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## Waits To See An Emergency Department Physician: U.S. Trends And Predictors, 1997-2004

*Overcrowding by patients unable to obtain nonurgent care elsewhere might be worsening care for those with truly urgent conditions.*

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### ABSTRACT:

**As emergency department (ED) patient volumes increase throughout the United States, are patients waiting longer to see an ED physician? We evaluated the change in wait time to see an ED physician from 1997 to 2004 for all adult ED patients, patients diagnosed with acute myocardial infarction (AMI), and patients whom triage personnel designated as needing "emergent" attention. Increases in wait times of 4.1 percent per year occurred for all patients but were especially pronounced for patients with AMI, for whom waits increased 11.2 percent per year. Blacks, Hispanics, women, and patients seen in urban EDs waited longer than other patients did. [*Health Affairs* 27, no. 2 (2008): w84-w95 (published online 15 January 2008; 10.1377/hlthaff.27.2.w84)]**

Emergency departments (EDs) in the United States serve a multitude of functions. They manage trauma, respond to disasters, care for serious illnesses, and provide care for many patients with nonurgent conditions. Between 1994 and 2004, total ED visits have increased an estimated 18 to 26 percent, while the number of EDs decreased between 9 and 12 percent, resulting in a 78 percent increase in visits per ED between 1995 and 2003.<sup>1</sup>

Increasing volume could prolong ED waits. Given the benefits of rapid treatment of heart attacks, sepsis, stroke, pneumonia, and trauma (among other conditions), longer wait times could diminish the quality of care in EDs.<sup>2</sup> Indeed, providing timely care was a key quality goal in the Institute of Medicine's (IOM) report, *Crossing the Quality Chasm*.<sup>3</sup>

Data from the 1999 and 2001 rounds of the Community Tracking Study suggested that wait time to see an ED physician increased between those two years.<sup>4</sup> Another study identified differences in ED waits for children of different ethnicities.<sup>5</sup> The National Center for Health Statistics (NCHS) has published fragmentary data on ED wait times.<sup>6</sup> However, no research has systematically evaluated trends

Our study examines recent trends in waits to see an ED physician using a nationally representative database, the National Hospital Ambulatory Medical Care Survey (NHAMCS). We address the following questions: (1) Are wait times increasing? (2) How are wait times changing for patients who may be severely ill, such as those with acute myocardial infarction (AMI) or those thought to need emergent attention? (3) Do trends in wait times differ by race, ethnicity, or sex or for patients visiting hospitals that vary by ownership or location (urban versus rural)? (4) What role do initial triage decisions play in differences in wait times among different demographic groups?

## Study Data And Methods

**Data source.** We used data from the NHAMCS, a survey of visits to U.S. EDs and hospital outpatient departments. The NHAMCS selects patient visits for inclusion based on a four-stage probability design, explained elsewhere.<sup>7</sup> We analyzed data from 1997-2000 and 2003-2004 (in 2001 and 2002 the NHAMCS did not record wait times). The NCHS conducts the study and supplies weights that can be used to produce national estimates. Military, veterans', and other federal hospitals are excluded.

Field representatives of the U.S. Census Bureau train hospital staff to complete survey forms for a random sample of patient visits during a randomly assigned, four-week reporting period. Information is recorded on age, race/ethnicity, sex, expected sources of payment, urgency of initial triage assignment, up to three patient complaints or reasons for visit, one primary and two other diagnoses, medical professionals seen during the visit, and disposition. The NHAMCS also collects data on hospital characteristics including ownership (voluntary nonprofit; government, nonfederal; or proprietary), region of the country, and urban (Metropolitan Statistical Area, or MSA) versus nonurban (non-MSA) location. Unless it is hospital policy to ask patients for their race/ethnicity, hospital personnel record this based on their own observations. Race is categorized as white; black/African American; Asian; Native Hawaiian/other Pacific Islander; American Indian; or Alaska Native. Hispanic ethnicity is coded separately. We analyzed race/ethnicity in four mutually exclusive categories: non-Hispanic white, non-Hispanic black, Hispanic of any race, and all others.

The NHAMCS computes wait time as the difference between time of patient arrival (specified as the first time recorded in the medical record—that is, arrival, registration, or triage) in the ED and the time of patient examination by a physician, both of which appear on the patient data form. In keeping with standard practice in most U.S. EDs, a triage nurse (or similar clinician) assigns patients at the time of ED arrival to one of four categories ("initial triage assignment") according to how long the clinician believes that the patient can safely wait to be evaluated by a physician: emergent (should wait less than 15 minutes); urgent (can wait 15-60 minutes); semi-urgent (can wait 1-2 hours); and nonurgent (can wait 2-24 hours). Anticipated source of payment is categorized as private insurance, Medicare, Medicaid, worker's compensation, self-pay, or no charge. We combined patients whose anticipated source of payment was listed as other, unknown, or blank.

The NHAMCS codes diagnoses using *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes, which we used to establish the diagnosis of AMI. We considered a patient to have chest pain if his or her presenting complaint was coded as chest pain, discomfort, pressure, tightness, or heaviness (includes chest pressure), burning sensation in the chest, or heart pain (includes anginal pain, heart distress, and pain over the heart). Extensive NHAMCS documentation is available elsewhere.<sup>8</sup>

**Statistical analysis.** Our principal analysis involved three overlapping groups: (1) all adults (age eighteen and older); (2) adults diagnosed with AMI while in the ED (including patients who presented with or without chest pain); and (3) adults identified at triage as needing attention "emergently," regardless of symptoms or ultimate diagnosis. We performed a subsidiary analysis of adults who both presented with chest pain, a symptom of AMI that is readily recognizable at the time of triage and should trigger a rapid response, and were diagnosed with AMI in the ED.

To analyze changes in wait times between 1997 and 2004, we performed bivariate linear regressions with year of visit serving as a continuous predictor of the log-transformed wait time. Wait-time data were missing for 36,232 adult visit records, which we compared, using chi-square tests, with the 92,173 adult visit records with nonmissing data. Patients with missing data did not differ from other patients in race/ethnicity, region, urban versus non-urban hospital location, or being seen by a resident physician. However, they differed in age, sex, anticipated source of payment, triage status, presence of chest pain, diagnosis of AMI, disposition, and hospital ownership. Initial triage group assignment was missing from 37.7 percent of patient records when wait time was absent, compared with 15.4 percent of records with wait times. The remaining differences were small, although statistically significant, as expected in light of the very large sample size.<sup>9</sup> We excluded patient records with missing wait times from most subsequent analysis.

We analyzed patient demographics, clinical factors, and hospital variables that we considered possible predictors of wait times. Because initial triage group assignment is intended to affect wait time, we included it in our multivariate models as a possible confounder. We included evaluation by a resident physician as a marker of teaching hospital status and admission to the hospital as a marker of severity of illness. We calculated medians and twenty-fifth to seventy-fifth percentiles (interquartile ranges, or IQRs) to describe the distribution of waits. Prior to statistical analysis, we log-transformed wait times to avoid distortion (that is, skewing) by outliers with very

long wait times. We compared binary predictors with t-tests. We generated multigroup predictor comparisons with linear regression models, using log-transformed wait time as the outcome. We then performed multivariate linear regression analyses to determine predictors of wait times in each of the patient visit groups

We constructed a multivariate linear regression model using all of the patient demographic, clinical, and hospital variables. For ease of interpretation, we present results as percentage change in wait time with respect to a reference group. We used interaction terms to determine whether changes in wait times between 1997 and 2004 were equally distributed between racial groups, men and women, patients seen in urban versus nonurban areas, and hospitals by ownership. We assessed triage assignment as a possible intermediary variable in the relationship between demographic factors and wait times to explore whether discriminatory triage might have led to longer waits for minorities and women. For this analysis, we compared linear regression models with and without inclusion of triage group assignment.

Finally, we used chi-square tests to examine secular changes in the urgency of ED visits (that is, triage assignment). For this analysis only, we included patients of all ages, whether or not wait time was missing.

For all analyses we used SAS version 9.1, SURVEYFREQ and SURVEYREG procedures, which allow accurate determination of standard errors adjusted for the complex sample design. The Cambridge Health Alliance Institutional Review Board approved this study.

## Study Findings

Of the 92,173 adult visit records with known waits, 987 (1.1 percent) had an ultimate ED diagnosis of AMI. At initial triage, 17,951 patients were thought to need attention emergently. This represents 332 million adult ED visits (of the 630 million total visits to these nonfederal hospitals during the six years studied), 3.7 million AMI diagnoses, and 67 million patients triaged as needing emergent attention nationwide, respectively ([Exhibit 1](#)).

### Exhibit 1.

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**General trends.** Between 1997 and 2004, the wait to see an ED physician increased from a median of twenty-two minutes in 1997 to thirty minutes by 2004 (4.1 percent increase per year), equivalent to an extra 1,550 years that Americans spent waiting in EDs in 2004. Median waits for patients diagnosed in the ED with AMI also increased from eight minutes to twenty minutes (11.2 percent increase per year). The patients triaged to the "emergent" group had median waits that increased from ten minutes in 1997 to fourteen minutes in 2004 (a 3.6 percent increase per year) ([Exhibits 2 and 3](#)). In addition, wait time for patients who presented with chest pain and whom ED staff ultimately diagnosed as having AMI (n = 683) also increased (12.2 percent per year).

### Exhibit 3.

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**Predictors of waits.** As expected with our large sample size, all variables were significantly associated with wait times in bivariate analysis of the group of all adult patients ([Exhibit 4](#)), for whom the median wait was twenty-five minutes. Whites waited a median of twenty-four minutes, while blacks waited a median of thirty-one minutes and Hispanics, thirty-three minutes. Females waited slightly longer than males, a median of twenty-six minutes versus twenty-five minutes. Patients seen in urban EDs waited a median of thirty minutes, while the median wait for those seen in nonurban EDs was only fifteen minutes ([Exhibit 4](#)).

#### Exhibit 4.

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Among those patients diagnosed with AMI, the median wait was twelve minutes. Among all AMI diagnoses, 373 (37.8 percent) were nonprovisional, and 614 (62.2 percent) were provisional. Although patients with nonprovisional AMI had shorter waits (mean 8.2 versus 13.3 minutes,  $p < 0.0001$ ), changes in waits were not different for these groups (11.9 percent versus 10.4 percent per year increase,  $p = 0.7$ ). Urban hospital location was associated with longer waits than nonurban location (median fifteen minutes versus seven minutes). Evaluation by a resident physician was associated with longer waits (median twenty minutes versus eleven minutes) (Exhibit 4). Of patients with AMI, 815 were admitted and 82 were transferred to another facility (no information is available on the receiving facility); 25 died in the ED. Transferred AMI patients had a very short median wait time: six minutes. Of patients diagnosed with AMI, waits were similar for those who presented with or without chest pain (data not shown).

Among those patients assigned to the "emergent" triage group, the median wait was ten minutes. Females waited slightly longer than males, a median of eleven versus ten minutes. Urban hospital location was also associated with longer waits: median twelve minutes versus nine minutes at nonurban hospitals (Exhibit 4).

In multivariate analysis of all patients (Exhibit 5), predictors of longer waits included black race (13.0 percent longer waits) and Hispanic ethnicity (14.5 percent longer) as compared to whites; anticipated source of payment listed as "no charge" (51.6 percent longer waits) as compared to Medicare; and urban hospital location (63.3 percent longer) as compared to nonurban location. Being male was associated with a 5.3 percent shorter wait time. Exhibit 5 lists other significant predictors.

#### Exhibit 5.

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In the multivariate analysis of patients diagnosed with AMI, admission to hospital predicted 48.6 percent longer waits, as a result of the extremely short waits of transferred patients. Each later year of visit predicted a 5.8 percent increase in wait time (Exhibit 5). Excluding AMI patients who neither were admitted, were transferred, nor died ( $n = 65$ ) did not significantly change these results. Our subsidiary multivariate analysis of the subset of AMI patients who presented with chest pain yielded results similar to those for all AMI patients. However, younger age did predict longer waits in this subset.

In the multivariate analysis of patients triaged as "emergent," patients ages 18-40 waited 11.4 percent longer and those ages 41-65 waited 8.4 percent longer than those older than age sixty-five. Patients visiting urban EDs waited longer than did patients in nonurban EDs (36.6 percent longer waits). Being male predicted shorter waits (-8.9 percent shorter) (Exhibit 5).

**Are wait times changing differentially?** We did not detect significant interactions when exploring whether wait times increased at different rates according to patients' race or sex, hospital location, or ownership in the all-patients group. For patients ultimately diagnosed with AMI, the only significant interaction term was urban versus nonurban, with city patients' wait times increasing 11.6 percent faster per year. Of patients triaged to the emergent group, interaction terms were significant only for race/ethnicity. Black patients' wait times increased at a rate 3.0 percent per year faster than did whites', while Hispanics' wait times increased at a rate 6.2 percent per year faster than did whites'.

**Triage decisions and wait times.** Triage assignment was not an intermediary variable in the relationship between race/ethnicity, sex, and wait time in any of the patient groups. During the seven years of the study, the

average urgency of all ED visits (as measured by their initial triage assignment) declined. The share of emergent visits fell from 26.9 percent to 15.2 percent. Meanwhile, urgent visits rose from 41.0 percent to 44.5 percent, as did semi-urgent visits, from 19.7 percent to 25.7 percent, and nonurgent visits, from 12.4 percent to 14.7 percent. Of the patients assigned to each triage group (emergent, urgent, semi-urgent, nonurgent), 28.1 percent, 13.5 percent, 7.0 percent, and 3.7 percent were admitted, respectively.

## Discussion

Between 1997 and 2004, the median ED wait time increased 36 percent. Patients needing emergent attention waited 40 percent longer, while median waits for AMI patients increased 150 percent. A variety of factors probably contributed to longer waits. Most important was likely crowding as a result of ED closures and an increase in total ED visits; between 1994 and 2004 the number of ED visits increased from 93.4 million to 110.2 million annually, while the number of EDs fell by as much as 12.4 percent.<sup>10</sup> Other likely contributors include inpatient bed shortages leading to bottlenecks in the ED; increasing uninsurance; population aging; shortages of staffing, space, and interpreters; and difficulties assuring non-ED follow-up care.<sup>11</sup>

Data on the relationship of primary care use to ED use are mixed.<sup>12</sup> We found that the proportion of ED visits that were emergent decreased over time, supporting the view that compromised access to primary care is increasing ED use. Barriers to routine primary and outpatient care for some Americans may be contributing to ED overcrowding and longer ED waits for all Americans, even those with life-threatening illnesses like AMI.<sup>13</sup>

Prolonged ED waits have serious implications for the quality of care. Known effects include prolonged pain and suffering, patients leaving without seeing a physician, and dissatisfaction with care.<sup>14</sup> Anticipation of long ED waits was associated with decreased willingness to seek free ED care among uninsured patients.<sup>15</sup> Importantly, protracted waits could translate into treatment delays for time-sensitive illnesses.

Waits are longest for patients seen in urban EDs, which account for nearly 80 percent of all ED visits. Women, blacks, and Hispanics wait longer than do other patients even after urban-nonurban differences are controlled for. Based on our analysis of interactions, biased triage assignment of minorities and women does not appear to cause their prolonged waits. Blacks' and Hispanics' longer waits may reflect greater ED crowding at hospitals serving predominantly minority patients; limitations in our data preclude analysis of this possibility. Longer waits for certain groups might be attributable to disparate use of tests such as electrocardiogram (EKG) and pulse-oximetry, often performed prior to physician evaluation.<sup>16</sup> Disparate treatment of women and minority patients by physicians could also explain these results.<sup>17</sup> Importantly, the race and sex disparities we detected did not diminish over time, despite widespread efforts to reduce disparities in medical care.<sup>18</sup>

Longer waits for patients evaluated by a resident physician may reflect the lower efficiency of physicians in training or longer waits at academic centers. Surprisingly, self-pay patients waited no longer than the insured, which suggests that in the ED, the uninsured may be treated comparably to the insured.

Reversing the trend of longer ED waits would likely require multiple reforms. Possible interventions include expanding insurance coverage and access to primary care resources to increase alternatives to ED visits; directing hospital resources to medical need (for example, the expansion of ED resources) instead of profitable but unnecessary services; increasing available ED space, staff, and specialty consultation services; and modified management of elective surgery scheduling.

**Study limitations.** Our study has limitations. For nearly a quarter of patient visits, ED staff failed to record wait times. However, these patients were very similar to patients with nonmissing data. We observed clustering of wait times around certain values (such as 0, 5, 10, 15 minutes). However, we doubt that this would bias our results. Data limitations precluded assessment of whether wait times increased as a result of crowding or whether it occurred everywhere or only at some hospitals. Nor could we analyze the effect of ED volume or patients' socioeconomic status on ED wait times. Similarly, we were unable to interpret patient transfer as a predictor of wait time, because we had no information on the receiving facility, although most transferred AMI patients were evaluated quickly and were probably quite ill. Lacking information about patients' use of non-ED services, we could not assess the policy-relevant question of the impact of primary care availability on ED use.

Emergency departments are the only place where help is offered twenty-four hours a day; like Robert Frost's conception of home, "the place where, when you have to go there, They have to take you in." Federal law (the Emergency Medical Treatment and Active Labor Act, or EMTALA) recognizes this important social role,

mandating that EDs accept all patients.<sup>19</sup> However, unless resources are reallocated to prevent ED overcrowding, the benefits of early intervention for time-sensitive conditions may be less attainable for all Americans

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## NOTES

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