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Dead Zones: An Analysis of South Dakota's Rural EMS System

by

Jenna Corrin

A Thesis Submitted in Partial Fulfillment
Of the Requirements for the
University Honors Program

Department of Health Science
The University of South Dakota
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The members of the Honors Thesis Committee appointed
to examine the thesis of Jenna Corrin
find it satisfactory and recommend that it be accepted.

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ABSTRACT

Dead Zones: An Analysis of South Dakota's Rural EMS System

Jenna Corrin

Director: Mrs. Jonelle Hook

Emergency Medical Services is a key component of South Dakota's rural healthcare network. However, research suggests that rural EMS agencies are ill-equipped to provide high quality emergency medical care. Delays or difficulty in delivery of care is exacerbated by sparsely spread resources. Evaluations of rural EMS agencies show that lack of volunteers and insufficient funding due to current reimbursement models are threatening the continued operation of rural EMS agencies. A survey conducted in 2016 by South Dakota Department of Health's EMS Program and SafeTech Solutions, LLP, a national EMS consulting firm revealed that South Dakota's EMS agencies are struggling to maintain a staffed agency. The results of this study confirm the discrepancies between the delivery of care in urban vs rural settings and bring into question the reliability of rural EMS agencies. Some rural states have piloted innovative programs to address the issue and integrate their rural EMS system into a larger healthcare network. But these are small measures, limited in scope to the grand scale of the rural crisis. It is hoped that more research brings policy change to the volunteer EMS model in order to address the issue that rural EMS agencies are facing.

KEYWORDS: Emergency Medical Services, Healthcare, Rural

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CHAPTER ONE

Introduction

Emergency Medical Systems (EMS) are public services that provide the first line of response during urgent healthcare emergencies (Chanta, S. et al., 2014). Requirements to deliver high-quality prehospital emergency care differ between rural and urban settings causing discrepancies to arise between urban and rural communities. Several factors adversely affect the delivery of prehospital emergency care in rural areas; poor access to care is due not only to lack of resources (providers, hospitals, and technicians) but also because of delays or difficulties in getting medical care (Chanta, S. et al., 2014). Rural demographics are characterized by lesser populations resulting in rural residents having to travel greater distances for access to healthcare. The irregular and episodic nature of seriously ill and injured patients in rural areas makes it difficult to plan, staff and equip emergency medical services in order to provide emergency medical care at the same level seen at higher volume urban or suburban institutions (Williams, Janet M. et al. n.d.).

CHAPTER TWO

Rural Staffing Challenges

Emergency Medical Services play a vital role in maintaining the healthcare system in South Dakota (SafeTechSolutions. 2016). Prehospital emergency care is provided by 160 ambulance services that are scattered across the rural state. Rural services have trouble recruiting and retaining healthcare providers because of the heavy demands of rural practice due to longer hours, no backup, or lack of hospital facilities to attract providers to the area (Hewitt, M. E. 1989). The older generation of volunteer EMTs are retiring and fewer residents are stepping up to replace them. In many rural areas the pool of potential EMS volunteers is reported to be getting smaller as economic conditions have made it more difficult for rural residents to have the spare time required to volunteer (Hewitt, M. E. 1989). Providers joining the EMS field can no longer support a family on a volunteer job alone. Cost of living expenses requires most providers to have a separate full-time job on top of their volunteer position making it especially hard to get volunteers for daytime shifts. A safe and humane schedule requires at least 14 people on a roster (SafeTechSolutions. 2016). At a minimum, a service is required to staff at least one EMT and one trained ambulance driver 24/7/365, a clinically necessary, but challenging bar for rural EMS departments to meet (Simon, L. 2015, February 4). Ambulance services that have fewer than 14 volunteers pose a risk to both volunteers and patients; overwork leads to exhaustion as well as physical and mental stress that could result in dangerous driver errors and mistakes in patient care (SafeTechSolutions. 2016).

Surveys of volunteer prehospital care providers suggest that the most important factors leading them to leave EMS service are economic conditions in rural areas, fear of personal risk, limited access to certification, and costs associated with volunteer work (Hewitt, M. E. 1989). The relatively small populations that characterize rural areas results in a low volume of emergency calls. In the face of low call volumes, it is difficult for the rural prehospital providers, especially those trained at the paramedic level, to maintain their skills (Hewitt, M. E. 1989). State regulations require that EMTs acquire 20 hours of continuing education every two years to renew a state license. The National Registry of EMTs requires that nationally certified EMT's acquire 40 hours of continuing education every two years to renew a National EMT license. This requirement helps to refresh skills through continued education, but the hands-on training gained through patient interaction is lost with low call volumes.

CHAPTER THREE

Rural Funding Shortages

Personnel shortages have been exacerbated by insufficient funding. “The problem is that most local governments fail to recognize that they've been floating their 911 response on the backs of volunteers” (Simon, L. 2015). This overlooked subsidy has masked the true cost of operating an EMS department. Aarron Reinert, chairman of the US DOT’s National EMS Advisory Council and a partner in the EMS consulting firm SafeTech Solutions conducted a study in South Dakota; according to Reinert, “the estimated cost of operating and staffing a single rural ambulance in rural South Dakota is \$330,000 per year. Eighty-four percent or \$280,000 of that cost is provided by a subsidy of donated labor and is typically not accounted for in terms of dollars.” In North Dakota, South Dakota, Nebraska, Iowa, Minnesota, Wyoming and Montana, this subsidy is estimated to collectively be worth more than \$240 million each year (Simon, L. 2015). The current federal reimbursement model fails to provide sufficient funding to support rural services because it is based on the number of transports per service, because of this, a rural ambulance service with low call volume doesn’t receive enough money to pay its personnel (Chanta, S. et al., 2014). Nationally, there is a shortage of trained paramedics, and ambulance services in rural areas often cannot afford to hire those that are available (Hewitt, M. E. 1989).

In many South Dakota towns a portion of the resident’s property taxes go towards funding the ambulance service. Rapid City for example, receives high enough call

volumes that historically, enough bills have been collected to avoid a taxpayer subsidy (Blackstone, S. 2018). However, it's unclear how sustainable that model will be in the future (Blackstone, S. 2018). When Citizens call 911 needing an ambulance, dispatch doesn't run a credit check or ask the caller to prove they can pay for the service, an ambulance is automatically sent, EMTs or paramedics respond and treat the patient, and weeks or months later, a bill for the service arrives in the mail (Blackstone, S. 2018). Unfortunately, many of those bills go unpaid. In December of 2018 Rapid City's Legal and Finance Committee approved a resolution to write off 2,676 unpaid ambulance bills worth more than \$1.7 million that date as far back as 2006 (Blackstone, S. 2018). Rapid City's Mayor reported that the city ambulance service currently only recovers about 50 percent of its annual charges ("2,676 Uncollectible" 2018). Of the 2,676 unpaid bills, almost 98 percent have been deemed uncollectible because they've passed the state's six-year statute of limitations or because the person who owes the money has died without an estate. Bankruptcy, incarceration and mandatory write-offs from Medicare and Medicaid denials comprise the rest (Blackstone, S. 2018).

Uncollected bills and write-offs are the cost of doing business, but the cost of providing the service is rising faster than reimbursements: this is a cost the city's ambulance service cannot afford (Blackstone, S. 2018). Jason Culberson, the department's emergency medical-services chief reports that a large number of Rapid City's residents using the ambulance service are Medicaid or Medicare patients. Increased regulations by the Centers for Medicare and Medicaid Services, and cuts in reimbursements from the Indian Health Service, have hurt the service's reimbursement outcomes (Blackstone, S. 2018). While the Medicaid state reimbursement rate has risen

in previous years, it was already so low that the rise only accounts for about \$36 per bill (Blackstone, S. 2018). Rapid City is not the only ambulance service facing this issue, it's affecting ambulance providers across the nation. This problem that is hindering ambulance operations in Rapid City, with a population of approximately 74, 421, is detrimental to rural communities across the state that are stark in comparison to Rapid City's population.

CHAPTER FOUR

Transportation

Traditional location models aim to maximize demand of the area that can be covered; consequently, these models favor locating ambulances in more densely populated areas, resulting in longer response times for patients in more rural areas (Chanta, S. et al., 2014). Rural residents lack quick access to definitive care due to the widespread location of specialized services such as trauma centers. One approach to decreasing time to definitive care is to improve the rural EMS transportation system (Chanta, S. et al., 2014). Rural transport may be improved through better organization of existing ground-based resources and by using air medical transport services. South Dakota provides rural EMS services through a variety of resources including ground ambulance, and air transport. Air medical programs use both fixed-wing aircrafts and helicopters (Hewitt, M. E. 1989). Rural areas that lack roads or are far from hospitals are especially dependent on air medical transport services when medical emergencies occur. Airplanes or helicopters are used in inter-hospital transfers of critical patients. Helicopters are generally more suitable than airplanes for transporting patients from an accident site to a hospital because of their flexibility in landing at a scene and at a trauma center (Hewitt, M. E. 1989). Although air medical services have offered some relief to the rural transportation crisis, the use is limited and cannot be relied upon due to a variety of factors. These factors include geographical barriers and weather conditions. Helicopter service augments the ground ambulance program and should be used in instances where

time, distance, medical personnel need, or scene isolation warrant it (Hewitt, M. E. 1989). The service area extends about 150 miles beyond the air medical base which generally includes rural areas. It may, however, take a helicopter as long as 90 minutes to travel 150 miles (Hewitt, M. E. 1989). This radius only encompasses a small demographic of our rural population and in extreme medical emergencies where time is critical, a 90-minute helicopter response is not quick enough.

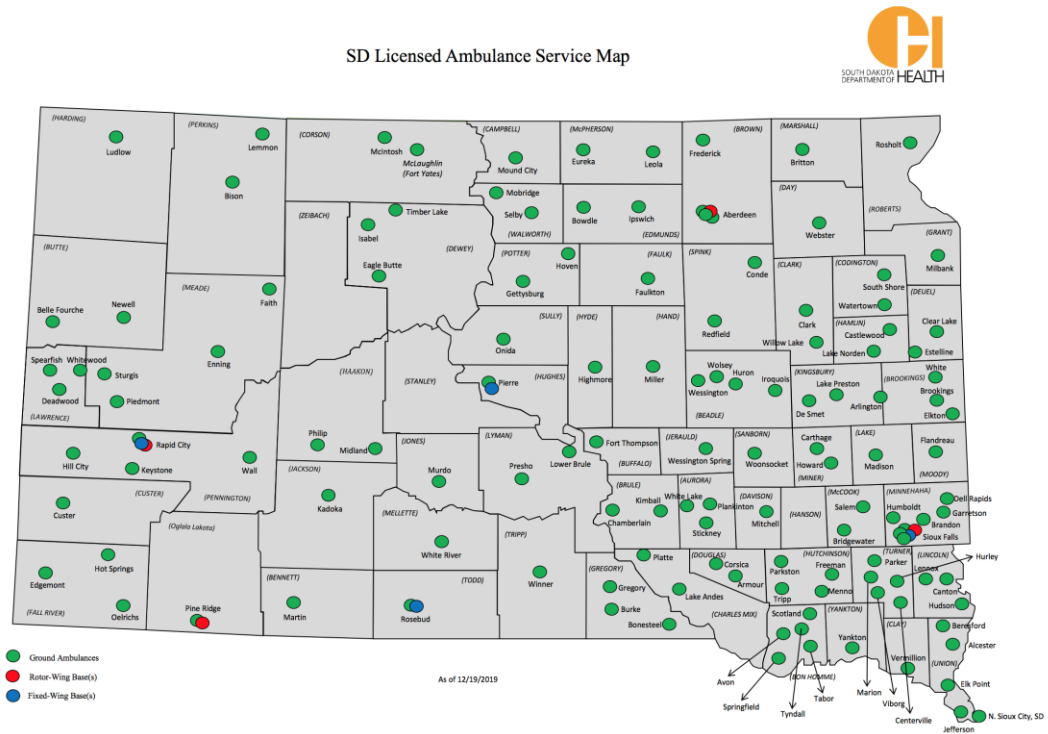


Figure 1. South Dakota Licensed Ambulance Service Map. Reprinted from South Dakota Department of Health

EMS transport is difficult and delayed in rural areas because of sparse, widespread populations compiled with remote or inaccessible service areas, geographic barriers, poor weather and road conditions (Hewitt, M. E. 1989). Limited communication

service may delay detection and reporting of the need for emergency care further delaying an ambulance response. Due to delayed responses, distance, and inaccessibility it is important to train and utilize community members who are bystanders to emergency medical events and can act as first responders on scene of an emergency. Prehospital care may be provided by many different types of providers, including accident bystanders trained in first aid, CPR, or trained emergency medical technicians (Hewitt, M. E. 1989). Fire and police department personnel may also provide prehospital care in addition to other services, such as extricating victims of motor vehicle crashes and controlling or preventing fires at the scene of an incident (Hewitt, M. E. 1989). When EMS response times are long because of an area's remoteness, road conditions, or lack of EMS resources, community members can be trained as first responders to deliver basic EMS care and assist in stabilizing the patient while EMS providers are in route. First responders can initiate prehospital care and administer first aid, CPR, or other interventions until dispatched units and trained EMS personnel arrive on scene. During time sensitive emergencies, quick action from community bystanders who are on scene can be pivotal to the outcome of the patient. Most rural EMTs are basic EMTs that can provide noninvasive procedures such as first aid, maintaining an adequate airway, administering oxygen and CPR to stabilize a patient for transport but definitive care and quick transportation to an adequate facility is crucial (Hewitt, M. E. 1989).

¹ EMS scope of practice breakdown located in Appendix.

CHAPTER FIVE

Comparison

In the evaluation of EMS systems, it is as important to examine the availability of local resources as it is to examine access to more distant specialized resources. While access to specialized services, such as those available in a trauma center, is central to a good EMS system, local resources must be adequate to handle the majority of EMS cases that do not require these specialized services (Hewitt, M. E. 1989). Carson County Ambulance Service in South Dakota is no longer licensed to transport patients, but volunteers still staff a Quick Response Unit that gets a local EMT to the patient's side to provide some measure of care and comfort until a transporting ambulance arrives from another county (Simon, L. 2015).

Making adjustments is difficult for many rural health care systems because they are small and lack diversification. There is no single solution for replacing the volunteer EMS model, but some communities are piloting innovative programs to address the issue (Simon, L. 2015). States and local communities have tried incentives to replace the labor that rural EMS programs have lost. The state of Oregon offers a two-hundred-and-fifty-dollar tax credit to rural EMS volunteers (Kohrman, N. 2019). Grand County, Utah imposed a small tax in 2016 to pay for its EMS system. Some small-town businesses offer their employees paid time off for shifts on the local ambulance (Kohrman, N. 2019). But these are small measures, limited in scope to the grand scale of the rural crisis.

For years, a single family ran the volunteer ambulance service in La Barge, Wyoming (Kohrman, N. 2019). A town of only some five hundred people located in the south western region of Wyoming. The single family consisting of two parents, their daughter, and their daughter's husband would alternate shifts to staff the local station. The phone would ring, and one of the couples would drive miles to the ambulance station, get into the ambulance, and drive miles to get to the patient (Kohrman, N. 2019). If higher level intervention is needed, the nearest hospital, South Lincoln Medical Center located in Kemmerer, is fifty miles from La Barge. This is common in many rural states with a lot of land and not a lot of hospitals. Forty-six million people live in America's rural counties, and, for decades, they have relied on volunteer ambulance services to respond to their medical emergencies (Kohrman, N. 2019).

Today, the system faces collapse (Kohrman, N. 2019). As these communities become less populated, there are fewer people left to staff ambulances, and fewer people left to pay the taxes that keep the ambulances in service. Andy Gienapp, Wyoming's director of Emergency Medical Services states, when a town's ambulance service closes, EMTs and medics in neighboring communities are often called on to cover more ground, which means longer ride times, and, as EMTs say, time is an issue. "We're facing a crisis in rural America," Gienapp said. "Someone needs to do some planning or one day we're going to call 911 and nobody's going to come" (Kohrman, N. 2019). In big cities, if someone calls 911, an ambulance can be there in minutes, and at the hospital in only a few minutes more. In a rural area, if someone gets in a car crash, they could call 911 and wait for EMTs from the nearest town but they'll usually get to the hospital faster if taken themselves (Kohrman, N. 2019).

CHAPTER SIX

Survey

In 2015, South Dakota Department of Health's EMS Program contracted with SafeTech Solutions, LLP, a national EMS consulting firm, to conduct a statewide survey of all transporting EMS agencies in South Dakota as well as to conduct regional listening sessions with EMS provider agencies and local stakeholders (SafeTechSolutions. 2016). A survey was developed by SafeTech in cooperation with the EMS Program and delivered online from May to July 2016. The goals of the survey included, learning about the current state of EMS in South Dakota and identifying local agency challenges and needs. All transporting EMS services in South Dakota were surveyed including: Agencies providing ground response and transportation, agencies providing fixed and rotary-wing air medical service, and agencies based outside South Dakota that provide significant response into South Dakota (SafeTechSolutions. 2016). Respondent agencies report the following about their agencies: populations served, services provided, call volumes, ownership, leadership and staffing, and major issues and challenges.

The data provided insight into the division of population across the rural state of South Dakota. A breakdown of population by service area concluded that 65% of agencies in the state serve populations of less than 3,000 residents and 36% of these serve populations of 1,000 residents or fewer. Populations served is an important indicator of

an agency’s ability to recruit volunteer workers. It was found that 73% of EMS agencies in South Dakota utilize volunteers (SafeTechSolutions. 2016). In working with hundreds of rural EMS agencies and communities, SafeTech Solutions has concluded that it takes about 100 residents in a service area to generate one volunteer (SafeTechSolutions. 2016). Beyond population, recruiting is also impacted by factors such as percentage of population over 65 years of age and economic and employment conditions (SafeTechSolutions. 2016). The study goes on to investigate rural call volumes. Call volume also influences an EMS agency's revenue generated and reimbursement. Many rural agencies struggle to maintain active emergency medical personnel due to low call volumes. A majority of South Dakota’s EMS agencies, 56%, respond to 200 or fewer calls each year (SafeTechSolutions. 2016).

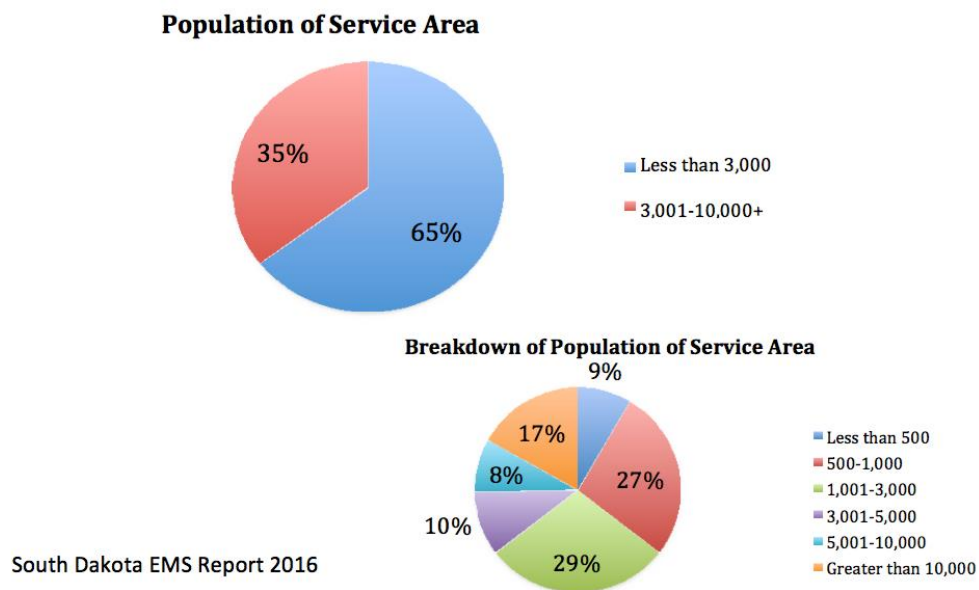


Figure 2. Population of Service Area Graph. Reprinted from SafeTech Solutions, 2016.

There are large discrepancies in the level of prehospital care provided across the state. The clinical services provided by an EMS agency are broadly categorized as either basic life support (BLS) or advanced life support (ALS) (SafeTechSolutions. 2016). Safetech found that 40% of agencies provide exclusively BLS care, 43% of agencies provide both BLS and ALS, and only 17% of agencies provide primarily ALS care (SafeTechSolutions. 2016).

Level of Clinical Services Provided

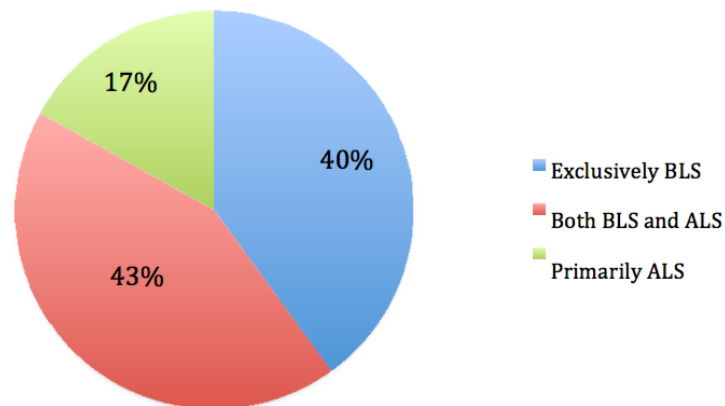


Figure 3. Level of Clinical Services Graph. Reprinted from SafeTech Solutions, 2016.

The level of prehospital care received can influence the outcome of a patient in time sensitive emergencies when coupled with transporting distance to the nearest facility. Only 43% of EMS agencies reported having a hospital in their same community, this means 57% of agencies surveyed reported that there is not a hospital in the same community as their headquarters or main stations and their patients require long distance transport to a facility for treatment (SafeTechSolutions. 2016). Of the 57% of agencies

without a hospital in their same community, 21% report distances greater than 40 miles to the nearest receiving facility (SafeTechSolutions. 2016).

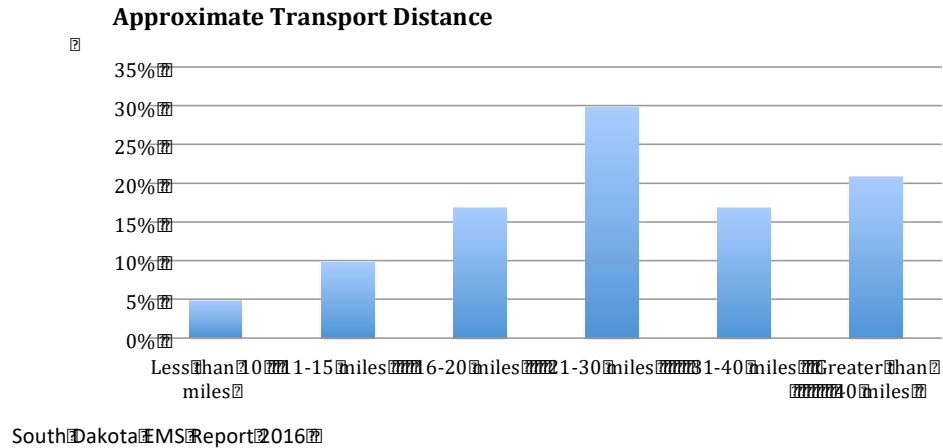


Figure 4. Approximate Transport Distance Graph. Reprinted from SafeTech Solutions, 2016.

The most common major issue and challenge reported was workforce shortages. Workforce shortages are an issue for both paid and volunteer agencies (SafeTechSolutions. 2016). 78% of agencies report staffing, or having enough people to adequately staff, is a challenge and 94% of agencies report workforce (recruiting, retaining, motivating and engaging workers) is their greatest issue (SafeTechSolutions. 2016). Statewide, only 36% of agencies agree or strongly agree that they have enough staff (SafeTechSolutions. 2016). Agencies with fully paid staff report some challenges with recruiting paramedics in general, and more specifically, with recruiting paramedics with paramedic experience who they describe as “quality” workers and clinical providers (SafeTechSolutions. 2016). The most noted shortages are in the agencies in South Dakota that use volunteers or donated labor in some form. Representatives from these agencies

report increasing difficulty in recruiting enough people to replace employees/volunteers/members who are leaving, aging out or becoming inactive (SafeTechSolutions. 2016).

The size of an agency's roster and the number of people on the roster who are active are indicators of an organization's workforce capability. "Active" can be loosely defined as those who are regularly available to be on call, regularly respond to calls and regularly attend agency meetings and training (SafeTechSolutions. 2016). SafeTech Solutions has found that it takes at least 14 active members to safely and humanely staff one 24/7 unit in a volunteer agency. With 14 active members, each member would need to take at least 24 hours of call per week if the unit is staffed with two members at a time (SafeTechSolutions. 2016). Of the 130 agencies who responded to the survey question, 74% report having 15 or fewer active employees, volunteers or members on their rosters (SafeTechSolutions. 2016). 48% report having less than 10 active employees, volunteers, or members on their roster (SafeTechSolutions. 2016). The harsh reality that rural agencies face low call volumes, staffing shortages, and funding shortages, gives rise to the question of reliability.

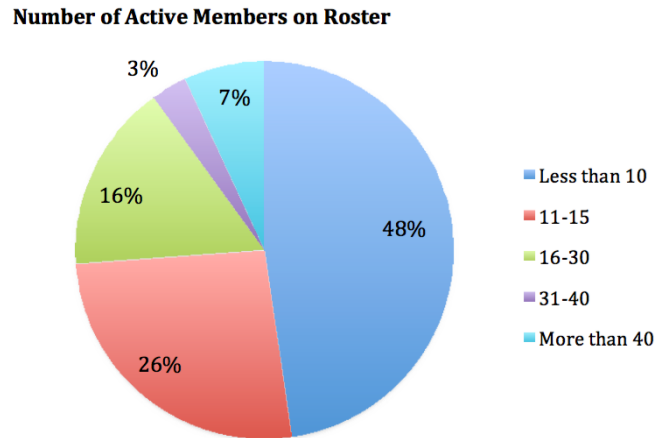


Figure 5. Number of Active Members Graph. Reprinted from SafeTech Solutions, 2016.

Volunteer EMS agency reliability is concerned with whether or not an agency is able to meet requests for service in a timely manner (SafeTechSolutions. 2016). SafeTech Solutions assesses an EMS agency's reliability by evaluating whether or not the agency was able to meet all requests for service in a given time period along with its chute times (a measurement of time from the notification of the crew until the ambulance begins moving toward the emergency scene). An agency's ability or inability to be reliable is an indicator of the impact of the shortage of volunteers it operates with (SafeTechSolutions. 2016). Assessing EMS agency reliability in South Dakota is difficult. There is currently no uniform reporting of responses missed or delayed, and there is no uniform tracking of chute time (SafeTechSolutions. 2016). The survey asked volunteer agencies to self-report missed responses and delayed responses, 91 volunteer agencies responded to the question, and 32% reported missing responses in the last year due to staffing shortages

(SafeTechSolutions. 2016). Of these 91 agencies, 29%, reported delayed responses in the past year due to staffing shortages (SafeTechSolutions. 2016).

The EMS system in South Dakota relies on local agencies to provide emergency medical care, however, volunteer agencies across the state are struggling to stay open due to these issues. Agency representatives expressed concerns about the limits of South Dakota's current EMS structure (SafeTechSolutions. 2016). Agencies voiced concerns that some laws and rules are out-of-date or do not reflect current practices (SafeTechSolutions. 2016). This could impede South Dakota's ability to keep pace with national EMS trends and healthcare expectations. A valid and real concern is whether or not these services will be able to continue operating in the future (SafeTechSolutions. 2016).

The resulting survey data collected by SafeTech has noted limitations including: The survey relies on the knowledge and accuracy of the person completing the survey, the data and information provided by the EMS agencies was not compared to other data sources such as census data, the survey sought to explore subjective perceptions and opinions, and respondents to the survey may have varied in how they defined terms such as "volunteer" (SafeTechSolutions. 2016).

CHAPTER SEVEN

Rural Initiatives

Communities are exploring ways to integrate ambulance providers into a larger rural healthcare network. The Rapid City Fire Department is the primary Advanced Life Support provider for the City of Rapid City, portions of Pennington County, Eastern Custer County, and portions of Meade and Lawrence Counties. The Rapid City Fire Department ambulances cover an area of 3,200 square miles, with a daytime population in excess of 300,000 people in the summer (Medical Operations. n.d.). In addition to ambulance services, the Fire Department implemented and operates non-traditional medical services including the Mobile Integrated Healthcare Program that was developed in conjunction with the State of South Dakota (Medical Operations. n.d.). The Department received approval from the South Dakota Board of Medicine to provide the Mobile Medic Program in June of 2016 supported through funding by the John T. Vucurevich Foundation. The program's goal is to provide quality medical care to medically underserved patients, and help patients navigate the complex healthcare system (Medical Operations. n.d.).

In 2018 the Rapid City Fire Department responded to 15,147 medical calls. In 2019 the total call volume increased 7.01% to 16209 total EMS calls. In 2018 the Mobile Medic Unit responded to 469 calls which increased by 251.17% to 1647 calls in 2019. Traditionally, the Rapid City Fire Department responds to an emergency medical call in an ambulance (2 people) or an ambulance and a fire apparatus (5-6 people) to calls for

service (Medical Operations. n.d.). The Mobile Medic Unit consists of a single provider, responding to calls for service that are non-emergent or don't require an ambulance for emergent transport. The Mobile Medic assesses the patient and in conjunction with a physician, helps that patient get to the right level of medical care in efficient time (Medical Operations. n.d.). Most of these calls are minor injuries, assists, or evaluations. Patients are treated on scene and referred to an urgent care facility such as Oyate Health, Monument Health, or Black Hills Urgent Care via means other than an ambulance.

The Mobile Medic program is aimed at helping patients who are frequently accessing healthcare services by calling 911. It is designed to assist non emergent patients in finding the appropriate level of care facility and the program helps these patients arrange transport to fulfil their needs (Medical Operations. n.d.). Capt. Chris Jolley lead for the Rapid City Fire Department's mobile medic unit stated some patients like to call several times a year, and one patient called up to 40 times a year for non-medical related calls (Matteson, C. 2019). Those calls can range from: "Get me a glass of water or help me get my medicine filled or I've stubbed my toe and that's not what an ambulance is for," says Jolley. "So, what we came up with was a single resource paramedic to go and answer these kinds of calls and to get this patient pointed in the right direction at the right time," says Jolley (Matteson, C. 2019).

This program alleviates the strain on call volumes caused by unwarranted, non-medical calls so EMS resources can be used more appropriately, and all patients receive the right care at the right time. Division Chief Jason Culberson states, "It allows an ambulance to stay in house and in service to respond to higher acuity calls for service" ("Fire dept.'s" 2018). According to Lead Mobile Medic Capt. Chris Jolley, one example

of when the program proved effective occurred when the Mobile Medic team responded to a patient who was experiencing nausea, and at the same time, an ambulance responded to a call for a cardiac arrest patient (“Fire dept.'s” 2018). "If that unit had been tied up on the nausea call, then we'd have to bring in an ambulance from another neighborhood across town to handle that same cardiac arrest, which would slow down the care that that patient needed,” Capt. Jolley said (“Fire dept.'s” 2018). The program also gives patients a more affordable care option. A lot of patients that rely on calling 911 for medical care are Medicaid and Medicare patients (“Fire dept.'s” 2018). By assisting these patients in getting to an appropriate care facility they are no longer being transported by ambulance to the emergency room which decreases the cost to taxpayers. Overall, the Rapid City Fire Department has decreased operation costs, and improved the delivery of patient care since implementing the Mobile Medic Unit in 2016 (“Fire dept.'s” 2018).

The University of South Dakota and Sanford Health are working together to fill the need for paramedics in rural healthcare facilities across the state (“USD, Sanford” 2019). In 2015 the university added the paramedic program to USD’s Health Science major. The program is offered to students on the Vermillion campus or at the University Center in Sioux Falls who are already EMT-certified and enrolled with the university’s Health Sciences major (“USD, Sanford” 2019). Completion of the five-semester specialization program will result in both paramedic certification and a Bachelor of Science degree in Health Sciences. Jon Bohlen, EMS outreach coordinator at Sanford Health and course director of the collaborative paramedic program, states, “If you’re getting a four-year degree anyway, you can pursue this and come away from it with paramedic certification” (“USD, Sanford” 2019). The shortage of certified paramedics, in

rural areas especially, is huge and growing. Cities in the state and region are experiencing a shortage of certified paramedics and EMS responders, forcing EMTs to pull nurses from hospitals for use in ambulances and emergency calls (“USD, Sanford” 2019). The added incentive of receiving a Bachelor of Science degree in Health Sciences while attaining your paramedic certification encourages certified EMTs to further their education and pursue their paramedic certification. With a specific program for paramedic certification, USD and Sanford can help provide trained individuals to areas in need (“USD, Sanford” 2019).

In November of 2019, South Dakota law enforcement agencies were awarded a \$3.6 million grant from the Helmsley Charitable Trust to equip every law enforcement vehicle in the state and state park locations with life-saving AEDs for cardiac arrest patients (Huber, M. 2019). The award, distributed through the South Dakota Department of Health, funded 1,200 new Automated External Defibrillators, AEDs, for agencies across the state (Huber, M. 2019). The donation will increase the likelihood of survival for patients because law enforcement is typically the first emergency responder on scene, said Mitch Krebs, the Helmsley Rural Healthcare program director (Huber, M. 2019). This healthcare program aims to connect rural patients to emergency medical care. AEDs previously used by some agencies will be relocated throughout communities, increasing the number of AEDs accessible to the public (Huber, M. 2019). For Volunteer Fire Departments this new addition to law enforcement vehicles is incredibly beneficial (Thorson, S. 2019). “This helps the rural communities that are far away from first responders, like us, or even the far-reaching areas of our district. Sometimes it takes a while to get there,” Assistant Chief of Box Elder Volunteer Fire Adam Kuenkel said

(Thorson, S. 2019). Using Wi-Fi, the new AED device can send current information, like the patient's heart rhythm, to the incoming ambulance or the hospital (Thorson, S. 2019). By equipping each law enforcement vehicle with a smart, wifi connected AED, patients will receive quicker high-quality CPR and incoming emergency medical personnel can be better prepared prior to arrival on scene to ensure better patient outcomes.

CHAPTER EIGHT

Prevention

Quick access to emergency services is essential for emergent, time-sensitive conditions. South Dakota’s largest Emergency Medical Service ground units average 6.62 minutes from the time of a 911 call to arrival on scene. That median time increases to more than 10 minutes in rural settings, with nearly 1 of 10 encounters waiting almost a half hour for the arrival of EMS personnel (“Study: Rural patients” 2017). Longer EMS response times have been associated with worse outcomes in trauma patients. In some, emergent conditions, even modest delays can be life threatening (Hewitt, M. E. 1989). Bystanders trained in first aid can effectively initiate emergency medical care during a public emergency medical event. Recognizing that “you are the help until help arrives” may be lifesaving (“Study: Rural patients” 2017).

Elite southdakota

Average Run Times Summary Report

Avg Unit Notified to Enroute in Minutes	Avg Unit Enroute to Arrived at Scene in Minutes	Avg Unit Arrived on Scene to Left Scene in Minutes	Avg Unit Left Scene to Arrived at Destination in Minutes	Avg Unit Arrived at Destination to Unit Back In Service in Minutes	Number of Runs
2.09	6.62	16.85	10.73	16.28	34,866

Report Filters

Incident Date: is between '01/01/2019' and '12/31/2019'

Agency Name (Dagency.03): is in 'Aberdeen Fire & Rescue/Advanced Care,American Medical Response,Brookings Ambulance Service,Mitchell Fire & EMS,Mobridge Regional Hospital Ambulance,Paramedics Plus,Rapid City Department of Fire & EMS,Watertown Fire Rescue,Yankton County EMS'

Response Type Of Service Requested (Eresponse.05): is equal to '911 Response (Scene)'

Average Run Times Summary Report					
Avg Unit Notified to Enroute in Minutes	Avg Unit Enroute to Arrived at Scene in Minutes	Avg Unit Arrived on Scene to Left Scene in Minutes	Avg Unit Left Scene to Arrived at Destination in Minutes	Avg Unit Arrived at Destination to Unit Back In Service in Minutes	Number of Runs
6.06	10.44	19.06	21.87	31.42	33,816

Report Filters	
Incident Date:	is between '01/01/2019' and '12/31/2019'
Agency Name (Agency.03):	is in 'Aberdeen Ambulance Service,Alcester Emergency Medical Service,Arlington Ambulance Service,Avon Save-A-Life Ambulance Service,Bennett County Hospital Ambulance Service,Beresford Community Ambulance Service,Bison Ambulance,Bonesteel - Fairfax Ambulance,Bowdle Ambulance Service,Bridgewater Community Ambulance,Burke Ambulance Service, Inc.,Butte County Ambulance Service-Belle Fourche,Butte County Ambulance Service-Newell,Campbell County Ambulance Service,Canton-Inwood Ambulance Service,Carthage Ambulance Service,Castlewood Ambulance District,Centerville Community Ambulance Service,Cheyenne River Service Unit IHS Ambulance,Christensen Ambulance Service, Inc.,Clark County Ambulance Service,Conde Ambulance Service,Crow Creek Sioux Ambulance Service,Custer Ambulance Service, Inc.,DeSmet Emergency Rescue Unit,Dell Rapids Community Ambulance Service,Deuel County Ambulance Inc.,Dewey County Ambulance Service-Isabel,Douglas County Ambulance-Armour,Douglas County Ambulance-Corsica,Edgemont Ambulance Service,Elk Point Community Ambulance Service,Elkton Community Ambulance Service,Estelline Ambulance Service,Faith Ambulance Service,Faulk County Ambulance Service,Frederick Fire and Rescue,Freeman Ambulance Service,Garretson Community Ambulance Corporation,Gettysburg Ambulance Service,Grant-Roberts Ambulance Service,Gregory Ambulance Association,Hand County Ambulance Service,Harding County Ambulance Service,Highmore Fire Department & Ambulance,Hill City Ambulance Service,Hot Springs Ambulance Service, Inc.,Hoven Ambulance Service,Hudson Ambulance Association,Humboldt Fire & Ambulance Service,Hurley Ambulance Service,Huron Ambulance Service, Inc.,Ipswich Ambulance Service,Iroquois Fire & Rescue District,Jefferson Ambulance Service,Jerauld County Ambulance Service,Jones County Ambulance Service,Kadoka Ambulance Service,Keystone Ambulance Service, Inc.,Kimball Volunteer Ambulance District,Kul Wicasa Oyate (Lower Brule),Lake Norden Ambulance District,Lake Preston Volunteer Ambulance Service,Lead-Deadwood Regional Hospital Ambulance,Lemmon EMT Association,Lennox Ambulance Service,Leola Ambulance Service,Lyman County Ambulance District,Madison Regional Health System,Marion Community Ambulance Service,Marshall County Ambulance Service,McCook County EMS Inc.,McIntosh VFD-Ambulance Service,Med-Star Paramedic Ambulance, Inc.,Mellette County Ambulance Service,Menno Ambulance Service,Midland Area EMS,Midwest Medical Transport Company,Miner County Ambulance Service,Missouri Valley Ambulance Service,Moody County Ambulance Service,North Sioux City Fire Rescue EMS,Northeast Ambulance Service, Inc.,Oelrichs Ambulance Service,Oglala Sioux Tribal Ambulance Service,Onida Fire Department, Inc.,Parker Volunteer Ambulance Service,Parkston Rural Ambulance District,Philip Ambulance Service,Piedmont Fire & Ambulance Service,Plankinton Ambulance Association, Inc.,Platte Ambulance Service,Rosebud Sioux Tribal Ambulance Service,Rural Meade Ambulance Service,Sanborn County Ambulance Service,Scotland Community Ambulance Service,Setby Volunteer Ambulance Service,South Shore Ambulance Service,Spearfish Emergency Ambulance Service,Spink County Ambulance Service,Springfield Ambulance Service,Standing Rock Ambulance - McLaughlin,Stickney EMS,Sturgis Fire & Emergency Services,Tabor Community Ambulance Service,Timber Lake Ambulance Service,Tripp Ambulance Service,Tripp County Ambulance Service,Tyndall Ambulance Service,Vermillion Fire EMS Department,Viborg Ambulance Service,Wagner/Lake Andes Ambulance District,Wall Ambulance Service,Wessington Ambulance Service,West McPherson EMS, Inc.,White Ambulance Service,White Lake Ambulance Service,Wolsey EMS'
Response Type Of Service Requested (Eresponse.05):	is equal to '911 Response (Scene)'

Figure 6. Average Run Times Summary Report. Reprinted from South Dakota Department of Health.

PulsePoint AED is a free app that shows where life-saving resources are located around the city. PulsePoint Respond alerts citizens to active incidents ranging from car crashes, fires, natural disasters, medical emergencies, and other accidents (“Next Generation” 2020). When a cardiac emergency strikes, finding an Automated External Defibrillator can help save a life. But that takes knowing where AEDs are located. PulsePoint AED is a simple-to-use app that enables a community to build a public AED registry (“Next Generation” 2020). PulsePoint was implemented in Rapid City in 2017 and as of 2019, 109 total AEDs are registered with PulsePoint and are identified as public access within the City (“Next Generation” 2020). The Rapid City Fire Department remains committed to improving Sudden Cardiac Arrest survival rates (Rapid City Fire

Department. 2018). One of the ways they are working to achieve higher survival rates is through use of the PulsePoint Respond and PulsePoint AED apps.

According to Lt. Jim Bussell with the Rapid City Fire Department, Rapid City averages about 18 cardiac arrests a month; seven of those are in public settings (Murat, M. 2018). “85 percent of those individuals received immediate bystander CPR, which is what we’re after,” said Lt. Bussell. “We are at 45 percent survival rate in public settings, so we’re above the national average there” (Murat, M. 2018). The national average survival rate for cardiac arrests is 14 percent. Although Rapid city is far above the national average with 45 percent survival, there is still room for improvement in the statistics (Murat, M. 2018). According to the American Heart Association, for every minute when someone is in cardiac arrest without CPR or the use of an AED, their chance of survival decreases by 10% (Kota. 2018). The PulsePoint AED app is an initiative that aims to improve the survival rate by giving bystanders the tools to respond to public emergencies and initiate immediate CPR. As of November 2018, 1,700 people were subscribed to PulsePoint Respond, and about 1,300 users had CPR alerts enabled (Murat, M. 2018). When signing up, users indicate if they are trained and willing to assist in the event of a cardiac arrest (“Next Generation” 2020). When 911 dispatch receives a call of cardiac arrest in a public location the PulsePoint app alerts nearby CPR-trained bystanders and shows the nearest location to an automated external defibrillator (Prather, S. 2019). Anyone can download the app and identify themselves as CPR-trained and their phone will beep or buzz, much like an Amber Alert does, when someone goes into cardiac arrest and a call for help is made (Prather, S. 2019).

Many people however are hesitant to initiate CPR on a bystander in an emergency situation due to the fear of causing harm or not knowing the proper technique. South Dakota is targeting younger populations to increase awareness and education. In March 2017, Gov. Dennis Daugaard signed into law a bill requiring hands-only CPR training to be mandatory in order for high school students to graduate (Murat, M. 2018). “Now you have graduating classes who are going to have individuals trained, at a minimum, in hands-only CPR,” said Lt. Bussell. “That is important to have that training out there” (Murat, M. 2018).

The American Heart Association develops science-based CPR guidelines and is the leader in first aid, CPR, and AED training (“American Heart Association”). The American Heart Association offers first aid, CPR, and AED training courses for healthcare professionals and the general public. Heartsaver courses are designed for anyone with little or no medical training, these courses can also be taken by anyone who wants to be prepared for an emergency in any setting (“American Heart Association”). With the completion of an American Heart Association course, students receive a certification card that is valid for 2 years (“American Heart Association”). It is important for the general public to become CPR certified and respond to medical emergencies in the public. A recognized limitation is maintaining valid certification and encouraging the public to renew their certification by retaking a class every two years.

AEDs that are managed using PulsePoint AED are accessible to emergency dispatchers and disclosed to emergency responders, including nearby citizens trained in CPR and off-duty professionals such as firefighters, paramedics and nurses. Instead of asking the caller if there is an AED available, dispatch center staff can inform callers of

nearby lifesaving devices (“Next Generation” 2020). Currently, Rapid City Fire Departments are spreading awareness of PulsePoint to businesses around the area to increase awareness and use of the lifesaving app (Kota. 2018). The PulsePoint app has limitations, unfortunately, public access AED usage has not been tracked up to this point. It is not known how many users are actually responding and initiating CPR once alerted that there is a public emergency nearby. 2019 analytics software is down, recent data cannot be obtained, only 2018 data has been analyzed to date.

CHAPTER NINE

Conclusion

The challenges faced by rural EMS services today are as wide-ranging and complex as the areas that they serve. However, it is clear that these challenges faced by rural EMS systems are not new. The current EMS model designed to favor urban communities does not optimize operations in rural areas and is a critical cause of many of the major challenges faced by rural EMS systems.

Rural EMS Challenges	The Problem	Solutions in Place
Recruiting and Maintaining Staff	Majority of South Dakota's ambulance agencies rely on volunteer staff to operate. There are few potential volunteers left in rural areas. Seventy four percent of agencies in South Dakota report not having enough staff to adequately operate.	
Low Call Volumes	Many agencies struggle to keep personnel due to low call volumes because it is difficult for rural providers to maintain their skills.	National training standards and recertification requirements put in place by the National Registry of Emergency Medical Technicians have closed the training gap between urban and rural providers.

Funding Shortages

Reimbursement models favor high call volumes.
Taxpayer subsidies in rural communities with few residents are too little to pay ambulance staff.

Transportation Distances

Location models favor locating ambulance services in more densely populated areas resulting in longer response times and transport distances for rural residents.

Air ambulance services can augment ground ambulance transport when distances are varied, however, use is limited and unreliable.

Increased Response Time

Longer EMS response times are associated with worse outcomes and modest delays can be life threatening.

First responders can initiate prehospital care when EMT response is delayed.

In 2019 the Helmsley Charitable Trust grant equipped every law enforcement vehicle and state park locations in the state with life-saving AEDs for cardiac arrest patients.

The PulsePoint AED, PulsePoint respond apps connect bystanders to lifesaving AEDs during cardiac arrest events.

Varying Ambulance Agency Ownership

Transporting ambulance agencies in South Dakota are owned by a variety of entities including local governments, fire departments, taxing districts,

	joint powers authorities, tribal government, the federal government, or private organizations.	
Level of Care Provided	Forty percent of agencies in South Dakota provide only basic life support care. There is a shortage of certified paramedics to provide advanced life support.	University of South Dakota and Sanford health implemented the paramedic program to USD's Health Science Major.
Lack of Supporting Facilities and Back up.	Rural areas lack supporting back up agencies and available resources can be easily backed up by non-medical calls for assistance.	The Mobile Medic Unit implemented by the Rapid City Fire department alleviates strain on call volumes caused by non-medical calls so resources can be appropriately allocated to high acuity calls.

It is important to note that a variety of challenges still remain, with few measures in place to address them. The lack of providers, sparse populations, economic conditions, and insufficient funding threaten continued access to emergency medical services. National EMS certification guidelines and training standards are an important step in the right direction, but at the state level, financing, and regulations differ, hindering operations in struggling rural communities. Although some agencies are implementing programs to integrate their ambulance providers into a larger healthcare network, it is evident that there is significant variation in how services are organized and delivered within our rural system. Transporting ambulance agencies in South Dakota are owned by

a variety of entities including local governments, fire departments, taxing districts, joint powers authorities, tribal government, or private agencies. This means that within a single county, fire departments, private agencies, and volunteer organizations may all be providing services, at a variety of levels.

Urban, and rural areas vary greatly by population demographics, geography, and economics. Such diversity has led to equally varied expectations of the EMS system within those areas. This variation gives rise to the question of effectiveness and reliability of our fragmented system. The development and continuation of EMS agencies has become a local, state issue in the absence of universal standards and federal initiatives. A national initiative could address EMS challenges and stimulate the development of a universal rural EMS system. With proper national leadership and distribution of funds, rural EMS systems could finally have the necessary resources to develop their own model of EMS service to operate in conjunction with the urban EMS model of care. The gap between urban and rural systems will remain unless steps are taken to systematically address rural challenges and integrate the rural EMS system into a coordinated, universal system.

Limitations

This research is subject to several limitations; due to the scope of body of this work, it is impossible to fully examine all aspects that impact South Dakota's rural EMS system. The availability of research specific to South Dakota was limited and difficult to obtain from some organizations. Data collected is was limited to the data collected by the State of South Dakota's EMS department. Some analytic programs were down during the

time this research was collected further limiting the data available. When analyzing the data obtained it is important to note the potential for response bias. Additional challenges not addressed in this research may arise in the future as rural agencies begin collaborating on a system wide level and are more inclined to report information. Due to limited research on comparable demographics it was difficult to compare challenges faced in other rural States. The definition of a rural EMS system also varies from state to state which makes an analysis difficult. Future research could compare a greater geographic area or be expanded to a multi-state analysis. It is hoped that the findings of this thesis will go beyond the addressed challenges and give rise to collective discussion and policy review in an effort to create a unified rural EMS system.

Final Remarks

Despite limitations, this literature review was able to analyze the issues that are threatening the collapse of rural EMS systems. The requirements to deliver high-quality prehospital care poses a unique obstacle to treating South Dakota's rural demographics. Improving the rural EMS system begins with understanding and addressing the factors that adversely affect the delivery of emergency care in rural areas. Sparse populations and lack of equipped facilities makes it difficult for rural facilities to plan and maintain preparedness for emergency medical incidents. Diminishing populations, economic conditions, and insufficient reimbursement threaten continued access to emergency medical services. Understanding the discrepancies in delivery of care is only part of the challenge. More research and policy review are needed before change can be made to the statewide system. Bringing awareness to the lack of funding

provided to rural EMS agencies could be the initial step towards updated reimbursement models and giving rural agencies the resources needed to adequately staff their agencies.

In rural South Dakota, where transportation times to the nearest medical facility are high, a fully optimized EMS system is crucial to ensure optimal patient outcomes. There is no single solution for replacing the volunteer EMS model, but, further investigation of this topic is essential to ensure the continued delivery of Emergency Medical Services to rural demographics in the State of South Dakota. The gap between urban and rural systems will remain unless steps are taken to systematically address rural challenges and integrate the rural EMS system into a coordinated, universal system.

Appendix

Appendix
EMS Scope of Practice Model

The interpretive guidelines are intended to guide the development of National EMS Education Standards, National EMS Certification, and National EMS Education Program Accreditation. The interpretive guidelines will also assist State regulatory agencies in developing and further refining their legislation and administrative rules/regulations. *These guidelines are not intended to appear in practice acts.*

Airway and Breathing Minimum Psychomotor Skill Set

Emergency Medical Responder	Emergency Medical Technician	Advanced EMT	Paramedic
Oral airway BVM Sellick's Maneuver Head-tilt chin lift Jaw thrust Modified chin lift Obstruction—manual Oxygen therapy Nasal cannula Non-rebreather face mask Upper airway suctioning	Humidifiers Partial rebreathers Venturi mask Manually Triggered Ventilator (MTV) Automatic Transport Ventilator (ATV) Oral and Nasal airways	Esophageal-Tracheal Multi-Lumen Airways	BiPAP/CPAP Needle chest decompression Chest tube monitoring Percutaneous cricothyrotomy ² ETCO ₂ /Capnography NG/OG tube Nasal and oral Endotracheal intubation Airway obstruction removal by direct laryngoscopy PEEP

² Percutaneous means access via needle-puncture (or other approved puncture device) and DOES NOT include "surgical" access using a scalpel.

Assessment Minimum Psychomotor Skill Set

Emergency Medical Responder	Emergency Medical Technician	Advanced EMT	Paramedic
Manual BP	Pulse oximetry Manual and auto BP	Blood glucose monitor	EKG interpretation Interpretive 12 Lead Blood chemistry analysis

Medical/Cardiac Care Minimum Psychomotor Skill Set

Emergency Medical Responder	Emergency Medical Technician	Advanced EMT	Paramedic
CPR AED Assisted normal delivery	Mechanical CPR Assisted complicated delivery		Cardioversion Carotid massage Manual defibrillation TC pacing

Pharmacological Intervention Minimum Psychomotor Skill Set

Emergency Medical Responder	Emergency Medical Technician	Advanced EMT	Paramedic
<u>Tech of Med Administration</u> -Unit dose auto-injectors for self or peer care (MARK I)	<u>Assisted Medications</u> -Assisting a patient in administering his/her own prescribed medications, including auto-injection <u>Tech of Med Administration</u> -Buccal -Oral <u>Administered Meds</u> -PHYSICIAN-approved over-the-counter medications (oral glucose, ASA for chest pain of suspected ischemic origin)	Peripheral IV insertion IV fluid infusion Pediatric IO <u>Tech of Med Administration</u> -Aerosolized -Subcutaneous -Intramuscular -Nebulized -Sublingual -Intranasal -IV push of D50 and narcotic antagonist only <u>Administered Meds</u> -SL Nitroglycerine for chest pain of suspected ischemic origin -SQ or IM epinephrine for anaphylaxis -glucagon and IV D50 for hypoglycemia -Inhaled beta agonist for dyspnea and wheezing -Narcotic antagonist -Nitrous oxide for pain relief	Central line monitoring IO insertion Venous blood sampling <u>Tech of Med Administration</u> -Endotracheal -IV (push and infusion) -NG -Rectal -IO -Topical -Accessing implanted central IV port <u>Administered Meds</u> -Physician-approved medications -Maintenance of blood administration -Thrombolytics initiation

Emergency Trauma Care Minimum Psychomotor Skill Set

Emergency Medical Responder	Emergency Medical Technician	Advanced EMT	Paramedic
Manual cervical stabilization Manual extremity stabilization Eye irrigation Direct pressure Hemorrhage control Emergency moves for endangered patients	Spinal immobilization Seated spinal immobilization Long board Extremity splinting Traction splinting Mechanical pt restraint Tourniquet MAST/PASG Cervical collar Rapid extrication		Morgan lens

Figure 7. EMS Scope of Practice Model. Reprinted from The National Highway Traffic Safety Administration, 2007.

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