



FirstNet and Public Safety Broadband Data Implications for Rural EMS Organizations

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National Association of State EMS Officials (NASEMSO)
EMS Communications Working Group

Purpose

The purpose of this white paper is to highlight unique issues facing rural EMS agencies and to examine how public safety broadband communications may be used to support and enhance EMS service delivery. The First Responder Network Authority, also known as FirstNet, is an independent authority within the U.S. Commerce Department chartered with providing a nationwide public safety grade broadband communications network for first responders. This new high-speed voice¹ and data network will be available to rural EMS agencies.

Executive Summary

Rural EMS providers have unique challenges that are vastly different from their urban and suburban sister agencies. These challenges exist in three areas: **time, resources, and incident types**. Access to high-speed public safety broadband services will provide solutions to mitigate some of these issues while enhancing EMS operations and patient care. As a result, it is likely that rural EMS providers will enjoy a greater benefit from public safety broadband wireless communications systems. For many, what was once perceived as a futuristic technology, such as in-the-field ultrasound examination of a trauma patient or live video consultation with a pediatrician is now becoming a reality.

¹ To date, FirstNet has indicated it plans to provide administrative voice. Provisions for mission critical voice are still being determined. Other voice components include two-way video conferencing between EMS personnel and physicians.

There are a variety of new technologies and devices² which will allow rural EMS providers to improve their standard of care. However, many of these new solutions require a reliable, high-speed broadband data connection such as will be provided by FirstNet. Rural EMS agencies are encouraged to review this report and communicate their operational and patient care needs to their State's FirstNet Single Point of Contact (SPOC³) or to FirstNet's Senior EMS Advisor.⁴

Definition of Rural⁵

For the purposes of this report, "rural" refers generally to all areas which are neither urban nor suburban. It includes areas that are both rural and highly rural (also referred to as "wilderness" or "frontier" areas).

Background

The provision of rural EMS service represents a significant challenge for EMS providers. One reason is the vastness of the geographical service area versus the population to be served. "Rural and Frontier areas in America represent 80 percent of our landmass and 20 percent of our population," states Dennis Behrens, Coordinator, Nebraska Office of Rural Health.⁶ The origin of EMS in rural areas varies, depending on the region of the U.S. Between the 1920s and the 1970s, some regions had EMS provided by volunteer ambulance and rescue squads.⁷

In some cases these squads only provided on-scene treatment, and local funeral homes provided transportation. In other cases these squads also provided transportation. Some of these volunteer squads also had basic extrication tools for motor vehicle accidents. In other regions, EMS was provided by volunteer and/or paid on-call rural fire departments, many of which started by having a resuscitator device (called a pulmotor at the time) to provide forced oxygen to patients who were not breathing. In those times, having Red Cross first aid training

² These include broadband networks other than FirstNet, including Next Generation 9-1-1 (NG911), and evolving technologies used by first responders including body worn video cameras, EKG and patient care telemetry systems, portable ultrasound equipment, etc.

³ <https://www.firstnet.gov/consultation/spoc>

⁴ <https://www.firstnet.gov/content/firstnet-and-emergency-medical-services>

⁵ The definition of "rural" is a contentious subject. See Texas' comments to FirstNet on this issue at [Texas Comments On Rural Definitions](#), and see [WashingtonPost Federal Definition Rural](#), wherein the federal government has at least 15 definitions of rural, depending on the federal agency involved.

⁶ "Rural and Frontier EMS Agenda for the Future", 2004, from the National Rural Health Association, written by Kevin McGinnis, MPH, WEMT-P, www.ruralcenter.org/sites/default/files/rfemsagenda.pdf The quote is from Dennis Behrens, Coordinator, Nebraska Office of Rural Health.

⁷ The first rescue squad in the U.S. was the Roanoke (Virginia) Life Saving and First Aid Crew founded in 1928 by Julian Stanley Wise.

was the sole certification requirement. The industry became formalized with the passage of the National Highway Traffic Safety Act in the 1960s, and later with the EMS Systems Act of 1973. These initiatives formally codified the skills and training required of EMTs and paramedics; the latter specified and funded the formation of regional EMS systems and, over time, rural EMS agencies fell into conformance with their requirements.

Today's Reality

Some rural EMS practitioners believe that public safety broadband communications will have a much greater impact on their day-to-day operations than it will for suburban or urban EMS providers. Rural EMS agencies have multiple unique issues that are different from their counterparts in urban or suburban areas. Access to public safety broadband services may help solve many of those issues. There are three major areas which impact rural EMS services: **Time, Resources, and Incidents, collectively referred to as "TRI."**

TIME: The following represent issues impacting the delivery of rural EMS care based on time:

1. Rural EMS response times are longer than urban times because of the dispersed nature of homes, farms, and businesses. Also rural EMS transport times are longer because of the extended distances to both community hospitals and to tertiary care facilities including Level 1 and Level 2 trauma centers and other specialized facilities (e.g., certified stroke center, STEMI center). Transport times may reach 30 to more than 60 minutes in rural areas, compared with 5 to 15 minute transport times in urban and suburban communities.
2. In some rural areas, local hospitals have closed or reduced their emergency care capacity, creating even longer transport times to the nearest facility. In other cases rural hospitals remain open but specialists are typically located at hub facilities in cities and suburbs.
3. Response times and transport times are frequently impacted by poor roadway conditions (inadequately maintained roads, dirt roads, winter snow and ice conditions, or heavy rain and floods).
4. Inclement weather may prevent aircraft, either fixed or rotary wing, from assisting rural EMS providers even though aircraft may be the best choice due to the extended distances involved.

5. When aircraft are available, they may be located at greater distances from the rural incident, extending initial patient care and transport time.
6. Some rural locations may have complex access issues. These include response to barrier islands, national parks and forests, as well as farms and ranches where there is no roadway infrastructure. Non-traditional methods to reach and transport the patient, including ATVs, boats, and snowmobiles, further extend the time before a patient reaches definitive care.
7. Lack of EMS capacity in rural areas may delay response to a second emergency call. Many rural areas have only one EMS unit and additional incidents are referred to an adjoining county or service. This may greatly extend the arrival of EMS beyond the delay already inherent in rural responses.

RESOURCES: The following represent issues impacting the delivery of rural EMS care based on the availability of resources:

1. Rural community hospitals closest to the EMS incident may not have the medical specialty service required, or the specialist may be on call and therefore not immediately available. EMS may need to stop at the community hospital for initial stabilization before transporting the patient to a distant and better equipped facility. The initial stabilization may involve the use of drugs and other equipment not normally used by EMS providers, creating a more complex patient care environment.
2. Changes in the insurance industry now emphasize the use of “in network” hospitals and patients may demand transport to a facility covered by their insurance plan.⁸
3. Rural patients may be more hesitant to be transported to the hospital based on the distances involved and the potential cost. Rural patients are less likely to have employer sponsored health insurance plans and may have plans with high deductibles and co-pays. EMS personnel may need access to additional diagnostic tools to convince the patient that transport is necessary.

⁸ While almost all insurance companies provide for emergency care at the closest facility, EMS is frequently called upon to transport patients with less urgent conditions, as well as managing non-emergency transports.

4. Many rural community hospitals utilize on call specialty staff, including x-ray and laboratory personnel. The lack of immediately available clinical resources puts greater pressure on EMS to have access to these services.
5. Nationwide, there is a shortage of paramedics in rural areas and many rural EMS systems operate at the Basic Life Support (BLS) or EMT-Advanced (EMT-A) level.⁹
6. Regardless of the EMS practitioner skill level, call volumes are lower in rural areas and many advanced procedures are performed infrequently. This puts pressure on rural EMS providers to maintain the clinical competency of their personnel. In urban and suburban settings EMS personnel respond to more patients and utilize their skills on a more frequent basis. For example, a rural paramedic may only perform endotracheal intubation once a year while an urban paramedic may perform the same procedure on a monthly basis.
7. Rural EMS providers may need to conduct enhanced patient assessments in the field in order to make a more clinically informed decision on patient destination and/or use of air transport, given the time of transportation factor. Working against this is that rural EMS personnel may have less patient care experience.
8. Education of EMS personnel, both initial and recurring training, is more difficult in rural settings due to budget constraints, lack of staff to backfill the missing employee, and the distance to the training center.
9. Training and re-certification requirements are increasing for all levels of EMS personnel, and it is becoming harder for many rural EMS providers to allocate the training time and budget resources needed to maintain basic and advanced certifications.
10. Funding for rural EMS services is frequently constrained by lower revenues caused by fewer calls for service while still having to maintain 24 hour availability. Reduced funding for capital purchases causes many rural agencies to extend the service life of vehicles and expensive equipment. This often results in the continued use of older emergency vehicles which are required to travel long distances, in all kinds of weather,

⁹ <http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/the-fire-service/administration/us-fire-department-profile>

over rough roads. Reduced capital funding also means that rural EMS agencies may have delayed access to new and emerging technologies which may specifically benefit their patient population. This includes newer (and more expensive) cardiac monitoring devices, advanced airway equipment, etc. Lack of full funding also impacts the daily operation of rural EMS providers. Dollars must be allocated for equipment and supplies that are deemed “essential.” Funds for training, enhanced communications equipment, and specialty drugs are frequently not available.

11. Urban EMS providers typically have full-time paid employees and additional support staff who help with the administrative duties. These include field supervisors and quality assurance personnel who help create a high performance system. Rural EMS providers do not have the call volume or budget capacity to fund support positions and rely heavily on unpaid volunteers or stipend based on call personnel. One third of the states reported that 50 percent or more of their EMS capacity is volunteer based.¹⁰ In some agencies, the same personnel who respond to EMS calls also perform administrative functions. Low rates of compensation also force many rural EMS personnel to work a secondary job which further reduces their availability for backup response. Like the fire service, EMS agencies who rely on volunteers are experiencing a decline in the number of citizens who are signing up to support their community. This makes it harder for EMS agencies to maintain a sufficient reservoir of trained volunteer or call personnel.¹¹

INCIDENTS: The following represent issues impacting the delivery of rural EMS care based on the types of emergency incidents these agencies respond to:

1. Rural EMS agencies respond to a disproportionate number of elderly patients which may represent more than 50 percent of their call volume.¹² Elderly patients have more complex medical problems and are frequently on multiple medications, making emergency treatment more difficult.
2. Rural areas frequently have reduced levels of easy access to primary care medicine. This may cause a medical condition to worsen significantly before the patient seeks care.

¹⁰ https://www.ems.gov/pdf/National_EMS_Assessment_Demographics_2011.pdf

¹¹ www.nvfc.org/wp-content/uploads/2016/02/NVFC-Fact-Sheet-2017.pdf,

¹² <https://www.princeton.edu/~ota/disk1/1989/8928/892805.PDF>

3. EMS incidents in rural areas involve illness and injury caused by a wide range of animals and livestock present on ranches and farms as well as in the wild. Certain diseases, such as avian influenza, which can infect humans, may be more prevalent in rural areas.¹³
4. Rural EMS incidents may also involve response to equipment, infrastructure, and chemical events. These include anhydrous ammonia exposure, grain elevator accidents, farm equipment incidents, etc.
5. Rural EMS incidents are more likely to involve significant trauma. This includes response to high-speed vehicle crashes,¹⁴ farm implement accidents, and collisions involving railroad trains. While only one-third of all motor vehicle accidents occur in rural areas, two-thirds of motor vehicle deaths occur on rural roads.¹⁵ It should be noted that rural roads comprise 80 percent of the road miles in the U.S.¹⁶ Rural residents are also nearly twice as likely as urban residents to die from unintentional injuries other than motor vehicle accidents.¹⁷
6. In many states, large state and federal prisons are located in rural areas. Prisons have large populations which include inmates with extensive medical problems. They may represent the equivalent of a city in an otherwise rural area and can place a strain on EMS resources. Patients from these facilities are usually transported only when their condition becomes serious and is beyond the capabilities of the prison clinic. EMS agencies are called to transport these patients and they frequently require advanced care and monitoring and are subject to special security issues.
7. Rural EMS agencies must also adapt to changes in incident volume caused by seasonal fluctuations in population and calls for service. Rural EMS agencies servicing recreational areas such as mountains, parks, lakes, and beaches typically see large increases in visitors during their peak season. This peak in visitor traffic is associated with commensurate increases in EMS call volume. An attendant problem with visitor populations is that the visitors are often not aware of local dangers (such as flash

¹³ <http://wtvr.com/2017/03/02/bird-flu-cases-surged-this-season-but-human-risk-remains-low-who-says/>

¹⁴ A disproportionate number of serious vehicular accidents occur in rural vs. urban settings. See <http://safety.transportation.org/htmlguides/rural/Section03.htm>

¹⁵ <http://ruralhealth.stanford.edu/health-pros/factsheets/disparities-barriers.html>

¹⁶ https://www.fhwa.dot.gov/planning/publications/rural_areas_planning/page03.cfm

¹⁷ <http://ruralhealth.stanford.edu/health-pros/factsheets/disparities-barriers.html>

floods), and are also not aware of what emergency response resources may or may not be available.

8. Rural EMS agencies must also respond to a variety of sporting and recreation incidents. These areas are popular for hiking, hunting, mountain and rock climbing, caving, as well as use of ATVs, mountain bikes, snow mobiles, cross country skiing, fishing, hunting, ice skating, etc. In all of these pursuits, the participant is often off road, and access to an injured patient will be delayed. It can be very problematic for rural EMS agencies to manage these incidents.

9. Rural EMS agencies frequently operate in more severe weather conditions than their urban and suburban counterparts. Towns and counties in rural areas typically have fewer resources to clear roadways and manage weather related impacts. Severe weather causes unique rescue incidents for rural EMS agencies while also making response to the scene and transport to the hospital more difficult.

Time, Resource, Incident Analysis
Comparison Table of Rural versus Urban and Suburban EMS Services

Attribute	Rural, Frontier	Suburban	Urban
TIME			
Reaction Time (From Incident to Discovery)	Delayed due to absence of a passerby or neighbor noticing the emergency incident.	Short due to presence of bystanders and others who are nearby the incident.	Short due to large number of persons in the area of the emergency and use of cell phones.
Response Time¹⁸ (From Station to Scene)	Extended/Delayed due to road conditions, dispersed personnel, and incident travel distances. Typical 30-120 minutes. ¹⁹	Short to Medium based on availability of more units and personnel and a more dense operating geography.	Short based on number of units and stations in a dense geography. Typical 4-50 minutes. ²⁰
Transport Times (From Scene to Facility)	30-60+ minutes	15-30 minutes	3-15 minutes
RESOURCES			
Patient Access	Roadway, aircraft, boat, ATV	Roadway, aircraft	Roadway, aircraft
EMS Responders - Training/Credentials	EMR, EMT, AEMT, some paramedics but not in all areas	EMR, EMT, paramedics	EMT, paramedics
EMS Responders - Available on Scene	1-4	2-6	2-6
EMS Responder Type	Primarily Volunteer, On-Call, Career	Primarily Career	Primarily Career
Availability of Training Courses and Programs	Low to medium	Medium to high	High
Access to new Technology and Equipment	Poor to medium	Medium to high	Medium to high
Communications Systems Performance (EMS to dispatcher, EMS to hospital)	Poor to medium	Medium to high	Medium to high

¹⁸ <http://safety.transportation.org/htmlguides/rural/Section03.htm> Also EMS service evaluations and comparative transport rates from Maine EMS data 1998-2010 by K. McGinnis.

¹⁹ <http://safety.transportation.org/htmlguides/rural/Section03.htm>

²⁰ <http://safety.transportation.org/htmlguides/rural/Section03.htm>

EMS Budget	Constrained (sharing sparse countywide funding)	More funding sources (county, city, etc.)	Multiple funding sources (county, city, grants, etc.)
Community Paramedicine Program Potential	Significant resource to citizens, useful due to distance from health care resources and complexity of elder population.	Significant resource to citizens, useful for consultation and management of complex medical patients.	Significant resource to citizens, useful to manage EMS and ED resources
INCIDENTS			
EMS Responder Interaction with High Risk/Critical Care patients	Low frequency of occurrence	Higher frequency of occurrence	High frequency of occurrence
Incident Types^{21 22} And Access to Tertiary Care	Poor access to Trauma Centers and Tertiary Care.	Access to Trauma Centers and Tertiary Care	Easier access to Trauma Centers and Tertiary care.

How Broadband Communications Will Assist Rural EMS Organizations

Rural EMS organizations could leverage public safety broadband services in the following ways:

Time

1. Advanced Automatic Crash Notification²³ (AACN) data bursts coming directly from crashed vehicles to PSAPs could be simultaneously transmitted to rural first responders, providing a pre-alert that allows for faster mobilization of resources.²⁴ AACN data also provides information that will allow for earlier deployment of specialized resources, including aeromedical helicopters and extrication equipment which may be responding from distant locations in rural areas. AACN information includes data on the type and physics of the crash (such as rollover, head-on collision, whether all occupants belted, and

²¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1448517/> (October 2004)

²² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5409522/> (January 2017)

²³ “OnStarSM is one example of such a service.

²⁴ Use of this proposed capability must be coordinated with the PSAP and may not be appropriate in non rural areas.

airbag deployment). It will be important that any automatic alerting devices, such as AACN or patient worn monitors, be capable of transmitting information directly to on-duty responders when required by local policies. This will allow for faster alerting of personnel, including on call personnel who must first respond to an EMS station before proceeding to the scene, as well as reducing errors when information is passed on.

2. Telehealth/Telemedicine software applications will enable EMS personnel to communicate with physicians and other healthcare specialists using picture and video imagery to improve decision support and treatment. These applications allow better management of complex medical emergencies during extended transport times to the hospital. This will also allow rural EMS personnel to immediately consult with a physician in situations beyond their level of training.

3. Public safety broadband will also enable the use of new patient care technologies in the field. This may include portable ultrasound devices and point of care laboratory testing.

Portable field ultrasound²⁵ and other advanced imaging technologies may identify or verify injuries and illnesses allowing for better routing of the patient to the appropriate hospital destination. This allows patients to be safely transported to local community hospitals instead of a more distant specialty facility, reducing cost and increasing EMS availability and provides longer lead time to get specialist medical and surgical teams in place when advanced facilities are needed.

Portable laboratory testing equipment, called Point Of Care (POC) systems, will allow for the rapid analysis of patient samples and enhance clinical decision making. For example, the ability to diagnose potential sepsis would allow for immediate transport to the most appropriate facility and could allow for early administration of appropriate drug therapy. Time critical medical events need faster intervention in rural areas due to extended transport times to definitive care.

4. Software applications installed on first responder Smart Phones provide alert notifications for emergency incidents and allow volunteer and on call personnel to acknowledge receipt of the call and confirm they are responding. Public safety broadband

²⁵ “We expect that rural services, those with long transport times, and those utilizing air-transport, will be the most common users of prehospital ultrasound.” From *Use of Prehospital Ultrasound in North America: A Survey of EMS Medical Directors*, <http://bmccmergmed.biomedcentral.com/articles/10.1186/1471-227X-14-6>

will allow for more innovation and enhanced capabilities with these systems, allowing for faster mobilization of personnel and reduced response times.

5. Many EMS organizations and most hospitals use Electronic Patient Care Records (ePCR). Hospital ePCR systems contain a wealth of patient medical data and historical records that can be critical when treating a patient. Yet, EMS networks are rarely interconnected to the hospital systems. Having access to a list of the patient's current medications, being able to view drug allergy alerts, and displaying the patient's most recent 12 lead EKG may allow for faster treatment. The long transport and return times and limited local resources in rural areas make it important to get EMS resources back in service in their assigned area as quickly as possible. Having broadband links to the receiving hospitals enables the first responder to fill out ePCRs while returning to quarters, or en route to the hospital for non-critical patients, reducing the time the EMS unit is out of service.

Resources

1. As mentioned above, software applications²⁶ allow responding EMS personnel to check in so that the number and type of responders is known. This is especially important in rural areas where on call and stand by EMS personnel are used. All personnel would be aware of who is responding (either directly to the scene or the station) and what their skill level is. The PSAP would also know if sufficient resources were responding, and could transmit a second request for needed personnel or dispatch mutual aid personnel more quickly if indicated.
2. Integration with ePCRs could update health information exchanges and other patient data repositories for repeat patients allowing responders to review the patient's prior medical history, medications, and other relevant information prior to arriving on scene.
3. Public safety broadband network connections would allow AACN messages and other patient care data to be transmitted to the nearest trauma center or specialty facility to ensure that the Emergency Department has received early notification regarding these incidents. These same network connections allow for the rapid dissemination of emergency alerts to nearby agencies including aeromedical services, hazmat, and extrication resources.
4. Telemedicine capabilities would allow EMS personnel to obtain expert advice from ED physicians and nurses while en route to an incident or while on the scene. This advice could

²⁶ IAmResponding.com is one such application.

be via a two-way video teleconference, as well as by sharing still images or a video clip of the patient or an injury. This may allow for more “treat and release” of patients on scene, in their homes, or in a centralized clinic such as in the EMS station. This would reduce the number of costly and resource consuming EMS transports for simple injuries or illnesses.

5. EMS responders could refer to online ‘just in time’ video refresher training if the call is known to likely involve an infrequently practiced skill, such as a cricothyrotomy or continuation of an infrequently used drug. This information is especially important when responding to incidents involving infants and children where drug doses and other treatment options are highly specialized and infrequently used.

6. Video surveys of the mechanisms of injury may allow Emergency Department personnel to more quickly activate trauma and airway specialists to treat an incoming critical care case. Faster notification and verification of these resource needs is especially important in rural community hospitals.

7. Public safety broadband will enable new the use of new software applications²⁷ which will provide more information to EMS personnel. Applications exist today to help with diagnosis, pharmacology, ECG interpretation, hazardous materials identification, etc.

8. In a mass casualty incident, simple ECG monitor apps²⁸ and patient tracking systems can be used to quickly monitor basic vital signs in patients and broadband network services can aggregate patient data for the on scene EMS personnel while also transmitting information to receiving hospitals.

9. Public safety broadband will also allow PSAPs to forward video and images received through 9-1-1 and other networks to responding EMS personnel. Images from traffic management cameras or video from a law enforcement helicopter can provide improved situational awareness for EMS personnel.

Incident

1. Unmanned Aircraft Systems (UASs or drones) could be immediately launched to fly over an incident. They can provide high resolution images of the scene and identify safety issues, determine the number of vehicles and victims, look for hazardous materials, and evaluate

²⁷ Some examples include ECG Guide, The Pill Identifier, and ER Res.

²⁸ AliveCor is one such app which is 1 lead; however physician review of this product has created many questions. Better ECG diagnostic tools could be expected in future.

road conditions and access requirements. These devices will need broadband wireless capabilities to send video and data information back to the PSAP and directly to responding units.

2. Community paramedicine is an important component to improving care to rural residents, and reducing unnecessary emergency calls for service. Providing video teleconferencing to physicians, physician's assistants, nurse practitioners, nurses, and other hospital based personnel will allow community paramedics to provide a better level of service. Video teleconferencing with higher level EMS providers could allow for the integration of "urgent care" standards into community paramedicine, allowing for the treatment of simple illnesses and injuries in the home. This will reduce unnecessary and resource consuming transports. It will also allow physicians to expand the reach of medical practice (e.g., antibiotics, sutures, lab work) yet at the same time maintaining necessary oversight for safety and quality reasons.

EMS Applications

Many of the benefits of broadband wireless communications will be embodied in software applications that either exist or will likely exist in the future. In July 2013 the NPSTC Broadband EMS Working Group created the [*EMS Broadband Application List for FirstNet PSAC*](#).²⁹ This document highlighted 37 software applications designed to support EMS and was provided to FirstNet to help illustrate the critical role that applications will play. The group is currently working on updates to that report.

The applications were grouped into three major categories; an example of each follows below.

Interfaces: Connections between different networks would allow for the rapid exchange and sharing of information. An example would be an interface that would allow for the transmission of real time patient information from a cardiac monitor to the receiving hospital.

Applications for Patient Care: Examples could include: a "12 lead EKG Helper" to allow basic EMTs to place 12 lead electrodes in the absence of an advanced provider; an app to send the EKG to the hospital; or mobile telemedicine/telehealth video conferencing.

²⁹ http://www.npstc.org/download.jsp?tableId=37&column=217&id=2885&file=EMS_App_List_110413F.pdf

Apps for the EMS System: An example would be an app that allows the multiple GIS layers to be read in order to better plan and execute patient transport.

Issues

In essence, public safety broadband services and the services and capabilities they support will bring needed technology to rural EMS providers that can help alleviate the issues of resource scarcity and time in the rural environment. However, the success of any technology or application is based on a number of important factors that must be addressed. Many of these factors take on increased importance for rural EMS organizations.

Ease of Use, Minimum Training: Rural EMS providers already face significant training and certification requirements that impact rural EMS personnel including volunteers. Any new technology must be designed for ease of use and require minimal training. Public safety broadband has the potential to enable higher levels of intervention by allowing advanced technology by minimally trained personnel. For instance, the use of portable scanning technology may allow a vehicle crash patient to be safely transported to a community hospital instead of to a distant trauma center. Ultrasound probes are not complex to use and public safety broadband would allow the images to be transmitted to a hospital for interpretation.

Therefore, the broadband network allows for EMS personnel to be trained in the operation of new equipment without having to master the skills necessary to interpret the results. In other cases, the patient care technology could have onboard analytics that provide an interpretation. This is best illustrated in the evolution of portable cardiac monitor/defibrillator devices used by EMS agencies. Interpretation of complex heart arrhythmias required continual refresher training of paramedics.

Today, most of these devices have onboard analytics which interpret a 12 lead ECG and identify cardiac anomalies with great accuracy. Advances in microprocessors and computer memory allowed for the introduction of Automatic External Defibrillators (AEDs) which allow basic EMTs and untrained civilians to activate the device, which automatically evaluates shockable rhythms and can defibrillate a patient in three easy steps.

Skill Degradation: The use of new patient care technology should not provide the basis for reduced training of EMS personnel. Even the most well designed piece of equipment may fail during an emergency and first responders must know how to care for the patient in the absence of the automated systems. It is essential that EMS personnel maintain a high degree of clinical competency regardless of the level of technology in use.

Big Brother Syndrome: it is important that new patient care technology be introduced in a way that is helpful for both EMS personnel and the patient. In many cases today, EMS personnel are able to manage the patient with no assistance from medical control. EMS agencies must take steps to ensure that the technology does not appear to be a way to monitor the performance of field EMS personnel, inject unneeded collaboration, or distract EMS personnel from their primary mission. Relationships between the EMS agencies and the medical director will be very important. It is likely that ED physicians will also need training, both in the use of the new technologies and the appropriate role for these technologies. Video telemedicine in rural areas will be helpful but the EMS medical director should provide guidance on the expected use of the technology.

ED Time Commitment: Most EDs experience periods of high activity. Depending on the number of ED personnel on duty and the volume and severity of patient cases being handled, ED personnel may not have time to review detailed patient care telemetry and video coming from the field. In the event of a mass casualty incident or even a busy weekend night, ED personnel may be too busy to interact with EMS personnel.

Fiscal Impact: The cost of public safety broadband service will be a major component for adoption by rural EMS providers. Most rural EMS services have very limited budgets, regardless of whether they are volunteer, fire department based, private, or hospital based.

Complexity/Training: Rural services already struggle to keep certifications current and continuing education hours up to state and national requirements. Even for basic EMTs, the number of training hours required is increasing. Training needed to understand and operate the public safety broadband equipment and associated technologies must be provided in a variety of low cost ways that will meet the operational and scheduling needs of rural agencies.

Broadband Coverage: Today, rural EMS providers experience poor coverage from commercial cellular providers in their areas and coverage has already been identified as an important component to ensure the success of the FirstNet network. Successful implementation of public safety broadband will require adequate indoor and outdoor coverage. EMS personnel frequently treat patients in their homes and offices and must have communications and data capabilities at the bedside.

Broadband Bandwidth: Less discussed, but arguably as important, is the need to have sufficient bandwidth to support the applications and services needed to deliver emergency care. In addition to two-way video conferencing, portable field ultrasound may be of greater benefit to

rural responders then to urban responders who are 10 minutes from the nearest facility. Testing of LTE capacity and bandwidth shows reduced throughput for emergencies as you approach the edge of a tower's coverage area. Rural areas are likely to be served with fewer cell sites than urban areas requiring close attention to coverage and capacity issues

Over Dependence: As with any communications or patient care technology, it will be necessary for EMS systems to provide guidance on work-around procedures during times when the public safety broadband network is not available.

Conclusion

For a variety of factors including time, resources, and types of incidents, rural Emergency Medical Services providers may find greater advantages to using public safety broadband wireless communications technologies than their urban or suburban EMS counterparts.

The time factor is largely a function of distance, but also the fact that rural responders may be responding from their homes as opposed to a central station. Rural providers frequently see extended response and extended transportation times that may affect patient outcomes.

Resources in rural areas are frequently limited, which can negatively impact rural healthcare and EMS. This includes a limited number of nearby community hospitals, greater distances to trauma centers and specialty facilities, a reduced number of EMS providers, challenges in maintaining skills proficiency and lack of equipment caused by budget constraints.

Finally, the types of incidents found in rural settings are different from urban settings, and include a higher risk for life threatening trauma.

Compounding these factors is another resource issue regarding the limited availability and capability of existing communications networks in the rural areas. The deployment of a public safety broadband wireless communications network can help through the provision of high speed data, video, and access to software tools and applications such as telehealth and mobile telemedicine. While it must be recognized that there are a number of issues and barriers to using these new technologies in the rural setting, rural broadband wireless has the potential to be a force multiplier for improving emergency care for these populations.

Rural EMS agencies are encouraged to review this report and communicate their operational

and patient care needs to their State's FirstNet Single Point of Contact (SPOC³⁰) or to FirstNet's Senior EMS Advisor.³¹

Additional Information Sources

Improving Access to EMS and Health Care In Rural Communities: A Strategic Plan, by The Joint Committee on Rural Emergency Care Of and For The National Association of State EMS Officials And The National Organization of State Offices of Rural Health, July 2010. To be noted is the reference to needing improved communications on page 7 section A.1.e.

<http://www.nasemso.org/Projects/RuralEMS/documents/FinalApprovedbyNASEMSO-NOSORH.pdf>

The Demand for EMS Services in Rural Areas, 1988:

<https://www.princeton.edu/~ota/disk1/1989/8928/892805.PDF>

³⁰ <https://www.firstnet.gov/consultation/spoc>

³¹ <https://www.firstnet.gov/content/firstnet-and-emergency-medical-services>