

## STATISTICAL BRIEF #14

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### Trends in Elderly Hospitalizations, 1997–2004

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#### Introduction

The elderly population in the U.S. is projected to more than double from approximately 35 million in 2000 (12 percent of the U.S. population) to an estimated 71 million in 2030 (20 percent of the U.S. population).<sup>1</sup> As the American population continues to age, the demand for hospital care will increase rapidly since elderly individuals are at high risk for costly, age-associated chronic diseases and other health conditions.

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) summarizing information about hospital stays for elderly individuals, age 65 and older, from 1997 to 2004. Specifically, this brief notes the most frequent reasons for hospitalizations among older patients, with a focused look at the characteristics of six select health conditions: congestive heart failure, pneumonia, acute myocardial infarction (heart attack), chronic obstructive pulmonary disease, acute cerebrovascular disease (stroke), and osteoarthritis. These conditions were selected based on volume as well as relevance to the priority conditions identified by the Department of Health and Human Services for research under the Medicare Modernization Act.<sup>2</sup> All differences between estimates provided in the text are statistically significant at the 0.05 level or better.

#### Findings

From 1997 to 2004, elderly individuals represented approximately 12 percent of the U.S. population each year;<sup>3</sup> however, this age group accounted for about 35 percent of hospital stays annually. Table 1 describes the general characteristics of hospitalizations among the elderly from 1997 to 2004.

The average hospital costs for these stays increased by over 25 percent—from \$7,800 per stay in 1997 to \$9,800 per stay in 2004

#### Highlights

- From 1997 to 2004, elderly individuals represented approximately 12 percent of the U.S. population each year; however, this age group accounted for a substantially larger portion—about 35 percent—of hospital stays annually.
- Heart and respiratory conditions, such as congestive heart failure and pneumonia, were consistently among the most common reasons for hospitalizations among elderly individuals between 1997 and 2004.
- Over the eight-year period, the top 10 conditions that accounted for about 40 percent of elderly hospitalizations each year were congestive heart failure, pneumonia, coronary atherosclerosis (hardening of the arteries), cardiac dysrhythmias, acute myocardial infarction (heart attack), osteoarthritis, stroke, chronic obstructive pulmonary disease, rehabilitation care, and fluid and electrolyte disorders.
- The average hospital costs for elderly hospitalizations increased by over 25 percent, from \$7,800 per stay in 1997 to \$9,800 per stay in 2004 (after adjusting for inflation). While costs increased, the average length of stay decreased by just under one day (from 6.4 days in 1997 to 5.7 days in 2004).
- From 1997 to 2004, the rate of hospital admissions initiated in the emergency department increased from 49 percent to 57 percent.

<sup>1</sup>Centers for Disease Control and Prevention. Public health and aging: Trends in aging—United States and worldwide. *Morbidity and Mortality Weekly Report (MMWR)*, 52(06):101–106, February 14, 2003.

<sup>2</sup>AHRQ Press Release. *List of priority conditions for research under Medicare Modernization Act released*. December 15, 2004.

<sup>3</sup>U.S. Census Bureau. *National population estimates—characteristics*. <http://www.census.gov/popest/national/asrh/> (Accessed July 11, 2006).

(after adjusting for inflation).<sup>4</sup> While costs increased, the average length of stay (ALOS) decreased by just under one day (from 6.4 days in 1997 to 5.7 days in 2004).

Across the years, many of these stays were complicated by chronic coexisting conditions, such as diabetes and hypertension; on average, each hospitalization for elderly individuals contained two comorbidities. In addition, from 1997 to 2004, an increasingly large proportion of hospitalizations for the elderly were admitted through the emergency department (ED)—a rise of 18 percent (49 percent in 1997 to 57 percent in 2004).

#### *Most frequent reasons for hospitalization among elderly individuals*

Heart and respiratory conditions, such as congestive heart failure and pneumonia, were consistently among the most common reasons for hospitalizations among elderly individuals between 1997 and 2004. Table 2 presents a list of the top 10 reasons for hospitalization in 1997, 2000, and 2004. These top 10 conditions accounted for nearly 40 percent of elderly hospitalizations each year.

#### *Trends in hospital costs and ALOS for select conditions*

Hospital costs increased across the years for each of the six select conditions that are the focus of this brief: congestive heart failure (CHF), pneumonia, acute myocardial infarction or heart attack (AMI), chronic obstructive pulmonary disease (COPD), acute cerebrovascular disease (stroke), and osteoarthritis. Figure 1 presents the changes in hospital costs for these six select conditions from 1997 to 2004. Specifically, hospital costs for CHF increased by about 48 percent—from \$6,200 per stay in 1997 to \$9,200 per stay in 2004. AMI also experienced a large cost increase of over \$4,000 per hospital stay (from \$11,900 in 1997 to \$16,000 in 2004). Stroke and osteoarthritis both increased by over \$2,000 per stay. For pneumonia and COPD, the average hospital cost increased by approximately \$1,000 per stay.

While hospital costs increased over time, hospital stays for each select condition were shorter in 2004 relative to 1997—dropping by 0.4 to 1.5 days, depending on the condition. In 2004, the ALOS for these six conditions ranged from 4 days to 6 days. Figure 2 presents the ALOS for these six select conditions in 1997, 2000, and 2004. The conditions with the greatest cost increases, CHF and AMI, experienced the smallest declines in ALOS: 0.4 days and 0.5 days, respectively. Pneumonia and stroke, the two diagnoses with the longest ALOS in 1997, experienced the greatest decreases in ALOS in 2004 (1 day and 1.5 days, respectively).

#### *Trends in admissions through the ED for select conditions*

From 1997 to 2004, the rate of hospital admissions initiated in the ED increased for all six select conditions. Hospitalizations for these conditions tended to originate in the ED more often, relative to other causes of elderly hospitalizations. Figure 3 presents the percentage of hospitalizations that originated in the ED for these select conditions in 1997, 2000, and 2004. With the exception of osteoarthritis, a condition for which there is typically a low rate of hospital admissions from the ED, hospitalizations commonly began in the ED in 2004, ranging from 67 percent of stays for AMI to 78 percent of stays for stroke. Among the six conditions, the three diagnoses that experienced the greatest increase in admissions from the ED (on average a 15 percent rise from 1997) were pneumonia, COPD, and stroke.

## **Data Source**

The estimates in this Statistical Brief are based on data from the HCUP 1997–2004 Nationwide Inpatient Sample (NIS). The NIS is weighted to provide national estimates of hospital use.

– In 1997, 22 states participated in the HCUP NIS:

Arizona, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Iowa, Kansas, Maryland, Massachusetts, Missouri, New Jersey, New York, Oregon, Pennsylvania, South Carolina, Tennessee, Utah, Washington, and Wisconsin.

– In 2000, 28 states participated in the HCUP NIS:

Arizona, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Missouri, New Jersey, New York, North Carolina, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.

<sup>4</sup>U.S. Department of Labor, Bureau of Labor Statistics. Consumer Price Index All Urban Consumers (CPI-U), U.S. city average. <http://www.bls.gov/cpi/home.htm> (Accessed September 20, 2006.)

- In 2004, 37 states participated in the HCUP NIS:  
Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, Wisconsin, and West Virginia.

Supplemental sources included data from the U.S. Census Bureau, Population Division (National Population Estimates—Characteristics), the Bureau of Labor Statistics (Consumer Price Index Tables), and the HCUP Cost-to-Charge Ratio files.

## Definitions

### *Types of hospitals included in HCUP*

HCUP is based on data from community hospitals, defined as short-term, non-Federal, general and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include OB-GYN, ENT, orthopedic, cancer, pediatric, public, and academic medical hospitals. They exclude long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals, but these types of discharges are included if they are from community hospitals.

### *Unit of analysis*

The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in one year will be counted each time as a separate "discharge" from the hospital.

### *Costs and charges*

Total hospital charges were converted to costs using cost-to-charge ratios (CCR) based on hospital accounting reports from the Centers for Medicare and Medicaid Services (CMS).<sup>5</sup> Costs will tend to reflect the actual costs of production, while charges represent what the hospital billed for the case. For each hospital, a hospital-wide CCR is used because detailed charges are not available across all HCUP States. Hospital charges reflect the amount the hospital charged for the entire hospital stay and does not include professional (physician) fees.

For the purposes of this Statistical Brief, all cost data have been presented in 2004 dollars using the Bureau of Labor Statistics Consumer Price Index All Urban Consumers (CPI-U) U.S. city average and reported to the nearest hundreds. (Note: Costs for 2004 data are imputed from the 2003 CCR file and costs for the 1998 data are imputed from the 1997 CCR file.)

### *Principal diagnosis and Clinical Classifications Software (CCS)*

The principal diagnosis is that condition established after study to be chiefly responsible for the patient's admission to the hospital. Secondary diagnoses are concomitant conditions that coexist at the time of admission or that develop during the stay. All-listed diagnoses include the principal diagnosis plus these additional secondary conditions. The conditions presented in this brief are based on the principal diagnosis.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 12,000 ICD-9-CM diagnosis codes. CCS categorizes ICD-9-CM diagnoses into 260 clinically meaningful categories. This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

The conditions detailed in this brief were defined by CCS principal diagnosis codes. The following CCS diagnosis codes were used to identify the six select conditions:

- 100 Acute myocardial infarction (AMI) (heart attack)
- 108 Congestive heart failure
- 109 Acute cerebrovascular disease (stroke)
- 122 Pneumonia
- 127 Chronic obstructive pulmonary disease (COPD)
- 203 Osteoarthritis

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<sup>5</sup>U.S. Department of Labor, Bureau of Labor Statistics. Consumer Price Index All Urban Consumers (CPI-U), U.S. city average. <http://www.bls.gov/cpi/home.htm> (Accessed September 20, 2006.)

## About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, non-rehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame of states that comprise 88 percent of the U.S. population for 2004. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

## About HCUP

HCUP is a family of powerful health care databases, software tools, and products for advancing research. Sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP includes the largest all-payer encounter-level collection of longitudinal health care data (inpatient, ambulatory surgery, and emergency department) in the United States, beginning in 1988. HCUP is a Federal-State-Industry Partnership that brings together the data collection efforts of many organizations—such as State data organizations, hospital associations, private data organizations, and the Federal government—to create a national information resource.

For more information about HCUP, visit <http://www.hcup-us.ahrq.gov/>.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

**Arizona** Department of Health Services  
**Arkansas** Department of Health & Human Services  
**California** Office of Statewide Health Planning & Development  
**Colorado** Health & Hospital Association  
**Connecticut** Integrated Health Information (Chime, Inc.)  
**Florida** Agency for Health Care Administration  
**Georgia** GHA: An Association of Hospitals & Health Systems  
**Hawaii** Health Information Corporation  
**Illinois** Health Care Cost Containment Council and Department of Public Health  
**Indiana** Hospital & Health Association  
**Iowa** Hospital Association  
**Kansas** Hospital Association  
**Kentucky** Department for Public Health  
**Maryland** Health Services Cost Review Commission  
**Massachusetts** Division of Health Care Finance and Policy  
**Michigan** Health & Hospital Association  
**Minnesota** Hospital Association  
**Missouri** Hospital Industry Data Institute  
**Nebraska** Hospital Association  
**Nevada** Division of Health Care Financing and Policy, Department of Human Resources  
**New Hampshire** Department of Health & Human Services  
**New Jersey** Department of Health & Senior Services  
**New York** State Department of Health  
**North Carolina** Department of Health and Human Services  
**Ohio** Hospital Association  
**Oregon** Office for Oregon Health Policy and Research and Oregon Association of Hospitals and Health Systems  
**Rhode Island** Department of Health  
**South Carolina** State Budget & Control Board  
**South Dakota** Association of Healthcare Organizations  
**Tennessee** Hospital Association  
**Texas** Department of State Health Services  
**Utah** Department of Health  
**Vermont** Association of Hospitals and Health Systems  
**Virginia** Health Information  
**Washington** State Department of Health

**West Virginia** Health Care Authority  
**Wisconsin** Department of Health & Family Services

For additional HCUP statistics, visit HCUPnet, our interactive query system at [www.hcup.ahrq.gov](http://www.hcup.ahrq.gov).

## References

For a detailed description of HCUP and more information on the design of the NIS and methods to calculate estimates, please refer to the following publications:

Steiner, C., Elixhauser, A., Schnaier, J. The Healthcare Cost and Utilization Project: An Overview. *Effective Clinical Practice* 5(3):143–51, 2002.

*Design of the HCUP Nationwide Inpatient Sample, 2004*. Online. August 8, 2006. U.S. Agency for Healthcare Research and Quality. [http://www.hcup-us.ahrq.gov/db/nation/nis/reports/NIS\\_2004\\_Design\\_Report.pdf](http://www.hcup-us.ahrq.gov/db/nation/nis/reports/NIS_2004_Design_Report.pdf)

Houchens, R., Elixhauser, A. *Final Report on Calculating Nationwide Inpatient Sample (NIS) Variances, 2001*. HCUP Methods Series Report #2003-2. Online. June 2005 (revised June 6, 2005). U.S. Agency for Healthcare Research and Quality. <http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf>

Houchens, R., Elixhauser, A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends*. (Updated for 1988–2004). HCUP Methods Series Report #2006-05 Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality. [http://www.hcup-us.ahrq.gov/reports/2006\\_05\\_NISTrendsReport\\_1988-2004.pdf](http://www.hcup-us.ahrq.gov/reports/2006_05_NISTrendsReport_1988-2004.pdf)

## Suggested Citation

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at [hcup@ahrq.gov](mailto:hcup@ahrq.gov) or send a letter to the address below:

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**Table 1. Characteristics of hospitalizations among the elderly, 1997–2004**

	1997	1998	1999	2000	2001	2002	2003	2004
Number of hospital stays, thousands (percentage of all hospital stays)	12,482 (36.0)	12,650 (36.3)	12,487 (35.2)	12,737 (35.0)	13,317 (35.8)	13,192 (34.9)	13,233 (34.6)	13,059 (33.8)
Mean costs per stay, dollars*	\$7,800	\$7,600	\$7,700	\$8,400	\$8,500	\$9,100	\$9,400	\$9,800
Mean length of stay, days	6.4	6.1	6.0	5.9	5.8	5.8	5.7	5.7
Percentage of hospital stays in which the patient died in the hospital	5.1%	5.1%	5.2%	5.0%	4.8%	4.7%	4.7%	4.5%
Percentage of hospital stays that were admitted from the ED	48.5%	50.0%	51.6%	51.5%	53.5%	57.4%	57.4%	57.0%
Number of comorbidities that were present on admission to the hospital	1.8	1.8	1.9	1.9	2.0	2.1	2.2	2.3

\*1997–2003 costs have been adjusted for inflation and are noted in 2004 dollars.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997–2004.

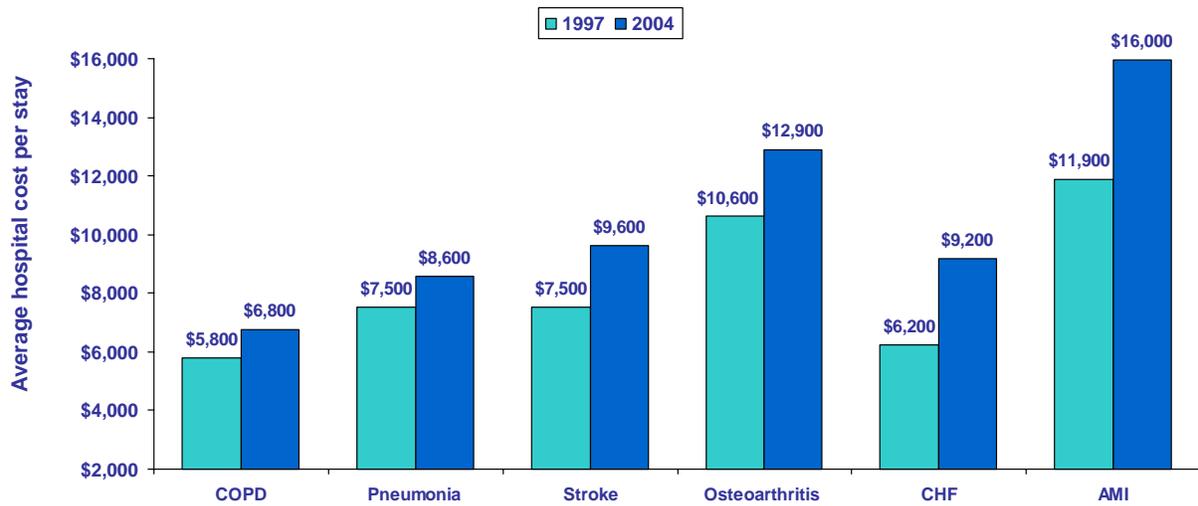
**Table 2. Top 10 reasons for hospitalizations among the elderly, 1997, 2000, and 2004**

Number of discharges in thousands (percent of elderly discharges)			
Principal diagnosis	1997	2000	2004
Congestive heart failure (CHF)	799 (6.3)	786 (6.2)	820 (6.3)
Pneumonia	727 (5.7)	743 (5.8)	713 (5.5)
Coronary atherosclerosis (hardening of the heart arteries)	825 (6.5)	751 (5.9)	641 (4.9)
Cardiac dysrhythmias	410 (3.2)	455 (3.6)	477 (3.7)
Acute myocardial infarction (AMI) (heart attack)	456 (3.6)	472 (3.7)	416 (3.2)
Osteoarthritis	315 (2.5)	293 (2.3)	405 (3.1)
Acute cerebrovascular disease (stroke)	484 (3.8)	426 (3.3)	375 (2.9)
Chronic obstructive pulmonary disease (COPD)	381 (3.0)	413 (3.2)	365 (2.8)
Rehabilitation care	299 (2.3)	330 (2.6)	341 (2.6)
Fluid and electrolyte disorders	<i>Not a top 10 condition in 1997</i>	289 (2.3)	294 (2.3)
Fracture of neck of femur (hip fracture)	312 (2.4)	<i>Not a top 10 condition in 2000</i>	<i>Not a top 10 condition in 2004</i>

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997, 2000, and 2004.



**Figure 1. Hospital costs increased for six select conditions among the elderly, 1997 to 2004**

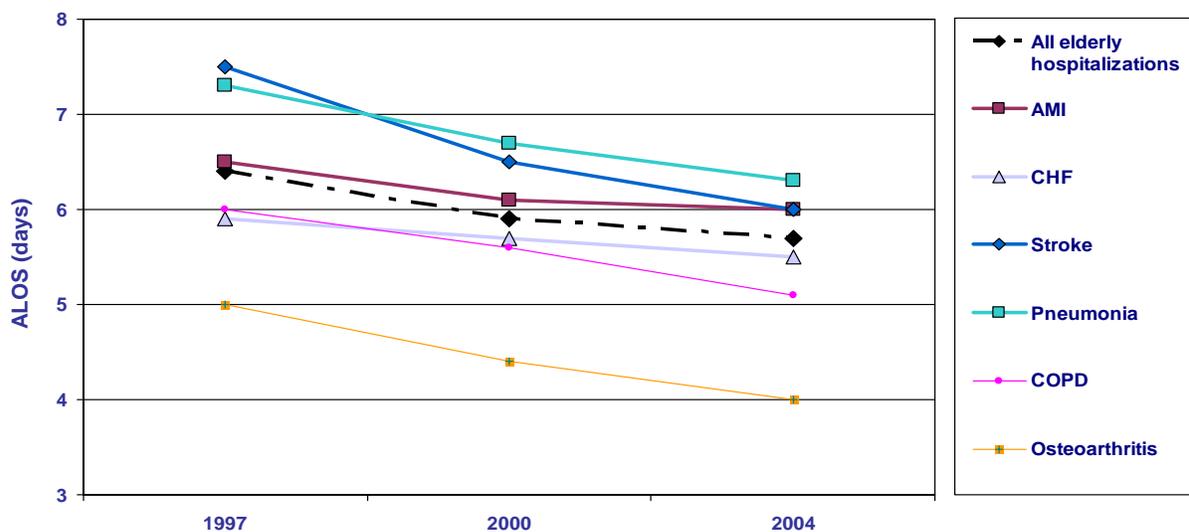


\*Based on principal diagnosis.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997, 2000, and 2004.



**Figure 2. Average length of stay (ALOS) decreased for six select conditions among the elderly, 1997, 2000, and 2004**

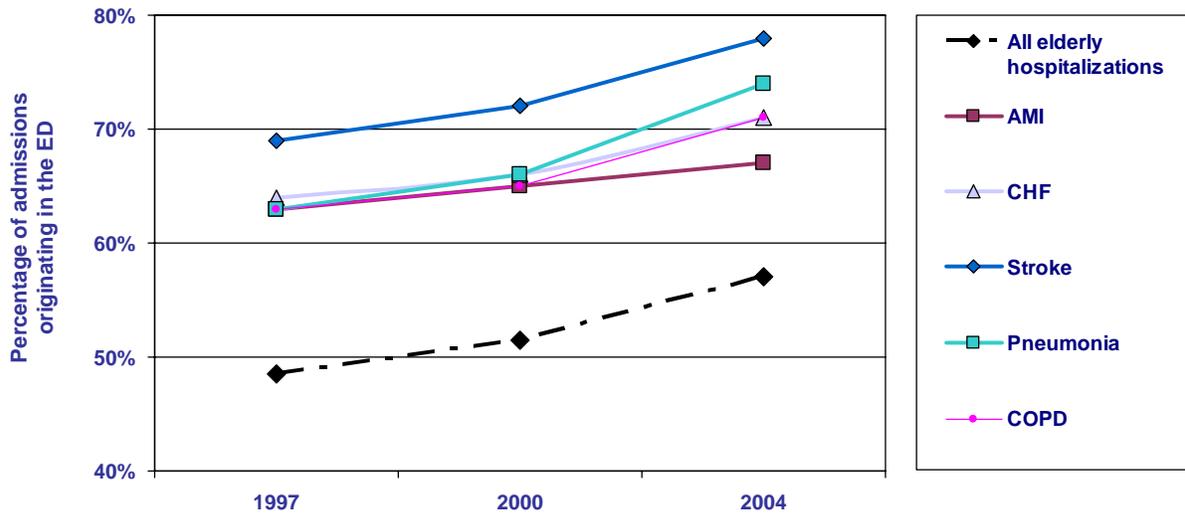


\*Based on principal diagnosis.

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997, 2000, and 2004.



**Figure 3. Hospitalizations originating in the emergency department (ED) increased for select conditions among the elderly, 1997, 2000, and 2004\***



\*Based on principal diagnosis.

Note: A small percentage of hospitalizations for osteoarthritis originated in the ED—2 percent to 3 percent each year (not shown).  
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 1997, 2000, and 2004.