BACKGROUND

By most accounts, the practice of ambulance diversion began in the 1980s, as hospital capacity decreased and patient volumes stayed constant or increased. Hospital administrators found themselves lacking available inpatient beds, or were faced with limited space in the emergency department (ED), and responded by requesting that ambulances bypass their hospitals. The intent of these policies was to insure that the patient would be able to receive appropriate care more quickly once he or she arrived. Lagoe and Jastremski describe an early installation (1989) of an ambulance diversion system in New York City.¹ They note that ambulance diversion was intended to be a temporary mechanism and not a long-term solution.

But ambulance diversion has endured. Data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) suggests that, nationally, about one-third of hospitals go on diversion at least once a year.² The extent to which hospitals are on diversion varies widely; about 12% of hospitals reported spending between 5% and 19% of their time on diversion, and fewer than 3% reported spending more than 20% of their time on diversion. The most frequently reported duration of ambulance diversion ranged between three and four hours. A 2003 study by the U.S. Government Accountability Office suggested that diversion was a more serious problem, with two-thirds of hospitals reporting ambulance diversion at least once during the year, and approximately 10% of hospitals being on diversion status for more than 20% of the year.³ Four years later, diversion appears to have worsened. A more recent study found that ambulance diversion occurred 25% of the time, and that more than half (53%) of ambulance transports occurred during a diversion period that coincided with the diversion period of neighboring hospitals.⁴ Those hospitals that were more likely to be on diversion have larger volumes and are in urban metropolitan areas, thereby directing ambulances to smaller hospitals during these periods. Older patients were also found to be more prone to being diverted than their younger counterparts.⁴

Since ambulance diversion is a relatively recent phenomenon, there is not an extensive body of research on the subject. However, we do know that ambulances provide a critical mode of transport to emergency departments. Nationally, about 16% of emergency department visits arrive by ambulance. This represents 17.9 million ambulance transports, which has increased about 25% from 14.3 million ambulance transports in 1997.⁵ We are still in the process of understanding the possible adverse effects of ambulance diversion. A 2006 review by Pham and colleagues⁶ identified several areas of concern, including small increases in transport times (including time to thrombolysis in patients with acute myocardial infarction) and lost hospital revenues. Other anecdotal evidence suggests the potential for more serious adverse events.⁷ Emergency and EMS providers have expressed concerns about the implications of continued reliance on ambulance diversion as the primary strategy for managing overcrowded hospitals and emergency departments.
AMBULANCE DIVERSION AND ITS IMPACT ON THE EMS SYSTEM

Ambulance diversion was created as a way to prevent hospitals from being overwhelmed with patients, but it has also had a significant impact on EMS systems and ambulances. In one medium-sized metropolitan area, one study demonstrated that when hospitals were on ambulance diversion, transport times and distances traveled increased for HMO patients but not for non-HMO patients. These differences were likely due to greater resource constraints in HMO hospitals. One concern in this study was the fact that paramedics incorrectly triaged 28% of the patients away from hospitals on critical care diversion when they did not meet criteria for critical care.8

In addition to lack of emergency department space, inpatient services, and specialty coverage, other factors play a role in the final destination of a patient. An analysis of a large, urban EMS system with a high concentration of hospitals found that special requests by patients, primary care providers, family members, and law enforcement personnel had a significant impact on ALS ambulances beyond ambulance diversion.9 However, this finding should be tempered by the fact that the study data were collected in 1999 and rates of hospital diversion have increased significantly since this time, perhaps lessening the impact such patient-centered preferences have in the current EMS environment.

From a resource availability perspective, there is the concern that hospital ambulance diversion takes ambulances out of service for longer periods of time, limiting the amount of patients who can be treated and transported during times of diversion. Currently, there is no evidence that this occurs, and one study demonstrated that EMS resources were maintained in one city-wide system during diversion periods.10 Nonetheless, patients taken to crowded emergency departments take longer to be transferred to a bed, subsequently increasing the turnaround interval for EMS personnel and increasing the time until the ambulance is back in service.11

CAUSES OF DIVERSION

Why do hospitals divert ambulances? A common perception has been that EDs may be overpopulated by Medicaid and uninsured patients who use the ED for minor problems. However, research over the last five years has determined that the use of the ED for minor problems has a relatively small role in determining how overcrowded an ED might be. Asplin and colleagues partition ED crowding into three components: input, throughput, and output.12 Research has addressed these components and determined that the critical bottleneck is primarily in hospital capacity; in other words, ambulances are most often diverted not because of the flood of patients coming to the front door of the ED, but because of the difficulty in obtaining an inpatient bed for ED patients requiring admission.3 For example, McConnell and colleagues examined diversion at a single teaching hospital and found that after increasing the number of ICU beds from 47 to 67, average daily hours on ambulance diversion decreased by two-thirds (from 3.8 hours to 1.4 hours).13

DEFINITIONS AND CRITERIA OF DIVERSION

As the practice of ambulance diversion has spread, there have been attempts to standardize the criteria for diversion. An early (1991) set of guidelines by the American College of Emergency Physicians (ACEP) suggested several variables for consideration: patient condition and location, patient request, requests from the patient’s physician, facility capabilities, and pre-planned regional system destinations.14 The National Association of EMS Physicians (NAEMSP) published their guidelines in 1996,15 and ACEP updated their guidelines again in 2000.16

The ACEP and NAEMSP guidelines share several themes. For example, both associations emphasize the importance of a working agreement among all participants in the EMS system. Both guidelines stress the importance of maintaining a record of diversion events, and both state that preferential routing based on “desirable” patient or financial criteria should not be used.

Beyond these themes, each set of guidelines focuses on specific issues within diversion. In general, the NAEMSP guidelines are more extensive, suggesting, for example, the following:

- System-wide triage rules may be appropriate if they focus on specialized levels of care, such as directing severe trauma, burn, and pediatric patients to pre-designated facilities. However, the NAEMSP guidelines discourage selective diversion due to a...
temporary lack of specific resources (e.g. neurosurgical or orthopedic capacity).

- The system must agree to criteria for overriding diversion status, which should include the patient’s condition, the duration of transport time, situations when all hospitals are on diversion, mass casualty incidents, and should designate of an appropriate authority to make overriding decisions.
- Communities should legislate immunity to protect EMS personnel who have made good-faith decisions about appropriate destinations for their patients.

The NAEMSP guidelines also suggest specific roles for EMS medical oversight, suggesting that written guidelines should address transportation times and distances between facilities. They endow the medical director, in consultation with other EMS system participants, with the power to modify the criteria for diversion as needed.

While the ACEP guidelines do not stand in direct contrast to the NAEMSP guidelines, there are some subtle differences. The ACEP guidelines are more accepting of resource-based diversion criteria, suggesting that diversion categories may include critical care diversion, routine admission diversion, and selective diversion. In addition, ACEP guidelines suggest the decision for diversion should be made by the ED physician, in coordination with nursing and/or administrative staff.

Despite the NAEMSP recommendation not to make diversion criteria resource-based or dependent on requiring out-of-hospital EMS workers to make diagnoses to predict the specific resources required, it is nonetheless common for hospitals to practice several types of diversion. In general, hospitals may go on “complete” diversion or “partial” diversion.

In theory, “complete” diversion means all ambulances should be rerouted. In practice, though, complete diversion is likely to have several important exceptions. For example, hospitals on “complete” diversion may stipulate the diversion criteria do not apply to patients in cardiac arrest, patients with an impaired airway, non-trauma patients too unstable to transport to another facility, patients refusing alternate facilities, obstetrics patients, or prearranged interfacility transfers.

Partial diversion, which is typically resource-based or based on specialized levels of care (such as pediatric, burn, or trauma patients), will be even more selective. Hospitals may go on “critical care” diversion, requesting to divert any ambulance transporting a patient who might require admission to an intensive care unit (ICU). In these cases, the designation must be made by out-of-hospital EMS personnel. Likewise, trauma diversion occurs when the trauma center has exceeded its capacity to manage trauma patients (because of insufficient personnel, equipment, surgical ICU beds, or other resources) and must divert patients to another regional trauma hospital.

PROXIMITY AND ITS INFLUENCE ON AMBULANCE DIVERSION

Emergency physicians and EMS providers have noted that when a hospital goes on ambulance diversion, a domino effect often ensues, with nearby hospitals quickly following suit. A study conducted in San Diego, which looked at two hospitals within several blocks of each other, confirmed this sentiment. Thus, it is likely that minimizing ambulance diversion will not be successful if its scope is limited to just one hospital, as external influences can undermine its effectiveness. Other studies have gone further and identified ambulance diversion as a community problem, noting that, when one hospital closed, the nearest EDs experienced an increase in diversion hours for the first four months after the closure. Therefore, system-wide approaches must be implemented and analyzed to create an effective EMS system capable of handling variations in patient volume.

SYSTEM-WIDE SOLUTIONS TO AMBULANCE DIVERSION

Given such interdependence of hospitals on ambulance diversion, more system-wide approaches have been attempted as recommended by both NAEMSP and ACEP. The use of system-wide tracking systems has allowed regions to collect data on such interventions and also measure the impact of surge events, such as influenza epidemics, on diversion hours. During the 1999–2000 winter influenza season in Milwaukee, the number of daily ambulance diversion hours correlated highly with confirmed cases of influenza. The following year demonstrated less correlation, due in part to higher baseline numbers of ambulance diversion hours. Only once such a system was in place could these trends be measured.
Apparently, hospitals’ ambulance diversion may be at least partially reduced by requests to hospitals to stay off diversion on a voluntary basis (e.g. no diversion unless patient safety became an issue). In one study, hospitals were asked to stay off diversion during one week. As a result, diversion hours decreased during the trial period and persisted into the third week after the intervention was removed. It is not known how long this effect was sustained over time.

A thorough review of a common set of guidelines used by all ambulance agencies and EDs in one system has been shown to decrease the number of patients affected by ambulance diversion. In San Diego, the establishment of a medical oversight committee that created a common set of rules for diversion was agreed upon by all participants. This voluntary, community-led effort, which focused on forums designed to align EMS community participants in reducing ambulance diversion, was apparently successful; it reduced average diversion from approximately 4,000 hours per month to approximately 1,000 hours per month during the intervention. The main facet of these rules was that diversion for any one hospital could last no more than one hour. After that time, the respective hospital would cease its diversion status and could not be eligible to resume diversion until it had taken at least one ambulance patient.

Syracuse, NY realized an almost 25% decrease in hours on ambulance diversion when both hospital-specific and system-wide policies were implemented. At the hospital level, these included the necessary approval of an on-call administrator, limiting the time on diversion to one-hour intervals, and improving the flow of patients through the hospital.

In Sacramento in 2001, a system-wide approach stated that no more than two hospitals in a three-hospital zone could be on diversion. Once the third went on diversion, all three were required to re-open to ambulances. This policy was monitored by an internet-based system, and as a result, there was a 74% reduction over a two-year period despite an increase in EMS, ED, and admission volumes during this same time period.

**AMBULANCE DIVERSION AND THE EMS MEDICAL DIRECTOR**

If you are an EMS medical director, there are several strategies you could use to help minimize ambulance diversion. The first step is to create a set of uniform guidelines that work in coordination with all EMS agencies in the service area. These guidelines need to be reviewed and approved by all necessary parties on a regular basis to assure they are appropriate for the current environment.

After defining the overall scope of the policy, system diversion guidelines should clearly state what objectives they hope to accomplish. The next step is to create standard definitions of the different types of diversion and determine how these are delineated and communicated.

How will the diversion status of one hospital be shared with EMS and other hospitals? Several internet-based software products currently exist, and choosing one depends on what best works for your system. However, there must be a communication center in place and personnel to continuously manage this system to assure it is properly maintained and updated.

In addition to how general ambulance diversion is managed, consider an approach to the diversion of trauma patients. A smaller subset of hospitals within the catchment area will be influenced by this policy. If the number of trauma centers in the catchment area is small, create a contingency plan to address the management of a critical mass of patients. It is important that the trauma diversion policy be kept separate from the overall diversion plan, since trauma resources are likely to be more limited in a given region.

If zone management is a part of your diversion plan, clearly define who is a part of this system. Hospitals need to be grouped into various zones based on their geographic locations and need to create an equitable network of resources that are available to patients in each region. A central operations base, which may be the same communication center used for diversion status notification, should be created to supervise and direct this once zone management needs to be put in place.

In addition to an overall, system-wide approach, EMS diversion policies should encourage hospitals to develop internal strategies to address and to prevent ambulance diversion. The EMS system should track the hours that each hospital spends on diversion, and high outliers need to be notified of where they stand. If possible, resources and expertise should be made available to hospitals to help them correct whatever problems exist. The jurisdiction a regional EMS system has over individual hospitals is highly variable and dependent on the locale and will affect how policies are enforced. However, the relationship should remain as collegial as possible before necessary, disciplinary actions are taken.
CONCLUSION

Using the appropriate resources and information, effective plans can be drafted and implemented for EMS systems that both address the issues of ambulance diversion and provide the best care for their patients. The more coordinated the care is within a region, the better these plans will work, enabling your EMS providers to supply quick delivery of time-emergent services. EMS is poised to take a proactive role in a problem that only continues to worsen, and without unified leadership, any hope for improvement will fail.

REFERENCES