

Clinical Science

Patient variables impacting hospital costs from 2008 to 2010



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Abstract

BACKGROUND: Studying the variables associated with the increased costs of health care provides valuable insight.

METHODS: A review and analysis of the pertinent variables and information collected for 118.3 million hospital admissions recorded as Nationwide Inpatient Samples database was done for the years 2008 to 2010. We used hospital charges as an approximation of costs in the analysis of the patient variables and other factors contributing to hospital costs.

RESULTS: The top 5 factors with the most impact on charges were diagnostic category, length of stay, number of procedures, major operating room procedures, and ownership of the hospital.

CONCLUSION: The top 5 factors with the most impact on charges were length of stay, number of procedures, major diagnostic category, major operating room procedures, and ownership of the hospital.

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The total cost of health care in the United States is \$2.6 trillion per year, representing 17.9% of gross domestic product.¹ The Centers for Medicare and Medicaid Services estimate inpatient hospital care accounts for approximately 31% of overall healthcare expenditures in the United States in 2010.^{1,2} Healthcare expenditures increased at approximately twice the general rate of inflation over the last decade. Medicare and Medicaid represent 37.4% and 20.7%, respectively, of healthcare expenditures. This federal 57.4%, coupled with the 33.5% of private insurance patients, and the remaining 9% of self-insured, uninsured, or other define the source of revenue for funding health

care.³⁻⁵ Emanuel and Emanuel⁶ noted that government and employers do not fund health care. Workers and households fund 100% of healthcare costs by paying directly with insurance premiums, copays and deductibles, or their tax dollars. The “payers” are in reality intermediaries between the citizens and the providers of care. Many suggest that the present system is unsustainable and rapidly rising costs remain a persistent and pernicious problem.⁷

Factors such as the increased size of the population (especially elderly and super-elderly patients), obesity, patient noncompliance, increasing incidence of chronic conditions, lack of quality improvement programs, length of stay (LOS) in the intensive care unit, and many technological advances, such as advanced imaging, pharmaceuticals, and increasingly sophisticated therapeutic devices, each contribute to a rising cost.⁸⁻¹³

This study was undertaken to look at factors impacting the cost of inpatient hospital care. Analyzing data collected from the Nationwide Inpatient Samples (NIS), for the years

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2008 to 2010, distributed by the Healthcare Cost and Utilization Project (HCUP), should help to gain some insight regarding the contributors to overall costs.

Patients and Methods

NIS is a well-recognized database within HCUP sponsored by the Agency for Healthcare Research and Quality. It contains the largest longitudinal hospital care data in the United States. Data are collected in a uniform format at the hospital, state, and federal levels. The NIS database collects data from approximately 8 million hospital admissions yearly from states participating in HCUP. It also contains all discharge data from 1,051 hospitals in 45 states representing approximately a 20% sample population of all US hospitals for the years 2008 to 2010. Data are limited to that specific hospital admission; no patient data following discharge are available.

We performed a review and analysis of the pertinent variables and information collected for the years 2008 to 2010. Data analysis focused on patient demographics, annual hospital charges, insurance status, household income, distribution of admission by region of the United States, most common indications for admission, patient disposition, and distribution of patient admission by classification of the hospital as rural, urban location, teaching, or nonteaching institution. Insurance status was defined as patient's coverage by one of the following: private insurance, Medicare, Medicaid, and patients with no insurance. Regions of the United States were classified Northeast, West, South, and Midwest as defined by the US Census Bureau report.¹⁴ Median household income was defined by quartiles: 25th, 50th, 75th, and 100th quartile. Patient disposition included death or discharge to home, short-term facility, home health care, against medical advice, other facilities. Hospital types were non-profit, federal, or government owned, and private investor-owned facilities. Procedures were classified as follows: minor diagnostic or therapeutic versus major diagnostic or therapeutic procedures. Finally, we selected for the most costly diagnoses-related groups (DRG) by

admission and determined the incidence, overall cost, and average cost of the top 10 DRG.

Using IBM Statistical Package for the Social Sciences version 19, both the demographics of patient hospital admissions and the charges incurred were analyzed. We compared specific patient characteristics, including income, age, sex, race, insurance status, and region of admission. Linear regression model with 34 variables were used as possible predictors of hospital charges. These variables included demographics of patients, details of admission, as well as characteristics of hospitals. Forward stepwise method was used as the model selection method and corrected Akaike information criterion for the selection criterion. Categorical variables were used as factors in the model and continuous variables as covariates. US Census 2010 results provided population information for the years 2008 to 2010.¹⁴ Additionally, we performed cost analysis by age groups. Analysis of variance testing compared multiple means with post-hoc analysis included. Chi-square testing was used to compare categorical data and *t*-tests were used to compare means. Confidence intervals were set at 95% and *P* less than .05 was considered to be statistically significant.

Results

The NIS database recorded 8 million admissions representing 118.3 million hospital admissions in the United States in the years 2008 to 2010 (39.9 million, 39.4 million, and 39.0 million, respectively). The mean age was 48.4 ± 27.8 years. When excluding patients less than 1 year old, the average age was calculated at 54.9 ± 22.8 years (Table 1). Women accounted for 58.1% of the population and men 41.9% (odds ratio of female:male = 1.35; 95% confidence interval: 1.35 to 1.355, *P* < .01). Compared with 2008 the number of annual admissions for Blacks, Hispanics, and Native Americans increased in 2009 and 2010, while the number of admissions decreased for Whites and Asian/Pacific Islanders (*P* < .05). The ratio of average annual admission rates per population based on race was also compared. The African American group had the highest ratio (11.3%),

Table 1 Age of patients in different calendar year

	Year 2008	Year 2009	Year 2010	Overall
Number of cases (millions)	39.89	39.43	39.01	118.33
Age (include patients <1 year old)				
Mean \pm SD	48.5 \pm 27.9	48.3 \pm 27.8	48.4 \pm 27.7	48.4 \pm 27.8
Median	52	52	52	52
Range	0–120	0–119	0–123	0–123
Age (exclude patients <1 year old)				
Mean \pm SD	55.1 \pm 22.8	54.8 \pm 22.8	54.6 \pm 22.9	54.9 \pm 22.8
Median	57	57	57	57
Range	1–120	1–119	1–123	1–123

SD = standard deviation.

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