To the Editor:

The efficient management of a major medical emergency is essential if the maximum number of patients are to be saved. Proper organization of responding emergency services and the coordination of emergency medical services (EMS) resources are important factors in the overall outcome of a major medical incident. The early coordination of EMS activities with the receiving hospitals and specialty-care centers is imperative to the successful resolution of this type of emergency.

This proposal will detail a means of speeding the delivery of essential information on hospital and specialty-care centers to the incident EMS commander. This information is necessary to provide for the timely treatment and transfer of victims to appropriate treatment centers to maximize the survivability and reduce the suffering of victims. Probably many victims have died while awaiting transfer to a treatment center because the emergency has been managed ineffectively.

The concepts presented in this letter can be assembled and put into use today using off-the-shelf hardware and software currently available. The use of electronic management was questioned in an article on computers in disaster management, which appeared in *Topics in Emergency Management* (January 1986). The questions asked addressed the role of computers—will they improve response, will they aid in saving lives or property, and can they be adapted to the tasks of emergency management?[1]

Communications has been identified as a weak link during disaster operations as evidenced by the following statement made by Dr. R A. Cowley from the Maryland Shock Trauma Center: "Communications is the element that is most important in the disaster situation. Through communications, there is transmission of command and the establishment of control, thus attaining coordination. This crucial element usually breaks-down in the first minutes of a disaster, when command is lacking and organizational interaction dissipates.

"Once command and control have been established, the medical community must be alerted to the fact that the disaster has occurred, the number of victims expected, the needed manpower and resources, etc."[2]

Communication between the scene and receiving hospitals is essential for situation analysis and casualty distribution, yet meaningful and informative scene-to-hospital information flow often is neglected. The disaster research center found that meaningful information exchange occurred between the disaster site and any area hospital in less than 22% of the cases. Even the existence of elaborate pre-planned procedures for scene-to-hospital communications related to triage activities was no guarantee that the procedures would actually be used.[3]

Although the fire service has been reluctant to change and adapt the current technology, it is imperative that emergency medical services (EMS) utilize any means available to increase patient care efficiency. This proposal details an interface method that allows two-way conversation between a mobile computer and a base facility. This method of information transfer only is in its infancy and will grow considerably over the next several years. The technology to perform these functions already exists, but is not in widespread use in the public sector and has no greater application than in the field of EMS.

The following equipment is necessary for the program to work and will require a certain amount of training and field testing:

1) Small transportable, personal computer with a fixed hard disk drive of at least 20 megabytes, a minimum of 640k of memory and a bulletin modem with at least 1200 BAUD rate of transfer (Toshiba 1200);

2) A cellular telephone system with ability to connect to the computer communications link;

3) A high-quality dot matrix printer capable of operating from a 12-volt vehicle battery system, or internal battery pack. This unit should have a print head rate of at least 300 cps (Diconix 300);

4) A fax machine is a desirable subsystem which allows hard copy distribution of technical materials to sector officers for reliable information transfer;

5) A base system capable of transmitting data through the telephone system and also receiving the data as it comes back from the scene with appropriate storage capability and a means of relaying this information to the appropriate receiving hospitals. The equipment requirement for this component is a terminal with a modem and the same software package discussed earlier. These units would be locked-out of the transmit mode after their initial status was input and would not be re-entered until the incident was terminated. Once the incident is terminated these units would be allowed access to the system for completion of records; and

6) A software communications package capable of receiving and displaying data as it is received. The system should display changes as information is updated and also produce continual print-outs of hospital status and equipment availability based on continuous information supplied from the coordinating center. The Maryland Institute for Emergency Medical Services produced a software program for tracking patients (on-site triage and patient-tracking program). This program may be able to be adapted for use in the manner discussed above with some modification and additional communications software. This program could also be modified to have a more rapid response to data entry. Additional information is available from MIEMSS Office of Testing and Certification.

Anticipated cost for the above equipment would be approximately [US] $5,500 for the mobile components. The cost of each hospital terminal with printers would be approximately $1,500 per unit. These costs are independent of any monthly user fees assessed by private companies for outside services.

In all of the literature researched, a problem brought up in every article was the failure to distribute patients of a multiple-casualty incident (MCI) in a rational or efficient manner. In most of the incidents, the patients were transported to the closest hospital without regard for overcrowding or overall system capability. The system proposed should function in the following manner at the scene of a major medical emergency in order to coordinate and disseminate patient status and treatment information, as well as hospital designation and treatment priorities.

In a major medical emergency, early patient prioritization and rapid coordination of medical treatment facilities can lead to increased patient survival and reduction in long-term disability. The Maryland system has been long recognized as a leader in the field of patient care and treatment and would be an ideal testing ground for this system because of its coordination of prehospital care services. In a disaster situation, the more coordination between receiving hospitals and prehospital

providers, the better the overall quality of care, and the better the patient outcome.

The system would operate as follows: When a major medical emergency occurs, emergency medical services (EMS) personnel respond in their usual manner and perform primary triage. When EMS command has been designated and the coordinating center has been notified of the significance and magnitude of the situation, the system will immediately begin to gather information on the area's hospital resources and specialty referral centers. The system will gather hospital status and the ability of those hospitals to provide disaster-response teams as well as the number and severity of patients that each can handle. The software should be able to show all hospitals in a geographic region and determine travel times from particular areas to these facilities. The system could also be expanded to include medic unit and ambulance response times.

As soon as the coordinating center operator has the pertinent information he or she will transmit these data to the mobile computer, which will display hospitals in order of the distance from the scene, availability of response team(s) from those facilities, number of patients each facility can handle, and what categories. This system will also show helicopter availability and response times. The system operator in the field will begin plugging in data to consist of patient-treatment priority, hospital designated, and triage tag number (this identification number will consist of a three-digit hospital identifier, a single-digit priority code, and a three-digit patient number corresponding to the order of transfer to that facility, e.g., 239–1–001), and transporting EMS unit. These data will be transmitted to the coordination center. The coordinating center will then notify the receiving facilities. When the hospitals receive their patient, they will send the data through their terminals to update the final reports with patient arrival times and names when available.

Such a system would greatly aid the EMS field provider responsible for secondary triage and transportation, and would increase the speed with which the patient reaches the hospital. This system would be a perfect tool for the transportation unit leader and medical communications manager. Such a device could result in the reduction of required personnel and also result in faster and more reliable dissemination of communications. It would also provide for better record keeping and would reduce the overall time necessary to get patient information to the receiving hospitals. At the conclusion of the incident, names and addresses for reports could be gathered more easily from the computer system. The system should provide for more rapid identification of survivors and notification of relatives.

The capabilities of such a system are almost unlimited and could also be utilized during routine operations to eliminate a great deal of paper record keeping. The key benefit is the management of patient transfer and more effective utilization of hospital and specialty referral centers.

There also are other side benefits of such a system and its applicability to other large-scale operations in the fire rescue service. The system offers the flexibility of being adaptable for use in hazardous materials emergencies as well as other widespread disaster operations. The computer will be used as a more effective management tool in all phases of emergency operation within the near future, particularly as we increase the responsibility on supervisors and require more productivity with less personnel.

Computers can help improve response, may aid in saving lives and property, and can be adapted to the tasks of emergency management. Computers are already in widespread use throughout the emergency services industry, from aiding in response and system status management, to vehicle tracking and call management. It is time we take an aggressive look at the use of these mobile information management systems to aid in fulfilling our missions. There are systems currently being developed to display entire geographical areas and aid in the management of all sorts of industrial, chemical, or human-made disasters. Computers offer more than just billing services. Now is the time to start developing programs to better utilize this available technology for EMS operations or we will be left along the wayside wondering how we got passed by again.

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