Telemedicine Aids Disaster Preparation in Rural Romania

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Background: While Romania was an early adopter of the specialty of emergency medicine in continental Europe, and emergency medicine has been a recognized medical specialty since 1994, the number of trained emergency physicians remains insufficient to staff many of the smaller emergency departments scattered throughout the country.
Aim: In order to cover the lack of specialized personnel, a telemedicine network that links Targu Mures Hospital Emergency Department with 42 other hospitals was created. The paper shows the results of the telemedicine system after its first year of activity and the potential role of it in case of a multiple casualty incident or a disaster.
Method: The total number of patients examined through the telemedicine system over the first year of activity was evaluated. The total number of patients transferred to a higher level hospital after the evaluation was also followed. The impact upon the method of transport employed was also a parameter of interest.
Results: In the first year of operation 255 patients were evaluated through the telemedicine system out of which a total of 216 were transferred to facilities with a higher level of care. Of the 216 patients transferred, 166 were moved via ambulance and 50 were transported by helicopter.
Conclusion: The telemedicine system created in Tîrgu Mureş may potentially serve as a model for other developing countries or regions that are expanding the scope of their disaster preparedness infrastructure or are enlarging the reach of their emergency medical services.

Keywords: telemedicine, aeromedical transport, disaster

Introduction

Telemedicine has become an increasingly popular modality for disseminating specialty medical services over the past fifteen years. Disaster medical care, with its inherent time, manpower, and equipment constraints, is potentially well-suited to improving the distribution of available resources via telemedicine. Prior reports have been published reflecting the developed countries' experiences with telemedicine expediting the care of acute surgical and trauma patients [1], pediatric patients [2], and stroke patients [3]. There are fewer reports from the developing world [4,5], and these often do not impact on disaster medical care. We report on our early experiences with a telemedicine program in rural Romania implemented in order to improve the functioning of an existing aeromedical transport system and intended to supplement future disaster management and resource allocation.

Concurrent with the institution of the nationwide aeromedical transport system, an educational program was instituted with the goal of preparing physicians at outlying hospitals for the appropriate use of the aeromedical system. It rapidly became apparent, however, that the system was not being used to its capacity. Despite the accessibility of aeromedical transport, serious cases occasionally remained at smaller, outlying hospitals with inadequate resources.

Additionally, it was recognized that in the instance of a widespread disaster, there was no mechanism to appropriately allocate the limited available resources over such a geographically dispersed area.

Methods

In an effort to address these issues, in 2008 a 860,000 Euro ($1.35 million USD) grant was obtained from the Romanian government to fund a disaster telemedicine pilot project in Tîrgu Mureş, a city of approximately 180,000 inhabitants in northern Romania. Tîrgu Mureş Emergency Hospital is one of the three, large, university centers which act as the central bases for the aeromedical services in Romania. The network created by this telemedicine project links Tîrgu Mureş Emergency Hospital's emergency department with six large county hospitals and 36 smaller local hospitals in the seven counties surrounding Tîrgu Mureş, covering a total area of 39455 sq. km.

The goal of the system is two-fold. In the event of a widespread disaster, the Tîrgu Mureş Emergency Hospital is the designated central receiving facility for all critical cases from the outlying 42 hospitals. The telemedicine system allows centralized evaluation of patients in distant centers in an effort to accurately and uniformly triage patients at the outlying hospitals and to expedite the appropriate allocation of limited aeromedical resources, thereby assuring that the most critically ill patients are transported in a timely manner. During non-disaster conditions, the telemedicine link with the 42 peripheral hospitals allows the outlying hospitals' emergency department physicians regular access to consultation with specialists from other medical specialties not available regularly at their local institutions. In either instance, consultations are immediate, with both the central and remote stations having video and

Fig. 1. View of the Telemedicine command control room in Mureș County

audio capabilities. As constructed, the physical structure of the central area of the telemedicine system in Tîrgu Mureș consists of a command control room adjacent to the main emergency department. The command control room has stations for two consulting physicians. Each station has two units, for a total capacity of evaluating four patients at four different outlying hospitals concurrently (Figure 1).

Fixed cameras, which are mounted in the ceiling in the center of the resuscitation rooms at each of the outlying hospitals, can be manipulated via a joystick operated by the consulting physician so that the consultant in Tîrgu Mureș can rotate the camera 360 degrees within the resuscitation room, or zoom at their discretion on any particular areas of interest (Figures 2 and 3). These cameras also provide audio to the command control room.

Audio and video feeds from the Tîrgu Mureș command control room to the outlying hospitals' emergency departments allow the remote physicians initiating the consult to see and speak directly with the consultants (Figure 4).

Physicians at outlying regional hospitals were encouraged prior to the installation of the system to have a low threshold for initiating contact with command control in

Fig. 3. View of an outlying hospital's resuscitation room as seen from the command control room monitor in Tîrgu Mureș

Fig. 2. Ceiling mounted camera in outlying hospital's resuscitation room operated from the command control room

Tîrgu Mureș. When a case is initially called in, a designated, attending level emergency physician is the initial, immediate consultant. The telemedicine link provides the physician in Tîrgu Mureș with a direct, internet based, audio and video link to the remote patient as well as a direct link to that patient's monitor, and also allows transmission of critical data such as the patient's ECG and radiology studies. The internet linkage between sites is provided and maintained by the Romanian Government Agency for Communications, thereby assuring the linkage's security.

The system went on-line on August 14, 2009. In the first year of operation there were 255 calls made to Tîrgu Mureș command control. Of the 255 patients evaluated by the telemedicine system, a total of 216 were transferred to

Fig. 4. View of the command control room physician as seen from an outlying hospital. The fixed camera above the monitor allows the physician initiating the consultation to remain in view of the command control physician.

facilities with a higher level of care. A total of two hundred patients were transferred to major regional centers with the highest level of available care, while the remaining 16 patients were sent to county or local hospitals. A total of 39 patients were not transferred from the referring facilities, although two of these cases were thought to require transport by the consulting physician but the patients involved refused transfer.

Of the 216 patients transferred, 166 were moved via ambulance and 50 were transported by helicopter. Thirty percent (77/255) of the referred cases were trauma patients, the remaining 70% were all medical cases. Six percent (15/255) of referred cases involved pediatric patients, while 64% (163/255) of patients were male.

Discussion

In the system's first year of operation, it averaged about 20 calls per month, or less than one call per day. As such, the additional burden of operating the system has had a minimal impact upon the daily operations of the Tîrgu Mureș emergency department. The system has, however, had significant impact upon the method of transport employed for many cases. Transfers have been both initiated and deferred based upon the results of the remote consultant's evaluation, while multiple transfers of the same patient from local to county to regional hospitals have been avoided. Additionally, the institution of the telemedicine system has significantly impacted the number of patients transferred by helicopter who are ultimately never admitted to the hospital, but are instead discharged home. In the period from August 15, 2008 to August 14, 2009 there were eight such cases, whereas in the subsequent year, with the telemedicine system functioning, there were no such cases. Assuming that these eight patients discharged from the ED represent less than critically ill patients inappropriately transferred by helicopter, the telemedicine system in its first year of operation eliminated these transfers.

With an estimated cost of 1350 Euros per hour of operation of the aeromedical service, this represents a significant cost reduction. To date there has been no widespread incident that has necessitated the use of the system in a disaster setting, but daily use has made physicians in the covered areas more familiar and comfortable with its operation. It should be noted that transfers initiated by the telemedicine system from outlying emergency departments represent a minority of the patients moved via the aeromedical service. The service also transfers in-patents from smaller hospitals' wards and intensive care units, as well as makes primary, pre-hospital interventions. This may explain the extremely small number of pediatric transfers. Many neonates are transferred directly from the hospitals' obstetrical units, and the telemedicine system is therefore not involved in the evaluation of neonates. The predominance of male patients transferred via the telemedicine system remains unexplained.

Conclusions

We believe that the kind of telemedicine system created in Tîrgu Mureș may potentially serve as a model for other developing countries or regions that are expanding the scope of their disaster preparedness infrastructure or are enlarging the reach of their emergency medical services.

References

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