

April 2009

# HOSPITAL EMERGENCY DEPARTMENTS

## Crowding Continues to Occur, and Some Patients Wait Longer than Recommended Time Frames



GAO

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Highlights of [GAO-09-347](#), a report to the Chairman, Committee on Finance, U.S. Senate

### Why GAO Did This Study

Hospital emergency departments are a major part of the nation’s health care safety net. Of the estimated 119 million visits to U.S. emergency departments in 2006, over 40 percent were paid for by federally-supported programs. These programs—Medicare, Medicaid, and the State Children’s Health Insurance Program—are administered by the Department of Health and Human Services (HHS). There have been reports of crowded conditions in emergency departments, often associated with adverse effects on patient quality of care. In 2003, GAO reported that most emergency departments in metropolitan areas experienced some degree of crowding (*Hospital Emergency Departments: Crowded Conditions Vary among Hospitals and Communities*, [GAO-03-460](#)). For example, two out of every three metropolitan hospitals reported going on ambulance diversion—asking ambulances to bypass their emergency departments and instead transport patients to other facilities.

GAO was asked to examine information made available since 2003 on emergency department crowding. GAO examined three indicators of emergency department crowding—ambulance diversion, wait times, and patient boarding—and factors that contribute to crowding. To conduct this work, GAO reviewed national data; conducted a literature review of 197 articles; and interviewed officials from HHS and professional and research organizations, and individual subject-matter experts.

View [GAO-09-347](#) or key components. To view the e-supplement to this report online, click on [GAO-09-348SP](#). For more information, contact Marcia Crosse at (202) 512-7114 or [crossem@gao.gov](mailto:crossem@gao.gov).

## HOSPITAL EMERGENCY DEPARTMENTS

### Crowding Continues to Occur, and Some Patients Wait Longer than Recommended Time Frames

#### What GAO Found

Emergency department crowding continues to occur in hospital emergency departments according to national data, articles we reviewed, and officials we interviewed. National data show that hospitals continue to divert ambulances, with about one-fourth of hospitals reporting going on diversion at least once in 2006. National data also indicate that wait times in the emergency department increased, and in some cases exceeded recommended time frames. For example, the average wait time to see a physician for emergent patients—those patients who should be seen in 1 to 14 minutes—was 37 minutes in 2006, more than twice as long as recommended for their level of urgency. Boarding of patients in the emergency department who are awaiting transfer to an inpatient bed or another facility continues to be reported as a problem in articles we reviewed and by officials we interviewed, but national data on the extent to which this occurs are limited. Moreover, some of the articles we reviewed discussed strategies to address crowding, but these strategies have not been assessed on a state or national level.

**Average Wait Time to See a Physician and Percentage of Visits in Which Wait Time to See a Physician Exceeded Recommended Time Frames by Acuity Level, 2006**

Patient acuity level <sup>a</sup> (recommended time frame)	Average wait time in minutes	Percentage of visits in which wait time exceeded recommended time frames
Immediate (less than 1 minute)	28	73.9
Emergent (1 to 14 minutes)	37	50.4
Urgent (15 to 60 minutes)	50	20.7
Semiurgent (greater than 1 to 2 hours)	68	13.3
Nonurgent (greater than 2 to 24 hours)	76	— <sup>b</sup>

Source: GAO analysis of data from HHS’s National Center for Health Statistics (NCHS).

Notes: Information on the standard error associated with estimates of averages is found in the report.

<sup>a</sup>Acuity levels describe the recommended time a patient should wait to be seen by a physician. NCHS developed acuity levels based on a five-level emergency severity index recommended by the Emergency Nurses Association.

<sup>b</sup>In 2006, no emergency departments reported visits with wait times in excess of 24 hours.

Articles we reviewed and individual subject-matter experts we interviewed reported that a lack of access to inpatient beds continues to be the main factor contributing to emergency department crowding, although additional factors may contribute. One reason for a lack of access to inpatient beds is competition between hospital admissions from the emergency department and scheduled admissions—for example, for elective surgeries, which may be more profitable for the hospital. Additional factors may contribute to emergency department crowding, including patients’ lack of access to primary care services or a shortage of available on-call specialists.

In commenting on a draft of this report, HHS noted that the report demonstrates that emergency department wait times are continuing to increase and frequently exceed national standards. HHS also provided technical comments, which we incorporated as appropriate.

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### Abbreviations

ACEP	American College of Emergency Physicians
AHRQ	Agency for Healthcare Research and Quality
DRG	diagnosis-related group
HHS	Department of Health and Human Services
IOM	Institute of Medicine
NCHS	National Center for Health Statistics
NHAMCS	National Hospital Ambulatory Medical Care Survey

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United States Government Accountability Office  
Washington, DC 20548

April 30, 2009

The Honorable Max Baucus  
Chairman  
Committee on Finance  
United States Senate

Dear Mr. Chairman:

Open 24 hours a day, 7 days a week, hospital emergency departments are a major part of the nation's health care safety net. Of the estimated 119 million visits to U.S. emergency departments in 2006, over 40 percent were paid for by federally-supported programs.<sup>1</sup> These programs—Medicare, Medicaid, and the State Children's Health Insurance Program<sup>2</sup>—are administered by the Department of Health and Human Services (HHS). Emergency department staff report being under increasing pressure, and concerns have been raised that they face challenges in providing timely and effective emergency medical care. For example, considerable attention has been given to reports of ambulance diversion—that is, emergency departments requesting that ambulances that would normally bring patients to their hospitals go instead to other hospitals that are presumably less crowded. Concerns have also been raised about the frequency of patients remaining in the emergency department—taking up staff and resources—after the decision has been made to admit them to the hospital or transfer them to another facility, a practice known as boarding. In addition, reports of long wait times in emergency departments have led to concerns of potential adverse effects on the quality of care for patients, such as prolonged pain and suffering.

We have reported on the extent of crowding in emergency departments and factors contributing to crowding. In 2003, we reported results from our survey of more than 2,000 hospitals with emergency departments

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<sup>1</sup>S. R. Pitts, R. W. Niska, J. Xu, and C. W. Burt, "National Hospital Ambulatory Medical Care Survey: 2006 Emergency Department Summary," *National Health Statistics Reports*, no. 7 (2008).

<sup>2</sup>Medicare is the federal health program that covers seniors aged 65 and older and eligible disabled persons. Medicaid is the joint federal and state program that finances health care for certain low-income individuals. The State Children's Health Insurance Program finances health care for low-income, uninsured children whose family incomes exceed the eligibility limits under their state's Medicaid program.

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located in metropolitan areas of the country and from our site visits to communities where media and other sources had reported problems with emergency department crowding.<sup>3</sup> Using three indicators of crowding—diversion, patients leaving the emergency department before a medical evaluation (presumably due to long wait times in the emergency department), and boarding—we found that while most emergency departments across the country experienced some degree of crowding,<sup>4</sup> crowding was much more pronounced in some hospitals and areas than in others. Generally, hospitals that reported the most problems with emergency department crowding were in metropolitan areas with populations of 2.5 million or more. We also found that crowding is a complex issue and that one key factor contributing to crowding at many hospitals was the inability of hospitals to move admitted patients out of emergency departments and into inpatient beds. Reasons given for why hospitals did not have the capacity to meet demand for inpatient beds from emergency department patients included financial pressures leading to limited hospital capacity and competition between admissions from the emergency department and scheduled admissions, such as for elective surgery. Finally, we reported on strategies that were implemented to address emergency department crowding in the six communities that we visited; however, we found that studies assessing the effect of these efforts were limited.

Since our 2003 report, Congress and others have raised concerns that hospital emergency departments are continuing to experience crowded conditions that could potentially compromise the nation's ability to provide effective emergency medical care. For example, in September 2003 the Institute of Medicine (IOM) convened a committee to examine, among other things, emergency department crowding.<sup>5</sup> In addition, in June

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<sup>3</sup>GAO, *Hospital Emergency Departments: Crowded Conditions Vary among Hospitals and Communities*, GAO-03-460 (Washington, D.C.: Mar. 14, 2003).

<sup>4</sup>We reported, for example, that two out of three metropolitan hospitals reported going on ambulance diversion—that is, asking ambulances to bypass their emergency departments and instead transport patients to other facilities.

<sup>5</sup>The objectives of this committee, the Committee on the Future of Emergency Care in the United States Health System, were to (1) examine the emergency care system in the United States; (2) explore its strengths, limitations, and future challenges; (3) describe a desired vision for the system; and (4) recommend strategies for achieving this vision. The results of the committee's efforts were described in three IOM reports released in 2006: *Hospital-Based Emergency Care: At the Breaking Point*; *Emergency Care for Children: Growing Pains*; and *Emergency Medical Services: At the Crossroads*.

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2007 the House Committee on Oversight and Government Reform held a hearing at which experts in hospital emergency care testified on the state of the nation's emergency care. Given this continued interest, you asked to us to report on information made available with respect to emergency department crowding since we issued our 2003 report. Specifically, this report examines information made available about (1) three indicators of emergency department crowding—ambulance diversion, wait times,<sup>6</sup> and patient boarding, and (2) factors that contribute to emergency department crowding.

To conduct this work, we reviewed national data, conducted a literature review, and interviewed federal and other officials. First, we obtained and reviewed national data on emergency department diversion and wait times for 2001 through 2006 from the National Center for Health Statistics (NCHS)<sup>7</sup> and data on hospital admissions—which were related to factors of crowding—from the Agency for Healthcare Research and Quality (AHRQ).<sup>8</sup> We obtained nationally-representative data from NCHS and AHRQ beginning with 2001 because these data became publicly available in 2003 or later, meeting the criterion for inclusion in our analysis. At the time we conducted our analysis, the most recent year for which data were available from NCHS and AHRQ was 2006. In addition, some data from NCHS were not available for all years between 2001 and 2006 because of revisions made by NCHS to questions on surveys used to collect

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<sup>6</sup>In this report, we use the broader indicator *wait times* to include patients leaving before a medical evaluation and intervals of wait times, such as the amount of time patients wait to see a physician and the total time patients spend in the emergency department. The National Center for Health Statistics (NCHS) defines the percentage of visits in which patients left before a medical evaluation as the percentage of visits in which the patient left after triage but before receiving any medical care.

<sup>7</sup>NCHS is an agency within HHS's Centers for Disease Control and Prevention that compiles statistical information to guide actions and policies to improve health. NCHS annually collects data on hospital emergency department utilization in the United States using a nationally representative survey, the National Hospital Ambulatory Medical Care Survey (NHAMCS). NCHS uses the NHAMCS to gather, analyze, and disseminate information on visits to emergency and outpatient departments of nonfederal, short-stay, and general hospitals in the United States. NCHS weights sample data from the NHAMCS to produce national estimates.

<sup>8</sup>AHRQ is an HHS agency that conducts and supports health services research. AHRQ sponsors the Healthcare Cost and Utilization Project, which is a family of health care databases and related software tools and products developed through a federal-state-industry partnership. Data we reviewed from AHRQ came from the Nationwide Inpatient Sample, which is one of a number of databases and software tools AHRQ developed as part of the Healthcare Cost and Utilization Project.



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information or a low response rate to certain questions on these surveys. As part of our review of available national data on emergency department diversion and wait times, we analyzed wait times in the emergency department using NCHS's data on recommended time for a patient to see a physician based on patient acuity levels.<sup>9</sup> We also reviewed national data on emergency department utilization to set up a context for our work. In this report, we present NCHS estimates; for those cases in which we report an increase or other comparison of these estimates, NCHS tested the differences and found them statistically significant.<sup>10</sup> To assess the reliability of national data from NCHS and AHRQ, we discussed the data with agency officials and reviewed the methods they used for collecting and reporting these data. We resolved discrepancies we found between the data provided to us and data in published reports by corresponding with officials from NCHS to obtain sufficient explanations for the differences. Based on these steps, we determined that these data were sufficiently reliable for our purposes.

We also conducted a literature review of 197 articles, including articles published in peer-reviewed and other periodicals, publications from professional and research organizations, and reports issued by federal and state agencies. In examining the information made available since 2003 about indicators of crowding during our literature review, we analyzed articles for what was reported on the effect of crowding on patient quality of care and on proposed strategies to address crowding. We reviewed 197 articles, publications, and reports (which we call articles)<sup>11</sup> on emergency department crowding published on or between January 1, 2003, and August 31, 2008. These included articles reporting on results of surveys

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<sup>9</sup>NCHS uses patient acuity levels to measure a patient's severity of illness. NCHS developed time-based acuity levels based on a five-level emergency severity index recommended by the Emergency Nurses Association. The NHAMCS collects data on five levels of acuity: immediate, emergent, urgent, semiurgent, and nonurgent. Acuity levels are assigned by medical staff after patients arrive in a hospital's emergency department.

<sup>10</sup>In addition, for those cases in which we present averages based on NCHS data, we are presenting the estimated mean as well as the standard error of the estimate. Standard error is a statistic used to calculate the range of values that expresses the possible difference between the sample estimate and the actual population value.

<sup>11</sup>For the literature review, we included articles reporting results of quantitative analysis, commentaries, articles reporting on literature reviews, or other articles, which includes articles published on or between January 1, 2003, and August 31, 2008, that were identified as a result of our interviews with officials and individual subject-matter experts, and from searches of related Web sites. Other articles include articles that were published by professional associations with reports of their surveys.

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conducted by the American College of Emergency Physicians (ACEP) and the American Hospital Association that provided information on ambulance diversion that was not available from NCHS. A complete bibliography for the literature review can be viewed at [GAO-09-348SP](#).

Finally, we interviewed officials from federal agencies and one state agency, professional and research organizations, other hospital-related organizations, and individual subject-matter experts to obtain and review information on indicators of emergency department crowding and factors that contribute to crowding. We interviewed federal officials from HHS's Centers for Medicare & Medicaid Services and the Office of the Assistant Secretary for Preparedness and Response, and officials from NCHS and AHRQ who have conducted research on emergency department utilization and crowding. We also interviewed officials from professional and research organizations, including ACEP, the American Hospital Association, the American Medical Association, the Center for Studying Health System Change, and the Society for Academic Emergency Medicine. Some of the officials from ACEP and the Society for Academic Emergency Medicine whom we interviewed have also published research in peer-reviewed journals. Additionally, we interviewed hospital-related organizations, including those involved in hospital accreditation and in developing quality measures for hospital emergency department care, and officials from the Massachusetts Department of Public Health. Finally, we interviewed three individual subject-matter experts knowledgeable about emergency department crowding. Additional information about our methodology can be found in appendix I.

We conducted this performance audit from May 2008 through April 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

Thousands of emergency departments operate in the United States, seeing millions of patients each year. In our 2003 report on emergency department crowding, we reported on the extent of crowding in metropolitan areas. Researchers have used three indicators—diversion, wait times, and boarding—in examining emergency department crowding.

## Emergency Department Utilization

Between 2001 and 2006, according to NCHS estimates, the number of emergency departments operating in the United States ranged from about 4,600 to about 4,900.<sup>12</sup> During the same period, the estimated number of visits to U.S. emergency departments exceeded 107 million visits each year, ranging from about 107 million visits in 2001 to about 119 million visits in 2006. (See table 1.)

**Table 1: Number of Emergency Departments and Emergency Department Visits in 2001 through 2006**

In thousands						
	2001	2002	2003	2004	2005	2006
Total number of emergency departments operating	4.6	4.9	4.7	4.7	4.6	4.8
Total annual emergency department visit volume	107,490	110,155	113,903	110,216	115,323	119,191

Source: GAO analysis of NCHS data.

Note: All estimates in this table are nationally representative. NCHS estimates the number of hospitals with an emergency department in the United States that is staffed and operated 24 hours a day.

Most hospitals with emergency departments are located in metropolitan areas, and the majority of emergency department visits occurred in metropolitan areas of the United States.<sup>13</sup> In 2006, about two-thirds of hospitals with emergency departments were located in metropolitan areas compared to about one-third in nonmetropolitan areas. In the same year, about 101 million (85 percent) of the approximately 119 million emergency department visits occurred in metropolitan areas compared to about 18 million (15 percent) visits in nonmetropolitan areas. (See fig. 1.)

<sup>12</sup>NCHS estimates the number of hospitals with an emergency department that is staffed and operated 24 hours a day.

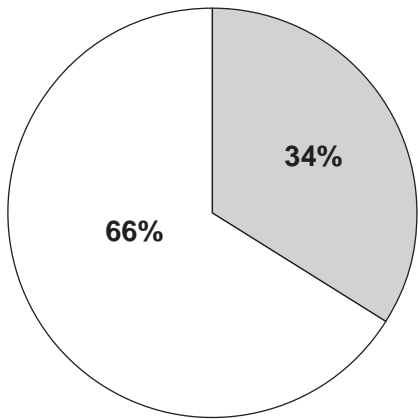
<sup>13</sup>For the purpose of this report, we use the term *metropolitan area* to indicate facilities and visits identified by NCHS as occurring in a metropolitan statistical area as defined by the Office of Management and Budget, and *nonmetropolitan area* to indicate facilities and visits identified by NCHS as not in a metropolitan statistical area. The Office of Management and Budget defines a metropolitan statistical area as an area containing a core-based statistical area associated with at least one urbanized area that has a population of at least 50,000, plus adjacent counties having a high degree of social and economic integration with the core as measured through commuting ties with counties contained in the core.

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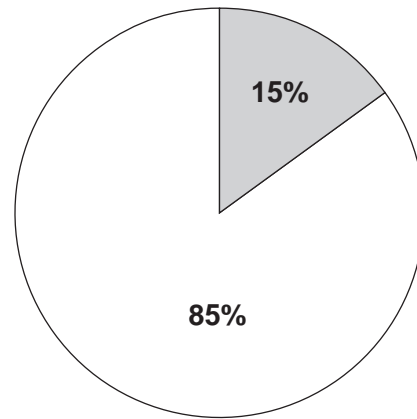
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**Figure 1: Percentage of Emergency Departments and Emergency Department Visits in Metropolitan and Nonmetropolitan Areas in 2006**

Percentage of emergency departments



Percentage of emergency departments visits

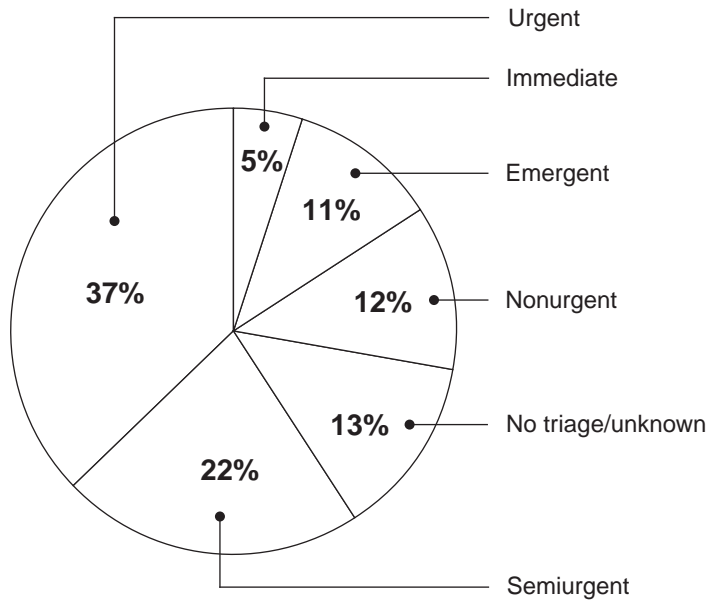


Metropolitan  
Nonmetropolitan

Source: GAO analysis of NCHS data.

Patients come to the emergency department with illnesses or injuries of varying severity, referred to as acuity level. Each acuity level corresponds to a recommended time frame for being seen by a physician—for example, patients with immediate conditions should be seen within 1 minute and patients with emergent conditions should be seen within 1 to 14 minutes. In 2006, urgent patients—patients who are recommended to be seen by a physician within 15 to 60 minutes—accounted for the highest percentage of visits to the emergency department. (See fig. 2.)

**Figure 2: Percentage of Emergency Department Visits by Acuity Level in 2006**



Source: GAO analysis of NCHS data.

Note: NCHS developed time-based acuity levels based on a five-level emergency severity index recommended by the Emergency Nurses Association. The acuity levels describe the recommended amount of time a patient should wait to be seen by a physician. The recommended time frames to see a physician are less than 1 minute for immediate patients, between 1 and 14 minutes for emergent patients, between 15 minutes and 1 hour for urgent patients, greater than 1 hour to 2 hours for semiurgent patients, and greater than 2 hours to 24 hours for nonurgent patients.

The expected sources of payment<sup>14</sup> reported for patients receiving emergency department services also vary. For example, from 2001 through 2006 patients with private insurance accounted for the highest number and percentage of visits to the emergency department. During the same period, the percentage of uninsured patients<sup>15</sup> seeking care in emergency departments ranged between 15 and 17 percent of total visits, and the percentage of patients visiting emergency departments with Medicare ranged between 14 and 16 percent. See appendix II for additional data on expected sources of payment and emergency department utilization.

<sup>14</sup>Expected sources of payment on the NHAMCS include private insurance, Medicaid or State Children's Health Insurance Program, Medicare, self-pay, no charge or charity, worker's compensation, other sources, and unknown sources.

<sup>15</sup>NCHS defines uninsured patients as those with expected sources of payment categories of only self-pay, no charge, or charity.

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## Key Findings from the 2003 GAO Report on Emergency Department Crowding

In 2003, using three indicators that point to situations in which crowding is likely occurring—diversion,<sup>16</sup> patients leaving before a medical evaluation, and boarding—we reported that emergency department crowding varied nationwide. We also reported that crowding was more pronounced in certain types of communities, and that crowding occurred more frequently in hospitals located in metropolitan areas with larger populations, higher population growth, and higher levels of uninsurance. We reported that crowding was more evident in certain types of hospitals, such as in hospitals with higher numbers of staffed beds, teaching hospitals, public hospitals, and hospitals designated as certified trauma centers.

In terms of factors that contribute to crowding, we reported that crowding is a complex issue and no single factor tends to explain why crowding occurs. However, we found that one key factor contributing to crowding was the availability of inpatient beds for patients admitted to the hospital from the emergency department. Reasons given by hospital officials and researchers we interviewed for not always having enough inpatient beds to meet demand from emergency patients included economic factors that influence hospitals' capability to meet periodic spikes in demand and emergency department admissions competing with other admissions for inpatient beds. Other additional factors cited by researchers and hospital officials as contributing to crowding included the lack of availability of physicians and other community services—such as psychiatric services—and the fact that emergency patients are older, have more complex conditions, and have more treatment and tests provided in the emergency department than in prior years.

Further, we reported that hospitals and communities had conducted a wide range of activities to manage crowding in emergency departments, but that problems with crowding persisted in spite of these efforts. These activities included efforts to expand capacity and increase efficiency in hospitals, and community activities to implement systems and rules to manage diversion. These efforts were unable to reverse crowding trends at hospital emergency departments, and we found that studies assessing the effect of these efforts were limited.

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<sup>16</sup>Federal law requires hospitals that participate in Medicare to screen all people and treat any with emergency medical conditions regardless of ability to pay. In certain circumstances, hospitals can place themselves on diversionary status and direct certain en route ambulances to other hospitals when they are unable to accept additional patients.

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## Indicators of Emergency Department Crowding

Researchers use the indicators we reported on in 2003 to point to situations in which crowding is likely occurring in emergency departments.<sup>17</sup> These indicators can point to when crowding is likely occurring but they also have limitations. For example, patients boarding in the emergency department can indicate that the department's capacity to treat additional patients is diminished, but it is possible for several patients to be boarding while the emergency department has available treatment spaces to see additional patients. Table 2 provides the definition of the three indicators of emergency department crowding we reviewed in this report—diversion, wait times, and boarding—and lists the usefulness and limitations of using these indicators to gauge crowding. Regarding wait times, in our 2003 report, we used “left before a medical evaluation” as an indicator of crowding related to long wait times in an emergency department. Since we issued our report in 2003, researchers have used intervals of wait times—including the length of time to see a physician and the total length of time a patient is in the emergency department—to indicate when an emergency department is crowded. As a result, for this report, we examined wait times more broadly, including data on the time for patients to see a physician, length of stay in the emergency department, and visits in which the patient left before a medical evaluation.<sup>18</sup>

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<sup>17</sup>While researchers have been using diversion, wait times (including patients leaving before a medical evaluation), and boarding as indicators that point to situations in which crowding is likely occurring, there is still no standard measure to quantify the extent to which emergency departments are experiencing crowded conditions. In the absence of a widely-accepted standard measure of crowding, researchers have proposed and conducted limited testing of potential measures of crowding. None of these measures of crowding, however, have been widely implemented by researchers and health care practitioners. See app. III for additional information on these potential measures.

<sup>18</sup>NCHS defines the percentage of visits in which patients left before a medical evaluation as the percentage of visits in which the patient left after triage but before receiving any medical care.

**Table 2: Indicators of Emergency Department Crowding**

<b>Indicator</b>	<b>Definition</b>	<b>Usefulness</b>	<b>Limitations</b>
Ambulance diversion	Hospitals request that ambulances bypass their emergency departments and transport patients to other medical facilities.	For emergency departments where local rules permit diversion, diversion is an indicator of how often emergency departments believe that they cannot safely handle additional ambulance patients.	The number of hours on diversion is a potentially imprecise measure of crowding because whether a hospital can go on diversion and the circumstances under which it can do so vary from location to location, according to both individual hospital policy and communitywide guidelines or rules.
Wait times	Intervals of wait time include the amount of time a patient waits in the emergency department to see a physician, the percentage of visits in which patients left before a medical evaluation, and the total length of time a patient spends in the emergency department.	Long wait times can occur when an emergency department is crowded and unable to treat patients waiting to be seen in a reasonable amount of time. Excessive wait time is the most common reason patients leave the emergency department before being treated.	Since emergency department staff triage patients, those with conditions that do not present an immediate emergency generally wait the longest. These patients may also be most likely to tire of waiting and leave before receiving a medical evaluation. In addition, because there are several ways to measure wait times, it can be difficult to compare wait times across hospitals or studies.
Patient boarding	A patient remains in the emergency department after the decision to admit or transfer the patient has been made, for example because an inpatient bed elsewhere in the hospital is not yet available.	Patients boarding in the emergency department take up space and resources that could be used to treat other emergency department patients. Boarding is an indicator that an emergency department's capacity to treat additional patients is diminished.	Boarding does not always indicate that an emergency department is crowded since it is possible for an emergency department to be boarding patients while also having available treatment spaces.

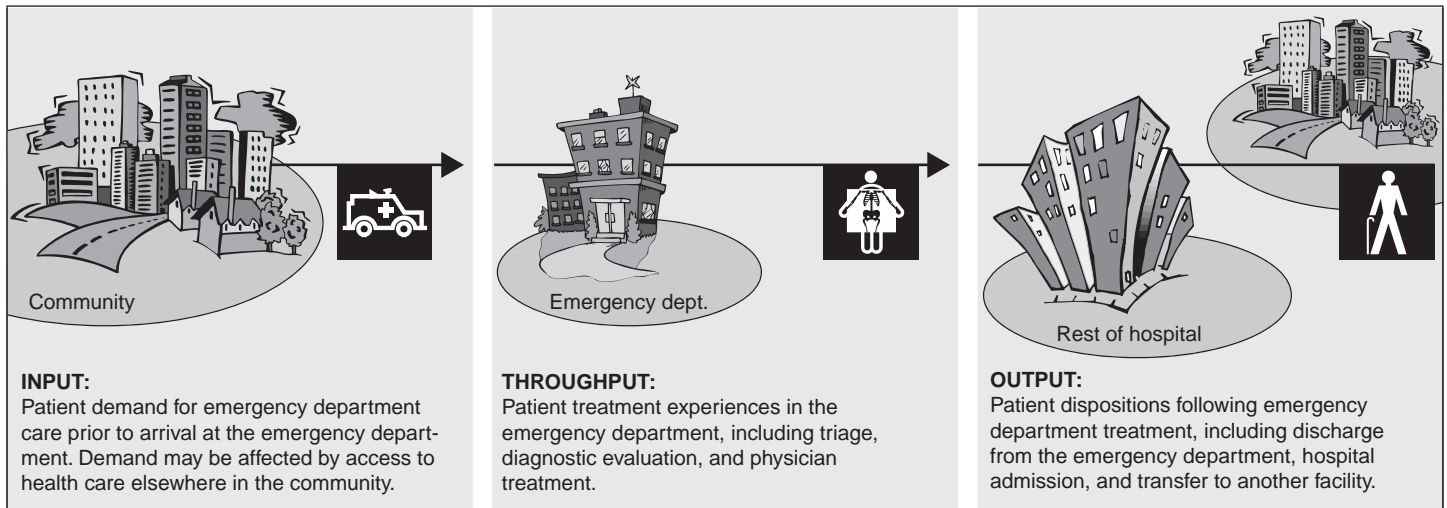
Source: GAO.

Researchers have developed a conceptual model to analyze the factors that contribute to emergency department crowding and develop potential solutions.<sup>19</sup> This model partitions emergency department crowding into three interdependent components: input, throughput, and output. Although factors in many different parts of the health care system may contribute to emergency department crowding, the model focuses on crowding from the perspective of the emergency department. (See fig. 3.)

<sup>19</sup>See, B. R. Asplin et al., "A Conceptual Model of Emergency Department Crowding," *Annals of Emergency Medicine*, vol. 42, no. 2 (2003): 173-180.



**Figure 3: Input-Throughput-Output Model of Emergency Department Crowding**



Source: GAO analysis of published literature, Art Explosion (graphics).

Researchers have used the input-throughput-output model to explain the connection between factors that contribute to emergency department crowding and indicators of crowding. The three indicators of emergency department crowding—diversion, wait times, and boarding—are most directly related to the input, throughput, and output components, respectively, of the model; but the causes of these indicators can relate to other components. For example, a hospital emergency department might experience long wait times—an indicator associated with the throughput component—because of delays in patients receiving laboratory results (related to throughput) or because staff are busy caring for patients boarding in the emergency department due to a lack of access to inpatient beds (related to output). Similarly, an emergency department may divert ambulances (related to input) because the emergency department is full due to the inability of hospital staff to move admitted patients to hospital inpatient beds (related to output).

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## According to Indicators, Emergency Department Crowding Continues

We found that ambulance diversions continue, wait times have increased, and reports of boarding in hospital emergency departments persist. Articles we reviewed also reported on the effect of crowding on quality of care and on strategies proposed to address crowding.

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## Hospitals Continue to Divert Ambulances

National data show that the diversion of ambulances continues to occur, but that the percentage of hospitals that go on diversion and the average number of hours hospitals spend on diversion varied by year. According to NCHS estimates, in 2003, 45 percent of U.S. hospitals reported going on diversion, and in 2004 through 2006, between 25 and 27 percent reported doing so. Of hospitals that reported going on diversion, the average number of hours they reported spending on diversion varied with an average of 276 hours in 2003 and an average of 473 hours in 2006.<sup>20</sup> (See table 3.) NCHS officials provided the percentage of missing diversion data for each year, which ranged from 3.75 percent in 2003 to 29.1 percent in 2005.<sup>21</sup> NCHS officials, however, were unable to provide an explanation for the variation of the percentage of hospitals going on diversion in the United States and average hours U.S. hospitals reported spending on diversion for these years. NCHS reported that hospitals in metropolitan areas spent more time on diversion than hospitals in nonmetropolitan areas in 2003 through 2004: almost half of hospitals in metropolitan areas NCHS surveyed reported spending more than 1 percent of their total operating time on diversion in 2003 through 2004,<sup>22</sup> compared to 1 in 10 hospitals in

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<sup>20</sup>The average hours spent on diversion in 2003 was 276 hours with a standard error of 42. The average hours spent on diversion in 2006 was 473 hours with a standard error of 73. Standard error is a statistic used to calculate the range of values that expresses the possible difference between the sample estimate and the actual population value.

<sup>21</sup>Diversion data were missing for 3.75 percent of emergency departments in 2003, for 24.1 percent in 2004, for 29.1 percent in 2005, and for 20.5 percent in 2006.

<sup>22</sup>For 2005 and 2006 the sample sizes were insufficient to calculate the average number of hours that nonmetropolitan hospitals reported going on diversion. Therefore, we were not able to compare the number of hours metropolitan and nonmetropolitan hospitals reported spending on diversion.

nonmetropolitan areas.<sup>23</sup> Some hospitals, however, reported that their state or local laws prohibit diversion.<sup>24</sup>

**Table 3: Percentage of Hospitals That Reported Going on Diversion, and Average Hours Hospitals Spent on Diversion in 2003 through 2006**

	2003	2004	2005	2006
Percentage of hospitals that reported going on diversion <sup>a</sup>	44.5	24.8	26.1	27.3
Average hours spent on diversion <sup>b</sup>	276	516	323	473

Source: GAO analysis of NCHS data.

Notes: All estimates in this table are nationally representative.

<sup>a</sup>Diversion data were missing for 3.75 percent of emergency departments in 2003, for 24.1 percent in 2004, for 29.1 percent in 2005, and for 20.5 percent in 2006.

<sup>b</sup>Average is the estimated mean. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value. The standard error for average hours spent on diversion was 42 for 2003, 70 for 2004, 58 for 2005, and 73 for 2006.

Other articles that reported on results from surveys also indicated that diversion has continued to occur in some hospitals. In 2006 and 2007, the American Hospital Association conducted surveys of community hospital chief executive officers that asked how much time hospitals spent on diversion in the previous year.<sup>25</sup> The results from these surveys show that

<sup>23</sup>C. W. Burt and L. F. McCaig, "Staffing, Capacity, and Ambulance Diversion in Emergency Departments: United States, 2003-04," *Advance Data From Vital and Health Statistics*, no. 376 (2006).

<sup>24</sup>For 2003 and 2004, 8 percent of all hospitals reported that their state or local laws prohibit diversion. According to NCHS, some hospitals that reported state laws prohibiting diversion also reported diversion hours. NCHS reported that the reasons for this are unknown but could include respondent or key error, allowable diversions within state laws that prohibit only certain types of diversion, change in state law after the diversion reporting period, or other factors. We did not attempt to validate the number of state or local laws that may govern ambulance diversion.

<sup>25</sup>American Hospital Association, "The State of America's Hospitals," *Taking the Pulse, A Chartpack* (Washington, D.C., April 2006), <http://www.aha.org/aha/research-and-trends/health-and-hospital-trends/2006.html> (accessed June 26, 2008); and American Hospital Association, "The 2007 State of America's Hospitals," *Taking the Pulse*, (Washington, D.C., July 2007), <http://www.aha.org/aha/research-and-trends/health-and-hospital-trends/2007.html> (accessed June 26, 2008).

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some hospitals reported going on diversion.<sup>26</sup> In both American Hospital Association surveys, urban hospitals more often reported diversion hours than rural hospitals. For example, among hospitals responding to the 2006 American Hospital Association survey, about 64 percent of respondents from urban hospitals reported going on diversion, compared to about 17 percent of respondents from rural hospitals. In addition, articles reporting on emergency department crowding in California<sup>27</sup> and Maryland<sup>28</sup> also found that diversion continues to occur and that the time hospitals spent on diversion varied.<sup>29</sup>

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### Wait Times Have Increased and in Some Cases Exceeded Recommended Time Frames

National data from NCHS indicate that wait times in the emergency department have increased and in some cases exceeded recommended time frames. For example, the average wait time to see a physician increased from 46 minutes in 2003 to 56 minutes in 2006.<sup>30</sup> Average wait times also increased for patients in some acuity levels.<sup>31</sup> (See fig. 4.) For

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<sup>26</sup>In its 2006 survey, the American Hospital Association surveyed about 4,900 community hospital chief executive officers and received 1,011 responses, a response rate of 20 percent. Of those hospitals that responded, about 425 hospitals (about 42 percent of respondents) reported going on diversion at least once during the year. In its 2007 survey, the American Hospital Association surveyed about 5,000 community hospital chief executive officers and received 840 responses, a response rate of 17 percent. Of those hospitals that responded to the survey, about 302 hospitals (about 36 percent of respondents) reported going on diversion at least once during the year.

<sup>27</sup>The Abaris Group, *California Emergency Department Diversion Project, Report One* (Oakland, Calif.: California HealthCare Foundation, March 2007). <http://www.caeddiversionproject.com/uploads/CAEDDiversionProjectReportOne3-21-07.pdf> (accessed Sept. 4, 2008).

<sup>28</sup>Maryland Health Care Commission, *Use of Maryland Hospital Emergency Departments: An Update and Recommended Strategies to Address Crowding* (Baltimore, Md., January 2007), [http://mhcc.maryland.gov/hospital\\_services/acute/emergencyroom/](http://mhcc.maryland.gov/hospital_services/acute/emergencyroom/) (accessed Sept. 17, 2008).

<sup>29</sup>In California, the total number of hours that hospitals statewide reported being on diversion decreased overall, from almost 300,000 hours in 2003 to less than 200,000 hours in 2006. The number of hours spent on diversion in individual counties, however, varied over these 3 years, with some counties reporting increases and others reporting decreases. In Maryland, the percentage of time hospitals statewide reported being on diversion increased from 2003 to 2006. Hospitals reported that 9.8 percent and 11.5 percent of their total available hours were spent on diversion in 2003 and 2006, respectively.

<sup>30</sup>NCHS did not collect the average wait time to see a physician in 2001 and 2002.

<sup>31</sup>According to NCHS, from 2003 to 2006 the increases in average wait times to see a physician for visits overall and by emergent, urgent, and semiurgent patients were statistically significant.

emergent patients,<sup>32</sup> the average wait time to see a physician increased from 23 minutes to 37 minutes, more than twice as long as recommended for their level of acuity. For immediate, emergent, urgent, and semiurgent patients, NCHS estimates show that some patients were not seen within the recommended time frames for their acuity level.

**Figure 4: Average Wait Time to See a Physician, and Percentage of Visits in Which Wait Time to See a Physician Exceeded Recommended Time Frames by Acuity Level in 2003 and 2006**

Acuity level <sup>a</sup> (recommended time frame)	Average wait time in minutes <sup>b</sup>		Percentage of visits in which wait time exceeded recommended time frames <sup>c</sup>	
	2003	2006	2003	2006
Immediate <sup>d</sup> (less than 1 minute)	23	28	37.5	73.9
Emergent <sup>d,e</sup> (1 to 14 minutes)		37		50.4
Urgent <sup>e</sup> (15 to 60 minutes)	42	50	17.0	20.7
Semiurgent <sup>e</sup> (greater than 1 hour to 2 hours)	60	68	9.6	13.3
Nonurgent (greater than 2 hours to 24 hours)	69	76	– <sup>f</sup>	– <sup>f</sup>
No triage <sup>g,h</sup>		45	– <sup>i</sup>	– <sup>i</sup>
Unknown <sup>h</sup>	48	66	– <sup>i</sup>	– <sup>i</sup>
All acuity levels	46	56	– <sup>i</sup>	– <sup>i</sup>

Source: GAO analysis of NCHS data.

Notes: All estimates in this figure are nationally representative.

<sup>a</sup>NCHS developed time-based acuity levels based on a five-level emergency severity index recommended by the Emergency Nurses Association. The acuity levels describe the recommended amount of time a patient should wait to be seen by a physician.

<sup>b</sup>Average is the estimated mean. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value. The standard error for average wait time to see a physician in 2003 ranged from 2 to 5 minutes. The standard error for average wait time to see a physician in 2006 ranged from 2 to 6 minutes with the exception of a standard error of 11 minutes for unknown acuity level.

<sup>c</sup>The numbers in these columns represent the percentage of visits with wait times exceeding the recommended amount of time for their acuity level.

<sup>d</sup>NCHS added an immediate wait time category to the NHAMCS survey instrument starting in 2005. For 2003, the emergent category was defined as a visit with a recommended wait time of less than 15 minutes.

<sup>e</sup>According to NCHS, from 2003 to 2006 the increase in average wait time to see a physician for visits by emergent, urgent, and semiurgent patients was statistically significant.

<sup>f</sup>For 2003, wait times in excess of 24 hours were not able to be reported on the NHAMCS survey instrument. For 2006, no emergency departments in the sample reported visits with wait times in excess of 24 hours. As a result, the percentages of nonurgent visits with wait times exceeding the recommended time frame were not available.

<sup>32</sup>NCHS defines emergent patients as patients who, based on triage, are recommended to be seen by a physician within 1 to 14 minutes.

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<sup>a</sup>A visit in which there is no mention of an acuity rating or triage level in the medical record, the hospital did not perform triage, or the patient was dead on arrival.

<sup>b</sup>For 2003, the NHAMCS survey instrument grouped no triage and unknown acuity level into a single category.

<sup>c</sup>Visits with no triage reported or an unknown acuity level did not have an associated recommended amount of time to see a physician. Therefore, percentages of visits with wait times exceeding recommended time frames could not be calculated for these categories of visits, or all acuity levels combined.

The average wait time to see a physician increased in emergency departments in metropolitan areas, and wait times were longer in emergency departments in metropolitan areas than in nonmetropolitan areas in 2006. In metropolitan-area emergency departments, the average wait time to see a physician increased from 51 minutes in 2003 to 60 minutes in 2006. In nonmetropolitan-area emergency departments, the average wait time to see a physician was estimated to be about 26 minutes in 2003 and 33 minutes in 2006.<sup>33</sup> According to NCHS data, the average length of stay in the emergency department and the percentage of visits in which patients left before a medical evaluation also increased. (See table 4.) See appendix IV for additional information about wait times in the emergency department.

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<sup>33</sup>For 2003 and 2006 estimates of average wait time to see physicians at metropolitan hospitals the standard errors are within 2 minutes. For 2003 and 2006 estimates of average wait time to see a physician at nonmetropolitan hospitals the standard errors are within 4 minutes.

**Table 4: Average Length of Stay in the Emergency Department, in Minutes, and Percentage of Visits in Which Patients Left before a Medical Evaluation in 2001 and 2006**

	2001 <sup>a</sup>	2006 <sup>b</sup>
Average length of stay in the emergency department, in minutes		
All hospitals	178	199
Hospitals in metropolitan areas <sup>c</sup>	189	211
Hospitals in nonmetropolitan areas <sup>c</sup>	131	139
Percentage of visits in which patients left before a medical evaluation <sup>d</sup>		
All hospitals	1.5	2.0
Hospitals in metropolitan areas <sup>c</sup>	1.7	2.2
Hospitals in nonmetropolitan areas <sup>c</sup>	0.6	0.9

Source: GAO analysis of NCHS data.

Notes: All estimates in this table are nationally representative.

<sup>a</sup>Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value. The standard error for the average length of stay in the emergency department in 2001 ranged from 4 to 5 minutes.

<sup>b</sup>The standard error for the average length of stay in the emergency department in 2006 ranged from 5 to 7 minutes.

<sup>c</sup>*Metropolitan* describes hospitals identified by NCHS as located in a metropolitan statistical area and *nonmetropolitan* describes hospitals identified by NCHS as not located in a metropolitan statistical area.

<sup>d</sup>NCHS defines the percentage of visits in which patients left before a medical evaluation as the percentage of visits in which the patient left after triage but before receiving any medical care.

## Boarding Continues to Be Reported, but National Data on Boarding Have Been Limited

More than 25 percent of the 197 articles we reviewed discuss the practice of boarding patients in emergency departments, and officials we interviewed noted that the practice of boarding continues. For example, in 2006 IOM reported that boarding continues to occur and has become a typical practice in hospitals nationwide, with the most boarding occurring at large urban hospitals.<sup>34</sup> One article published in a peer-reviewed journal reported that it is not unusual for critically ill patients to board in the emergency department.<sup>35</sup> In addition, officials we interviewed noted that the practice of boarding patients in emergency departments persists. In particular, officials from the Center for Studying Health System Change

<sup>34</sup>Institute of Medicine, Future of Emergency Care, *Hospital-Based Emergency Care: At the Breaking Point* (Washington, D.C.: The National Academies Press, 2006).

<sup>35</sup>L. Fryman and L. Murray, "Managing Acute Head Trauma in a Crowded Emergency Department," *Journal of Emergency Nursing*, vol. 33, no. 3 (2007).

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noted that boarding still occurs in emergency departments and continues to be one of the main indicators of emergency department crowding. Officials from ACEP noted that boarding continues to occur in emergency departments nationwide and remains a concern for emergency physicians and their patients.

National data on the boarding of patients in the emergency department, however, have been limited. In 2006, IOM reported that hospital data systems do not adequately monitor or measure patient flow, and therefore may be limited in their ability to capture data on boarding. For example, few systems distinguish between when a patient is ready to move to another location for care and when that move actually takes place.<sup>36</sup> In addition, from 2001 to 2006, NCHS did not collect data on boarding because, according to NCHS officials, data on boarding were not easily obtained from patient records. A question about emergency department boarding was added to NCHS's NHAMCS questionnaire in 2007; however, data from this survey were not available at the time we conducted our analysis. Other articles that reported on results of surveys conducted by professional associations supported officials' statements that boarding has been widespread. For example, in an article reporting on a 2005 ACEP survey of emergency department directors with a 30 percent response rate, 996 of the 1,328 respondents reported that they boarded patients for at least 4 hours on a daily basis and more than 200 respondents reported that they did so for more than 10 patients per day on average.<sup>37</sup>

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### Articles and Officials Discussed the Effect of Crowding and Strategies for Decreasing Diversion, Wait Times, and Boarding

Ten of the articles we reviewed and officials from ACEP and the Society for Academic Emergency Medicine whom we interviewed raised concerns about the adverse effect of diversion, wait times, or boarding on the quality of patient care, but quantitative evidence of this effect has been limited. Officials from ACEP reported that research has begun to analyze the effect of crowding on patient quality of care, and that anecdotal reports indicate patients are being harmed. Ten of the articles we reviewed discussed the effect of diversion, wait times, or boarding on quality of care. One of these articles, the 2006 IOM report, noted that ambulance diversion could lead to catastrophic delays in treatment for seriously ill or injured patients and that boarding may enhance the potential for errors,

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<sup>36</sup>Institute of Medicine, *Hospital-Based Emergency Care*, 154.

<sup>37</sup>American College of Emergency Physicians, *On-call Specialist Coverage in U.S. Emergency Departments* (Irving, Tex., 2006).



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delays in treatment, and diminished quality of care.<sup>38</sup> Other articles—some of which were published in peer-reviewed journals—also discussed the effect of crowding on the quality of patient care, including the following:

- An examination of the relationship between trauma death rates and hospital diversion, which suggested that death rates for trauma patients at two hospitals may be correlated with diversion at these hospitals.<sup>39</sup>
- A review of 24 hospital emergency departments that suggested when an emergency department experienced an increase in the number of patients leaving before a medical evaluation, fewer patients with pneumonia at the emergency department received antibiotics within the recommended 4 hours.<sup>40</sup>
- Information from a database of 90 hospitals that showed patients who were boarded in the emergency department for more than 6 hours before being transferred to the hospital's intensive care unit had an almost 5 percent higher in-hospital mortality rate than those who were boarded for less than 6 hours.<sup>41</sup>
- Five other articles reported potential associations between diversion, boarding, and wait times and decreased quality of patient care, including articles on the effect of increasing wait times for nonurgent patients in the emergency department and delayed treatment time for those patients who left before a medical evaluation.

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<sup>38</sup>Institute of Medicine, *Hospital-Based Emergency Care*, 4.

<sup>39</sup>C. E. Begley et al., "Emergency Department Diversion and Trauma Mortality: Evidence from Houston, Texas," *The Journal of Trauma, Injury, Infection, and Critical Care*, vol. 57, no. 6 (2004).

<sup>40</sup>J. M. Pines et al., "The Association between Emergency Department Crowding and Hospital Performance on Antibiotic Timing for Pneumonia and Percutaneous Intervention for Myocardial Infarction," *Academic Emergency Medicine*, vol. 13 no. 8 (2006). The Joint Commission (formerly the Joint Commission on Accreditation of Healthcare Organizations) and the Centers for Medicare & Medicaid Services have published measures of emergency department quality, including the percentage of patients with community-acquired pneumonia that receive antibiotics within 4 hours of presenting at an emergency department.

<sup>41</sup>D. B. Chalfin et al., "Impact of Delayed Transfer of Critically Ill Patients from the Emergency Department to the Intensive Care Unit," *Critical Care Medicine*, vol. 35, no. 6 (2007).

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While these studies support the widely held assertion that emergency department crowding adversely affects the quality of patient care, a 2006 National Health Policy Forum<sup>42</sup> report stated that the consequences of crowded emergency departments on quality of care have not been studied comprehensively and therefore little quantitative evidence is available to confirm this assumption.<sup>43</sup> Officials from the Society for Academic Emergency Medicine reported that diversion, wait times, and boarding can contribute to reduced quality of care and worse patient outcomes. In addition, officials from both ACEP and the Society for Academic Emergency Medicine noted that additional studies about the effects of diversion, wait times, and boarding on quality of care are needed.

Articles we reviewed, and officials and an expert we interviewed, discussed a number of strategies that have been proposed, and in some cases tested, that could decrease emergency department crowding. These strategies relate to the three interdependent components—input, throughput, and output—of the model of emergency department crowding developed by researchers. While several of these strategies have been tested, the assessment of their effects has generally been limited to one or a few hospitals and we found no research assessing these strategies on a state or national level. Table 5 outlines some strategies to address emergency department crowding and, to the extent they have been tested, the assessment of their effects on the indicators of crowding.

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<sup>42</sup>The National Health Policy Forum is a nonpartisan organization that provides information on health policy issues and works to foster more informed government decision making. It serves primarily senior staff in Congress, the executive branch, and congressional support agencies.

<sup>43</sup>J. Taylor, *Don't Bring Me Your Tired, Your Poor: The Crowded State of America's Emergency Departments* (Washington, D.C.: National Health Policy Forum, 2006).

**Table 5: Strategies to Address Indicators of Emergency Department Crowding**

Strategy	Description of strategy	Assessment of the strategy's effect on indicator(s) of crowding
<b>Strategies related to emergency department input</b>		
Changing diversion policies for the community	A community developed a policy that specified when and under what conditions a hospital was allowed to go on diversion. For example, hospital officials were required to have a process in place that ensured all resources in the hospital were exhausted before going on diversion.	An analysis comparing diversion hours before and after implementation of a new diversion policy found that this strategy reduced the hours on diversion by 74 percent in a community of 17 hospitals. <sup>a</sup>
Physician-directed ambulance destination-control program	Emergency medical service providers were asked to call a dedicated telephone number that was staffed by attending physicians. A destination-control physician determined the optimal patient destination by using patient and system variables as well as emergency medical service providers' and patients' input.	An analysis comparing the diversion hours with and without this program at two hospitals found that this program reduced the hours on diversion by 41 percent at one hospital and 61 percent at the other hospital. <sup>b</sup>
State policy prohibiting diversion	State officials developed a policy that would prohibit hospitals from going on diversion unless the hospital is inoperable under certain conditions.	Officials from the state of Massachusetts issued a letter stating that hospitals would no longer be allowed to go on diversion unless the hospital was inoperable; however, this policy was implemented in January 2009 and the effect on diversion had not yet been analyzed. <sup>c</sup>
<b>Strategies related to emergency department throughput</b>		
A fast-track system	A system that allowed nonurgent patients to be treated in less time because these patients can be seen by a medical provider other than a physician.	An analysis comparing wait times before and after implementation of a fast-track system at one hospital found that this strategy reduced both the amount of time patients waited to be seen by a physician and the number of patients who left before a medical evaluation by 50 percent. <sup>d</sup>
A point-of-care testing satellite laboratory	A testing laboratory was set up in close proximity to the emergency department and staffed with a research nurse and laboratory technicians. These staff made rounds to the emergency department to collect specimens every 15 minutes and reported results directly to clinicians in the emergency department by telephone or by fax.	An analysis reviewing effects of implementation of a point-of-care testing laboratory in a large university-associated urban hospital found that turnaround times for test results were reduced by an average of 87 percent and length of stay in the emergency department decreased for some patients by an average of 41 minutes. <sup>e</sup>
A rapid entry and accelerated care at triage process	A hospital computer system was revised to integrate the emergency department computer system with the computer system for the rest of the hospital, creating a new process when entering data for patients at triage. This process allowed staff to eliminate some of the administrative work associated with patients entering the emergency department.	An analysis comparing wait times before and after initiation of this process at one hospital found the process significantly decreased both the rate of patients leaving before being seen and average wait times. The rate of patients leaving before being seen decreased by 3.3 percent and the average wait time decreased by 24 minutes. <sup>f</sup>

Strategy	Description of strategy	Assessment of the strategy's effect on indicator(s) of crowding
Bedside registration	During times when emergency department rooms or beds were available, patients were transported immediately after triage to a patient-care area where they could be simultaneously seen by medical staff and registered at the bedside by a registration clerk.	An analysis of treatment time before and after implementation of bedside registration at one hospital found a small, significant decrease of 13 minutes for treatment time after bedside registration was implemented. However, this decrease did not last and treatment time even increased a year after bedside registration was implemented at this hospital. <sup>g</sup>
<b>Strategies related to emergency department output</b>		
Increase the capacity of the adult intensive care unit	A hospital expanded the number of beds in its adult intensive care unit from 47 to 67 beds.	An analysis comparing diversion hours before and after the number of adult intensive care unit beds had increased at one hospital found that hours on diversion decreased by 66 percent. <sup>h</sup>
Boarding in the inpatient hallways	A system for moving nonurgent patients admitted to the hospital to inpatient hallways instead of boarding them in emergency department hallways.	Not analyzed in published articles <sup>j</sup>
A pull system in the hospital	Staff on inpatient floors played an active role in placing emergency department patients into available beds.	Not analyzed in published articles <sup>k</sup>
Streamlining of elective surgery schedules	The strategy will streamline elective surgery schedules to make elective daily admission volume even, and increase the opportunity for emergency department admissions.	Case studies were conducted at several hospitals to determine the influence of reducing the variability of elective surgical scheduling. In one hospital, waiting times for emergent and urgent surgeries has been reduced by about 33 percent despite a 30 percent increase in their volumes. <sup>l</sup>

Source: GAO analysis of articles published between January 1, 2003, and August 31, 2008, and interviews.

<sup>g</sup>P. B. Patel et al., "Ambulance Diversion Reduction: the Sacramento Solution," *American Journal of Emergency Medicine*, vol. 24, no. 2 (2006).

<sup>h</sup>M. N. Shah et al., "Description and Evaluation of a Pilot Physician-directed Emergency Medical Services Diversion Control Program," *Academic Emergency Medicine*, vol. 13, no. 1 (2006).

<sup>i</sup>The Commonwealth of Massachusetts, Executive Office of Health and Human Services, Department of Public Health, Circular Letter: DHCQ 08-07-494 (Boston, Mass., July 3, 2008).

<sup>j</sup>M. Sanchez et al., "Effects of a Fast-Track Area on Emergency Department Performance," *The Journal of Emergency Medicine*, vol. 31, no. 1 (2006).

<sup>k</sup>E. Lee-Lewandrowski et al., "Implementation of a Point-of-Care Satellite Laboratory in the Emergency Department of an Academic Medical Center Impact on Test Turnaround Time and Patient Emergency Department Length of Stay," *Archives of Pathology & Laboratory Medicine*, vol. 127, no. 4 (2003).

<sup>l</sup>T. C. Chan et al., "Impact of Rapid Entry and Accelerated Care at Triage on Reducing Emergency Department Patient Wait Times, Lengths of Stay, and Rate of Left Without Being Seen," *Annals of Emergency Medicine*, vol. 46, no. 6 (2005).

<sup>m</sup>K. M. Takakuwa, F. S. Shofer, and S. B. Abbuhl, "Strategies for Dealing with Emergency Department Overcrowding: A One-Year Study on How Bedside Registration Affects Patient Throughput Times," *The Journal of Emergency Medicine*, vol. 32, no. 4 (2007).

<sup>n</sup>K. J. McConnel et al., "Effect of Increased ICU Capacity on Emergency Department Length of Stay and Ambulance Diversion," *Annals of Emergency Medicine*, vol. 45, no. 5 (2005).

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<sup>1</sup>C. Garson et al., "Emergency Department Patient Preferences for Boarding Locations When Hospitals Are at Full Capacity," *Annals of Emergency Medicine*, vol. 51, no. 1 (2008).

<sup>2</sup>While researchers have proposed this strategy to alleviate crowding, analysis has not been published in articles we reviewed to determine if this strategy would decrease boarding.

<sup>3</sup>M. Wilson and K. Nguyen, "Bursting at the Seams, Improving Patient Flow to Help America's Emergency Departments," (Washington, D.C.: Urgent Matters, September 2004), [http://www.urgentmatters.org/reports/UM\\_WhitePaper\\_BurstingAtTheSeams.pdf](http://www.urgentmatters.org/reports/UM_WhitePaper_BurstingAtTheSeams.pdf) (accessed Sept. 30, 2008).

<sup>4</sup>Description of strategy and assessment based on conversation with a subject-matter expert who oversaw these efforts. Additional information is also available on [www.bu.edu/mvp](http://www.bu.edu/mvp) (accessed on Apr. 9, 2009).

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## Available Information Suggests Lack of Access to Inpatient Beds Is the Main Factor Contributing to Crowding, and Other Factors May Also Contribute

Available information suggests that a lack of access to inpatient beds is the main factor contributing to emergency department crowding. Additionally, other factors—a lack of access to primary care, a shortage of available on-call specialists, and difficulties transferring, admitting, or discharging psychiatric patients—have also been reported as contributing to crowding.

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## Articles and Subject-Matter Experts Have Reported a Lack of Access to Inpatient Beds as the Main Factor Contributing to Crowding

Of the 77 articles we reviewed that discussed factors contributing to crowding, 45 articles reported a lack of access to inpatient beds as a factor contributing to emergency department crowding, with 13 of these articles<sup>44</sup> reporting it was the main factor contributing to crowding.<sup>45</sup> (See table 6.) In addition, two individual subject-matter experts we interviewed also reported a lack of access to inpatient beds as the main factor that contributes to emergency department crowding. When inpatient beds are not available for ill and injured patients who require hospital admission, the emergency department may board them, and these patients take up extra treatment spaces and emergency department resources, leaving fewer resources available for other patients.

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<sup>44</sup>See for example, American College of Emergency Physicians, *Emergency Department Crowding: High-Impact Solutions* (Irving, Tex., 2008).

<sup>45</sup>No factor other than a lack of inpatient beds was reported in the articles we reviewed as the main factor contributing to crowding. The next factor most commonly reported as one of a number of factors contributing to crowding was a lack of access to primary care, reported in 22 articles.

**Table 6: Number of Articles Reviewed That Reported Factors Contributing to Emergency Department Crowding**

Factor	Number of articles reporting this factor as one of a number of factors contributing to crowding
Lack of access to inpatient beds	45
Lack of access to primary care	22
Shortage of available on-call specialists	7
Difficulty transferring, admitting, or discharging psychiatric patients	3
Other factors <sup>a</sup>	15
<b>Total number of articles reporting factors contributing to emergency department crowding</b>	<b>77</b>

Source: GAO analysis of articles published on or between January 1, 2003, and August 31, 2008.

Notes: Numbers do not sum to total because some articles reported more than one factor.

<sup>a</sup>Five other factors—an aging population, increasing acuity of patients, staff shortages, hospital processes, and financial factors—were mentioned in 15 articles. During our interviews with officials and individual subject-matter experts, however, there was little mentioned about these factors and how they contribute to crowding.

One of the reasons that emergency departments are unable to move admitted patients to inpatient beds may be due to competition between emergency department admissions and scheduled hospital admissions—for example, for elective surgical procedures—which we also reported on in 2003. This reason was reported by 9 articles we reviewed and by officials from ACEP, the Society for Academic Emergency Medicine, the Center for Studying Health System Change, and three individual subject-matter experts whom we interviewed. In 2006, IOM reported that hospitals might prefer scheduled admissions over admissions from the emergency department because emergency department admissions are considered to be less profitable.<sup>46</sup> One reason that admissions from the emergency department are considered to be less profitable is because these admissions tend to be for medical conditions, such as heart failure and pneumonia, rather than surgical procedures, such as joint replacement surgeries and scheduled cardiovascular procedures. Available data from AHRQ’s 2006 Healthcare Cost and Utilization Project<sup>47</sup> show all 20 of the

<sup>46</sup>Institute of Medicine, *Hospital-Based Emergency Care*, 137.

<sup>47</sup>Data we reviewed from AHRQ came from the Nationwide Inpatient Sample, which is one of a number of databases and software tools AHRQ developed as part of the Healthcare Cost and Utilization Project.

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most-prevalent diagnosis-related groups (DRG)<sup>48</sup> associated with admissions from the emergency department in 2006 were for medical conditions rather than surgical procedures. In contrast, 7 of the 20 most-prevalent DRGs for nonemergency department admissions in 2006 were for surgical conditions. Officials from the Society for Academic Emergency Medicine told us that because treating surgical conditions is considered more profitable for a hospital than treating emergency medical conditions, hospitals had an incentive to reserve beds for scheduled surgical admissions rather than to give them to patients admitted from the emergency department.<sup>49</sup>

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### Additional Factors Reported as Contributing to Crowding

Available information suggests that other factors also contribute to emergency department crowding including a lack of access to primary care, a shortage of available on-call specialists, and difficulties transferring, admitting, or discharging psychiatric patients.

#### Lack of Access to Primary Care

Twenty-two articles we reviewed reported a lack of access to primary care as a factor contributing to emergency department crowding. For example, one of these articles reported that difficulty in receiving care from a primary care provider was associated with an increase in nonurgent emergency department use.<sup>50</sup> Another article described a study in New Jersey that indicated that almost one-half of all emergency department visits within the state that did not result in hospital admission could have been avoided with improved access to primary care services.<sup>51</sup>

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<sup>48</sup>The Centers for Medicare & Medicaid Services uses DRGs to establish payment rates for hospitals that provide medical and surgical services to patients with Medicare.

<sup>49</sup>In addition, available data from AHRQ's Healthcare Cost and Utilization Project indicate that the source of payment for admissions from the emergency department differs in some cases from the source of payment for admissions for elective surgeries. For example, for 2006, AHRQ estimates that of hospital admissions from the emergency department, the source of payment was private insurance for 25 percent of admissions, Medicare for 49 percent of admissions, Medicaid for 15 percent of admissions, uninsured for 8 percent of admissions, and other sources for 4 percent of admissions. In the same year, AHRQ estimates that of hospital admissions for elective surgeries, the source of payment was private insurance for 46 percent of admissions, Medicare for 32 percent of admissions, Medicaid for 15 percent of admissions, uninsured for 3 percent of admissions, and other sources for 4 percent of admissions.

<sup>50</sup>D. C. Brousseau et al., "The Effect of Prior Interactions with a Primary Care Provider on Nonurgent Pediatric Emergency Department Use," *Archives of Pediatric & Adolescent Medicine*, vol. 158, no. 1 (2004).

<sup>51</sup>D. DeLia, *Potentially Avoidable Use of Hospital Emergency Departments in New Jersey* (New Brunswick, N.J.: Rutgers Center for State Health Policy, 2006).

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Additionally, officials from the Center for Studying Health System Change and the Society for Academic Emergency Medicine mentioned a lack of access to primary care as a factor contributing to emergency department crowding. When patients do not have a primary care physician, or cannot obtain an appointment with a primary care physician, they may go to the emergency department to seek primary care services. In addition, patients who do not have access to primary care may defer care until their condition has worsened, potentially increasing the emergency department resources needed to treat the patient's condition. These situations involve patients that could have been treated outside of the emergency department and may add to the number of patients seeking care at the emergency department.

Articles we reviewed provided conflicting information on the effect of increasing numbers of uninsured patients on emergency department crowding. Five of the 22 articles that mentioned a lack of access to primary care as a factor also reported that increasing numbers of uninsured patients also contributed to emergency department crowding. For example, 1 article indicated that a reason for longer wait times at 30 California hospitals in lower-income areas was that these hospitals treat a disproportionate number of uninsured patients who may lack access to primary care.<sup>52</sup> Two other articles we reviewed, however, suggested that increasing numbers of uninsured patients is not a factor contributing to crowding. For example, the Center for Studying Health System Change reported that contrary to the popular belief that uninsured people are the major cause of increased emergency department use, insured Americans accounted for most of the 16 percent increase in visits between 1996 through 1997 and 2000 through 2001.<sup>53</sup> In addition, officials from AHRQ noted that a larger proportion of patients using the emergency department are insured than uninsured.

#### Shortage of Available On-Call Specialists

Seven articles and officials from the Center for Studying Health System Change, ACEP, the American Hospital Association, and the American Medical Association whom we interviewed reported that a shortage of on-call specialists available to emergency departments is a factor that

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<sup>52</sup>S. Lambe et al., "Waiting Times in California's Emergency Departments," *Annals of Emergency Medicine*, vol. 41, no. 1 (2003).

<sup>53</sup>P. Cunningham and J. May, "Insured Americans Drive Surge in Emergency Department Visits," *Issue Brief*, no. 70 (Washington, D.C.: Center for Studying Health System Change, October 2003).



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contributes to emergency department crowding. Hospitals often employ on-call specialists, meaning specialists such as neurosurgeons or orthopedic surgeons who only travel to the hospital or emergency department when needed and called. When patients wait for long periods in the emergency department for an on-call specialist who is not immediately available—for example, busy covering other hospitals or in surgery—these patients might not receive timely and appropriate care. In addition, these patients may utilize treatment spaces and resources that could be used to treat other patients, potentially crowding the emergency department.

In 2006 IOM reported that over the preceding several years, hospitals had found it increasingly difficult to secure specialists for their emergency department patients.<sup>54</sup> Additionally, another article reported the results of a 2007 American Hospital Association survey of hospital chief executive officers that asked about maintaining on-call specialist coverage for the emergency department.<sup>55</sup> While this survey had a low response rate, it indicates that hundreds of emergency departments reported experiencing difficulty in maintaining on-call coverage for certain specialists. For example, of those chief executive officers that responded to the survey (840 chief executive officers; 17 percent of those surveyed), 44 and 43 percent noted difficulty in maintaining emergency department on-call coverage for orthopedic surgeons and neurosurgeons, respectively. Additionally, officials from the Center for Studying Health System Change told us that delays in obtaining specialty services may contribute to crowding. None of the articles we reviewed, nor officials or individual subject-matter experts we interviewed, quantitatively assessed the relationship between the availability of on-call specialists and emergency department crowding.

### Difficulties in Transferring, Admitting, or Discharging Psychiatric Patients

Three articles we reviewed and officials from NCHS, ACEP, and the Center for Studying Health System Change whom we interviewed reported difficulties transferring, admitting, or discharging psychiatric patients from the emergency department as a factor contributing to emergency department crowding. One of these articles reported the results of a national ACEP survey of emergency physicians that asked about

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<sup>54</sup>Institute of Medicine, *Hospital-Based Emergency Care*, 218.

<sup>55</sup>American Hospital Association, “The 2007 State of America’s Hospitals,” *Taking the Pulse* (Washington, D.C., July 2007), <http://www.aha.org/aha/research-and-trends/health-and-hospital-trends/2007.html> (accessed June 26, 2008).

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psychiatric patients in the emergency department.<sup>56</sup> Of the physicians responding to the survey (328 physicians; approximately 23 percent of those surveyed), about 40 percent reported that, on average, psychiatric patients waited in the emergency department for an inpatient bed longer than 8 hours after the decision to admit them had been made, including about 9 percent who reported that psychiatric patients waited more than 24 hours. Medical patients in the emergency department—those diagnosed with nonpsychiatric conditions—generally waited less time for an inpatient bed: 7 percent of responding physicians reported that, on average, medical patients waited longer than 8 hours after the decision to admit them had been made; slightly less than 1 percent reported that the medical patients waited more than 24 hours. In addition, the survey respondents indicated psychiatric patients waiting to be transferred or discharged added to the burden of an already crowded emergency department and affected access for all patients requiring care. Also, officials from NCHS said that psychiatric patients in the emergency department are a national concern because they are frequent visitors to the emergency department and they may spend more than 24 hours in an emergency department.

National data from NCHS show that, in 2006, psychiatric patients constituted a small percentage of emergency department visits but had a longer average length of stay in the emergency department. Almost 3 percent of emergency department visits in 2006 were by patients presenting with a complaint of a psychological or mental disorder and these patients had an average length of stay in the emergency department that was longer than the average length of stay for all other visits (397 minutes, compared to 194 minutes for all other visits).<sup>57</sup> Emergency department patients with psychiatric disorders may need to be isolated from other patients and may require resources that are not available in many hospitals. Hospital emergency departments often have limited or no specialized psychiatric facilities and emergency department staff may experience difficulties transferring such patients to other facilities, admitting them to the hospital, or discharging them from the emergency

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<sup>56</sup>American College of Emergency Physicians, *ACEP Psychiatric and Substance Abuse Survey 2008* (Dallas, Tex., 2008).

<sup>57</sup>The standard error is within 80 minutes for average length of stay in the emergency department for patients presenting with a complaint of a psychological or mental disorder in 2006. The standard error is within 4 minutes for average length of stay in the emergency department for all other patients in 2006.

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department. Additionally, emergency department staff may spend a disproportionate amount of time and resources caring for psychiatric patients while these patients wait for transfer, admission, or discharge.

### Other Possible Factors That Contribute to Crowding

Our literature review identified five other factors that may contribute to emergency department crowding. For example, in 2006 IOM reported these five factors—an aging population, increasing acuity of patients, staff shortages, hospital processes, and financial factors—as possible factors that might contribute to emergency department crowding,<sup>58</sup> and these five factors were also mentioned in 14 other articles we reviewed. However, during our interviews with officials and individual subject-matter experts, there was little mentioned about these factors and how they contribute to crowding.

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## Agency Comments and Our Evaluation

HHS provided comments on a draft of this report, which are included in appendix V. In its comments, HHS noted that the report demonstrates that emergency department wait times continue to increase and frequently exceed national standards. HHS also commented that strengths of the report include its clarity, focus, and tone.

In addition, HHS commented on the scope of the report and limitations of the indicators used in it. HHS suggested that the information provided in the report would be strengthened by inclusion of articles published prior to 2003 and articles reporting on studies conducted outside of the United States. We focused our literature review on articles published since 2003 to review information made available since we issued our 2003 report. And while articles reporting on studies conducted outside of the United States may include valuable information regarding aspects of emergency department crowding as it occurs in other countries, we reviewed articles reporting on studies conducted in the United States because our focus was on the U.S. health care system. HHS also commented that the indicators of crowding that we used had limitations. As we noted both in our 2003 report and in this report, these indicators have limitations but, in the absence of a widely accepted standard measure of crowding, they are used by researchers to point to situations in which crowding is likely occurring.

HHS also provided technical comments, which we incorporated as appropriate.

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<sup>58</sup>Institute of Medicine, *Hospital-Based Emergency Care*, 39, 56, 129, 137.

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the Secretary of Health and Human Services and other interested parties. The report will be available at no charge on GAO's Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-7114 or [crossem@gao.gov](mailto:crossem@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff members who made major contributions to this report are listed in appendix VI.

Sincerely yours,

A handwritten signature in black ink that reads "Marcia Crosse". The signature is written in a cursive style with a long horizontal line extending to the right.

Marcia Crosse  
Director, Health Care

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# Appendix I: Scope and Methodology

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To examine national data made available since 2003 on emergency department diversion and wait times, we obtained and reviewed data collected by the National Center for Health Statistics (NCHS) through its National Hospital Ambulatory Medical Care Survey (NHAMCS).<sup>1</sup> We analyzed available NCHS data<sup>2</sup> for 2001 through 2006 on diversion<sup>3</sup> and wait times<sup>4</sup> to determine what changes, if any, have occurred over time. We analyzed wait time data by patient acuity level<sup>5</sup> and hospital characteristics, such as hospital ownership,<sup>6</sup> metropolitan or

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<sup>1</sup>NCHS annually collects national health statistical information on hospital emergency department utilization in the United States using a nationally representative survey, the NHAMCS. NCHS uses the NHAMCS to gather, analyze, and disseminate information on visits to emergency and outpatient departments of nonfederal, short-stay, and general hospitals in the United States. A complex, multistage sample design is used in the NHAMCS, which includes primary sampling units (geographic areas such as counties or groups of counties), hospitals within these units, clinics within outpatient departments, and patient visits within emergency departments and clinics. Sample data are weighted to produce national estimates. The scope of the emergency department component of the NHAMCS includes emergency departments that are staffed and operated 24 hours a day.

<sup>2</sup>The data provided by NCHS were estimates. Each estimate has a standard error associated with it. For the purposes of this report, we report standard errors for averages.

<sup>3</sup>NCHS began collecting data on diversion in a supplement to the NHAMCS that covered the 2-year period of 2003 through 2004. Beginning in 2005, NCHS included a question about diversion on the NHAMCS. Due to the low response rates for the NHAMCS questions about diversion in 2004, 2005, and 2006, we were unable to analyze diversion by characteristics such as hospital type or geographic region. For 2005 and 2006 the sample sizes were insufficient to calculate the number of hours that nonmetropolitan hospitals reported being on diversion. Therefore, we were not able to compare the number of hours metropolitan and nonmetropolitan hospitals reported spending on diversion for those years.

<sup>4</sup>NCHS did not collect data on wait times to see a physician in 2001 or 2002.

<sup>5</sup>To measure severity of illness, NCHS developed time-based acuity levels based on a five-level severity index recommended by the Emergency Nurses Association. The acuity levels describe the recommended amount of time a patient should wait to be seen by a physician. In the 2006 NHAMCS, NCHS collected data on five levels of acuity: immediate, emergent, urgent, semiurgent, and nonurgent.

<sup>6</sup>NCHS uses voluntary nonprofit, government, and proprietary to distinguish hospital ownership. NCHS defines a government-owned hospital as a hospital operated by a state, county, city, city-county, or hospital district or authority.

nonmetropolitan area location,<sup>7</sup> and geographic region.<sup>8</sup> We analyzed wait times in the emergency department using NCHS's data on recommended time for a patient to see a physician based on patient acuity levels. Further, to determine the average length of stay in the emergency department for patients who presented with a psychological or mental disorder, we analyzed emergency department length of stay by the type of patient complaint at time of the visit. We also analyzed NCHS data on emergency department utilization by payer source, including Medicare, Medicaid, and the State Children's Health Insurance Program,<sup>9</sup> self pay, no charge or charity care; and by hospital characteristics, such as whether the hospital was located in a metropolitan or nonmetropolitan area, to provide context for our work. We also reviewed and analyzed data from the Agency for Healthcare Research and Quality's (AHRQ) Healthcare Cost and Utilization Project<sup>10</sup> to determine the diagnosis-related groups (DRG)<sup>11</sup> most commonly associated with hospital admissions from the emergency department and most commonly associated with non-emergency department admissions—information we determined was related to

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<sup>7</sup>For the purpose of this report, we use the term *metropolitan area* to indicate facilities and visits identified by NCHS as occurring in a metropolitan statistical area as defined by the Office of Management and Budget, and *nonmetropolitan area* to indicate facilities and visits identified by NCHS as not in a metropolitan statistical area. The Office of Management and Budget defines a metropolitan statistical area as an area containing a core-based statistical area associated with at least one urbanized area that has a population of at least 50,000, plus adjacent counties having a high degree of social and economic integration with the core as measured through commuting ties with counties contained in the core.

<sup>8</sup>NCHS categorizes geographic regions in the NHAMCS as Northeast, Midwest, South, and West as defined by the U.S. Census Bureau.

<sup>9</sup>Medicare is the federal health program that covers seniors aged 65 and older and eligible disabled persons. Medicaid is the joint federal and state program that finances health care for certain low-income individuals. The State Children's Health Insurance Program finances health care for low-income, uninsured children whose family incomes exceed the eligibility limits under their state's Medicaid program.

<sup>10</sup>AHRQ sponsors the Healthcare Cost and Utilization Project, which is a family of health care databases and related software tools and products developed through a federal-state-industry partnership. The Healthcare Cost and Utilization Project databases bring together the data-collection efforts of state data organizations, hospital associations, private data organizations, and the federal government to create a national information resource of patient-level health care data. Data we reviewed from AHRQ came from the Nationwide Inpatient Sample, which is one of a number of databases and software tools AHRQ developed as part of the Healthcare Cost and Utilization Project.

<sup>11</sup>The Centers for Medicare & Medicaid Services uses DRGs to establish payment rates for hospitals that provide medical and surgical services to Medicare beneficiaries.

factors that contribute to crowding.<sup>12</sup> We obtained NCHS and AHRQ data beginning with 2001 because these data became publicly available in 2003 or later, meeting the criterion for inclusion in our analysis. Some data were not available from NCHS for all years between 2001 and 2006 because of revisions made by NCHS to questions on surveys used to collect information and because of low response rates to certain questions on these surveys. At the time we conducted our analysis, the most recent year for which data were available from NCHS and AHRQ was 2006. In this report, we present NCHS estimates; for those cases in which we report an increase or other comparison of these estimates, NCHS tested the differences and found them statistically significant.<sup>13</sup> To assess the reliability of national data from NCHS and AHRQ, we interviewed agency officials and reviewed the methods they used for collecting and reporting these data. We resolved discrepancies we found between the data provided to us and data in published reports by corresponding with officials from NCHS to obtain sufficient explanations for the differences.<sup>14</sup> Based on these steps, we determined that these data were sufficiently reliable for our purposes.

To examine information available since 2003 about three indicators of emergency department crowding and the factors that contribute to crowding, we conducted a literature review. In examining information made available since 2003 about indicators and factors of crowding during our literature review, we analyzed articles for what was reported on the effect of crowding on patient quality of care and proposed strategies to address crowding. We conducted a structured search of 16 databases that included peer-reviewed journal articles and other periodicals to capture articles published on or between January 1, 2003, and August 31, 2008. We

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<sup>12</sup>We also analyzed data from AHRQ's Healthcare Cost and Utilization Project on the source of payment for hospital admissions from the emergency department and admissions not from the emergency department in 2006.

<sup>13</sup>In addition, for those cases in which we present averages based on NCHS data, we are presenting the estimated mean and as well as the standard error of the estimate. Standard error is a statistic used to calculate the range of values that expresses the possible difference between the sample estimate and the actual population value.

<sup>14</sup>For example, we compared data on the estimated number of emergency departments operating in the United States in 2006 from NCHS with the number of emergency departments operating in the United States in 2006 from the American Hospital Association and found differences. We discussed the discrepancy with NCHS officials and, because we chose in this report to use other NCHS estimates, we used NCHS's estimates of the number of emergency departments throughout the report.

searched these databases for articles with key words in their title or abstract related to emergency department crowding, or indicators and factors of crowding, such as versions of the word “crowding,” “emergency department,” “diversion,” “wait time,” and “boarding.” We also included articles published on or between January 1, 2003, and August 31, 2008, that were identified as a result of our interviews with federal officials, professional and research organizations, and subject-matter experts. We also searched related Web sites for additional emergency department crowding publications, including articles reporting on surveys conducted by professional organizations, such as the American Hospital Association. For these articles, we identified the number of respondents and response rates, and for those with lower response rates, we noted them in our report. From all of these sources, we identified over 300 articles, publications and reports (which we call articles) published from January 1, 2003, through August 31, 2008. Within the more than 300 articles, we excluded articles that were published outside of the United States, reported on subjects or data from outside the United States, were only available in an abstract form, had a focus other than day-to-day emergency department operations, or were unrelated to emergency department crowding. We supplemented the articles that were not excluded from our search by reviewing references contained in the bibliography of these articles for additional articles published on or between January 1, 2003, and August 31, 2008, on emergency department crowding that met our inclusion criteria. In total, we included 197 articles<sup>15</sup> in our literature review and analyzed these articles to summarize information on emergency department crowding, including information on diversion, wait times, and boarding, the effect of these indicators of crowding on quality of care, proposed strategies to decrease these indicators, and factors that contributed to emergency department crowding. To review a complete bibliography of these articles, see [GAO-09-348SP](#).

Additionally, we interviewed officials from federal agencies and one state agency, officials from professional, research, and other hospital-related organizations, and individual subject-matter experts to obtain and review

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<sup>15</sup>For the literature review, we included articles reporting results of quantitative analysis, commentaries, articles reporting on literature reviews, or other articles, including those identified as a result of our interviews with officials and individual subject-matter experts, and from searches of related Web sites. In total, we reviewed 80 articles reporting on quantitative analysis, 64 commentaries, 8 articles reporting on literature reviews, and 45 other articles.



information on indicators of emergency department crowding and factors that contribute to crowding. During our interviews, we asked about the effect of crowding on patient quality of care and proposed strategies for addressing crowding. We interviewed federal officials from the Department of Health and Human Services' Centers for Medicare & Medicaid Services and the Office of the Assistant Secretary for Preparedness and Response, and officials from NCHS and AHRQ who have conducted research on emergency department utilization and crowding. We also interviewed officials from the Massachusetts Department of Public Health to discuss the state's planned implementation of a new diversion policy in January 2009. We interviewed officials from professional organizations, including the American College of Emergency Physicians (ACEP), the American Hospital Association, the American Medical Association, the Emergency Nurses Association, the National Association of EMS Physicians, and the Society for Academic Emergency Medicine. Some officials from ACEP and the Society for Academic Emergency Medicine have published research in peer-reviewed journals. In addition, we interviewed officials from research organizations, such as the California Healthcare Foundation, the Center for Studying Health System Change,<sup>16</sup> the Heritage Foundation, and the Robert Wood Johnson Foundation's Urgent Matters. We interviewed officials from the Joint Commission (an organization involved in hospital accreditation), the Medicare Payment Advisory Commission (an organization that studies Medicare payment issues and reports to Congress), and the National Quality Forum (an organization that develops quality measures for emergency department care). We also interviewed three individual subject-matter experts who have conducted research on emergency department crowding and strategies to reduce crowding.

We conducted this performance audit from May 2008 through April 2009 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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<sup>16</sup>Officials at the Center for Studying Health System Change are researchers who interviewed providers from across the country.

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# Appendix II: Emergency Department Utilization, 2001 through 2006

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This appendix provides information on nationally-representative estimates of emergency departments and emergency department visits in the United States by characteristics such as patient acuity level, payer source, hospital ownership type, geographic region, and type of area (metropolitan or nonmetropolitan) from the National Center for Health Statistics' (NCHS) National Hospital Ambulatory Medical Care Survey (NHAMCS). Specifically, for 2001 through 2006<sup>1</sup> this appendix presents the following information:

- the percentage of emergency departments by hospital ownership type, by geographic region, and by type of area (metropolitan or nonmetropolitan) (table 7);
- the number and percentage of emergency department visits by acuity level (figure 5) and payer source (table 8);
- the number and percentage of emergency department visits by hospital ownership type, geographic region, and type of area (table 9); and
- the number and percentage of emergency department visits that resulted in hospital admissions (table 10).

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<sup>1</sup>We obtained NCHS data beginning with 2001 because these data became publicly available in 2003 or later, meeting the criterion for inclusion in our analysis. At the time we conducted our analysis, the most recent year for which data were available from NCHS on emergency department utilization was 2006.

**Appendix II: Emergency Department Utilization, 2001 through 2006**

**Table 7: Percentage of Emergency Departments by Hospital Ownership Type, Geographic Region, and Type of Area in 2001 through 2006**

	2001	2002	2003	2004	2005	2006
<b>Hospital ownership type</b>						
Voluntary, nonprofit	62	65	62	67	68	68
Government <sup>a</sup>	27	22	27	25	22	22
Proprietary	11	13	12	8	9	10
<b>Geographic region<sup>b</sup></b>						
Northeast	15	15	16	15	15	14
Midwest	30	29	29	30	31	29
South	37	38	39	37	37	39
West	18	18	17	18	17	19
<b>Type of area</b>						
Metropolitan <sup>c</sup>	62	60	58	66	65	66
Nonmetropolitan <sup>c</sup>	38	40	42	34	35	34

Source: GAO analysis of NCHS data.

Notes: Percentages may not sum to 100 because of rounding.

<sup>a</sup>NCHS defines a government-owned hospital as a hospital operated by a state, county, city, city-county, or hospital district or authority.

<sup>b</sup>NCHS categorizes geographic regions in the NHAMCS as Northeast, Midwest, South, and West as defined by the U.S. Census Bureau.

<sup>c</sup>*Metropolitan* describes hospitals identified by NCHS as located in a metropolitan statistical area, and *nonmetropolitan* describes hospitals identified by NCHS as not located in a metropolitan statistical area.

**Figure 5: Number and Percentage of Emergency Department Visits by Acuity Level in 2001 through 2006**

Number in thousands (percentage)						
<b>Acuity level<sup>a</sup> (recommended time frame)</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
Immediate <sup>b</sup> (less than 1 minute)	20,691 (19)	24,551 (22)	17,297 (15)	14,202 (13)	6,385 (6)	6,084 (5)
Emergent <sup>b</sup> (1 to 14 minutes)					11,313 (10)	12,817 (11)
Urgent (15 to 60 minutes)	34,057 (32)	37,639 (34)	40,128 (35)	41,624 (38)	38,433 (33)	43,666 (37)
Semiurgent (greater than 1 hour to 2 hours)	17,543 (16)	20,427 (19)	22,830 (20)	24,012 (22)	23,870 (21)	26,173 (22)
Nonurgent (greater than 2 hours to 24 hours)	9,790 (9)	11,209 (10)	14,571 (13)	13,774 (13)	16,068 (14)	14,478 (12)
No triaged <sup>c,d</sup>					2,397 (2)	1,860 (2)
Unknown <sup>d</sup>	25,409 (24)	16,328 (15)	19,077 (17)	16,605 (15)	16,857 (15)	14,114 (12)

Source: GAO analysis of NCHS data.

Notes: Percentages may not sum to 100 because of rounding.

<sup>a</sup>NCHS developed time-based acuity levels based on a five-level severity index recommended by the Emergency Nurses Association. The acuity levels describe the recommended amount of time a patient should wait to be seen by a physician.

**Appendix II: Emergency Department  
Utilization, 2001 through 2006**

<sup>b</sup>NCHS added an immediate wait time category to the NHAMCS survey starting in 2005. For 2001 through 2004, the emergent category was defined as a visit with a recommended wait time of less than 15 minutes.

<sup>c</sup>A visit in which there is no mention of an acuity rating or triage level in the medical record, the hospital did not perform triage, or the patient was dead on arrival.

<sup>d</sup>For 2001 through 2004, the NHAMCS survey instrument grouped no triage and unknown triage level into a single category.

**Table 8: Number and Percentage of Emergency Department Visits by Payer Source in 2001 through 2006**

Number in thousands (percentage)						
<b>Payer source<sup>a</sup></b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
Private insurance	43,213 (40)	42,802 (39)	41,461 (36)	39,344(36)	39,565 (34)	40,037 (34)
Medicare	15,879 (15)	16,964 (15)	18,525 (16)	16,909 (15)	16,043 (14)	16,780 (14)
Medicaid/State Children's Health Insurance Program	18,789 (18)	21,751 (20)	24,415 (21)	24,489 (22)	28,661 (25)	30,351 (26)
Worker's compensation	2,665 (3)	2,148 (2)	2,130 (2)	1,964 (2)	1,941 (2)	2,045 (2)
Self-pay <sup>b</sup>	15,854 (15)	15,935 (14)	16,066 (14)	17,669 (16)	18,581 (16)	19,260 (16)
No charge/Charity <sup>b</sup>	1,042 (1)	1,155 (1)	1,113 (1)	885 (1)	885 (1)	1,756 (1)
Other	2,327 (2)	2,551 (2)	2,800 (2)	3,081 (3)	2,184 (2)	3,311 (3)
Unknown	6,024 (6)	5,266 (5)	6,014 (5)	4,946 (4)	5,996 (5)	4,314 (4)
Blank	1,697 (2)	1,582 (1)	1,377 (1)	930 (1)	1,466 (1)	1,337 (1)

Source: GAO analysis of NCHS data.

Notes: Percentages may not sum to 100 because of rounding.

<sup>a</sup>In 2001 through 2004, the survey asked for primary expected source of payment. In 2005 and 2006, multiple sources could be reported. For the purposes of comparability, in this table, 2005 and 2006 data were recoded to produce a primary expected source of payment based on this hierarchy of responses: Medicare, Medicaid, private insurance, worker's compensation, self-pay, no charge, other, and unknown.

<sup>b</sup>NCHS defines no insurance as having only self-pay, no charge, or charity as payment sources.

**Appendix II: Emergency Department  
Utilization, 2001 through 2006**

**Table 9: Number and Percentage of Emergency Department Visits by Hospital Ownership Type, Geographic Region, and Type of Area in 2001 through 2006**

Number in thousands (percentage)	2001	2002	2003	2004	2005	2006
<b>Hospital ownership type</b>						
Voluntary, nonprofit	78,458 (73)	76,869 (70)	82,170 (72)	82,117 (75)	83,288 (72)	86,731 (73)
Government <sup>a</sup>	18,663 (17)	20,279 (18)	21,116 (19)	18,832 (17)	19,576 (17)	20,882 (18)
Proprietary	10,370 (10)	13,007 (12)	10,617 (9)	9,267 (8)	12,459 (11)	11,578 (10)
<b>Geographic region<sup>b</sup></b>						
Northeast	20,802 (19)	18,895 (17)	23,814 (21)	22,274 (20)	22,245 (19)	22,669 (19)
Midwest	26,688 (25)	26,006 (24)	25,205 (22)	26,806 (24)	28,771 (25)	25,735 (22)
South	40,512 (38)	45,544 (41)	44,958 (40)	41,150 (37)	43,871 (38)	50,642 (43)
West	19,489 (18)	19,710 (18)	19,926 (18)	19,986 (18)	20,436 (18)	20,145 (17)
<b>Type of area</b>						
Metropolitan <sup>c</sup>	88,605 (82)	89,170 (81)	92,847 (82)	94,826 (86)	98,622 (86)	100,727 (85)
Nonmetropolitan <sup>c</sup>	18,885 (18)	20,985 (19)	21,056 (19)	15,391 (14)	16,700 (15)	18,464 (16)

Source: GAO analysis of NCHS data.

Notes: Percentages may not sum to 100 because of rounding.

<sup>a</sup>NCHS defines a government-owned hospital as a hospital operated by a state, county, city, city-county, or hospital district or authority.

<sup>b</sup>NCHS categorizes geographic regions in the NHAMCS as Northeast, Midwest, South, and West as defined by the U.S. Census Bureau.

<sup>c</sup>*Metropolitan* describes hospitals identified by NCHS as located in a metropolitan statistical area, and *nonmetropolitan* describes hospitals identified by NCHS as not located in a metropolitan statistical area.

**Table 10: Number and Percentage of Emergency Department Visits That Resulted in Hospital Admissions in 2001 through 2006**

In thousands	2001	2002	2003	2004	2005	2006
Number of emergency department visits resulting in hospital admissions	12,626	13,471	15,809	14,615	13,867	15,210
Percentage of all emergency department visits resulting in hospital admissions	11.7	12.2	13.9	13.3	12.0	12.8

Source: GAO analysis of NCHS data.

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# Appendix III: Proposed Measures of Emergency Department Crowding

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Researchers continue to use diversion, wait times (including patients who left before a medical evaluation), and boarding as indicators to point to situations in which crowding is likely occurring in emergency departments; however, as we reported in our 2003 report, there is no standard measure of the extent to which emergency departments are experiencing crowding. In the absence of a widely-accepted standard measure of crowding, researchers have proposed and conducted limited testing of potential measures of crowding. During our literature review of articles on emergency department crowding published on or between January 1, 2003, and August 31, 2008, we identified proposed measures of crowding that researchers have tested, either in a single hospital setting or for a limited period of time. Table 11 describes these proposed measures. While researchers have claimed varying levels of success using these measures to gauge crowding, we found no widely accepted measure of emergency department crowding, and that none of these measures of crowding had been widely implemented by researchers and health care practitioners.

**Appendix III: Proposed Measures of  
Emergency Department Crowding**

**Table 11: Proposed Measures of Emergency Department Crowding**

<b>Measure</b>	<b>Description</b>	<b>Scale</b>
Emergency department occupancy rate	The total number of patients in the emergency department divided by the total number of licensed emergency department treatment bays available per hour.	An emergency department occupancy rate above 1.0 indicates that there are more patients in the emergency department than treatment bays. The higher the emergency department occupancy rate, the more crowded the emergency department. <sup>a</sup>
Emergency department work index, also known as EDWIN	A summary statistic that describes the ratio of patients in the emergency department at each triage level compared to the number of attending physicians and unoccupied beds in the emergency department.	Higher EDWIN scores are associated with more crowding in the emergency department, greater acuity among emergency department patients, or both. <sup>b</sup>
Emergency department work score	A composite score that measures where emergency departments utilize resources. The emergency department work score incorporates the number of patients in the waiting room, workload per nurse for patients under evaluation in the emergency department, and the number of patients boarding in the emergency department.	Increases in the emergency department work score indicate an increased probability that an emergency department will go on diversion. <sup>c</sup>
National emergency department overcrowding study, also known as NEDOCS	A screening tool used to determine the degree of emergency department crowding at an academic institution. NEDOCS incorporates the number of patients in the emergency department, wait times, staffing in the emergency department, and emergency department hours on diversion.	The NEDOCS score is measured on a scale between 0 and 200. Scores over 100 reflect a progressively more crowded emergency department. <sup>d</sup>
Real-time emergency analysis of demand indicators, also known as READI	A measure used to predict emergency department demand. The READI analysis evaluates treatment space availability, the acuity of emergency department patients, the productivity of physicians, and an overall measure of demand. The READI analysis uses a bed ratio, an acuity ratio, and a provider ratio to create a demand value score.	Demand value scores greater than 7 should alert the staff to look at each specific ratio to determine possible contributors to demand in excess of emergency department capacity. <sup>e</sup>
Emergency department crowding scale	The scale is used to provide an objective measure of emergency department crowding based on a small set of easily accessible factors. These factors include the number of attending emergency physicians, number of staffed emergency department beds, number of critical-care patients, total number of emergency department patients, number of staffed hospital beds, and hospital occupancy rate.	An emergency department crowding scale score greater than 65 may be predictive of both ambulance diversion and the number of patients who leave without being seen by a physician. <sup>f</sup>

Source: GAO analysis of articles published between January 1, 2003, and August 31, 2008.

<sup>a</sup>M. L. McCarthy, et al., "The Emergency Department Occupancy Rate: A Simple Measure of Emergency Department Crowding?" *Annals of Emergency Medicine*, vol. 51, no. 1 (2008).

<sup>b</sup>S. L. Bernstein, et al., "Development and Validation of a New Index to Measure Emergency Department Crowding," *Academic Emergency Medicine*, vol. 10, no. 9 (2003).

<sup>c</sup>S. Epstein and L. Tian, "Development of an Emergency Department Work Score to Predict Ambulance Diversion," *Academic Emergency Medicine*, vol. 13, no. 4 (2006).

<sup>d</sup>S. Weiss, et al., "Estimating the Degree of Emergency Department Overcrowding in Academic Medical Centers: Results of the National ED Overcrowding Study (NEDOCS)," *Academic Emergency Medicine*, vol. 11, no. 1 (2004).

<sup>e</sup>T. Reeder, et. al., "The Overcrowded Emergency Department: A Comparison of Staff Perceptions," *Academic Emergency Medicine*, vol. 10, no. 10 (2003).

<sup>f</sup>S. Jones, et al., "An Independent Evaluation of Four Quantitative Emergency Department Crowding Scales," *Academic Emergency Medicine*, vol. 13, no. 11 (2006).

# Appendix IV: Emergency Department Wait Times

This appendix provides information on nationally-representative estimates of intervals of emergency department wait times in the United States: wait time to see a physician, length of stay in the emergency department, and the percentage of visits in which patients left before a medical evaluation.<sup>1</sup> Specifically, this appendix presents the following information from the National Center for Health Statistics' (NCHS) National Hospital Ambulatory Medical Care Survey (NHAMCS):

- for 2003 through 2006 (the only years for which data were available from NCHS), the percentage of emergency department visits by wait time to see a physician (table 12), average and median wait times to see a physician by patient acuity level (figure 6), average wait times to see a physician by payer type, hospital type, and geographic region (table 13), and average wait times by the hospitals' percentage of visits in which patients left before a medical evaluation (table 14); and
- for 2001 through 2006, the percentage of visits by emergency department length of stay (table 15), the average and median length of stay by patient acuity level (figure 7), the average length of stay in the emergency department by payer type, hospital type, and geographic region (table 16); and average length of stay by the hospitals' percentage of visits in which patients left before a medical evaluation (table 17).

**Table 12: Percentage of Emergency Department Visits by Wait Time to See a Physician, in 2003 through 2006**

Wait time to see a physician	2003	2004	2005	2006
Less than 15 minutes	23.4	21.5	22.2	21.9
15 to 59 minutes	39.2	42.3	41.0	39.9
1 hour or more, but fewer than 2 hours	13.3	14.3	15.4	14.8
2 hours or more, but fewer than 3 hours	4.3	4.4	5.2	5.5
3 hours or more, but fewer than 4 hours	1.6	1.8	2.3	2.2
4 hours or more, but fewer than 6 hours	1.4	1.2	1.4	1.4
6 hours or more	0.1	0.1	1.1	0.9
Blank	16.7	14.4	11.4	13.5

Source: GAO analysis of NCHS data.

Note: Percentages may not sum to 100 because of rounding.

<sup>1</sup>The National Center for Health Statistics (NCHS) defines the percentage of patients who left before a medical evaluation as the percentage of visits in which the patient left after triage but before receiving any medical care.



**Appendix IV: Emergency Department Wait Times**

**Figure 6: Average and Median Wait Time to See a Physician, in Minutes, by Acuity Level, in 2003 through 2006**

Acuity level <sup>a</sup> (recommended time frame)	2003		2004		2005		2006	
	Avg (SE) <sup>b</sup>	Median	Avg (SE) <sup>b</sup>	Median	Avg (SE) <sup>b</sup>	Median	Avg (SE) <sup>b</sup>	Median
Immediate <sup>c</sup> (less than 1 minute)					30 (4)	10	28 (3)	11
Emergent <sup>c</sup> (1 to 14 minutes)	23 (2)	12	26 (2)	13	36 (3)	15	37 (3)	17
Urgent (15 to 60 minutes)	42 (2)	26	43 (2)	28	55 (2)	32	50 (2)	30
Semiurgent (greater than 1 hour to 2 hours)	60 (2)	42	60 (2)	41	69 (3)	45	68 (3)	45
Nonurgent (greater than 2 hours to 24 hours)	69 (5)	44	65 (3)	42	66 (3)	41	76 (6)	44
No triage <sup>d,e</sup>	48 (5)	25	49 (4)	28	31 (7)	15	45 (6)	22
Unknown <sup>e</sup>					63 (7)	27	66 (11)	30
All Acuity Levels	46 (2)	27	47 (1)	29	56 (2)	31	56 (2)	31

Source: GAO analysis of NCHS data.

<sup>a</sup>NCHS developed time-based acuity levels based on a five-level severity index recommended by the Emergency Nurses Association. The acuity levels describe the recommended amount of time a patient should wait to be seen by a physician.

<sup>b</sup>Avg is the estimated mean and SE is the standard error of the estimate. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value.

<sup>c</sup>NCHS added an immediate wait time category to the NHAMCS survey instrument starting in 2005. For 2003 and 2004, the emergent category was defined as any visit with a recommended wait time of less than 15 minutes.

<sup>d</sup>No triage indicates a visit in which there is no mention of an acuity rating or triage level in the medical record, the hospital did not perform triage, or the patient was dead on arrival.

<sup>e</sup>For 2003 and 2004, the NHAMCS survey instrument grouped no triage and unknown triage level into a single category.

**Appendix IV: Emergency Department Wait Times**

**Table 13: Average Wait Time to See a Physician, in Minutes, by Payer Type, Hospital Type, and Geographic Region, in 2003 through 2006**

	2003 (SE) <sup>a</sup>	2004 (SE) <sup>a</sup>	2005 (SE) <sup>a</sup>	2006 (SE) <sup>a</sup>
Average wait time to see a physician by payer type <sup>b</sup>				
Private insurance	45 (2)	46 (1)	55 (2)	55 (3)
Medicare	40 (2)	43 (1)	52 (3)	52 (3)
Medicaid/State Children's Health Insurance Program	49 (2)	50 (2)	59 (2)	56 (2)
Worker's compensation	37 (3)	46 (2)	39 (3)	41 (3)
Self-pay	50 (2)	49 (2)	57 (3)	62 (4)
No charge/charity	104 (30)	72 (8)	69 (7)	81 (15)
Other	52 (6)	48 (5)	58 (4)	48 (6)
Unknown or blank	48 (3)	56 (4)	64 (3)	57 (5)
Average wait time to see a physician by hospital type				
Voluntary, nonprofit	46 (2)	47 (2)	57 (2)	55 (2)
Government <sup>c</sup>	51 (6)	50 (4)	51 (4)	59 (7)
Proprietary	42 (5)	45 (3)	57 (7)	58 (11)
Average wait time to see a physician by geographic region <sup>d</sup>				
Northeast	48 (3)	51 (3)	57 (4)	56 (3)
Midwest	42 (2)	42 (4)	49 (3)	50 (4)
South	48 (4)	48 (2)	58 (3)	61 (4)
West	48 (5)	50 (3)	63 (6)	49 (5)

Source: GAO analysis of NCHS data.

<sup>a</sup>Average is the estimated mean and SE is the standard error of the estimate. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value.

<sup>b</sup>In 2003 and 2004, the survey asked for primary expected source of payment. In 2005 and 2006, multiple sources could be reported. For the purposes of comparability, in this table, 2005 and 2006 data were recoded to produce a primary expected source of payment based on this hierarchy of responses: Medicare, Medicaid, private insurance, worker's compensation, self-pay, no charge, other, and unknown.

<sup>c</sup>NCHS defines a government-owned hospital as a hospital operated by a state, county, city, city-county, or hospital district or authority.

<sup>d</sup>NCHS categorizes geographic regions in the NHAMCS as Northeast, Midwest, South, and West as defined by the U.S. Census Bureau.

**Table 14: Average Wait Time to See a Physician, in Minutes, by Hospitals' Percentage of Visits in Which Patients Left before a Medical Evaluation, in 2003 through 2006**

Percentage of visits in which patients left before a medical evaluation <sup>a</sup>	2003 Avg (SE) <sup>b</sup>	2004 Avg (SE) <sup>b</sup>	2005 Avg (SE) <sup>b</sup>	2006 <sup>c</sup> Avg (SE) <sup>b</sup>
Less than 1 percent	30 (2)	30 (1)	38 (3)	37 (3)
1 percent to 2.49 percent	37 (3)	43 (3)	44 (4)	44 (3)
2.5 percent to 4.49 percent	49 (4)	60 (4)	58 (6)	60 (5)
4.5 percent or more	66 (5)	63 (4)	80 (7)	84 (8)

Source: GAO analysis of NCHS data.

<sup>a</sup>NCHS defines the percentage of visits in which patients left before a medical evaluation as the percentage of visits in which the patient left after triage but before receiving any medical care.

<sup>b</sup>Avg is the estimated mean and SE is the standard error of the estimate. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value.

<sup>c</sup>These 2006 data exclude outlier data from a single hospital because a majority of visits to this hospital's emergency department resulted in lengths of stay that exceeded 24 hours.

**Table 15: Percentage of Visits by Emergency Department Length of Stay, in 2001 through 2006**

Emergency department length of stay	2001	2002	2003	2004	2005	2006
Less than 60 minutes	16.6	15.8	14.0	13.9	13.7	12.8
1 hour or more, but fewer than 2 hours	25.1	25.5	25.2	25.2	24.8	24.0
2 hours or more, but fewer than 4 hours	28.5	30.4	30.9	31.0	31.5	33.0
4 hours or more, but fewer than 6 hours	9.1	10.8	11.5	11.7	12.8	13.9
6 hours or more, but fewer than 10 hours	4.2	5.2	5.7	6.0	6.9	7.3
10 hours or more, but fewer than 14 hours	1.5	1.4	1.4	1.4	1.9	1.7
14 hours or more, but fewer than 24 hours	1.5	1.4	1.4	1.3	1.6	1.0
24 or more hours	0.4	0.8	0.6	0.6	0.2	0.5
Blank	13.4	8.7	9.4	9.0	6.7	5.7

Source: GAO analysis of NCHS data.

Note: Percentages may not sum to 100 because of rounding.

**Appendix IV: Emergency Department Wait Times**

**Figure 7: Average and Median Length of Stay in the Emergency Department, in Minutes, by Acuity Level, in 2001 through 2006**

Acuity level <sup>a</sup> (recommended time frame)	2001		2002		2003		2004		2005		2006	
	Avg (SE) <sup>b</sup>	Med <sup>c</sup>	Avg (SE) <sup>b</sup>	Med <sup>c</sup>	Avg (SE) <sup>b</sup>	Med <sup>c</sup>	Avg (SE) <sup>b</sup>	Med <sup>c</sup>	Avg (SE) <sup>b</sup>	Med <sup>c</sup>	Avg (SE) <sup>b</sup>	Med <sup>c</sup>
Immediate <sup>d</sup> (less than 1 minute)	197 (8)	132	200 (9)	139	221 (11)	149	228 (11)	155	211 (14)	143	238 (12)	174
Emergent <sup>d</sup> (1 to 14 minutes)									225 (9)	163	224 (10)	168
Urgent (15 to 60 minutes)	185 (5)	128	191 (7)	133	201 (7)	142	198 (6)	143	208 (6)	153	204 (6)	160
Semiurgent (greater than 1 hour to 2 hours)	163 (4)	124	183 (8)	129	185 (6)	134	184 (6)	129	188 (6)	140	181 (7)	136
Nonurgent (greater than 2 hours to 24 hours)	147 (6)	108	155 (7)	112	156 (7)	114	158 (7)	115	161 (5)	115	169 (9)	123
No triage <sup>e,f</sup>	176 (12)	115	216 (23)	134	190 (12)	131	191 (9)	133	123 (8)	92	159 (17)	101
Unknown <sup>f</sup>									197 (9)	139	220 (28)	141

Source: GAO analysis of NCHS data.

<sup>a</sup>NCHS developed time-based acuity levels based on a five-level severity index recommended by the Emergency Nurses Association. The acuity levels describe the recommended amount of time a patient should wait to be seen by a physician.

<sup>b</sup>Avg is the estimated mean and SE is the standard error of the estimate. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value.

<sup>c</sup>Med indicates the median measurement.

<sup>d</sup>NCHS added an immediate wait time category to the NHAMCS survey instrument starting in 2005. For 2001 through 2004, the emergent category was defined as a visit with a recommended wait time of less than 15 minutes.

<sup>e</sup>A visit in which there is no mention of an acuity rating or triage level in the medical record, the hospital did not perform triage, or the patient was dead on arrival.

<sup>f</sup>For 2001 through 2004, the NHAMCS survey instrument grouped no triage and unknown triage level into a single category.

**Appendix IV: Emergency Department Wait Times**

**Table 16: Average Length of Stay in the Emergency Department, in Minutes, by Payer Type, Hospital Type, and Geographic Region, in 2001 through 2006**

	2001 (SE) <sup>a</sup>	2002 (SE) <sup>a</sup>	2003 (SE) <sup>a</sup>	2004 (SE) <sup>a</sup>	2005 (SE) <sup>a</sup>	2006 (SE) <sup>a</sup>
Average length of stay in the emergency department by payer type <sup>b</sup>						
Private insurance	169 (5)	182 (6)	183 (5)	179 (3)	186 (4)	190 (6)
Medicare	225 (6)	246 (11)	244 (10)	242 (9)	240 (7)	242 (7)
Medicaid/State Children's Health Insurance Program	171 (5)	172 (6)	176 (6)	183 (6)	188 (7)	188 (5)
Worker's compensation	116 (5)	130 (10)	132 (8)	128 (6)	115 (7)	131 (6)
Self-pay	172 (6)	184 (8)	187 (7)	192 (6)	192 (6)	197 (7)
No charge/charity	223 (12)	274 (19)	267 (20)	279 (29)	257 (16)	247 (19)
Other	191 (12)	230 (33)	198 (11)	196 (19)	194 (11)	207 (17)
Unknown	179 (11)	187 (12)	201 (11)	195 (11)	205 (9)	212 (12)
Average length of stay in the emergency department by hospital type						
Voluntary, nonprofit	177 (5)	193 (7)	193 (5)	189 (4)	198 (4)	195 (5)
Government <sup>c</sup>	183 (10)	194 (13)	189 (14)	216 (16)	189 (12)	205 (13)
Proprietary	175 (13)	172 (16)	195 (17)	176 (16)	191 (12)	218 (33)
Average length of stay in the emergency department by geographic region <sup>d</sup>						
Northeast	209 (8)	203 (7)	213 (8)	200 (5)	208 (5)	203 (5)
Midwest	157 (9)	180 (11)	174 (6)	190 (8)	184 (7)	185 (11)
South	173 (6)	184 (7)	191 (9)	186 (6)	189 (7)	206 (10)
West	187 (11)	209 (20)	201 (13)	201 (10)	213 (12)	196 (8)

Source: GAO analysis of NCHS data.

<sup>a</sup>Average is the estimated mean and SE is the standard error of the estimate. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value.

<sup>b</sup>In 2001 through 2004, the survey asked for primary expected source of payment. In 2005 and 2006, multiple sources could be reported. For the purposes of comparability, in this table, 2005 and 2006 data were recoded to produce a primary expected source of payment based on this hierarchy of responses: Medicare, Medicaid, private insurance, worker's compensation, self-pay, no charge, other, and unknown.

<sup>c</sup>NCHS defines a government-owned hospital as a hospital operated by a state, county, city, city-county, or hospital district or authority.

<sup>d</sup>NCHS categorizes geographic regions in the NHAMCS as Northeast, Midwest, South, and West as defined by the U.S. Census Bureau.

**Appendix IV: Emergency Department Wait Times**

**Table 17: Average Length of Stay in the Emergency Department, in Minutes, by Hospitals' Percentage of Visits in Which Patients Left Before a Medical Evaluation, in 2001 through 2006**

<b>Percentage of visits in which patients left before a medical evaluation<sup>a</sup></b>	<b>2001 (SE)<sup>b</sup></b>	<b>2002 (SE)<sup>b</sup></b>	<b>2003 (SE)<sup>b</sup></b>	<b>2004 (SE)<sup>b</sup></b>	<b>2005 (SE)<sup>b</sup></b>	<b>2006<sup>c</sup> (SE)<sup>b</sup></b>
Less than 1 percent	137 (7)	150 (12)	147 (6)	152 (6)	145 (6)	150 (8)
1 percent to 2.49 percent	157 (6)	158 (8)	168 (9)	154 (7)	163 (7)	163 (7)
2.5 percent to 4.49 percent	194 (15)	192 (15)	180 (13)	197 (11)	187 (13)	193 (11)
4.5 percent or more	227 (16)	209 (12)	233 (16)	216 (12)	228 (10)	249 (16)

Source: GAO analysis of NCHS data.

<sup>a</sup>NCHS defines the percentage of visits in which patients left before a medical evaluation as the percentage of visits in which the patient left after triage but before receiving any medical care.

<sup>b</sup>Average is the estimated mean and SE is the standard error of the estimate. Standard error is a statistic used to calculate the range of values that express the possible difference between the sample estimate and the actual population value.

<sup>c</sup>These 2006 data exclude outlier data from a single hospital because a majority of visits to this hospital's emergency department had lengths of stay that exceeded 24 hours.

# Appendix V: Comments from the Department of Health and Human Services

Note: Page numbers in the draft report may differ from those in this report.



DEPARTMENT OF HEALTH & HUMAN SERVICES

OFFICE OF THE SECRETARY

Assistant Secretary for Legislation  
Washington, DC 20201

APR 8 2009

Marcia Crosse  
Director, Health Care  
U.S. Government Accountability Office  
441 G Street N.W.  
Washington, DC 20548

Dear Ms. Crosse:

Enclosed are comments on the U.S. Government Accountability Office's (GAO) report entitled: **Hospital Emergency Departments: Crowding Continues to Occur and Some Patients Wait Longer Than Recommended Time Frames (GAO-09-347)** and **Special Publication-Hospital Emergency Department: Bibliography (GAO-09-348SP)**.

The Department appreciates the opportunity to review this report before its publication.

Sincerely,

A handwritten signature in cursive script that reads "Barbara Pisaro Clark".

Barbara Pisaro Clark  
Acting Assistant Secretary for Legislation

Attachment

**GENERAL COMMENTS OF THE DEPARTMENT OF HEALTH AND HUMAN SERVICES (HHS) ON THE GOVERNMENT ACCOUNTABILITY OFFICE'S (GAO) DRAFT REPORT ENTITLED: HOSPITAL EMERGENCY DEPARTMENTS: CROWDING CONTINUES TO OCCUR AND SOME PATIENTS WAIT LONGER THAN RECOMMENDED TIME FRAMES (GAO-09-347)**

The Department appreciates the opportunity to review and comment on the GAO Draft Report and Special Publication entitled, "Hospital Emergency Departments: Crowding Continues to Occur and Some Patients Wait Longer Than Recommended Time Frames" (GAO-09-347) and "Hospital Emergency Department: Bibliography" (GAO-09-348SP), respectively.

The GAO report, an update of a 2003 GAO survey of the extent of emergency department (ED) crowding, demonstrates that ED waiting times are continuing to increase and frequently exceed national standards; particularly at the highest acuity levels, where delays make the biggest difference. Strengths of the report include its clarity, focus, and a dispassionate tone.

However, designed as an update, it excluded articles and studies published before 2003. This method presupposes that readers will be familiar with the GAO's earlier survey and the large body of literature presented in it. The valid interpretation of this updated information would be strengthened by the content and context of the findings and literature that was reviewed prior to 2003. Moreover, the exclusion of studies conducted outside the US (such as relevant studies conducted in Australia, the UK, and Canada) may limit the readers' insight to this important topic.

Further, the GAO study focuses on the ED and three commonly cited measures of Crowding. It is worth noting that these are process metrics and are limited to patient flow within the Emergency Department. This is potentially important in that they do not provide a direct measure of broader systematic issues of hospital throughput that effect emergency department patient flow such as smoothing elective surgery schedules and facilitating inpatient discharges and bed turnover. Additionally, information regarding process may not be directly related to actual patient outcomes such as treatment success or failure, adverse outcomes or direct harms resulting from the lack of system capacity. The report does discuss this issue on page 19 under "Impact of Crowding" and notes the lack of sufficient quantitative evidence to confirm this assumption, however it may worth specifically noting the limitations of these three process metrics.



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# Appendix VI: GAO Contact and Staff Acknowledgments

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## GAO Contact

Marcia Crosse, (202) 512-7114 or [crossem@gao.gov](mailto:crossem@gao.gov)

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## Acknowledgments

In addition to the contact named above, Kim Yamane, Assistant Director; Danielle Bernstein; Susannah Bloch; Ted Burik; Aaron Holling; Carla Jackson; Ba Lin; Jeff Mayhew; Jessica Smith; and Jennifer Whitworth made key contributions to this report.

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