

# Patterns and Correlates of Emergency Department Use by Individuals With Diabetes

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In the U.S., there has been a rapid increase in emergency department visits, and studies indicate that up to 50% of emergency department visits are for non-urgent problems (1,2). Several studies have suggested that individuals with diabetes are significantly more likely to use the emergency department than their nondiabetic counterparts (3–5). However, most of these studies did not adequately control for key factors that influence health utilization, and many did not explore potential predictors of emergency department use in individuals with diabetes.

The objectives of this study were to use nationally representative data to 1) compare patterns of emergency department use in people with and without diabetes, 2) compare the odds of emergency department use in both groups while controlling for potential confounders, and 3) determine correlates of single and multiple emergency department use in people with diabetes. It was hypothesized that while controlling for known confounders, the odds of emergency department use would not differ significantly between people with and without diabetes.

## RESEARCH DESIGN AND METHODS

— Data from the sample adult core of 1999 National Health Interview Survey (NHIS) (6) were analyzed. The NHIS is a nationally representative household survey of U.S. adults aged  $\geq 18$  years. The sample is selected by a complex sampling design involving stratifica-

tion, clustering, and multistage sampling with a nonzero probability of selection for each person. Final weights allow estimates from the NHIS to be generalized to the adult civilian population of the U.S. (7).

The diagnosis of diabetes was based on self-report. Emergency department use was defined as having one or more hospital emergency room visit in the previous 12 months. Emergency department use was further categorized according to the number of visits in the previous 12 months: none, one, two to three, and four or more. Confounding variables included age (18–34, 35–49, 50–64, and  $\geq 65$  years), race/ethnicity (white, black, Hispanic, and other), education (less than high school graduate and high school graduate or greater), employment (employed versus unemployed), household income ( $< \$20,000$  and  $\geq \$20,000$ ), having a single usual source of medical care in the previous 12 months, and perceived health status (defined as better or same versus worse compared with previous 12 months). Other variables included comorbidity (defined as self-reported diagnosis of coronary artery disease, heart failure, chronic obstructive pulmonary disease, stroke, end-stage renal failure, chronic liver disease, or cancer). An additional variable was created for individuals with diabetes to assess presence or absence of diabetes-related complications (defined as the presence of any of the following self-reported conditions: coronary artery disease, stroke, end-stage renal fail-

ure, macular degeneration, retinopathy, or blindness).

Statistical analysis was performed with Stata version 7.0 (8). Sample characteristics and patterns of emergency department use were compared among individuals with and without diabetes using  $\chi^2$  statistics. Multiple logistic regression models were used to compare odds of emergency department use in people with and without diabetes while controlling for confounders. Confounding variables were selected for sequential entry into the model based on the behavioral model of health services use (9). Predisposing factors included age, sex, race/ethnicity, education, and employment. Enabling factors included household income and having a regular source of care. Need factors included perceived health status and comorbidity. Among people with diabetes, multiple logistic regression models were used to determine the independent correlates of single and multiple (two or more) emergency department visits while controlling for confounders.

**RESULTS** — Table 1 compares sample characteristics and patterns of emergency department use among people with and without diabetes. The prevalence of emergency department use was higher in people with diabetes than in people without diabetes: one visit (16 vs. 12%), two to three visits (8 vs. 4%), and four or more visits (3 vs. 1%).

In the full multivariate model comparing odds of emergency department use and controlled for known confounders, the odds ratio (OR) of emergency department use was not significantly different between people with and without diabetes (OR 0.92 [95% CI 0.78–1.08]). In models without need factors, individuals with diabetes had higher odds of emergency department use (predisposing alone: 1.83 [1.62–2.09]; enabling alone: 1.65 [1.45–1.88]; predisposing and enabling: 1.75 [1.53–2.00]). When only need factors were controlled for, there was no significant difference in odds of

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**Abbreviations:** NHIS, National Health Interview Survey.

A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

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Table 1—Characteristics of adults with and without diabetes, U.S., 1999

	Diabetes (n = 1,794, N = 10,318,191)	No diabetes (n = 28,228, N = 184,883,434)	P
Age (years)			<0.001
≥65	39.7 (1.33)	15.0 (0.27)	
50–64	35.5 (1.37)	18.9 (0.26)	
35–49	18.0 (1.09)	32.7 (0.35)	
18–34	6.8 (0.73)	33.5 (0.40)	
Women	53.1 (1.12)	52.2 (0.35)	0.550
Race/ethnicity			<0.001
Non-Hispanic white	68.5 (1.27)	75.3 (0.40)	
Hispanic	11.5 (0.84)	10.1 (0.27)	
Non-Hispanic black	16.3 (0.99)	10.8 (0.29)	
Non-Hispanic other	3.7 (0.65)	3.8 (0.18)	
Less than high school education	29.4 (1.18)	17.1 (0.31)	<0.001
Unemployed	55.8 (1.28)	25.1 (0.33)	<0.001
Household income <\$20,000	32.9 (1.30)	20.1 (0.36)	<0.001
No usual source of care	3.0 (0.43)	11.0 (0.25)	<0.001
Worsening health status	16.8 (1.01)	6.8 (0.17)	<0.001
Comorbidity			<0.001
Zero or one chronic condition	25.6 (1.20)	90.5 (0.20)	
Two chronic conditions	37.1 (1.37)	7.1 (0.17)	
Three or more chronic conditions	37.3 (1.34)	2.4 (0.10)	
Emergency department visits			
None	73.1 (1.21)	83.5 (0.28)	<0.001
One	15.6 (0.96)	11.7 (0.24)	<0.001
Two to three	8.1 (0.78)	3.6 (0.14)	<0.001
Four or more	3.3 (0.45)	1.2 (0.08)	<0.001

Data are weighted percentage (SE). Comorbidity: coronary artery disease, heart failure, chronic obstructive pulmonary disease, end-stage renal disease, chronic liver disease, or cancer. n, unweighted sample; N, weighted sample.

emergency department use (0.91 [0.78–1.05]), suggesting that need factors were primarily responsible for the differences in emergency department use.

Among people with diabetes, independent correlates of single emergency department use were age 18–34 years (OR 2.35 [95% CI 1.06–5.25]), perceived worsening of health (1.66 [1.12–2.44]), and having three or more chronic comorbid conditions (1.56 [1.06–2.30]). Correlates of multiple emergency department use included younger age (18–34 years: 8.69 [3.72–20.31]; 35–49 years: 2.87 [1.54–5.33]), unemployment (2.33 [1.39–3.90]), having a usual source of care (8.45 [1.08–65.76]), perceived worsening of health (2.77 [1.92–3.99]), having three or more chronic comorbid conditions (3.04 [1.40–6.58]), and having diabetes complications (2.11 [1.29–3.48]).

**CONCLUSIONS**— This study shows that while controlling for factors known

to predict emergency department use, the odds of emergency department use are not significantly different between individuals with and without diabetes. This demonstrates some of the pitfalls of analyzing health services use without using an appropriate conceptual framework or using multivariate models to adjust for known determinants of health services utilization. Prevalence estimates alone would suggest that individuals with diabetes have higher emergency department use than individuals without diabetes. However, once an appropriate conceptual framework is used to select confounding variables and these variables are included in multivariate models, the presumed higher use of emergency department services by individuals with diabetes is found to be nonexistent.

Among people with diabetes, there were differences in factors associated with single and multiple visits to the emergency department. Some of the factors have been reported previously (1,10–12).

However, in contrast to results of earlier studies, this study did not find significant associations between sex, educational level, and race/ethnicity and emergency department use.

The findings of this study are subject to some limitations. This study did not distinguish trauma-related visits from non-trauma-related visits or urgent from nonurgent visits, and diabetes and other chronic medical conditions were based on self-report.

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