

## Emergency Medical Communication in North Carolina: Past, Present, and Future Challenges

Carl C. Van Cott

*If the best equipped ambulance arrives unannounced at the emergency room door and the hospital is unprepared for the arrival, the system has broken down and patients can be lost because of it. There must be good reliable communications between the person reporting the accident, the dispatcher of the appropriate vehicle and personnel, the police and fire departments (when called for), the hospital emergency department, the medical specialists available to the hospital, and those bigger hospitals (trauma centers) to which the patient might in some cases be sent directly.*

This excerpt from the 1973 Report of the Legislative Research Commission to the General Assembly of North Carolina recognized the importance of emergency medical services (EMS) communications to the safety and quality of emergent care. Since its inception, EMS communications has made measured progress. This article explores some history, examines the current status of EMS communications, and highlights some of the future challenges faced in North Carolina.

An EMS communication system must be examined under two operational conditions: routine or day-to-day operations and disaster or larger scale emergency situations. For the local systems to be effective, wide area standards for operations and equipment, radio frequencies, and technical requirements must be provided. These standards must be sufficient to ensure compatibility and interoperability throughout all systems statewide. Communication functions must also adapt if an emergency situation escalates. Communications must be capable of extending to adjacent counties, states, and national disaster management agencies. The establishment of interoperable systems requires time to develop and needs consistent financing and direction. System creation is an evolutionary process requiring understanding and acceptance. Common goals and language must exist to facilitate this development.

### Public Access Communication

In the 1970s public access to emergency services was uncoordinated. Numerous telephone numbers were listed on the inside cover of local telephone directories for the various sources of EMS and rescue services. Callers seeking assistance were fortunate if they could identify the telephone number necessary for their needed emergency service; they may have had to call multiple phone numbers and choose between the various services and providers, thus being delayed in obtaining assistance.

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Currently, public access to EMS is achieved through universally available 9-1-1 emergency telephone systems. Public Safety Answering Points (PSAPs) have been established in all 100 North Carolina counties and the state has progressed to being served fully by "Enhanced 9-1-1," also known as E9-1-1. Enhanced 9-1-1 enables a PSAP to determine the caller's location from data linked to the telephone number. Considerable effort has been expended in implementing these E9-1-1 systems. The introduction of new communications technologies has, however, created new challenges. For example, an estimated 70% of calls to PSAPs in North Carolina are now made from cellular telephones, but many PSAPs cannot accurately identify the location of the cellular telephone. Similarly, Voice over Internet (VoIP) telephones, also a popular new technology, do not automatically tie to the system that provides user location information. This requires the user to register the VoIP telephone to a location. These differences may cause delays and inaccuracies in dispatching emergency help, which can result in loss of life and property.

Cellular telephones also offer new advantages for EMS communication. They have features such as geographic positioning systems (GPS), digital picture and video transmission and reception capabilities, text messaging, and mapping capabilities. These new capabilities, however, are not utilized by most 9-1-1 centers. They could have considerable usefulness in the emergency dispatching system. Methods to utilize these new system capabilities for EMS systems should be explored. For example, a cellular caller could send pictures of a crash location or other emergency situation, in essence extending the eyes of the dispatcher to the emergency scene. Consider the range of possibilities when the cell phone device in the field can also receive messages or video from the 9-1-1 dispatcher. This could provide information on how to perform cardiopulmonary resuscitation (CPR) or other emergency procedures or even direct evacuations in preparation for an impending weather event or other large scale emergency.

## **Dispatch and Coordination Communication**

In times past, virtually no training was provided to emergency dispatchers. Dispatching services were not recognized as having a high degree of importance and were not always provided 24 hours a day. Sometimes emergency telephone numbers changed from day to night depending on which person took the ambulance home that evening. Times have changed. Telecommunicators that function in a coordinated PSAP are generally required to have a minimum level of telecommunications training. There is increasing recognition of the important role telecommunicators play as the first of the first responders and the sole point of contact for all emergency services. The dispatcher is responsible for making the decision of what services are to be dispatched and for the coordination of all of the emergency functions and field responses. If this function is poorly performed, nothing else will go well in the response. Telecommunicators are rightfully assuming recognition in a new profession.

Emergency medical dispatch (EMD) training is available throughout North Carolina. Emergency medical dispatch certification is an advanced life support service that requires a

medical director. Currently, 73 communications agencies or 63% of the approximately 115 emergency dispatch centers within the state have approved EMD programs.<sup>1</sup> These centers are trained to recognize life-threatening conditions and provide telephonic direction in medical emergencies such as childbirth and CPR.

Emergency medical services communications understanding must extend further to the educational requirements for all users of the system. This education must include training for the public on how and when to call for assistance and what to expect when they call. The dispatcher's training must include providing prearrival medical instructions. Field responders and hospital personnel need instruction on how to use their communications equipment. Methods must be developed to accurately and quickly exchange information about a patient's condition and treatment, and a standardized radio reporting template to present a patient to the emergency department must be developed. Finally, education must extend to licensing radio systems, maintaining the equipment, and testing the operational readiness of the entire emergency communications system.

Public Safety Answering Point operations should be encouraged to recognize the importance of certification and training programs. These certifications also extend to fire and law enforcement operations. Caller algorithms (flip cards and computer programs) for directions to provide assistance to callers must continue to be reviewed and expanded to a broadened array of programs and to additional medical conditions where early intervention can be critical. All emergency communications centers should have the ability to provide CPR instructions over the telephone. All emergency answering points should be able to provide information on the location of nearby automatic electronic defibrillators in high population areas such as malls, airports, fairs, and other public gathering places and to be able to provide instruction on the use of these devices to the caller.

Devices that provide mapping, location, and direction information to emergency events must be made commonly available to PSAPs, emergency response vehicles, and field responders. Vehicle GPS systems should be widely available to report to the PSAP the location of ambulances and to provide the dispatcher with information on the location of the closest units available to respond to any given situation. Coordination of emergency communications services between geographic areas such as cities and counties must become the rule and not the exception. There should be a common statewide approach to providing public safety services.

## **Medical Communication**

In the early 1970s physician medical direction communication to field EMS units did not exist. Notification of an impending patient arrival via ambulance at a hospital was sporadic and information concerning a patient's condition was provided only as a local service option. In most instances it did not exist. Hospital radio systems operated on various radio frequencies with different channel designations. A statewide common hospital radio frequency was not available. Ambulance personnel making

patient transports to out-of-county hospitals generally were not able to communicate after leaving their local service area.

A statewide common hospital very high frequency (VHF) was implemented in the later half of the 1970s and a standardized channel name was designated. During the 1980s and 1990s every ambulance and every hospital with an emergency department had a radio that operated on 155.340 MHz, now commonly called "340." A state publication entitled Dial Codes provided information about each hospital's radio frequencies and telephone and radio access numbers or codes. Ultra high frequency (UHF) "MED" radio systems were widely implemented and paramedic advanced life support communications systems were installed. These radio systems had the ability to transmit a patient's electrocardiogram to aid in patient care and treatment.

In the late 1990s wide area compatible hospital radio systems in parts of the state began to decline, both in numbers and in operational reliability. In part this was due to the lack of consistent funding to encourage hospitals and EMS agencies to install systems that met statewide standards and to the failure of hospitals to keep their radio equipment in prime operating condition. At times there was disagreement on who was responsible for providing the radio or maintaining the ambulance-hospital equipment serviced, especially when the services were under different administrative structures.

All hospitals in North Carolina with emergency departments currently have radios licensed on the state hospital 340 VHF frequency. Some of these radios have not been replaced or upgraded since the original installation 25 or more years ago. Even when functional, the single frequency hospital radio system is overloaded in metropolitan areas and during disaster situations.

Some counties and EMS agencies that previously had equipment operating on the state standard UHF MED channels have now removed these radios, electing not to repair or replace older radio equipment in favor of purchasing new 800 MHz systems. The expanded capabilities of the 800 MHz trunked systems, however, extend only to users that function within the same communications network. Compatibility between adjacent counties or to other communications systems may not exist or is difficult to achieve due to differences in the equipment when it is supplied by different manufacturers. Unless common direction and standards are consistently available, system designs may fail to maintain common statewide frequencies. This can result in situations where an ambulance transporting outside the county is not able to communicate with the receiving hospital or is unable to maintain contact en route. Cellular telephones appear to fill this communications gap, but they do not function when the telephone network becomes overloaded. This situation is common during disasters and can occur even during moderate traffic congestion situations.

The North Carolina Medical Communications Network (NCMCN) has been developed to provide common geographic wide area UHF radio coverage. The state network of radio repeater installations operates on two channels to increase connectivity between hospitals. The system functions both for routine radio communication and during disasters. The system serves as a redundant system to local EMS radio systems and as

an interim system for disaster medical communication. By October 2007 NCMCN radios will be installed in all hospitals within North Carolina. Even with this advancement in statewide capabilities, channel capacity of the system is not sufficient to ensure communications during large scale emergencies or disasters. Additionally, there are currently insufficient numbers of ambulances equipped with UHF radios to ensure operational capability with the system.

Efforts are underway to create a new public safety statewide radio network in the 800 MHz spectrum. This system is the Voice Interoperability Plan for Emergency Responders or "VIPER" network. The system is intended for use by all emergency responders including law enforcement, fire, and EMS services.

A medical communications component has been added to the VIPER network to provide an additional layer of compatible medical radio operation to hospitals and EMS services. This component is designated the Viper Medical Network (VMN), and it provides another radio option for hospitals and EMS services. Funding to encourage wide participation in this system has not yet been identified. The first level of deployment of the VMN is underway through funding provided by the US Health Resources and Services Administration (HRSA). Eventually, it is envisioned that every hospital in the state will have access to its own "talk group" on the network, which will enable any hospital or ambulance to establish voice contact from anywhere within the state.

Complicating the advancement of the new VIPER system is the necessity to provide additional radios to ambulances. In the short term this could result in an ambulance being required to have up to three separate radios installed—one functioning on the hospital VHF 340 for communications on the statewide VHF hospital frequency and with its local dispatch operations, a second for the UHF NCMCN, and a third to participate in the VIPER VMN 800 MHz state trunked network. This amount of radio equipment is costly to acquire and maintain. Unfortunately, there does not appear to be any easy alternative. Some efforts are underway by the state and some counties to install gateway systems that will patch between various radio systems. For these systems to function, however, the radio coverage between the patched systems must be geographically coincidental. Until all systems statewide can be upgraded to a common band or to the VIPER system or until equipment becomes available to enable radio operation compatibility on the many systems and radio bands, multiple radios in hospitals and ambulances will continue to be required. Furthermore, alternative sources for equipment compatible with the VIPER network must be identified. Equipment is currently available from only a very limited selection of suppliers. Technical assistance and guidance regarding radio communications as well as the VIPER network must be made available to hospitals and EMS providers.

National long-term plans may convert all public safety communications to a common frequency band, but this will not be possible in the short term and requires interim systems to remain functional as the new systems and equipment

become defined and available. There are already known technical situations and pending FCC actions that impact the development of these high capability systems. Developments of new capability systems and technology will keep EMS systems in a state of flux for years to come.

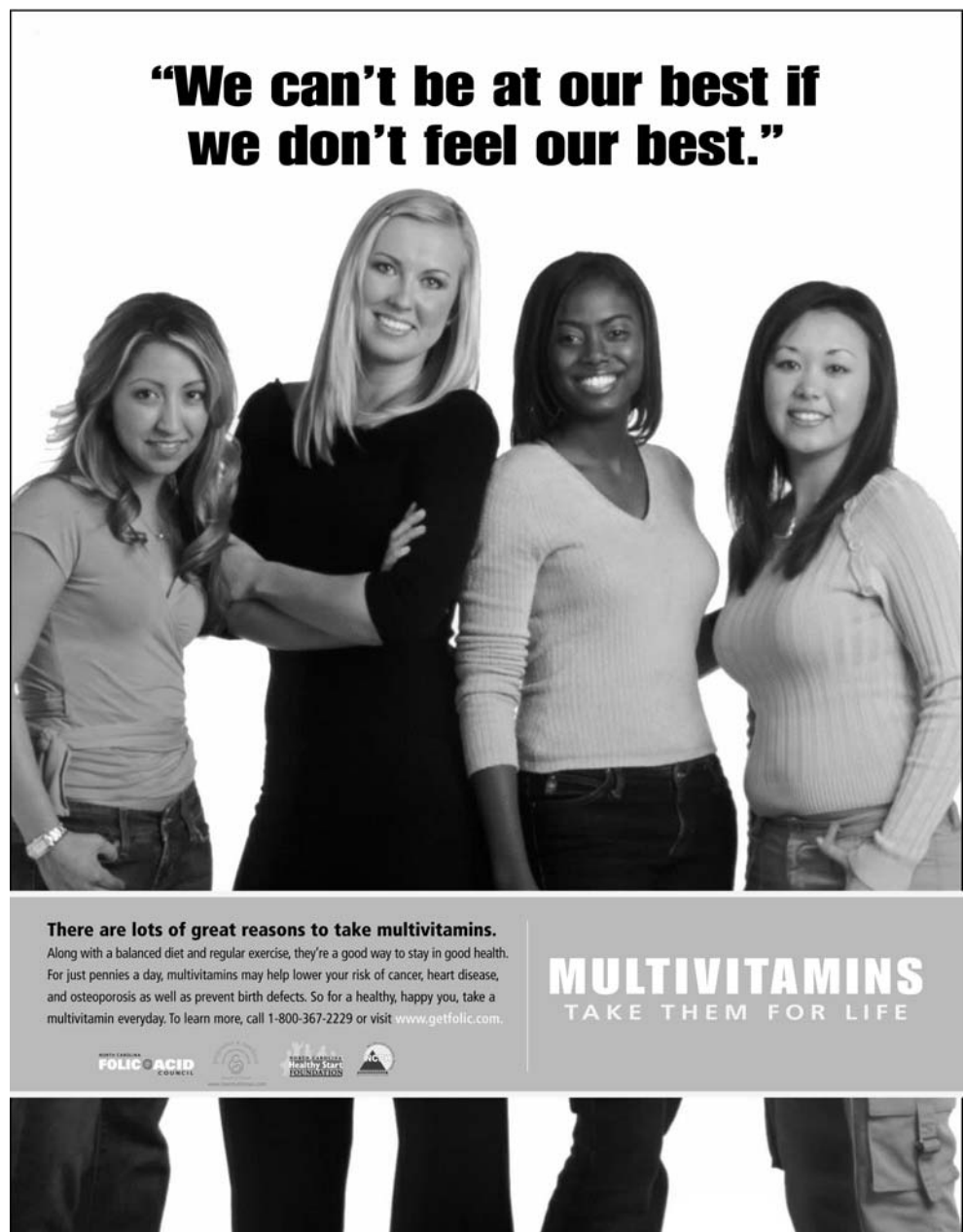
Implementation of an EMS communications system is an evolutionary process. Implementation requires a series of compromises and trade-offs made within the confines of time

and funding. Directives, rules, laws, technology, motivation, and expectation all influence the outcome. Every aspect of the communications system must continually be revisited, evaluated, refined, refurbished, and improved to maintain North Carolina's readiness and ability to provide the services to respond and be prepared for the eventualities. **NCMJ**

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## REFERENCES

- 1 North Carolina Office of Emergency Medical Services CIS data system, April 26, 2007.



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