

Staffing, Capacity, and Ambulance Diversion in Emergency Departments: United States, 2003–04

by Catharine W. Burt, Ed.D., and Linda F. McCaig, M.P.H., Division of Health Care Statistics

Abstract

Objective—The increased demand for emergency department (ED) services over the past decade has resulted in crowding. This report presents estimates of structure and process characteristics of hospital EDs related to their capacity to treat medical and surgical emergencies. Estimates of EDs experiencing crowded conditions are also presented.

Methods—Several facility supplements were added to the 2003–04 National Hospital Ambulatory Medical Care Survey (NHAMCS), which were completed by hospital staff. NHAMCS samples nonfederal, short-stay, and general hospitals in the United States. Of all sample hospitals that operated 24-hour EDs, 83 percent completed the supplemental questionnaires. Data from 467 hospitals were weighted to produce national annual estimates of ED characteristics.

Results—There was an annual average of 4,500 EDs operating in the United States during 2003 and 2004. Over one-half of EDs saw less than 20,000 patients annually, but 1 out of 10 had an annual visit volume of more than 50,000 patients. Although 16.1 percent of hospitals expanded their ED physical space within the last 2 years, approximately one-third of others planned to do so within the next 2 years. Most EDs used outside contracts to provide physicians (64.7 percent). One-half of EDs in metropolitan statistical areas (MSAs) had more than 5 percent of their nursing positions vacant. Of all on-call specialists, the services of plastic and hand surgeons were most frequently reported as somewhat or very difficult to obtain (49.4 percent). Approximately one-third of U.S. hospitals reported going on ambulance diversion sometime in the previous year. About 12 percent of hospitals in MSAs reported having spent between 5 and 19 percent of their operating time in diversion status. Between 40 and 50 percent of U.S. hospitals experienced crowded conditions in the ED with almost two-thirds of metropolitan EDs experiencing crowding.

Keywords: crowding • emergency department • NHAMCS

Introduction

In recent years, growth in the use of hospital emergency medical services (EMS) has coincided with a decline in the number of EDs, leading to concerns about the capacity of EDs that continue to operate. The annual number of ED visits in the United States rose by 18% between 1994 and 2004 (from 93 million to 110 million), whereas the number of hospitals operating 24-hour EDs decreased by 12% during the same time frame (1). Although most of the increase in visits can be explained by growth in the U.S. population, over one-third is accounted for by the growth in per capita use during the last 11 years (2). Fewer EDs with increasing overall volume led to average increases in the number of cases among operating EDs (up by 78% between 1995 and 2003) (Figure 1) (3).

A number of indicators have been used to assess the capacity of EDs to handle growth in demand, including the time patients wait to receive services (4), ED length of stay and treatment time (which decreases the availability of

Acknowledgments

This report was prepared in the Division of Health Care Statistics. Kimberly R. Middleton in the Ambulatory Care Statistics Branch edited the data. Roberto H. Valverde in the Technical Services Branch developed the analytical files. This report was edited by Klaudia M. Cox, Office of Information Services, Information Design and Publishing Staff; typeset by Annette F. Holman, CoCHIS/NCHM/Division of Creative Services; and graphics were produced by NOVA contractor, Kyung Park, of CoCHIS/NCHM/Division of Creative Services.



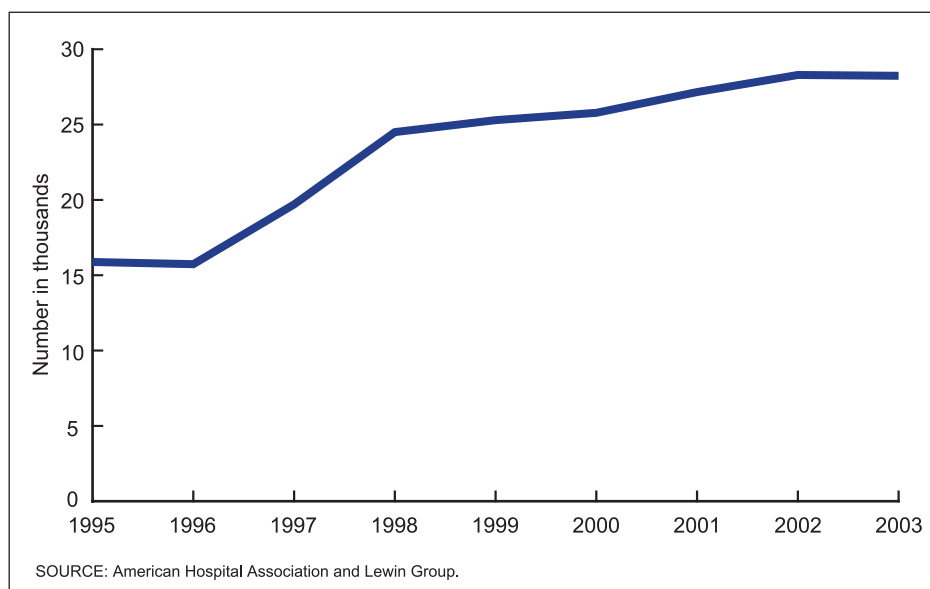


Figure 1. Volume of annual visits per operating emergency department: United States, 1995–2003

space for other patients), the extent to which hospitals go on “diversion status” (periods of time when ambulances are diverted to other hospitals), and the percentage of patients who leave the ED without being seen (which may indicate patients’ frustration at long wait times or delays in treatment). These measures are important because they can be indicative of systemic hospital inpatient problems such as a shortage of inpatient beds and nursing staff (5). As inpatient discharges and days of care declined through the 1980s and 1990s, many hospitals decreased bed availability to cut operating expenses and, as a result, occupancy rates increased, thereby decreasing the hospitals’ capacity to handle an influx of patients from the ED (6). Until now, there have been no national estimates of occupancy rates and their relationship with ambulance diversion practices.

Understanding ED capacity is important because hospitals may be unable to accept incoming patients when the volume of ED visits increases to a certain level. EDs experience pressure when patients are boarded to await admission while additional cases are incoming. The crowding problem is exacerbated by the fact that EDs are required by law to screen incoming patients and if the patient needs

emergency treatment, to treat or stabilize the patient for transfer to another facility. The Emergency Medical Treatment and Active Labor Act (EMTALA) places two requirements on hospitals: first, a hospital must provide an appropriate medical screening examination to anyone who comes to the ED and requests examination or treatment for a medical condition or for whom care is requested and second, if the hospital determines that the person

has an emergency medical condition, it must provide appropriate stabilization treatment or transfer (and hospitalization if it is deemed necessary) (7). Hospitals are held liable for the cost of care of patients who are unable to pay their bills. Increased use of the ED by persons unable to pay their bills not only influences patient volume, but leads to increased uncompensated care. Although hospitals do not keep records of the amount of uncompensated care for EMTALA-related care, the American Hospital Association has calculated that the cost of uncompensated care was \$26.9 billion for all community hospitals in 2004 (8).

Besides increased waiting times and more patients leaving without being seen, crowded EDs result in lengthened EMS ambulance runs (9), ambulance diversion (6,10), greater risk for poorer patient outcomes (11), and the lessened ability of hospitals to respond to public health emergencies including natural disasters and mass casualty incidents. In an effort to reduce crowding, ambulance diversion practices resulted in the diversion of about 3 percent of ambulance patients to more distant hospitals (12). Among the many other problems faced by EDs are lack of treatment space, on-call specialists, and language translation services. Much has

Selected emergency department staffing, capacity, ambulance diversion, and throughput indexes at a glance

Index	Total ¹	Metropolitan ²	Not metropolitan ³
Daily visit volume	67.6	93.4	25.8
Standard treatment spaces	14.6	19.8	6.3
Number of physicians with ED ⁴ privileges	13.3	17.5	6.4
Daily visits per treatment space	4.6	4.9	4.1
Percent of nursing positions vacant	5.3	6.1	3.9
Percent arriving by ambulance	13.0	13.8	11.8
Average waiting time in minutes	37.1	45.8	22.8
Average visit duration in minutes	159.7	181.6	124.2
Percent left before seen	1.4	1.8	0.7
Percent transferred	3.0	2.1	4.5
Percent admitted to hospital	12.5	13.4	11.1
Inpatient staffed bed size	136.5	192.1	47.7
Inpatient daily occupancy rate	60.3	66.4	50.6
Annual hours on ambulance diversion	146.0	242.7	0.5

¹Based on responses from 699 emergency departments.

²Emergency departments located in metropolitan statistical areas.

³Emergency departments located in micropolitan or rural areas.

⁴ED is emergency department.

NOTE: Means per emergency department in the United States, 2003–04.

been published on creative ways to handle and measure ED crowding issues (13–18), including increasing the efficiency of and removing barriers to patient flow.

Although the problem of ED crowding has received national attention (19), there have been no previous national surveys of how EDs operate in such a challenging environment. This report is the first to describe the Nation's EDs in terms of their staffing and capacity (including staff relative to treatment space available); the availability of specialized services (such as translation services and access to specialty physicians); the effect of demand and capacity on the ability to provide services (in the form of ambulance diversions, wait time, and length of stay); and variability among EDs in areas that are metropolitan and not metropolitan.

See data highlights in the text box on previous page.

Methods

Sample and data collection

A series of special facility supplements were added to the 2003–04 National Hospital Ambulatory Medical Care Survey (NHAMCS) to assess the structure and process characteristics of hospitals related to their capacity to treat medical and surgical emergencies. NHAMCS is a national probability survey conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS). The target of the NHAMCS is in-person visits made in the United States to outpatient departments (OPDs) and EDs of nonfederal, short-stay hospitals (hospitals with an average length of stay of less than 30 days) or those whose specialty is general (medical or surgical) or children's general. The hospital sampling frame consisted of hospitals listed in the 1991 Verispan Hospital Database (VHD) updated using hospital data from Verispan, L.L.C., specifically their "Healthcare Market Index, updated May 15, 2003," and their "Hospital Market Profiling Solution, Second Quarter, 2003." These products were formerly

known as the SMG Hospital Database. Using the 2003 data to update the sample allowed for the inclusion of hospitals that had opened or changed their eligibility status since the previous sample was updated for 2001.

The sample frame contains information about hospitals including geographic region, metropolitan statistical area status (metropolitan and not metropolitan, including rural areas), medical school affiliation, ownership, and inpatient bed size. Although the primary purpose of NHAMCS is to estimate annual volume and characteristics of medical encounters occurring in EDs and OPDs, it also includes facility-level information.

A two-stage probability sample design is used to select EDs in the NHAMCS. The design involves samples of geographic primary sampling units (PSUs) such as counties or groups of counties, representing the 50 states and the District of Columbia and hospitals within PSUs. Hospitals are randomly assigned to 1 of 16 4-week rotating panels. In any given year, only 13 panels are used. Hospitals are eligible for ED facility questions if they report having a 24-hour ED.

A four-stage probability sample was used to collect information on ED visits. The sample involves 112 geographic PSUs, hospitals that have EDs or OPDs within PSUs, emergency service areas within EDs and clinics within OPDs, and patient visits within emergency service areas and clinics. Hospital staff were asked to complete Patient Record forms for a systematic sample of 100 visits that occur during a randomly assigned 4-week reporting period. The 2003 NHAMCS was conducted from December 30, 2002, through December 28, 2003, and the 2004 NHAMCS was conducted from December 29, 2003, through December 26, 2004.

To provide unbiased national annual estimates of EDs and their characteristics, a facility weight was constructed for each responding ED that takes into account the selection of the geographic area and hospital as well as survey nonresponse. Detailed information on NHAMCS, including its sample design and estimation strategies, is reported elsewhere (20). During 2003

and 2004, a total of 1,060 hospitals were approached to determine their eligibility. An additional 66 hospitals selected in 2003 were included without regard to sampled geographic areas to increase the representation of rural and proprietary hospitals specifically for making the facility-level estimates in this report. Of all sample hospitals that operated 24-hour EDs, 83 percent completed the supplemental questionnaires ($n = 699$ ED records (467 unique hospitals, of which 235 responded in both 2003 and 2004)) and provided the requisite amount of encounter records (76,842 visit records). See the "Technical Notes" for sample sizes and weighted response rates by hospital characteristics.

No personally identifying information is collected in NHAMCS. The NHAMCS protocol was approved by the NCHS Research Ethics Review Board and an exception to patient authorization for release of health information for the survey was granted for compliance with the research provisions of the Health Information Portability and Accountability Act Privacy Rule. The U.S. Census Bureau was responsible for data collection and processing of the supplements.

Survey instruments

The supplements were self-report instruments, which were left with hospital staff at the time of induction into NHAMCS. The content of the supplements included information on ED staffing, treatment and physical space, language translation services, inpatient occupancy, and ambulance diversion. Completed questionnaires were collected after the hospital's assigned 4-week reporting period. The relevant content of the supplements is described below.

- **Staffing, Capacity, and Ambulance Diversion (SCAD)**—Questions about treatment spaces, expansion of physical space (2004 only), credentials of ED physicians, contract staffing, nursing vacancies, difficulty in providing on-call physician coverage for 19 specialties (2004 only), availability of language

translation services and list of languages provided (2004 only), other nearby EDs, and regulations prohibiting ambulance diversion (see <http://www.cdc.gov/nhamcs/data/NHAMCS-903.pdf> for a copy of the form).

- **Ambulance Diversion Log**—Entries made for each diversion period experienced during the 4-week reporting period including start and end time, reason for diversion, and who authorized the diversion status (see <http://www.cdc.gov/nhamcs/data/NHAMCS-904.pdf> for a copy of the log).
- **Hospital Capacity Card**—Numbers and types of licensed and staffed inpatient beds, daily entries of inpatient census, and number of open beds as of midnight for each day during the reporting period (see <http://www.cdc.gov/nhamcs/data/NHAMCS-902.pdf> for a copy of the card).
- **Bioterrorism and Mass Casualty Preparedness (BT supplement)**—Total number of hours on ambulance diversion during the previous year (see <http://www.cdc.gov/nhamcs/data/NHAMCS-905.pdf> for a copy of the form). For estimates from other items in this supplement, see <http://www.cdc.gov/nchs/data/ad/ad364.pdf>.

Capacity and diversion measures were created for each ED from the data collected on the above forms. For each responding ED, information from the diversion log was used to create an average length of a diversion (median) and summed to create total time on diversion during the reporting period. The number of diversion entries was also summed to provide a total number of diversion periods in each ED. Percentages of time on diversion were calculated for each reason reported (multiple entries allowed per diversion period). The daily inpatient census information for each of the 28 days and the number of staffed beds reported on the Hospital Capacity Card were used to calculate an average daily occupancy rate (mean) for each ED. Although the variation among days in occupancy rates and numbers of diversion periods is of interest, these variables were

summarized to provide a single measure of each ED for analysis in this report.

Analysis

For this report, aggregated estimates of each sampled hospital's ED utilization were created to describe how EDs vary with regard to important facility use characteristics. These aggregated estimates come from the Patient Record form responses for each ED (see [http://www.cdc.gov/nchs/data/ahcd/NHAMCS-100\(ED\)2004.pdf](http://www.cdc.gov/nchs/data/ahcd/NHAMCS-100(ED)2004.pdf) for a copy of the form) and were merged to each ED record that contained data on the facility from the induction interview, supplements, and sample frame. Tables in this report have estimates for all EDs and separate estimates for EDs located in areas that are metropolitan and not metropolitan. Metropolitan status is based on the U.S. Census Bureau 2003 definitions of MSAs. Hospitals located in MSAs are considered metropolitan hospitals, and the remaining are considered not metropolitan hospitals and include those located in micropolitan and rural areas. Hospital responses were weighted to produce

national estimates averaged over 2003 and 2004. There were a few supplement questions that were asked only during 2004, for which the 2004 estimate is supplied. Because estimates are based on a sample rather than the entire universe, they are subject to sampling variability. Standard errors were calculated using Taylor approximations in SUDAAN, which take into account the complex sample design of NHAMCS (21). Estimates whose standard error represents more than 30 percent of the estimate have an asterisk (*) to indicate that they do not meet the reliability standard set by NCHS. Determination of statistical significance was based at the 0.05 level. Additional information regarding NHAMCS data collection, sampling or nonsampling errors, and estimation and tests of significance can be found in another publication (22).

Indexes of staffing, capacity, ambulance diversion, and throughput for each ED were created from the above data elements based on those suggested in the Solberg et al article (18). They are shown in the text box below.

Sources for selected emergency department staffing capacity, ambulance diversion, and throughput indexes

Index	Source
Daily visit volume	Annual visit volume divided by 365.5
Standard treatment spaces	Response from staffing, capacity, and ambulance diversion (SCAD) question
Number of physicians with ED ¹ privileges	Response from SCAD question
Daily visits per treatment space	Daily visit volume divided by number of standard treatment spaces
Daily visits per physician	Daily visit volume divided by number of physicians with ED ¹ privileges
Physicians per space.	Number of physicians with ED ¹ privileges divided by number of standard treatment spaces
Percentage of nursing positions vacant	Response from 2004 SCAD question
Percentage arriving by ambulance	Percentage of sampled visits with ambulance as mode of arrival
Average waiting time in minutes	Mean waiting time from sampled visits
Average visit duration in minutes	Mean length of stay from sampled visits
Percentage left before seen	Percentage of sampled visits with left as a disposition
Percentage transferred.	Percentage of sampled visits with transfer as a disposition
Percentage admitted to hospital	Percentage of sampled visits with admit as a disposition
Inpatient staffed bed size	Number of staffed beds from the sample frame
Inpatient daily occupancy rate	Mean percentage of staffed beds occupied at midnight during the 28-day reporting period from the Hospital Capacity Card
Annual hours on diversion.	Response from the bioterrorism question on ambulance diversion hours

¹ED is emergency department.

Crowding in the ED is a result of demand exceeding capacity. Although crowding is often measured as an opinion of ED staff or recently measured as full waiting rooms (23, 24), NHAMCS did not collect these data elements. To estimate the number of hospitals experiencing ED crowding, responses to the SCAD and BT supplements and estimates of throughput from the NHAMCS visit data for each hospital were used. Therefore, in this report, the measure of whether the ED experienced crowded conditions was obtained using the following criteria: having any ambulance diversion hours reported, having a mean waiting time for urgent cases greater than 60 minutes, or having the percentage of cases left without being seen greater than or equal to 3 percent. In a raw sample, 428 ED records met the criteria for crowding and 149 did not. A national estimate of the percentage of hospitals experiencing crowding is presented, as well as those indexes with significant differences ($p < .05$) between EDs experiencing crowded conditions and those that did not.

Results

There was an average of 4,500 EDs operating in the United States during 2003 and 2004. Two-thirds were located in states within the Midwest and South; 4 out of 10 were located in areas that are not metropolitan (Table 1). Most EDs were operated by voluntary, nonprofit hospitals (65.2 percent), and many were located in hospitals with fewer than 100 beds (57.2 percent). Public hospitals accounted for one-quarter of all EDs. Over one-half of EDs saw fewer than 20,000 cases annually, but 1 out of 10 EDs had an annual visit volume of more than 50,000 cases. EDs in metropolitan areas tended to have a much larger visit volume than their counterparts in areas that are not metropolitan. The average daily inpatient occupancy rate in metropolitan hospitals was also larger than in hospitals in areas that were not metropolitan. One-half of hospitals not in metropolitan areas reported occupancy rates under 50 percent

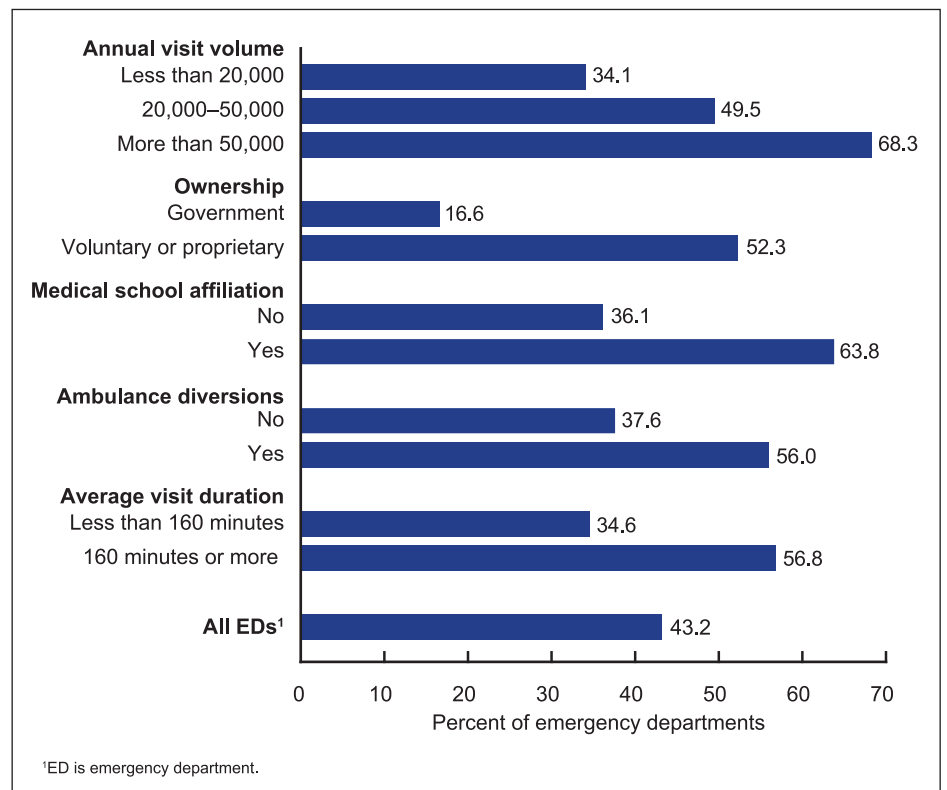


Figure 2. Percentage of emergency departments that have recently expanded or plan to expand physical space, by selected characteristics: United States, 2004

compared with 17.1 percent of metropolitan hospitals.

Treatment spaces

EDs in metropolitan areas reported more standard and auxiliary treatment spaces than those not in metropolitan areas (Table 2). Auxiliary treatment spaces may include chairs or hallway stretchers. Due to the higher volume found in metropolitan areas, metropolitan EDs were more likely to have increased both the number of treatment spaces and their physical space within the last 2 years. Although 16.1 percent of all hospitals expanded their ED physical space within the last 2 years, approximately one-third of others plan to do so within the next 2 years. About 43.2 percent of all EDs recently expanded or plan to do so, but expansion varied by most ED characteristics (Figure 2). EDs more likely to choose expansion included those with higher volume; those classified as proprietary, voluntary, or nonprofit; those affiliated with medical schools; and those with any ambulance

diversion hours reported and larger average visit durations.

Staffing

Most EDs employed physicians using outside contracts (64.7 percent). Presence of emergency medicine specialists (either through board certification or emergency medicine residency programs) varied greatly across hospitals (Table 3). In many EDs (38.7 percent), some or all ED physicians had responsibilities elsewhere in the hospital, such as providing inpatient care or administrative functions. Physicians in hospitals in areas that were not metropolitan were more apt to have non-ED responsibilities than those in metropolitan hospitals. EDs in metropolitan areas were more likely to have nursing vacancies. Although 34.7 percent of metropolitan EDs had 5% or more of their nursing positions vacant, only 18.3 percent of EDs in areas that were not metropolitan had 5% or more vacant nursing positions (calculated from Table 3). About

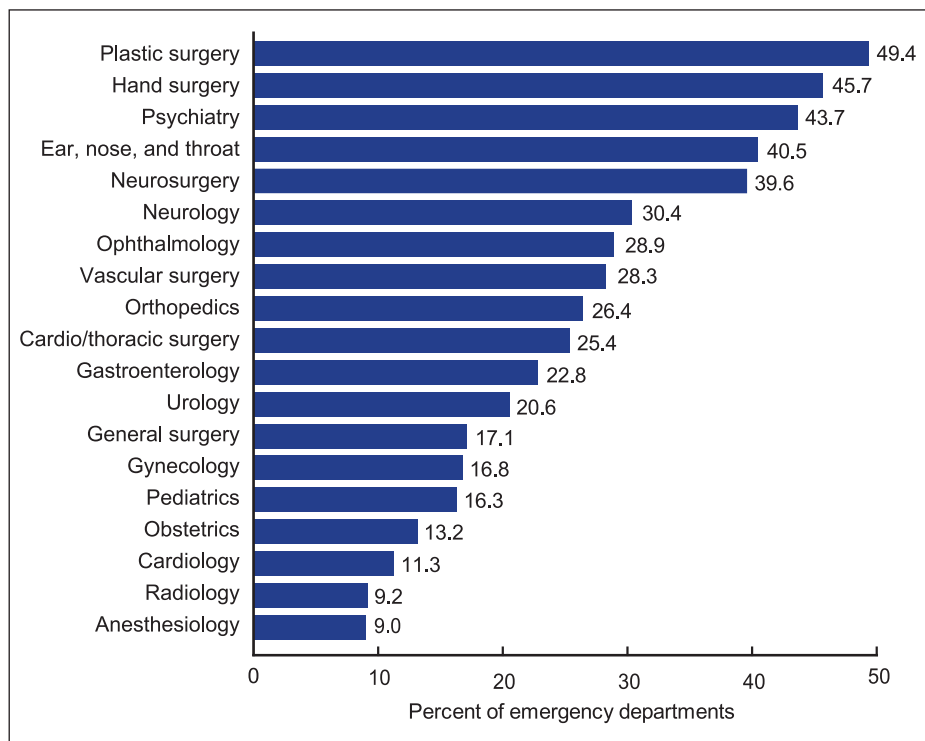


Figure 3. Percentage of emergency departments indicating difficulty in providing on-call physicians by physician specialty: United States, 2004

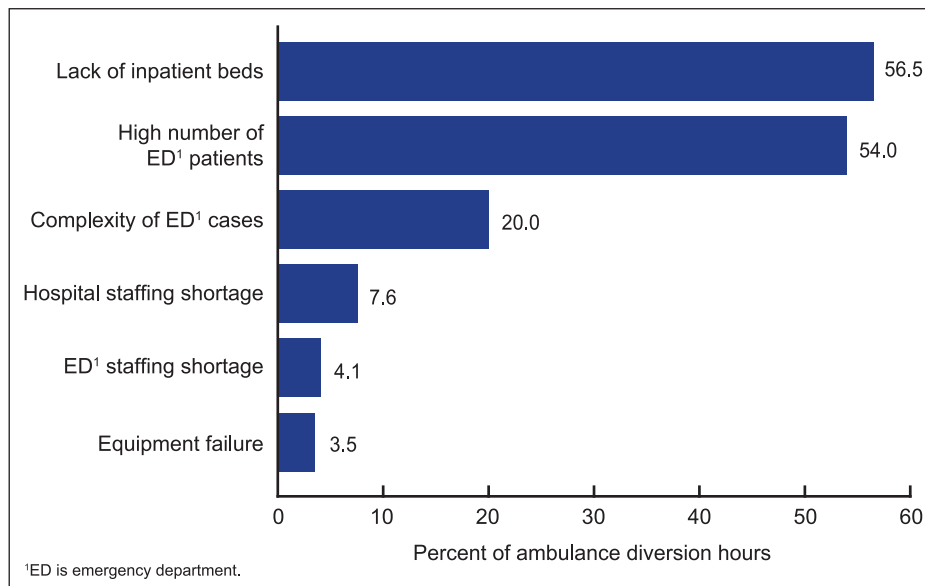


Figure 4. Mean percentage of diversion hours by reasons for diversion: United States, 2003-04

three-quarters of EDs that were not in metropolitan areas reported that less than 5% of nursing positions were vacant compared with one-half of metropolitan EDs. Difficulties in obtaining services of on-call specialists were reported in many EDs, with plastic surgeons and hand surgeons more frequently being reported as somewhat

or very difficult to obtain (Figure 3). The services of radiologists and anesthesiologists were fairly easy to obtain.

Ambulance diversion

Approximately one-third of U.S. hospitals (34.4 percent) reported going

on ambulance diversion status sometime in the previous year, whereas 51.4 percent reported no diversion hours. Information on the number of hours on diversion was missing for 14.2 percent of EDs. Metropolitan hospitals were more likely to have diversion hours reported (50.1 percent) compared with hospitals not in metropolitan areas (9.2 percent). About 12 percent of metropolitan hospitals reported having spent 5–19% of their operating time in diversion status, with about 2.7 percent spending 20% or more of their time on diversion (Table 4). Although the duration of ambulance diversion periods varies widely, the most frequently reported duration ranged between 3 and 4 hours. Lack of inpatient beds and ED crowding were frequent reasons for going on diversion. Staffing shortages and equipment failure were cited less frequently (Figure 4). Diversion periods were most frequently ordered by nursing staff or the hospital administrator (Figure 5). Percentage of time on diversion is positively related to occupancy rates and bed sizes of hospitals. Figure 6 plots the centroid for EDs on occupancy and bed size by percentage of time on diversion (none, 1–4%, 5–9%, 10–19%, and 20% or more). For example, EDs with no diversion hours reported had the smallest mean bed size (138) and smallest mean occupancy rate (60%), and EDs reporting 20% or more of their time on diversion had the largest mean bed size (311) and largest mean occupancy rate (81%).

Triage levels

EDs often use nursing triage to identify the most urgent patients (Table 5). Most hospitals used a 3- or 4-level triage system (63.6 percent), and about one-quarter used a 5-level system.

Language translation services

EDs reported providing a wide range of translation services. Although Spanish was the most frequent language provided (77.5 percent of EDs), Russian, French, Chinese, and Vietnamese were each reported as available in 10–14 percent of metropolitan EDs.

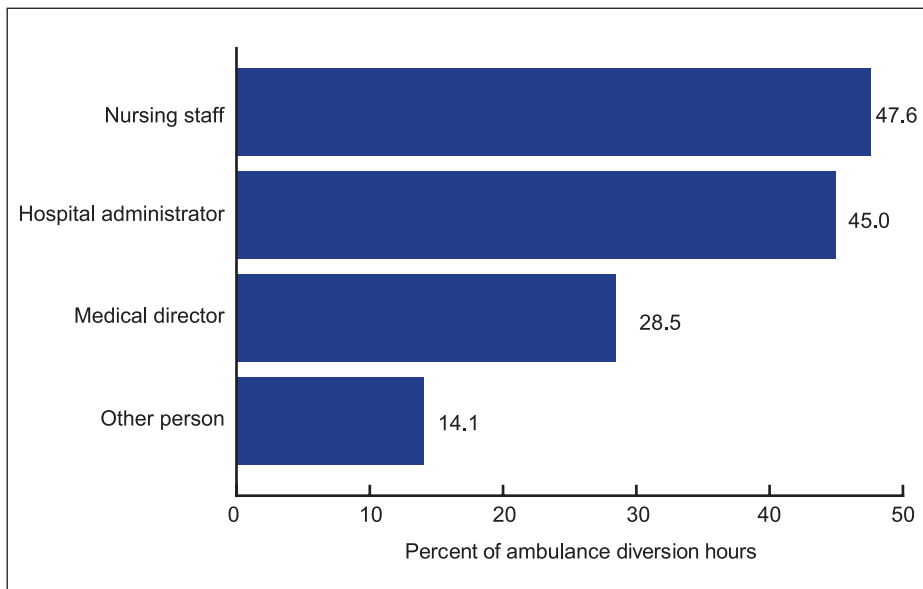


Figure 5. Mean percentage of diversion hours by who ordered the diversion: United States, 2003–04

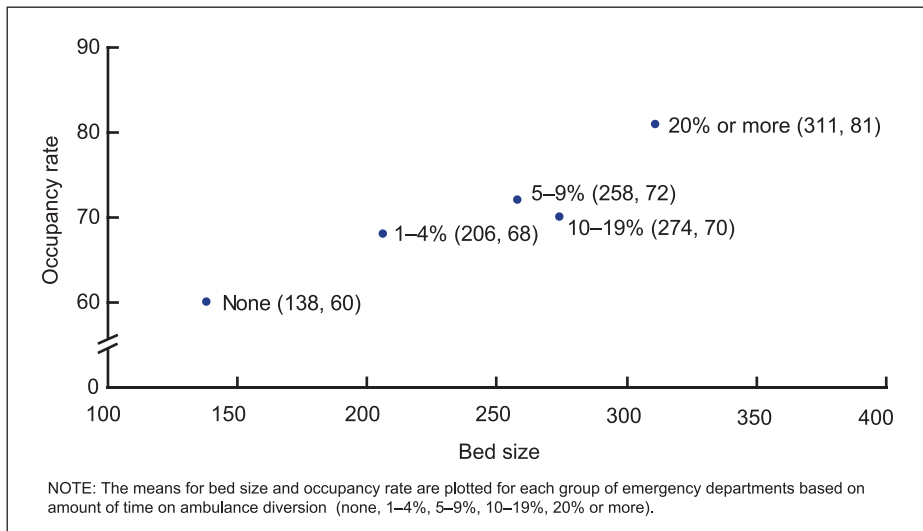


Figure 6. Percentage of time on ambulance diversion as a function of hospital bed size and occupancy rate in metropolitan emergency departments: United States, 2003–04

Emergency department utilization

EDs varied widely in terms of their profile of patient and payment characteristics, diagnostic and treatment services, and case disposition (Table 6). Two-thirds of EDs not in metropolitan areas saw fewer than 30 cases each day. In contrast, two-thirds of metropolitan EDs cared for 50–200 cases each day. Children represented 10–30% of the ED caseload, and seniors represented 5–25% of the caseload. One in 10 EDs reported that 50% or more of their cases had Medicaid, and 18.6 percent of EDs

reported that 25% or more of their cases were uninsured (Table 6). Figure 7 shows the distribution of EDs on the relative caseloads for expected payment sources. For example, private insurance accounts for about 33% of all ED visits, and uninsured cases make up about 15% of all ED visits. These percentages varied considerably among EDs.

ED caseloads also varied by patient acuity as measured by cases arriving by ambulance and cases triaged as emergent or urgent. About one-third of hospitals had less than 10% of their patients arriving via ambulance, and 13.8 percent had 30% or more of their

patients arriving via ambulance. One in five EDs had less than 20% triaged as emergent or urgent, whereas 38.1 percent of EDs had 65% or more of their cases so triaged. ED caseload acuity did not vary by metropolitan status. However, the provision of diagnostic or therapeutic services did vary, with metropolitan EDs providing greater numbers of services per 100 cases (Table 6). For example, only 19.4 percent of metropolitan EDs provided an average of less than 40 therapeutic services (e.g., intravenous fluids, wound care) per 100 visits compared with 41.5 percent of EDs not in metropolitan areas. About 28.6 percent of metropolitan EDs provided an average of 70 or more therapeutic services per 100 visits compared with 12.9 percent of EDs not in metropolitan areas. About one-half of EDs employed the services of physician assistants and nurse practitioners, with 18.5 percent using their services in 20% or more of their cases.

On average, 2 percent of cases were transferred to another facility. However, 18.5 percent of EDs transferred an average of 10% or more of their cases to other hospitals. Overall, only 1.7 percent of cases left without being seen, although 7.2 percent of EDs had 5% or more of their patients leave without seeing a physician.

Waiting times in metropolitan areas were longer than in areas that were not metropolitan. One-fifth of patients in metropolitan EDs waited over an hour to see a physician, whereas 31.7 percent of patients in areas that were not metropolitan were seen within 15 minutes. About 12.8 percent of metropolitan EDs had average waiting times greater than 60 minutes for their urgent cases, which are defined during triage as cases that should be seen between 15 and 60 minutes after arrival (Table 6). Overall, treatment times tended to be longer in metropolitan areas than in areas that were not metropolitan. For example, about one-half of patients in areas that were not metropolitan spent less than 90 minutes in the treatment area, whereas in metropolitan areas only one in five patients had treatments that lasted less

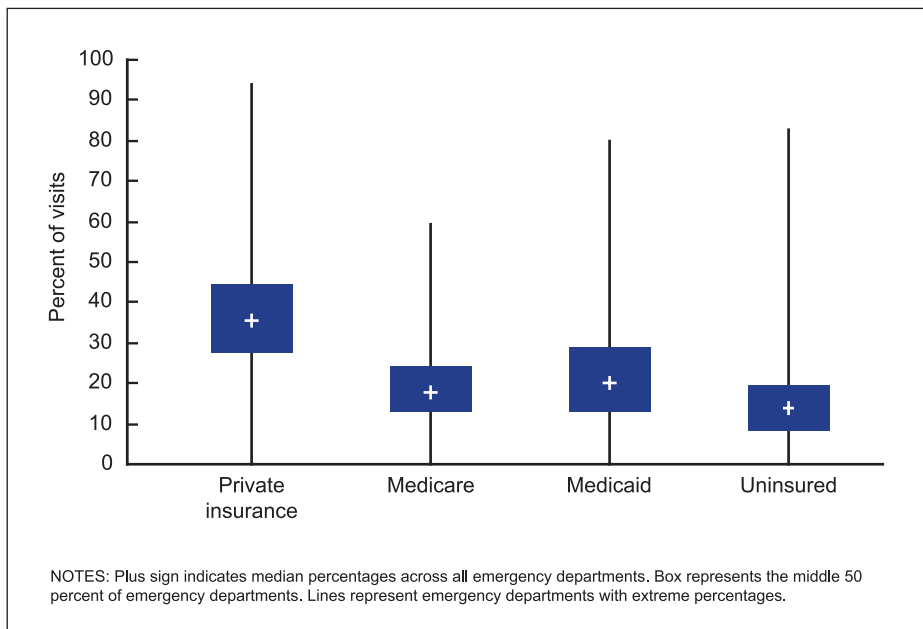


Figure 7. Box plots of emergency departments on caseload percentages for expected sources of payment: United States, 2003–04

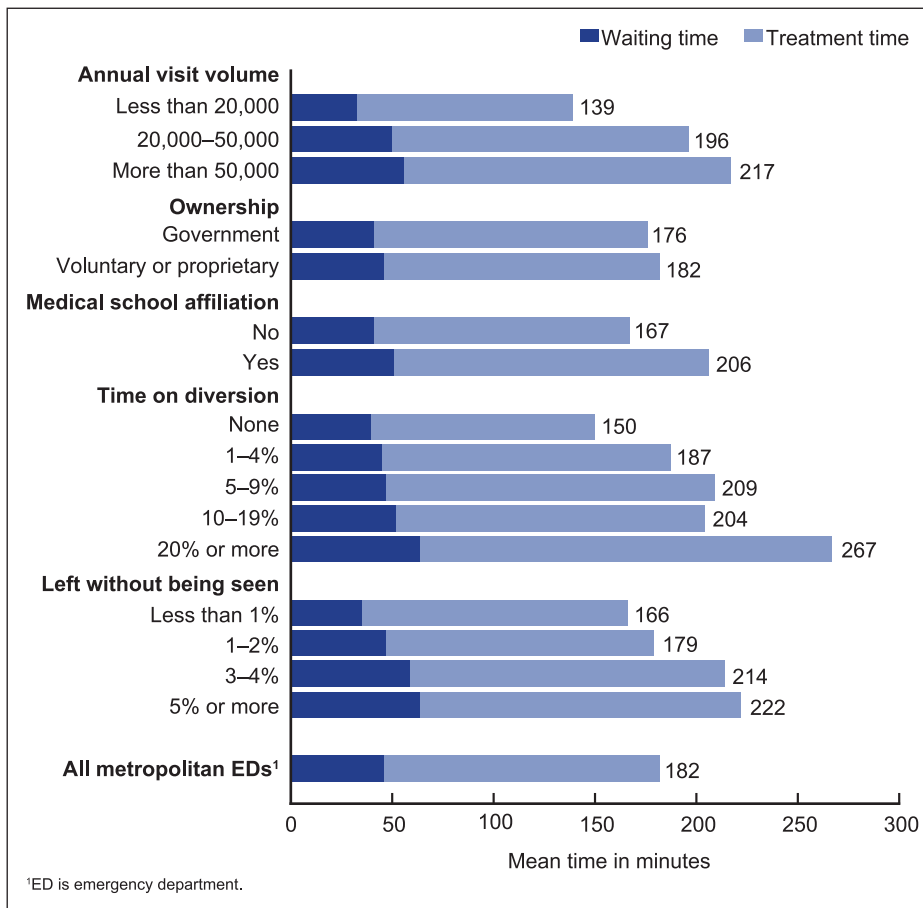


Figure 8. Average total visit duration parsed by waiting and treatment times in metropolitan areas by emergency department characteristics: United States, 2003–04

than 90 minutes. The total ED visit duration is the sum of the waiting time and the treatment time. Figure 8 displays

the total visit duration parsed by waiting and treatment times according to selected ED characteristics. Both waiting

and treatment times contributed to total visit duration being longest in EDs that go on diversion 20% or more of the time. Metropolitan visits lasted 2–3 times longer than nonmetropolitan visits, on average.

Indexes of staffing, capacity, and throughput

Table 7 presents selected indexes of ED functioning using measures from NHAMCS. The indexes are mean estimates for all EDs combined and separately for those in metropolitan areas and areas that were not metropolitan. The 25th, 50th, and 75th percentiles are also presented to show the variation across EDs. Significant differences between urban and rural areas were found for all indexes with the exception of visits per space, visits per physician, physicians per space, percentage arriving by ambulance, and percentage admitted to hospital. For EDs that had any diversion, the average number of hours on diversion for the year was 363.9; among metropolitan EDs, the average number of hours on diversion was 403.9 (Table 7). For metropolitan EDs, 25 percent reported being on diversion for more than 524.4 hours during the previous year.

Estimates of ED crowding

Ambulance diversion cannot be used as the sole criteria for ED crowding because about 8 percent of hospitals reported that there were laws prohibiting that practice in their location. Using the criteria of any ambulance diversion hours, average waiting time greater or equal to 60 minutes for urgent cases, or percentage of visits where the patient left before being seen greater than or equal to 3 percent, approximately 44.9 percent (95% confidence interval, 39.8 to 50.0) of EDs experienced crowding some time during 2003 and 2004. Approximately 63.7 percent of metropolitan EDs experienced crowding compared with 14.4 percent of EDs that were not metropolitan. Because EDs experiencing crowding tend to be larger in annual ED visit volume, this corresponds to 62.6 percent of all emergency visits being made to hospitals that experienced

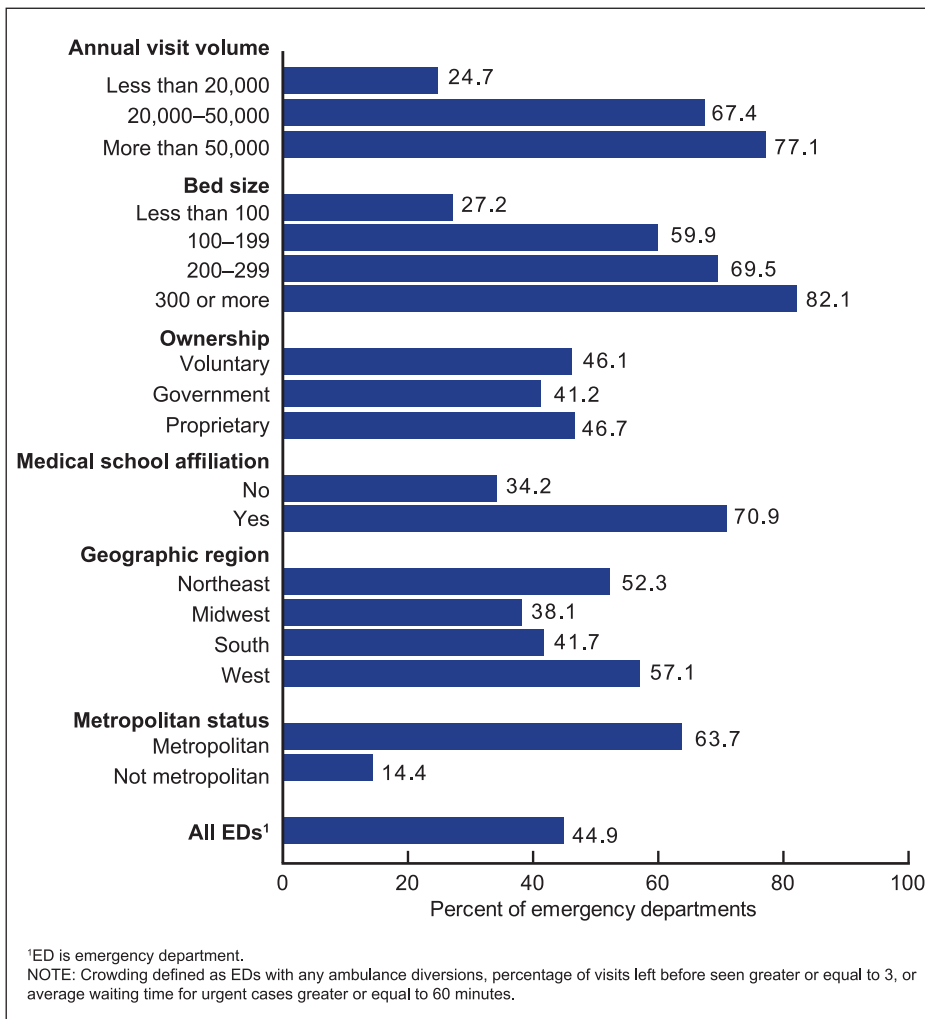


Figure 9. Percentage of emergency departments that experienced crowding by selected hospital characteristics: United States, 2003–04

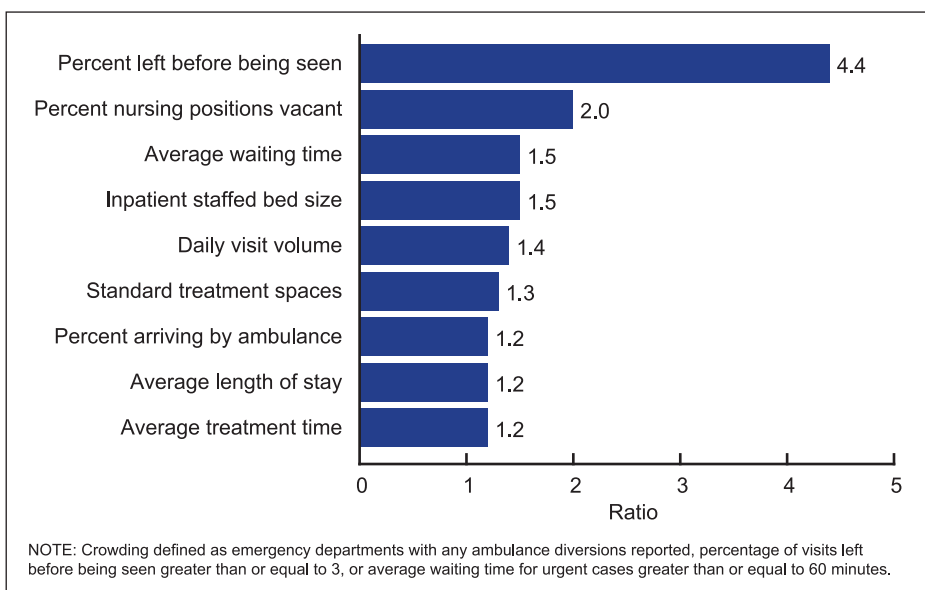


Figure 10. Ratio of indexes with significant differences between crowded and uncrowded emergency departments in metropolitan areas

ED crowding. Additionally, crowding was more common among EDs with larger inpatient bed sizes and those associated with medical schools (Figure 9).

When examining differences in the staffing, capacity, and throughput indexes for EDs located in metropolitan areas, EDs experiencing crowding were significantly higher than those not experiencing crowding for about one-half of those measures (Figure 10). The percentage of cases left before being seen in crowded EDs (2.1%) was four times as high as the percentage in uncrowded EDs (0.4%). The percentage of nursing positions vacant in crowded EDs (7.7%) was twice that of uncrowded EDs (3.9%). Average waiting time was 50% longer in crowded EDs (51.8 minutes) compared with uncrowded EDs (35.4 minutes).

Discussion

This report shows how U.S. nonfederal, general, and short-stay hospitals vary with respect to structure, process, and patient attributes in providing emergency medical care. National estimates of the steps hospitals take to provide such care are described separately for hospitals located in metropolitan areas and in areas that were not metropolitan. The fundamental differences in the size of metropolitan hospitals, both in terms of bed size and ED visit volume, affect many of the observed differences in staffing patterns, ED crowding, and duration of visits. In effect, the problems facing urban EDs are very different than those facing rural EDs. In areas that were not metropolitan, most EDs are the only one available for patients residing in the catchment area. There are no “nearby” choices for an emergency visit, whereas most metropolitan EDs have several other EDs available within a 20-minute ambulance ride or a 5-mile radius. ED patient profiles also vary by metropolitan status. EDs that are not in metropolitan areas were more likely to have a higher proportion of Medicare patients and to transfer patients.

One area of distinction between hospitals that are in metropolitan or not

metropolitan areas is the issue of crowding. NHAMCS data provide information on key measures of ED crowding. Some of the indexes developed by an expert panel (18) covering several domains of ED functioning (e.g., patient demand, ED capacity, patient complexity, and ED efficiency) were used to describe EDs experiencing crowding. Using the definition of crowding in this report, 40 to 50 percent of U.S. EDs experienced crowding at some point in 2003 and 2004. Among EDs located in metropolitan areas, the percentage increased to 64 percent. Indexes of ED functioning related to demand, capacity, and throughput found that one-half of those studied were related to crowded conditions in metropolitan EDs. Surprisingly, indexes of staffing were not related to crowding with the exception of the percentage of nursing positions vacant.

This report showed that periods of ambulance diversion occurred in one-half of EDs located in metropolitan areas. Ambulance diversion is an effect of ED crowding and some of its consequences are increased transit times and the potential for poor clinical outcomes (5). In addition, a study conducted in Los Angeles found that diversion hours at one ED were interrelated with the diversion hours of the nearest ED so that when one ED went on diversion, others nearby soon followed. In addition to crowding in the ED, a leading reason for ambulance diversion is insufficient appropriate inpatient beds to place critically ill or injured patients. As with the 2002 Government Accountability Office study of metropolitan EDs (6), NHAMCS found that diversion was positively related to hospital inpatient occupancy rates. The average occupancy rate for metropolitan hospitals with no diversions was 60%, whereas it was 81% for hospitals that spent as much as 20% of their time on diversion.

Increasing demand on EDs that are still open has caused almost one-half of all EDs to expand their physical space. A California study found that although the number of beds per population remained stable during the 1990s, the beds were being occupied by more

labor-intensive patients, resulting in decreased capacity (25). The NHAMCS results showed that metropolitan status was not related to expanding physical space.

This report shows that ED treatment spaces and staffing levels vary across metropolitan and not metropolitan areas. Most EDs that are not in metropolitan areas have fewer than 10 standard treatment spaces, where metropolitan EDs typically have 10 to 50 spaces. Providing nursing staff to cover all the spaces in metropolitan areas is another matter. NHAMCS found that one-quarter of metropolitan EDs had 5–19 percent of their nursing positions vacant. In addition to nursing shortages in the ED, there is the problem of high turnover leading to a high proportion of new, inexperienced emergency nurses. Sometimes nurses unfamiliar with the ED are sent to work from other areas of the hospital, which can contribute to reduced efficiency in the delivery of care (7).

On-call physician specialists provide specialized care for patients beyond the expertise of the emergency physician and usually have no guarantee of payment for the services they provide. From a specialist's business perspective, being on-call may result in time spent with little generation of income (26). NHAMCS data showed that on-call services provided by plastic and hand surgeons were the most difficult to obtain compared with other specialties. A California survey of emergency medicine physicians found that five of the seven specialties in which the greatest proportion of EDs reported trouble with specialty response were surgical (27).

Triage systems are known to vary from hospital to hospital. However, they all share the same goal of prioritizing patients for treatment. This prioritization is relevant to patient safety, especially when ED crowding delays evaluation. Although research found that the reliability and validity of the Emergency Severity Index, a 5-level triage system, were better than in a 3-level system (28,29), NHAMCS findings showed that about one-quarter of U.S. EDs used the former, and those that used the 5-level

system were predominantly in metropolitan areas.

This survey found that multiple language services were available more frequently in metropolitan EDs. Medical errors may result from patient-provider communication problems due to language barriers. Limited English proficiency can lead to increased use of medical resources in children (30) and serious medical events during pediatric hospitalizations (31). NHAMCS data showed that over 90 percent of EDs reported providing language translation services, with one-third offering 30 or more different languages.

Visit and patient profile patterns differed among hospitals indicating wide variation in reimbursement and treatment practices. Over one-quarter of hospitals had 30% or more of their visits made by Medicaid recipients, and about one-fifth had 25% or more of their visits made by uninsured persons. Such hospitals treat a larger proportion of cases from safety-net populations and are at risk of higher rates of uncompensated care. Most of these high safety-net hospitals do not receive sufficient Medicaid Disproportionate Share Program funds to offset their financial losses (32). Collected charges for self-pay patients are as low as 1% for the hospital to under 20% for the physician (33,34). Office-based physicians are also at risk for under payment when they provide EMTALA-related care in hospitals. In 2003–04, 22.8 percent of office-based physicians reported that they spent an average of 10.6 hours providing EMTALA-related care during their last full week of work. (35)

Hospitals also vary with respect to numbers of pediatric cases seen in the ED. A separate study using supplemental data from the 2002–03 NHAMCS found that hospitals with few pediatric ED cases are least prepared for handling the stabilization of severe pediatric emergencies with regard to small-sized equipment, such as needles, endotracheal tubes, and access to emergency medicine specialists, especially those specializing in pediatric emergencies (36). The NHAMCS data in this report found that one-fifth of EDs transferred as much as 10% or

more of their cases, including pediatric cases, implying that these hospitals were not best equipped to handle a sizable volume of their cases.

This report also showed variation among hospitals with respect to ED throughput measures. In metropolitan hospitals, one-fifth of EDs had patients waiting, on average, an hour or more before receiving treatment, and one in nine EDs had 5% or more of their patients leaving before being seen. A study conducted in a California public hospital of patients who left before being seen found that about one-half were judged to require immediate care, and 11 percent were hospitalized within a week (37). NHAMCS data found that on average, the percentage of patients leaving before being seen was positively associated with increased waiting times in metropolitan EDs.

Although a previous study found that 91 percent of ED directors nationwide reported overcrowding (38), this advance data report is the first to present objective findings of ED crowding in the United States. The data presented support the Institute of Medicine's (IOM) recent report on the crisis in U.S. emergency medical care (39). The IOM found that capacity and expertise were lacking for normal operations and that the system lacked stability and the capacity to respond to large disasters and epidemics. This advance data report shows that the majority of urban hospitals experience crowding and commonly turn away severely ill or injured patients. This could affect the capacity of larger hospitals to treat patients who are injured due to a mass casualty event or become ill as a result of an infectious disease outbreak.

Limitations

Utilization estimates for EDs were based on visits sampled during the 4-week reporting period rather than the full year. To the extent that visit characteristics vary in a hospital across months, then the variation around the distribution of EDs on visit characteristics may be understated. Also, the sample size for hospitals that are not metropolitan (n = 122) was not always

large enough to produce reliable estimates for some variables associated with large volume EDs because such EDs are rarely found in rural areas. The percentage of EDs experiencing crowded conditions is most likely an underestimate because information concerning diversion hours was not reported for 14 percent of the EDs. Consistency between 2003 and 2004 data collection among hospitals that participated both years shows that among those EDs missing ambulance diversion hours in 2004, most provided an answer for 2003, of which about one-half had reported diversion hours (data not shown).

Conclusions

This report provides many basic statistics necessary for reviewing the structure, process, and patient profile characteristics associated with the delivery of emergency medical care in this country. It also provides national benchmarks for potential measures of workflow necessary for understanding, monitoring, and managing ED crowding. Other reports will examine the relationship that these variables may have on the quality of emergency medical care. Further information about NHAMCS and its supplements may be found at www.cdc.gov/nchs/nhamcs.htm.

References

1. American Hospital Association (personal communication with Scott Bates). 2006.
2. McCaig LF, Nawar EW. National Hospital Ambulatory Medical Care Survey: 2004 emergency department summary. Advance data from vital and health statistics; no 372. Hyattsville, MD: National Center for Health Statistics. 2006.
3. ACEP Statistics Fact Sheet. Available from: http://www.acep.org/webportal/Newsroom/Templates/Default_Primary.aspx?NRMODE=Published&NRORIGINALURL=%2fwebportal%2fNewsroom%2fNewsMediaResources%2fStatisticsData%2fdefault%2fhtm&NRNODEGUID=%7b0AA2DBFD-5FA5-4E21-9C66-F69C8AFCC35B%7d&NRCACHEHINT=NoModifyGuest#wait.

4. McCaig LF, Ly N. National Hospital Ambulatory Medical Care Survey: 2000 emergency department summary. Advance data from vital and health statistics; no 326. Hyattsville, MD: National Center for Health Statistics. 2002.
5. Derlet RW, Richards JR. Overcrowding in the nation's emergency departments: Complex causes and disturbing effects. *Ann Emerg Med.* 35:63–8. 2000.
6. General Accounting Office. Hospital emergency departments: Crowded conditions vary among hospitals and communities. Washington. General Accounting Office. 2003.
7. Emergency Medical Treatment and Active Labor Act (EMTALA), codified as amended at 42 U.S.C. 1395dd, 1990; Health Care Financing Administration EMTALA Regulations, 42 C.F.R. Parts 488, 489, 1003. 1994.
8. American Hospital Association. Uncompensated hospital care cost fact sheet, American Hospital Association. 2005. Available from: <http://www.aha.org/aha/content/2005/pdf/0511UncompensatedCareFactSheet.pdf>.
9. Silka PA, Geiderman JM, Kim JY. Diversion of ALS ambulances: Characteristics, causes, and effects in a large urban system. *Prehosp Emerg Care.* 5:23–28. 2001.
10. Sun BC, Mohanty SA, Weiss R, et al. Effects of hospital closures and hospital characteristics on emergency department ambulance diversion, Los Angeles County, 1998 to 2004. *Ann Emerg Med.* 47:309–16. 2006.
11. Schull MH, Vermeulen M, Slaughter G, Morrison L, Daly P. Emergency department crowding and thrombolysis delays in acute myocardial infarction. *Ann Emerg Med.* 44:577–85. 2004.
12. Burt CW, McCaig LF, Valverde RH. Analysis of ambulance transports and diversions among U.S. emergency departments. *Ann Emerg Med.* 47:317–26. 2006.
13. Brewster LR, Felland LE. Emergency department diversions: Hospital and community strategies alleviate the crisis. Issue Brief No.78, Center for Studying Health System Change, Washington. 2003.
14. McConnell KJ, Richards CF, Daya M, et al. Effect of ICU capacity on emergency department length of stay

- and ambulance diversion. *Ann Emerg Med.* 45:471–8. 2005.
15. Kelen GD, Scheulen PA, Hill PM. Effect of an emergency department (ED) managed acute care unit on ED overcrowding and emergency medical services diversion. *Acad Emerg Med.* 8:1095–1100. 2001.
 16. Spaite DW, Bartholomeaux F, Guisto J, et al. Rapid process redesign in a university-based emergency department: Decreasing waiting time intervals and improving patient satisfaction. *Ann Emerg Med.* 39:168–77. 2002.
 17. Taylor J. Don't bring me your tired, your poor: The crowded state of America's emergency departments. National Health Policy Forum Issue Brief no 811. 2006. Available from: http://www.nhpf.org/pdfs_ib/IB811_EDCcrowding_07-07-06.pdf.
 18. Solberg LI, Asplin BR, Weinick RM, Magid DJ. Emergency department crowding: Consensus development of potential measures. *Ann Emerg Med.* 42:824–34. 2003.
 19. U.S. News and World Report. Code blue crisis in the ER. 2001. Available from: http://www.usnews.com/usnews/health/articles/010910/archive_003670_4.htm.
 20. McCaig LF, McLemore T. Plan and operation of the National Hospital Ambulatory Medical Care Survey. National Center for Health Statistics. *Vital Health Stat* 1(34). 1994.
 21. Research Triangle Institute. SUDAAN (Release 9.0.1) [Computer Software]. Research Triangle Park, NC: Research Triangle Institute. 2005.
 22. McCaig LF, Burt CW. National Hospital Ambulatory Medical Care Survey: 2003 emergency department summary. Advance data from vital and health statistics; no 358. Hyattsville, MD: National Center for Health Statistics. 2005.
 23. Epstein SK, Tian L. Development of an emergency department work score to predict ambulance diversion. *Acad Emerg Med.* 13:421–6. 2006.
 24. Asplin B. Measuring crowding: Time for a paradigm shift. *Acad Emerg Med.* 13:459–61. 2006.
 25. Lambe S, Washington DL, Fink A, et al. Trends in the use and capacity of California's emergency departments, 1990–1999. *Ann Emerg Med.* 39:389–96. 2002.
 26. Taylor TB. Threats to the health care safety net. *Acad Emerg Med.* 8:1080–7. 2001.
 27. Rudkin SE, Oman J, Langdorf MI, et al. The state of ED on-call coverage in California. *Am J Emerg Med.* 22:575–81. 2004.
 28. Travers D, Waller A, Bowling J, et al. Five-level triage system more effective than three-level system in tertiary emergency department. *J Emerg Nurs.* 28:395–400. 2002.
 29. Fernandes C, Wuerz R, Clark S, et al. How reliable is emergency department triage? *Ann Emerg Med.* 34:141–7. 1999.
 30. Hampers LC, McNulty JE. Professional interpreters and bilingual physicians in a pediatric emergency department. *Arch Pediatr Adolesc Med.* 156:1108–13. 2002.
 31. Cohen AL, Rivara F, Marcuse EK, et al. Are language barriers associated with serious medical events in hospitalized pediatric patients? *Pediatrics.* 116:575–9. 1999.
 32. Burt CW, Arispe IE. Characteristics of emergency departments serving high volumes of safety-net patients: United States, 2000. National Center for Health Statistics. *Vital Health Stat* 13(155). 2004.
 33. Beck CM, Paul RI. Payment of emergency department bills by Medicaid patients. *Ann Emerg Med.* 5(4), 330–3. 1998.
 34. Irvin C, Fox J, Pothoven K. Financial impact on emergency physicians for nonreimbursed care for the uninsured. *Ann Emerg Med.* 42(4):571–6. 2003.
 35. Hing E, Burt CW. Characteristics of office-based physicians and their practices: United States 2003–04. National Center for Health Statistics. *Vital Health Stat* 13(164). To be published.
 36. Middleton KR, Burt CW. Availability of pediatric services and equipment in emergency departments: United States, 2002–03. Advance data from vital and health statistics. no 367. Hyattsville, MD. National Center for Health Statistics. 2006.
 37. Baker DW, Stevens CD, Brook RH. Patients who leave a public hospital emergency department without being seen by a physician: Causes and consequences. *JAMA.* 266:1085–90. 1991.
 38. Derlet RW, Richards JR, Kravitz RL. Frequent overcrowding in U.S. emergency departments. *Acad Emerg Med.* 8:151–55. 2001.
 39. Institute of Medicine. Hospital-based emergency care: At the breaking point. Future of emergency care series. Uncorrected proofs. June 14, 2006.

Table 1. Percent distribution of emergency departments and corresponding standard errors, by hospital characteristics, according to metropolitan status: United States, 2003–04

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
All emergency departments	100.0	...	100.0	...	100.0	...
Geographic region						
Northeast	15.3	1.1	18.2	2.0	10.4	2.0
Midwest	30.4	2.6	23.6	2.2	41.4	5.7
South	37.1	2.1	35.4	3.1	39.9	5.0
West	17.2	1.3	22.8	2.3	*8.3	2.5
Ownership						
Voluntary, nonprofit	65.2	3.9	69.9	3.4	57.6	8.1
Government	25.2	3.9	18.7	3.0	35.6	8.5
Proprietary	9.6	1.5	11.4	1.9	*6.8	2.2
Annual emergency department visit volume						
Less than 20,000	55.4	2.8	33.0	3.9	91.8	2.7
20,000–50,000	32.5	2.5	47.6	3.3	*6.1	2.6
50,000 or more	12.1	1.2	19.5	2.1	*0.1	0.1
Staffed bed size						
Less than 100	57.2	2.7	35.1	3.5	93.1	2.3
100–199	20.0	2.1	28.0	2.8	*7.0	2.3
200–299	10.9	1.4	17.6	2.3	*0.0	...
300 or more	11.9	1.1	19.3	1.9	*0.0	...
Inpatient daily occupancy rate ¹						
Less than 50	29.2	2.8	17.1	2.8	48.8	6.1
50–59	12.7	2.2	11.4	2.5	14.9	4.4
60–69	10.5	1.3	13.9	2.0	4.9	1.0
70–79	13.8	1.7	17.7	2.1	*7.5	2.9
80–89	13.2	2.0	17.6	2.3	*6.1	4.3
90–99	8.3	1.4	9.5	1.6	*6.4	2.6
Missing	12.3	1.7	12.9	1.9	11.4	3.4
Medical school affiliation						
Yes	28.1	2.4	38.4	2.9	*11.3	4.5
No	70.6	2.4	59.5	3.0	88.7	4.5
Missing	*1.3	0.5	*2.1	0.8	*	*
Metropolitan status						
Metropolitan area	61.8	3.2	...	...	...	...
Not metropolitan area	38.2	3.2	...	...	...	...

... Category not applicable.

* Figure does not meet standard of reliability or precision.

0.0 Quantity more than zero but less than 0.05.

¹Defined as beds filled as of midnight divided by staffed beds.

Table 2. Percent distribution of emergency departments and corresponding standard errors, by treatment space characteristics, according to metropolitan status: United States, 2003–04

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
All emergency departments	100.0	...	100.0	...	100.0	...
Number of standard treatment spaces						
Less than 5	14.3	3.8	1.4	0.7	35.2	8.4
5–9	31.7	3.1	20.0	3.2	50.5	7.5
10–19	26.9	2.7	36.1	3.2	*12.1	3.9
20–49	23.2	1.7	36.8	2.8	*1.2	0.8
50 or more	2.6	0.6	4.2	0.9	*0.0	...
Missing	*1.4	0.5	1.5	0.6	*1.1	0.8
Number of other treatment spaces ¹						
Less than 5	64.4	2.7	49.9	3.4	87.9	3.6
5–9	16.7	2.1	23.1	2.9	*6.2	2.0
10–19	10.0	1.3	14.8	2.0	*2.1	1.2
20 or more	6.0	1.0	8.9	1.5	*1.2	0.8
Missing	3.0	0.8	3.2	0.8	*2.6	1.7
Increased number of standard treatment spaces in last 2 years ²						
Yes	22.7	2.5	27.0	3.1	*14.9	6.1
No	76.1	2.7	71.1	3.3	85.1	6.1
Missing	*1.2	0.7	*1.9	1.1	*0.0	...
Expanded physical space in last 2 years ²						
Yes	16.1	2.5	16.0	2.5	*16.3	5.3
No	82.7	2.6	82.1	2.8	83.7	5.3
Missing	*1.2	0.7	*1.9	1.1	*0.0	...
Physical space expansion planned within next 2 years ^{2,3}						
Yes	32.3	4.1	38.7	4.5	*20.6	8.9
No	45.7	4.2	42.3	4.1	51.8	9.2
Missing	22.0	4.0	19.0	2.8	*27.6	9.8

... Category not applicable.

* Figure does not meet standard of reliability or precision.

0.0 Quantity more than zero but less than 0.05.

¹Other treatment spaces includes chairs or stretchers in hallways.

²Data available only for 2004.

³Excludes emergency departments that expanded space within the last 2 years.

Table 3. Percent distribution of emergency departments and corresponding standard errors, by staffing characteristics, according to metropolitan status: United States, 2003–04

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
All emergency departments	100.0	...	100.0	...	100.0	...
Employment status of emergency department physicians						
Hospital	21.4	2.2	23.5	2.7	17.9	3.4
Outside contract	64.7	3.1	68.6	2.9	58.5	6.0
Both	11.6	2.4	5.6	1.4	21.4	5.0
Other	2.2	0.6	2.2	0.5	2.2	1.4
Missing	*0.1	0.0	*0.1	0.1	*0.0	...
Number of emergency department physicians						
Less than 5	22.5	3.8	14.1	2.4	36.2	8.2
5–9	23.8	2.4	22.1	2.9	26.7	4.6
10–19	22.5	2.3	27.5	2.6	14.3	4.1
20 or more	13.7	1.7	19.9	2.4	3.6	1.8
Missing	17.5	2.2	16.5	2.1	19.2	4.8
Percent of emergency department physicians with emergency medicine residency						
Under 5	17.8	2.5	9.4	2.3	31.5	4.9
5–24	5.2	1.3	4.9	1.5	5.6	2.3
25–49	7.1	1.5	9.2	1.8	3.8	2.5
50–74	10.5	1.7	11.5	1.8	9.0	3.3
75–89	6.7	1.2	10.7	1.8	0.3	0.3
90 or more	20.2	2.1	25.2	2.4	12.2	3.6
Missing	32.4	2.7	29.3	2.7	37.5	5.6
Percent of emergency department physicians with emergency medicine board certification						
Less than 5	43.2	2.8	40.3	2.6	47.9	5.7
5–24	2.3	0.7	2.1	0.6	2.7	1.5
25–49	5.2	1.4	5.0	1.5	5.5	2.7
50–74	4.4	1.1	4.9	0.9	3.6	2.4
75–89	3.4	0.7	5.4	1.2	*0.0	...
90 or more	10.0	1.3	13.1	1.7	4.9	2.1
Missing	31.6	2.5	29.3	2.5	35.5	5.5
Percent of emergency departments where physicians have responsibilities elsewhere in the hospital						
Yes, some physicians	25.7	2.5	23.7	2.6	28.8	4.9
Yes, all physicians	13.0	2.9	9.0	1.9	19.5	6.7
No	60.0	3.4	65.8	3.1	50.6	6.9
Missing	1.3	0.4	*1.5	0.5	1.1	0.8
Percent of nursing positions currently vacant ¹						
Less than 5	57.1	3.7	48.5	4.5	73.8	8.0
5–9	9.9	1.8	13.9	2.6	*1.2	1.6
10–19	11.3	1.9	12.3	2.6	*9.4	3.3
20 or more	8.3	2.4	*8.5	2.6	*7.7	4.8
Missing	13.4	2.3	16.7	3.1	*7.2	3.5

... Category not applicable.

* Figure does not meet standard of reliability or precision.

0.0 Quantity more than zero but less than 0.05.

¹Data available only for 2004.

Table 4. Percent distribution of emergency departments and corresponding standard errors, by ambulance diversion characteristics, according to metropolitan status: United States, 2003–04

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
All emergency departments	100.0	...	100.0	...	100.0	...
Number of nearby emergency departments						
0	34.6	3.0	19.8	2.3	58.5	7.4
1–2	36.5	3.5	34.7	3.1	39.3	7.5
3–4	15.7	1.9	24.4	2.8	1.6	0.9
5–7	8.9	1.3	14.0	2.0	0.6	0.5
8 or more	2.8	0.5	4.6	0.8	*0.0	...
Missing	1.6	0.4	2.5	0.7	*0.0	...
State or local law/regulation prohibiting diversion						
Yes	8.0	1.7	7.5	1.8	8.9	3.2
No	91.2	1.7	91.3	1.9	91.1	3.2
Missing	0.8	0.3	1.2	0.5	*0.0	...
Percent of operating time in diversion status during previous year						
0	51.4	2.5	33.3	3.4	80.8	3.5
1–4	25.6	2.3	35.9	2.9	9.1	3.4
5–9	3.8	0.8	6.2	1.4	*0.0	...
10–19	3.3	0.6	5.4	0.9	*0.0	...
20 or more	1.7	0.3	2.7	0.5	*0.0	...
Missing	14.2	1.8	16.6	2.1	10.1	3.3
Average length of ambulance diversion ^{1,2}						
Less than 2 hours	17.0	3.5	17.7	3.6	...	...
2 hours	14.1	2.3	14.7	2.9	...	...
3–4 hours	32.5	4.2	33.7	4.2	...	...
5–9 hours	24.1	4.1	22.7	4.1	...	...
10 or more hours	12.3	3.1	11.2	3.0	...	...

... Category not applicable.

* Figure does not meet standard of reliability or precision.

0.0 Quantity more than zero but less than 0.05.

¹Based on approximately 930 emergency departments reporting ambulance diversions.

²Distribution of ambulance diversions.

Table 5. Percent distribution of emergency departments and corresponding standard errors, by triage and language translation characteristics, according to metropolitan status: United States, 2003–04

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
All emergency departments	100.0	...	100.0	...	100.0	...
Number of levels in nursing triage system						
3	47.2	2.7	43.8	3.0	52.7	5.9
4	16.4	2.4	17.5	2.5	*14.8	5.1
5	23.3	2.5	28.2	2.7	*15.3	4.7
Other	4.3	1.1	5.0	1.3	*3.3	2.0
No triage system	7.2	1.9	*3.0	1.9	13.0	3.8
Missing	*1.7	0.6	*2.0	0.8	*1.0	1.0
Number of different languages in translation service ¹						
1	21.4	3.0	15.4	3.4	32.5	6.7
2–9	20.0	3.0	21.4	3.1	*17.3	5.9
10–29	9.8	2.8	*11.4	3.5	*6.8	4.4
30 or more	34.3	4.3	39.5	4.3	*24.8	8.8
No language translation service	*8.6	3.0	*5.5	2.4	*14.4	7.2
Missing	*5.9	1.9	*6.7	2.3	*4.2	3.0
	Percent of emergency departments	Standard error	Percent of emergency departments	Standard error	Percent of emergency departments	Standard error
Leading languages offered ¹						
Spanish	77.5	3.2	79.4	3.5	74.0	6.2
Russian	9.0	1.7	14.0	2.4	0.0	0.0
French	*8.6	2.7	*11.9	3.8	*2.4	2.4
Chinese	7.2	1.3	11.1	2.1	*0.0	0.0
Vietnamese	6.7	1.5	10.4	2.3	*0.0	0.0
Korean	3.9	1.0	6.1	1.6	*0.0	0.0

... Category not applicable.

* Figure does not meet standard of reliability or precision.

0.0 Quantity more than zero but less than 0.05.

¹Data available only for 2004.

Table 6. Percent distribution of emergency departments and corresponding standard errors, by utilization estimates, according to metropolitan status: United States, 2003–04

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
All emergency departments	100.0	...	100.0	...	100.0	...
Daily visit volume						
Less than 30	32.2	3.3	11.0	3.1	66.9	6.4
30–49	18.0	2.6	15.5	2.9	22.1	5.6
50–99	24.6	2.2	33.5	2.9	10.3	2.8
100–199	19.5	1.6	31.1	2.6	*0.7	0.6
200 or more	5.5	0.9	8.9	1.4	*0.0	...
Patient characteristics						
Percent under 18 years:						
Less than 10	6.3	0.8	9.8	1.2	*0.5	0.5
10–19	21.5	2.2	25.6	2.7	14.8	3.9
20–29	45.3	2.8	35.5	2.5	61.2	5.1
30–49	18.1	2.4	18.4	2.9	17.6	4.0
50 or more	8.9	1.5	10.7	1.9	*5.9	2.7
Percent 65 years and over:						
Less than 5	6.2	1.2	10.0	1.8	*0.0	...
5–14	33.8	2.5	41.9	2.7	20.6	3.8
15–24	35.4	2.9	31.1	2.8	42.4	5.2
25–34	13.8	2.1	10.3	1.7	19.6	4.7
35 or more	10.8	1.8	6.8	1.5	17.5	3.9
Percent Medicare:						
Less than 5	4.8	1.1	7.7	1.7	*0.0	...
5–14	28.0	2.6	35.4	2.9	15.9	4.1
15–24	36.4	2.5	40.4	2.7	30.0	4.8
25–34	17.6	2.7	6.9	1.4	34.8	5.8
35 or more	13.3	1.7	9.6	1.4	19.3	3.7
Percent Medicaid:						
Less than 10	16.1	2.0	19.2	2.1	*11.1	3.6
10–19	28.5	2.8	30.8	3.2	24.6	5.4
20–29	27.7	2.6	22.4	2.2	36.3	5.5
30–49	17.3	2.2	17.7	2.4	16.5	4.2
50 or more	10.5	1.5	9.8	1.7	11.6	3.1
Percent private insurance:						
Less than 10	4.8	1.0	4.0	0.7	6.1	2.5
10–19	5.7	1.1	6.6	1.2	4.2	1.9
20–29	21.5	2.2	18.0	2.2	27.2	4.7
30–49	45.2	2.5	43.6	2.5	47.9	5.2
50 or more	22.8	2.0	27.8	2.6	14.6	3.5
Percent uninsured:						
Less than 5	16.0	2.4	14.5	2.0	18.5	5.4
5–14	38.4	3.0	32.4	2.5	48.1	6.4
15–24	27.1	2.7	30.8	3.0	21.1	5.1
25–34	10.4	1.6	11.5	1.7	*8.7	3.5
35 or more	8.2	1.3	11.0	1.6	*3.7	2.1
Patient acuity						
Percent arriving by ambulance:						
Under 10	37.6	2.8	36.5	3.1	39.5	5.6
10–14	45.7	3.1	43.0	2.9	50.0	6.0
15–29	2.9	0.6	4.4	0.9	*0.4	0.3
30 or more	13.8	2.1	16.1	2.2	*10.2	3.9
Percent emergent and urgent:						
Under 20	21.8	2.6	22.4	2.8	20.8	4.7
20–34	12.9	1.9	14.0	1.9	*11.0	3.7
35–49	14.2	1.7	15.3	2.3	12.3	2.6
50–64	13.0	1.8	12.4	1.8	14.1	3.9
65 or more	38.1	2.9	35.8	3.2	41.9	5.8

See footnotes at end of table.

Table 6. Percent distribution of emergency departments and corresponding standard errors, by utilization estimates, according to metropolitan status: United States, 2003–04—Con.

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
Services provided						
Average number of diagnostic services per 100 visits:						
Less than 200	18.7	2.5	14.8	2.2	25.2	5.6
200–299	24.9	2.2	24.0	2.4	26.4	4.0
300–399	27.4	2.5	23.0	2.2	34.4	5.5
400 or more	29.0	2.7	38.2	3.1	*14.1	4.5
Average number of therapeutic services per 100 visits:						
Less than 40	27.8	2.5	19.4	2.7	41.5	5.0
40–59	34.2	3.0	33.0	2.6	36.1	6.7
60–69	15.4	2.2	19.0	2.4	*9.6	4.1
70 or more	22.6	2.1	28.6	2.5	12.9	3.1
Percent using physician assistants or nurse practitioners:						
0	57.3	3.5	51.6	2.9	66.5	7.7
1–9	15.2	2.0	18.0	2.4	10.5	3.2
10–19	9.0	1.4	11.7	1.6	*4.7	2.4
20 or more	18.5	3.1	18.7	2.1	18.3	7.4
Percent not seeing a physician:						
0	18.0	2.4	14.4	2.1	23.8	5.2
1–2	18.4	2.2	18.2	2.1	18.7	4.6
3–19	37.9	2.7	44.4	2.7	27.3	5.2
20 or more	25.8	3.3	23.0	2.3	30.2	7.5
Disposition						
Percent admitted:						
Less than 5	24.0	2.6	23.2	3.0	25.4	5.2
5–9	11.3	1.9	11.5	2.0	*11.1	3.8
10–14	18.9	2.4	17.4	2.0	21.3	5.2
15–19	19.3	2.4	17.2	2.2	22.6	5.2
20 or more	25.5	2.0	30.8	2.4	19.5	4.1
Percent transferred:						
Less than 1	28.9	2.5	38.4	2.9	*13.4	4.1
1–2	19.8	2.0	20.7	2.1	18.3	4.1
3–9	32.9	3.0	23.8	2.5	47.6	6.0
10 or more	18.5	1.8	17.0	2.1	20.8	3.5
Percent left before being seen:						
Less than 1	57.9	2.8	50.4	3.5	70.0	5.1
1–2	25.9	2.3	27.6	2.9	23.2	3.9
3–4	9.0	1.6	11.0	1.9	*5.9	3.4
5 or more	7.2	1.3	11.0	2.0	*0.9	0.7
Throughput measures						
Average waiting time:						
Less than 15 minutes	17.6	2.2	9.0	2.0	31.7	4.6
15–29 minutes	29.8	3.1	19.2	2.7	46.9	5.4
30–44 minutes	24.7	2.4	29.3	2.8	17.3	4.2
45–59 minutes	14.9	1.9	22.2	2.7	*3.0	1.7
60 minutes or more	13.0	1.4	20.3	2.1	*1.2	0.8
Average treatment time in minutes:						
Less than 60 minutes	8.2	2.7	*4.8	1.8	13.7	6.3
60–89 minutes	21.9	2.1	15.4	2.2	32.6	4.6
90–119 minutes	29.1	3.1	27.4	2.7	31.8	6.8
120–179 minutes	29.2	2.6	35.6	2.9	19.0	4.6
180 minutes or more	11.6	1.3	16.9	2.0	3.0	0.7
Average total visit duration:						
Less than 2 hours	31.8	3.5	17.5	3.4	54.9	6.8
2 hours	39.8	3.0	41.2	2.8	37.5	6.8
3 hours	18.2	1.8	26.0	2.5	*5.7	2.8
4 hours or more	10.2	1.2	15.3	1.9	*1.9	1.2

See footnotes at end of table.

Table 6. Percent distribution of emergency departments and corresponding standard errors, by utilization estimates, according to metropolitan status: United States, 2003–04—Con.

Characteristic	Total		Metropolitan area		Not metropolitan area	
	Percent distribution	Standard error	Percent distribution	Standard error	Percent distribution	Standard error
Throughput measures—Con.						
Average waiting time for urgent cases ¹ :						
Less than 15 minutes	27.3	2.9	16.5	3.0	44.6	5.4
15–29 minutes	25.1	2.8	20.0	2.4	33.3	5.9
30–44 minutes	27.3	2.4	31.8	2.7	20.1	3.9
45–59 minutes	12.5	1.5	18.9	2.3	*2.0	1.1
60 minutes or more	7.9	1.0	12.8	1.6	*0.1	0.0

... Category not applicable.

* Figure does not meet standard of reliability or precision.

0.0 Quantity more than zero but less than 0.05.

¹Urgent cases are defined as those that must be seen within 15–60 minutes.

Table 7. Means and quartiles for selected indexes of staffing, capacity, ambulance diversion and throughput in emergency departments: United States, 2003–04

Index	Mean	Standard error	25th percentile	Median	75th percentile
Daily visit volume					
Total	67.6	3.0	23.1	47.8	94.0
Metropolitan area	93.4	4.1	46.0	81.9	125.9
Not metropolitan area	25.8	2.6	13.3	21.8	32.3
Standard treatment spaces					
Total	14.6	0.6	5.7	10.0	19.4
Metropolitan area	19.8	0.8	9.9	16.4	25.0
Not metropolitan area	6.3	0.6	2.7	5.4	7.6
Number of physicians with ED ¹ privileges					
Total	13.3	2.8	3.7	7.6	14.3
Metropolitan area	17.5	4.4	5.7	10.6	18.8
Not metropolitan area	6.4	0.8	2.3	4.3	8.3
Visits per space					
Total	4.6	0.1	3.4	4.4	5.4
Metropolitan area	4.9	0.1	3.7	4.6	5.5
Not metropolitan area	4.1	0.3	2.8	3.8	5.3
Visits per physician					
Total	7.5	0.5	2.8	5.8	10.0
Metropolitan area	8.4	0.5	4.2	6.9	10.4
Not metropolitan area	6.1	0.9	1.7	3.1	8.1
Physicians per space					
Total	1.3	0.3	0.5	0.7	1.3
Metropolitan area	1.3	0.4	0.5	0.7	1.0
Not metropolitan area	1.4	0.2	0.5	1.0	1.9
Percent nursing positions vacant ²					
Total	5.3	0.7	0.0	0.7	7.7
Metropolitan area	6.1	0.9	0.0	1.9	9.0
Not metropolitan area	3.9	1.4	0.0	0.0	1.8
Percent arriving by ambulance					
Total	13.0	0.4	7.4	12.1	17.4
Metropolitan area	13.8	0.5	7.3	12.8	18.7
Not metropolitan area	11.8	0.6	7.4	11.4	15.2
Average waiting time ³					
Total	37.1	1.2	19.0	33.1	48.6
Metropolitan area	45.8	1.4	29.5	41.5	56.7
Not metropolitan area	22.8	1.4	13.8	19.3	29.0
Average treatment time ³					
Total	126.0	3.4	86.9	111.0	151.2
Metropolitan area	139.6	3.9	100.2	125.0	159.1
Not metropolitan area	103.6	5.2	73.8	96.1	111.7
Average visit duration ³					
Total	159.7	3.8	112.7	145.2	187.2
Metropolitan area	181.6	4.7	132.9	166.1	212.1
Not metropolitan area	124.2	5.1	92.9	117.8	136.7
Percent left before being seen					
Total	1.4	0.1	0.0	0.0	1.9
Metropolitan area	1.8	0.2	0.0	1.0	2.6
Not metropolitan area	0.7	0.2	0.0	0.0	1.1
Percent transferred					
Total	3.0	0.2	0.9	2.0	4.2
Metropolitan area	2.1	0.2	0.0	1.3	3.0
Not metropolitan area	4.5	0.5	1.7	3.4	6.0

See footnotes at end of table.

Table 7. Means and quartiles for selected indexes of staffing, capacity, ambulance diversion and throughput in emergency departments: United States, 2003–04—Con.

Index	Mean	Standard error	25th percentile	Median	75th percentile
Percent admitted to hospital					
Total	12.5	0.4	5.9	12.6	18.1
Metropolitan area	13.4	0.6	6.1	13.2	19.4
Not metropolitan area	11.1	0.7	5.7	10.5	16.8
Inpatient staffed bed size					
Total	136.5	6.1	38.4	85.0	175.8
Metropolitan area	192.1	8.7	79.4	143.2	271.3
Not metropolitan area	47.7	4.3	23.2	37.8	61.2
Inpatient daily occupancy rate ⁴					
Total	60.3	1.5	42.5	61.7	79.9
Metropolitan area	66.4	1.6	54.2	71.2	82.6
Not metropolitan area	50.6	3.4	34.8	47.4	65.2
Annual hours on ambulance diversion					
Total	146.0	16.6	0.0	0.0	7.7
Metropolitan area	242.7	29.0	0.0	1.6	108.8
Not metropolitan area	0.5*	0.2	0.0	0.0	0.0
Annual hours on ambulance diversion for EDs that reported any diversions ^{1,5}					
Total	363.9	41.4	1.8	24.9	453.4
Metropolitan area	403.9	44.8	1.9	44.8	524.4
Not metropolitan area	*	*	*	*	*

* Figure does not meet standard of reliability or precision.

0.0 Quantity is zero or more than zero but less than 0.05.

¹ED is emergency department.²Data available only for 2004.³Time in minutes.⁴Defined as beds filled as of midnight divided by staffed beds.⁵Ambulance diversion hours were reported by 34.4 percent of all emergency departments and 50.1 percent of those in metropolitan areas. Too few emergency departments reported any diversion hours in nonmetropolitan areas to provide a reliable estimate of mean numbers of hours.

Technical Notes

Number of hospital emergency departments and survey responses by selected hospital characteristics: United States, 2003–04

Hospital characteristic	Number of sampled in-scope EDs ¹	Number of responding EDs ^{1,2}	Number of nonresponding EDs ¹	Unweighted response rate ²	Weighted response rate ^{2,3}
All 24-hour EDs ¹	839	699	140	83.3	84.7
Geographic region					
Northeast	197	154	43	78.2	85.2
Midwest	195	161	34	82.6	84.6
South	284	240	44	84.5	86.5
West	163	144	19	88.3	79.5
Metropolitan status					
Metropolitan area	685	577	108	84.2	86.5
Not metropolitan area	154	122	32	79.2	83.0
Ownership					
Voluntary	586	495	91	84.5	83.0
Government	160	132	28	82.5	88.7
Proprietary	91	71	20	78.0	82.2
ED annual visit volume ¹					
Less than 20,000	225	188	37	83.6	85.0
20,000 to 50,000	368	311	57	84.5	85.3
Over 50,000	246	200	46	81.3	81.5
Medical school affiliation					
Yes	391	324	67	82.9	85.2
No	448	375	73	83.7	84.5

¹ED is emergency department.

²Responding to both the Staffing, Capacity, and Ambulance Diversion Supplement and the annual request for visit data.

³Weighted by the first two stages of sample selection (primary sampling unit and hospital).

Suggested citation

Burt CW, McCaig LF. Staffing, capacity, and ambulance diversion in emergency departments: United States, 2003–04. Advance data from vital and health statistics; no 376. Hyattsville, MD: National Center for Health Statistics. 2006.

Copyright information

All material appearing in this report is in the public domain and may be reproduced or copied without permission; citation as to source, however, is appreciated.

National Center for Health Statistics

Director
Edward J. Sondik, Ph.D.
Acting Co-Deputy Directors
Jennifer H. Madans, Ph.D.
Michael H. Sadagursky

U.S. DEPARTMENT OF
HEALTH & HUMAN SERVICES

Centers for Disease Control and Prevention
National Center for Health Statistics
3311 Toledo Road
Hyattsville, MD 20782

FIRST CLASS POSTAGE & FEES PAID CDC/NCHS PERMIT NO. G-284
--

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, \$300

To receive this publication regularly, contact the National Center for Health Statistics by calling 1-866-441-NCHS (6247)
E-mail: nchsquery@cdc.gov
Internet: www.cdc.gov/nchs

06-0139 (9/06)
CS105940
T26541
DHHS Publication No. (PHS) 2006-1250