claims this is a result of consolidation of dispatch, an AHS interviewee claims that these concerns were the same when dispatch was consolidated for the region approximately 15 years ago.

A medical first responder interviewee not in favour of consolidated EMS dispatch stating that in the current system ambulances often take over an hour to respond to their rural community. A local dispatch centre has local knowledge and may not be as busy as a large dispatch centre and will therefore have time to pay attention to the EMS call. Interviewee(s) from PSAP centre(s) stated there are no positive effects and benefits and refuted AHS claims that there are no negative events resulting from the transition of dispatch. The interviewee felt one strategy does not fit all areas of the province and questioned why the system was ‘torn down’ until something else was in place.

Another key issue discussed by government interviewees is the funding of PSAP centres and the need to capture some of the revenue Telus charges customers for a 911 fee. 911 fees charged to landlines go to municipality funding but the same fees charged to cell phones are not being received by municipalities. One interviewee claimed there is a cross government group working on this issue.

A number of interviewees considered the halt of EMS dispatch consolidation a political decision that will negatively impact EMS’ ability to coordinate EMS responses effectively and efficiently. AHS interviewees feel this is a political decision that is a result of lobbying by smaller communities in the province and claims of service degradation using unsubstantiated examples.

Learnings from the postponement of the EMS dispatch consolidation were articulated by an AHS interviewee as now having time to make sure the correct technology is deployed and to work on better stakeholder engagement.

The question arose as to whether or not the government was aware of EMS dispatch related issues and if they understood the need to connect fire and EMS considering their relationship on emergency responses.

One interviewee felt the government was not aware of 90% of the dispatch issues and were surprised when issues did surface. Government subsequently reacted to these issues and the halt of EMS dispatch consolidation was a result of one of the reactions.

There is general opinion that the rural environment has some challenges and the management of the EMS dispatch system still seems to be considerably urban-centric.

The term ‘staging’ was introduced by one interviewee related to the filtering of calls coming into dispatch that were considered high risk to EMS requiring police back-up or support, such as a stabbing victim. The interviewee’s concerns related to poor call evaluation by dispatchers and poor or non-existent radio communication between responding services.

According to AHS interviewees, dispatchers in AHS EMS were better educated and used standardized protocols post transition. The use of standardized MPDS (Medical Priority Dispatch System) cards allows for the deployment of the right resources based on the information asked by the dispatcher. Other interviewee(s) claimed there are no universal dispatching standards or training standards for dispatch operators in the PSAP system. One interviewee commented that people generally don’t know a lot about how 911 works and wondered if they are actually using the system properly. This interviewee also pointed out that Alberta is one of the few provinces that doesn’t have overarching 911 (PSAP) provincial legislation.

Non-AHS interviewees stated EMS dispatch in rural Alberta is an issue. Issues cited include: removal of EMS resources from communities to facilitate transfers, fragmented emergency response between fire, police and EMS, poor communication capability between EMS and medical first responders, disenfranchised employees in the rural environment, lack of local knowledge by dispatchers resulting in increased response times and lack of understanding by dispatchers of rural needs and complexities, and the lack of medically trained back-up for EMS responders in small communities. Poor radio and cell communications between Alberta and Saskatchewan was also cited as a major concern for a particular area resulting in challenges locating an address which delays response.

One interviewee stated there is value in consolidating fire dispatch and considered the 911-PSAP system a mess. While First Nations or settlements don’t have 911 they do have a specific number to call. Another interviewee felt that small dispatch centres can’t afford a good functioning CAD system with a good data system and good navigational tools.

Once interviewee commented that a centralized dispatch doesn’t work in Alberta like it does in other provinces because of the contracted services currently in place. An interviewee from a PSAP centre stated a consolidated dispatch does not understand distances between communities, long response times and unique locations.

Cooperation and technology appear to be barriers to EMS dispatch consolidation in the north Peace River area.

As one AHS interviewee commented, the great debate for staffing in EMS dispatch is whether to hire medically trained dispatchers, paramedics, EMTs or EMRs, or non-medically trained personnel who are hired and trained to dispatch. In the past there was a variety in the skill level of dispatchers. Some dispatch centres used paramedics while others had non-clinicians working with standardized protocols.

One interviewee suggested dispatch has been a fiasco and AHS has “screwed it up”. This comment is in reference to the large tracks of land on reserves and settlements and the ability of medical responders to find the location of a call. The issue revolves around the perceived need for local knowledge in dispatch and familiarity with the people and the tribe. They have been pushing hard for funding to accurately produce mapping but do not want the reserves to assume the cost.

The same interviewee states it is evident there is a 15 minute delay for medical first responders when the call goes to AHS EMS dispatch first. No one seems to be clear as to what the criteria is to make the determination of when the medical first responders should be dispatched and the interviewee is confident it is an Alberta wide issue. The communication system with respect to radios is also an issue and the interviewee indicated a desire to work with AHS to have one channel on their radio to be the line with EMS so they can talk to each other and possibly the RCMP. No one even advised them that they would no longer be able to talk to EMS.

Rural medical first response

Throughout the interviews responses articulating the term ‘first responder’ were generally in reference to fire department medical first responders and/or community volunteer first responders.

Many interviewees targeted medical first responders and the role they play in the AHS EMS service delivery and dispatch model, primarily in the rural setting. An AHS interviewee commented on the need to incorporate medical first responders into the EMS response mix as part of the response plan. Where the expectation of an eight minute EMS response has been promoted in large urban centres this same expectation is not possible in rural environments due to long distances to travel. AHS hasn’t defined what the response expectations are for these areas and the interviewee feels that by incorporating medical first responders into the EMS model and supporting medical first responders in rural communities, an assurance could be made by AHS that emergency medical coverage is available in all communities. A government interviewee also acknowledged medical first responders are critical to the current response system and AHS EMS needs to develop a strategic alliance with medical first responder agencies in the province.

There are varying levels of medical first responder training in the province from standard first aid to advanced life support (ALS). Some AHS interviewees articulated concerns around: the existence of protocols for medical first responders but no training, varying levels of responders, questionable medical protocols and auditing, and the lack of engagement of medical first responders prior to the transition. Interviewees felt there is a need to have a medical first response from fire departments and it should be built into the EMS model and confirmed this is an important part of the EMS system and an important piece of community response plans that includes fire, police and EMS. A municipal interviewee identified the need to align medical first responders into the AHS EMS response plan including the online training support for practitioners.

An AHS interviewee stated that about two months after the transition the then Minister of Health sent a letter to AHS EMS Medical Directors directing them to provide medical oversight for fire medical first responders as well. Challenges to the oversight of medical first responders include funding, medical oversight, training, administration and dispatching. The role of medical first responders requires definition and clarification of legislation and medical oversight. AHS EMS responded by assigning a

project lead and developing a strategy. Four different plan options including proposed costing were developed and submitted in a briefing note to AHS EMS leadership.

One interviewee claimed lack of resources for medical direction in one of the AHS zones, including that for medical first responders.

The difficulty in maintaining qualifications and registration with the Alberta College of Paramedics was discussed as not only a time commitment challenge for practitioners, including volunteers, but also a funding issue for municipalities and practitioners. Non-AHS interviewees articulated concerns about the Alberta College of Paramedics (ACP) mandated standards for medical first responders forcing volunteers out who can't afford the money or time to upgrade for training. One solution proposed to address this was the need to change the medical requirements of medical first responders to advanced first aid versus that of a registered practitioner with the College. One government interviewee feels the work medical first responders do for the community is valued but AHS shouldn't be paying for this. The interviewee argues there should be funding available for them as a partner for things such as training and equipment but not at the expense of EMS resources. Another interviewee supports the role of fire as medical first response as a partner to EMS for time sensitive emergencies but acknowledged there is a need for firefighter staff to revert back to the fire response role quickly. Another interviewee questioned fire services' reason to be involved in medical response, that being a true desire to provide health care or a funding subsidization issue for fire services.

Challenges of staffing in rural areas was identified specific to retention of medical first responder volunteers and firefighters and maintaining their training to ensure the competency gap is narrowed between volunteers and full-time staff. Volunteer burn-out was discussed as well as difficulties in recruiting staff and volunteers because of workload and training on days off. One solution proposed to address sustainable staffing in rural and remote areas of the province was to hire full time instead of relying on an unpredictable casual pool like AHS currently uses in some parts of the province. The interviewee advised checking out the system in British Columbia.

AHS interviewees queried how and when to dispatch medical first responders, and if dispatched, want to know that medical first responders have a basic quality management process in place to manage medical oversight, and standards for charting and auditing. It was commented by one AHS respondent that AHS could potentially dispatch medical first responders but this would take some time and effort to do this effectively and efficiently. It was suggested by an interviewee that the province should take on fire dispatch as well but doesn't see that happening. Staff would see a benefit and there would be a lot of strength in an integrated service delivery model. A government interviewee commented that while EMS is functioning well there is a lack of connectivity to medical first responders and EMS needs to talk to this group during the response phase. EMS and medical first responders need direct communication with each other and it should be through the dispatch centre. According to one AHS interviewee, there are approximately 400 volunteer and fire organizations in the province not including ski patrol and search and rescue with a wide range of standardization and oversight from full to none.

The AHS contract process for EMS contractors appears to be a contentious issue. Comments were made during the interviews regarding the inflexibility of the contract and the renewal process and the challenge of projecting service requirements and costs 5-9 years out. AHS interviewees consider the contract process part of their strategic delivery model that includes direct delivery and contracted services. From their perspective AHS provides predictable and sustainable funding in their new agreements. They

acknowledge the health delivery model is different than what was in place before and this has created discomfort with some municipalities. AHS interviewees described how AHS entered into two year contracts with contractors at the beginning as a learning process then contracts were extended another year. The request for proposal (RFP) process is completed for private for profit services and is now going to not-for-profit municipalities. AHS is also in the process of developing a new contract delivery model where accountabilities are clearly articulated with clear expectations of service delivery and quality.

The issue of coverage in rural, remote areas of the province, including First Nations reserves and Métis settlements, was brought up as a concern by a number of interviewees. One medical first responder interviewee identified that Alberta Health has an identifier for First Nations but not Métis settlements and this is required to improve service locally and they have it built into the health care number. First Nation and Métis require clarity and support regarding funding and EMS/medical first responder response in a contract, particularly in the assignment of an AHS identifier for Métis.

A medical first responder interviewee related negative interactions with AHS management in discussions related to coverage on Métis settlements. The interviewee is of the opinion funding for First Nations and Métis is not forthcoming and AHS has skewed salary structures which is challenging service providers to hire staff based on their own current salary structure. The interviewee did agree that the standard of care as defined by the provincial Medical Control Protocols is good although somewhat restrictive. The interviewee claims Indian Affairs has stated the provision of ambulances is not in the treaty agreement and the federal government is suggesting AHS to take over the provision of EMS on reserves and settlements. The interviewee also recommended the provision of support from AHS for staff training, particularly allowing access to the AHS EMS online training site.

The logistical conundrum of maintaining clinical competency in an environment of low call volume was discussed. Recommendations were put forth to place ALS practitioners in rural environments where they are best needed and put in place a rotation process whereby they would rotate into a high call volume urban service to maintain clinical competency. The union logistics regarding staff deployment and personal challenges of housing, family, and travel were also brought up as major considerations to this type of model.

EMS delivery model

There was general consensus from interviewees that EMS is an integral part of the health system. The benefits of the integration of EMS into health were articulated by a number of interviewees and included the opportunities for EMS to work in other areas of health and disaster management. A government interviewee cited approximately 12 reports that recommended EMS be part of health. AHS interviewees suggested municipalities and health need to understand EMS and its response reporting and resourcing processes. The integration of EMS into health was cited by respondents as having positive benefits especially in rural and remote areas where physicians may not always be available and EMS practitioners work with allied health professionals such as nurse practitioners in medical facilities.

There were benefits of the EMS model cited by AHS and government interviewees. Users of the system can benefit from any of the resources in an expedited way with improved quality of service delivery. The current service delivery model also allows under-resourced areas of the province access to programs previously only available in the urban centres, for example the administration of thrombolytics.

It was identified by interviewees that the design of the current EMS model was based on the results of an advisory council evaluation of EMS stand alone, fire, private and health based systems. The current AHS EMS model was described by AHS as an integrated, coordinated, borderless system that is not based on community resources and not limited to skill sets. The current model of direct delivery plus contracted service delivery was claimed by one interviewee to have been set by the then Health Minister who declared that anyone wanting to provide an EMS service would still be able to provide that service under the new model. One AHS interviewee stated the blended direct and contract model improves quality of service.

One interviewee felt one metro centre was better funded than another metro centre prior to transition. Where the metro centres were resourced well, smaller communities struggled to fund EMS. Some municipalities didn't view EMS as health or viewed them as another service the municipality would provide for citizens. Those that felt EMS was health were reluctant to fund EMS feeling it should be funded by government health dollars. When EMS was declared health and would be funded by the government municipalities acknowledged the benefit of this funding model. The downside for communities appears to be the perceived loss of control of EMS they once had in exchange for a now provincially funded service.

Comments generally favour the provincial funding of EMS but there is an indication from the comments of many interviewees that the funding of EMS after the transition is somewhat challenged. The equalization of resource distribution appears to be an area of concern identified in some responses. While 'have not' areas of the province may be benefitting from enhanced training and quality assurance it has been at the expense of the large urban centres that were well resourced prior to the transition and have seen those resources distributed provincially after the transition.

There are perceptions that funding and resources for EMS are not keeping up with growth. They are reduced in areas that were well resourced prior to transition and somewhat improved in areas of the province that were historically under resourced. While AHS states they have developed benchmarks on costing, some interviewees claim a loss of funding for quality assurance and training in metro centres and no plan for supply management and funding for municipalities. One government interviewee expressed concern that there is not an evidence based plan to determine what resources are required and how they are allocated and alternative transportation strategies should be considered. AHS comments also reflected the need for sustainable funding but specifically more for a methodology to predict resource allocation and funding.

One municipal interviewee stated there are fewer ambulances responding in the city today than when the city ran the system with no investment in capital since the province took over. The interviewee feels they need to have a certain number of ambulances dedicated to their community in order to get appropriate response. What adds to this dilemma is that now the local ambulances can be dispatched to calls outside of their community. An AHS interviewee was critical of the lack of consideration for service areas when the provincial model was put into place. In metro centres where demands for EMS are continually increasing, these areas that were previously well resourced are now seeing ambulances re-deployed outside the cities leaving them less resourced than before the transition. Conversely, outlying areas may be required to bring their resources into the cities. The interviewee felt that when boundaries were removed the previously good service provided to those areas was lost. Mutual aid agreements between service areas prior to transition worked but this is not the case with the current system.

Governance and administration

The question posed regarding the impact of the transition on EMS generated responses from AHS regarding the recent EMS re-alignment from a provincial operations reporting structure to a zone operations reporting structure. AHS respondents were generally in favour of operations now reporting to a zone AHS leadership team allowing for more local attention and relationship building. The perceived benefit at this time is the foundation is now set with provincial protocols but it will be a challenge from a care and quality perspective to maintain standards and there is the risk of zones moving in separate directions. Work is being done to develop a charter and reporting structure. Some aspects of EMS will remain provincial such as air, quality, training, and data management which presents a dual reporting structure within a single discipline. However, one interviewee was concerned that the EMS move into a zone operational model may result in the loss of the ability to be more innovative at a provincial level. One interviewee perceived the current EMS administration to be top heavy with a dysfunctional Leadership Council, and also commented on the difficulty of trying to get policy developed and approved.

Other challenges brought forward with respect to governance included the challenge of bureaucracy and getting things done and decisions made in a timely fashion – for example taking two years to get uniforms approved. Frequent internal change and change fatigue were identified as a major challenge along with the loss of connection with local communities and a loss of identity for practitioners.

AHS interviewees said they are reacting to political pressure and public expectations and are challenged by the size of AHS with respect to responding quickly to requests. Political pressures are impacting decisions regarding performance metrics that are designed to meet political requests rather than measuring from a clinical perspective. A better relationship with Alberta Health is required according to one interviewee and AHS EMS needs strong leadership to champion EMS in AHS and in the public forum. Another interviewee suggested political constraints can be overcome by showing how the math is displayed perhaps using technology where someone can move the ambulance on a screen and see the impact in a community.

Some interviewees with a PSAP centre connection were frustrated with the inflexibility of AHS as a large organization and felt EMS should be managed locally and provided on a regional basis, differentiating between rural and urban needs.

Integrated services

Opinions regarding an integrated fire/EMS service model were split between all interviewees, even within organizations. AHS, and government interviewees were of the opinion an integrated operational model for EMS is more expensive to run than direct delivery service. However, for small communities an integrated model may prove to be more efficient from a staffing and costing perspective.

Pro integration responses were cited around efficiencies gained including: collaboration and cooperation between services during a response, cross training between fire and EMS, on-scene support between services, public expectation that an emergency response from fire will include medical support, and the ability to staff fire or EMS within the single service based on the nature of a call. Benefits were cited for smaller communities where financial and operational efficiencies could be realized but examples of success of an integrated service in large cities were also cited such as New York and Phoenix. One interviewee pointed out that more than 80% of services in the U.S. are integrated services. On the other side, London England was cited as an example of a large city that was not integrated. Some Alberta cities

were referred to as examples of successful integrated services. Another AHS interviewee is of the opinion an integrated EMS/fire model is a good one citing the number of practitioners that could be on scene to support an event. A government interviewee felt there is not an issue with the patient care provided by integrated services.

Criticisms against an integrated model included: the challenges of staffing based on competing urgencies at a large scale event that requires fire and EMS resources, the non-health focus of fire and municipal priorities that are primarily fire focused, staffing for both services and meeting the EMS demands as required including EMS integration into health care, and the erosion of EMS in large centres. Comments were made on the training and staffing of EMS/fire personnel. From a training perspective most interviewees were supportive of the level of training EMS practitioners received but one interviewee felt the funding for training is a contentious issue. Skill erosion and the need for specialized EMS training for EMS versus cross-training for EMS and fire roles was cited as a concern with respect to skill retention and erosion in an integrated service model.

The staffing of experienced practitioners was cited as a concern in a fire based service where fire roles are the priority and promotions within a service are based on promotions into fire administration. This results in experienced EMS practitioners in an integrated service taking non-health administration roles thus leaving more junior, inexperienced practitioners taking on EMS health related roles and responsibilities.

An AHS interviewee explained the need for ALS services in smaller southern communities due to difficulties in retaining physicians in the community. An expanded scope of practice for EMS practitioners was implemented to support emergency departments or acute care sites. Taking this into consideration, the interviewee felt a municipally run fire/EMS service would have limited ability to provide these types of health services. Although integrated services provide good emergency response services that are well coordinated, there is not so much focus on the overall health system. The claim was made that the International Association of Fire Fighters (IAFF) needs to take on EMS for the survival of fire departments because of the low call volumes experienced by fire departments.

The primary issues emerging from interviewees included the need for EMS in an integrated service to be available for all EMS related business including: emergency calls, transfers, integration into the health system in other areas such as emergency departments, clinics, or care centres. Claims were made that EMS resources in integrated services weren't always available for these tasks or were specifically declined if not related specifically to emergency response or sometimes transfers. Interviewee responses pertained to whether integrated services had the desire to do transfers or should be required to do them as part of the contractual obligation. Resistance to partake in this function appears to be a matter of resource allocation for the function resulting in resource depletion in the community when staff are required to complete a transfer over a long period of time. Municipalities interviewed were concerned about the challenges an integrated model would present with respect to employees functioning within one service delivery model but being accountable to two different governing bodies – one medical, AHS, and one municipal.

Funding EMS in integrated services was also cited as a key issue, primarily with respect to separating out the costs specific to EMS and not funding, or subsidizing fire related services that are perceived to be the responsibility of the municipality. Many interviewees were clear that any funding for EMS was funding for health care and the funding of any fire related services should not continue. Many questioned why EMS costs could not be accurately calculated and subsequently included in the contractual service

agreements. Within the contract should be language specific to the resources dedicated to run EMS for the integrated service.

One interviewee referenced the Cenaiko report, a precursor to the transition, which suggested integrated service systems for fire and EMS were working well in North America and communities were well serviced by this model.

Staffing and training

Staffing an EMS system in Alberta emerged from responses as a secondary code under the service delivery theme. Issues related to hiring, retention of staff, staff satisfaction, EMS students and volunteers were presented.

One medical first responder interviewee felt more Critical Incident Stress Management (CISM) type of support for practitioners involved in critical events would help retention. Another interviewee felt the current AHS EMS staff complement of one person to manage EMS CISM in the province was inadequate.

One challenge identified from the interviewees was that of staffing and maintaining volunteers in the rural areas of the province. Where staff in the large urban centres are not required to be on-call when off duty, rural employees will often cycle into an on-call status after a full time shift acting as a back-up if required. Volunteers have the added challenges of being on-call without pay and maintaining qualifications and credentials through additional training that occurs on days – off, often at their own expense. One interviewee stated this resulted in burn-out and the volunteer eventually opting out of the medical first responder role. Skill retention in rural areas, lower pay in rural areas, higher skill areas in the city than in rural were issues brought forward by interviewees. Retention of staff appears to be tougher in the north of the province as opposed to the south according to two interviewees with the rationale given that the AHS in the north loses employees to oil and gas sites.

Also from a staffing perspective the issue of diversity or lack of diversity within EMS and integrated services was discussed as an issue by one of the interviewees, related specifically to the need for more ethnic, aboriginal, and gender diversity within the profession. One response also recommended the need for EMS practitioners to have the knowledge and expertise to deal with culturally disenfranchised populations

The issue of staff apathy and lack of supervision was identified by one interviewee. Increased apathy of staff due to staff perception that no one cares about their challenges was stated as an observed behavior. This was reinforced in the interview by statements citing increased observations of poor EMS attitudes when dealing with allied agencies, the public and hospital staff and observations of staff sleeping during their shift and ignoring station responsibilities. These responses culminated in the reference to the lack of staff supervision in the interviewee's area leading to the issue of poor performance going unnoticed. It was also recommended that succession planning needs to be part of the overall planning process for EMS.

Some AHS interviewees identified staff burn out related to system demands on time. They cited an accumulation of services from municipalities divesting into AHS direct delivery without an increase in staff to address under-resourced areas. Staff are frustrated with the system and the number of people leaving the AHS EMS system is a challenge. There was also concern from this group of interviewees regarding the young inexperienced practitioners on the job that often results in a practitioner calling in a

second unit for back-up and tying up resources. The question arose as to where are the senior medics? This was reiterated in a PSAP centre interview identifying the practice of pairing inexperienced EMS crew members with another inexperienced EMS crew member in the rural environment.

Recent frontline practitioner surveys suggest staff are extremely unhappy in their work environment and one association interviewee identified their group is working with AHS EMS administration to resolve identified issues.

The hiring process was brought into question by one interviewee stating the process isn't selective with an "anybody will do mentality". Claims were also made regarding constant staffing issues resulting in unmanned ambulances or ambulances taken out of service. Claims were also made by one interviewee that supervisory positions were awarded to seemingly unqualified individuals from services divesting into AHS without opening up a competition to others that may have been more qualified.

One interviewee identified EMS student practicum placements in AHS EMS as a cause for concern. The interviewee articulated that while the process of EMS student ambulance practicum coordination looked good on paper, the reality is an inconsistent process, exists within AHS, between the north and south.

Legislated under the *Health Disciplines Act*, EMS practitioners are practicing under the license of a medical director who oversees their service. AHS feels they are not funded to audit all practitioners (including contract providers) but because they have medical accountability for the practitioners AHS has chosen to train them. An AHS interviewee is of the opinion they are missing resources, technology and people, to address the current auditing and training needs of the organization and it was suggested the level of investment for training is static and training should include managers and senior leadership. The practitioner competency data base needs IT support and staff resources and staff and technology resources are required to support the on-line access to training and education by practitioners across the province. The EMS Medical Control Protocol app that has been downloaded 12 thousand times on iPhones was reported as an innovative solution currently in place but the interviewee came with a recommendation to look at best practice services such as in Australia where iPhones and iPads are provided to EMS practitioners.

Consistent education was cited as a positive for practitioners but one non-AHS interviewee felt there is a lack of effective training to operate in rural areas but staff are trained well for the city. Conversely, one interviewee felt rural areas are getting more training than prior to the transition but there needs to be an investment in education technology.

AHS interviewee(s) cited queries from communities about the clinical competency of providers on the one hand and acknowledging the improvement in practitioner skill levels in smaller Alberta communities on the other hand. One interviewee felt there is a general decline in crew competence because attendants are constantly changing.

Expanded scope of practice

The integration of EMS into the health system was cited as an opportunity to expand the scope of the profession and the practitioners to support under-resourced communities.

AHS interviewees support the integration of EMS into health where skills are being used on a continual basis and practitioners have the ability to enhance relationships with patients and health personnel. An example provided of this relationship is the integration of the former Palliser region EMS personnel into

the hospital system and health facilities. Skills were being used on a continual basis and relationships with patients and health care personnel were enhanced. This relationship made the transition easier for many practitioners.

One municipal interviewee discussed the concept of community paramedicine as an EMS model being implemented in areas such as Brisbane, Australia and Saskatoon. Saskatoon has a community bus to support First Nations. While not elaborated upon extensively in the interview, the concept was the focus of the recent EMS Chiefs of Canada Conference in Vancouver where international delegates presented the benefits of numerous community paramedic programs from around the world.

The treat and refer pilot project in a metro centre has been implemented to expand patient care in the community. A response from an interviewee suggests projects like these require good literature and should proceed with caution.

Hospital wait times

Hospital wait times still emerge as an issue impacting the ability of EMS to respond to calls and were a contentious issue for some AHS interviewees and government interviewees citing this issue as very negative for EMS. Now that EMS is part of AHS, hospital wait issues for EMS may be better resolved because it is the system's issue instead of just EMS.

While physicians are of the opinion hospital wait times are down for EMS, the data to support this is questionable and requires some supporting evidence. One municipal interviewee stated prior to the transition their community (a large urban centre) had calculated time EMS spent waiting in a hospital and extrapolated the information to a dollar value and equitable staffing into a loss of productivity. Another interviewee acknowledged the issue of EMS wait times in the emergency departments needs improving but suggests things are getting better to improve patient flow and an over- capacity protocol was cited as a solution that appears to be working.

Air medevac

Comments related to how to improve the EMS delivery model in the province included a comprehensive air medevac system that works seamlessly, suggested by a municipal interviewee, and includes both rotary and fixed wing coordination and funding for Shock Trauma Air Rescue Service (STARS). One interviewee considered the overall EMS system of air and ground response and transport could address the geographical challenges presented regarding long response times. A provincial medevac model was recommended as a method of covering such a large geographic region as Alberta. AHS interviewee (s) suggested air ambulance service can support the ground ambulance service and recommended checking best practice EMS models in BC, UK, and Nova Scotia.

Inter-facility transfers

Inter-facility transfers (IFT) emerged as a separate code based on the number of responses directed at IFT. While the benefits and potential of a good patient transfer system were acknowledged by interviewees, the efficiency of the current system/process since the transition is questionable based on interview responses. Challenges articulated by interviewees for rural areas include: depletion of emergency resources to complete a non-emergent transfer, inefficient utilization of vehicles for transfers, payment to

contractors for transfers vs. emergency calls, depletion of rural coverage to engage in concurrent transfers and the implication that staff are delaying booking back in to service to avoid being tasked with a transfer.

Supporting this concern of resource management was a response from an interviewee suggesting the system status management (SSM) process in place for IFT is being used inappropriately for non-ambulance transfers. This was supported by an AHS interviewee. SSM is designed to send the closest available ambulance to a call and while this is currently managed manually AHS EMS is attempting to acquire an optimization tool to better manage the process. The use of non-ambulance transports (NAT) by AHS in the metro centres was brought up as an alternative transport method but this model is not being used in the rural areas. These units are staffed by two EMR's and require minimal support and training.

From the perspective of some AHS interviewees, IFT is considered under-resourced compared to emergency response resources. The most frequent complaint, as cited by one interviewee, is the delays in how long it takes to do a STAT transfer for cases such as a ST segment elevation myocardial infarction (STEMI). Claims of complaints from outside facilities were made that it may take 2-3 hours to get a patient from an out-patient clinic even if the transfer is pre-booked. Dispatch is unsure of where units are and how much time it will take to do a transfer and sometimes IFT units in a metro centre are asked to respond to some of the rural calls.

One AHS interviewee claimed the decision to halt the consolidation of EMS dispatch hampers moving forward on the integration of IFT provincially and subsequently hampers getting the closest resource to a call. A transfer matrix was developed to determine what resources would be required to do a transfer based on patient medical condition and location. This matrix was trialed in the central zone with some success but due to the halt in dispatch consolidation it can't be fully implemented.

One municipal interviewee articulated how the community he represents works around requests for transfers as a result of miscommunication between hospital requests for a transfer and the dispatch centre deploying an ambulance. The work around is: the local dispatch centre will contact the hospital directly to determine the resources required for a transfer.

It was identified that IFT resources in the metro centres need to expand into rural areas but there are still places that don't require a dedicated transfer resource based on low call volume.

Because AHS declared the budget for transfers would be controlled centrally the number of transfers has gone up. The interviewee felt AHS needs to take back control of transfers and place more accountability on the user groups with respect to budgeting and funding of transfers. IFT also needs to balance the workload and manage utilization of resources between transfers and urgent calls that occur as a result of overcapacity.

It is clear from interviewees that the AHS EMS IFT system and process needs to be reviewed to ensure a better coordinated system is in place across the province to demonstrate the system is not draining community resources and coverage is available. A well communicated, transparent and strategically developed plan is required for all stakeholders, including First Nations and Métis settlements. Data management and reporting will be a key piece in this plan. The IFT role and provincial response plan needs to be clarified and was identified as an integral part in the solution to reduce hospital wait times. One recommendation was provided to investigate a University of Alberta algorithmic solution to assign

vehicles for transfers and to consider investigating Sydney Australia where an algorithmic solution has been implemented.

Medical direction/oversight and patient care

As referenced earlier, medical direction and patient care was not identified as a key theme emerging from the thematic analysis of interview. While it is acknowledged that the provision of emergency medical services in Alberta is part of the patient care continuum and part of healthcare, AHS interviewees and most other interviewees were consistent in the positive impact the transition has had in implementing consistent medical direction and medical consultation with centralized online support. The development of provincial Medical Control Protocols by Alberta Health, physicians, paramedics, Administrative services and the subsequent training and education of all staff was proactive in addressing protocol issues and patient safety. AHS EMS practitioners have the same medical direction and the same clinical practice guidelines. Protocols are accessible to all staff and are also available on phone apps. Changes to protocols however pose a significant challenge and a 101 point checklist was cited when changing a protocol.

The distinction between medical direction and medical oversight was brought up and questioned by one interviewee. While the distinction between the two was not readily clarified by the interviewee, the question was posed as to what the role of the medical director should really be. The response suggested medical control of EMS is currently delegated by legislation but medical oversight provides some autonomy to the practitioner with respect to decision making with physician support. The interviewee was of the opinion medical control is dictated by medical control protocols and these basically de-skill a practitioner and don't work. This interviewee suggested the protocols were not based on evidence citing the protocols vs. advanced cardiac life support (ACLS) guidelines. Standardization on a big scope does not necessarily work in areas of specialization; a police arrest processing unit being cited as one area of specialization where medical control protocols don't necessarily work.

Medical oversight can empower paramedics to do what they need to do, something the interviewee felt will occur once EMS becomes part of the *Health Professions Act* giving paramedics more authority over their practice. This was supported by an AHS interviewee who considered EMS legislation under the *Health Professions Act* to be a benefit for practitioners working with allied health professions in rural and remote facilities in Alberta.

Comments from interviewees regarding the impact of the transition on patient care fairly consistently indicate the quality of patient care has improved, especially in the rural environment, largely due to consistent Medical Control Protocols. Fleet standardization has solved some patient safety issues and response times have decreased. IFT is more efficient with respect to crew changes rather than switching patients from one ambulance to another when crossing boundaries. Standardized Medical Control Protocols across the province and consistent medical oversight have also contributed to improved quality of patient care. From a negative standpoint, the evidence supporting this improvement in the quality of patient care was not provided and it was suggested by one interviewee that the evidence does not yet exist. It was the opinion of one municipal interviewee representing a large urban centre the medical protocols and practitioner scope of practice are less than before the transition

One interviewee commented that the implementation of an electronic patient care report has impacted patient care and coverage. This is due to the amount of time it takes to complete the report thereby taking

the ambulance out of service and dividing the EMS attendant's time between filling out the ePCR and attending to the patient.

The issue of standards or lack of standards arose from AHS interviewees with respect to standards in fire based EMS systems. Government interviewees articulated the lack of standards for fire based services and also questioned the licensing process and maintenance of vehicles in these services. One regulatory body interviewee also questioned the quality of patient care considering the practice of promoting experienced paramedics to fire positions within a fire based service resulting in more junior, inexperienced members filling the EMS roles in the service.

A number of interviewees cite the provincial 24/7 call in line for EMS practitioners as a positive implementation to support practitioners operating independently in more rural areas, supported by medical control protocols that factor in rural and EMS settings. Interviewees acknowledge patient care has improved through the consolidation of EMS dispatch and the standardization of equipment, medication and medical oversight and the implementation of the 24/7 online medical control. Conversely another interviewee was of the opinion that different protocols are required for rural and urban EMS response. This was tempered by the suggestion this system is underfunded for physicians. One interviewee expressed the need for EMS to become a self-regulated profession and to become more entrenched in the community as health advocates promoting healthy lifestyles to reduce high risk factors such as smoking and poor nutrition.

Municipality Questionnaire Analysis

Questionnaire sample group

Potential respondents to the municipality questionnaire were identified from the Municipality and Community Contact list found on the Alberta Municipal Affairs website.⁸³ For definition within the EMS review 'municipality' refers to cities and to the municipality, towns, villages, summer villages and Métis settlements contained within the Counties, Municipal Districts, Special Areas Board and Improvement Districts of Alberta. Three hundred and fifty-seven questionnaires were e-mailed along with a detailed letter explaining the purpose of the review and the objectives of the review. Respondents were invited to complete the questionnaire and e-mail, fax or mail the completed document to the HQCA contact information provided in the letter. A second and third reminder email was also sent to municipalities. Any references to specific municipalities identified in the questionnaire were not included in the final analysis to maintain anonymity.

Methodology

A thematic analysis using qualitative research methodology was undertaken to systematically analyze the information from the interviews. As per the description found under the Methodology section for the Stakeholder Interviews, the codes identified from the analysis of question three, by two separate analysts, were used for the thematic analysis of the municipality questionnaires. The codes were later merged into the previously identified themes.

Results

A total of 357 municipalities were emailed the questionnaire. A total of 101 responses were analyzed from 62 different municipalities, resulting in a response rate of 16.8%. Responses were received from a

variety of different positions, including chief administrative officer, assistant chief administrative officer, fire chief, reeve, mayor, deputy mayor, town manager, councillor, emergency manager, director, administrator, and board member.

Three respondents requested an interview in lieu of completing the questionnaire.

Analysis

Impact of transition

There were mixed reviews from the municipalities regarding the decision to move EMS into health away from municipal governance and funding. A number of municipalities indicated that they were not aware of any changes or stated the transition of funding and governance has not resulted in any significant changes to their municipalities. Some municipalities believed that by moving EMS into health, the service had improved. The new model gave stability to the service and continuity of patient care through its integration into the provincial health care system. One municipality commented that “there appears to be more support at the scene of an accident and that the services seem to be better coordinated. The relief of these responsibilities was welcomed by a number of municipalities. Responses citing a positive impact were related to the provincial funding of EMS and the ability of municipalities to reallocate funds previously designated for EMS or provide some funding relief for taxpayers. As a couple of respondents articulated, the “reliable long term funding” for EMS by the province has “lightened the financial burden on municipalities”.

A larger number of municipalities believe that EMS was best left to local governance as this was all part of community based public safety. When municipalities governed EMS they were able to coordinate the EMS, fire response and community/volunteer based medical first response services. They were able to adapt the service delivery to specific and unique needs of their community and were able to resource their service in a way that they felt was more cost effective, efficient and provided a higher level of EMS response.

Negative responses provided related to the provincial funding model of EMS, specifically regarding the service provision contract. Some municipalities feel the AHS contract negotiation process is lengthy, restrictive, and as one respondent suggests is “borderline shameful”. As one respondent articulated in a response, the level of delivery standards defined in the new contract proposal are nearly impossible for small rural volunteer services to meet, for example maintaining a BLS minimum service level, no exemption from inter-facility transfers, and no change order process within the contract. Net negative funding was cited as a result of the transition specific to the now borderless system where ambulances responding from farther distances result in longer response times and municipalities are subsequently funding medical first response strategies within their communities.

The longer response times were cited by many municipalities as one of the major negatives resulting from the transition. Units are responding from farther distances, communities are being left without local coverage, the number of ambulances in the area have been reduced in numbers, and previously ALS supported communities are now reduced to BLS support. Inter-facility transfers are considered a major contributor to municipalities being left without local ambulance coverage. One respondent recommended an increase in resources for municipalities that are vacation destinations and see periodic population

surges. Admittedly some respondents stated they do not have evidence to support their claims of longer response times.

Data management

As cited in the analysis of data from the interviews, prior to the transition performance measures and benchmarks varied considerably with each service across the province. There were a number of negative comments related to the impact of transition on quality assurance. Several municipalities commented about concerns that AHS is not actively monitoring local response times and they have not identified a level of service for specific communities.

While data management emerged as a primary theme in the qualitative analysis of all stakeholder interviews and questionnaires, 25 municipalities did not comment on the data section or considered it not applicable to their community. There were some responses specifically highlighting the inability to access EMS data from AHS and one municipality respondent representing a local ambulance board cited the decision of the board to remain in place in order to provide oversight for local EMS that they felt was required in the absence of EMS performance data from AHS. A few respondents stated they either reported their data to AHS, could access EMS data on the AHS website or were aware of data collection and reported it to their board.

The key performance measure indicated by most municipalities was that of response times. Most municipalities identified that their measure for response times was from when the dispatcher receives the 911 call to the time the responding unit arrives at the scene or address of event. The response time for a number of municipalities remains the same and several municipalities indicated their response time had improved. A number of municipalities stated that they do not get data from AHS on response time but they would find it helpful. Before transition, some municipalities measured specific data while others relied on anecdotal information. A number of municipalities reported they had documented cases of delayed response times while waiting for AHS EMS.

One municipality expressed their disappointment that AHS does not have a stated standard for response times for the delivery of EMS in Alberta. There is no response time standard in the contracts for EMS although there are chute times which they feel do not provide critical performance. This municipality measures and reports many more key performance indicators.

Negative comments related to data management were targeted at the perception of longer response times and hand-off times albeit without the provision of evidence to support the claims within the responses. Conversely, some respondents actually reported no change in response times since the transition and also reported improvements in hospital hand-off times. Two municipal respondents stated specifically that data is not collected for EMS, one stated data is collected internally, and one respondent went so far as to state there is too much emphasis on statistics and this heavily influences funding and service during contract negotiations.

EMS dispatch and communications

Several communities stated that while services have remained stable and patients are receiving good care there are still problem areas arising from the transition of EMS particularly with dispatch consolidation and communication between AHS and municipalities including their fire medical first responders.

Inter-organization communication

There were a number of responses from the municipalities regarding difficulties communicating with AHS. AHS neither listens to or seeks feedback from people who have experienced specific issues as a result of the transition in their area. Fire chiefs are upset with incidents that are occurring and how these incidents are handled; medical first responders feel ignored and are frustrated with not being heard that changes are not working. It was also reported that AHS is not communicating adequately with the municipalities. Specific areas that municipalities wanted to be kept informed of included plans to address concerns brought forward by municipalities, communication problems between ambulance crews and fire first response, lack of data/reports back to municipalities, rising costs and training needs for fire medical first responders as there is a growing demand on their services as response times for EMS is increasing in many area. One municipality stated that AHS has refused to acknowledge the service that currently exists in their area.

Dispatch

There were mixed reviews from the municipalities related to the impact of the transition of EMS and consolidation of EMS dispatch centres. A number of the municipalities stated that dispatching of EMS needs to be managed locally by those who have local knowledge and the ability to coordinate emergency response between police, ambulance and fire/community medical first response. Once such response was, “The separation of ambulance and fire in the dispatch system is a complete and utter failure and has resulted in hazards for our emergency services personnel.” A number of municipalities requested that dispatch be returned to one entity, to their local PSAP dispatch centre. One municipality summed up the benefits of continuing with regional dispatching services (instead of complete consolidation) as: “...redundancy, surge capacity, local knowledge, and service delivery cooperation have been realized. Information and communication gaps or delays to emergency agencies have been avoided through the use of a regional dispatch multi-service provider that can quickly communicate and coordinate EMS and Fire co-response agencies, resulting in better service to our patients”.

The consolidation of dispatch centres was halted resulting in some dispatch centres being transitioned while others remained the same (a local PSAP/dispatch). This halt has created unique problems particularly that of poor or lack of communication between the dispatch centres. Municipalities that currently provide dispatching services indicated that any change to the current dispatching model is likely to have a significant negative impact on the ability to coordinate EMS and medical first responders across the region. They still dispatch both EMS and medical first responders through a local dispatch centre while the municipalities that have gone through the consolidation, dispatch medical first response while the EMS is dispatched through an AHS. With the consolidation of dispatch centres, the communication between EMS and Fire occurs through a time consuming process of relaying information between the two dispatch centres. This makes it very difficult to coordinate EMS and medical first responders. An example of the juggling of calls between dispatch centres was given of a cell phone call going to their county’s 911 dispatcher who will process a call:

... (within 90 seconds at least 90% of the time). This includes dispatching a rescue truck and an ambulance (or other resources as required) at the same time from the nearest station or location to the emergency. The understanding of how a similar call would be processed in the proposed AHS model is that their 911 dispatcher would still answer the call but the call would then be

transferred to the AHS dispatch centre, which they believe would take an average of 34 seconds. The AHS dispatcher would then ascertain an ambulance is needed and then dispatch a county ambulance, possibly from the same station that first received the call. The caller would then be another 34 seconds.

Challenges with communication between existing dispatch centres and emergency services such as police, fire and EMS were presented as negative issues as a result of the transition. The need for interoperability is required sooner than later and while the Alberta First Responder Radio Communications System (AFRRCS) project was cited as a positive initiative it needs to be implemented quickly.

Adding to the difficulty with communication between dispatch centres, municipal radios were removed from many of the ambulances so there is now a delay in communications between the fire departments and the ambulance service although some municipalities reported they have been able to find ways to communicate with incoming ambulances.

As a result, dispatch centres may not be aware of the location of the ambulances. The accuracy of information being relayed as 911 calls are juggled between caller and the different dispatch centres was reported as a concern by a number of municipalities. Also, a number of municipalities indicated concerns that there have been delays in activating the medical first response. With fire, EMS and police being dispatched by 3 separate centres, the difficulty in coordinating services was seen as a significant contributing factor in miscommunication, inefficiencies and impacting response times negatively. The following responses from the questionnaires convey some of the challenges experienced by municipalities:

- Implementing technology in the field has not kept pace addressing ambulance service demands. Specifically, the use of mapping technology and vehicle locating devices to determine the closest ambulance and/or to provide location information to responding ambulance staff serving the region.
- Continued lack of cell phone coverage in the area which impacts GPS and the ability to respond quickly to an emergency.
- There has been a lack of communication or coordinated approach towards updating information within the 911 system to indicate the closest available ambulance- which can cause delays.
- Why is it our last ALS ambulance is being utilized for a BLS inter-facility transfer, and it is acceptable to flex a BLS ambulance into our community to cover emergency calls?
- Providing regional dispatching services has effectively addressed AHS' System Status Management goals within Central Alberta - without consolidation.

In one area AHS sought the ability to maintain access to the Government of Alberta FireNet radio system and was supported by the region, eventually in 2012 the channels have been added into an AHS dispatch centre but infrequently used. AHS EMS also installed mobile satellite (MSAT) radio systems into selected units to also improve communication however the area's dispatch seems to still have to provide a liaison responsibility to direct assets when they become lost or off of the AHS dispatch network. Additional coordination of multiple response agencies such as fire, EMS and other medical first responders used to occur on one radio frequency, now with EMS on MSAT and other systems, reliance is on telephone updates to determine where the responding EMS unit will arrive which is inefficient and time consuming.

A mobile data terminal (MDT) has been put on-site at a contracted dispatch and the respondent stated they now have some sense of where the ambulance is, but are still unable to initiate communications with them except through their AHS dispatch. Arrangements are made to deal with these problems through technologies such as the MDT however there are exceptions, usually significant or major events that cause us the greatest concerns. For example: recently there was a collision involving a train & motor vehicle. In reporting the event the caller did not use the 911 system. PSAP was left out of the loop initially and as a result there was a delay in sending the appropriate responses. This did not result in loss of life nor did it significantly impact the patient. In this situation an ambulance was dispatched first. Had they discovered a dangerous scene they could not have worked safely or effectively. A timely arrival by the fire department is integral to patient care & scene safety.

Many of the municipalities believe that dispatch consolidation has adversely affected response times. Contributing factors include the transfer of calls between dispatch centres, ambulances being out on transfers or dispatched to other communities, inaccurate information from the central communications centre (CCC) and lack of local knowledge. As one respondent articulated, the transfer of a call is confusing to the public and they don't understand the rationale for this and it causes some frustration when they have to repeat the same information twice. A metro centre EMS dispatch was mentioned a number of times as having challenges with GPS, Telus addressing, and delays in dispatch as a result of challenges finding addresses.

With the frequent delays in response by EMS, many municipalities report growing demands on their medical first response to be the first on the scene. Examples describing the difference between the arrival of medical first responders and EMS unit at the scene ranged from several minutes to 45 minutes: fire and EMS are not being dispatched simultaneously according to some municipal respondents. Comments from two municipalities suggest rural communities are being treated differently than urban centres; they are being treated like “second class citizens”, in the words of one respondent.

There were a number of responses indicating system status management has been a significant contributing factor in increasing response times. As ambulances stationed in one community are being dispatched to other municipalities, response times of EMS are increasing and more strain is being put on the first response system of that community. Some of the medical first responders are volunteers and losing salary when they are responding. Some municipalities are also finding that some of the other surrounding municipalities are not willing to relocate their ambulance as requested. This system also results in ambulances that are unfamiliar with the area being brought in from as far away as 20 to 45 minutes. Another concern that was reported based on the status management system is that of no “midrange coverage offered to cover off the ambulance that had been rerouted.”

One municipality “would like this review to advise the government on how to make sure that phone companies actually forward the monies that we all have to pay for cell phone access to 911 to the call centres”.

Municipalities have made significant investments in technology to ensure their system is reliable and able to coordinate responses with all agencies and now they are losing that. Some municipalities contracted dispatch services with other municipalities. As a result of the consolidation, some of these dispatch centres have lost contracts even though they reportedly had a history of strong performance in the delivery of EMS (and fire) dispatch.

The need for local knowledge was cited as a critical concern by a number of municipalities and it was generally indicated that PSAP provided the local knowledge & familiarity with the area while the AHS dispatch does not. AHS dispatch does not appear to be aware of or have the correct GPS data for specific addresses particularly in rural Alberta.

Inter-facility transfers again emerged as a concern with respect to the inefficiency of the system and the utilization of emergency response units to do non-emergency transfers. Comments from respondents cite lack of coverage in their communities as a result of transfers and deployment to other areas for more urban based coverage. One respondent cited a document that describes how units can be removed from one area of rural coverage for coverage in more populated urban regions.

Rural medical first response

As reported in the interview analysis section of this report, the EMS transition did not define a medical first responder nor the role of medical first response within Alberta. Throughout the questionnaire responses, municipalities most commonly used the term ‘first responder’ in reference to fire department medical first responders and/or community volunteer first responders.

Responses related to rural first response for medical emergencies indicate a strong need and/or desire for AHS to acknowledge the role of medical first responders in rural and remote communities and how it is integral to the EMS operational plan. While EMS relies on local medical first responders in communities to fill the time gap of a long response from an ambulance deployed from outside a community or municipality, questionnaire respondents suggest the timely dispatching of medical first responders does not occur on a regular basis nor is it necessarily simultaneous with the dispatching of an ambulance. One municipal respondent commented that the information that is communicated is often insufficient to determine the correct level of community response. Issues of communication between responding agencies were identified with respect to inter-agency operability and the need to establish better working relationships with emergency response agencies was also documented.

In addition to acknowledging the importance of the role of the medical first responder in the rural and remote environs, issues of compensation to support these roles was also identified as a primary concern. Responses suggest municipalities are bearing the cost of this role but consider it to be health related since medical first responders are called by EMS dispatch to respond. Part of the compensation issue is that of the standardized quality training needed for medical first responders to ensure consistent patient care is provided with medical oversight. The issue of training to an EMR level was presented in a number of questionnaire responses with respect to AHS compensating services, primarily fire based services, opting to provide an EMR level of medical first responder service to the municipality. However, two municipal respondents claim their current service model is volunteer, EMR trained and one municipal respondent claims this model is at risk of surviving based on the requirements of the service delivery contract. Another component is the challenge related to recruiting and retaining volunteers in medical first responder roles.

Some municipalities reported a degradation of their level of service. One municipality’s ALS ambulances may be dispatched to calls outside their municipality while they may get a BLS ambulance in response to their calls. At times there are no EMS units in the community while the local units are covering other municipalities. Response times were reported by many municipalities as having increased because local

units are in other communities or on inter-facility transfers outside of the area. This has placed a greater demand on the medical first responders.

Several municipalities reported they did not think consideration was given into how the new service delivery model and the transition into it would affect rural areas. AHS, in applying the same service delivery model across the province, has not addressed unique situations in communities. This new service delivery model appears to be designed for cities and larger centres, with little or no consideration to the needs of rural Alberta. Time, care and consideration was not used in determining the needs of rural communities. While each community has unique issues, examples from municipalities regarding specific issues with training, resources and service delivery are:

- municipalities on the Alberta borders; and
- areas with great seasonal variance in population and activity such as municipalities that have lakes with summer villages, parks, ski hills etc.

One municipality respondent criticized the provincial government for essentially tearing apart the “safety systems communities have funded and worked very hard to put in place... and not providing something better in its place. To do so shows a total disregard for the safety of the community and its residents.”

EMS delivery model

Municipalities that are happy with the transition of EMS to AHS gave reasons such as improved flow of patient care, and being relieved of the challenges of funding ambulances and administering EMS. A borderless system was seen as more efficient in that there was “better utilization of resources across the region (although not always) and increased transfer efficiencies by reducing ‘empty’ return trips”. Better flow for patient care was also reported. One municipality reported that AHS has committed to providing “seasonal manpower and equipment to meet with the community need during peak seasonal demands i.e.; ski season and weekend increases in call volume”.

Although it was felt that the care to the patient remained very good, a number of the key issues were identified with the new EMS delivery model. The coordination of local resources has become much more difficult with the dispatching of medical first response and EMS from different dispatch centres making communication between each other difficult or delayed. This has resulted in responses where more than one ambulance or no ambulances were dispatched, dispatch centres not being aware of where the ambulances are, fire first responders and EMS not being able to communicate to each other prior to arrival on scene, and the CCC not being aware of which unit would be most appropriate to dispatch based on both level of care and geographic location. At times communities do not have ambulance coverage due to increased inter-hospital transfers and system status management model so a backup ambulance from another community is required. An example given that illustrates this is that a patient in a long term care facility was in a life threatening situation but they had to wait about 45 minutes for an ambulance to come from another community to move this patient 3 blocks to a local hospital. For many municipalities where transition has occurred, their territory has expanded without increasing the number of ambulances.

One respondent stated that they have been unofficially told that ambulance personnel will no longer go off road into remote areas such as coulees or trails when they have to ride on a fire department apparatus to get to a patient. If this is part of a change in policy for ambulance personnel, that leaves fire department medical first responders with the task of assessing injured patients in order to move them on

unconventional vehicles such as ATV's or gators. If ambulance personnel are not able to attend to the scene this will require the municipalities to train all of their firefighters to a minimum of EMT or EMR in order to have 24 hour medical expertise to assess injuries in order to transport.

Some communities are losing their volunteer ambulance service. One municipality reported that most of the calls that they responded to were non-emergent transfers that worked well with volunteer help. They find it difficult to justify a twenty-four hour full time service to replace this service. Others who are currently contracting services to AHS are finding it difficult to remain sustainable based on contract requirements.

A number of municipalities reported that the same level of service has not been maintained. Prior to transition they were providing ALS and now with AHS EMS, they are only getting BLS response. Several municipalities have reported that they now have fewer ambulances available now or their ALS crews are sent out on calls outside their territory and BLS crews from outside their territory respond to their calls.

There is a sense from responses that all types of ambulance responses are increasing and long distance transfers are increasing at a particularly dramatic rate. One municipality cited their increase in responses to medical events as an average of 5% per year and an increase in long distance transfers as 40% in the last 2 years which is work done in addition to regularly scheduled ambulances.

It was noted in one response that as the medical events increase, the frequency of the circumstance where all the ambulances in the area are deployed simultaneously also increases. In this area, the point at which all ambulances are dispatched concurrently is described as a "code red event". Historically, the frequency of these events was monitored and used as an indicator of the stability of the EMS system. Code red events are projected to nearly double from 123 in 2011 to 240 in 2012. To manage the risk of prolonged ambulance response during these events, the City provides medical first responses at an ALS level. The investment was minimal as the staff trained at the ALS, or paramedic level, were already in place on the fire trucks- one of the inherent efficiencies of the integrated Fire/EMS model. The addition of the ALS medical equipment was the only investment required to provide an ALS first medical response. In 2011, fire trucks responded to 2935 medical incidents, often arriving before the ambulance. Further, 66 of these medical first responses occurred during code red events when ambulance responses were delayed. The ALS medical first response ensures that critical ALS interventions are not delayed because an ambulance is not immediately available.

A number of municipalities requested that AHS work with them to build a partnership and improve communication. Several municipalities commented about not having an understanding of AHS's long term goals for EMS or the desired level of service for their community. This is particularly challenging for municipalities that continue to provide EMS. It was also pointed out that AHS EMS administrators have not indicated how AHS intends to provide service as municipalities grow and the demand for ambulance services continues to increase. The need to know and have input into the level of EMS response was noted by several municipalities. A number of concerns were raised about how a municipality in the past could provide ALS response and under the new model are receiving more or only BLS. In some situations their municipalities' ALS crew are dispatched outside the municipality and only BLS units are dispatched into their municipality.

Several municipalities see the transition of funding for ground ambulance services to AHS as positive in that it has eased the financial pressures on municipalities. Other municipalities reported a reduction in resources with the new governance and funding model. It appears that most resource planning is based on metro/urban resource models. The rural/remote areas do not have the same resources in terms of number of trained staff, equipment, and specialty teams (and resources). One municipality responded that “There is no trust between municipalities and the bureaucracy in AHS due to matters such as cost, training, supplies. Even getting equipment back from receiving hospitals is an issue that has required municipalities to go to the urban hospitals to retrieve equipment.” Several comments were made about the need for a long-term ambulance dispatch agreement to facilitate their long-term planning. Many of the contracts are around four years old and “there has been a large increase in expectations in the level of service we have to provide but no increase in funding to alleviate the increasing costs.”

There is a loss of local decision making to arrange EMS coverage for special community events because sometimes the ambulances for their municipality are out of their community for extended times due to being held up at a receiving hospital or because they are responding to calls outside their territory. The increased need for medical first responders to fill that gap left by the increased response time from EMS impacts municipalities resources and funding. There was the suggestion that municipalities should be able to bill to offset costs when an ambulance is unavailable to respond quickly.

One municipality pointed out that dispatch centres need to understand the need and be proactive in dispatching resources in a more timely and effective manner.

Governance and administration

The loss of local decision-making with the new governance and funding model has resulted in the reduction and lack of flexibility with how resources are used. An example of this impact is that communities were able to arrange EMS coverage for special community events in the past.

Since transition, EMS is taking longer to get to a scene so medical first responders are being relied on more now to be the first on the scene. This growing demand is impacting municipality’s resources and funding; there was the suggestion that municipalities should be able to bill to offset costs when an ambulance is unavailable to respond quickly.

Issues with EMS management emerged from many respondents and included: the lack of a long term vision and a lack of goals for EMS, the perception of too many managers and a budget used to support the bureaucracy, a centralized structure that should be de-centralized, a need to inform the public as to how EMS works, a climate of mistrust between AHS and integrated services, and a lack of communication with municipalities. The relationship between municipalities and AHS may best be reflected by one comment from the questionnaire: “There is no trust between municipalities and the bureaucracy in AHS due to matters such as cost, training, and supplies.”

Integrated services

Of the questionnaires analyzed, many respondents either did not comment on an integrated fire/EMS delivery model, felt it was not applicable, or had no knowledge of the model. Not all responses presented under the integrated model section of the questionnaire actually related to the model itself and instead presented comments on other issues. Those comments that related directly to an integrated fire/EMS model of service delivery supported an already existing model of integration operating in primarily small

rural municipalities where this type of model may have financial efficiencies for those municipalities with low population and low call volumes. In one instance an integrated fire/EMS service found it challenging to comply with the requirements of the contract and subsequently opted to divest of the EMS service but commented there is now a lower level of EMS service provided to citizens.

Concerns about the integrated fire/EMS service model include:

- As ambulance and fire communications become disconnected and the ability to coordinate these resources no longer exists, it will be difficult to maintain the existing integrated fire/EMS services.
- Prior to the transition, one municipality reported that their provision of integrated fire and EMS was more efficient as resources could be deployed to any emergency within the municipality. Under the new service delivery model this efficiency is lost because of the requirement by AHS to ensure staff are available for EMS emergencies, even when no emergencies occur. They stated that the funding provided by AHS does not cover all of the costs required to provide this dedicated EMS resource.

Staffing and training

Concerns from respondents regarding staffing and training included:

- Change of staff schedules to flex time; “96 hour shifts being asked of local EMS crew”.
- Important to have more “training opportunities between EMS and Fire”.
- “Vast differences in staff qualification criteria and operational methods at the various dispatch centres”.
- “Efforts towards interagency cooperation and training in the field of emergency management is harder now, as many different services are responding in any given jurisdiction, and you don't know who will show up at your incident”.

Expanded scope of practice

Nothing significant was reported.

Hospital wait times

The time the EMS crew needs to wait and provide care to a patient they have transferred into a health care facility were referred to as *hospital wait times* or *hand-off times*. There were mixed reports about the effect of the transition on these hand-off times. Responses included being unaware of hand-off times, perceptions there was no change since prior to the transition or that handoff times had improved but there was still room for improvement. Several municipalities reported that the hand-off to their local rural hospitals was quick but the handoff to urban hospitals still was slow and in some cases getting worse. However most municipality responses identified hand-off times as a contributing factor to slower EMS response times in a number of municipalities. Situations were reported where EMS crews were caring for patients for extended periods of time before being able to hand-off the patient to facility staff. Examples included EMS crews providing care in a facility for up to 7 hours, and; an EMS crew stayed all day with a patient waiting to be admitted who, at the end of the day, went back to the sending site without being seen by a doctor. A solution was reported where urban EMS crews take over from rural EMS, but that wait can still be 2 to 4 hours.

Air medevac

Nothing significant was reported.

Inter-facility transfers (IFT)

The AHS EMS inter-facility transfer model appears to be an issue of contention among respondents. The types of inter-facility transfers of greatest concern were those such as diagnostic imaging, out-patient clinics and emergencies.

Questionnaire responses suggest emergency capable ambulances are being deployed away from a community to complete non-emergent transfers thereby taking the ambulance well away from a community. This results in a reliance on first responders within a community to fill the time gap until an emergency ambulance responds from somewhere else. The now longer response distances have perceptively increased response times and as some have claimed, put patients and communities at risk. Respondents articulate municipality perceptions that AHS EMS treats rural communities as “second class citizens” because the standard of response is less than that of urban centres with respect to the timeliness of response and the quality of the responder, that being a minimum of BLS for rural communities while urban centres can expect ALS response units for EMS calls.

Recommendations were provided to improve coverage in rural and remote areas and improve the IFT model. Rotary and fixed wing air support was strongly suggested by a number of respondents as a way to improve response into areas a long distance from primary health care. For IFT, recommendations to have less expensive, dedicated non-emergency transfer units such as the non-ambulance transport (NAT) units currently in place in major urban centres, would leave more emergency capable response units in place to respond quicker to urgent medical emergencies.

Other comments expressed by municipality respondents include: the need to address the unique issues of a rural environment and one-size does not fit all; assigning staff to meet regional needs to resolve staffing issues in rural environs; ensure adequate resources are in place to support the approved operational model for EMS; and the need to bring all EMS employees, whether working for AHS or a service contracted to AHS, up to an equal level of pay. One respondent stated public safety is a municipality responsibility as per language in the *Municipal Government Act*.

Positive comments, though few, were general in nature and articulated a provincial system as a good idea that is presently working well but needs some improvements

Medical direction/oversight and patient care

One respondent commented that EMS medical care in rural areas should be equal to that in urban centres, another respondent would like medical consultation with Medical Directors to occur at the local level, and a third respondent expressed concern that while hand-off times appear to be less, the reason is a result of physician examinations in hospital hallways, a situation that may be compromising patient confidentiality.

One municipality reported that medical control was at a significantly lower standard now than it was before the transition.

One municipality reported that the implementation of Emergency Medical Dispatch protocols has resulted in consistent and effective dispatching of ambulance resources.

One municipality explained how they had hired physicians to work as patient advocates, review staff competence, participate in staff training, adjust medical protocols based upon evidence and data and audit patient care reports. They stated that “today, there is minimal medical direction or support, and the quality of medical protocols utilized has diminished as a result.”

PSAP Centre Questionnaire Analysis

Questionnaire sample group

Potential respondents to the PSAP centres questionnaire were identified by a representative of the Alberta Emergency Management Agency as key contacts representing specific Public Safety Answering Point (PSAP) centres in Alberta. Twenty-eight respondents were identified, including 3 RCMP PSAP centres, and e-mailed a detailed letter explaining the purpose and objective of the review. Attached to the e-mail was the questionnaire and contacts were invited to complete the questionnaire and e-mail, fax or mail the completed document to the HQCA contact information provided in the letter.

Methodology

A thematic analysis using qualitative research methodology was undertaken to systematically analyze the information from the interviews as described in the Stakeholder Interview Methodology. Using the four key themes emerging from the stakeholder interview analysis, responses provided in the PSAP centre questionnaire were classified under one of the key themes. As per the interview analysis, a fifth secondary category was identified as Medical Direction and Patient Care which will be discussed later in this analysis.

Results

Responses from fifteen questionnaires were submitted and analyzed.

Analysis

Impact of transition

Many respondents indicated the transition resulted in no change to EMS, weren't aware of a change to service, cited no negative issues with the transition, and had no comment regarding the transition or felt it was not applicable to their agency.

Responses citing the negative effects of the transition related primarily to an increase in dispatching times, difficulties in communicating with AHS administration, funding, response times, and decreased ambulance coverage in rural areas and the need for medical first responders to fill the perceived gap left by AHS EMS. Communication at the frontline between practitioners and other responders was also cited as a negative with respect to radio communications and technology. Funding issues related to the challenges of municipalities to prop up medical first responders in their communities and a concern their voices aren't being heard because they are no longer part of the funding model. The challenges of the North Communications Centre were presented with respect to it being an incomplete technological

implementation at the time of the transition resulting in a number of delayed dispatching and response issues.

Questionnaire responses citing positive impacts of the transition were numerous and consistent with benefits cited throughout the questionnaire. The benefits of the funding model were presented as a centralized systemic model that allows for future planning and growth without the bias or influence of regional interests. Conversely the issue of decreased funding and viability of local dispatch centres was also presented. Positive impacts from a service delivery model related to comments about the ability to deploy the closest ambulance to an emergency within a borderless system using up-to-date mapping and dispatching technology. The advantages of EMS being aligned with health were also cited as best for the patient as a result of inclusion into a system that tracks a patient from point of contact to discharge from the hospital. While one respondent agreed with this inclusion into health the caution was presented that there still needs to be consideration for EMS as part of the public safety net for communities.

Data management

It is evident from the responses provided in the PSAP questionnaire that processes and parameters to collect and analyze EMS performance data are very inconsistent and disparate across the province. While each dispatch or PSAP centre, be it an AHS centre, contracted EMS dispatch centre to AHS, or PSAP service claims they are collecting accurate data efficiently and regularly, the difficulty in comparative analysis to determine actual EMS performance metrics across the province will continue to exist until such time as performance metrics are consistently defined, applied, collected and measured. Many respondents claimed increased response times in their communities suggest local challenges exist as a result of the transition of EMS governance and funding to EMS however, the challenge of comparing current data to data prior to the transition exists locally and would be extremely difficult systemically. That being said, negative responses consistently presented anecdotal evidence of increased response times and increased times in dispatching as a result of the transfer of a call from a local dispatch centre to an EMS dispatching centre. The same can be said for emergency department hand-off times where responses from the questionnaire generally cite an increase in hospital wait times. The need for local knowledge by dispatchers was cited by most of the respondents as a key issue to dispatching and reducing response times in their local regions but this issue was not presented by any of the three provincial AHS dispatch centre respondents.

Consistency in data management does appear to exist with the Alberta Health AAIMS database. All EMS in the province are required to report into the database and there is an indication from respondents that there may be an opportunity for some comparative data analysis using this database. It is also evident from responses that CAD to CAD interoperability is required in order to successfully communicate between centres and practitioners and successfully collect and analyze data.

EMS dispatch and communications

A response from one agency suggested the removal of the EMS dispatch function from municipalities reduced the workload on local dispatch centres however the cost of maintaining these centres remained the same or increased. The issue of financial viability was also presented in other responses in reference to previously funded PSAP centres having their funding removed for EMS dispatching and transferred to dispatch centres contracted by AHS.

Concerns expressed by some respondents regarding the state of dispatching EMS in Alberta related to the increase in dispatching time for EMS when a PSAP center has to now transfer the call for EMS to an EMS dispatching centre, the claim being made by one respondent that this did not happen prior to the transition and now causes a delay in the dispatching of an ambulance. Many specific examples were provided by respondents of delayed responses, delayed dispatching, inability to find a location, or arrival at the wrong location.

A quote from one agency response states “Inexperienced dispatch staff without knowledge of the areas they serve has made the system untrustworthy”. This statement speaks to two recurring issues identified by respondents not considered by AHS: that of the perceived need for local knowledge by dispatch personnel in rural dispatch centres, and of the general conveyance of distrust and lack of confidence in AHS staff, particularly with regards to how AHS engages or communicates with stakeholders and reports data. Claims of ‘one size doesn’t fit all’ were articulated with statements to the effect that an urban dispatch model does not apply to the rural environment.

Respondents from AHS consolidated dispatch centres have a much more positive perception about the state of EMS dispatch in Alberta. Respondents cited a positive impact on patient response times and care because all ambulances are equipped with: enhanced province wide communications using the i/DEN radio system, mobile satellite radios for isolated areas, enhanced VHF radio channels for full interoperability with police and fire, mobile data terminals (MDT), and a province wide mapping and GPS vehicle location system. A consolidated dispatch model allows centres to send the closest ambulance to a patient regardless of what area or municipality the ambulance originates from, resulting in a borderless dispatch model. According to respondents, AHS works closely with PSAP centres and rural dispatch centres and has placed MDTs in in a couple of centres to provide instant notification of emergency medical events impacting the centres and their communities. Those in favour of consolidated dispatch favour less than more centres citing three centres as ideal.

Rural medical first response

Issues and concerns related to rural medical first response were presented specifically related to ambulance coverage in communities and the impact of medical first responder response. Respondents articulated delays in the response of an ambulance into a community resulting in responses by community medical first responders, particularly fire department medical first responders. Delays in ambulance response, compounded by ambulances being deployed outside a community for coverage or being delayed in an urban centre, has resulted in a decrease in ambulance coverage in many rural and remote areas of the province. Responses in the questionnaire suggest fire departments/municipalities are therefore filling a gap and a need in communities and are essentially subsidizing AHS EMS for health care costs thereby increasing municipality costs and producing a loss of productivity in fire services. It was articulated there is no funding provided by AHS EMS for non-AHS medical first response in communities.

Integrated service providers suggested the need for language in the service contracts acknowledging the existence of an integrated model and other contracted service respondents articulated the need for a long term contract that includes clear funding structures and support from AHS for the procurement of equipment and pharmaceuticals.

One respondent identified that fire service providers in Alberta do not have consistent practices for medical first responders and this presents a challenge for the consolidated dispatch model and the ability to consistently manage the deployment of ambulances. Local fire departments generally decide when and how to respond to a medical emergency as first responders.

ALS and BLS responses into far rural and remote areas of the province require a defined funding and deployment strategy that includes air medevac and consideration for a change in practice to allow industrial providers to transport patients. Currently these issues result in a drain on available EMS resources in the region as a result of long response and transport times.

AHS claims they have ensured full radio operability with first responders thru their respective dispatch centres.

Medical direction/oversight and patient care

The analysis of responses from the PSAP centre questionnaires showed a lack of reference to patient care. The term ‘patient care’ was presented a total of 17 times in the consolidation of all responses. Three references supported a positive impact on patient care as a result of the transition, two reported a positive impact as a result of either an integrated fire/EMS model and fire department first response, but the majority of responses cited a negative impact to patient care based on the current model of EMS delivery since the transition. However, no evidence was presented or recommended to support either the positive or negative impact.

EMS delivery model

Responses from the questionnaire suggest the AHS transition plan was good in theory but the perception from respondents is efficiencies projected have not materialized and there continue to be delays in dispatching units and an increase in EMS response times around the province. Respondents not part of AHS or contracted to AHS were critical of AHS EMS citing: a lack of identified goals and strategies, lack of accountability by AHS, and a cumbersome bureaucracy made more challenging by what is perceived to be an intimidating administration. One respondent claimed stakeholders are working around the system to meet their own local needs. Anecdotal claims of increased hospital wait times and claims of overall inefficiency were made but some respondents also admitted no data is available to support these claims.

The issue of industrial providers was identified by one respondent who deals regularly with service providers on industrial sites. The issue of concern is the inflexibility of AHS administration to engage in discussion with industrial partners with respect to the transfer or transport of patients off a private industrial site onto public land which then becomes the responsibility of AHS with respect to patient transport and care. This impacts the local EMS service provider and how they operate in this environment.

Conversely, one AHS respondent cited an improvement in the management of resources provincially, specifically related to inter-facility transports (air and ground) when transports are coordinated from a central location, a process that did not occur prior to the transition, a result of no communication between regions and the tendency to operate within defined operational borders. According to the respondent, air ambulance activity is now coordinated with IFT and resources are deployed without consideration of previously defined borders thus providing the opportunity for transport of patients in both directions. The

respondent also made the claim that all EMS crews now have access to on-board mapping and communications systems. This claim requires some clarification to determine if this is the case with all EMS including contracted service providers or just AHS EMS ambulances.

Regarding comments related to an integrated service delivery model it is of interest to note five of the 15 agency respondents chose not to comment on this model. Comments supporting this model relate to efficiencies possibly gained having both EMS and fire responders dispatched and available at the scene, and the cost effectiveness of this model. Negative comments regarding an integrated service delivery model were specific to the challenge of separating out EMS roles and responsibilities in a fire based service, dedicating resources to perform such roles as inter-facility transfers and health integrated related functions, and the inflexibility of the current contract to address the aforementioned issues. Competing urgencies between fire department needs within municipal boundaries and EMS related functions requiring staff to operate outside boundaries were identified as operational challenges.

Issues related to ambulance coverage in rural areas of the province were identified as key concerns for many respondents. It was perceived by many that communities were left without coverage for long periods of time as a result of units being deployed to either conduct an inter-facility transfer taking an ambulance outside the community and/or being deployed to an urban centre in times of high call volumes and reduced resources. Responses provided regarding the issue of ambulance coverage were compounded by the issue of medical first responders within the community, primarily fire department staff and/or volunteers, being called out for medical emergencies. Responses were then directed at the undefined role of medical first responders within the AHS service delivery model including a municipality's need to fund medical first response in the absence of any AHS commitment or support.

It is clear from all responses that the terms 'urban, rural and remote' need to be defined for AHS and all stakeholders. Responses revealed 17 different definitions to describe the above terms.

Contracted Service Provider Questionnaire Analysis

Questionnaire sample

A list of the AHS EMS contracted service providers was provided by AHS. Forty-one contractors were e-mailed a detailed letter explaining the purpose and objectives of the review. Attached to the e-mail was the questionnaire and contacts were invited to complete the questionnaire and e-mail, fax or mail the completed document to the HQCA contact information provided in the letter.

Methodology

A thematic analysis using qualitative research methodology was undertaken to systematically analyze the information from the questionnaires. Each recorded piece of data from a questionnaire was reviewed and analyzed as described in the Stakeholder Interview Methodology. Using the four key themes emerging from the stakeholder interview analysis, responses provided in the contracted service provider questionnaire were classified under one of the key themes.

Analysis

Of the 41 questionnaires delivered by e-mail, 18 (44%) were completed and returned. One of the respondents requested an interview; it has been included in this analysis. Five other contracted provider questionnaires were returned as part of another respondent group.

Whereas analyses of stakeholder interviews, municipality questionnaires, and PSAP centre questionnaires resulted in the emergence of four key themes (data management, dispatch and communications, rural response, and EMS delivery model) the responses in the questionnaire from contracted service providers were much more targeted. The general themes emerging from this questionnaire were: ambulance coverage within contract service areas, and the contract itself.

As a result of the transition of governance and funding for EMS to AHS respondents cited both benefits as well as negative issues.

Positive impacts from transition were expressed regarding; more stable funding for municipalities; a now borderless system where the closest ambulance is dispatched; high quality training to areas previously under-resourced for staff training; and standardized medical control protocols supported by online medical control for the province. Contractors generally feel they are meeting AAIMS requirements and are meeting quality standards within their services that were defined prior to the transition. Most contractors also documented that they regularly report required data to AHS EMS as a requirement of the contract but they aren't sure who is receiving the data and they have difficulty in receiving data from AHS EMS and Alberta Health AAIMS. Many respondents did not comment on data collection or analysis for their services or AHS.

While there were some positive benefits cited for the consolidation of EMS dispatch such as mapping tools and the ability to manage a large scale incident, these positives were shrouded under respondents' overwhelming support and preference for a more regionalized dispatch model versus a centralized model.

Ambulance coverage

On the negative side, hospital 'hand-off' times are perceived to be longer in urban centres but most responses from contractors suggest these times have not changed in their own response areas. Contractor responses reflecting no change in hand-off times are based on the availability of their local ambulance within their service area.

Many negative responses relate to the decreased availability of ambulances in their service areas as a result of deployment outside the area for non-emergency inter-facility transfers resulting in longer response times into the community from another ambulance. In addition to the longer response times, contractors feel this places more accountability on smaller communities to resource and fund medical first responders in the community to fill the gap of a longer ambulance response time, an issue AHS has not yet addressed with communities. When an ambulance is deployed outside of their community service area this also decreases the contractor's ability to manage surge capacity effectively.

A key issue identified throughout the responses was that of inter-facility transfers. Responses were consistent in how the deployment of ambulances across the province to facilitate inter-facility transfers regularly leaves a community without an ambulance resource. Respondents suggest this results in an ongoing struggle to adapt and modify resources to fill the gap in the community and to rely on medical

first responders to respond to medical emergencies until the arrival of an ambulance from outside the contracted service area arrives.

Issues of delays in dispatch were documented in the responses, specifically in one area but this dispatch is under transition to AHS and some concerns were speculative for the new system. The delays in dispatch were primarily in reference to PSAP centres that previously dispatched EMS now having to transfer the call to one of the EMS dispatch centres. One respondent felt the consolidation of dispatch in their area has resulted in an increase in call volume for inappropriate responses that were cancelled just prior to arrival but taking the ambulance out of the community for the response. The issue of local knowledge for dispatchers was articulated with respondents concerned knowledge is now lost with consolidated dispatch resulting in delays. It was suggested that one size doesn't fit all and local dispatch centres know the needs of their areas better than those dispatching from a more centralized centre. This is compounded by community medical first responders who contractors suggest cannot be dispatched by one of the consolidated dispatch centres. Respondents were overwhelmingly in support of a more regionalized dispatch model versus a centralized model.

The EMS service contract

Based on the responses recorded from the questionnaire, contractors are of the opinion the contract doesn't accurately reflect resource requirements for contractors nor compensate the contractor when added resources are required. An example was given where extra staff were hired and more ambulances staffed to meet contract requirements. Lack of a long term contract and increased travel times resulted in more costs incurred by communities and decreased resources available within the contract service area.

Responses on the questionnaire reflect the need to address the medical first responder issue with respect to overall management, resourcing, compensation and ongoing AHS support for training medical first responders in communities. Issues regarding the retention of volunteer medical first responders and maintaining the skill level of medical first responders were also presented. Respondents want to be considered a partner in the system rather than a sub-standard service being criticized and dictated to, an issue that reflects the communication and engagement, or lack thereof, of stakeholders by AHS EMS administration.

An integrated fire/EMS delivery model was supported in general terms with respect to being affordable and efficient for smaller communities. However issues of resource depletion for fire departments were presented as a concern when staff are required to transport a patient or attend to a patient in the hospital resulting in the absence of that staff member for a long period of time. Six contractor respondents did not comment on an integrated fire/EMS model.

Definitions for urban, rural and remote were varied and inconsistent amongst all respondents which speaks to the need for clarification and consistency within AHS and Alberta Health. One respondent provided relatively clear definitions and recommended investigating terms defined by The Centre for Public Safety Excellence.

While funding for contractors was cited as a benefit for municipalities and contractors with respect to knowing the funding structure and reducing or eliminating municipal costs to operate EMS, the funding defined in the service contract is generally considered inadequate to cover expenses and does not take into

consideration the need for medical first responders within more rural and remote communities where ambulance responses may be long.

Interview and questionnaire analyses - limitations

As Glesne⁸⁴ describes, it is up to the qualitative researcher to bring meaning to words and phrases through analysis and interpretation and how this is communicated determines how plausible the interpretation appears to others. Analysis of the responses from the interviews and questionnaires is an exploratory process to identify common themes emerging from the perceptions, perspectives, and opinions of the respondents. It is the interpretation and reporting of the findings that will inform and support the findings from the other investigative components for the review. Results of the interview and questionnaire analyses convey the overall perceptions and perspectives of the respondents. While a limitation of this type of analysis may be the results are not necessarily generalizable, the importance of capturing the voice of stakeholders will support the findings and recommendations.

None of the interviews were audio recorded. To ensure comments were accurately recorded, two to three interviewers were present during an interview and recorded comments by typing them into a computer and hand-writing notes. Notes were then compared by the interviewers at the end of the session, consolidated into one electronic document. While the limitation to this process is the inability to capture verbatim comments, it was deemed a plausible process to ensure capture of an interview process given the potential for interviewer anxiety if audio-recording was implemented.

Another limitation of this analysis may be that not all key stakeholders were engaged, or offered to participate in the process. However, the list of potential participants for interviews and questionnaires was quite extensive. Participants were also given the opportunity at the end of an interview or questionnaire to recommend a key stakeholder in EMS in Alberta, an expert within the province, a national expert, or an international expert, these suggestions were also taken into consideration.

The use of questionnaires as a tool for data collection may be considered a limitation. The key advantage to using a semi-structured, open-ended response process allows respondents time to answer the questions and provide as much information as deemed necessary. This type of format also “allows respondents to state their opinions in ways not pre-selected by the researcher” (Anderson, 2007). A limitation to this data collection methodology is the potential for low return response rates to the questionnaires. There is also the potential for responses to be generated by individuals or groups with an issue to present. This did not appear to be evident in the analysis of responses with both negative and positive issues being presented.

Summary of interview and questionnaire responses

A total of 181 responses were qualitatively analyzed: 47 stakeholder interviews, 101 municipality questionnaires (representing responses from 62 number municipalities), 15 PSAP centre questionnaires, and 18 contracted service provider questionnaires.

The interview analysis evolved from the identification of 63 separate categories to 10 separate codes and the final emergence of four distinct primary themes: data management, dispatch and communications, rural first response, and EMS delivery model; and one secondary theme: medical direction and patient care. The coding and themes were applied to the analysis of the municipality questionnaires while the data from the analysis of the PSAP centre questionnaires fit within the four defined emergent themes

without the need to apply the previously identified 10 codes. Analysis of the data from the contracted service provider questionnaires was very targeted and resulted in the emergence of two separate themes for this group of responses: ambulance coverage and the EMS service delivery contract.

Impact of transition

Respondents generally agree that EMS is health but expressed a consideration for EMS as part of the public safety model that includes emergency response from fire and police services. There were mixed reviews from interview and questionnaire respondents regarding the decision to move EMS into the provincial health system away from municipal governance and funding. There is general agreement but most (but not all) that the EMS system prior to the transition to AHS was inconsistent, disjointed, disconnected, not standardized, local in focus, and inequitably funded across the province. It is generally understood it takes time to build a great system and there will be growing pains. However, the EMS transition occurred at the same time the entire health system in Alberta was being revamped and decisions were being made without a solid foundational structure. The change management process was poorly addressed with staff during the transition of EMS to AHS and the ongoing organizational changes within AHS and EMS since the transition have resulted in what some respondents have termed ‘change fatigue’.

The positive impacts of the transition were reported as: standardization of medical control protocols, training, some quality assurance auditing and the standardization of fleet and equipment. Negative aspects of the transition were cited as: a loss of community connection for EMS, perceived decreased ambulance coverage in rural areas, a culture of mistrust, a perceived lack of adequate resources to meet system needs, and the cultural challenge of staff shifting in a new organization culture. One issue that was pervasive through the analysis of all four groups was the poor stakeholder engagement and communication by EMS administration.

There was some reported relief by municipalities from the EMS transition of governance and funding but there are a number of municipalities who still feel local governance of EMS allows for better coordination of local emergency services as part of a public safety model.

Data management

Based on the fairly consistent comments documented, the collection, analysis and overall management of EMS data is a key issue requiring further investigation and solutions. Prior to the transition data management was variable and disparate across the province ranging from no collection of data to sophisticated data management processes in more well-resourced urban centres. Data collection and analysis was therefore inconsistent and difficult to conduct comparative analyses, a situation that is slowly improving since the transition. The Alberta Health AAIMS database was implemented years before the transition and although compliance regarding submission of data was required by all EMS providers in Alberta, compliance did not exist. There were claims by many respondents that they have been unable to acquire accurate statistical data from Alberta Health and these claims extend now to AHS and the difficulty in getting data services need to improve operations and patient care.

EMS dispatch and communications

It is clear from the majority of respondents that the consolidation of EMS dispatch centres across the province has many advantages including: the ability to track and monitor EMS units across the province

and dispatch the closest ambulance to an incident, standardization of dispatch processes including staff training and operating procedures, and using consistent technology across the province. Until the issues of resource depletion in rural areas, or the perception of such, are resolved there will be resistance to dispatch consolidation from areas where local dispatch centres exist. Consistency in technology is required across the province for mobile data terminals (MDT), computerized assisted dispatch (CAD), GPS, and radios for interoperability between emergency services. Negatives cited revolved around political interference to halt the consolidation thereby hindering progress to standardize and gain efficiencies.

Rural areas consistently cited the lack of local knowledge for dispatchers in a consolidated centre as a concern that will lead to longer response times. Responses countering this argument contended that consistency in technology in areas of mapping and GPS on all units would solve the need for local knowledge. PSAP centres reported funding losses for local dispatch centres when EMS funding was removed and expressed concerns around the viability of these centres as a result. As reported previously from the municipality questionnaire analysis “Many of the municipalities believe that dispatch consolidation has adversely affected response times. Contributing factors include the transfer of calls between dispatch centres, ambulances being out on transfers or dispatched to other communities, inaccurate information from the AHS dispatches and lack of local knowledge.”

Rural medical first response

The term ‘first response’ has many interpretations for different groups and requires defining for future discussion. The term implies the first medical response in a community when an ambulance is not readily available and/or will be delayed in response. Historically medical first responders in a rural community will be fire department based and/or volunteers. Medical first response was not considered in the transition plans however AHS EMS relies heavily on this type of community response and is integral in the EMS response model. Claims were made during interviews and questionnaires that health funding for EMS in integrated services supports fire functions. Conversely, municipalities and contracted service providers feel they are supporting EMS functions without funding by training medical first responders and providing resources for response. Concerns were articulated over a lack of standards and poor medical oversight for first responders. However, AHS EMS medical directors were directed by the Minister to provide medical oversight for these groups and according to one AHS respondent a proposal has been developed and forwarded to the Minister’s office for approval to implement an AHS EMS medical first responder plan.

Contracted services as well as other respondents reported on the inflexibility of the current AHS EMS service contract for contractors and had issues with the fact the contract doesn’t reflect resource requirements and compensation for added resources when required. It is also clear from responses the terms ‘rural, urban, and remote’ need to be defined to better reflect service requirements and expectations in these areas.

Inter-facility transfers (IFT) were identified as a factor that has had a significant impact on rural services. A number of municipalities cited that they had a significant increase in inter-facility transfers since the transition which has impacted the availability of ambulances for emergency calls. Responses suggest IFT need to be addressed with respect to the provision of an overall service plan and adequate resources to support the plan.

Medical direction/oversight and patient care

This emerged as a secondary theme for two reasons. First, responses were generally positive citing the benefits of standardized medical control protocols, centralized online medical control and the inclusion of EMS into health as a key partner in the patient care continuum. While patient care is perceived to be improved as a result of the transition, there is no quantitative evidence yet to support these perceptions. The second reason this is not a primary theme identified from the responses is the surprising lack of reference to patient care throughout the analysis of responses.

EMS delivery model

The complexity of designing an EMS delivery model for the province is evident from the plethora of responses related to this key theme. The identified themes from analysis of the interviews: data management, dispatch and communications, rural medical first response and the secondary theme of medical direction/oversight and patient care are all key factors contributing to the design and function of a sustainable EMS delivery model.

The phrase ‘one size does not fit all’ was articulated by more than one respondent suggesting a more differentiated delivery model to address the needs for urban, rural and remote is required. However, while ideally each community would like its own ambulance it is evident from responses that there is a general understanding that it is financially and clinically impractical to place a highly qualified ambulance crew with sophisticated equipment in an ambulance in a rural or remote community that has a very low call volume. The converse argument to this is that the rural environment, where the level of emergency is often critical and the distances from a medical facility are often far, is where you want to place an ALS response unit versus a BLS response unit. The question of skill degradation arose in the responses for practitioners stationed in low call volume areas with the possible solution recommended as a rotation of staff through a rural shifting structure. Another solution to skill degradation and the provision of medical care in communities was identified as the integration of skilled EMS practitioners into community medical facilities working with other allied health professionals. The concept of community paramedicine was recommended and is a concept gaining international attention particularly in Canada through the EMS Chiefs of Canada and its applicability in Alberta is worth investigation.

Recommendations for a model of EMS delivery in Alberta proposed by one respondent included investigation into the forecasting model used for The City of Calgary EMS prior to the transition. This consisted of: creating more flexible shifts– a combination of 10 and 12 hour shifts, balancing the number of vehicles with the number of stations, and investigating the timeframes when performance issues are occurring. Other suggestions proposed for AHS included: using a broader set of responders such as police and fire; defining how you measure performance and looking at rural and urban demands, times of high demands, travel considerations including weather and road conditions; and looking at scene times and proximity and availability to handle demands. The respondent was of the opinion EMS calls could be predicted days in advance. Other recommendations included ensuring the technology you need is in place and used correctly and looking at alternate forms of transportation instead of just ambulances.

From the interview responses, an EMS delivery model needs to be:

- Patient centric and patient focused based on evidence based practice;
- Measurable and outcome focused;
- Clearly defined and articulated to all stakeholders including the public, provincial communities and municipalities including First Nations and Métis settlements;
- Comprehensive in nature and differentiated enough to address provincial and local needs and include all modes of response and transport including air, ground, non-emergency, inter-facility transfers, and rural first response;
- Based in the health care system yet strategically aligned with allied emergency responders;
- Technologically sophisticated and robust enough to accurately measure and report performance, be predictive for resource requirements and utilization, communicate with practitioners and responders, and support training.

Appendix VIII: EMS Review Frontline Worker Interviews Report

Health Quality Council of Alberta

Review of Operations of Emergency Medical Services in Alberta: *Interviews with Front Line EMS Workers*

Kathy Germann PhD & Lisa Casselman MSW, RSW
October 30, 2012

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Introduction

As part of the Health Quality Council of Alberta's (HQCA) review of emergency medical services (EMS) services, fifty semi-structured telephone interviews were conducted with EMS workers, including EMRs, EMTs, EMT-Ps¹¹ and first responders. The intent was to elicit frontline perspectives about the impact of the transition of EMS services to Alberta Health Services (AHS) on the quality and safety of patient care. This document begins with a description of the approach adopted, including limitations. A presentation of key findings follows. These are organized under four broad themes: perceived benefits of the transition to AHS; communications, the transition process and relationships with other EMS stakeholders; impacts of the transition on the delivery of services; and, finally, impacts on front line EMS workers. In the final section, a small number of closing remarks are presented.

PART I: Approach

An independent research team was contracted to conduct the interviews. The team worked closely with HQCA staff to conduct the interviews. An interview guide including interview procedures and semi-structured interview questions was provided by HQCA, as were lists of stratified random samples of EMS workers and first responders. The HQCA made the initial contact with prospective interviewees by way of e-mails that introduced the EMS review project and HQCA's intent to interview frontline workers as part of this review. In this message, the HQCA introduced the research team and advised the e-mail recipients that they may be contacted by a member of the research team and invited to participate in an interview. The research team subsequently contacted prospective interviewees, arranged and conducted interviews, analysed the interview data and prepared this report.

Interview questions

An interview guide was provided to the research team by the HQCA. This guide outlined the general approach to be taken for the interviews including a description of the Alberta Evidence Act and measures to be taken to ensure interviewee awareness that their participation was voluntary and that the information they provided would be kept confidential. It also included a core set of interview questions. The questions focused on:

- *Information about the interviewees' role, credentials and background*

¹¹ EMR= Emergency medical responder
EMT= Emergency medical technician
EMT= Emergency medical technologist - paramedic

- *Effects that have occurred as a result of the transition of funding and governance for ground ambulance from municipalities to AHS (benefit, issues, any changes in response times or hand-off times in emergency rooms)*
- *Impact of the transition on patient care*
- *How changes to the EMS were communicated during the initial transition and at present*
- *Changes related to dispatch (benefits, issues, whether dispatch was consolidated and if so, impacts on patient care)*
- *Effect of the transition on relationships between EMS and first responders*
- *Effect of the transition on integrated fire/EMS service providers*
- *Perceptions of how EMS response is working in other areas (urban, rural, remote; any specific challenges for these areas)*
- *Knowledge of EMS data collection and analysis*
- *Anything else the interviewee wished to say*

Please see Appendix A for the complete interview guide provided by HQCA.

Sampling strategy

The original intent was to conduct 40 interviews with an equal representation of emergency medical responders (EMRs), emergency medical technologists (EMTs), paramedics (EMT-Ps) and first responders in urban, rural and remote areas of the province. The HQCA provided the research team with a stratified sample of frontline EMS workers and first responders, with the intention of ensuring that a well-rounded representation of different experiences and different voices from across the province was heard. The purpose was not to have a provincially representative sample, but rather to capture a broad range of perspectives from across Alberta.

The sample was based on three sources. One was a confidential list of “frontline” AHS Emergency Medical Services staff and their contact information (5,152 people or 53.4% of registered EMS providers in Alberta), including both direct delivery and contracted service providers. This list was cross-matched based on first and last name with the registration information exported from the Alberta College of Paramedics website (9,651 registrants in Alberta at that time) in order to determine discipline (i.e. EMR, EMT or EMT-P). Next, using information provided by AHS and in conjunction with geographic information about Alberta, a categorization of “urban, rural or remote” was approximated for each person. A random number generation process was used to generate a stratified random sample based on discipline, work description and geographic categorization.

The second source was a list of frontline practitioners who responded to a request sent out by HQCA for volunteers. These respondents (N=264) were also categorized into the three EMS disciplines and the geographic area within which they worked. Once again, a random number generation process was used to generate a stratified random sample based on discipline and geographic categorization.

Lastly, a confidential list of fire first responders from the Alberta Fire Chiefs Association (N=678) was provided to the HQCA. Using the addresses provided on this list, individuals were once again assigned into one of the three geographical categories (i.e. urban, rural and remote). A random number

generation process was used to generate a stratified random sample of fire first responders based on geographic categorization.

The interviews were conducted between September 11 and October 18, 2012. The research team contacted prospective interviewees as per the lists generated and supplied by the HQCA. If no response to the initial request was received within 2 to 3 days, a reminder e-mail was sent. If there was still no response, the research team moved to the next person on the list and the process was repeated. In total, approximately 160 people were contacted with a request for an interview. The research team found it particularly difficult to recruit interviewees from remote areas of the province, but ultimately did interview the required number of people from these areas. The majority of first responders interviewed were Fire Chiefs or Deputy Fire Chiefs from paid and volunteer fire services. The research team found that some interviewees who had been listed as “frontline” workers had moved into management or other out-of-scope positions; some had changed jobs and locations, and others worked in more than one community.

An artifact of randomization, the way in which urban workers were identified, and of the self-selection of interviewees to participate in an interview resulted in most of the initial cohort of “urban” interviewees being from locations other than Edmonton and Calgary. To rectify this, and to ensure a representative proportion of perspectives from these major centres, the sample was augmented with four additional interviews from Calgary and four from Edmonton. Two additional interviews with rural providers were conducted to compensate for the fact that some interviewees were new to their jobs and had limited knowledge of the transition to AHS or its impacts. This resulted in a total of 50 interviews being conducted.

The goal of capturing a broad range of perspectives from across the province was achieved. EMS providers and first responders (i.e., fire-fighters) from 30 different communities across Alberta participated in the interviews. Geographical areas represented by the interview participants are presented in Table 1 below.

Table 1. Geographical areas represented by the interview participants

- | | | |
|------------------|-----------------|--------------------|
| • Banff | • Bonnyville | • Bow Island |
| • Brooks | • Calgary | • Chauvin/Edgerton |
| • Coaldale | • Edmonton | • Edson |
| • Fort MacLeod | • Fort McMurray | • Fox Creek |
| • Grande Prairie | • High Level | • High Prairie |
| • Hinton | • Lethbridge | • Olds |
| • Onoway | • Oyen | • Picture Butte |
| • Raymond | • Red Deer | • Sherwood Park |
| • Spirit River | • Swan Hills | • Taber |
| • Trochu | • Three Hills | • Vegreville |

Data collection, management and analysis

Three researchers conducted the interviews, all via telephone. Interviewees were informed that they were protected under Section 9 of the *Alberta Evidence Act*, that their information would be anonymized and kept confidential, and that it would be shared only with the HQCA which is required to store all data in a secure manner.

All interviews but two were digitally recorded with the interviewee's permission. In most cases, interviewees received the semi-structured interview questions prior to being interviewed; several took the time to review the questions and prepare their responses. The researchers took notes during the interviews and subsequently listened at least once to the audio recordings, making further notes or refining those already taken, and in some cases, transcribing key sections of the interview. Textual data was recorded and stored in two ways. First, an Excel-based data collection template was developed to capture responses to the key questions outlined by the HQCA. Second, pertinent passages of interviews were transcribed and stored in the QSR NVIVO qualitative data analysis software. Combined, the data constituted an estimated 200 pages of single-spaced text.

An iterative process of data analysis was undertaken. After the first few interviews, the research team met by telephone to compare notes and discuss emerging themes. These kinds of conversations continued throughout the two month data collection and analysis period. A preliminary report of emerging themes was provided to the HQCA mid-way through the process. Coding and analysis of data (via cutting and pasting into Excel spreadsheets and coding in the NVIVO program) occurred alongside data collection. While research team members frequently discussed themes emerging from their interviews, they coded their data independently. Once the majority of interviews were completed, the researchers shared their data and their coding schemes. The coding had some variations based on different groups of people interviewed (e.g. rural versus urban perspectives) but the key emergent themes were otherwise remarkably consistent.

The most intensive phase of data analysis occurred during the preparation of this report. This required intensive conversations within the research team to share and compare data, and to ultimately develop the findings that are presented herein. The final phase of the analysis was to compare themes emerging from the frontline EMS data with those identified in other HQCA-conducted interviews for the review. While the themes were titled differently, it was found that the EMS front line worker data could be easily mapped to the broader themes generated through the HQCA review.

Limitations

There are some limitations to the findings reported herein. First, people inevitably made a choice as to whether they would participate or not in an interview for the review. Individuals tend to make the decision to participate when they feel they have something important they want to say. Generally speaking this includes people who have either quite positive or quite negative experiences related to the interview topic. Also, when the topic being explored in an interview is sensitive in nature, some

individuals may choose not to participate because they do not feel safe in voicing their opinions. What is presented in this document, then, is the perspectives of the people who did choose to participate in the review process. There is no way of knowing whether the individuals who chose not to participate in an interview as in some way different, and may have had different perspectives, from those individuals who did participate.

Second, although the interview sample represents a good breadth of perspectives across the province, it lacks the depth of perspectives that would be required to make any generalizations about the impact of the transition of EMS services to AHS across the province as a whole. Thus in reviewing the themes reported herein it is essential to keep in mind that the intent is not to make generalizations about the state of EMS in Alberta, but is rather to demonstrate the range of perspectives expressed in the interviews and to identify both points of convergence and divergence.

Finally, these interviews were conducted and the data analysed in a short period of time. While every attempt has been made to capture the major themes presented in the data it is possible that some nuances may have been missed and other sub-themes thus may not have been captured.

PART II: Findings

In this section, interview findings are presented, beginning with perceived benefits of the transition and followed by issues related to communications, the transition process and relationships with other EMS stakeholders. This is followed by presentation of major themes related to interviewees' perceptions about the impacts of the transition to AHS on service delivery. Finally impacts of the transition on EMS workers are presented.

Benefits of the transition to AHS

Two major themes related to perceived benefits of the transition to AHS emerged from the interview data. The first and dominant theme was the increased ability to provide a higher and more consistent level of patient care across the province. This was reported by the majority of interviewees. As one person noted,

“The really big overshadowing outcome of [the transition] is that there is far greater consistency in the level of service provided. Before, when there was many mom and pop organizations running ambulance services, it really seemed to be inconsistent with both quality of service and the quantity and equipment. So the transition to AHS really seemed to fill a lot of that gap and even out the playing field”. (Rural first responder)

Contributing factors include the implementation of standardized medical care protocols (MCPs) across the province and the provision of online medical consultation (OMC) by a core group of medical directors who are knowledgeable of the MCPs and the scope of practice of EMS workers. These directors are available to EMS workers 24 hours a day, seven days week. Combined, the MCPs and OMC appear to have facilitated an expanded scope of practice for some EMS workers and thus the provision of more advanced care on the ground. They have similarly resulted in consistent provision of care no matter

where in the province the patient is being treated. Enabling this in some cases (but not all) is the addition of new and better, standardized equipment.

The second major theme is related to the professional benefits to EMS workers. These include improved and equalized salaries, job portability, training, and an expanded range of career opportunities within AHS.

These themes are described in more detail below.

Improved ability to provide high quality and consistent patient care across the province

Medical care protocols (MCPs). When asked about the benefits of the transition to AHS, a large number of interviewees mentioned the implementation of medical care protocols (MCPs) across the province, even for contracted EMS services. As one interviewee noted, *“even contracted services are providing care “the AHS way” – they are providing standardized care – it’s beautiful”*. Another noted,

“If I was injured in “yesteryear”, there was a question about the kinds of services I’d get... Now, one positive is that everyone is getting the same level of care, with the same protocols, with the same kind of equipment.” (Urban EMT-P)

Some people particularly appreciated that the protocols are available to them as an application for their iPhones.

Online medical consultation (OMC). Several interviewees expressed their appreciation of the group of medical directors who support EMS workers on the ground 24 hours a day, seven days a week. Particularly appreciated was the fact that these directors know the AHS medical care protocols and they know the EMS workers’ scope of practice. Knowing that a knowledgeable physician was just a call away was perceived as an important advantage, particularly in rural and remote areas.

In some cases, interviewees noted that previous medical directors, particularly those who were unfamiliar with EMS workers’ scope of practice, had been reluctant to allow them to carry out certain advanced procedures. With the AHS medical directors, they were pleased to be able to practice to their full capacity. A caution noted by one interviewee, however, is that it is unclear to what extent the MCPs are being consistently implemented on the ground and with what level of expertise. On the other hand, some interviewees did report processes such as peer audits and AHS reviews of patient care records to examine consistency of practice with the MCPs.

Innovations in advanced care and expanded use of paramedics in health care services. Some interviewees commented on the “groundbreaking” innovations they are involved with via AHS. One is the Vital Heart Study – in which paramedics can transmit ECG recordings directly to a cardiologist, administer clot-busting drugs in the field, and bypass emergency to take the patient directly to the cardiac catheterization lab was seen as “state of the art” by some paramedics in that city. Another innovation in development is a service standard for palliative care. Rather than transporting a palliative patient to hospital for pain control, ambulances can be stocked with narcotics which can be administered by paramedics in the patient’s home.

New roles in the health care system are emerging for EMS workers, particularly paramedics. An example is the use of paramedics in the emergency room in south Calgary's new hospital and in some rural and remote hospitals and health care settings (e.g., Raymond, High Level). In Rainbow Lake, paramedics, working with the online medical consultation service, "man the fort" when nurse practitioners or physicians are not available.

New, better and standardized equipment and supplies. Also frequently mentioned was that equipment is, for the most part, universal throughout the province. At least for direct delivery service, EMS workers can re-stock their trucks in hospitals rather than returning to their station to do so. Thus, they can be back on the road sooner. It also means that it is easier for workers to move from ambulance to ambulance and from station to station across the province because the equipment is familiar. As one worker noted,

"With the amalgamation of services around Calgary, we all have the same equipment and the same protocols and the same drugs. In the past, Foothills Regional EMS and Cochrane both had very progressive services (e.g., Doppler ultrasound monitors and dopamine) on the truck, and some of the nicer "toys" for paramedics. It's nice now that we're all the same. When calling for relief in hospitals or for back-up, I know that all the outlying areas are trained in the same protocols and we don't have to worry about who my back-up is going to be – I know they will have the same knowledge and skills." (Urban EMT-P)

Particularly important to interviewees who had previously worked for services in which EMS was less of a priority, was the receipt of new equipment. One person, for example, noted that,

"[Before the transition], it was "bottom of the barrel". If they didn't want to spend the money we didn't get it. So even our defibrillators – we didn't get a Lifepak until we joined AHS – we had dinosaurs – so it's been great to standardize ourselves with the rest of the province". (Rural EMT)

Another noted a key advantage of the transition was not having to deal with a municipality that is historically "cheap": *"If the government mandates, that is wonderful... We have been underfunded for years on end."* (Rural EMT-P)

However, not all interviewees reported having access to new equipment and there were some reports of poorly maintained equipment and ambulances.

Professional benefits for EMS workers

Another commonly cited benefit of the transition to AHS, particularly for rural and remote workers, was an increased or at least leveled up rate of pay, the ability to progress through the pay scale more quickly, and greater parity of salaries across the province: *"The pay is better, obviously that's one thing we're happy about...the pay is certainly better and more in line with what it should be"* (Rural EMT-P).

Two or three interviewees also noted their appreciation of the fact that they can now move about in the province without losing their seniority. Some people appreciated the increased availability of training opportunities with the transition to AHS, including the online delivery of medical care protocol training and the ability to recertify for CPR at the local hospital rather than traveling much further away to do so.

In the next section, issues related to communications, the transition process and relationships with other EMS stakeholders are presented.

Communications, the transition process and relationships with other EMS stakeholders

The interview question regarding communications with AHS during and after the transition process prompted considerable discussion not only about communication processes per se, but also more broadly about how AHS managed the change process and worked with stakeholders, particularly communities and municipalities. The topic is broad and multi-layered including the style, frequency, clarity, consistency and relevance of communication from AHS; the degree of consultation between AHS and contracted services or employees; management of the change process; and relationships with municipalities and fire services.

Communications during the transition to AHS

Many interviewees expressed frustration about AHS communications during the transition noting that there was insufficient consultation and “top-down” communication with a “heavy-handed” approach. There were specific concerns regarding the lack of consultation with municipalities and communities about their needs and current ways of delivering service (see below). One interviewee seemed to capture the reaction of many other respondents when he said, “AHS came in and said this is how it will be.” Another said,

“We were told about it. That was it. We didn’t have a lot of input into it; neither did our Council...we were told about it and it happened.” (Rural First Responder)

Some interviewees said that they had wanted (and still want) to work together with AHS – “to be friends, not enemies” – and help make the system work; however, they seemed to think that this opportunity was not provided. A few recognized that AHS was “under the gun” to make the transition happen and that this time pressure likely impacted the nature and frequency of communication. As one respondent said,

“It would have been better if they'd had more lead time and they'd paid more attention to us, and I don't know if they had the luxury of that. Come out and visit us and we can tell you what our needs are. We can tell you how this can work for us. We're not interested in being a square peg in a round hole.” (Rural EMT-P)

Respondents who were dissatisfied with the communication during transition would have appreciated a more collaborative approach, more information about the transition process, and better responsiveness to key questions about how services would work under AHS. It was noted by several that much of the communications during transition had the flavour of, “we don’t know for sure – we’ll get back to you on that” and then no answer would be given. One person said it more than six months to determine whether they would have to hire a new medical director or not. Another noted,

"I thought there was a lot of, "Well, we'll have to check in and look into that" and then we never heard. I think they jumped in feet first and didn't have a clear plan in place." (Rural EMT)

Individuals who were satisfied with or neutral about communication during the transition tended to mention getting information from their supervisor. Some of these respondents were volunteers and/or living in remote areas where they functioned quite autonomously.

Ongoing communications

There were mixed responses about current communications and this seemed to differ depending on whether the interviewee was linked to the fire system (i.e., first responder) and/or worked in a contracted service, or was an employee of AHS. Responses ranged from those, particularly in rural, remote and fire or contracted services, who said they see no or very little information, to some in AHS who said they get too much irrelevant information (e.g., weekly updates on changes in organizational structure) or inconsistent information, to some who were pleased with existing communication. Typical comments were:

"We have team leads ... they're supposed to be a go-between between management and us. I've had to go to management with questions and they've said, 'Well your team lead should be telling you this'... and the team lead says, 'We didn't know this'."

"During the initial transition we just got bits and pieces and it wasn't often or accurate ... now it's better, it's more accurate."

Several who were satisfied with communication mentioned that they received what they needed from their manager or fire chief while others were pleased with the website (ahsems.com) noting that it has a lot of good information. Some mentioned going online to get updated on new protocols. One manager noted that staff surveys had been helpful in getting suggestions from staff. Several respondents said they thought communication was improving while others said AHS should "overkill" with communication for a while to help satisfy concerns.

One respondent noted that AHS needs to increase its communication to the public about the role of EMS and promote the services provided. This person noted that police and fire roles are well understood but not that of EMS.

Communications with municipalities and rural communities

Communication with municipalities was a particular area of concern; many thought it was lacking during transition and in some cases stated that is still the case. A few observed that AHS "bit off more than it could chew" with the municipalities and that the change was implemented too quickly. Specific municipal concerns included loss of the local voice; lack of information required to be accountable to funders, governance and citizens (e.g., explaining loss of ambulances); challenging contractual discussions; and lack of consultation. Respondents commented,

"The xxx ambulance service has provided this community with service for xxx plus years of ambulance service and it's been good service. And when AHS just comes in and says, "Nope, we're

doing it this way", you know, it's almost a slap in the face to the volunteer crew that has been working for so long." (Rural EMR)

"They did away with the boards that were comprised of the people that were actually living and working in the area, like the numerous towns, whatever governing body was throwing money into the ambulance service did have a voice in what was going on. Now it's a provincial voice that's taken." (Rural first responder)

"There's probably no better way to do it, but the way they did it was not very successful. There wasn't a lot of lead up communication with the municipalities that were losing whether it was their ambulance dispatch or just their ambulance service altogether. It was just kind of rumour in the wind that it was going to happen and maybe it might happen and then all of sudden, boom, there was a phone call saying 'you need to transfer this over'. So it felt like...there was really not a lot of say or involvement in the process... It was just disappointing that such a large change in tactics like this is was done basically behind so many closed doors...as a municipality we felt really blind-sided and we didn't really feel the citizens' best needs were taken care of." (Rural first responder).

Others said the transition process was satisfactory and acknowledged that some confusion and misunderstanding were to be expected. One interviewee thought that AHS communication with the community was positive, noting,

"It is nice to see that AHS does work with the community when problems come up... I see that AHS and the communities are trying to work things out -- it's not like "you'll do what I say"...we can voice our displeasure at something and things have changed a wee bit..." (Remote first responder)

One size does not fit all: Rural and urban differences

Some rural and remote providers expressed concerns that AHS decisions about service delivery are predominantly being made by people from urban areas and based on an urban model of care but that there are important differences between urban and rural EMS that need to be considered. The vastness of rural geography and longer response and transport times, for example, result in different needs and issues than in urban centres. As one person noted,

"The urban mentality is you can be there in 5 to 10 minutes. That doesn't work in the country... if you're 30 miles away at 100 km/hour, that's thirty minutes of driving time. If it's an emergency, we're 30 minutes into the golden hour." (Rural first responder)

Local geographical knowledge can be critical and it can be very frustrating to be required to follow inappropriate dispatcher directions given that local service providers have intimate knowledge of their areas. And, urban-based policies don't always work in rural areas. One interviewee offered the example that in the north, an EMS worker can leave on a call at 8 in the evening, stay at the event all night to stabilize a patient who is too unstable for ground ambulance, and wait until a helicopter can

arrive in the morning. This situation does not “mesh” with provincial protocols that are designed for metro centres.

One person summarized that it is important for AHS to understand the whole picture – urban *and* rural; several noted that every area is unique and this uniqueness needs to be factored in to the way services are provided. They also noted that local service providers have intimate knowledge of “what works” and how to maximize use of their resources. Thus it is important that municipalities and/or communities have some ability to manage resources and customize service delivery to suit local needs, abilities and circumstances. As one person said, “*We’re the experts in our own area and I’m not sure what their experience is... but we do know what works here*”.

Relationships between first responders and EMS

At the level of actual service delivery, the transition to AHS impacted relationships between first responders and EMS in various ways which appear to depend on how or if previous arrangements between fire and EMS had changed, and to what extent. In some cases, where fire and EMS continued on as separate services, there appears to have been little impact on relationships and almost half or a third of interviewees said this was the case. Many rural and remote interviewees described a long history of collegial working relationships between the two services and stated that these hadn’t been impacted much by the transition. On the other hand, where fire and EMS had previously worked for the same employer and EMS workers moved to AHS during the transition, several interviewees thought this created tension between the services. There were reports of significant distress in one community where this separation of services occurred. Those from urban centres noted little change in relationships between fire and EMS and in some instances respondents reported an improvement in relationships.

Tension in relationships. Respondents who described unease between fire and EMS following separation of the two services were careful to clarify that this is put aside when they are working together in a professional capacity serving the public. One interviewee described the situation by saying that the “*background relationship has more tension*”. A few observed that more staff stayed with fire or have transferred back than the other way around. Reasons for the tension included:

- Becoming two separate services
- No longer being co-located
- No longer training together
- Having to choose to work with one service or the other
- The introduction of a new and separate union (HSAA) with different benefits

One fire services paramedic said that the transition “*put a wedge into the relationship*”. He added that when people have conflict there is more impetus to work it out if they are all in one department but that “*when there are two separate employers people are not as interested in getting along*”. He said that the percent that don’t get along may not increase but the issues don’t get resolved. Not being co-located in the same building can weaken relationships. Several interviewees noted that the two services don’t get together for training now because AHS staff can’t access the required training dollars.

Among some there seemed to be the feeling that *“if you have gone with AHS you are the bad guy”*. One person described the sentiment he sensed as, *“I built the house and someone else (AHS) is living it”*. Perhaps associated with this, one AHS rural employee reported feeling isolated and said that the fire service appeared to have better camaraderie. A couple of AHS staff not working in an integrated service reported some tension when they crossed working paths with those in integrated services, reporting a *“cold shoulder”*. Some thought that the addition of another union (HSAA) caused some problems since it resulted in different benefits including pensions and different approaches for funding the *“kitty”* for food, televisions for the hall.

One interviewee spoke about the significant community discord that has been created since the transition. EMS and the volunteer services in that community were separated. Paramedics went to AHS in paid positions while EMTs and EMRs stayed with the volunteer fire service which now primarily operates as a transfer service. Interviewees from surrounding communities also commented on the difficulties this community is experiencing.

Others commented that the two services had different cultures before the transition, with one urban EMS respondent noting there had been some tensions between the two services prior to transition and that the changeover had aggravated this. As one urban paramedic noted,

“There is a culture difference between EMS and firefighters. The two cultures clashed pre-AHS transition. Now add things like AHS takes over and there is the in-station kitty that all station participants pay into to buy food, TV’s, etc. Previously CUPE directed funds off a pay cheque into the station kitty. There are no financial mechanisms in AHS payroll services to do this automatic garnishing, and this has created huge dissension, distrust and issues in the Stations. The lifestyle in the cohabited facilities creates a huge strain.” (Urban EMT-P)

To help create stronger relationships, one urban paramedic suggested *“bringing in people who understand both worlds – change management people”* to help facilitate the process, adding that *“money spent will save them in customer satisfaction and law suits”* and that the police should be part of this as well.

Positive and/or enhanced relationships. In other situations fire and EMS staff were reported to be *“on the same page”*, although one interviewee noted that both are *“frustrated”* and feel *“they had no say”* but enjoy a *“very good working relationship”*. Others did not report frustration with the change and said they continued to work well with the other service – several fire representatives in remote and rural areas mentioned having social gatherings for both groups – a Firemen’s Ball, barbecues and so on.

One remote first responder with a volunteer fire department said that the transition resulted in more communication between the two departments. *“We’ve had a real change in the way that EMS looks at Fire and the way we look at them.”* He added that there was less segregation and more mutual respect for each other’s roles. The same respondent described the situation as:

“Prior to transition, EMS was run by the xx municipalities and Fire worked only occasionally with EMS on motor vehicle accidents. Now we do a lot of work and training together with EMS. We go out on

more calls, and now know how their system works. Training has helped a lot with that. Ten of our firefighters are EMRs now, and they work closely with EMS. This happened post-transition. Some volunteer FF's are going on as part time EMR's with AHS. The local EMS guys suggested that this might be a good idea, and so we moved ahead with this EMR training. They have also gone out to quite a few cardiac arrests, and doing a little bit more. The fire department paid for the EMR training for their volunteers." (Remote first responder)

For one urban paramedic the relationships “deteriorated initially but it has given us a chance to sit back and see what will make this work and it has sparked some communication between the two operations groups and the two dispatch groups”.

Going forward: Clarifying the role of fire services in EMS

Several interviewees, particularly from rural areas of the province, wondered what the future of fire services and first response or medical co-response will be. There are perceptions that AHS “wants nothing to do with fire” and some cited the separation of fire and EMS in some communities as evidence of this. Many spoke about the importance of fire, EMS and police working seamlessly in communities. An urban first responder noted that, “the medical response system would fall flat on its face without fire fighter involvement.”

Some people spoke of the need for government and/or AHS to make a decision about the role of fire services within EMS and how it wants to work with this essential emergency service provider. One person noted, for example,

“I think the biggest mistake EMS is making right now is not making a decision on what they want to do and how they want to work with them. These guys, all they want to do is help....their communities and make a difference in their communities. And I think the biggest problem we have is that our hierarchy are not making a decision on terms of how to work with them... just make a decision about whether it's right or wrong... [Fire services] doesn't know where they stand...I don't know if they've defined a clear relationship now and how that's going to work...What kind of training do co-responders have to have? Who looks after it in terms of medical oversight et cetera?” (Rural EMT-P)

Another noted that, “government needs to make some decision about what is the scope of firefighter practice across the province”.

Interestingly, a half dozen interviewees spoke passionately about the value of integrated fire and EMS systems – that is, those in which paramedics and firefighters are cross-trained, as a potential solution for increasing service demands in rural communities and smaller towns and cities. This is discussed in the next section.

Impacts on service delivery

A constellation of issues related to service delivery were described by interviewees. At the hub of these are two inter-related aspects of service delivery: dispatching and the deployment of ambulances. Other

issues raised by interviewees included, reduced numbers of ambulances, long hand-off times in urban emergency rooms; levels of EMS provision; and increased call volumes for volunteer fire services. This section also includes data regarding the perceived merits of an integrated fire-medical model, perceptions of the impacts on patient care and data regarding service delivery.

Dispatch

Analysis of data from the 50 interviews revealed a patchwork of EMS dispatching systems including centralized dispatch centres instituted by AHS since the transition and numerous local and municipal dispatching services. This is further complicated by the fact that some services dispatch all emergency services – police, fire, and EMS - while in other situations, fire and EMS are dispatched separately.

A small number of interviewees expressed appreciation of AHS's centralized dispatching system. One remote worker, for example, commented that it is helpful to have one dispatch centre dealing with all of the EMS folks in the area. This person also appreciated that the AHS Dispatch Manager and the Deputy Fire Chief work closely together to address concerns in order to improve service on the ground. Another commented,

“Definitely the clouds opened up when we went with [centralized dispatch]. It's definitely been an improvement - even though things are changing all the time. It's EMS, they're EMS dispatchers. They understand what we're going to and try and give us as much information as possible...They're supportive - they understand what we're doing.” (Rural EMT)

A handful of others who are not yet part of the centralized system said they looked forward to becoming centralized as this would solve confusion about service area boundaries.

However, a greater number of interviewees, both rural/remote and urban, expressed concerns about centralized dispatching, many observing that AHS had been unrealistic in trying to reduce to three centres in Alberta in such a short time. When asked about the benefits of the transition to AHS, many said, *“the fact that we kept our local dispatch”*. Two major concerns were expressed about centralized dispatch. The first and most frequently cited concern was the apparent lack of knowledge and experience of the AHS dispatchers; the second was the lack of geographical knowledge of local communities. These interviewees commonly noted that this was not the fault of dispatchers per se, as many simply lack training and experience. It was also recognized that the quality of dispatching is often dependent on the quality of information received – often from people who are under duress and in difficult situations.

Experience level of dispatchers. A large number of interviewees expressed concern about the quality of centralized dispatching by people who through no fault of their own, lack medical training and experience *“on the street”*. Some commented that this practice is intentional and based on research that indicates lay people make better dispatchers. The quote below is typical of what many interviewees expressed:

“How is dispatch working? It's not...One of the biggest complaints we had was that we are having lay people dispatch us who have never done the job. They have absolutely no idea what it is like to

do our job and be in the situations we sometimes get involved in. But it's not their fault, they haven't done this and They're naïve as to what happens and can happen. They don't have those "spidey senses". Not to mention they're not medically trained at all. And so they don't understand a lot of the complaints that come in." (Urban EMT-P)

Three interviewees from Edmonton expressed serious concerns about dispatching, including a shift from a trusted and "exceptional" system staffed with seasoned and medically trained dispatchers to a system with new, untrained dispatchers and with new procedures. A new and added challenge is that EMS workers no longer have the ability to speak directly with the 911 call-taker who in the past has been a rich source of information en route to the scene about the patient and the situation. This informed communication was viewed as instrumental in preparing the ground crew for what to expect when they arrived on scene. Without having this information, workers said they now feel like they are going in "blind" and this creates significant anxiety, particularly in potentially volatile situations. As one interviewee noted,

"I want an educated individual on the phone when I'm in a situation where I'm walking into someone else's environment and I want an educated individual to tell me whether it sounds secure, whether it sounds like there's a family dispute going on; whether it sounds like the person is being evasive about their answers, whether there's screaming in the background. And our dispatchers aren't taking the time to do that now." (Urban EMT-P)

Another concern is institution of a new "pre-alert" system in which ambulances are routed to a scene before the nature of the call is clearly delineated. On some occasions, workers have wound up in potentially dangerous situations because hold-back procedures have not been put in place to ensure the scene is secured by police before workers attend to patients.

To help rectify some of these concerns, several EMS workers suggested it would be valuable for new dispatchers to do ride-alongs on the street so they could understand how the information they provide affects the EMS workers. This was noted to have been a common and regular practice by some services in the past. However it was noted that currently, it was believed that there is little or no budget to enable this to occur.

Geographical knowledge. Several interviewees worried that dispatchers in a centralized system lack local geographical knowledge which can be important in efficient deployment of EMS units. One interviewee, for example, said,

"Now, the reasons for being centralized, there was valid reasons for that. ...the down side is a lot of service provisions were lost when that happened and one of the biggest service provisions was the knowledge of the local area. So as a dispatcher, when you're sitting up in [the Centre] and the road you're talking about or even the town you're talking about is 400 or 600 km away. There's a good chance that dispatcher has never been through there, understand what the towns look like or anything like that, so having it more regionally we had a better coverage of that." (Rural First Responder)

The theory presented by these interviewees is that lack of geographical knowledge can lead to difficulties in locating patients which results in delayed response times.

Inconsistent determination of EMS response levels. Another concern raised was that since the transition to AHS dispatching there seems to be an inconsistent determination of the appropriate level of the call - that is whether the ambulance should go “normal traffic” or “lights and siren” and whether an advanced life support (ALS) unit or a basic life support (BLS) unit is required. This was again attributed to lack of dispatcher knowledge and inability to discern, beyond the card system, what might be serious and what is not. These interviewees noted that driving with lights and sirens is dangerous for EMS and the public, and the decision to do so is not taken lightly, so unnecessary use of lights and sirens increases risk. One person noted that, “since the transition we’re going on more Delta calls... [but sometimes we don’t go Delta because of the notes we’re given] and...sometimes I’m going lights and sirens to something that is nothing; then there are times when I’m going regular traffic to something life threatening”. Two interviewees reported incidents in which they were routed “normal traffic” although the information provided by the caller indicated there was potentially life threatening situations (one was a heart attack, another was a brain hemorrhage).

In addition, sending ALS units to calls that require only BLS equates to inefficient use of limited resources. One urban EMT-P remarked that 70 per cent of calls for an ALS unit are appropriate but many calls do not require a paramedic level of care. If dispatch had the ability to deny inappropriate requests (e.g., a physician ordering an ALS unit for continuous blood pressure monitoring) and a better ability to evaluate calls then that would help avoid the problem of having an ALS unit unnecessarily tied up with basic care.

Dispatch issues specific to rural and remote areas. Interviewees from rural and remote areas identified three additional concerns with dispatching. First, the co-existence of centralized and non-centralized dispatch can make things confusing. There are grey areas and occasional disagreements about who should take a call that is on the boundary of two service areas. Sorting this out can create delays in response times. As one person explained,

“So [dispatch centre 1] dispatches for [Town A]; our dispatcher is in [Town B] so there could be a lot of confusion sometimes on who gets dispatched where because if it’s not [Dispatch Centre 1’s] area, then it gets sent to [Town A]; sometimes it gets bounced over to another service. So it would be nice if somebody took over that function... it’s a hit and miss kind of thing – people wouldn’t get missed but it could take a little bit longer until they actually figure out whose call it is.” (Rural first responder)

Second, in some areas, fire and EMS are dispatched separately. This can create miscommunication and time delays. Some people referred to this as “the parlour game” in which a message gets repeated so many times it winds up being distorted. One person noted that the more interactions there are amongst parties, the greater potential for error and provided a recent example of EMS getting lost on the way to a car crash:

“We had a car accident....and the dispatcher...got the exact location of it from the caller. They sent

fire to it, fire basically went straight there. EMS ended up getting lost for about 30-35 minutes because that direction hand off [went awry]...And that created a chain of effects because we had to deal with the patient longer when that should have been handed off to EMS 30 minutes ago... and if there was another call, we're tied up with something another agency should be involved with." (Rural first responder)

A third issue is that many different tools and technologies - some of which are not compatible - are in use throughout the province for EMS and fire communication. There are also blackouts and dead zones where certain phones or radios don't work. This is problematic if a unit needs police or backup. Several rural and remote interviewees noted that some systems are incompatible and that practitioners have to use at least two sets of radios and/or cell phones to communicate. In some cases this reflected the need to communicate with AHS dispatch as well as their own dispatch, and the use of different technology among different jurisdictions. One person explained this by saying,

"... Dealing with multiple dispatchers; which radio do I grab? I have two radios on me at all times. Our dispatchers listen into the AHS one. I try to just talk to AHS and our dispatchers listen in so I don't have to radio them."

A rural first responder explained,

"[We used to be able to communicate with EMS] so communications were very good. We could talk to them either on provincial ambulance or they could come on our fire channel and we could give them updates on what the patient condition was. Now, they've gone to [a different dispatch] which uses mike phones and ... they have reception issues... we're having a hard time communicating with them now." (Rural first responder)

Some interviewees spoke optimistically of an anticipated provincial radio system for EMS; others expressed some degree of doubt about how effective the system will be.

Deployment issues

A number of issues related to deployment of ambulances also surfaced in the interviews. This includes the use of system status management, sending the closest ambulance to a call, loss of ambulances, staff shortages, hand-off times in emergency rooms and downgrading of services from ALS to BLS.

The borderless system, flexing, and the "closest ambulance goes". Almost all interviewees spoke about various facets of AHS's "borderless system" which they described as the sharing of resources amongst neighbouring services and throughout the province. Most noted that in theory and on paper, this approach makes sense – it should ensure efficient use of scarce resources and reduce response times. However they noted that in actual practice, there are some challenges.

Two practices associated with the borderless system surfaced frequently in the interviews. The first is system status management, or "flexing", referred to by one person as "chasing ghosts" and by another as "the dice game", in which an ambulance is moved from its own service area to be closer to a

neighboring service that is experiencing a temporary shortage of ambulances. System status management occurs in most areas of the province, including the cities, but it was interviewees from rural areas that expressed the most concern about this practice because they are pulled to cover in other areas, leaving their own communities with a reduced level of service. Several said it is just a matter of time until a patient suffers because his/her local ambulance service is covering another community.

One interviewee noted that the principle is good: *“We’re all one so we can move ambulances around”* but that it works better in Edmonton and Calgary: *“In Calgary, where they have 30 ambulances it works great. If there’s no ambulance in the north side of the city, they just send a couple up there.”* However, system status management is more problematic for rural communities because of the potential for communities to be left without service or to have increased response times. When the ambulances in Lethbridge are all busy or out of town on transfers, for example, then ambulances from the neighbouring communities of Taber or Raymond are pulled in, leaving those communities underserved and *“backed up”* by ambulances from further afield, thereby lengthening response times in Taber and Raymond. Other interviewees made similar comments:

“Our ambulance used to be five minutes down the street sitting in the ambulance station – now it’s sitting somewhere [else]... so we’ll be covered by a service that’s 20 minutes or 40 minutes away... we’re seeing that quite frequently ... it certainly works in the city but there’s a difference ...in the rural area when you’re that far afield you have increased the response time.” (Rural first responder)

Three times in the past two weeks our ALS crew has been staged [outside our community] because [neighbouring communities] have been on Red... Our crew has had to take calls in [larger urban centre] and that leaves the local community at risk. If there is an emergency in the local community, we have to rely on the first responder unit. (Rural EMR)

The philosophy of *“the closest ambulance goes”* to a call was described as another aspect of the borderless system. This means that the closest ambulance to a call will be directed to that call, even if it is not in that unit’s normal service area. For example, if an ambulance from Olds has just transported a patient to the Foothills hospital in Calgary, and a call comes in from that vicinity, the Olds ambulance can be directed to take that call. This ambulance can wind up staying several hours caring for patients in Calgary and potentially being directed to take other calls, leaving Olds short or dependent upon an ambulance from a neighbouring community 20 minutes away, which then increases the response time for calls to Olds. One urban EMS worker provided an example of this:

“In Strathcona County, there are fewer ambulances being contracted by AHS so now there are more cross-boundary ambulances being used...They can have trouble getting out of the city as if they’re the closest ambulance to a city call, they are instructed to take it. This means that outlying areas that are close to Edmonton are often short of ambulances....the system is also a problem in rural areas... it took [a colleague] 20-25 minutes with lights and sirens to get to a patient with severe breathing problems.” (Urban EMT)

Reduced number of ambulances and long hand-off times in urban emergency rooms. The problems associated with flexing and “closest ambulance goes” are compounded by reductions in the number of ambulances since the transition and what seems to be an increase in the number of inter-facility transfers which can take rural ambulances out of service for several hours as they transport patients to the larger centres. In addition, there were some comments that AHS has been known to take ambulances off the street rather than pay overtime. This situation is further compounded when EMS workers are required to continue providing patient care in busy urban emergency rooms, or when no beds are available for a patient who is transferred for admission. Interviewees from large urban centres noted it is not uncommon to have several ambulance crews tied up in emergency rooms for several hours at a time. Some noted that efforts had been made to address this issue in Edmonton and those efforts were successful, but recently there has been slippage back to longer hand off times.

“A big issue is the lack of ambulances – the number has decreased since the transition – many units wind up stuck in ER providing care to patients until ER staff can take over – especially if the patient isn’t critical...for patients being transported to see a specialist it would make things better if they could bypass ER.” (Urban EMT-P)

“I’d pick up patients from [small town] and had to take them to [city] on just a simple transfer and had to wait with them for four or five hours before they had room in the ER to take them. That, to me, leaves massive holes within the EMS system; there are thousands of people out there and potential areas that are now unprotected... they start shifting and shuffling people around... but as an EMS system, we need to be back on the roads. We don’t need to be sitting in hospitals... I know [the city] has more people than [the town], but there are still people in [the town] who pay taxes.... And what it’s going to take is [someone] is going to get hurt or die and then it’s going to be brought to light and unfortunately there’s going to be a lot of stink raised over it.” (Rural EMT-P)

On the other hand, not all interviewees reported long hand off times in emergency rooms. Several reported either no change in ER hand off times or improvements. One rural EMT noted that Calgary hospitals usually get them in as quickly as possible whereas before the transition they might have spent up to eight hours waiting in a hallway. Typical wait times now are between 30 minutes and two hours. One interviewee from Calgary noted that the ability to take patients to urgent care centres has helped to reduce the number of transports to emergency rooms.

Three people mentioned the REPAC system which was developed to direct urban ambulances to hospitals with the shortest waiting time. All three said the system works poorly and often results in several ambulances converging in one emergency room at the same time. One said, “We hate it, management doesn’t like it, hospitals don’t like it, nurses hate it, but the region says it improves patient care. It is passed off to patients as, “you will be seen more quickly, but this isn’t often true”. (Urban EMT-P)

Staff shortages. Many employees reported that EMS staffing is “thin” in many areas of the province and that the large urban centres are experiencing significant shortages. This, combined with an “edict” to eliminate or reduce overtime has resulted in ambulances being taken off the road if no staff on “regular time” is available to man them.

Levels of EMS provision. Many comments were also made about the level of service provided in various communities. In rural areas, many services do not have ALS units, while others do. Several people noted that it is the rural areas that actually require ALS units the most because of the long transports to tertiary care. One person noted, for example, that in rural areas, the “golden hour” can be eaten up by transport times and so more intensive interventions are required in the field or in the ambulance. As two people said,

“Let’s face it, in rural Alberta –you’re further away from a hospital – if you need ALS anywhere, it’s in the rural areas. In Calgary you could get away with BLS cars... because the hospitals are nearby.... A lot of times [you need to do] life saving skills on scene ... my personal opinion is if anything needs to be, it’s to have the para-medicine covered in the rural areas. (Rural first responder)

“Absolutely, ALS is absolutely imperative to rural services. It is so important because that golden hour is literally gone before we get our patients to the hospital and a higher level of care is absolutely important especially for somebody that’s in a critical situation.” (Rural EMT)

One remote first responder worried that the level of service in his community had dropped from ALS to BLS with the transition. This is an area with a lot of oil and gas industry and lots of industrial accidents. The first responder noted that caring for people involved in these accidents is “way beyond my training level and even higher than what BLS units can handle”. While ALS units can be sent from other areas, there is an increased response time associated with this.

Issues about the level of service provision also surfaced in Edmonton where it appears that a shortage of paramedics means that not every ambulance can be an ALS unit.

Increased call volumes for volunteer fire services. While EMS workers expressed concerns about practices that take ambulances out of their local communities, representatives from volunteer fire services noted this also impacts them. At least three noted that since the transition to AHS, their services are much busier because their local ambulances are busy, often transporting patients to larger centres or relocated as part of system status management. In the absence of ambulances, the volunteer fire system is the “next up” for a call. This is problematic particularly during weekdays when volunteers are at their full time jobs. While employers have been tolerant of occasional calls, they seem to be less tolerant of the increasing number of calls. Two people commented that,

“Our volunteer firefighters seem to be getting more burned out because there’s getting to be a greater number of calls than before... and that seems to be more from the flexing.” (Rural first responder)

“There’s only so many times where an employer can let their employee leave before it gets to the point where the juice isn’t worth the squeeze to have them on staff... so our people are raring to go [on a call] but their job dictates that they can’t. And so what we’re faced with is daytime shortages – it’s to the point where we’re not far away from not being able to provide anything...the only way to remedy these issues is to have paid staff to be there.” (Rural first responder)

An alternate model – Integrated EMS and fire services. A number of interviewees talked about the benefits of an integrated fire and EMS service – that is, a model in which staff is dually trained as paramedics and firefighters. While some interviewees didn’t support this integrated approach, those who had worked in it were strong advocates for its value. This model was noted to have worked very successfully in Lethbridge, Red Deer and Fort McMurray. One person noted this approach may be uniquely suited to smaller cities. Reasons for supporting the model included that it is more cost-effective (both in infrastructure and emergency response), provides better client service, and enhances the quality of work life.

Many of those who supported the integrated model were passionate about it and saw it as the very best way of delivering service. One person said that *“one of the worst decisions that came out of transition was to get rid of integration”*. Another expressed frustration that the model works so well and yet because AHS doesn’t understand it, it dismisses it as a viable option for service delivery:

“We share the hall, we share the people, and we have the same equipment. So I think there’s lots of misunderstanding because they don’t fully understand it and they just dismiss it because they think, oh this can’t work because it’s different. I think just because it is different doesn’t mean it is wrong. I’m really passionate about it. I think it’s a good thing.” (Urban EMT-P)

Cost effective. Efficiencies were seen as arising from having less overhead (e.g., one set of buildings, administrators, managers) and from efficiencies in deployment. One paramedic explained that their integrated service has three people on all ambulances and that these are sent to all Alpha through Delta calls. He added *“AHS will send six to a call where the integrated service would only send three”*. It was noted that *“AHS has strict limits –it has gone from integrated to amalgamated. This increases costs for both fire and ambulance and reduces capacity – we can’t bring in a third ambulance”*.

Service enhancement. Those who supported the integrated model also spoke about better service, with some stating that the integrated model helps ensure that skilled back-up is there when it is needed, with no delay. In some services *“every firefighter is an EMS and can do two jobs.”* As one interviewee said, *“If we go to a car crash and the car is on fire, all of the guys are on board and we know exactly what needs to be done to get this person safely out. And then I can take off my turnout gear and jump in the back of the ambulance and start IVs”*. This example was also used to illustrate the value of cross-training, *“You go to a car crash and all of a sudden you have 10 paramedics - to*

have that is such a bang for the buck for the people....” Another noted that with a cross-trained team there are “so many people working together on the common goal of getting this person within their golden hour to the most appropriate place.” This supported the notion that “cross utilization is great from a public safety perspective”.

One interviewee offered the following story as an example of the value of the integrated approach. He noted that the city was on a Code Red, with no available ambulances, two ambulances were being brought in to cover (system status management), and a call came in that a woman had a broken leg:

“We sent an ALS pump with paramedics on it because we're all the same - we're all paramedics, we're all firefighters - that fire truck went to the scene. They started an IV...they gave her some morphine, they got her in a position of comfort. They got her all ready for transport but in that 35 minutes that they're waiting for [the ambulance] to come, she's getting paramedic care. She's getting everything she needs...Now, if we didn't have that, that patient would be on the phone going, where the hell is my ambulance - my leg is broken, the bone is sticking out, where is my ambulance?” (Urban EMT-P)

Quality of work life. An enhanced sense of team and a “*much higher quality of life at work*” were highlighted as benefits. Integration was seen as helping EMS and first responders better understand each other’s roles: “*Anybody who is medical is trained as a firefighter – we understand what the other side is doing.*” As another noted,

“Everyone is on board and everyone is thinking ahead of you - you're like okay I need this and someone else knows. It's not like trying to tell a firefighter has no medical experience so you can't say, hey can you hold the c-spine or can you set up an IV... they know....”

Some interviewees spoke enthusiastically about being able to do both jobs and one interviewee spoke about the value of being able to go back and forth between the two roles, noting that he could be with EMS when he wanted to be with patients and then when he was tired of dealing with the public he could switch over to fire for a while. In terms of the sense of team one person said that in the integrated model “everyone is the same” and added that “*if two people can't work together there is someone else who can work with them.*”

Perceived impacts on patient safety and quality of care

Given all of the issues reported above, one might think that the safety and quality of EMS patient care in Alberta is suffering. But, while interviewees had a lot to say about various impacts of the transition to AHS, when it came down to articulating the actual effect on the *quality* of care provided, most were hard-pressed to conclude that these issues are directly impacting patients – at least not yet. The majority commented that the quality of patient care provided by EMS has not suffered because they equate “quality” with the care they personally provide to patients. One urban EMS worker, for example noted, “*I don't know so much that patient care is affected because... the patient care comes from me.*”

Indeed, interviewees consistently demonstrated a high degree of commitment to providing excellent patient care and making improvements to the system that would promote continued delivery of a high

quality, safe care. Almost all of the EMS workers and many of the first responders chose to be interviewed on their personal time; two chose to be interviewed while they were on vacation. Many said that they loved their jobs – not necessarily the politics of the job – but working with patients. EMS workers also expressed a great deal of pride in their profession, some making comments such as, *“The profession in this province, Alberta, clearly in my eyes, is second to none in the country”*.

Some workers noted that the system is still working because they compensate for potential problems. One person, for example, said that,

“In spite of what's happened, we still deliver outstanding, over and above the average patient care. ... As long as we tweak it and nudge it, there is good patient care.” (Rural EMT-P)

Another said, “I don’t think patient care was negatively impacted ... there was more impact on staff because patient care always comes first.”

The extent to which the dedication and professionalism of EMS workers to providing the very best care is indeed compensating for system problems is hard to validate. Likewise, it is not possible to speculate about the extent to which system changes and dedicated care by EMS workers will impact future patient care. However, there did appear to be a sense of optimism that patient care could be further enhanced through continuous improvement initiatives at a provincial level.

In addition, as outlined in the “benefits of the transition” section above, many noted that the quality of care on a broader level had actually improved due to the consistency of care now afforded by the medical care protocols, the availability of online medical consultation, and universal equipment. Several mentioned the “leveling off” of the standard of patient care. Another commented that,

“The impact on patient care and patient safety? The benefits are definitely the protocols, everyone being on the same page. That’s huge. The online medical control is good. Resources for the rural EMS that [previously] couldn’t afford a new monitor. That’s good for them. The training, too.”
(Rural EMT-P)

Others believed service has improved through the advancement of BLS services to an ALS level. One noted that pay parity has brought more experienced paramedics to rural communities.

In contrast, a few people explicitly stated they believed that patient care is suffering, at least in some areas of the province. One person noted this is due to reduced levels of service (e.g., downgrading from ALS to BLS units in Edmonton):

“My opinion is that patient care has decreased significantly, due to lack of advanced care paramedic units in Edmonton. Prior to the transition there were ALS paramedics on all cars. Now, it’s basically a scoop and run, as more units just have basic life support trained people on them.”
(Urban first responder)

Another observed that,

“There is a decline in service in the Edmonton Metro area and a decline in equipment (ambulances), problems with dispatch, and major problems with staff turnover, all of which contribute to an increase in response times.... [My] on-the-ground experience suggests that response times are increasing in Edmonton.” (Urban EMT-P)

In contrast to perceptions about the quality of care actually received, many interviewees speculated that patient care is potentially being impacted by longer response times resulting from practices such as system status management, and being held up in busy emergency rooms, and not having enough ambulances on the road.

“Due to flexing and shortage of ambulances and long waits in emergency rooms, the impact on patient safety is astronomical – but tough to measure because emergencies are unpredictable. If you went into dispatching, I bet some emergencies will have a delayed response.” (Urban EMT-P)

On the other hand, several people said response times hadn’t really changed in their services since the transition. Without sufficient EMS performance data, it is difficult for them to say conclusively that patient care has changed or not changed. Matters related to EMS data are presented in the next section.

A final note is that many people also said it is difficult to attribute impacts specifically to the transition as there are many other factors that influence patient care.

EMS data

In response to queries about the collection and availability of EMS data, there was a wide range of interpretations about what constitutes ‘data’ including, for example, chute and response times, syndrome surveillance, system status management and electronic patient care records. However, for the most part, people referred to chute times, response times, and so on. Access to EMS data varied but the number of respondents not having the desired access outnumbered those who did and a pattern was noted in which workers recalled receiving regular reports of response times and related data prior to the transition to AHS, but such reports were sparse or absent afterward. While some interviewees said they didn’t have time in their jobs to review or worry about EMS data, many more spoke about the value of data for assessing performance, planning services and being accountable to municipalities. A more detailed summary is provided below.

Accessing data. A number of interviewees commented on availability of data, with some saying they don’t see EMS data now but that prior to AHS transition they received regular reports. Others expressed concern that they might lose access to data over time as AHS becomes more involved. As one person described,

“We still maintain our stats because we still dispatch.We are building a new station because we have the stats. Will we have the stats when we transition? We think the indication is we won’t. “

Many said they contribute data or noted that they thought that AHS dispatch collects this data but many did not know what happens to it. One person noted, *“We fire it into the vacuum and never see it again”*. In one setting the respondent commented that AHS was receiving, reviewing and responding to data. He said,

“We keep track of a lot of data ourselves - our calls, our minutes, response times, making sure PCRs are properly written up and that we're following our protocols ... we give our stuff to AHS and they check and if somebody has screwed up they let us know about it... I think that's working pretty well.” (Rural EMR)

There were a few comments about the Alberta Ambulance Maintenance Information System with one saying it is a searchable database but that training is needed to make the best use of it and that there are technical challenges. Others expressed concerns about the quality of data (e.g., *“garbage in-garbage out”*) or said that the reports need to be prepared in a manner that is useable. One commented, for example that his response time from one community to another an hour away was recently documented as being seven seconds. Another was hopeful about the future of the EMS database and said,

“You can get basic reports out of it (Alberta Ambulance Maintenance Information System). ... We hope to get more specific information so we can get down to the minutiae of what is happening in our county.”

A few people mentioned the website, ahsems.com, noting that it is a great resource, including the newsletter.

There were a few concerns that AHS had gone from *“tried and true methods”* of data collection to its own requirements, noting that AHS wasn’t prepared for the new reporting lines and tools and that they are trying to take applications that work for other areas such as nursing and make them work for the pre-hospital context. Several said that AHS questions the validity of response times in terms of patient outcomes and thus is shifting to measurement of patient outcomes (e.g., number of successful intubations, number of failed attempts at starting intravenous lines). However, one interviewee remained skeptical about the reasons for this:

“The common response time to target is ...9 minutes and AHS doesn’t endorse this target. Research-wise this target is not supported as research only supports this as a target for cardiac calls. But my sense is we’re not using it because we can’t come close to meeting it.” (Urban EMT-P)

Others expressed similar sentiments, noting that prior to the transition, workers were made well aware of targets and performance, and wondered if AHS is not reporting response times now because they have increased:

“[They] used to release stats on response times, as that was considered the most important performance indicator. If EMS didn’t get to their critical patients in 8 minutes or less than that, patients will begin to deteriorate. [The city] was basing their planning and need for more resources on this benchmark (i.e., 8 minutes or less). Everyone kept track of this benchmark, and staff knew how they did on every trip. As of April 1, 2009, this was gone and staff no longer knew how they were doing. Some staff feel that this is purposeful, so that we won’t know whether response times are deteriorating. ” (Urban EMT-P)

Another noted that there may be legitimate reasons for why data are not being shared with staff and communities, but the optics of the data not being shared might suggest that AHS is hiding something:

My council has a lot of frustration right now. They want to know how the system is working. Just saying, “Okay, AHS, you've taken over the system, but you're not telling us if it's working any better.” So by not giving them information, you know what Council thinks - it must be worse. So what are you hiding? Even though that might not be the situation at all... [AHS needs] to be a little bit more open somehow with the reporting. (Rural first responder)

Data for assessing performance. Several noted the importance of having access to data such as response times, saying that it helps practitioners to “stay on their toes”. They took pride in seeing how they were doing and bettering their responses. As one person commented, “I like to have a fast response time and service might improve if we saw the response times.” Another said, “It would be nice to see this information - number and nature of calls, response time - more often and to have performance issues for the group highlighted. I would like to get this twice a month.”

As well, there was a suggestion that data about successes be shared at a system level, possibly through ahsems.com. A respondent noted,

“From a citizen of Alberta point of view, some means of reporting to the people what's happened and what's going on. Because all you hear now is the dirt and I know there's a lot of good things going on, like the benefit - there's definitely benefit in other areas.” (Rural first responder)

Other interviewees working directly within AHS observed that it is not clear what benchmarks AHS has in place for assessing EMS performance. One person said, that many of his/her colleagues were questioning what system performance measures were actually in place.

Data to support decisions. The value of having good data on which to base decisions was raised by many. There were concerns from some interviewees working in a contracted arrangement that fire departments, and municipalities aren’t getting the data they need for service planning and compliance with their specific guidelines for reporting. As these staff noted,

“Prior to transition our municipality could see data; post-transition we are blind - we are forced to take away from fire system to support ambulances. We are not getting data so we make decisions on anecdotes.”

“We are trying to replicate the data we used to have..... We report to a municipality and there are specific guidelines for reporting and we aren’t getting the information.”

Data for business intelligence was mentioned with one respondent noting that *“how ambulance service delivery gets better depends on their ability to react to patterns”* while another suggested that system status management data might *“help inform if it is worth having ALS.”* Others commented on the value of exploring patterns in the data to better inform EMS response such as the respondent quoted below.

“Syndrome surveillance tells you something is going on – real time tools – we need to increase that capacity.”

In the next section, interviewees’ perceptions about how the transition has, and is affecting them personally and professionally are presented.

Impacts on front line EMS workers

While there was no specific interview question to elicit perceptions about impacts of the transition of EMS workers, interviewees inevitably voiced their concerns. As noted earlier in this report, interviewees consistently mentioned their appreciation of medical care protocols and online medical consultations and an increased scope of practice in many cases. Interviewees also described other impacts related to pay, benefits, staffing, hours of work, safety and morale. These are described below.

Pay and benefits

A general trend in the data is that many workers from rural and remote areas expressed pleasure with the fact that their pay had increased with the transition to AHS. On the other hand, workers in Edmonton reported that the transition had resulted in some wages being frozen (causing some people to resign) and the discontinuation of a valued supplemental pension plan that would allow them to retire earlier.

Staffing

Many interviewees mentioned high rates of staff turnover, the loss of many highly skilled EMS workers, and staff shortages during the transition to AHS and currently. One urban EMS worker, for example, noted, *“[The City is] hemorrhaging paramedics and needs to do something about this”*. A few people commented that AHS is now “top heavy” with management but doesn’t have enough staff on the road.

The loss of experienced EMS workers and their replacement with less experienced ones, and reliance on casual workers to fill in for shortages creates discomfort for workers who depend on having a skilled and trustworthy partner. One person noted,

“The quality of life for EMTs has decreased... we lost some of our best EMTs... now we have new, inexperienced people. I would prefer to have someone show up who has done it for a long time.”
(Rural EMT-P)

Another said, “When you're sitting with your partner who's been on the ambulance a week and you're doing a complicated procedure that we're not 100% familiar with, it makes people fearful.”

It was also mentioned that the hiring process in AHS can be lengthy – sometimes taking up to six months between recruitment and having the new person trained and ready to go out on calls.

Another issue is a recent policy to cancel incentives (i.e. cover costs of gas for travel to EMS station) for casuals to work in rural areas. Two people noted this reduced the number of casual staff who are willing to travel to their sites.

Hours of work and workload issues

Another difference between urban and rural/remote workers is related to hours of work and workload. Interviewees from rural and remote areas described various shift schedules. Some work four-24 hour shifts in a row. After a certain number of hours worked in a 24 hour shift (10 hours in some cases; 16 in others) workers are “timed out” and required to go off duty and sleep. However, it is possible to work around the clock but not reach the 10 or 16 “time out” criteria. Thus a worker can be up several times during the night and still be required to work a full day the next day. As call volumes increase, this appears to be happening more often. This situation leads to exhaustion and increased potential for error. One person noted that the call volume in his/her service is increasing and that,

“The 24 hour thing is becoming a problem because we’re houring out. We’re exhausted... I can work 8-5 all day and then go out from 2-7 in the morning. Because that’s less than 16 hours, I don’t get mandatory sleep and I have to be back at work at 8 am.” (Rural EMT)

One interviewee observed that in some rural or remote areas, EMS staff are on call for 24 hour periods but are only paid for 10 hours and thus are providing 24 hours of service for 10 hours of pay. Others alternate between working 10 hour days and then being on call for 14 hour nights and vice versa.

In contrast, workers in cities typically work 10, 12 or 14 hour shifts and then go home. However, these urban workers consistently noted that they are extremely busy, often for their entire shift. Many said that on certain days and times of the week, as soon as they finished one call, they are dispatched to another. Now, with wage parity in rural areas, there were several reports that urban EMS workers are moving out of the city because, despite the different hours of work, the workload is perceived to be less intense. One person said, for example, that

“I’m currently looking elsewhere - I don't believe I have the ability to retire in the (city) due to the nature of the call volume itself ... and if I were to keep this pace up ... I wouldn't have a good retirement. So I'm looking for another place that's a little more relaxed. I am looking rurally.... even with the flexing they are doing I still think they maintain better overall health and wellness than we do in the city.” (Urban EMT-P)

Another issue raised by a small number of interviewees was AHS' reluctance to pay overtime, and in some occasions, shutting down ambulances rather than paying overtime, which in turn, increases workload for other EMS staff who are working that shift.

Safety issues

A number of people expressed concerns about their safety on the job. These concerns appear to stem from a number of issues. In two isolated cases, rural EMS workers noted the police in their local areas were not taking appropriate measures to ensure their safety on the scene. One spoke of, for example, having to enter a bar to provide care for patients involved in a brawl while the police stood outside. Other safety concerns stem from failure to institute hold-back protocols for potentially dangerous or volatile situations. The hold-back protocol means that ambulances are staged a short distance away from the scene and wait there until it is secured by the police. However, at least three interviewees reported situations in which the hold-back protocol was not put in place. This resulted in EMS workers unknowingly entering dangerous situations. One interviewee described an incident that involved a shooting with fatalities. The event was coded as an *"unknown issue"* and thus the hold-back protocol was not instituted. All six workers who attended the scene wound up on leave due to the stress they experienced as a result.

Another safety issue is an artifact of dispatching EMS and fire separately. A rural first responder noted that,

"A lot of times EMS is on scene well before we're even dispatched...its putting the AHS staff in a bit of a predicament as far as keeping them safe on scene, especially when they have no traffic control and they're doing their best to get to the patient but they're putting their lives in jeopardy getting into the vehicle when it hasn't been secured."

Finally, in terms of psychological safety, one worker noted that before the transition and before workloads became so intense more attention was paid to ensuring staff time to debrief and to heal after critical incidents such as a pediatric code:

"Before, when something like that happened, you were pulled off the road and immediately put into critical incident stress debriefing and you were sent home for the day, because they're horrific calls...that still isn't happening to the degree that it should." (Urban EMT-P)

Morale

Many interviewees spoke of poor morale amongst EMS workers. Some from Calgary and Edmonton made particularly strong statements in this regard. One person noted, for example, that, *"the Calgary EMS strike in 2000 was the benchmark of low morale, but now is considered the new benchmark for low morale."*

A number of factors such as those described above (e.g., workload, loss of benefits, safety issues) seem to be contributing this, and not all are directly related to the transition to AHS. However, one

consistently mentioned factor in both rural and urban areas is the style of some managers who were described as “micro-managers”, “authoritarian”, “strict” or “dictatorial”. One interviewee reported being bullied by management. Several reported feeling unsupported by managers when they express concerns about service delivery issues and as a result, people have stopped raising concerns because they feel like that is a waste of their time. Several noted that they are rarely asked for their opinions or perspectives about work-related matters, and if they are, it is in a token manner only – feedback provided does not appear to be considered. One rural EMT noted that management is driven by budget and the front line is driven by patient care and that dealing with this everyday on the front line is draining. Another reminisced about a former manager who took the time to know staff and their families and who was always willing to listen, in contrast to the current situation:

“I knew if I had a genuine concern, I could walk into [his] office and he’d pull out a chair and get me a coffee and we’d talk. Someone would take it to headquarters and 9 times out of 10, it would be implemented in six months. When I walk into headquarters now there isn’t the same ... sense of community.... The [new manager] will walk right by us and not say a word”. (Urban EMT-P)

An EMS worker in one city noted there are some platoons that are difficult to work in and which breed disrespect and poor morale, but there are others that do know how to manage their staff well:

“[This platoon is] far more engaged in how they treat their staff in regard to getting them out of the hospital and ensuring if you’ve had a tough call, they’ll come to the hospital and check up on you. “Are you okay? Do you need a break?” If you’ve gone on six calls in a row and they’re back-to-back and you’re only seven hours into your shift, they’ll come and track you down and say, “Take 15 or 20 minutes, drive to station, make sure you have something to eat and let me know when you’re ready to go. It’s a fantastic way to manage your staff.” (Urban EMT-P)

Two interviewees recommended that it would help if staff could see that their managers were held accountable for their actions. They also said there should be mechanisms through which staff can provide feedback about their manager to that manager’s supervisor. For example, one person said,

“I think we need to look at ourselves and take a very harsh stance in regard to accountability of our managers and I think that would go a long way. If they are requesting staff to be accountable on a regular basis, then I’d like to see some accountability of our managers to our leaders.”

In some areas there appears to be some growing optimism that things are getting better, although it has taken some time to get there. One interviewee noted, for example, that:

“There are so many things that are accumulating and accumulating over the last few years that just make things so frustrating....it just seems like the people that are up in the top running it don’t understand what it’s like in the trenches. Things are gradually getting better, but, boy, oh, boy, it’s been a long time coming.” (Rural EMT)

Another said,

“Hopefully, we can get back to a place to put employee health and wellness as a priority. I don’t know if it will ever be a priority again. But my hope is that health and wellness of the employee is at the forefront of the organization”.

This concludes the findings section of the paper; some final closing remarks are presented below.

PART III: Closing remarks

Clearly, those who participated in the interviews had a lot to say about the impact of the transition of EMS to Alberta Health Services. They described many benefits resulting from the transition, and also many challenges and thus there are mixed views about impacts on the quality and safety of EMS patient care.

The impacts experienced personally and professionally by at least some front line EMS workers are also important to recognize. These findings bring to light an additional factor for consideration in the review of EMS in Alberta – the health and well-being of workers in the system. Just as shortages of resources and delayed response times have the potential to impact the quality and safety of EMS care, so does the well-being of these highly skilled people upon whom Albertans and their families rely when emergency medical services are needed.

From the beginning of this project, it was clear that the feedback provided by these fifty individuals was in the spirit of making things better for patients, for the system, and for worker well-being. Many recognized that the transition was a monumental undertaking, that change is always difficult, and that there probably was no painless way to make such a significant change in the system. They acknowledged that while change creates turmoil, progress is being made, and there is optimism for the future of EMS in Alberta.

Appendix One – Interview Procedure and Guide

Procedure

Interviews of frontline EMS providers to gain perspective on historical and current practices related to ground EMS operations

Participant Selection

Participation in the EMS review will be voluntary.

Process

Pre-Interview

1. A semi-structured process will be developed for use during each interview. (Appendix I: Opening Statement and Interview Questions)
2. Interview questions will be developed based on the objectives of the Project Charter.

Interview

1. An overview of Section 15(1) of the *Health Quality Council of Alberta Act* will be provided and any questions about the interview process answered.
2. An overview of Section 9 of the *Alberta Evidence Act* (Appendix II: Section 9) will also be provided. The names of people who either initiated an interview with the HQCA review team or were invited to participate, and whether or not they participated, will be kept confidential by the QAC.
3. Interviewees will be reassured that all notes will be kept confidential and will be destroyed at the end of the review.
4. The interviewers will explain that they have been contracted by HQCA to conduct the interviews of frontline EMS providers.

Post-Interview

1. The interview notes will be used to for the qualitative analysis, and will be provided to HQCA after completion of the qualitative analysis.

Opening Statement for QA Sub-Committee Interviews

Welcome & Introductions

Thank you for agreeing to meet with us today.

Interviewers introduce themselves (interviewee will be asked to provide their background at the start of the interview).

Before we begin, we would like to provide you with a bit of background about the process.

The Review

Pursuant to section 15 (1) of the *Health Quality Council of Alberta Act*, the HQCA will conduct an independent review of the operations of ground emergency medical services in Alberta.

The HQCA, through a quality assurance committee under section 9 of the *Alberta Evidence Act*, will conduct a review of the implications for quality and patient safety with respect to ground emergency medical services that includes but is not limited to:

6. Transition issues related to the transfer of governance and funding of ground EMS from municipalities to Alberta Health Services
7. Dispatch consolidation
8. Challenges specific to integrated fire/EMS service providers
9. Challenges specific to urban, rural and remote areas of the province
10. Availability and adequacy of data about EMS

3 Important Pieces of Information

There are three important things that we would like to tell you before we begin:

1. Section 9 of the *Alberta Evidence Act* (see attached)

The Review is being undertaken under section 9 of the *Alberta Evidence Act*. That section prohibits information provided by or created in these proceedings from being used in any type of legal action. In summary,

- a. you cannot be asked about what happened here today nor are you allowed to answer any questions about what happened here in any action;
- b. you cannot be asked to produce any record that is for our committee or received by our Committee.

The protection obviously does not apply to original hospital or medical records that were created outside our process e.g. original patient charts or notes.

Our process is not designed to lay blame or deal with issues outside our terms of reference. Our process is aimed at improving the quality of health care and health service and the capabilities of health service providers.

2. Confidentiality and its limits

The fact that you are here and the fact that you provided certain information to us will be kept in confidence. The effective operation of the quality assurance process requires this confidentiality be maintained. You cannot reveal the content or nature of our discussions.

However, you must be aware that:

- a. A report of this process will be prepared and that report will be made public. That report will include facts collected in this process, that we determine in our opinion to be indisputable and that we determine in our opinion will not reveal the identity of the source.
- b. If you provide us with information that we are required to disclose by statute, we must disclose it. Although this is extremely unlikely in this Review, an example would be the obligation to make a report of a child in need of intervention under the *Child, Youth and Family Enhancement Act*. This could also apply to a specific patient who is at continuing risk of serious harm.

3. Voluntary participation

Your presence here today is voluntary. You are not compelled to be here. You may leave at any time. You may refuse to answer questions. Obviously, we sincerely hope that you are willing to remain and answer any questions so that we can collect all the information we need.

Questions - Before we begin do you have any questions?

EMS – Interview Questions

Semi-structured interview questions:

Please tell us about yourself.

- What is your current position/ role?
- Do you provide front line medical treatment to patients?
- What are your credentials?
- What is your background?
- Where in the province do you live/ work?

From your perspective, what effects have occurred as a result of the transition of funding & governance for ground ambulance from municipalities to AHS?

- Positive effects (benefits)
- Negative effects (issues)
- Prompt: From your perspective, has there been a change (positive or negative) in response times and hand-off in ED times?

From your perspective as a result of the transition of EMS what has been the impact to patient care?

- During the initial transition
- At present

Have the changes to the EMS system been communicated to you? How?

- During the initial transition
- At present

From your perspective, have there been any changes related to dispatch?

- Positive effects (benefits)
- Negative effects (issues)
- Prompt: Was your dispatch consolidated?
How has this impacted patient care?

From your perspective, what effect has the transition had on relationships between EMS and first responders?

From your perspective, what effect has the transition had on integrated Fire/EMS service providers?

How do you feel EMS response is working in:

- urban areas of the province?
- rural areas of the province?
- remote areas of the province?
- Do you feel there are specific challenges for these different areas? What are they?

Do you have any knowledge about EMS data collection & analysis?

- Prompts: Is information (data) available?

Who sees and uses the data? (administration, frontline, public)?

Closing:

- Is there anything else you wish to tell us?
- Who to contact if there are documents you would like to share with us or if you have anything further you would like to add: Donna MacFarlane (donna.macfarlane@hqca.ca)

Thanks

Section 9

- (ii) the level of skill, knowledge and competence of health service providers;
 - (b) “quality assurance committee” means a committee, commission, council or other body that has as its primary purpose the carrying out of quality assurance activities and that is
 - (i) appointed by
 - (A) a regional health authority,
 - (B), (C) repealed 2008 cH-4.3 s8,
 - (D) the board of an approved hospital under the *Hospitals Act*, or
 - (E) the operator of a nursing home,
 - (ii) established by or under another enactment of Alberta, or
 - (iii) designated by an order of the Minister of Health and Wellness as a quality assurance committee for the purposes of this section,but does not include a committee whose purpose, under legislation governing a profession or occupation, is to review the practice of or to deal with complaints respecting the conduct of a person practising a profession or occupation;
 - (c) “quality assurance record” means a record of information in any form that is created or received by or for a quality assurance committee in the course of or for the purpose of its carrying out quality assurance activities, and includes books, documents, maps, drawings, photographs, letters, vouchers and papers and any other information that is written, photographed, recorded or stored in any manner, but does not include software or any mechanism that produces records.
- (2)** A witness in an action, whether a party to it or not,
- (a) is not liable to be asked, and shall not be permitted to answer, any question as to any proceedings before a quality assurance committee, and

(b) is not liable to be asked to produce and shall not be permitted to produce any quality assurance record in that person's or the committee's possession or under that person's or the committee's control.

(3) Subsection (2) does not apply to original medical and hospital records pertaining to a patient.

(4) Notwithstanding that a witness in an action

- (a) is or has been a member of,
- (b) has participated in the activities of,
- (c) has made a report, statement, memorandum or recommendation to, or
- (d) has provided information to,

a quality assurance committee, the witness is not, subject to subsection (2), excused from answering any question or producing any document that the witness is otherwise bound to answer or produce.

(5) Neither

(a) the disclosure of any information or of any document or anything contained in a document, or the submission of any report, statement, memorandum or recommendation, to a quality assurance committee for the purpose of its quality assurance activities,

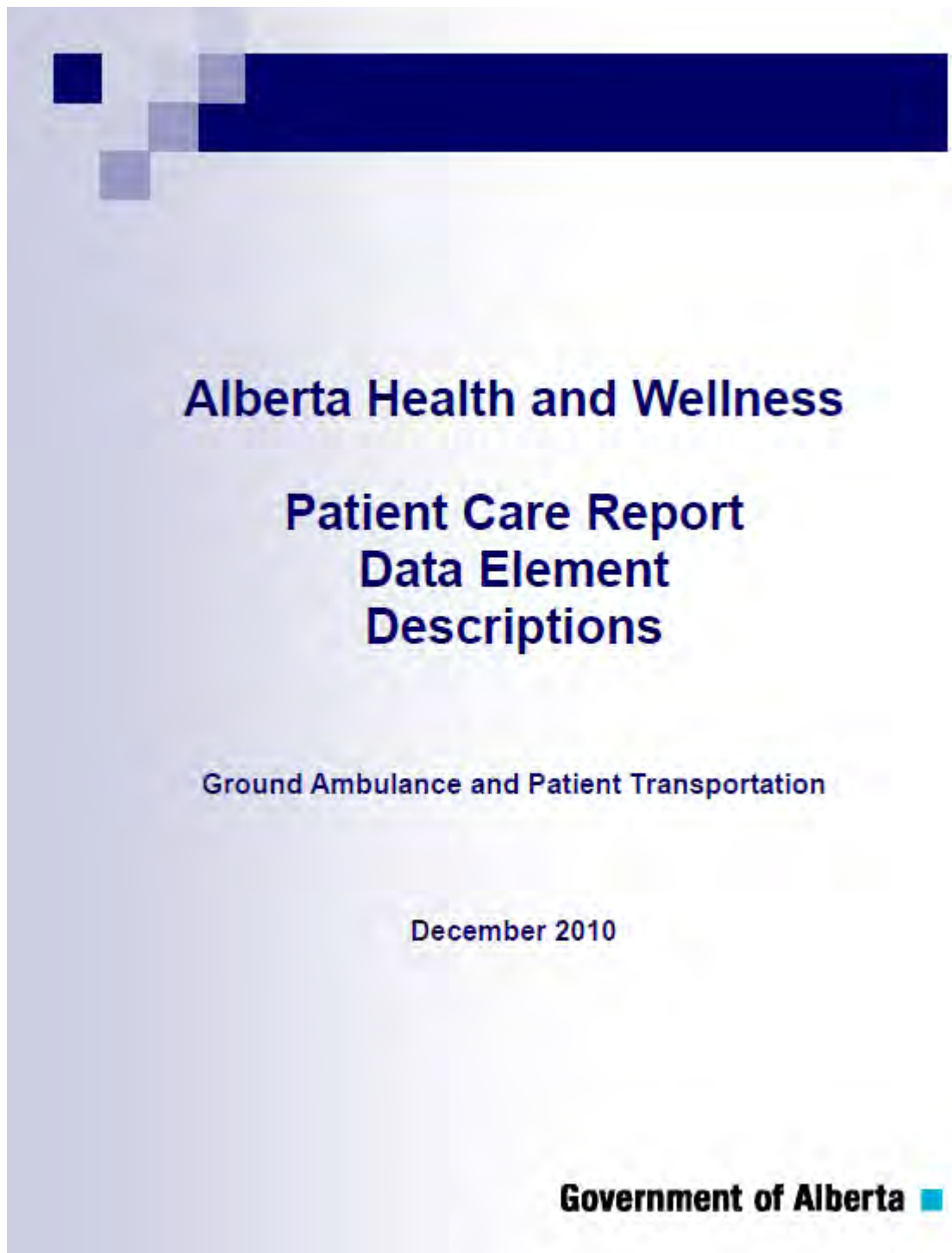
nor

(b) the disclosure of any information, or of any document or anything contained in a document, that arises out of the quality assurance activities of a quality assurance committee,

creates any liability on the part of the person making the disclosure or submission.

RSA 2000 cA-18 s9;2008 cH-4.3 s8

Appendix IX: Data Elements that are Collected within AAIMS



Data Element	Description
PCR Number	Unique number assigned to identify each Patient Care Report.
Date of Service	Date the unit or medical crew responded and/or service was provided.
Local Unit No.	Unit ID number assigned by the Ambulance Operation for dispatch or communication purposes.
Patient number	Represents the number of the patient treated and/or transported in a single ambulance relative to the total number of patients treated and/or transported during the same incident in that same ambulance.
Total Number of Patients	Represents the total number of patients treated and/or transported in a single ambulance at the same time.
Call Type	Code to indicate the type of service (e.g. emergency, rendezvous, scheduled transfer, etc.).
Incident/Invoice No.	Unique number which may be generated by individual ambulance operators for an incident.
License No.	Number assigned by Alberta Health and Wellness (AHW) to identify the ambulance operator that delivered the service.
Station No.	Number assigned by AHW to identify the station from which the ambulance vehicle is based. A station can be a firehall, ambulance bay, EMS service, etc.
EHS Unit ID	Number assigned by AHW to identify an ambulance vehicle.
Level of Service	Level of Service provided. ALS – Advanced Life Support BLS – Basic Life Support EMR – Emergency Medical Response
AMB Code	Designation of medical priority assigned by individual Ambulance Operators for dispatch and/or communication purposes.
Responded To	Location to where the ambulance responded.
Facility ID (if applicable)	Unique identifier to indicate the facility to which the ambulance responded.
Transported To	Location to where the patient was transported.
Facility ID	Unique identifier to indicate a facility to which the patient was transported.
Primary Attendant 'A'	Name of the attendant primarily responsible for providing care to the patient.
Reg. No.	Alberta College of Paramedics Registration Number for the Primary Attendant 'A'.
Attendant 'B'/Driver	Name of the secondary attendant on the ambulance and the person who drove the ambulance during the patient transportation phase.
Reg. No.	Alberta College of Paramedics Registration Number for Attendant B.
Attendant 'C'/Student	Name of an additional attendant or student on the ambulance.
Reg. No.	Alberta College of Paramedics Registration Number for Attendant C.
Km Finish	Reading on the ambulance's odometer at the end of the incident.
Km Start	Reading on the ambulance's odometer at the start of the incident.
Km Total	Total kilometres for the incident.
Personal health number	Patient's personal health number.
Province	Abbreviation which identifies the province/territory within Canada responsible for the patient's health coverage.
Patient's Last Name	Surname of patient.

Data Element	Description
Given Name(s)	First and middle name of patient.
Mailing Address	Patient's mailing address.
City	City or town where patient resides.
Province	Province, territory or state where patient resides.
Postal Code	Postal code or zip code of patient's mailing address.
Patient's Home Phone	Patient's 10-digit home telephone number.
Business Phone	Patient's 10-digit business telephone number.
Gender	Gender of patient.
Date of Birth	Patient's date of birth.
Age	Patient's age (or best approximation).
Weight (kg)	Patient's weight (or best approximation).
Personal Directive	Indicates if a patient has a personal directive.
Patient Complaint/Reason for Ambulance	Describes the patient complaint/reason for ambulance as provided by patient or other person.
Treatment/No Transport	Indicates if assessments and/or treatments were provided when a patient is not transported.
Authorized By	Name of the person who authorized the treatment and/or transportation of the patient. If the patient authorized it would be "Patient" or "Self", and if a minor was being cared for then the applicable guardian would be referenced (e.g. parent, babysitter or principal of the school, etc.).
Air Ambulance Dispatch No.	When applicable, a unique number that is generated by Air Ambulance Dispatch.
Allergies	Indicates if the patient has any known allergies and to what.
Medic Alert	Indicates if the patient is wearing a Medic Alert and the reason.
Next of Kin	Name of a person who is 'Next of Kin' to the patient.
Relationship	'Next of Kin' relationship to the patient.
Address	'Next of Kin's' mailing address.
Phone	'Next of Kin's' 10-digit home telephone number.
City	City or town where patient's 'Next of Kin' resides.
Province	Province, territory or state where patient's 'Next of Kin' resides.
Postal Code	Postal code or zip code of 'Next of Kin's' mailing address.
Blue Cross	Group number and identification number of the patient's Blue Cross coverage.
Health Canada	Indicates Health Canada may be responsible for ambulance charges for that patient.
Income Support	Indicates Income Support may be responsible for ambulance charges for that patient.
DND	Indicates DND may be responsible for ambulance charges for that patient.
WCB	Indicates WCB may be responsible for ambulance charges for that patient.
Child Health Benefit	Indicates Child Health Benefit may be responsible for ambulance charges for that patient.

Data Element	Description
Other	Indicates an agency or third party insurer other than those listed above may be responsible for ambulance charges for that patient.
Coverage Info.	Coverage information provides an area where billing information about a third party payer can be recorded (e.g. band/treaty number, policy number, claim number).
Time Received	Time the call is received by the Dispatch Centre.
Unit Notified	Time that Dispatch Centre notifies an individual ambulance unit.
Unit Responded	Time the responding unit starts physical motion.
Arrived Scene	Time the responding unit stops physical motion at scene (last place that the unit or vehicle stops prior to accessing the patient).
Arrived Patient	Time the responding attendant/s establish direct contact with patient.
Left Scene	Time when the ambulance unit starts physical motion from scene.
At Destination	Time when ambulance unit arrives at destination or transfer point.
Transfer of Care	Time when responsibility for the patient's care has been transferred.
Stand By Hours	Amount of standby (waiting) time.
In Service	Time that the ambulance unit is back in service or arrives back in its response area or base.
Attnd	Identifies which Attendant (A, B or C) took the vitals.
Time	Time the patient's vital signs were taken.
Heart Rate	Record of the patient's heart rate expressed as number per minute.
Blood Pressure Systolic	Record of the patient's systolic blood pressure.
Blood Pressure Diastolic	Record of the patient's diastolic blood pressure.
Respiratory Rate	Record of the patient's respiratory rate expressed as number per minute.
Oxygen Saturation	Record of the patient's oxygen saturation values expressed by per cent.
Skin	Description of the patient's skin condition.
Pupils	Description of the state of the patient's pupils and their response to light.
Pre-Hospital Index BP (Systolic Blood Pressure)	Pre-Hospital Index scale based on the patient's systolic blood pressure.
Pre-Hospital Index P (Pulse)	Pre-Hospital Index scale based on the patient's heart rate.
Pre-Hospital Index R (Respirations)	Pre-Hospital Index scale based on the patient's respiratory effort.
Pre-Hospital Index C (Consciousness)	Pre-Hospital Index scale based on the patient's level of consciousness.
Pre-Hospital Index Mol (Mechanism of Injury)	Pre-Hospital Index scale based on the mechanism of injury.
Pre-Hospital Index T (Total)	Represents the patient's total Pre-Hospital Index Score.

Data Element	Description
BGL mmol/L	Represents the patient's blood glucose level.
GCS E (Eye Opening)	Glasgow Coma Scale score based on the patient's ability for eye opening.
GCS V (Verbal Response)	Glasgow Coma Scale score based on the patient's ability for verbal response.
GCS M (Motor Response)	Glasgow Coma Scale score based on the patient's ability for motor response.
GCS T (Total Glasgow Coma Scale)	Represents the patient's total Glasgow Coma Scale score.
Attnd	Identifies the attendant who administered a treatment and/or medication.
Treatments Given	Codes representing treatments provided to the patient.
Medications	Codes representing medication administered to the patient by the attendant(s).
History and Treatment	Text section for attendants to document history and treatment in an open narrative form.
Patient Medications and Dosage	Lists all medications and the dosages that the patient takes at home.
Family Physician/Sending Physician (Transfers)	Name of the patient's family physician or the sending physician for inter-facility transfers.
Receiving Physician	Name of the physician who takes over responsibility for care of the patient at the receiving facility.
ER Chart No.	Number assigned to the patient by the receiving facility.
Continuation Form	Indication that the attendant used a 'Continuation Form' when there was not enough room on the PCR to complete documentation of the call.
Response Type	Indicates whether or not the lights and sirens were used to respond to the scene.
Transport Type	Identifies whether or not lights and/or sirens were used when transporting the patient.
No Transport Reason	Code that indicates the reason when the patient was not transported.
Safety Equipment	Indicates whether or not the patient was using any safety equipment, and what type.
Other Resources	Identifies if any other specialized resources (e.g. ICU team, RN Assist, etc.) were required for the trip.
Bystander	Indicates if CPR or defibrillation was provided by a bystander prior to the arrival of the ambulance.
Co-Responder	Indicates if a co-responder (allied emergency response agency) was on the scene or provided CPR or defibrillation prior to the arrival of an ambulance.
Signs/Symptoms 1	Code representing the patient's first sign or symptom as noted by the attendant.
Signs/Symptoms 2	Code representing a second sign or symptom.
Signs/Symptoms 3	Code representing a third sign or symptom.
Signs/Symptoms 4	Code representing a fourth sign or symptom.
Provider Impression Code	Code representing the primary attendant's clinical impression, which led to the treatment plan used.

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Provider Impression Code	Code representing the primary attendant's clinical impression, which led to the treatment plan used.

Appendix X: Saskatchewan EMS Review 2009 – Summary of Recommendations

Recommended Strategic Vision

Over the next five years, Emergency Medical Services (EMS) in Saskatchewan will develop into a Mobile Health Services system. This part of the healthcare system will provide patients with a seamless transition within the continuum of care. MHS will continue to provide strong emergency care services while providing opportunities for augmented, high quality patient care. The MHS system will be fully integrated within Saskatchewan’s provincial health system.

Recommendations

1. Clarifying Roles, Responsibilities, Decision-Making and Accountability

It is recommended that roles and responsibilities within the current system are clarified to enable the development of a collaborative, mobile health services system in Saskatchewan. Further, it is recommended that this clearer structure of governance be implemented by January 1, 2010 utilizing the following framework for system-wide governance

2. Develop an Advisory Body in Support of System Governance

It is recommended that a Mobile Health Policy Advisory Council be established, reporting to the Minister of Health, with a mandate to help ensure that quality-based standards become a core component of Saskatchewan’s system.

3. Clarify Medical Advisor Roles

It is recommended that physician medical advisor roles within the MHS system of health regions are clarified.

4. Document Administrative and Clinical Policy

It is recommended that a policy framework is developed, with a well-documented set of administrative and patient care policies, and aligned with the clarified roles and responsibilities of within the MHS system.

5. Ensuring Minimum Standards in Service Provision

It is recommended that a consistent set of standards are developed for the MHS system that is supported by a clearly articulated provincial policy framework. The type of standards to be considered may include:

- Access Standards – regarding standards on patient access to response from MHS personnel, both an emergency response by First Responders and road ambulance providers, and a non-emergency response involving other types of service provision;
- Quality of Services – regarding the standards and minimum requirements for services, levels of training for practitioners, minimum registration and scope of practice level of providers available to patients including access to EMT-Paramedic resources;

- Quality assurance – including processes and related medical advisor roles and responsibilities;
- Licensing of Fleet and Inspections – pertaining to ambulance operators, ambulance units and equipment.

6. Reducing Inter-Hospital Transfer Costs to Patients

It is recommended that patient access to the health system is improved by reducing or eliminating inter-hospital transfer fees.

7. Better Meet Needs of First Nations Patients

It is recommended that work with Health Canada is undertaken to ensure the two levels of government support improving the consistency and quality of MHS services accessible to First Nations peoples.

8. Standardize Funding of Road Ambulance Services

It is recommended that a standardized model is created to guide the funding of RHAs in their implementation of MHS to be delivered by various categories of service providers.

9. Enhance Regulatory Environment Affecting Road Ambulance Services

It is recommended that a more flexible regulatory environment is developed that enables the implementation of a collaborative MHS system described in this report.

It is further recommended that the Minister of Health engage key industry stakeholders including a new Mobile Health Policy Advisory Council in the development of changes to statutes impacting service contracts and in the development of a template service agreement that combine to support the development of a collaborative Mobile Health services system. This work will need to address transition issues that operators and health regions may face in the move toward an MHS system.

10. Develop a Strategy for Saskatchewan First Responders

It is recommended that a review of the provincial First Responder program is undertaken. This review will address the following issues:

- Standards for First Responder registration;
- Standards for equipment and support to First Responders;
- Registration responsibility of First Responders;
- The role of EMS dispatch in providing First Responder services; and,
- Guidelines to support the consistent deployment of First Responders within the future collaborative Mobile Health Services system.

It is recommended that the review of the First Responder program will consult with stakeholders and the recommended Advisory Council.

The Committee further recommends work by the Ministry to support the recruitment and retention of volunteer groups providing service to the First Responder program.

11. Developing a Long-Term Human Resource Strategy

It is recommended that a comprehensive human resource strategy is developed to provide the human resource capacity and competency that meets the needs of the future MHS system.

12. Increase Accessibility of Educational Programming

It is recommended that the Ministry of Health work with the Ministry of Advanced Education, Employment and Labour and other key stakeholders to explore means to increase accessibility to educational programming.

13. Support Recruitment and Retention Initiatives

It is recommended that, in addition to other recommendations that will support sustainability of human resources in the longer term, consideration is given to a bursary program for students of EMS education programs that include a return for service commitment.

14. Providing Equipment for the Future

It is recommended that a mechanism is developed to address ambulance unit and equipment needs within an MHS funding model for health regions that is linked to provincial service standards.

15. Pursue an Information and Technology Strategy for MHS

It is recommended that an information and technology strategy is developed to facilitate MHS, including patient transport and MHS service coordination. Under this general recommendation, two near-term issues must be addressed to develop a functional information technology infrastructure that will allow the system to track the quality of care patients are receiving while optimizing the efficient delivery of services.

15a) Emergency Medical Services Information System

It is recommended that the Ministry redevelop or replace the existing Provincial Ambulance Information System (PAIS) so that the information system is more robust, enables operational (e.g. quarterly) data analysis and reporting, and enables interaction with other data systems (including billing systems, electronic patient care reports, Ministry databases and the Electronic Health Record). Potential jurisdictional partnerships for effective and timely PAIS redevelopment should also be explored.

15b) Emergency Medical Services Dispatch Information Infrastructure

It is recommended that a review is undertaken of opportunities to develop a shared dispatch information infrastructure to improve system redundancy and allow for system optimization. Further, this system should include provisions to provide for automated mapping and GPS based Automatic Vehicle Locating as well as Computer Assisted Dispatch services.

16. Initiate a Set of Pilot Projects in Support of the Mobile Health Vision

It is recommended that support be given to pilot projects which will enable the development of a Mobile Health Service system.

17. Enable Coordinated Patient Transfers

It is recommended that system stakeholders are engaged in the development of a patient transfer coordination system.

In the short term, the Committee recommends development of a provincial policy enabling joint mechanisms within the industry to break down patient fee barriers to coordinated transfers, and an implementation strategy for health regions and contracted operators.

18. Enable Role Change for Practitioners

It is recommended that work is undertaken to remove barriers for MHS practitioners to best serve patients and more fully utilize their skills through development of:

- Supports for integration of MHS practitioners within the health care team, aided by relationship building between provincial stakeholders and role clarity in the work place.
- Transport destination options from current requirement of nearest or physician-directed appropriate hospital emergency department, to alternative destinations where appropriate for the patient;
- Potential “treat and refer” protocols, training and policies; and,
- Role clarification and change to support better integration within the health care team in a range of health facility and community settings.

19. Reevaluate Ministry Roles and Capacity

Finally, the Committee further recommends a review of the current mandate, role and capacity of the ministry work unit responsible for ground ambulance services.

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ACRONYMS

AAIMS	Alberta Ambulance Information Management System
AAMDC	Alberta Association of Municipal Districts and Counties
ACLS	Advanced Cardiac Life Support
ACP	Alberta College of Paramedics
AED	Automated External Defibrillator
AFRRCS	Alberta First Responder Radio Communications System
AH	Alberta Health
AHS	Alberta Health Services
AHW	Alberta Health and Wellness
ALS	Advanced Life Support
AOCP	Alberta Occupational Competency Profile
ATV	All-Terrain Vehicle
AUMA	Alberta Urban Municipalities Association
AVL	Automatic Vehicle Location
BC	British Columbia
BLS	Basic Life Support
CAD	Computer-assisted dispatch
CCC	Central Communications Centre
CCP	Critical Care Paramedic
CFD	Calgary Fire Department
CISM	Critical Incident Stress Management
CMA	Canadian Medical Association
CPR	Cardiopulmonary Resuscitation
CS	Clinical Surveillance
E911	Enhanced 911
ECO	Emergency Communications Officer
ED	Emergency Department
EHS	Emergency Health Services
EMR	Emergency Medical Responder
EMS	Emergency Medical Services
EMSCC	Emergency Medical Services Chiefs of Canada
EMT	Emergency Medical Technician
EMT-P	Emergency Medical Technician-Paramedic
ePCR	Electronic Patient Care Records
GPS	Global Positioning System
HAD	Health Disciplines Act
HALO	High Acuity, Low Occurrence
HDB	Health Disciplines Board
HIV	Human immunodeficiency virus
HQCA	Health Quality Council of Alberta
HSAA	Health Sciences Association of Alberta
iDEN	Integrated Digital Enhanced Network

IFT	Inter-facility Transfers
KPIs	Key Process Indicators
KPM	Key Process Measures
MCI	Mass Casualty Incidents
MCP	Medical Control Protocols
MCR	Medical Co-Response
MDT	Mobile Data Terminal
MFR	Medical First Response
MPDS	Medical Priority Dispatch System
MSAT	Mobile Satellite
NAT	Non-ambulance Transfer
NOCP	National Occupational Competency Profile
OM	Outcome Measures
PCP	Primary Care Paramedic
PCR	Patient Care Record
POLMC	Online Medical Control
PSAP	Public Safety Answering Point
QAC	Quality Assurance Committee
QI	Quality Indicators
RCMP	Royal Canadian Mounted Police
RCTs	Randomized Controlled Trials
RED.doc	Rural EMS Direction
REPAC	Regional Emergency Patient Access and Coordination
RFP	Request for Proposal
SSM	System Status Management
STARS	Shock Trauma Air Rescue Service
STAT	Statim (Latin)
STEMI	ST segment elevation myocardial infarction
UK	United Kingdom
US	United States
VoIP	Voice over Internet Protocol

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