Improving Transparency and Oversight of Emergency Medical Services in Minnesota

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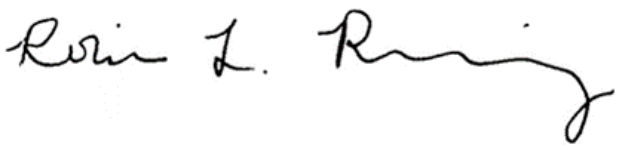

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Prepared for Minnesota State Fire Chiefs Association (MSFCA) on behalf of the University of Minnesota Resilient Communities Project (RCP)

Executive Summary

This report presents findings from a capstone project led by a Research Policy Team comprised of students of the Humphrey School of Public Affairs. The project, commissioned by The Resilient Communities Project of the University of Minnesota, was prepared on behalf of the Minnesota State Fire Chiefs Association (MSFCA). The Research Policy Team discovered that there is a lack of transparency and oversight of Emergency Medical Service (EMS) delivery in Minnesota.

Critical research questions that helped the team substantiate the problem include:

1. What changes have occurred in communities and health care since the inception of the current EMS regulations in Minnesota?;
2. What are the pros and cons of different EMS delivery models?; and,
3. What challenges are facing Minnesota's EMS system that impact EMS service delivery across the state?

During the project, the scope of consideration was broadened to include the findings of interviews with EMS professionals stating desired reforms and challenges. Desired reforms included the establishment of performance standards for EMS delivery, recalibration of the Emergency Medical Services Regulatory Board (EMSRB) composition to increase more diverse professional representation, increased opportunities for local input in EMS management, the need for connection and engagement between EMS professional and the communities they serve, and increases in pay and professional acknowledgement commensurate with the services provided to the community and equivalent medical professionals in other settings.

A number of challenges were also identified. This included the ongoing shortage of paramedics and EMS professionals to provide EMS coverage, exacerbated by the increasing pressure on EMS to support the needs of an aging population. Other challenges also include a lack of local control in EMS decision making; inequitable payment and reimbursement systems that do not compensate for services provided by onscene and non-transporting EMS ; little to no quality measurement indicators (QMIs) leading to lack of performance improvements; low volunteerism; low Medicare/Medicaid reimbursement rates; and the diversion of ambulances for use as non-emergency medical transportation. .

The Research Policy Team found that there are multiple factors that need to be addressed in order to address the ongoing challenges and necessary reforms. Complicating factors include the complexity of the policy space; a lack of consensus on problems and priorities; the need for more work to engage community & stakeholders in decisions making; and the lack of diversity on the EMSRB. The reality is that as the need for EMS continues to grow so will the complexity of the challenges.

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About the Project

This project was completed as part of a partnership between the Minnesota State Fire Chiefs Association (MSFCA) and the University of Minnesota's Resilient Communities Project (RCP) (http://www.rcp.umn.edu). The goal of this project was to determine the pros and cons of EMS service delivery models and provide evidence that may inform and guide future legislative revisions of EMS policy which may enhance standard practices of EMS providers across the state of Minnesota. MSFCA project lead BJ Jungmann collaborated with students in completing their Master's of Public Affairs final project to contextualize changes in communities and healthcare since the inception of the current EMS regulations in Minnesota and recommend changes that can be made to Minnesota's EMS system and legislation to enhance oversight of EMS providers across the state. A final student report and presentation are available. A videorecording of the students' final presentation is also available at https://vimeo.com/586854984.

Resilient Communities Project (RCP)

The Resilient Communities Project (RCP) partners with city and county government agencies in Minnesota to address locally identified environmental, social, economic, and livability issues and needs through year-long, collaborative community-university partnerships. Through the program, University faculty, staff, and students have an opportunity to provide research and technical assistance on real-world issues by way of course-based and independent student projects.

Minnesota State Fire Chiefs Association (MSFCA)

The Minnesota State Fire Chiefs Association (MSFCA), an industry association that represents the leadership of the Minnesota Fire Service, assesses current regulatory practices of Emergency Medical Services (EMS) in Minnesota. MSFCA is composed of 700 fire departments and works in partnership with the Minnesota Fire Department Association, Fire Marshals Association of Minnesota, and International Arson Investigators Association Minnesota Chapter.

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Definitions

Advanced Life Support (ALS) Ambulances. Ambulances are staffed by at least one paramedic that provides transportation to patients who require a higher level of medical monitoring.

Ambulance Service Licensing. Ambulance services are licensed to provide a certain level of care (basic life support, advanced life support or a combination). The level of care is largely dependent on the training level of the personnel. Each ambulance service is licensed to provide care in an assigned primary service area (PSA) which has defined geographic boundaries.

Basic Life Support (BLS) Ambulances. Ambulances staffed by EMT caregivers that provide transportation for patients who require basic medical treatment and monitoring.

Bundled Payment (BP). The provider receives a single payment for an episode of care, which includes a defined set of services the patient may or may not need based on the patient's condition. Providing unneeded services does not lead to additional payment.

Capitation. The provider receives a per-unit-time payment for each patient in the panel. The provider must provide all necessary services for the patients within their panel. The most common forms of capitation in the US are Health Maintenance Organizations (HMOs) and Accountable Care Organizations (ACOs).

EMS Models. EMS agency types can be divided into three main groups: (1) EMS agencies responding to 911-based emergencies with or without transport; (2) EMS agencies that provide scheduled medical transport, often referred to as non-emergent transport; and (3) EMS agencies known as Specialty Care Transport that provide emergent interfacility transport from one healthcare facility to another.

Emergency Medical Services (EMS). EMS is a prehospital acute care service consisting of trained medical care providers, such as paramedics, and vehicles for transporting patients, such as ambulances.

Emergency Medical Services Regulatory Board (EMSRB). The regulatory board for EMS in the state of Minnesota. Its duties include (1) administer and enforce the provisions of [MINN. STAT. § 144E[1]] and other duties as assigned to the board; (2) advise applicants for state or federal emergency medical services funds, review and comment on such applications, and approve the use of such funds unless otherwise required by federal law; (3) make recommendations to the legislature on improving the access, delivery, and effectiveness of the state's emergency medical services delivery system; and (4) establish procedures for investigating, hearing, and resolving complaints against emergency medical services providers.

Fee-for-Service (FFS). The provider receives a separate payment for each service provided to the patient. Reimbursement can depend on the service and patient type.

Mutual Aid. In emergency services, mutual aid is an agreement among emergency responders to lend assistance across jurisdictional boundaries.

Performance Improvement (PI) Process. PI is a mechanism for continued system review to ensure that protocols are being followed, that sources of error are identified and addressed, and recurrences prevented.

Primary Service Areas (PSAs). A PSAs is an area designated by the EMSRB in which a licensed ambulance service is serving a primary service area or areas.

Quality Measurement Indicators (QMIs). QMIs are measurable, objective indicators of the efficiency of the key segments of a system.

[1] MINN. STAT. § 144E (2020) (titled "Emergency Medical Services Regulatory Board").

Introduction & Background

In the United States, Emergency Medical Services (EMS) involves complex partnerships between public and private sector providers. EMS typically begins with a consumer action (placing an emergency 9-1-1 call), involves the private sector (telecommunications service provider) delivering the call, the public sector (public-safety answering point [PSAP], state police) receiving and dispatching the call, the private and/or public sector (ambulance service, fire, or police) providing first response, transport and health care services, and finally either a public or private sector hospital or trauma center delivering appropriate health care services[2].

The multivariable and multi-organization nature of EMS has led to a lack of data sharing, communications, and consistent regulation across services. This in turn has made it difficult for states and regulatory agencies to maintain quality control and implement performance improvement (PI) processes that would improve the efficacy of EMS delivery. The issue is complicated by the lack of data driven and agreed upon measurements for the efficacy of EMS delivery.

EMS were first instituted and funded in the United States in large part by the federal government through the Highway Safety Act of 1966 and the EMS Act of 1973. In the 1980's federal support for EMS agencies declined and states and localities began financing and designing local EMS programs. According to Pearce, "The result has been considerable fragmentation of EMS care and wide variability in the type of care that is offered from state to state and region to region"[3]. This has been true in Minnesota as well - the Primary Service Areas (PSAs) model has resulted in wide variations in the services, staffing, and quality of EMS across service delivery areas. This greatly impacts the components of PSA services that include end-to-end performance, quality of care, timeliness, cost, documentation and mortality.

Although EMS varies greatly by locality, there are some shared characteristics including that EMS providers are required to obtain a license (although many states, including Minnesota, provide exceptions for extraordinary circumstances, such as major catastrophes) and that each locality has a regulatory entity that is responsible for administering and enforcing the state's EMS statutes and regulations, such as a state agency, board, or committee[4]. In Minnesota, this regulatory entity is the Emergency Medical Services Regulatory Board (EMSRB).

Birkeland & Scott further categorized local EMS regulation into four broad models, although this does not encapsulate every model currently in use in the United State:

- Ambulance provider service areas (PSAs in Minnesota);
- State oversight and regional delegation;
- Local input and control; and,
- Comprehensive statewide planning.

States will often use characteristics from multiple models.

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[2] Schooley, Ben L., and Thomas A. Horan. "Towards end-to-end government performance management: Case study of interorganizational information integration in emergency medical services (EMS)." Government Information Quarterly 24.4 (2007): 755-784.

[3] Pearce, A. P. "Emergency medical services at the crossroads." (2009): 685-685.

[4] Birkeland, Cole, and Scott May. "Improving Emergency Medical Services in Minnesota: A Legal Analysis of Minnesota's EMS Statutes and Regulations." (2021).

For PSAs, the state regulatory authority licenses ambulance services by geographic service areas. In Minnesota and Connecticut, only one ambulance service is assigned to each geographic area. Other states using this model allow for more than one ambulance operator per service area or may allow service areas to overlap. In Minnesota, once an ambulance service is licensed to operate a PSA, they maintain that license into perpetuity. Public input is considered when an ambulance service is first licensed, but there are limited opportunities for public input once the license is granted and there are no standards of service that the ambulance service must maintain to keep their license and exclusive rights to their PSA. .

Most states have multiple entities involved in the administration and enforcement of EMS laws and regulations, including advisory committees, councils, and commissions. Minnesota is unusual in that its EMS system is governed and overseen by a single, state-level entity, the EMSRB. Many states also implement a system for regulating EMS services that divides the state into districts or regions. In most states that operate a similar "top down" EMS system, they have other state-level boards or committees for the purposes of accountability, advising, oversight, and planning.

Some states explicitly provide that local political subdivisions are legally entitled to establish their own EMS systems or furnish EMS to their communities. Other examples of this model require regional EMS councils to adopt "service zone plans" and prohibit ambulance services from providing primary response in an area if not designated as the "primary ambulance service".

Some states have a comprehensive and unified statewide plan. These plans often include local input, regional allocation, and many other factors in determining ambulance provider service areas and developing local EMS systems. The plan includes coordinating providers and assisting local governments and is implemented through regional councils, which also must prepare regional plans.

The integration of PSAs, state oversight and regional delegation, local input and control, and comprehensive statewide planning creates a complexity in the field, and requires agreed upon standards for coordination to maintain effective service.

History & Current State of EMS in Minnesota

For our project, we will be focusing on the state of Minnesota. Here we have outlined the relevant regulatory and statutory models for the state.

Minnesota's EMS Statutes and Regulations

EMS in Minnesota is governed by MINN. STAT. § 144E[5] (titled "Emergency Medical Services Regulatory Board"). Originally, Minnesota's EMS laws were administered and enforced by the Board of Health, which was abolished and replaced by the Department of Health (MDH) in 1977. In turn, MDH was responsible for administering and enforcing the state's EMS laws until the establishment of the Emergency Medical Services Regulatory Board (EMSRB) in 1995. Today, Minnesota's EMS laws are administered and enforced by the EMSRB. The regulations promulgated by the EMSRB are compiled at MINN. R. 4690[6].

Emergency Medical Services Regulatory Board

The EMSRB is comprised of the following members who are appointed by the governor: an emergency physician, a representative of hospitals, a representative of fire chiefs, a full-time

[5] MINN. STAT. § 144E (2020) (titled "Emergency Medical Services Regulatory Board").
[6] MINN. R. 4690 (2013) (titled "Ambulance Services").

firefighter who serves as an emergency medical responder, a volunteer firefighter who serves as an emergency medical responder, an attendant currently practicing on a licensed ambulance service who is a licensed paramedic or emergency medical technician, an ambulance service director, a representative of sheriffs, a member of a local board of health, two representatives of regional EMS programs, a registered nurse currently practicing in a hospital emergency department, a pediatrician, a family practice physician, a public member who resides in Minnesota, the commissioner of the Department of Health or their designee, and the commissioner of the Department of Public Safety or their designee. At least seven of these members must reside outside of the Twin Cities metropolitan area, which includes Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington counties. Additionally, one state representative and one state senator serve as ex officio, non voting members.

The EMSRB's duties are prescribed by MINN. STAT. § 144E[7].01(6)(a), which provides that the EMSRB shall:

1. Administer and enforce the provisions of [MINN. STAT. § 144E] and other duties as assigned to the board;
2. Advise applicants for state or federal emergency medical services funds, review and comment on such applications, and approve the use of such funds unless otherwise required by federal law;
3. Make recommendations to the legislature on improving the access, delivery, and effectiveness of the state's emergency medical services delivery system; and
4. Establish procedures for investigating, hearing, and resolving complaints against emergency medical services providers.

The EMSRB is also authorized, but not required, by MINN. STAT. § 144E.01(6)(b) to "prepare an initial work plan, which may be updated biennially" and "may include provisions to" (1) prepare an emergency medical services assessment which addresses issues affecting the statewide delivery system; (2) establish a statewide public information and education system regarding emergency medical services; (3) create, in conjunction with the Department of Public Safety, a statewide injury and trauma prevention program; and (4) designate an annual emergency medical services personnel recognition day.

Primary Service Areas (PSAs) in Minnesota

A unique feature of EMS regulation in Minnesota is that Minnesota law dictates that the EMSRB must define Primary Service Areas (PSAs) under which it must designate a "licensed ambulance service as serving a primary service area or areas"[8]. Minnesota Supreme Court's ruling in Twin Ports Convalescent, Inc. v. Minn. State Bd. of Health, 257 N.W.2d 343 (Minn. 1977) led to the state legislature establishing PSAs and the Court's ruling remains entrenched within the state's ambulance service licensing procedure to this day. PSAs can vary in size and resources and often cut across local political subdivisions.

The EMSRB licenses ambulance services in Minnesota. Each ambulance service is licensed to provide a certain level of care (basic life support, advanced life support or a combination). The level of care is largely dependent on the training level of the personnel. Each ambulance service is licensed to provide care in an assigned PSA which has defined geographic boundaries. There are no Quality Measurement Indicators (QMIs) or defined criteria for reviewing the effectiveness of an ambulance

[7] Same.
[8] Birkeland, Cole, and Scott May. "Improving Emergency Medical Services in Minnesota: A Legal Analysis of Minnesota's EMS Statutes and Regulations." (2021).

service provider's service to the community and patient during license renewal and once granted, it is difficult for the public or local government to request revocation or change the ambulance services provider in a PSA.

The Minnesota State Fire Chiefs Association (MSFCA), the client for this project, has stated that one of the top priorities of the approved legislative agenda is to work to establish local control over the provision of EMS in Minnesota. There are concerns that once a service is granted a license with a specific territory, they are allowed to operate that license into perpetuity. These licenses do not have any performance criteria and can be part of mergers and acquisitions without any local input or consideration of its potential effects.

Birkeland & Scott in their legal analysis criticized what they saw as Minnesota's "centralized, undemocratic, and unflinchingly rigid PSA law," lack of meaningful local input and control over the furnishing of EMS in communities, and the heavy centralization of decision-making and oversight for EMS within the EMSRB[9].

A lack of regulatory oversight at the state level can lead to problems in the effectiveness/efficiency of service provision. For example, a WCCO-TV investigative series in the late 1970s illustrated that there was a troubling lack of effective regulatory oversight in Minnesota[10]. The series provided several examples where individuals died or were injured through ambulance services failing to transfer emergency calls to another service when their own ambulances were not available to avoid losing the businesses. The state agency at the time responsible for administering and enforcing ambulance regulations claimed that they lacked sufficient resources to thoroughly supervise every ambulance service. Although there have been some regulatory improvements since the 1970's, there is a remaining concern that similar scenarios are still possible and that there is a lack of effective oversight and transparency in ambulance service licensing.

Early Analysis of the Problem

MSFCA initially requested two outcomes from this project:

1. A policy analysis that compares Minnesota's EMS regulations to those in other states, including identifying other states that provide for local control over their EMS; and,
2. A legal analysis of the current EMS regulations through a federal antitrust lens.

The initial research and legal analysis was completed in spring 2021 by Cole A. Birkeland & Scott M. May from the University of Minnesota Law School[11]. After reviewing the legal analysis and available information on Minnesota's EMS models, we determined there was not enough publicly available research defining the challenges with Minnesota's current EMS models or the QMIs that could be used to determine which EMS models in the United States would be most effective for Minnesota to look at for comparison. We recommended that MSFCA revise the focus of this project to gather

[9] Birkeland, Cole, and Scott May. "Improving Emergency Medical Services in Minnesota: A Legal Analysis of Minnesota's EMS Statutes and Regulations." (2021).
[10] WCCO-TV Channel 4 News, (WCCO-TV Channel 4 television broadcasts, late 1970s) (on file with authors) (showing various ambulances that served the Twin Cities metropolitan area during the late 1970s).
[11] Birkeland, C., & May, S. (2021). Improving Emergency Medical Services in Minnesota: A Legal Analysis of Minnesota's EMS Statutes and Regulations.

qualitative and quantitative evidence to support or contradict the anecdotal problem of lack of local control over EMS.

Literature Review

Our team reviewed the available literature on EMS models specifically as it relates to the development of QMIs, challenges currently facing EMS, and available mechanisms of reforming EMS delivery. We found that research on EMS models is relatively new and there was a lack of consensus or agreed upon frameworks to examine the efficacy of different service models.

Quality Measurement Indicators (QMIs)

QMIs are measurable, objective indicators of the efficiency of the key segments of a system. There are no standardized QMIs for EMS in the United States or Minnesota. Several possible indicators have been used including quality of care, timeliness, end-to-end performance, cost, documentation, mortality, and Road Traffic Injuries (RTIs). As part of determining the efficacy of EMS models in Minnesota, QMIs are required to examine and determine what constitutes effective EMS. Our research was limited by the data available for QMIs that are publicly available.

- Quality of Care
    - Using quality of care as a performance measure is likely to be difficult because quality of care varies greatly across local EMS services and there is no agreed upon way to define, improve, and standardize medical care performance measures, data collection, and analysis. There is a need to better understand how to measure quality of care and how information systems can best extract such data in highly complex, dynamic, time-critical health care delivery environments[12].
- Timeliness
    - Time has long been used in EMS to measure interorganizational system performance but there is some debate on its accuracy as a proxy for quality or effectiveness of care (IOM, 2006). EMS systems often invest heavily in efforts to minimize response and patient-care time intervals[13]. While time is a critical factor in specific medical emergencies like ventricular fibrillation and cardiac arrest, research has not determined it to be an accurate QMI across all services EMS provide. It was also interesting to read that, although rural communities are believed to face geographic barriers to timely EMS care, there is relatively little variation in response, scene, and transport times between urban, suburban, and rural EMS responses in the United States[14].
- End-to-End Performance
    - Schooley & Thomas recommended the use of end-to-end performance when measuring EMS service performance, from service initiation (e.g., 9-1-1 phone call), through dispatch, EMS response, and resolution (e.g., definitive healthcare at a hospital)[15]. This would provide a more holistic determination of QMIs across the entire experience of the patient.

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[12] Schooley, Ben L., and Thomas A. Horan. "Towards end-to-end government performance management: Case study of interorganizational information integration in emergency medical services (EMS)." Government Information Quarterly 24.4 (2007): 755-784.
[13] Wang, Henry E., et al. "National characteristics of emergency medical services responses in the United States." Prehospital emergency care 17.1 (2013): 8-14.
[14] Same.
[15] Schooley, Ben L., and Thomas A. Horan. "Towards end-to-end government performance management: Case study of interorganizational information integration in emergency medical services (EMS)." Government Information Quarterly 24.4 (2007): 755-784.

Determining QMIs for end-to-end performance is often difficult because data is not shared or standardized between the different organizations responsible for EMS patient care. Furthermore, there is no state level standardization of practices in Minnesota, meaning that each ambulance service provider would need to be examined individually to determine their unique service model.

- Cost
    - Cost of care is a rising concern, as a national survey estimated that 17% of ambulance trips to hospital emergency departments were medically unnecessary, and these unnecessary trips make up an increasing proportion of all EMS trips[16]. These non-emergency patients are a controllable arrival stream that can be redirected to an appropriate care provider, reducing congestion in EDs, reducing costs to patients and health care payers, and improving patient health, but prehospital triage to identify these patients is almost never implemented by EMS providers in the United States.
    - According to Webb & Mills, prehospital triage is unlikely to occur under the current structure of fee-for-service reimbursements, regardless of how effective the triage process might be, unless low-acuity patients are unprofitable, and a hospital is willing to coordinate with EMS[17]. Furthermore, Medicare and insurance reimbursement rates often do not reflect the total costs of providing EMS in the community and many providers need to be subsidized or rely on volunteer support to underwrite the true cost of the services provided to the community.
- Documentation
    - One interesting QMI to consider is the failure of EMS to document basic measures of scene physiology, specifically heart rate (highest, lowest), systolic blood pressure (lowest), respiratory rate (highest, lowest), and scene Glasgow coma scale (GCS). Failure of reporting is associated with increased mortality. Monitoring these process measures may improve the sensitivity to identify deviations in care that are associated with patient outcomes[18].
- Patient Outcomes & Mortality
    - EMS is often viewed as part of public safety and not fully integrated into healthcare systems in the United States. As a result, there is a lack of data sharing on the patient outcomes and mortality once the patient enters the hospital or other final destination medical provider. Furthermore, current patient morbidity and mortality outcome performance measures are insensitive to regional system failures, as well as, to the effect of any corrective measure implemented for suboptimal performance. As a result, mortality is an inadequate indicator of the quality of the trauma system[19].
- Indicators for Road Traffic Injuries (RTIs)
    - In the United States and nationally, EMS has been closely linked to national efforts to improve road safety. One way to measure the efficacy of EMS is to use data collected by the National Highway Traffic Safety Administration on traffic safety and road accident outcomes as a proxy. Azami-Aghdash, et al. developed three subcategories for QMIs in RTIs: structural, performance, and management indicators. Although Azami-Aghdash

[16] Webb, Eric M., and Alex F. Mills. "Incentive–Compatible Prehospital Triage in Emergency Medical Services." Production and Operations Management 28.9 (2019): 2221-2241.
[17] Same.
[18] Laudermilch, Dann J., et al. "Lack of emergency medical services documentation is associated with poor patient outcomes: a validation of audit filters for prehospital trauma care." Journal of the American College of Surgeons 210.2 (2010): 220-227
[19] Same.

originally developed the RTIs for Iran, the indicators could be adjusted for the Minnesota (or United States) model of EMS[20]. Some possible structural indicators that could be adapted include road emergency service coverage rates, number of backup ambulances, the ratio of active ambulances to the total number of ambulances, and active workforce.

- Indicators of performance and management
    - Recommended performance indicators that could be adapted included the average time in each part of the response from dispatch to reaching the hospital, per capita responses performed for each ambulance, patient satisfaction, successful CPR rate, death rate during transfer. As mentioned before, there is some debate of using time as a proxy for quality of care and improved patient outcomes.
    - Recommended management indicators that could be adapted included management visits from pre-hospital emergency stations, training courses in the field of trauma care, average distance between pre-hospital emergency centers, and average distance between pre-hospital emergency centers to hospitals. Although Azami-Aghdash, et al. presented several possible indicators, using public data in Minnesota to access such a wide range of information on the indicators may be difficult due to lack of reporting and publicly available information.

Challenges

The literature has provided several examples of challenges to researching EMS models in the United States. Furthermore, there are several challenges to implementing changes to EMS that must be considered.

- Adoption of New Technology & Information Management
    - Schooley & Thomas recognized that the dynamic, complex, time-critical, and multivariable nature of emergency and trauma care work creates a number of technology usability issues and challenges, which cause emergency professionals to take a conservative approach to new information and technologies to support EMS[21].
- Time Critical Information Sharing (TCIS)
    - Horan & Schooley, who developed a model for Time Critical Information Sharting (TCIS) in EMS services identified the lack of data and information sharing across organizations as the biggest challenge to EMS reform[22]. These challenges and others were explored within a Minnesota context through our qualitative research and interviews with stakeholders.
- Lack of Regulatory Oversight
    - Birkeland & Scott identified the lack of regulatory oversight in licensing and lack of centralized governance, planning and infrastructure despite Minnesota's state level control and lack of local input in ambulance licensing as a major challenge.

[20] Azami-Aghdash, Saber, et al. "Development of quality indicators to measure pre-hospital emergency medical services for road traffic injury." BMC health services research 21.1 (2021): 1-12.
[21] Schooley, Ben L., and Thomas A. Horan. "Towards end-to-end government performance management: Case study of interorganizational information integration in emergency medical services (EMS)." Government Information Quarterly 24.4 (2007): 755-784.
[22] Horan, Thomas A., Michael Marich, and Ben Schooley. "Time-critical information services: analysis and workshop findings on technology, organizational, and policy dimensions to emergency response and related e-governmental services." Proceedings of the 2006 international conference on Digital government research. 2006.

Mechanisms of Reform

Despite the challenges presented in the literature, there are also a number of possible mechanisms to be used for reform and improving EMS efficacy. Depending on the challenges identified in our interviews, there are several recommended avenues for reform.

- Performance-based Contract
    - Schooley & Thomas recommended that clear lines of interorganizational authority and accountability tend to enhance information sharing and technology and could be implemented through performance-based contracts that clearly define authoritative boundaries and information sharing was enforced. To implement performance-based contracting, we would need to understand the interorganizational workflows, partnership arrangements, organizational structures, governance structures, and organizational policies as a valuable step to improving end-to-end service performance. This could be a difficult recommendation in Minnesota without revisions to the current laws overseeing PSAs and ambulance licenses.
- Financial Incentives
    - Webb & Mills argued that reform in EMS would not occur without payment reforms that would make recommended changes incentive compatible[23]. The current fee-for-service (FFS) model used in Minnesota does not incentivize improving EMS efficacy. Medicare has been experimenting with other payment models including Bundled Payments and Capitation that would incentivize EMS to adopt cost efficient changes. Payment reforms could be used as a level to incentivize the adoption of other recommendations as well.
- Information Sharing & Interorganizational Cooperative Agreements
    - Enabling interorganizational information sharing has been identified as an important precursor to improving EMS research and system-wide services[24].. EMS continues to operate without a sufficient research basis to support many of its operational and information systems decisions. Implementing Interorganizational Cooperative Agreements would increase the sharing of information through a shared set of goals and cooperative agreements that facilitate information sharing. Once again, this could be a difficult recommendation in Minnesota without revisions to the current laws overseeing PSAs and ambulance licenses.

Development of Research Questions

After the initial literature review and discussions with B.J. Jungmann, Chair of the MSFCA's Legislative Committee, the Research Policy Team identified the outstanding problem for exploration as, "There is a lack of transparency and oversight of Emergency Medical Service (EMS) delivery in Minnesota.

To explore this problem, the Research Policy Team recommended investigating three research questions:

1. What changes have occurred in communities and healthcare since the inception of the current EMS regulations in Minnesota?;

[23] Webb, Eric M., and Alex F. Mills. "Incentive–Compatible Prehospital Triage in Emergency Medical Services." Production and Operations Management 28.9 (2019): 2221-2241.
[24] Schooley, Ben L., and Thomas A. Horan. "Towards end-to-end government performance management: Case study of interorganizational information integration in emergency medical services (EMS)." Government Information Quarterly 24.4 (2007): 755-784.

2. What are the pros and cons of different EMS delivery models?; and,
3. What challenges are facing Minnesota's EMS system that impact EMS service delivery across the state?

Each question would allow us to better define the current problem(s) with Minnesota's EMS system and develop recommendations on improving EMS in Minnesota that could then be developed into legislative and policy recommendations.

Changes in Community & Health Demographics

There have been no major revisions to Minnesota's EMS regulatory environment since the EMSRB was implemented in 1995. Since then, there have been major changes in the demographic composition of the state that impact EMS delivery now and into the future. To research these issues we examined demographic changes in Minnesota reported in the American Community Survey (ACS) and the Census and completed an informational interview with Susan Brower, Minnesota State Demographer and head of the Minnesota State Demographic Center (SDC). We then examined these demographic changes in comparison with trends pulled from the EMSRB's data of EMS in Minnesota in 2020. Anecdotal information was also gathered through interviews with EMS professionals in leadership positions both fire-based and non-fire based as well as an EMSRB public member (non-EMS professional).

EMS Delivery Models

There are a number of different EMS delivery models both in Minnesota and across the country. We wanted to examine existing models in the state and begin to develop a framework for understanding the pros and cons of each model to help determine where current challenges and opportunities for improvement exist. To do this we developed a list of possible QMI for EMS models and evaluated their feasibility of implementation based on the available EMS data for 2020 from the EMSRB. Similar to the previous questions, anecdotal information was also gathered through interviews with fire-based EMS and first responders, private EMS providers, and hospital-based EMS workers.

Challenges to Minnesota's EMS Systems

We reviewed the current laws & regulations governing EMS and developed a list of possible changes to policy that could improve transparency and oversight. At this stage we are making recommendations regardless of the political feasibility of implementing the changes in the current political and regulatory climate. A stakeholder and political feasibility analysis will be included at the end of this report to examine how the current climate will impact possible changes and the final recommendations for improving transparency and oversight.

Methodology

To answer our three research questions, we decided to use two approaches: qualitatively with a focus on gathering anecdotal evidence from EMS professionals and other key stakeholders to identify diverse perspectives regarding the pros and cons of different models of EMS in Minnesota and quantitatively to understand the changes to Minnesota's demographics that will impact EMS services and provider, determining the availability and efficacy of QMIs for EMS data in the state of Minnesota; and examining available QMIs for trends in quality and efficacy of EMS delivery. We used both qualitative and quantitative methods to highlight trends in the EMS system in the state and make recommendations on improving transparency and oversight.

Qualitative

The qualitative research was conducted to better understand the challenges of our agreed upon problem statement. The qualitative research focused on obtaining anecdotal evidence from EMS professionals and other key stakeholders to identify diverse perspectives regarding the pros and cons of different models of EMS in Minnesota. Our strategy centered on understanding the processes, experiences, challenges, successes, standards, goals and models of EMS delivery. This information has become critical in understanding the landscape of the EMS ecosystem, and key factors that contribute to areas of systemic breakdown. Once comprehensive qualitative data was collected, we used it to inform our recommendations to help EMS leaders identify and implement solutions that advance the EMS field in Minnesota.

We were fortunate to work in partnership with BJ Jungmann, Burnsville Fire Chief and Legislative Chair of the MSFCA, who provided a list of fire chiefs, active and retired, and other stakeholders to serve as interview subjects. Additionally, he connected our sub-group to additional EMS professionals of different roles and titles to capture varied responses and experiences.

We set out to conduct virtual research interviews via Zoom and phone. Initially we were given a preliminary overview that strongly suggested lack of local control for EMS delivery services led to lack of transparency and oversight noted in the problem statement. However, we worked to maintain a neutral stance in conducting qualitative research so we are not influenced by biases in our research and final recommendations. We worked to identify what makes the problem a "problem", and whether or not the problem has led to tragedy or bureaucratic challenges. Each interview was structured to position the interview subject to be open and transparent about their experience, and thoughts they have for instituting changes to the field. The interview questions are included in addendum 1.

To date, we have interviewed twelve EMS professionals out of a list of more than twenty. Of the individuals interviewed, there has been a mix of those who work for municipalities that have a police and fire based EMS model for medical calls, and hospital based providers for transportation of individuals; fire based models with advanced life support (ALS), or non-profit medical providers serving as first responders. The research questions were prepared for each interview and slightly tailored to best follow the responses of the interviewee.

Additional Archival Research

We observed videos that described some EMS delivery challenges and successes in Minnesota.

The first set of videos were provided by our client and we observed these at the start of our project. This was a weeklong series of reports by Don Shelby of WCCO[25]. These videos from 1983 shed light on a need for change to public policy due to a lack of regulation of emergency medical services. It looked as if profit was the primary driver for some ambulance services.

The second video, A Look Back at the WCCO 1983 I-Team Ambulance Story, was provided to us by Brian LaCroix, one of the interviewees. This video was published in 2010[26]. Mr. LaCroix credits Don Shelby's report (along with others) with the public policy change of the creation of PSAs in MN.

[25] WCCO-TV Channel 4 News, (WCCO-TV Channel 4 television broadcasts, late 1970s) (on file with authors) (showing various ambulances that served the Twin Cities metropolitan area during the late 1970s).
[26] WCCO-TV Channel 4 News, (WCCO-TV Channel 4 television broadcasts, 1983) (on file with authors) I-Team Ambulance Story).

Quantitative

As touched upon in our literary review, the multivariable and multi-organization nature of EMS has led to a lack of data sharing, communications, and consistent regulation across services. There is no shared standard framework or methodology for data collection, QMIs, or continuous improvement measures for EMS in Minnesota or nationally. The lack of standard data practices nationally has made it difficult to maintain quality control and implement performance improvement (PI) processes that would improve the efficacy of EMS delivery.

As part of our quantitative approach, the Research Policy Team examined the quality of data available on EMS efficacy in Minnesota and determined what QMIs may be developed based on currently available data. The quantitative research focused on three areas:

1. Understanding changes to Minnesota's demographics that will impact EMS services and providers;
2. Determining availability and efficacy of QMIs for EMS data in the state of Minnesota; and,
3. Examining available QMIs for trends in quality and efficacy of EMS delivery.

To examine these focus areas, the team examined three data sets: American Community Survey (ACS, 2018), the U.S. National Census (Census, 2020), and the Emergency Medical Services Regulatory Board (EMSRB, 2018 - 2020). The ACS and Census are publicly available and free to researchers and the public. The EMSRB data is private and our information request was limited by the time and cost of preparing the requested data.

The Government Data Practices Act (Minnesota Statutes, Chapter 13) presumes that all government data are public unless a state or federal law says the data are not public. Government data means all recorded information a government entity has, including paper, email, flash drives, CDs, DVDs, photographs, etc. However, the EMSRB data set included information about individuals that restricted it as private and was not available to the public.

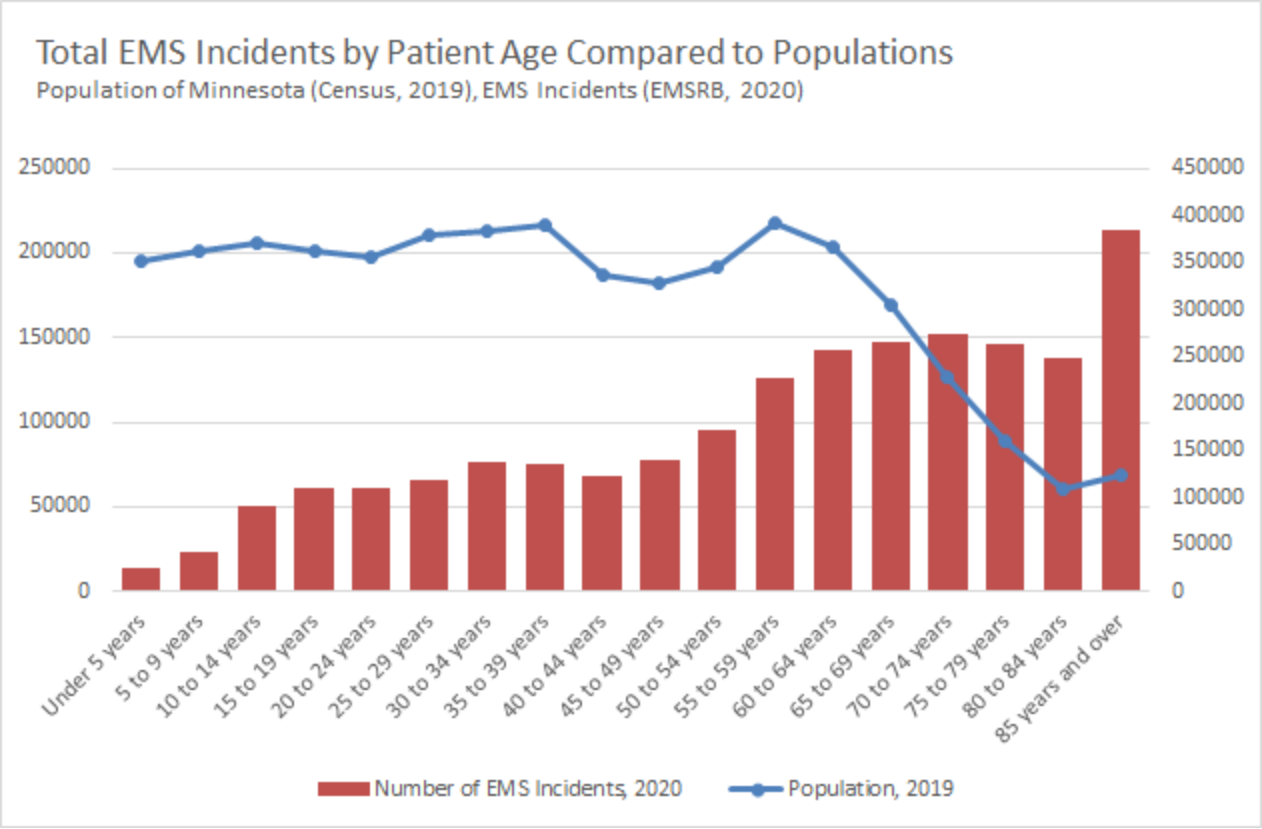
Findings

Research Question 1: Demographic Trends

Both our interviews and quantitative analysis provided insight on our first research question: What changes have occurred in communities and healthcare since the inception of the current EMS regulations in Minnesota?

In addition to our analysis of quantitative data, the team interviewed Susan Bower, State Demographer at the Minnesota State Demographic Center, to get a better understanding of the trends in Minnesota's communities and health that will impact EMS systems in the future. Our interviews with EMS providers also suggest trends that will impact EMS delivery in the future. The current EMS models have not been revised since 1995 when the EMSRB began managing ambulance licenses and there have been significant changes in population dynamics and healthcare needs in the intervening years. Key changes include: an aging population, increase in disability, decline in workforce and volunteer pool, Medicare and health insurance rates, immigration and non-English speaking households, and the needs of uninsured populations. In addition, our interviews suggested that social unrest and renewed focus on racial equity will lead to changing expectations regarding community needs.

Figure 1: Older Adults are more likely to require EMS services.



The Effects of an Aging Population on EMS

According to the Minnesota State Demographic Center, the number of Minnesotans turning 65 in this decade (about 285,000) will be greater than the past four decades combined[27]. The total number of older adults (65+) is anticipated to double between 2010 and 2030. In Figure 1, you can see that the likelihood of needing EMS services increases with age, despite older adults representing a small percentage of the total population. As more of the population becomes older adults, more EMS personnel and resources will be needed to meet the increase in demand for EMS services.

With an aging population comes increases in the number of people with disabilities, especially linked to mobility. The share of Minnesotans with a disability tends to increase among older age groups, from less than 1% of young children to 63% of older adults age 85+[28]. Concurrent disabilities can complicate EMS assessment and treatment in emergency situations[29]. As the number of people living with a disability(ies) increases, additional training, EMS personnel, and EMS infrastructure will be needed to meet more complex EMS demands.

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[27] *Data by Topic: Aging*. MN State Demographic Center. (2020, March 18). https://mn.gov/admin/demography/data-by-topic/aging/.

[28] Wilder Research. (n.d.). Minnesota Compass: All Minnesotans by Disability Status. Minnesota Compass. https://www.mncompass.org/topics/demographics/disability.

[29] Koch, K. (2020, December 10). Concurrent Disabilities Can Complicate EMS Assessment and Treatment in Emergency Situations. JEMS. https://www.jems.com/patient-care/concurrent-disabilities-can-complicate-ems-assessment-and-treatment-in-emergency-situations/.

As the population of the state ages, there will also be a decline in available workforce and volunteers. Minnesota's labor force projections indicate slowing labor force growth in Minnesota until a low point of less than 0.1% average annual growth during the 2020-2025 period[30]. During our interviews multiple EMS professionals reported experiencing a shortage of paramedics, high turnover in the field, and low registration in EMS training programs in part due to low pay, lack of community connection, high requirements, and not a favorable reputation in the community. To combat this shortage, the Minnesota Department of Health recommended expanding the Community Paramedic (CP) certificate program, a level of licensing for paramedics with additional training who delivers primary and preventive health care services, often in patients' homes and community settings, and connects patients to local community and public health resources.

The Minnesota Department of Health says 80% of the state's rural ambulance services rely on volunteers, and 60% of volunteer services reported being short-staffed in 2019[31]. Rural ambulance services often cannot afford to hire professional full-time staff. The Minnesota Department of Health provides tools and resources for volunteer recruitment and funding, but the problem will continue to grow as rural populations age faster than the rest of the state.

Medicare & Health Insurance Rates

Health insurance rates in Minnesota have remained relatively stable with 4.7% of Minnesotans uninsured in 2018, about half the rate of all Americans (9.4%)[32]. Rural Minnesotan are more likely to rely on public healthcare options like Medicare than their urban counterparts[33]. This can have an impact on EMS delivery because Medicare reimburses EMS providers for services at a lower rate than most private health insurers and the reimbursement rates often do not cover the full cost of the provided services.

For example, in the United States the average EMS agency receives 42% of its operating budget from Medicare fees, 19% from commercial insurers, 12% from Medicaid, and 4% from private pay; this requires approximately 23% in additional subsidization to cover the cost of EMS with the difference most often provided by local taxes[34]. This disproportionally affects rural communities due to there also being a smaller population base to cover the additional costs of care through local taxes. With the number of people over the age of 65 expected to double between 2010 and 2030 in Minnesota, the percentage of EMS calls being covered by Medicare will likely increase as well as the need to subsidize the cost of EMS across the state.

Immigration & Non-English Speaking Households

In 2018, 11.7% of Minnesotans (age 5+) spoke a language other than English at home[35] with Spanish as the most common non-English language spoken at home by Minnesotans and 8% of Minnesotans were immigrants, up from 5% since 2000. Although there is no data available for race, or gender of

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[30] Data by Topic - Labor Force. MN State Demographic Center. (2020, March 18). https://mn.gov/admin/demography/data-by-topic/labor-force/.
[31] Minnesota Department of Health. (2019, November 21). Rural Health Care in Minnesota: Data Highlights Chartbook 2019. https://www.health.state.mn.us/facilities/ruralhealth/docs/ruralhealthcb2019.pdf.
[32] *Data by Topic - Health & Disability*. MN State Demographic Center. (2020, March 18). https://mn.gov/admin/demography/data-by-topic/health-disability/.
[33] Minnesota Department of Health. (2019, November 21). Rural Health Care in Minnesota: Data Highlights Chartbook 2019. https://www.health.state.mn.us/facilities/ruralhealth/docs/ruralhealthcb2019.pdf.
[34] Pearce, A. P. (2009). Emergency medical services at the crossroads.
[35] *Data by Topic - Immigration & Language*. MN State Demographic Center. (2020, March 18). https://mn.gov/admin/demography/data-by-topic/immigration-language/.

EMS responders in Minnesota. Nationally, EMS workers also remain disproportionately white and male. This is an issue because workforce diversity can reduce communication barriers and equity in healthcare delivery, especially in settings where time pressure and incomplete information may exacerbate the effects of implicit biases[36].

Furthermore, language, communication, and cultural barriers can impact effective EMS delivery and lead to more negative health outcomes for this growing sector of Minnesota's population. As the number of people in the state speaking different languages increases, additional training, EMS personnel and medical interpreters, and EMS infrastructure will be needed to meet more complex EMS demands.

Focus on Health Disparities

An increased focus on racial and economic disparities in Minnesota has highlighted the intersections of race and health. There are also health inequities reflected in who has access to health insurance in Minnesota with people of color still twice as likely as white Minnesotans to be without health insurance. A recent study has debunked the assumption that those without health insurances use the emergency services more than those with healthcare[37] but anecdotally in Minnesota there are still concerns that EMS serves as the healthcare provider of last resort for Minnesotan without healthcare.

As previously mentioned, a lack of diversity in the EMS workforce and time sensitive and high pressure nature of EMS response may increase the likelihood of implicit bias that could impact care for Black Minnesotas. Attention should be given to providing implicit bias training to EMS personnel and encouraging Minnnesotan's from underrepresented groups to consider careers in EMS and emergency medicine. This could also help relieve some of the pressure by the decline in the overall workforce & volunteer pool, as younger Minnesotans are more likely to be people of color.

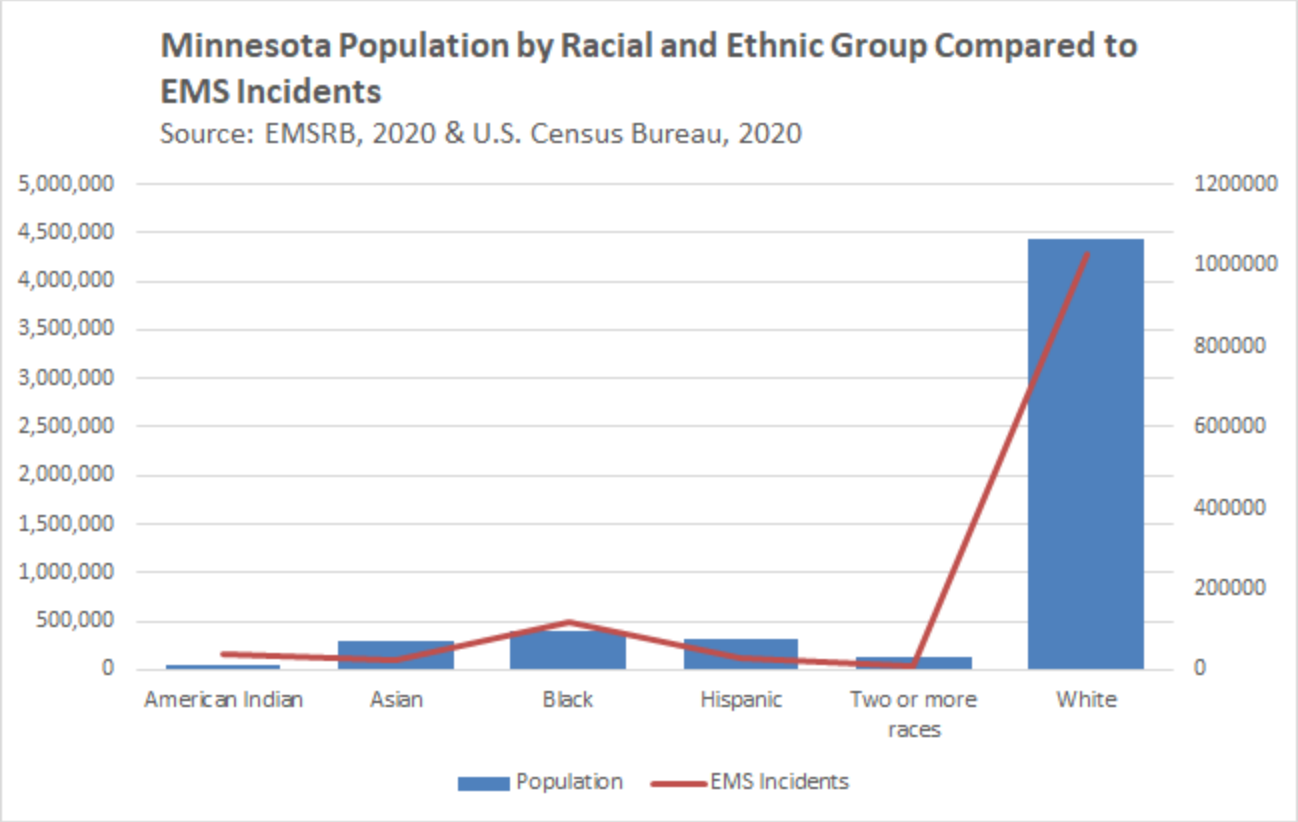
Recognizing the Impact of Civil Unrest & Social Justice Movements

The impact of civil unrest and social justice on the EMS field and the answers it provides in advancing the field to be of better service to the community, including community representation in leadership and community engagement was brought up as a major issue that should be addressed given the social climate of today. Additionally, we learned that EMS physicians are individuals that have influence and power in effecting change that could improve the EMS ecosystem. It was suggested that the EMSRB position EMS physicians to be the voice of the field at the legislature, pushing a legislative agenda that they create to improve health equity and EMS delivery in Minnesota.

Figure 2: Black Minnesotans had the highest use of EMS compared to population in 2020.

[36] Crowe, R. P., Krebs, W., Cash, R. E., Rivard, M. K., Lincoln, E. W., & Panchal, A. R. (2020). Females and minority racial/ethnic groups remain underrepresented in emergency medical services: a ten-year assessment, 2008–2017. Prehospital Emergency Care, 24(2), 180-187.

[37] Zhou, R. A., Baicker, K., Taubman, S., & Finkelstein, A. N. (2017). The uninsured do not use the emergency department more—they use other care less. Health Affairs, 36(12), 2115-2122.



Research Question 2: Pros/Cons of Different EMS Delivery Models

Our second research question, 'What are the pros and cons of different EMS delivery models?', positioned the team to review the differences in public providers (government, non-fire and fire departments); private providers (non-hospital) nonprofit or profit; and hospitals (state, government owned and public - nonprofit). The Research Policy Team relied on interviews with EMS professionals to identify the differences in different EMS delivery models, and the opportunities for making the models more efficient.

Quality Measurement Indicators

The first step in evaluating efficacy was to arrive at a set of quality measurement indicators. The team developed a list of possible QMI for EMS models and evaluated their feasibility of implementation based on the available EMS data for 2020 from the EMSRB. In our literature review, we found multiple frameworks for determining QMIs including Quality of Care, Timeliness, Cost, End-to-end Performance, Documentation, Mortality, and Indicators for Road Traffic Injuries (RTIs). Our analysis suggests that timeliness represents the best indicators for quality at this time. There is not enough information available on the variables recommended by literature review to establish correlation between different variables and patient outcomes and EMS efficacy. While we will use timeliness as a QMI, there are significant limitations to the measurement and opportunity for bias in reporting.

Originally, we included all records, but there were several non-emergency records that skewed the time EMS was notified by dispatch to the EMS being en route; dispatch was notified of the pending incident over 24 hours before EMS was dispatched. Similarly, the Incident Unit Back In Service Date Time often included when EMS went out of service and this skewed the total time on call.

To avoid this, we examined only emergency EMS incidents that included the Incident Unit Notified By Dispatch Date Time, Incident Unit En Route Date Time, Incident Unit Arrived On Scene Date Time, Incident Unit Left Scene Date Time, and Incident Patient Arrived At Destination Date Time. This did decrease the number of included incidents from 1,794,468 to 1,094,938 records. As you can see in Figure 3, there was still wide variation in Timeliness With the average time spent on a call being 54 minutes but the longest time spent on a call totaling over 48 hours. The large variety in the types of incidents EMS respond to likely explains this variation.

Figure 3: There is a wide variation in 2020 EMS Incident Timeliness (Hours).

Time	Notified by Dispatch to En Route	En Route to Arrived at Scene	Arrive on Scene to Left Scene	Left Scene to Patient Arrived	Total Time on Call
Min	0:00:00	0:00:00	0:00:00	0:00:00	0:00:00
Max	24:45:35	48:04:34	48:17:18	25:56:00	48:44:00
STNDV	0:16:59	0:12:30	0:19:28	0:26:30	0:44:29
Average	0:02:41	0:08:13	0:20:52	0:22:42	0:54:27

Types of EMS Incidents

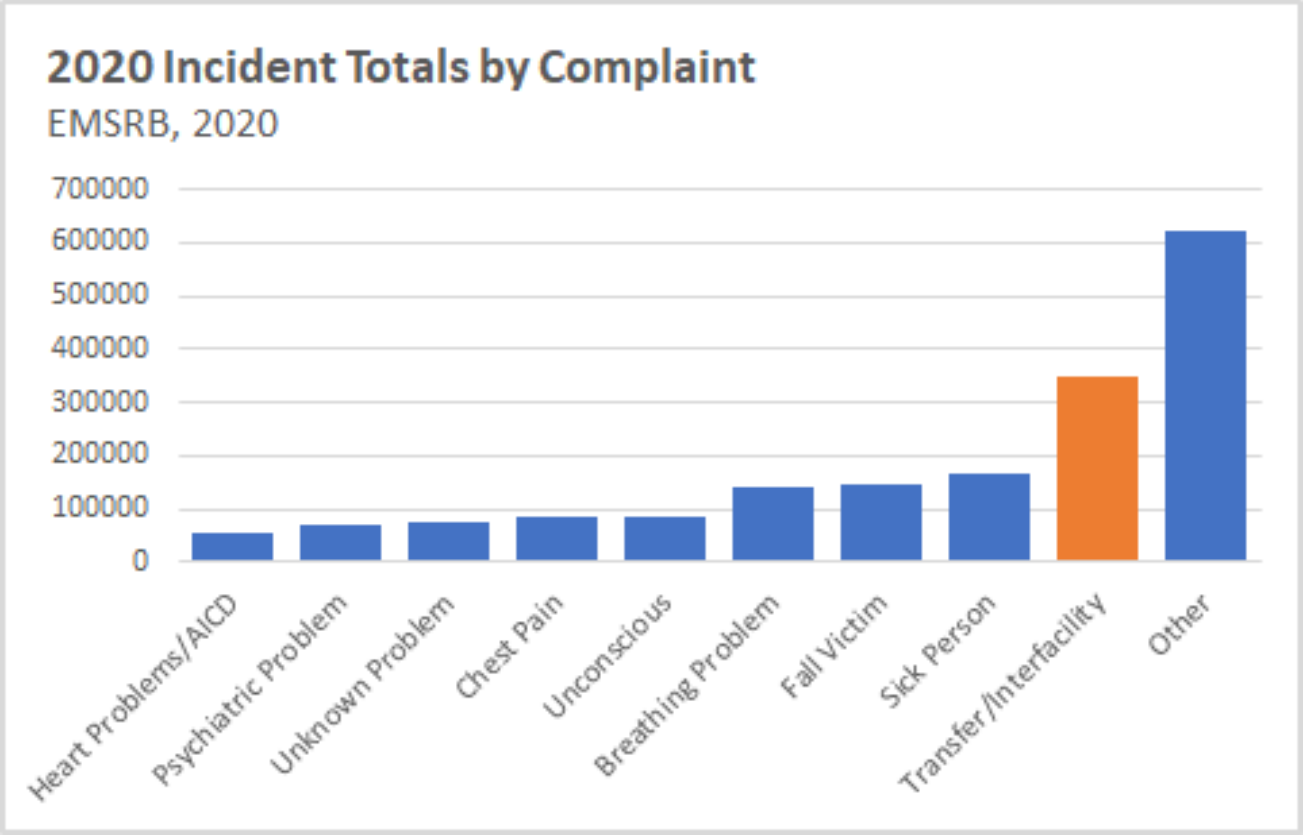
The number one type of incident where patients utilized EMS providers in 2020 was transferring patients between medical facilities. These transfers were often pre-planned - being submitted to dispatch multiple hours or even days in advance of when EMS providers would be dispatched. This utilization skews timeliness as a QMI because timeliness is not a critical factor in quality of care or efficacy when dealing with non-emergency situations.

The use of EMS for transportation services also causes issues with covering the cost of EMS. Federal health care policy currently reimburses ambulance service as a transportation benefit. This means that the ambulance must transport the patient to a hospital emergency department (ED) to receive compensation from federal payers and most commercial insurance companies. EMS providers are often not compensated for provided transportation between medical settings in a non-emergency or are reimbursed for less than the cost of providing the service[38].

Using ambulances for non-emergency transfers takes away the availability of vehicles and staff to respond to emergencies and can take ambulances out of centralized locations. One EMS professional from southern Minnesota stated that their ambulance is sometimes taken out of circulation for 2-3 hours for long distance transfers, this reduces the likelihood of quick EMS response for 911 emergencies.

[38] National Highway Traffic Safety Administration. (2016, December 2). EMS System Funding and Reimbursement. National EMS Advisory Council Committee Report and Advisory. https://www.ems.gov/NEMSAC-advisories-and-recommendations/2016/NEMSAC_Final_Advisory_EMS_System_Funding_Reimbursement.pdf.

Figure 4: Transfers & Interfacility Transports were the number one incident that EMS responded to in 2020.



Timeliness as a QMI for Cardiac Arrests

To use timeliness as a QMI for current Minnesota EMS models, only incidents designated as Cardiac Arrests were analyzed. Cardiac Arrest treatment is time sensitive and would be considered an emergency call by EMS providers. The number of Cardiac Arrest incidents in Minnesota in 2020 was 22,024. As you can see in Figure 5, the average number of minutes to transport a Cardiac Arrest patient varies greatly by county from a low of 15 minutes in Lac Qui Parle county, to a high of 203 minutes in Big Stone county.

Public & Private Providers

In Minnesota, the majority of EMS incidents are responded to by hospital-based EMS providers (54%), private (non-hospital) providers (20%), governmental (non-fire) providers (17%) and fire departments (10%). Government (non-fire) and fire departments are public providers; private (non-hospital) are private providers; and hospitals are a mix of public (state/government owned and public - nonprofit) and private (private - nonprofit) providers.

Figure 5: The average number of minutes to transport Cardiac Arrest patients varies by county.

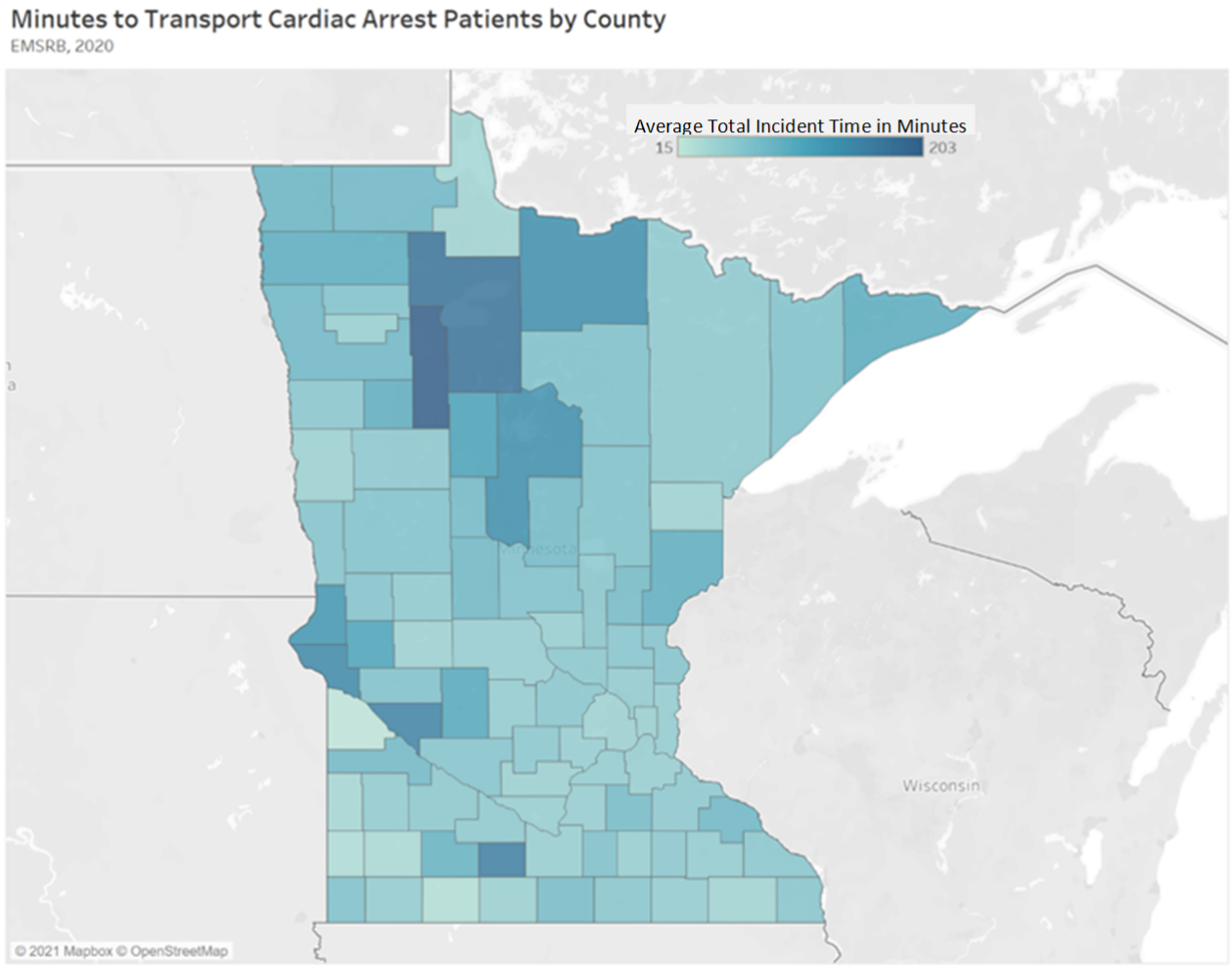


Figure 6: Hospital-based EMS responded to the highest number of EMS incidence in 2020.

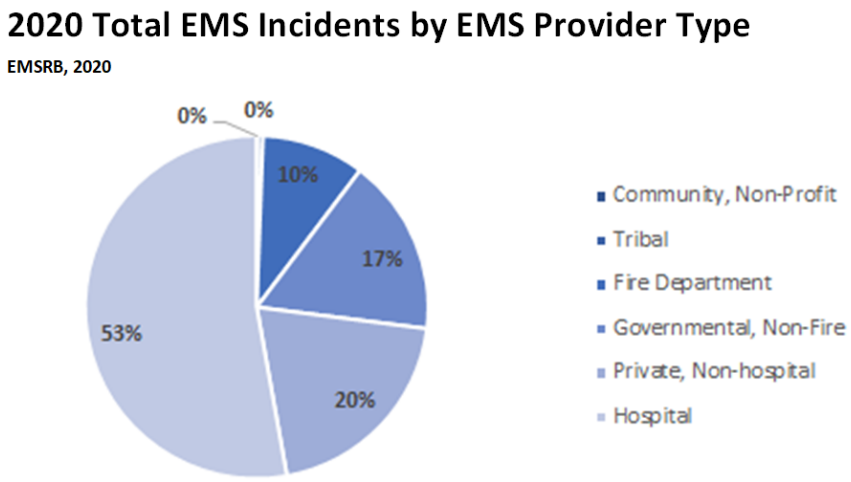


Figure 7: Fire Department-based EMS providers were the most timely overall in 2020.

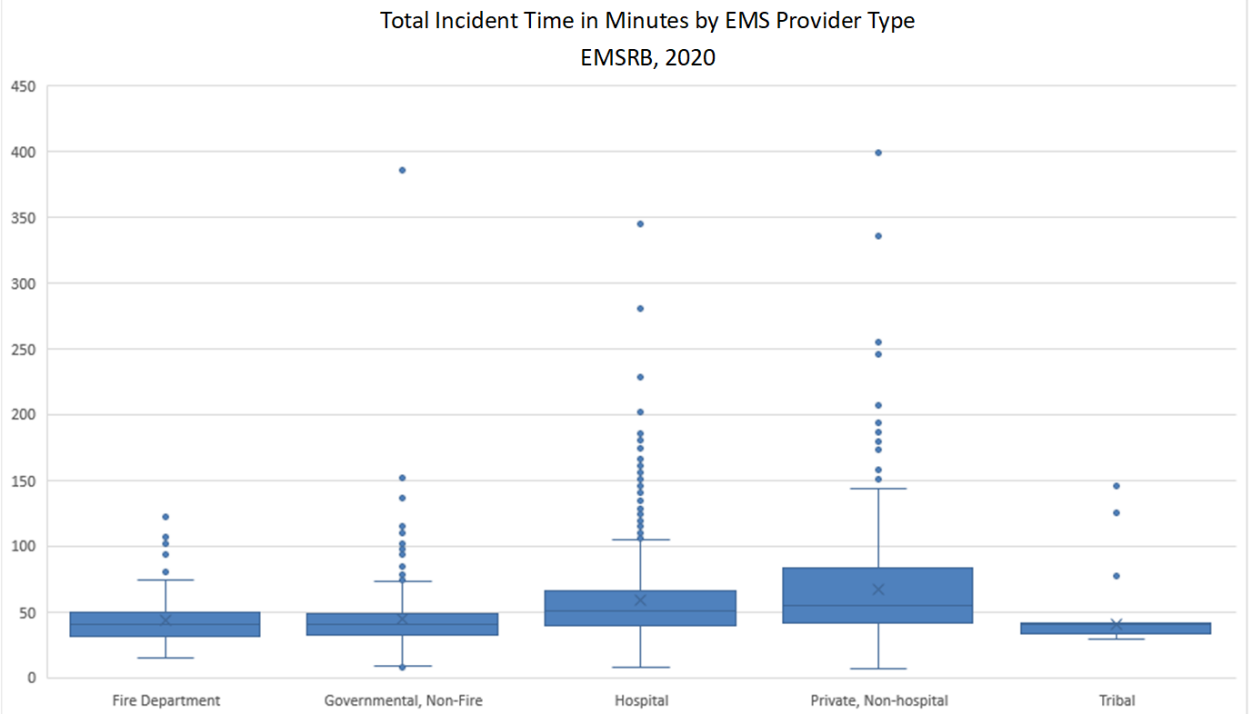


Figure 8: Chart of 2020 Total Time on a Call in Minutes by EMS Provider Type.

EMS Provider Type	Total Incidents	Average (Min)	Max (Min)	Min (Min)	StdDev (Min)
Fire Department	1,842	44	122	16	17
Governmental, Non-Fire	2,515	44	386	8	21
Hospital	10,693	59	345	8	32
Private, Non-hospital	6,881	67	399	7	40
Tribal	92	41	146	29	15
Overall - All Providers	22,023	59	399	7	34

Fire department based EMS provided the best overall timeliness out of all service provider types with the second to lowest average total time on a call (44 minutes), the lowest maximum time on a call (122 minutes), and second to lowest standard deviation (17 minutes). That being said, fire department

based EMS responded to less than 8.4% of the total Cardiac Arrest incidents in 2020, the second lowest response rate overall. Private, non-hospital, EMS provided the worst *overall* timeliness with the highest overall average time on a call (67 minutes), the highest maximum time on a call (399 minutes), and highest standard deviation (40 minutes).

Research Question 3: Continuing Challenges and Opportunities for Minnesota's EMS Systems

This project began with the goal of identifying legislative avenues for reforming EMS systems in Minnesota. Our analysis, examination of Minnesota's changing demographic, and evaluation of the current EMS, has revealed that the complex policy landscape does not map easily onto a single set of policy recommendations. Having also reviewed the current laws & regulations governing EMS, these analyses suggest multiple possible intervention points that might be further examined to strengthen EMS systems in Minnesota through improved transparency and oversight. Our analysis, based on the quantitative data and qualitative interviews, suggests the following areas for intervening at a policy level: funding and reimbursements, the adoption of QMI framework & data standards, local input and community engagement, and workforce development and retainment. At this stage we are making these recommendations regardless of the political feasibility of implementing the changes in the current political and regulatory climate. A stakeholder and political feasibility analysis will be included at the end of this report to examine how the current climate will impact possible changes and the final recommendations.

Adoption of QMI Framework & Data Standards

The Minnesota legislature should empower the EMSRB to work with EMS providers and community groups to develop an agreed upon framework and basic standards of service that could be used to evaluate the performance of EMS providers and create an incentive for continual performance improvements. In order to implement this change, there would need to be a clearer understanding of inter-organization interactions and leadership and accountability across different provider models in the state.

Funding should be provided to allow all EMS providers to adopt and accurately implement EMSRB data standards and increase reporting. With improved and expanded reporting, additional QMIs could be developed. Data sharing should be encouraged and a culture of transparency should be cultivated through shared learning opportunities and funding and licensing incentives tied to improved data standards and efficacy of service.

Funding & Reimbursements

Current models of funding and healthcare reimbursement are inadequate. As previously mentioned, EMS agencies receive the majority of their operational funding from Medicare fees. Medicare reimbursement rates are currently too low to cover the full cost of the services provided, leaving local communities to subsidize the cost of EMS through local taxes or other means. Furthermore, the number one type of incident that EMS is responding to are requests for interfacility transfers which are often not reimbursed by insurance companies or are reimbursed at a lower rate.

To be reimbursed by insurance, incidents also must result in the transportation of the patient to a hospital emergency department - this means that nationally the 26% of incident responses that do

not require transportation to a medical facility[39] are not reimbursed by insurance providers. Additionally, local municipalities who provide EMS services on the scene are often not reimbursed for their services at all because only the final ambulance service providing transportation receives the payment for those services. The lack of an adequate and comprehensive funding model for EMS has created a perverse incentive for agencies to transport patients to the hospital emergency department, even if transport is not what a patient needs or wants, and even if other alternatives might be better, less expensive, or more patient centered[40].

Minnesota legislators and the EMS providers must advocate for national changes to the reimbursement rate of the fee-for-service model to increase overall insurance reimbursement rates, account for services that do not result in the transportation for patients to a hospital emergency department such as on scene treatment or triage to non-emergency medical providers, and reimburse all providers responding to an incident, not just the provider that provides final transportation to hospital emergency departments. Alternative solutions should be investigated including:

- Payment arrangements other than fee-for-service such as Bundled Payments and Capitation;
- Additional community level grants and state-wide funding structures that adequately support professional EMS workers and reduce the reliance on volunteers; and
- Encouraging the adoption of community-based paramedics and pre-hospital emergency department triage.

Local Input & Community Engagement

Local municipalities have little to no control on who provides their ambulance services, how ambulances in their PSA are staffed, and what services are available. Furthermore, there was also a knowledge and communication gap between EMS providers and local communities, with many local leaders expressing little to no knowledge of how ambulances in their PSA are staffed or managed. There is a need for more community connection and engagement that does not solely upon good neighbor relationships.

Workforce Development & Retainment

With the tighter labor market and the growing need for both voluntary and professional EMS staff, workforce engagement and retainment is critical to ensuring an adequate EMS system for the state of Minnesota now and in the future. Many EMS professionals express frustration over an inability to increase wages for EMTs/paramedics, to provide better benefits or opportunities for advancement, and to increase the quality of EMS management[41]. The EMSRB should be gathering data on Minnesota's EMS workforce including salary surveys, workforce numbers, and education opportunities to help advocate for changes in EMS employment practices to improve workforce numbers and retention rates. Volunteerism is reducing. There are costs associated with maintaining EMT/paramedic credentials, even for volunteers. Some families have experienced negative financial

[39] Munjal, K. G., Silverman, R. A., Freese, J., Braun, J. D., Kaufman, B. J., Isaacs, D., ... & Prezant, D. J. (2011). Utilization of emergency medical services in a large urban area: description of call types and temporal trends. Prehospital Emergency Care, 15(3), 371-380.
[40] Munjal, K., & Carr, B. (2013). Realigning reimbursement policy and financial incentives to support patient-centered out-of-hospital care. Jama, 309(7), 667-668.
[41] National Highway Traffic Safety Administration. (n.d.). EMS Workforce for the 21st Century: A National Assessment . https://www.ems.gov/pdf/research/Studies-and-Reports/National_Workforce_Assessment.pdf.

impacts by the recent public health crises which has contributed to a reduction of volunteerism in Minnesota.

To improve workforce flexibility, the EMSRB should adopt definitions for provider levels and workforce terms (e.g., credentialing, registration, certification, licensure) and licensing requirements that are consistent with neighboring states and nationally and encourage the adoption of new and alternative EMS models like Community Paramedics to meet the demand for services in rural areas. Many Minnesota EMS professionals also expressed that there was a lack of community understanding of the role of EMS profivers, with EMS workers expressing a desire to be recognized as medical professionals/clinicians and not just drivers. Whenever possible, EMS should also be integrated into the healthcare system and not treated and compensated accordingly.

Cultural competency and building community trust will also be critical to workforce recruitment and development. Although all race groups have grown recently in MN, but between 2010 and 2018, the state has added five times as many People of Color as non-Hispanic White residents[42]. EMS providers must help create diverse pipelines of education, training, and recruitment that encourage People of Color to pursue careers in healthcare and EMS and also support them as professionals to increase retention. This will also improve the overall quality of cultural competency in EMS in the state and help build trust between EMS and the communities they serve. Additional training in combating cultural bias and opportunities for EMS professionals to engage with community members are also critical to bridging the gap in trust and engagement many EMS professionals expressed.

EMSRB Composition

EMSRB should implement policies that commit to a regular rotation of members that is truly representative of community needs and a diversity of voices from profession to cultural representation. Additionally, EMS professionals shared a need to position EMS physicians to draft and advance a legislative agenda on behalf of the field at the Minnesota Legislature.

Limitations & Bias

Our client for this project, MSFCA, has stated that one of the top priorities of the approved legislative agenda is to work to establish local control over the provision of EMS in Minnesota. Although our client has a specific viewpoint on this issue, we approached this project from a position of neutrality whenever possible and attempted to represent the broad diversity in ambulance service providers and stakeholders in the state of Minnesota. Our goal was to provide qualitative and quantitative data that would illustrate the challenges facing EMS in Minnesota and to offer a spectrum of recommendations for how to address them. Furthermore, our team would like to recognize the limitations and biases we encountered when preparing this report.

Qualitative Data

We partnered with our client Chief BJ Jungmann, on behalf of the MSFCA, to conduct 12 interviews of EMS professionals of Minnesota via a University of Minnesota Zoom account. The interviews were recorded and transcribed, and we were able to pull distinct themes from the collected data. The data collected provided us with the opportunity to course correct our data collection by broadening our understanding of the problem.

[42] Data by Topic - Age, RAce & Ethnicity. MN State Demographic Center. (2020, March 18). https://mn.gov/admin/demography/data-by-topic/age-race-ethnicity/.

Quantitative Data

Given our recommendations to enhance data, it is important to point out the following limitations on the EMSRB (2020) data:

- It relies solely on data submitted by participating EMS agencies within states/territories and it is not a population-based data set which results in both selection bias and information bias;
- Includes a disproportionate number of EMS agencies with the resources and leadership necessary to be an adopter of the EMSRB data standard. The data may not be representative of all states or EMS agencies in the nation;
- Data are "event-based" and not "patient-based" and a single patient may be represented in more than one record for a variety of reasons;
- Data is missing from a significant number of elements and results may be misleading when excluding all observations with missing data or null values; and,
- In 2020, during the COVID-19 pandemic, there were reduced EMS call volume, excess at-home deaths, decreased vehicular crashes, additional opioid overdoses and increased mental-health related EMS calls that were occurring during the pandemic.

Furthermore, due to patient privacy laws and a lack of information sharing agreements between EMS and other healthcare providers there are no records of patient outcomes or patient dispositions after the patient arrived at their transport destination. This makes it difficult to determine if EMS QMIs are related to patient outcomes. This is another area where inter-organization data sharing across the EMS care spectrum would improve data that could be used for process improvement.

Conclusion

In conclusion, EMS services in its infancy 40+ years ago responded to the need of regulating protocols, practices, and policies that ensured the timely, effective and quality service so the public can be confident they would be provided for in emergency situations. While this review was critical, it didn't evolve with the times. The EMS field serves the needs of the community, but is now at a critical juncture where evaluation of governance, policies, practices, and community representation will determine its effectiveness. EMS culture and climate must change proactively, or, be stunted by reactively responding to emergent needs of communities that will require it to change in time.

Acknowledgements

The authors would like to thank the following groups and individuals:

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David Rogers and the Emergency Medical Services Regulatory Board;

Susan Brower and the Minnesota State Demographic Center;

Robin Phinney, Ph.D. & Dr. Kevin Gerdes at the University of Minnesota - Humphrey School of Public Policy;

Everyone who participated in research interviews; and,

All of Minnesota's EMS workers & volunteers!

Addenda

Addendum 1: Interview Questions

How do you describe the model of EMS delivery in the town/city you work in?

What are the pros and cons of this model of EMS delivery?

What does successful (thinking "efficient") EMS delivery look like

(from dispatch to patient arrival at hospital)? How do you know if success is

being achieved or not?

What is local control in this environment? What type of input does the local community have in EMS service delivery?

Do you have examples of consequences of the lack of data sharing (transparency)/communication around service delivery or issues with PSAs?

(human injury/death)?

What performance criteria are required of your license in your

area? Are there any changes you think need to be made to these criteria?

In your experience, how is time measured for EMS calls (dispatch to reach a hospital)?

What do you see as the biggest barrier to success/effectiveness in EMS delivery?

Addendum 2: Information Sheet for Research

You are invited to be in a research study. You were selected as a possible participant because of your experience related to EMS delivery. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by: Maya Beecham, Dieudonne Kabaso, Ander Bolduc, & Kaitlin Ostlie under the direction of Dr. Robin Phinney from the Humphrey School of Public Affairs at the University of Minnesota

Procedures: If you agree to be in this study, we would like to talk with you for approximately 30-60 minutes via Zoom. At the beginning of our conversation, we will ask your permission to video-record, and we will not record unless you give permission. Documenting our conversation will let us concentrate on our conversation so that we do not have to rely on our memory of it.

Confidentiality: The recording and/or notes of this interview will only be used for the stated purpose of researching EMS Services.

Voluntary Nature of the Study: Participation in this study is voluntary. Your decision whether to participate will not affect your current or future relations with the University of Minnesota. If you

decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions: The researchers conducting this interview are Maya Beecham and Ander Bolduc. You may ask any questions you have now. If you have questions later, you are encouraged to contact us at beec0016@umn.edu (Maya) boldu004@umn.edu (Ander) or Dr. Robin Phinney rphinney@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

Addendum 3: Data Elements & Variables for 2020 EMS Incidents

<table>
<tr><th>Data Element</th><th>Variables</th><th>Trends & Limitations</th></tr>
<tr><td>Response Time Measurements</td><td>Not all response time measurements are equally relevant or consistently documented. I am recommending we use the following response time measurements to determine timeliness:

-Incident Unit Notified By Dispatch Date Time
-Incident Unit En Route Date Time
-Incident Unit Arrived On Scene Date Time
-Incident Unit Left Scene Date Time
-Incident Patient Arrived At Destination Date Time</td><td>
<table>
<tr><th>Percentage of Records Completed</th><th>%</th></tr>
<tr><td>Incident PSAP Call Date Time</td><td>56%</td></tr>
<tr><td>Incident Dispatch Notified Date Time</td><td>77%</td></tr>
<tr><td>Incident Unit Notified By Dispatch Date Time</td><td>100%</td></tr>
<tr><td>Incident Unit En Route Date Time</td><td>100%</td></tr>
<tr><td>Incident Unit Arrived On Scene Date Time</td><td>97%</td></tr>
<tr><td>Incident Unit Arrived At Patient Date Time</td><td>84%</td></tr>
<tr><td>Incident Transfer Of EMS Patient Care Date Time</td><td>1%</td></tr>
<tr><td>Incident Unit Left Scene Date Time</td><td>87%</td></tr>
<tr><td>Incident Patient Arrived At Destination Date Time</td><td>86%</td></tr>
<tr><td>Incident Destination Patient Transfer Of Care Date Time</td><td>20%</td></tr>
<tr><td>Incident Unit Back In Service Date Time</td><td>98%</td></tr>
<tr><td>Incident Unit Cancelled Date Time</td><td>4%</td></tr>
</table>
</td></tr>
<tr><td>OrgType</td><td>-Community, Nonprofit
-Fire Department
-Government, Non-Fire
-Hospital
-Private, Non-hospital
-Tribal</td><td>
<table>
<tr><th>OrgType</th><th>2020 Total</th><th>%</th></tr>
<tr><td>Community, Non-Profit</td><td>1993</td><td>0.11%</td></tr>
<tr><td>Fire Department</td><td>174229</td><td>9.71%</td></tr>
<tr><td>Governmental, Non-Fire</td><td>299819</td><td>16.71%</td></tr>
<tr><td>Hospital</td><td>947761</td><td>52.82%</td></tr>
<tr><td>Private, Non-hospital</td><td>362005</td><td>20.17%</td></tr>
<tr><td>Tribal</td><td>8557</td><td>0.48%</td></tr>
<tr><td>(blank)</td><td>104</td><td>0.01%</td></tr>
<tr><td>Grand Total</td><td>1794468</td><td>100.00 %</td></tr>
</table>
</td></tr>
</table>

Agency Level2	-Central -Metro -Northeast -Northwest -South Central -Southeast -Southwest -West Central	

Agency Level	2020 Total	%
Unknown	425	0.02%
Central	240468	13.40%
Metro	990951	55.22%
Northeast	106536	5.94%
Northwest	62620	3.49%
South Central	70327	3.92%
Southeast	164599	9.17%
Southwest	89947	5.01%
West Central	68595	3.82%
Grand Total	1794468	100.00 %

Response Type Of Service Requested With Code	-911 Response (Scene) -Flagdown/Walk-in Emergent -Intercept/Rendezvous -Interfacility (Hospital to Hospital) Transport -Interfacility Transfer -Interfacility Transfer (Unscheduled) -Medical Transport -Medical Transport (Scheduled) -Mutual Aid -Public Assistance/Other Not Listed -Response (Scene) -Standby -Transfer to Air Ambulance from Hospital -(blank)	

Response Type	2020 Total	%
911 Response (Scene)	1281129	71.39%
Flagdown/Walk-in Emergent	3	0.00%
Intercept/Rendezvous	11747	0.65%
Interfacility (Hospital to Hospital) Transport	391375	21.81%
Interfacility Transfer	6654	0.37%
Interfacility Transfer (Unscheduled)	367	0.02%
Medical Transport	58487	3.26%
Medical Transport (Scheduled)	701	0.04%
Mutual Aid	6687	0.37%
Public Assistance/Other Not Listed	3331	0.19%
Response (Scene)	29748	1.66%
Standby	3981	0.22%
Transfer to Air Ambulance from Hospital	197	0.01%
(blank)	61	0.00%
Grand Total	1794468	100.00 %

Patient Gender	-Female -Male -Not Applicable -Not Available -Not Recorded -Not Reporting -Unknown (Unable to Determine)	

Patient Gender	2020 Total	%
Female	820174	45.71%
Male	878287	48.94%
Not Available/Other	96007	5.35%
Grand Total	1794468	100.00 %

<table>
<tr><td></td><td>-(blank)</td><td></td></tr>
<tr><td>Patient Race List</td><td>-American Indian or Alaskan Native
-Asian
-Black or African American
-Hispanic or Latino
-Native Hawaiian or Other Pacific Islander
-Not Applicable
-Not Recorded
-Not Known
-Other Race
-Whites</td><td>
<table>
<tr><th>Patient Race</th><th>2020 Total</th><th>%</th></tr>
<tr><td>American Indian or Alaskan Native</td><td>37901</td><td>2.11%</td></tr>
<tr><td>Asian</td><td>23623</td><td>1.32%</td></tr>
<tr><td>Black or African American</td><td>118872</td><td>6.62%</td></tr>
<tr><td>Hispanic or Latino</td><td>31167</td><td>1.74%</td></tr>
<tr><td>Native Hawaiian or Other Pacific Islander</td><td>2295</td><td>0.13%</td></tr>
<tr><td>Not Applicable/Not Recorded/Not Known</td><td>539580</td><td>30.07%</td></tr>
<tr><td>Other Race</td><td>123</td><td>0.01%</td></tr>
<tr><td>Whites</td><td>1026611</td><td>57.21%</td></tr>
<tr><td>Two or More Races</td><td>9643</td><td>0.54%</td></tr>
<tr><td>(blank)</td><td>4653</td><td>0.26%</td></tr>
<tr><td></td><td>1794468</td><td>100.00 %</td></tr>
</table>
</td></tr>
<tr><td>Patient Age</td><td>-Number (Continuous variables)</td><td>Oldest person in Minnesota is currently 113 years old, so information for patients over 113 was removed as likely errors.</td></tr>
<tr><td>Vitals Signs Taken</td><td>-Date, Time (Continuous variables)</td><td>1,680,980 of the incidents note that vitals were taken. There was no additional information available on what vitals were taken.</td></tr>
<tr><td>Final Acuity</td><td>-Critical (Red)
-Dead without Resuscitation Efforts (Black)
-Emergent (Yellow)
-Improved
-Lower Acuity (Green)
-Not Applicable
-Not Recorded
-Unchanged
-Worse
-(blank)</td><td>
<table>
<tr><th>Final Acuity</th><th>2020 Total</th><th>%</th></tr>
<tr><td>Critical (Red)</td><td>43992</td><td>2.45%</td></tr>
<tr><td>Dead without Resuscitation Efforts (Black)</td><td>400</td><td>0.02%</td></tr>
<tr><td>Emergent (Yellow)</td><td>202702</td><td>11.30%</td></tr>
<tr><td>Improved</td><td>82182</td><td>4.58%</td></tr>
<tr><td>Lower Acuity (Green)</td><td>83051</td><td>4.63%</td></tr>
<tr><td>Not Applicable</td><td>70965</td><td>3.95%</td></tr>
<tr><td>Not Recorded</td><td>1131621</td><td>63.06%</td></tr>
<tr><td>Unchanged</td><td>87122</td><td>4.86%</td></tr>
<tr><td>Worse</td><td>1237</td><td>0.07%</td></tr>
<tr><td>(blank)</td><td>91196</td><td>5.08%</td></tr>
<tr><td>Grand Total</td><td>1794468</td><td>100.00 %</td></tr>
</table>
</td></tr>
<tr><td>Patient Disposition</td><td>-Cancelled - Out of Primary Service Area
-Cancelled - Prior to Dispatch
-Cancelled - Request Transferred to -Another Provider</td><td>
<table>
<tr><th>Patient Disposition</th><th>2020 Total</th><th>%</th></tr>
<tr><td>Other</td><td>21119</td><td>1.18%</td></tr>
<tr><td>Treated, Transferred Care to Other EMS Agency</td><td>6609</td><td>0.37%</td></tr>
</table>
</td></tr>
</table>

	-Dead at Scene – No Resuscitation (with Transport to morgue) -Transport of Body Parts or Organs Only -Dead at Scene – With Resuscitation (With Transport) -Dead at Scene -Treated, Referred to Law Enforcement -Transported but Refused Care &/or Evaluation -EMS Agency Assist -Assist, Unit -Treated, Transported by Private Vehicle -Transported to Landing -Zone/Airport, Care Transferred -Cancelled -Treated, Transferred Care -Standby - With Patient Contact(s) -Public Assist -Standby - No Patient Contacts -No Patient Found -Dead at Scene – No Resuscitation -Attempted (without Transport) -Treated, Transferred Care to Other -EMS Agency -Dead at Scene – Resuscitation Attempted (without Transport) -Transport Refused by Patient (AMA) -Canceled On or After Arrival at Scene -Treated, Transported by EMS -Treated and Released (per protocol) -Person Refused Evaluation, Care, and Transport -No Treatment/Transport Required -Canceled Prior to Arrival at Scene -Treated & Transported by this EMS Unit	
Disposition EMS Transport Method	-Fixed Wing/Airplane -Ground-Ambulance -Ground-Bariatric -Ground-Mass Casualty Bus/Vehicle	

Dead at Scene – Resuscitation Attempted (without Transport)	8931	0.50%
Transport Refused by Patient (AMA)	11307	0.63%
Canceled On or After Arrival at Scene	14062	0.78%
Treated, Transported by EMS	33802	1.88%
Treated and Released (per protocol)	41070	2.29%
Person Refused Evaluation, Care, and Transport	41424	2.31%
No Treatment/Transport Required	47976	2.67%
Canceled Prior to Arrival at Scene	58497	3.26%
Treated & Transported by this EMS Unit	1509537	84.12%
Grand Total	1794468	100.00 %

Disposition Methods	**2020 Total**	**%**
Fixed Wing/Airplane	4978	0.28%
Ground-Ambulance	1389560	77.44%

	-Ground-Other Not Listed -Ground-Rescue Vehicle (extrication etc.) or ATV -Ground-Wheelchair Van -Medevac/HEMS -Not Applicable -Not Recorded -Water-Boat -(blank)	

Ground-Bariatric	105	0.01%
Ground-Mass Casualty Bus/Vehicle	7	0.00%
Ground-Other Not Listed	635	0.04%
Ground-Rescue Vehicle (extrication etc.) or ATV	26	0.00%
Ground-Wheelchair Van	7	0.00%
Medevac/HEMS	49906	2.78%
Not Applicable	21088	1.18%
Not Recorded	288169	16.06%
Water-Boat	6	0.00%
(blank)	39981	2.23%
Grand Total	1794468	100.00 %

Disposition Reason For Choosing Destination List	-Closest Facility -Diversion -Family Choice -Insurance Status/Requirement -Law Enforcement Choice -Not Applicable -Not Recorded -On-Line/On-Scene Medical Direction -Other -Patient / Family Choice -Patient's Physician's Choice -Protocol / Guideline -Specialty Center (Trauma, STEMI, Stroke) -Specialty Resource Center -(blank)	

Disposition Reason	**2020 Total**	**%**
Closest Facility	449971	25.08%
Diversion	45861	2.56%
Family Choice	89432	4.98%
Insurance Status/Requirement	627	0.03%
Law Enforcement Choice	8521	0.47%
Not Applicable	70949	3.95%
Not Recorded	199560	11.12%
On-Line/On-Scene Medical Direction	2642	0.15%
Other	41013	2.29%
Patient / Family Choice	538227	29.99%
Patient's Physician's Choice	163934	9.14%
Protocol / Guideline	18525	1.03%
Specialty Center (Trauma, STEMI, Stroke)	202599	11.29%
Specialty Resource Center	6696	0.37%
(blank)	7728	0.43%
Grand Total	1794468	100.00 %

Incident Complaint	-Not Available -Auto vs pedestrian -Machine/equipment Injury -Intercept -Not Known -Invalid Assist/Lifting Assist -CO Poisoning/Hazmat -Not Recorded -Not Applicable -MCI (Multiple Casualty Incident)	

Incident Complaint	**2020 Total**	**%**
Other	621197	34.62%
Heart Problems/AICD	54257	3.02%
Psychiatric Problem/Abnormal Behavior/Suicide Attempt	68295	3.81%
Unknown Problem/Person Down	74744	4.17%
Chest Pain	85314	4.75%

	-Stab/Gunshot Wound -Other -Fire Standby -Altered Mental Status -Cardiac Arrest -Healthcare Professional/Admission -Electrocution/Lightning -(blank) -Ingestion/Poisoning -Industrial Accident/Inaccessible Incident/Other Entrapments (Non-Vehicle) -Automated Crash Notification -Drowning/Diving/SCUBA Accident -Eye Problem/Injury -Animal Bite -Unconscious/Fainting -Traffic Crash -Alcohol/Substance Abuse/Withdrawal -Fire -Carbon Monoxide/ Hazmat/Inhalation/CBRN -Medevac/HEMS Transport -Heat/Cold Exposure -Burns/Explosion -Well Person Check -Unknown Problem/Man Down -Choking -Stab/Gunshot Wound/Penetrating -Trauma -Headache -Pain -Medical Alarm -Pregnancy/Childbirth/Miscarriage -Standby -Allergic Reaction/Stings -Back Pain -Assault/Battery/Abuse Victim Diabetic Problem -Hemorrhage/Laceration -Pandemic/Epidemic/Outbreak -Cardiac Arrest/Death -Traumatic Injury -Abdominal Pain/Problems -Medical Transport -Overdose/Poisoning/Ingestion -Convulsions / Seizure -Stroke/CVA	

Unconscious/Fainting/Near-Fainting	87109	4.85%
Breathing Problem	143010	7.97%
Fall Victim	147708	8.23%
Sick Person	165277	9.21%
Transfer/Interfacility/Palliative Care	347618	19.37%
Grand Total	1794529	100.00 %

	-Traffic/Transportation Incident -Heart Problems/AICD -Psychiatric Problem/Abnormal Behavior/Suicide Attempt -Unknown Problem/Person Down Chest Pain -Unconscious/Fainting/Near-Fainting -No Other Appropriate Choice -Breathing Problem -Fall Victim -Sick Person -Transfer/Interfacility/Palliative Care	

Addendum 4: NEMSIS Data Review for Additional Research

We also looked at utilizing the National Emergency Medical Services Information System (NEMSIS), the national database that is used to store EMS data from states and territories. According to NEMSIS, it provides the framework for collecting, storing, and sharing standardized EMS data from states nationwide. The NEMSIS uniform dataset and database help local, state, and national EMS stakeholders more accurately assess EMS needs and performance, as well as support better strategic planning for the EMS systems of tomorrow. Data from NEMSIS is also used to help benchmark performance, determine the effectiveness of clinical interventions, and facilitate cost-benefit analyses[43]. Unfortunately, NEMSIS is only available in STATA, SAS, and ASCII and the labs at the University of Minnesota with the program necessary to analyze these data types were closed due to COVID-19. Instead, we focused on EMSRB as the source for data on EMS in Minnesota. EMSRB collects the data from EMS providers that is shared with NEMSIS.

[43] Goals and Objectives. NEMSIS. (n.d.). https://nemsis.org/what-is-nemsis/goals-and-objectives/.