Ambulance Diversion and Lost Hospital Revenues

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Study objective: We estimate ambulance revenues lost from each hour spent on ambulance diversion at an urban teaching hospital's emergency department (ED) and examine the financial impact of increased ICU capacity, which reduced diversion hours by 63%.

Methods: This was a secondary analysis of administrative data to determine the time and date of ambulance arrivals, as well as the insurance status and revenues from each ED patient arriving by ambulance between January 1, 2002, and December 31, 2003. The primary outcome measure was hourly revenues (ie, payments to the hospital) for ambulance patients.

Results: Ten thousand three hundred one adult, non–trauma-system ED patients arrived by ambulance in 2002 and 2003, with average hospital revenues of $4,492. Each hour spent on diversion was associated with $1,086 (95% confidence interval $611 to $1,461) in forgone hospital revenues from ambulance patients. In August 2002, the study hospital increased its staffed ICU beds from 47 to 67, and diversion decreased from an average of 307 to 114 hours per month. In association with the reduction in diversion, the hospital received more patients by ambulance, which translated into approximately $175,000 in additional monthly revenues from ambulance patients. However, these gains were relatively small in relation to total ambulance revenues and to their large monthly variance.

Conclusion: Ambulance patients generated substantial revenues for hospital services. Decreasing diversion time led to improved revenues. The potential for increased revenues may provide some incentive for hospitals to take greater efforts to reduce ambulance diversion. [Ann Emerg Med. 2006; 48:702-710.]

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INTRODUCTION

Ambulance diversion has become routine in many parts of the country, despite widespread attention from the national media, hospital administrators, and the emergency medicine community.[1-8] Ambulance diversion is a public health concern.[1,4, 9-11] It may also be a financial concern for hospitals because turning away patients could lead to a substantial loss in revenues.

The goal of this study is to estimate the net ambulance revenues lost to a hospital during an hour of ambulance diversion. We also examine the change in monthly net revenues from ambulance patients that occurred after the study hospital increased ICU capacity, a change in inpatient capacity that was associated with a 63% reduction in diversion hours.

Net revenues represent actual payments (and not, for example, billed charges) for emergency department (ED) and inpatient services that are received by the hospital from the insurer or patient. Information on revenues from ambulance patients is valuable because it can provide the emergency medicine community some guidance on where to focus their efforts to reduce ambulance diversion. If the losses from ambulance diversion are shown to be large, hospitals may be motivated to reduce ambulance diversion on their own accord. If such losses are negligible, hospitals may have less financial motivation, and emergency providers' efforts to reduce

Editor's Capsule Summary

What is already known on this topic

Ambulance diversion has increased dramatically throughout North America in response to emergency department (ED) crowding. However, the economic consequences of ambulance diversion are largely unknown.

What question this study addressed

This article estimates the amount of hospital revenue lost for each hour of ambulance diversion at an urban academic ED. The analysis also estimates the effect of increasing ICU capacity at this facility, which was associated with a substantial decrease in ambulance diversion hours.

What this study adds to our knowledge

This study demonstrates that ambulance diversion can adversely affect hospital revenues and that decreasing time on diversion mitigates this effect.

How this might change clinical practice

Although the specific impact will vary across hospitals, the findings identify a potential economic incentive for decreasing diversion hours. Hospital leaders will need to weigh other factors such as operating costs and revenue from nonambulance patients to determine whether reductions in ambulance diversion hours provide economic benefit at their institution.

ambulance diversion may be more successful if they emphasize other consequences of diversion, such as the potential for diversion to adversely affect patient outcomes and community relations.

MATERIALS AND METHODS

Study Design

Our study examines hourly hospital net revenues received for services provided to patients arriving by ambulance. Net revenues, ie, reimbursements to the hospital, are a function of the number of patients arriving per hour, their insurance status (eg, private, commercial insurance typically reimburses at a higher rate than Medicare, Medicaid, or than patients without insurance), and of the types of services provided (eg, admitted patients will typically require more services and have larger medical bills than patients discharged home from the ED).

When hospitals are on diversion, fewer patients may arrive by ambulance. We hypothesized that net revenues during an hour on ambulance diversion would be lower than during an hour when no ambulances were diverted.

This was a retrospective review of administrative data for patients presenting to the study hospital's ED. Data on patient charges, revenues, and payer class were obtained from hospital financial data. The institutional review board at the study hospital approved the research proposal.

Setting

The study was conducted at an academic, 400-bed, acute care hospital. The study hospital provides primary, secondary, and tertiary care to a catchment area of approximately 1 million residents. Its ED averages approximately 43,000 patients per year. Approximately 8,000 of those visits are by patients transported by ambulance. The hospital is a Level I trauma center. There are 10 other EDs in the greater metropolitan area.

During the study period, staffed ICU beds were increased from 47 beds to 67 beds, which was followed by a reduction in ambulance diversion by approximately two thirds.[12] Before the increase in ICU beds, the hospital was on diversion approximately 47% of the time.

Selection of Participants

We included patients who visited the study ED during 2002 and 2003. For analyses of the revenues from ambulance patients, we included adults (age ≥18 years) transported by ambulance to the ED and excluded any transports that were designated as trauma system patients by the patient tracking system. We excluded trauma system patients for 3 reasons. First, diversion of trauma system patients depends on a different set of criteria than other types of ambulance diversion. Second, trauma system diversion is infrequent. Third, because the study hospital is one of only 2 Level I trauma centers in the entire state, trauma system diversion is a relatively weak tool for decreasing ambulance arrivals.

Methods of Measurement

The focus of this study is revenues generated by ED ambulance patients and received by the hospital for hospital (facility) services, and not, for example, revenues received by emergency physicians or other physicians in the hospital.

Revenues for the emergency physician component and hospital component are collected in 1 payment; ie, the hospital submits a bill to the payer that jointly covers the emergency physician's fee and the hospital facility fee. To remove revenues for emergency physician services, we estimated net revenues for hospital facilities by multiplying total revenues times the ratio of facility charges to total charges. (As described below, we conducted sensitivity analyses to assess the robustness of this method.)

Data Collection and Processing

Data for this study were extracted from 3 databases. Financial data were extracted from the hospital's patient records and management system. Data on the time and mode of arrival were based on the ED's electronic patient tracking system (EmSTAT, A4 Health Systems, Cary, NC). Data on ambulance diversion were based on records from administrative hospital log of times and types of diversion. Financial data were inflation-

adjusted to a base year of 2003 using the Medical Care Consumer Price Index.[13]

Outcome Measures

Our primary outcome measure was hourly hospital net revenues from ambulance transports to the ED. Net revenues represent actual payments (and not billed charges) to the hospital.

Our study compares revenues received by the hospital from 4 subsets of patients arriving by ambulance: (1) arrivals during periods when the hospital was not on diversion; (2) arrivals during periods of any diversion at all; (3) arrivals during periods of "critical care" ambulance diversion; and (4) arrivals during periods of "complete" diversion.

We defined "any" ambulance diversion as any occurrence of critical care diversion or complete diversion. Critical care diversion is defined as diversion of ambulances transporting a patient who might require admission to the ICU. Complete diversion is defined as diversion of all patients except for a small, designated subset of patients (eg, patients in cardiac arrest, patients with an impaired airway, noninjured patients too unstable to transport to another facility, patients refusing alternate facilities, obstetrics patients, prearranged interfacility transfers).

We also examined several other outcome measures. We examined hourly hospital charges for services to patients transported to the ED by ambulance. Charges are of interest because they provide some measure of resource use that is independent of the rate of reimbursement, which may differ by insurance status. We also examined differences in insurance status and other patient characteristics between patients transported by ambulance to the ED and patients arriving by other means.

In addition to the analysis of revenues lost during an hour of diversion, we also examined the change in *monthly* revenues from ambulance patients that occurred after the study hospital increased ICU capacity and experienced a 63% decrease in ambulance diversion hours.

Primary Data Analysis

Data on ambulance arrivals in the ED and ambulance arrivals were available on a real-time, minute-by-minute basis for 2002 and 2003. We divided each day into 24 periods, each period spanning 1 hour, and determined the number of ambulance arrivals, hospital net revenues, and hospital charges for each hour, whether the hospital was on diversion, and the type of diversion (ie, any, critical care, or complete). In many cases, a chronologic hour was divided into 2 or more periods of "on diversion" or "off diversion." These observations were assigned proportionate weights, and weighted means were used in carrying out the analyses.

We calculated mean patient arrivals, net revenues, and charges for periods on diversion and compared those to periods when the hospital was off diversion. Because net revenues are not normally distributed (ie, nonnegative and extremely skewed), we used bootstrapping with 1,000 repetitions to derive 95% bias-corrected confidence intervals (CIs).

Our study also provides the potential for assessing the financial gains from measures taken to reduce ambulance diversion. In August 2002, the study hospital increased its ICU beds from 47 beds to 67 beds. As described previously, this led to substantial decreases in diversion.[12] We analyzed the association between this decrease in ambulance diversion and net revenues from patients arriving by ambulance.

Sensitivity Analyses

We conducted 3 types of sensitivity analyses. As described above, our primary outcome, hospital net revenues, was derived by multiplying total net revenues (ie, actual payments for hospital facility services *and* emergency physician services) by the ratio of hospital facility charges to total charges. Our first sensitivity analysis used total net revenues to see whether there were substantial qualitative differences in our results when we included the emergency physician component.

Second, we conducted an analysis of differences in patient arrivals, net revenues, and charges by comparing periods when the hospital was on diversion to periods when the hospital was on diversion, and had been on diversion for at *least* 1 hour. We conducted these analyses because we hypothesized that when hospitals first go on diversion, emergency medical services personnel and ambulance drivers may not change their plans if they are already en route to the hospital. If ambulance patients continued to arrive at the same rate for the first 15 or 30 minutes of a diversion episode, estimates of revenues lost to diversion would be understated.

Third, we conducted sensitivity analyses to determine whether going on diversion on certain days or times of day would cause a greater loss of revenues. We divided each day of the week into 3 8-hour periods: daytime (8 AM to 4 PM), evening (4 PM to 12 AM) and night (12 AM to 8 AM). We conducted 21 subanalyses on each of these periods for each day of the week.

We used Stata software (version 9.0, Stata Corporation, College Station, TX) for all analyses.

RESULTS

Characteristics of Study Subjects

Table 1 describes hospital characteristics. In 2002 and 2003, 85,911 patients were registered in the study ED, and 15,653 (18.2%) of these were transported by ambulance. Among those 15,653 individuals transported by ambulance, 2,373 were pediatric patients and 2,979 were trauma patients, leaving 10,301 adult, non–trauma-system ambulance patients for analysis.

Table 2 describes characteristics of adult, non–trauma-system patients who were transported by ambulance and who arrived by other means. In general, ambulance patients were more likely to be admitted than other patients. Ambulance patients were significantly more likely to be covered by Medicare and less

Table 1. Hospital characteristics.

Hospital Variable	2002	2003	Total
Total patients	44,425	41,486	85,911
Ambulance arrivals	7,282	8,371	15,653
Ambulance arrivals (adults, nontrauma)	4,797	5,504	10,301
Admissions	7,212	7,542	14,754
Insurance status, %*			
Privately insured	30	29	30
Medicare	12	13	12
Medicaid	39	34	36
Other/unknown insurance	2	2	2
Self-pay	18	22	20
Time on critical care diversion, h			
Total on diversion	1,799	814	2,613
Average length of each diversion episode	12	11	12
Median length of each diversion episode	7	7	7
Longest diversion episode	91	52	52
Time on complete diversion, h			
Total on diversion	998	529	1527
Average length of each diversion episode	5	3	4
Median length of each diversion episode	2	2	2
Longest diversion episode	73	19	73
Total time on diversion (critical care+complete), h			
Total on diversion	2,797	1,343	4,140
Average length of each diversion episode	10	6	8
Median length of each diversion episode	5	3	4
Longest diversion episode	126	57	126

*Percentiles may not add to 100 because of rounding.

Table 2. Ambulance patient characteristics.

Patient Variable	Arrivals by Ambulance (Adults, Non-trauma System)	Arrivals by Other Modes (Adults, Non-trauma System)
Total	10,301	53,499
Admitted to hospital, %	36	12
Insurance status, %	21	28
Privately insured, %	21	28
Medicare, %	32	13
Medicaid, %	29	32
Other/unknown insurance, %	4	2
Self-pay, %	13	25
Charges, $*		
Average	10,418	2,919
Average for admitted patients	24,408	18,719
Average for patients discharged home from ED	2,636	794
Net revenues, $*		
Average	4,492	1,140
Average for admitted patients	11,052	7,769
Average for patients discharged home from ED	843	248

*Charges and net revenues are for hospital facility fees and do not include physician services.

likely to be privately insured, covered by Medicaid, or to be uninsured.

Visits by ambulance patients resulted in average net revenues and charges that were almost 3 times larger than those for patients arriving at the ED by other means. The total percentage of charges reimbursed was higher for ambulance patients (43%) than for patients arriving by other means (39%). (Trauma patients, although not the focus of our study, generated the highest revenues, at an average of $18,243 per ambulance patient.)

Main Results

Table 3 shows ambulance patients' average hourly revenues, charges, and arrivals, as received by the hospital, for the 4 subsets of data: no diversion, any diversion, critical care diversion, or complete diversion.

Table 3. Average ambulance arrivals, charges, and net revenues received by the hospital during 1 hour.*

Outcome Variable	No Diversion	Any Diversion	Critical Care Diversion	Complete Diversion
Average net revenues, $	2,894 (2,667–3,110)	1,808 (1,491–2,232)	1,651 (1,272–2,307)	2,074 (1,662–2,678)
Average charges, $	6,751 (6,300–7,216)	3,963 (3,265–5,073)	3,681 (2,714–5,392)	4,447 (3,573–5,560)
Average arrivals, No.	0.65 (0.64–0.67)	0.38 (0.36–0.40)	0.37 (0.35–0.40)	0.39 (0.35–0.43)

*Numbers in parentheses represent 95% CIs.

Table 4. Losses associated with 1 hour of diversion.*

Outcome Variable	Any Diversion	Critical Care Diversion	Total Diversion
Lost net revenues, $	1,086 (611–1,461)	1,243 (562–1,698)	820 (206–2,678)
Lost charges, $	2,788 (1,617–3,606)	3,070 (1,302–4,173)	2,304 (1,013–3,328)
Lost arrivals, No.	0.27 (0.25–0.30)	0.28 (0.25–0.31)	0.26 (0.22–0.30)

*Numbers in parentheses represent 95% CIs.

Table 5. Changes in ambulance arrivals and net revenues after ICU expansion.

	Monthly Averages		
Statistics for Adult, Nontrauma Patients	Pre-ICU Expansion	Post-ICU Expansion	Change, %
Arrivals to the ED			
Monthly ED census	2760	2635	−5
Ambulance transports	384	452	18
Nonambulance transports	2376	2183	−8
ICU admissions			
Patients admitted to ICU from ED	94	111	18
Patients admitted to ICU from ED (ambulance transports)	31	42	36
Patients admitted to ICU from ED (nonambulance transports)	63	68	9
Average per-patient net revenues			
All ambulance patients	$4,736	$4,402	−7
Ambulance patients admitted to the ICU	$23,349	$18,321	−22
Aggregate net revenues			
All ambulance patients	$1,816,437	$1,990,584	10
Ambulance patients admitted to the ICU	$723,819	$771,183	7

Table 4 shows lost revenues, charges, and number of ambulance arrivals associated with each type of diversion. Compared with hours in which the hospital was not on diversion, an hour of diversion was associated with $1,086 (95% CI $611 to $1,461) in lost ambulance revenues (Table 4). Losses were slightly higher for periods of critical care diversion ($1,243) compared to periods of complete diversion ($820), although this difference was not statistically significant. (As discussed in our sensitivity analyses, the lower revenues during periods of complete diversion may be related to the brief duration of these episodes.)

Diversion resulted in 0.27 (95% CI 0.25 to 0.30) fewer patients arriving by ambulance per hour. However, a surprising number of ambulances continued to arrive during periods of diversion. For example, the hospital still received an average of 0.38 (95% CI 0.36 to 0.40) patients per hour, which translated into $1,808 (95% CI $1,491 to $2,232) in ambulance revenues per hour.

In addition to estimates of hourly losses, our study also provides the potential for assessing the aggregate financial gains from measures taken to reduce ambulance diversion. After the study hospital increased ICU capacity, monthly hours on diversion decreased from an average of 307 before August 2002 to an average of 114 in the following months. After this ICU expansion, the hospital received an additional 68 patients per month on average and approximately $175,000 more in net revenues from ambulance patients. Table 5 describes the changes in ambulance arrivals and additional revenues after the ICU expansion.

Sensitivity Analyses

We conducted 3 sensitivity analyses. First, because our measure of hospital revenues was imputed by multiplying total revenues (hospital facility plus emergency physician) by the ratio of hospital charges and total charges, we conducted separate analyses of total revenues (ie, including payments to emergency physicians). Charges and payments for the emergency physician component are relatively small compared with all hospital services; thus, there were no qualitative differences in this analysis. For example, when we included payments for emergency physicians, lost revenues associated with an hour of any diversion were estimated to be $1,133 (95% CI $663 to $1510) compared with our "hospital facility only" estimate of $1,086 (95% CI $611 to $1,461).

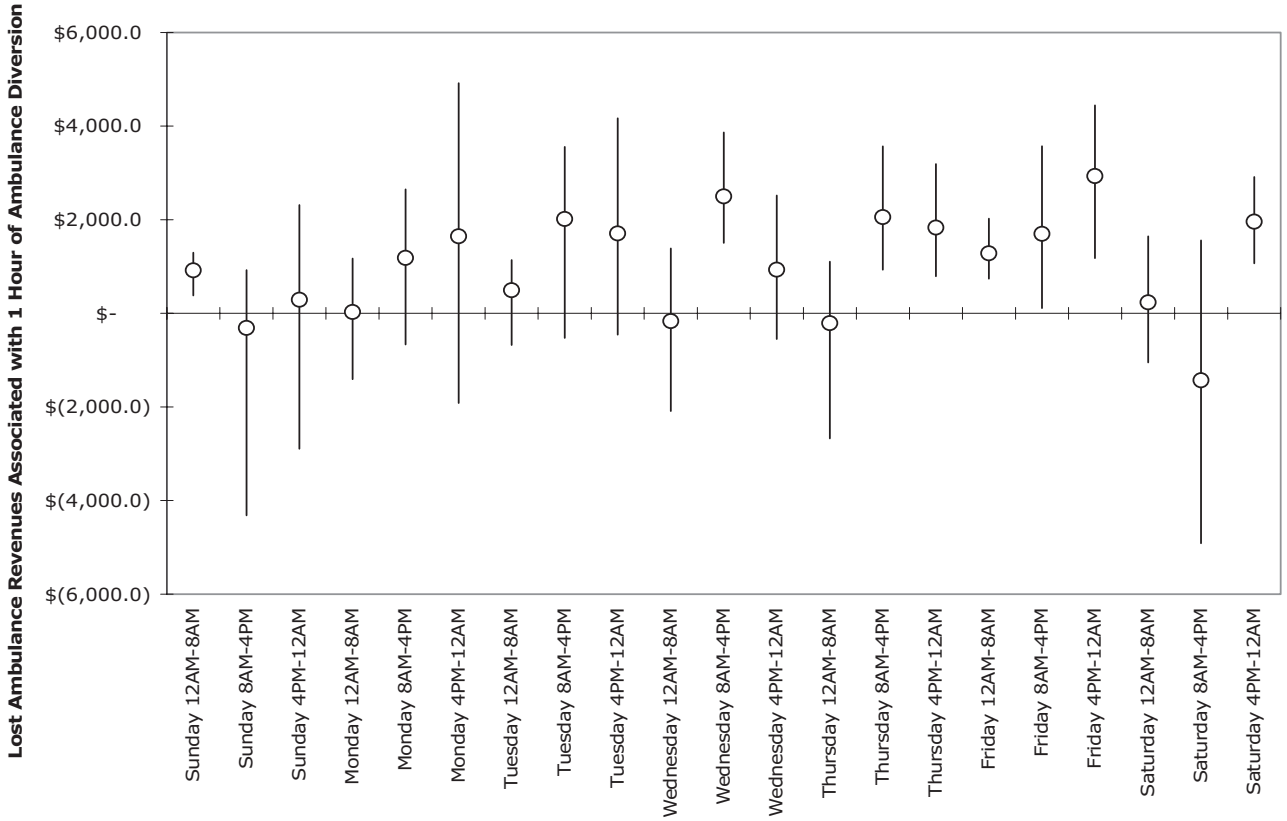

Figure. Hourly losses during 1 hour of any diversion during selected 8-h periods. Vertical lines represent the 95% CIs; circles represent means.

Second, we conducted analyses of losses to diversion, examining periods of diversion in which the hospital had been on diversion for at least 1 hour. When we restricted our analysis to these periods of diversion, we found a slightly larger reduction in patients arriving by ambulance (0.33 [95% CI 0.31 to 0.35]) and slightly higher lost revenues per hour ($1,279 [95% CI $889 to $1,731]). Of note, this difference was attributable primarily to changes we observed during periods of complete diversion. Periods of complete diversion lasting more than 1 hour were associated with a loss of 0.41 (95% CI 0.38 to 0.44) patients per hour and a loss of $1,339 (95% CI $824 to $1,894) in net revenues. The higher losses in complete diversion are probably attributable to episodes of complete diversion being typically shorter than episodes of critical care diversion (median length of 2 hours compared with median length of 7 hours), and patients en route may have continued to arrive at a relatively high rate in the first hour of diversion.

The Figure displays the results of our third sensitivity analysis, which was conducted to determine whether there could be financial advantages to avoiding diversion at certain times or on certain days. We divided each day into 3 8-hour periods (daytime [8 AM to 4 PM], evening [4 PM to 12 AM] and night [12 AM to 8 AM]). We conducted subanalyses on each of these periods for each day of the week. Our analyses suggest that the avoiding diversion on the long stretch beginning Thursday morning (8 AM) and continuing all the way through Friday evening (until 11 PM) would be financially beneficial. That fewer periods of the week do not show significant differences between on- and off-diversion times may be a result of a loss of power. However, there are likely to be times during the week in which efforts to avoid diversion may not translate into substantially more ambulance patients and revenues and other times in which avoiding diversion can capture significantly more revenue.

LIMITATIONS

An important limitation to our study is that it does not examine revenues from other (non-ED) patients in the hospital. The extent to which a hospital is on diversion is likely to be correlated with the availability of inpatient beds.[12,14,15] However, hospitals may be unwilling to free additional inpatient beds if it means turning away prescreened, privately insured patients who arrive for scheduled surgeries or medical care. Therefore, although our study estimates the revenues lost to ambulance patients during an hour of diversion, it does not estimate the *gains* in revenues that might be occurring as a hospital fills its inpatient beds with prescreened, elective surgeries. A better understanding of the incentives of hospitals would require information on the hospital's opportunity cost of avoiding diversion; ie, revenues that would be forgone by freeing beds to reduce ambulance diversion.

Another limitation of our work is the inability to control for the potential dual causality between ambulance diversion and ambulance arrivals. Our analysis assumes that the rate of *potential* ambulance arrivals (and the characteristics of their patients) is consistent between periods of diversion and off diversion. In reality, this may not be true. For example, periods of slack in hospital capacity (in which there is little need for diversion) may be correlated with a low level of arrivals by ambulance. Conversely, too many arrivals by ambulance may cause the hospital to go on diversion. In this case, our estimate of the effect of 1 hour of diversion would tend to underestimate the actual gain in patients and revenues that could be expected by avoiding a single hour of diversion. Fortunately, the increase in ICU capacity provides a setting to observe the change in revenues when changes in ambulance diversion are driven primarily by something other than short-term temporal fluctuations in patient arrivals.

Furthermore, although our study estimates revenues from ambulance patients during an hour of diversion, reducing time spent on diversion may not translate directly into increased revenues for all hospitals. The extent to which revenues can be increased depends in large part on how often nearby hospitals are on diversion and what proportion of those patients the target hospital might be able to capture.

Our study was also limited by the focus on revenues. Many hospitals will care more about the profitability (revenues minus cost) of patients than the revenues that they generate. This limitation is important because ambulance patients are more likely to be covered by Medicare, which reimburses fairly close to cost. Thus, hospitals may be less inclined to take steps to avoid ambulance diversion if they believe that the additional revenues will be substantially offset by the cost of caring for the patient.

Finally, our analysis is based on data from a single academic teaching hospital. Estimates of patient arrivals, net revenues, and charges may differ substantially in other settings. Nonetheless, our estimates provide some indication as to the financial impact of ambulance diversion and should provide physicians and hospital administrators some measure of the changes that could be anticipated in their institutions.

DISCUSSION

Three years ago, in an editorial in this journal, Asplin[1] asked whether ambulance diversion matters. His answer was a conditional yes: ambulance diversion matters to emergency providers, but it would be difficult to convince others to address the problem unless research explored 4 outcomes: clinical outcomes, patient and provider satisfaction, quality-of-life measures, and economic outcomes. This study has addressed economic outcomes.

In the context of economic outcomes, does ambulance diversion matter? Our answer to this question is also a conditional yes. Our study suggests that avoiding diversion can generate substantial revenues for a hospital, approximately $1,100 per hour of diversion avoided. Furthermore, at the study hospital, a two thirds decrease in ambulance diversion was followed by increased revenues for ambulance patients of approximately $175,000 per month.

Our study offers evidence that decreased ambulance diversion may lead to increased hospital revenues. Such information is important for the emergency medicine community. However, in terms of providing motivation for hospitals to reduce ambulance diversion, the story may be more complicated. The extent to which increased revenues can act as a financial incentive depends on other factors, including the increase in revenues relative to average revenues from ambulance patients, revenues from other hospital services, and the distribution of revenues across ambulance patients (ie, the magnitude of the variance and skewness of revenues).

Our estimate of $175,000 represents a 10% increase in monthly net revenues from ambulance patients. Is 10% a large increase in revenues? At the study hospital, it represented approximately a 0.4% increase in *total* monthly hospital revenues of $46,000,000. Although most hospitals and EDs would gladly welcome the increased revenues, it is not clear whether these relatively modest increases would be enough to motivate hospitals to take the necessary, resource-intensive steps to substantially reduce their ambulance diversion.

Another reason that revenues from ambulance patients may be less attractive to hospitals is that the variance around those revenues is quite large. By the nature of their payer source and the wide range of illnesses and injuries, the revenues associated with ambulance patients are highly variable and extremely skewed. In our sample, the range of revenues from patients ranged from $0 to more than $500,000. Furthermore, in our sample, about 30% of all net revenues from ambulances were attributable to only 5% of patients. This phenomenon occurred in both 2002 and 2003.

Hospitals, like many other organizations, may be risk averse and thus may tend to show a preference for revenue streams with low variance rather than those with high variance. Thus, even if ambulance patients generate high revenues on average, the large variance may make it difficult to manage hospital resources. The uncertainty and lack of predictability around revenues from ambulance patients may be implicit in hospital decisionmaking and may lead hospitals to allocate resources in favor of other services, leading to ED crowding and ambulance diversion. Future research in the area of variability of ED patients' costs and revenues may be helpful in improving the understanding of the ED's role in hospitals' financial matters.

As mentioned in the Limitations section, our study focused on revenues lost to ambulance patients but did not estimate the revenues that hospitals may capture by filling their inpatient beds with prescreened, elective surgeries. Another useful line of future research would be to develop generalizable estimates of the opportunity cost of maintaining an available inpatient bed. Such an analysis might use administrative patient data (including revenues and information about diagnoses and illness

severity), hospital cost data, and information on hospital occupancy rates. Ideally, estimates of cost would include the "operating" cost of an available bed (such as the costs of nursing), as well as the "opportunity cost" (the profits [net revenues minus cost] forgone when the bed is not filled with a non–ED-admitted patient). These estimates would be useful in understanding the tradeoffs that hospitals face in their efforts to reduce diversion. Moreover, such estimates would also provide policy-relevant information about the costs of improving surge capacity in the nations' hospitals.

The combination of factors discussed above—the opportunity cost of maintaining open inpatient beds, the relatively small percentage of revenues attributable to ED ambulance patients, and the large variability in the revenues from these patients—may make it hard to convince hospitals to take steps to reduce diversion on the basis of their own financial interest. As Asplin's[1] editorial suggested, it may take external financial payments or regulatory policies to provide a more powerful incentive to alleviate ambulance diversion.

Several hospitals and communities have taken steps to successfully reduce ambulance diversion.[16-18] An equally important question to consider is *why* these interventions were undertaken. One could speculate that the reasons are related to a combination of leadership, civic outcry, regulatory threat, and financial pressure. It may be useful for the emergency medicine community to have a better understanding of the combination of factors that allow interventions to be successful and sustainable.

Our study was limited in its single hospital setting and its relatively narrow range of economic outcomes. At least 1 study has identified potential revenue losses associated with crowding in the ED,[19] and it is possible that other studies may find substantial economic costs associated with ambulance diversion. However, it may be more fruitful to search for rationales to reduce ambulance diversion in the areas of clinical outcomes, patient and provider satisfaction, and quality-of-life measures. Schull et al[10,11] have provided the first indications of the potential for adverse clinical outcomes from ambulance diversion.

In summary, our study provides insight about the magnitude and importance of lost net revenues from ambulance diversion. We found significant losses associated with 1 hour of ambulance diversion. However, these losses may not be large enough to provide the necessary motivation for hospitals to take steps to reduce ambulance diversion. Efforts to reduce diversions may be difficult if they hinge on expected financial benefits and may be more effective if they are directly tied to patient outcomes, provider satisfaction, and improved community relations.

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