

# Trends in the Use and Capacity of California's Emergency Departments, 1990-1999

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**See editorial, p. 430.**

**Study objective:** Concerns over the ability of the nation's emergency departments to meet current demands are growing among the public and health care professionals. Data supporting perceptions of inadequate capacity are sparse and conflicting. We describe changes in the use and capacity of California's EDs between 1990 and 1999, as well as trends in severity of patient illness or injury.

**Methods:** Data from California's Office of Statewide Health Planning and Development (OSHPD), which describe all hospital and health service use in the state, were analyzed and later verified using a telephone survey of all 320 open EDs in California. Six variables were analyzed: hospital's ownership type (public or private), total number of annual ED visits, severity of patient illness or injury (percentage of visits categorized as critical, urgent, or nonurgent), number of ED beds, proximity to a closed ED, and teaching status. We tested 2 main hypotheses: (1) Have statewide ED visits, ED beds, visits per ED, and visits per bed increased or decreased between 1990 and 1999? and (2) Has severity of patient illness or injury, as reported to OSHPD, changed over the past decade? State level data were analyzed using ordinary least-squares regression. Hospital level data were analyzed using repeated measures analyses.

**Results:** The number of EDs in California decreased by 12% ( $P < .0001$ ). The number of ED treatment stations (ie, physical spaces for the treatment of patients) increased by 687 (16%) statewide ( $P = .0001$ ), or an average of 79 beds per year. The average annual change in ED visits was not statistically significant ( $P = .5$ ), whereas visits per ED increased by 27% for all EDs ( $P < .0001$ ), although with differing trends noted at public and private hospitals. At private hospitals, the average increase was 512 visits/ED each year, whereas at public hospitals, visits decreased by an average of 1,085 visits/ED each year ( $P < .0001$ ).

Overall, critical visits per ED increased by 59% ( $P < .0001$ ), and nonurgent visits per ED decreased by 8% ( $P < .0001$ ).

**Conclusion:** The number of EDs in California decreased significantly during the 1990s, whereas the number of ED beds increased. Increases in visits per ED, beds per ED, and in the proportion of patients categorized as critical may help explain the perception that ED capacity is inadequate to meet growing demand.

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## INTRODUCTION

Both the public and health care professionals have become increasingly concerned about the ability of the nation's emergency departments to meet the perceived growing demand for care, charging that inadequate capacity may be leading to long waiting times, an unpleasant therapeutic environment, and possibly unsafe medical care.<sup>1-13</sup> As a result, a number of states have begun to formulate legislation to address some of these issues, with mixed success.<sup>14,15</sup>

Although the public's concern and the number of proposed legislative solutions have increased in recent years,<sup>6,7</sup> there is a lack of objective data validating ED overcrowding in California. There is clear evidence, however, that the use of emergency services throughout the United States is increasing<sup>16,17</sup> and that disquiet has arisen over the health care system's capacity to meet this growing demand.

In California, data regarding the adequacy of the state's EDs have been sparse and conflicting. The only publicly available report on the use and capacity of California's EDs over the past decade comes from the California Emergency Medical Services Authority (EMSA) Task Force,<sup>18</sup> which reported that between 1990 and 1997 the number of ED beds increased by 15% and the proportion of critically ill patients increased by 24%, but the total number of visits and admissions to EDs remained unchanged. On the other hand, 96% of respondents in a 1999 survey of California ED directors reported overcrowding and prolonged waiting times for care as problems, and two thirds of the respondents believed that these problems have worsened during the past 5 years.<sup>19</sup>

Although this survey and an increasing number of media reports suggest a growing problem with the availability of prompt emergency care in California, a systematic evaluation has not yet been conducted to identify the

characteristics or extent of the problem. Many questions remain unanswered, including whether the capacity of California's EDs is sufficient to meet the needs of critically ill patients throughout the state. This study aims to address some of these questions by analyzing data from California's Office of Statewide Health Planning and Development (OSHPD), which describe all hospital and health service use in the state. Using OSHPD data from 1990 to 1999, the study evaluates changes in the capacity and use of California's EDs and trends in severity of patient illness or injury.

## MATERIALS AND METHODS

We used OSHPD's Annual Utilization Report of Hospitals to obtain data on variables relevant to emergency care in California's hospitals. All California hospitals are required to submit a standardized data reporting form to OSHPD describing annual use of services. The form includes 490 variables related to a wide range of hospital resources (eg, psychiatric services, cardiac catheterizations, hospice, radiation therapy, birth, abortion data). OSHPD defines the variables to be collected but does not specify who is responsible for data collection or how data should be obtained. For each year from January 1, 1990, to December 31, 1999, we analyzed data on the hospital's ownership type (public or private), emergency medical services (EMS) licensure (standby, basic, or comprehensive), total number of ED visits, severity of patient injury or illness (critical, urgent, or nonurgent), number of ED beds, proximity to a closed ED, and teaching status.

In addition, we used a telephone survey to validate the annual hospital utilization data reported to OSHPD and US Census data to estimate changes in California's population over time.

We defined an ED as any hospital offering standby, basic, or comprehensive EMS as reported to OSHPD in the Annual Utilization Report of Hospitals between 1990 and 1999. We included all hospitals licensed as general acute care or rural general acute care facilities and measured the number of EDs in service on January 1st of each year. For any given year between 1990 and 1999, we excluded EDs if the hospital was reported as closed, was licensed but not in operation, had its license in suspense (ie, was temporarily closed) on January 1, or reported the number of ED patient visits as zero. We also excluded all hospitals licensed as acute psychiatric facilities, psychiatric health facilities, chemical dependency recovery hospitals, and state correctional facilities because these facilities do not operate nonpsychiatric or general medical EDs for noninstitutionalized patients.

ED data from OSHPD's Annual Utilization Report of Hospitals were examined for logical inconsistencies, and these were investigated and resolved. Between August 15 and August 20, 2000, we also conducted a telephone survey of all 320 facilities that had reported basic or comprehensive emergency services to OSHPD on December 31, 1998. The purpose of the survey was twofold: (1) to validate any openings, closures, or downgrades OSHPD had reported and (2) to identify and resolve any logical inconsistencies in the OSHPD data. ED personnel who answered the telephone were asked whether their hospital had a functioning ED with a physician on duty 24 hours a day and whether they received severely ill patients via ambulance. If they responded "yes" to both questions, they were classified as a basic or comprehensive ED. Of the 490 variables collected by OSHPD, we limited our validation efforts to these variables because they are the variables that are most critical to the classification of EDs for our analysis.

Using this same methodology, we also verified OSHPD-reported ED closures and downgrades by surveying the 24 facilities whose EMS level had changed from basic or comprehensive to standby or no EMS between January 1, 1996, and August 2000. If we were unable to reach hospital personnel (eg, when a hospital was no longer in operation), we contacted nearby hospitals and community organizations (eg, the local chamber of commerce) to verify the status of the closed ED. When we found inconsistencies between the OSHPD data and the telephone survey results, we used the information obtained from the telephone survey. For example, the OSHPD dataset reported 2 hospitals as providing basic emergency services, although they were licensed as psychiatric acute care facilities. Interviews with hospital personnel revealed that neither facility had reported ED visits or beds, and we subsequently excluded these 2 sites from the analysis.

To better characterize data collection procedures for OSHPD's ED measures, we conducted telephone interviews with hospital administrators and ED managers at 6 EDs. All 6 sites had 3 reporting procedures in common. First, the hospital administrator responsible for reporting to OSHPD obtained ED data from the ED nurse manager or director. Second, annual ED visits were determined from administrative or triage data and not from claims or financial data. Third, severity of illness or injury was determined on the basis of the patients' level of severity as designated at ED triage.

However, severity levels were not defined in a uniform manner at all 6 sites. For example, at 1 private Southern California trauma center, patients are triaged into 3 cate-

gories when they arrive, and the administrative nurse reports to OSHPD that patients with the highest severity rating are critical, those in the middle category are urgent, and those with the lowest rating are nonurgent. In contrast, at a rural community hospital, there are more than 3 original triage categories, and a physician determines which patients should be categorized as critical, urgent, and nonurgent from their original triage classification and/or medical charts.

Using the OSHPD data, we determined the EMS level (ie, the level at which the facility is licensed by the California Department of Health Services' Division of Licensing and Certification) for each hospital. Title 22 of the California Code of Regulations defines 3 licensing levels for EDs: standby, basic, or comprehensive.<sup>20</sup> Standby EDs provide emergency medical care in a specifically designated area of the hospital that is equipped and maintained at all times to receive patients with urgent medical problems and are capable of providing physician services within a reasonable period of time. A physician need not be present in the hospital at all times but must be readily available when summoned. Basic EDs, by contrast, must have a physician on the premises and available 24 hours a day (eg, a community hospital ED). Comprehensive EDs provide a more extensive scope of services than basic EDs, with inhouse capability for managing all medical situations on a definitive and continuing basis (eg, a tertiary care center ED).

We defined (1) an "opening" as any hospital whose OSHPD reporting status changed from no EMS or standby EMS to basic or comprehensive services between January 1, 1990, and December 31, 1999, and (2) a "closure" or "downgrade" as any hospital whose EMS level had changed from basic or comprehensive to no emergency services or standby emergency services, respectively, between January 1, 1990, and December 31, 1999. By this definition, closures represent permanent termination of emergency services at that facility.

In assessing the impact of ED closures on nearby facilities, we identified all facilities that had reported basic or comprehensive emergency services on January 1, 1995, and then determined which of those had changed their status between 1995 and 1999 using the OSHPD data and verifying the results using the telephone survey. We defined the year of closure as the last year that the hospital reported EMS visits and staffed EMS beds to OSHPD.

We classified severity on the basis of the 3 categories of severity of ED patient illness or injury reported to OSHPD<sup>20</sup>: nonurgent, urgent, and critical. In the OSHPD instruction manual, a nonurgent visit is defined as "a

patient with a non-emergency injury, illness, or condition; sometimes chronic; that can be treated in a non-emergency setting and not necessarily on the same day they are seen in the EMS department (eg, pregnancy tests, toothache, minor cold, ingrown toenail).” An urgent visit is defined as “a patient with an acute injury or illness where loss of life or limb is not an immediate threat to their well-being, or patient who needs a timely evaluation (eg, fracture or laceration).” A critical visit is “a patient who presents an acute injury or illness that could result in permanent damage, injury, or death (eg, head injury, vehicular accident, a shooting).” To assist hospitals in completing the form, OSHPD suggests *Current Procedural Terminology* codes for each severity level. However, at all 6 sites where we investigated data collection procedures, respondents used triage or administrative data, rather than claims data, to obtain data for the OSHPD report.

In the OSHPD database, ED beds are referred to as EMS treatment stations. These stations are defined as specific places within EDs that are adequate to treat 1 patient at a time. OSHPD specifically instructs hospitals not to include holding or observation beds in their count of ED beds.

We considered facilities to be public hospitals if they reported state, county, or city ownership to OSHPD between 1990 and 1999. We considered all other facilities to be private hospitals.

The hospitals reported their teaching status to OSHPD. The only year for which these data were available is 1999.

We defined hospitals as “closed adjacent” if they were located in the same health service area (HSA) as an ED that closed between January 1, 1995, and August 31, 2001. HSAs represent local health care markets for community-based inpatient care. They were identified by the Dartmouth Atlas of the Health Care Working Group using 1993 Medicare provider files and 1992 to 1993 utilization data.<sup>21</sup> Their analysis resulted in the identification of 3,436 HSAs throughout the United States, serving populations ranging in size from 627 (Turtle Lake, ND) to 2,949,506 (Houston, TX) in the 1998 edition of the Dartmouth Atlas. California has 192 HSAs ranging in size from 1 to 15 hospitals. Because closed adjacent data were derived from our August 2000 telephone survey, it includes data on closures occurring after December 31, 1999 (the time limit for our OSHPD data.)

We first computed descriptive statistics for the aforementioned specified measures for all of the EDs from 1990 through 1999. We next conducted statistical analyses and modeling focusing on changes in the ED characteristics over time. Specifically, we tested 2 main hypotheses: (1) Did statewide ED visits, ED beds, visits per ED, and visits

per bed change (increase or decrease) between 1990 and 1999? and (2) Did severity of patient illness or injury, as reported to OSHPD, change over the past decade?

For measures at the individual ED level, we analyzed the data using repeated measures models.<sup>22</sup> In the analysis, the first optimal covariance structure was selected using the Akaike Information Criteria (AIC), the penalized likelihood to determine which model would best fit the data. We then fit the repeated measures models with the best covariance structure to estimate the change in ED characteristics over time.

For measures at the state level, we used ordinary least squares regression models to estimate the change in ED characteristics over time, with the independent variable being the year in which the data were collected (ie, time). The change across time also was analyzed by adjusting for severity of patient injury or illness, which was estimated using the percentage of critical, urgent, and nonurgent patient visits. We used the 1990 patient severity distribution as the reference year. Possible interactions between independent variables were evaluated.

Next, we created a multivariate, repeated measures model to compare changes over time based on ownership (public versus private), teaching status (teaching versus nonteaching), and proximity to closure (closed-adjacent versus not closed-adjacent), controlling for annual ED visits, percentage of urban areas in the hospital zip code, per capita income in the hospital zip code, percentage of population older than age 65 in the hospital zip code, percentage of critical visits reported to OSHPD, and percentage of nonurgent visits reported to OSHPD.

We evaluated the overall goodness of fit of the models by R-squares for cross-sectional ordinary least squares models and maximum likelihood for repeated measures longitudinal models. These goodness of fit measures were used in assisting model selection process. We did not conduct residual analysis because, although they could be used for goodness of fit analysis, they are mainly used for detecting biased mean structure of the model and outliers, which we do not believe we have.

All analyses were performed using Stata (version 6, Stata Corporation, College Station, TX) or SAS (version 6, SAS Inc., Cary, NC) software.

This project is exempt from review by the human subjects protection office at our institution.

## RESULTS

Of the 731 facilities that reported to OSHPD between 1990 and 1999, we excluded from our analysis 96 acute

psychiatric facilities, 36 psychiatric health facilities, 27 federal hospitals (primarily Veteran's Administration hospitals), and 20 chemical dependency recovery hospitals. Of the remaining 552 facilities, according to the OSHPD data, as of January 1, 1999, there were 357 EDs statewide. Of these, 301 were basic, 47 were standby, and 9 were comprehensive facilities.

On the basis of the results of our telephone survey, we reclassified 6 EDs: 2 EDs were reported incorrectly as closed between 1996 and 1998, so we reclassified these as being closed before 1995; 4 facilities closed and reopened immediately in the same HSA with the same staff and patients, so we reclassified these as being "not closed." Of the 320 facilities reporting basic or comprehensive emergency services in December 1998, the telephone survey confirmed that all were classified correctly. These 320 basic and comprehensive facilities included 310 EDs reflected in the 1999 OSHPD database and 10 EDs that closed after December 1998. There were no facilities that reported a change in ownership type to OSHPD during the study period.

As the Figure illustrates, the total number of EDs (standby, basic, and comprehensive) in California decreased by 12.3% between 1990 and 1999, from 407 to 357 ( $P < .0001$ ). The number of basic and comprehensive EDs decreased by 8.6% ( $P < .0001$ ); 48% of these closures

occurred between 1996 and 1999. Despite these decreases, the total number of ED beds increased by 687 (16%), from 4,015 in 1990 to 4,777 in 1999, with an annual average increase of 79 beds per year ( $P = .0001$ ). Adjusting for the growth in California's population between 1990 and 1999, the number of ED beds per 100,000 persons increased from 14.5 to 15.3, representing an increase of 0.08 beds per 100,000 persons per year ( $P < .0001$ ).

A disproportionate number of ED closures were among standby EDs. In 1990, standbys represented only 17% of all EDs in the state but represented 42% of closures. Of the 19 basic and comprehensive EDs that closed between 1995 and 2000, the mean and median distances from closed ED to nearest open ED were 3.0 and 2.4 miles (range 0.2 to 10.5 miles). Three quarters of ED closures were less than 3.0 miles from the nearest open ED.

The total number of ED visits statewide increased from 8.4 million in 1990 to 9.4 million in 1999, representing an overall growth of 12% ( $P = .5$ ). Most of this increase occurred nonlinearly, primarily at the beginning and end of the decade. However, when we controlled for population growth, the total number of visits per 100,000 persons decreased during the decade, with an average overall decline of 275 visits per 100,000 persons per year, representing a decline of just under 1% per year ( $P = .0498$ ).

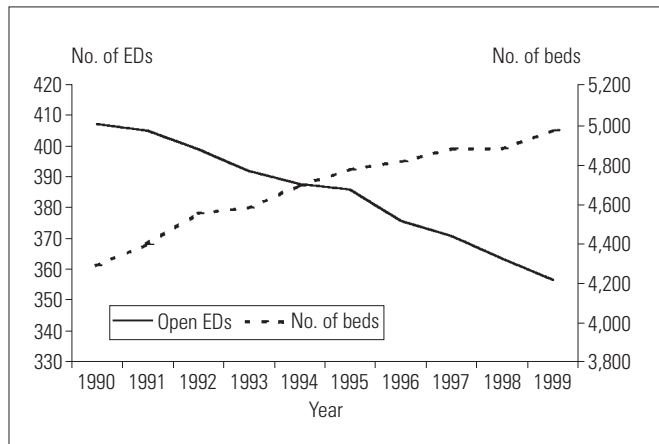
The total number of visits per ED increased by 27%, from an average of 20,377 in 1990 to 25,778 in 1999 ( $P < .0001$ ). When we stratified these findings by type of visit, we found that (1) critical visits increased by 59%, from an average of 2,161 in 1990 to 3,433 in 1999, representing an average increase of 91 critical visits per ED per year ( $P < .0001$ ); (2) urgent visits increased by 36%, from an average of 9,719 in 1990 to 13,190 in 1999, representing an average increase of 203 urgent visits per ED per year ( $P < .0001$ ); and (3) nonurgent visits decreased 8%, or an average of 129 nonurgent patients per ED per year ( $P < .0001$ ).

Visits per bed also changed during the 1990s, with increases between 1990 and 1991, steady decreases between 1991 and 1996, and increases again through 1999. Across the decade, total visits per bed decreased by 4.5%, or approximately 0.16 visits per bed per year ( $P = .002$ ). When we considered the type of visit per bed, we found that over the decade the number of (1) critical visits did not change significantly ( $P = .4$ ), (2) urgent visits decreased nonsignificantly ( $P = .4$ ), and (3) nonurgent visits decreased significantly by 30% ( $P < .0001$ ).

From 1990 to 1999, the total number and proportion of critical and urgent visits increased significantly. On the other hand, the number and proportion of nonurgent

**Figure.**

Number of open California EDs and aggregate ED beds, 1990 to 1999. The number of open EDs was determined from the number of open hospitals reporting to OSHPD that they provide emergency services. Free-standing urgent care centers and EDs not part of a hospital are excluded. ED beds are defined as specific places within the ED adequate to treat 1 patient at a time. Holding or observation beds are not included.



patients decreased significantly. Critical visits increased from approximately 880,000 to 1.2 million, a growth of 43% ( $P=.0014$ ), and the proportion of such visits increased from 10% to 12% of all ED visits ( $P=.0002$ ). Likewise, the number of urgent visits increased 20% from 3.9 to 4.8 million ( $P=.0001$ ), and the proportion of these visits increased from 44% to 50% of all ED visits ( $P<.0001$ ). In contrast, the number of nonurgent visits decreased by 6% ( $P=.005$ ), and the proportion of such visits decreased from 46% to 38% of total ED visits ( $P<.0001$ ). Controlling for population growth, we found that critical and urgent visits per 100,000 persons increased, although not significantly, and the number of nonurgent visits per 100,000 persons decreased by approximately 348 visits ( $P=.0005$ ).

The following independent variables were examined in multivariate models predicting visits per ED, visits per bed, and beds per ED: ownership (public versus private), teaching status (teaching versus nonteaching), and proximity to a closed ED (closed-adjacent versus not closed-adjacent). These models controlled for the following: per capita income in the hospital zip code, percentage of urban areas in the hospital zip code, percentage of population older than 65 years in the hospital zip code, percentage of ED patients reported to OSHPD as critical, and percentage of ED patients reported to OSHPD as nonurgent.

Between 1990 and 1999, the total number of visits per ED increased by an average of 512 visits per ED per year at private hospitals ( $SE=367$ ) and decreased by 1,085 visits per ED per year at public hospitals ( $SE=359$ ). The difference in these trends was significant ( $P<.0001$ ). There were no significant differences between public and private hospitals in terms of visits per bed or beds per ED.

During the 1990s, total visits per bed decreased at teaching hospitals by an average of 46 visits per bed per year ( $SE=22$ ), whereas they increased at nonteaching hospitals by an average of 13 visits per bed per year ( $SE=2.5$ ;  $P=.01$ ). Although the number of ED beds at teaching hospitals did not change significantly across the decade, the number of ED beds at nonteaching hospitals increased by an average of 0.23 beds per ED per year ( $SE=0.1$ ); however, the difference in these trends was not significant. The number of visits per ED was not significantly different at teaching and nonteaching facilities.

Those hospitals adjacent to recently closed EDs experienced an average increase of 3,242 visits per ED per year ( $SE=502$ ), whereas other facilities had an average increase of only 354 visits per ED per year ( $SE=86$ ;  $P<.0001$ ). Likewise, EDs adjacent to a closed ED had an increase of 1.2 beds per ED per year ( $SE=0.22$ ), whereas other EDs expe-

rienced an increase of 0.2 beds per ED per year ( $SE=.04$ ;  $P<.0001$ ). There were no significant differences in visits per bed.

## DISCUSSION

From 1990 to 1999, the number of EDs in California decreased by 12%. During this same period, the number of visits per ED increased by 27%, the number of ED beds increased by 16%, and severity of patient illness or injury intensified, with a 59% increase in patients categorized as critical and an 8% decrease in patients categorized as nonurgent per ED. However, this increase was not consistent across the decade: visits per ED increased markedly between 1990 and 1993, stabilized in the mid-1990s, and then continued to increase again from 1996 to 1999. The increases during the early and latter parts of the decade mirror physician and media concerns about ED capacity during those same time periods. In the early 1990s, the issue received significant attention from the media<sup>23,24</sup> and professional organizations,<sup>25-28</sup> but this interest waned during the mid-1990s, only to resurge as visits per bed began to increase again at the end of the decade.<sup>1,2,4-7,9,10,13,18,19,29,30</sup>

Compared with national statistics, our findings revealed that the increase in visits to California EDs was lower than that of the United States as a whole. Total annual ED visits in California changed from 26.9 to 26.8 visits per 100 persons between 1996 and 1998, whereas National Hospital Ambulatory Medical Care Survey data indicate that nationwide visits increased from 35.6 to 37.3 visits per 100 persons, or 90.3 to 100.4 million.<sup>16,17</sup> These data indicate that more than 1 in 3 people in the United States visit the ED each year.

We also found that the patient severity levels in California's EDs were not markedly different from those of the United States as a whole. In 1998, 14% of California ED visits were categorized as critical, 50% were urgent, and 36% were nonurgent. Likewise, national estimates for the same year show that 19.2% of ED visits were emergency (should be seen in <15 minutes), 31.2% were urgent (should be seen in 15 to 60 minutes), 13.7% were semiurgent (should be seen in 1 to 2 hours), 9.0% were nonurgent (should be seen in 2 to 24 hours), and 27% were categorized as "no triage/unknown."<sup>17</sup> Unlike the OSHPD database, which is administrative and uses a 3-tiered severity system, the national data were collected via a survey of emergency care providers and are based on 5-tiered triage-based categories.

Despite these findings, our analysis has several limitations. First, to determine the annual change in the number of open EDs in California, we counted only those that were open on January 1 of each year. Because these estimates of point prevalence do not account for EDs that were open for only part of the year, we may have underestimated the total amount of available emergency services in any given year of the study period. However, our estimates did include EDs that were open on January 1 and subsequently closed; therefore, they provide a reasonable estimate of capacity. In addition, our telephone survey of ED staff revealed that the operating status reported to OSHPD was correct for all 320 EDs providing basic or comprehensive emergency services on December 31, 1998, and in 18 of the 24 EDs that had reported a closure or downgrade between January 1, 1996, and December 31, 1998. Thus, it is reasonable to assume that our estimates of capacity were fairly accurate for the remaining years of the study.

A second limitation stems from the lack of standardization evident in the reporting of ED beds and severity of illness or injury. Data on severity of patient illness or injury were not collected uniformly throughout the sample hospitals. Although all 6 hospitals surveyed used triage or administrative data to determine severity of patient illness or injury, in some facilities, this was derived directly from the triage category, and in others, a physician, nurse, or administrator made the judgment based on both triage assessment and the medical record. We did not survey all hospitals, and it is possible other sites might use claims data to ascertain severity of patient illness or injury. If this is so, part of the increase in the number of critical patients may be caused by incentives to increase physician reimbursement or nursing full-time equivalents, rather than a true rise in the proportion of critical patients. However, given the size and the incremental, unidirectional nature of the increase, it seems unlikely it is entirely attributable to upcoding.

In reporting ED beds, it is possible that some facilities designated standard ED beds as "holding" or "observation" beds in a marketing move and that this does not reflect the true use of the beds. Given that OSHPD specifically excludes observation beds, such a bias would have led us to underestimate the increase in ED beds statewide. Thus, if ED observation beds are widely being used for acute care, the true increase in ED beds may be greater than the 16% reported to OSHPD. In addition, we have no data on whether respondents understood what the OSHPD instruction manual was looking for. Despite these limitations with the database, when we validated 2 other

OSHPD variables (operational status and level of service) at all open EDs in the state, the data error rate was 1.7%.

Another limitation is that we were restricted to the data collected by OSHPD. During the study period, OSHPD monitored 3 measures of ED capacity (open EDs, their level of service, and ED beds) and 2 measures of ED use (total visits and severity of patient illness or injury). There are arguably many more components to use and capacity. The study does not describe ED conditions for patients, physicians, and staff; the extent to which resources are stretched at any given facility; or the impact that these factors might have on the quality of care. Nor does the study explore the impact that increased patient volume and severity of illness or injury might have on available resources, including physician and staff hours, physical space, on-call physicians, satellite labs, and radiography machines. However, we are in the process of collecting such data for a sample of EDs in California and will address these issues in a future report.

Our findings suggest that an increase in visits per ED, beds per ED, and the proportion of patients categorized as critical may be responsible for perceived inadequate capacity. This is in contrast to recent reports from New York City<sup>31,32</sup> and remarks by Surgeon General David Satcher<sup>33</sup> that ED inadequate capacity is the result of an increase in the use of EDs for lower severity conditions. We also found a small but significant decrease in the number of visits per ED bed. This change is difficult to interpret in the face of increases in the proportion of patients categorized as critical and in the absence of data on how additional ED beds are supported (eg, staffing, ancillary services, physical space, inpatient capacity, on-call services).

Future studies in this area should focus on an evaluation of ED waiting times statewide and other factors to help better define ED use and capacity and its consequences for patients. We are in the process of collecting these data for a sample of EDs in California, and we hope to use our results to better characterize the ED experience for patients and staff. In addition, given our results regarding the reported increase in severity of patient illness or injury, additional efforts should be undertaken to examine the process of emergency care to the increasing proportion of patients categorized as critical being treated in California's EDs.

Author contributions: DLW, SMA, AF, and SL conceived the project and developed the study methodology. SL, DLW, AF, SMA, and JSF supervised the conduct of the study, data collection, quality control, and analysis. HL provided statistical advice and analysis. KH provided expertise in geocoding and medical geography. SL drafted the manuscript, and all authors contributed substantially to its revision. SL takes responsibility for the paper as a whole.

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