THE USE OF EMERGENCY MEDICAL DISPATCH PROTOCOLS TO REDUCE THE NUMBER OF INAPPROPRIATE SCENE RESPONSES MADE BY ADVANCED LIFE SUPPORT PERSONNEL

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ABSTRACT

Objectives. To determine whether implementation of an emergency medical dispatch (EMD) system would reduce the rate of inappropriate advanced life support (ALS) utilization, and enable more accurate identification of those patients requiring ALS care. Methods. An emergency medical services (EMS) site providing basic life support (BLS) and ALS care to a population of 200,000 served as the study site for calendar year 1996. This study compared the prospective identification of patients as ALS or BLS using EMD with that using chief complaint-based dispatch criteria. Each patient served as his or her own control. The ALS or BLS priority was assigned using both chief complaint and EMD criteria. Chief complaint-based dispatching meant that all patients with preestablished chief complaints received ALS without further triage questions, while EMD allowed the dispatchers to question callers using a scripted set of questions. The outcome measures included the number of calls categorized as ALS or BLS, the number of calls cancelled by BLS, and the number of ALS calls released to BLS care. Yates-corrected chi-square was used for statistical analysis. Results. There were 11,174 patients enrolled. The use of EMD was associated with a significant decrease in the proportion of calls designated as ALS (44.7% vs 55.8%, p < 0.0001), as well as a significant decrease in the number of ALS responses cancelled by BLS (9.2% vs 23.8%, p < 0.0001) and patients released to BLS by medical control (4.7% vs 7.3%, p < 0.0001). Conclusions. Implementation of an EMD system significantly decreased inappropriate ALS dispatching, as defined by decreased rates of ALS cancellations and BLS releases. Further study is needed to see whether other EMD dispatch models may further refine ALS dispatch. Key words: emergency medical dispatch; advanced life support; utilization; triage protocols.

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Across the United States, advanced life support (ALS) has assumed prominence as a valuable resource in prehospital care. With advances in training and equipment, ALS has also become expensive to the extent that jurisdictions with limited financial resources may not be able to afford providing an advanced level of care. Despite the expense of ALS, many emergency medical services (EMS) systems dispatch ALS units to emergencies that they have prospectively determined to necessitate ALS care, without the use of protocols, or utilize protocols that are ineffective in accurately identifying those emergencies necessitating an ALS response.1 Failure to properly identify responses requiring advanced care often leads to a high overutilization rate for ALS resources.2 Previous studies have suggested that only 3% to 30% of all prehospital responses require advanced levels of care.3-6 In an attempt to better utilize this valuable and limited resource, emergency medical dispatch (EMD) triage protocols have been developed for dispatchers to use in an attempt to mobilize the appropriate level of care needed for a given medical emergency. These protocols involve algorithms to determine acuity and necessary level of response, coupled with advanced training in giving prearrival instructions.

Questions still exist regarding the effectiveness of EMD. Emergency medical dispatch protocols decrease the utilization of ALS units by 20% for febrile seizures and 10% for cerebrovascular accidents (CVAs).2 Whether this reduction is desirable or promotes better outcomes is a matter open to debate. Approaching the problem from the perspective of assigning a priority for a prehospital response at the time of dispatch with a retrospective comparison with emergency department assessment concluded that a high degree of overtriage may still exist even among systems using some form of EMD.7

This observational study was undertaken to prospectively evaluate whether an EMD system decreases the rate of inappropriate ALS utilization compared with a chief complaint dispatch scheme, which categorizes a call as requiring an ALS response based only on the chief complaint, without further triage to determine acuity.

METHODS

This study was conducted in a mixed suburban and rural county with a total population of approximately 200,000. Prehospital care is provided by a two-tiered EMS response system. Basic life support (BLS) is provided by local volunteer fire services, and ALS is pro-
vided by five paramedic units, each staffed by two nationally registered paramedics (NREMT-Ps) placed throughout the county. The BLS units are responsible for transport. The EMS service uses enhanced 911, and calls are received at county-based public safety answering points. Dispatchers have historically used a chief complaint-based triage system that uses only the chief complaint to determine need for ALS care without further determination of acuity. These were a series of predetermined chief complaints that were felt to require ALS dispatch. For example, if it were felt that a caller might be experiencing a stroke, an ALS unit would be dispatched. After assessing the patient, if it is felt that ALS care is not needed, the BLS units arriving on scene have the option of canceling the ALS unit based on their assessment, and ALS units may request release to BLS after assessment and contact with online medical direction.

During year 1 of the study, an EMD system was implemented using Priority Medical Dispatch, 4th Ed. (Medical Priority, Inc., Salt Lake City, UT). Priority Medical Dispatch (PMD) uses the patient’s chief complaint to select the most appropriate algorithm for eliciting information through directed questioning. Using a set of predetermined questions, dispatchers work through the algorithm to determine the severity of a complaint and to assessprehospital treatment needs. At any time the dispatcher can interrupt questioning and give prearrival instructions to the caller, providing early lifesaving care. All dispatchers underwent training and certification in EMD. A quality assessment/quality improvement (QA/QI) program was developed to monitor compliance with dispatch protocols. The traditional chief complaint protocol had QA/QI measures as well, including dispatcher compliance and call review, done prior to initiation of the EMD system. Compliance was found to be more than 90%.

During year 2, dispatchers began applying the EMD program to EMS calls. For QA/QI reasons, dispatchers used the EMD program to assign a priority code to the incident, but continued to dispatch units based on the traditional chief complaint–based protocol. This was done by answering the call, following the EMD protocol, assigning a priority based on EMD, but still dispatching ALS based only according to the chief complaint method, without regard for acuity. For example, a patient with a chief complaint suggestive of an overdose would go through the EMD triage questions, receive a priority code based on EMD, but receive an ALS unit regardless of the acuity determined, because the chief complaint method required ALS dispatch. This dual categorization was done for a limited phase-in period to monitor compliance with protocol use, and implementation. An incident could be assigned one of four priorities under the EMD system. “Alpha” responses are BLS only, nonemergency. “Bravo” responses are BLS only, lights and siren. “Charlie” and “Delta” responses are combined BLS/ALS responses.

This study used each incident as its own control. Since each incident was given an EMD priority but was dispatched using the chief complaint protocol, we were able to compare the call priority under the EMD system with the priority under the chief complaint criteria. The EMD coding of an incident was not provided toprehospital personnel at the time of dispatch so they were not aware of the acuity determined by EMD. Compliance with the EMD protocol was monitored and found to be greater than 95%. Data gathered included responses dispatched as BLS only, dual ALS/ALS responses, ALS cancellation prior to ALS arrival, and ALS requests for release to BLS. All data were collected from the dispatch QA/QI database, and allprehospital responses during the study period were included in the study. Data were analyzed using the Yates-corrected chi-square test for proportions and significance was declared at the 0.05 level.

**RESULTS**

During the study period, calendar year 1996, there were a total of 11,174 responses. Using the chief complaint protocol, 6,232 (55.8%) were designated ALS responses, and 4,942 (44.2%) were BLS-only responses. Of all the chief complaint protocol ALS responses, 1,485 (23.8%) were cancelled by BLS prior to ALS arrival, and 459 (7.3%) were released to BLS after ALS arrival. Of the 6,232 responses designated as ALS incidents, 4,288 (68.8%) had ALS transport to the hospital.

Using the EMD system, 4,991 (44.7%) were designated as ALS responses and 6,183 (55.3%) were designated as BLS-only responses. For all the responses designated as ALS by the EMD protocol, 464 (9.2%) were cancelled by BLS prior to ALS arrival, and 239 (4.7%) were released to BLS after ALS arrival. Of the 4,991 responses designated as ALS by the EMD protocol, the same 4,288 (85.9%) had ALS utilization and transport.

Emergency medical dispatch would have reduced the total number of calls designated as ALS responses from 6,232 to 4,991, a 19.9% reduction. Emergency medical dispatch also would have reduced the number of responses initially designated as ALS, but upgraded to ALS by either cancellation or release. This would have reduced the number of ALS dispatches that became BLS transports from 1,944 (31% of total ALS calls) in the chief complaint protocol group to 703 (14% of total ALS calls) in the EMD group.

The percentage of calls originally dispatched as ALS that were transported as ALS increased from 68.8% in the standard protocol group to 85.9% in the EMD dispatch group. With the exception of the numbers of patients transported with ALS in each group, which were identical, all differences between the standard
protocol group and the PMD-designated groups were significant (p < 0.0001).

**DISCUSSION**

In this study, the EMD system designated 44.7% of the calls as ALS, a percentage comparable to those of previous studies.\(^1\)\(^2\)\(^6\)\(^7\) Our study demonstrated that the use of an EMD system to determine utilization of ALS resources reduced the dispatch of ALS responses to calls later determined to require BLS by almost 20%. The number of calls dispatched as ALS that received ALS service increased from 69% to 86%.

One of the major limitations to our study was that we were unable to determine how many patients were undertriaged to BLS then upgraded to ALS on arrival. Because of the way the data system collected data, the number of runs upgraded from BLS to ALS was not retrievable. There is no way to determine in our study whether there were patients who did not receive ALS who might have benefited from it. Undertriage is a concern with any triage-based system. A 1993 study by Curka et al. using a similar EMD system, reported 14,100 EMS calls dispatched as BLS only.\(^8\) Of those, 235 (1.6%) were upgraded to ALS at BLS request. One hundred sixty-seven of those patients upgraded to ALS received intravenous fluids as their only advanced therapy. Twenty-seven patients required ALS resuscitation, with 11 being critically injured and seven in traumatic cardiac arrest. Of the 27 patients who were critically ill, ALS arrived before BLS for nine of them as a result of dispatchers' upgrading the call due to new information. The rate of undertriage for critically ill patients was 27 of 14,100, or 0.19%.

The idea of using criteria to appropriately utilize ALS services is not new. As early as 1985, Slovis et al. studied the use of decision trees for 36 primary chief complaints.\(^9\) Calls were ranked as priority 1, 2, or 3. For the life-threatening emergencies (priority 3), average response times were reduced by 3.8 minutes using the new triage system. Utilization of ALS crews for calls designated as priority 3 increased from 17% in the control group to 34% in the case group, with undertriage in only 7% of cases, and overtriage in 47%.

A subsequent study by Palumbo et al. in 1996 compared a retrospective chart review of 320 emergency department charts, finding that the dispatcher assigned BLS to 41 calls (12.8%) judged to be ALS by the physician.\(^10\) Information regarding the criteria used by the physicians was unavailable, and patient acuity level was not uniformly known. Most of the undertriage by dispatchers occurred in the priority 2 category or those calls requiring ALS but not with perceived critical illness or injury.

A 1994 study reported the effect of EMD on ALS utilization for two chief complaints, CVA and febrile seizures.\(^11\) The use of EMD decreases ALS utilization from 41% to 21% for febrile seizures and from 41% to 28% for CVAs. Emergency medical dispatch use also resulted in a decrease from 4.7% to 3.8% in the number of calls where BLS requested an ALS upgrade. It appears that triage-based medical dispatch systems reduce inappropriate utilization.

Undertriage is a concern inherent to all dispatch systems. We must be careful not to develop a system that systematically withholds ALS care from patients who need it. But how does one define the numerator? What constitutes an undertriage? Some studies have defined it as the number of calls for which BLS requests ALS. This can be deceptive, however, since BLS personnel may request ALS for many reasons not associated with patient care, and may themselves practice an element of overtriage or “being on the safe side.” Both of these are valid reasons for calling ALS and should never be discouraged; however, they demonstrate the complexity of defining undertriage, and furthermore are elements that can never be built into a system. In one study, the undertriage rate was defined as BLS requests for ALS and was 1.6%. The proportion of patients undertriaged and found to be critically ill was only 0.19%. Another study used retrospective physician review to define undertriage. The problem is twofold. First, the physician does not use the same information as the dispatcher to determine appropriateness of ALS utilization. The physician uses retrospective data, lending to bias. The other problem is that as with BLS upgrades to ALS, how many of the patients truly needed ALS care and how many were overtreated by the evaluator trying to “be on the safe side”? Once again, being safe should never be discouraged and only lends to the complexity of appropriate dispatch.
Defining which patients are over- or undertriaged becomes even more complex when we consider that there is no definition of which patients need ALS care. Advances in both BLS and ALS care occur constantly. As this occurs, we are required to change our definition of who requires ALS care. Furthermore, research and understanding of diseases demonstrate that there are certain disease entities for which we previously thought patients required ALS care, who we now realize benefit little from the added resources provided. So the question of what constitutes an ALS patient is difficult to define at best, and ever changing with further research and expanding care possibilities for all levels ofprehospital care. This makes defining patients as ALS or BLS much more arbitrary. If we can develop objective criteria determining which patients benefit from ALS, then we will be better able to objectively evaluate the appropriate utilization of this limited resource. The question of objective criteria, however, is beyond the scope of this study.

These are questions that may have no easy answers. What we can continue to do is prospectively evaluate triage-based PMD systems, keeping in mind the need for an element of overtriage or “safety net” and being cautious of not systematically undertriaging those patients who require ALS. We should better define what constitutes an undertriage based on outcome measures. We should also begin to develop better outcome-based definitions of what constitutes an ALS emergency at the onset and define who benefits from the level of care provided by ALS professionals. Together, these ever-changing definitions will aid in better utilization of a limited resource.

CONCLUSION

Emergency medical dispatch systems are able to effectively reduce the number of inappropriate responses made by ALS crews. While the amount of undertriage is not known in our study, historically, criteria and priority-based dispatch systems lean toward conservative levels of overtriage in order to achieve low undertriage rates.

References