Patient and Hospital Factors Associated With Hospital Admissions for Ambulatory Care Sensitive Conditions

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Background. Patients admitted into hospitals with ambulatory care sensitive (ACS) conditions generally lack adequate primary care or are not adequately managed on an ambulatory basis. This study explored the magnitude of discharges of patients with ACS condition in American hospitals and examined patient and hospital factors associated with hospital admissions for ACS conditions.

Methods. Data for this study was obtained from the 1994 National Hospital Discharge Survey. Bivariate statistical comparisons were performed to test the differences between ACS condition and non-ACS condition groups in specific demographics and hospital characteristics. Logistic regression was then applied to determine the independent effect of individual demographic and hospital factors in relation to hospitalizations for ACS conditions.

Results. We found that about 12% of the hospitalized patients were discharged with ACS conditions. Hospitals likely to have a higher rate of ACS discharges were governmental, relatively small in terms of beds, and situated in the non-West region. Patients likely to be discharged with ACS conditions were older, male, African American, unmarried, without insurance, or without an expected secondary source of payment.

Conclusions. Using regularly collected hospital discharge data at the national, state, and community levels, providers and decision makers can easily make timely assessments about population needs and the extent of access barriers faced by special population groups. **(Mid Taiwan J Med 2000;5:1-15)**

Key words

affecting factors, ambulatory care sensitive condition, hospital factor, patient factor, prevalence

INTRODUCTION

Ambulatory care sensitive (ACS) conditions refer to diagnoses for which timely and effective outpatient or ambulatory care can help reduce the risks of hospitalization by either preventing the onset of an illness or condition, or managing a chronic illness or condition [1]. Patients admitted into hospitals with ACS conditions generally lack adequate primary care or are not adequately managed on an ambulatory basis. High admission rates for ACS conditions are an indication of suboptimal outpatient care, defined as

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outpatient care inappropriate in type, location, intensity or timeliness for the condition being treated [2]. The use of inpatient services instead of ambulatory care for ACS conditions is usually more costly.

In their study of access to hospital services by the poor, Epstein et al found that people with lower income had greater hospitalization rates for conditions that could have been treated earlier in an outpatient setting [3]. Weissman et al noted that uninsured patients and patients on Medicaid in Massachusetts and Maryland were more likely to be admitted to a hospital for chronic medical conditions than privately insured patients [4]. Billings et al at the United Hospital Fund of New York examined the impact of socioeconomics on hospital admissions associated with ACS conditions, based on patterns of hospital use in New York City in 1988 [5,6]. They concluded that for conditions identified as ACS, the hospitalization rates were higher in low-income areas than they were in higher income areas where appropriate outpatient or ambulatory care was more readily available. Consistent patterns of evidence were offered by the Codman Research Group whose 15-state comparative study indicated that the per capita admission rates for ACS conditions were directly related to the poverty rates in all states with significant urban populations [7]. Recently, Bindman et al examined the discharge data from California hospitals and concluded that low-income communities where people perceived limited access to medical care had higher rates of hospitalization for preventable ACS conditions [6]. The conditions studied included asthma, hypertension, congestive heart failure, chronic obstructive pulmonary disease, and diabetes. These studies demonstrated that large differences in rates of hospital use seem to be attributable to differences in access to and configuration of local systems of outpatient care [7]. Thus ACS conditions can serve as an indicator of access to ambulatory care.

The purpose of this study was to expand the analyses by other researchers on hospital admissions for ACS conditions by going beyond the income-hospitalization association that most existing studies have examined. Specifically, we first examined the magnitude of ACS condition discharges in American hospitals and the most common ACS conditions among discharged patients. Next, we explored a host of patient and hospital factors associated with hospital admissions for ACS conditions based on a recent National Hospital Discharge Survey (NHDS). Policy makers can gain much from understanding the significant individual and hospital factors associated with hospital admissions for ACS conditions. Given the links between access barriers and hospital admissions for ACS conditions, a clearer understanding of the profiles of individuals typically experiencing access barriers to primary and ambulatory care is evident and policies and programs that improve access for these individuals can be developed.

MATERIALS AND METHODS

Data

The data for this study were obtained from the 1994 NHDS. The NHDS is conducted annually by the National Center for Health Statistics (NCHS) and is a principal source of information on inpatient hospital utilization in the United States. This survey collects medical and demographic information from a sample of discharge records selected from noninstitutional hospitals, exclusive of Federal, military, and Veterans Administration hospitals, located in the 50 states and the District of Columbia. Only short-stay hospitals (hospitals with an average length of stay for all patients of less than 30 days) or those whose specialty is general (medical or surgical) or children's general are included in the survey. The hospitals surveyed have six or more beds staffed for patients' use.

The NHDS sample included all hospitals

with 1,000 or more beds or 40,000 or more discharges annually. The remaining sample of hospitals was based on a stratified, three-stage design. The first stage consisted of selecting 112 primary sampling units (PSU's) that comprised a probability subsample of PSU's used in the 1985-94 NHDS. The second stage consisted of selecting non-certainty hospitals from the sample PSU's. At the third stage a sample of discharges was selected using a systematic random sampling technique. The detailed descriptions of the sampling design have been published elsewhere [8].

Beginning with 1988 the NHDS sampling frame consisted of hospitals that were listed in the April 1987 SMG Hospital Market Tape [9], met the above criteria, and began accepting patients by August 1987. For 1994 the sample consisted of 525 hospitals. Of the 525 hospitals, 13 were found to be ineligible because they went out of business or otherwise failed to meet the criteria for the NHDS. Of the 512 eligible hospitals, 478 hospitals responded to the survey.

Two data collection procedures were used for the survey. The first was a manual system of sample selection and data abstraction, used for approximately 62% of the responding hospitals. The second was an automated method that involved the purchase of computerized data tapes from abstracting service organizations, state data systems, or from the hospitals themselves. This method was used for approximately 38% of the respondent hospitals. The system used for coding the diagnoses and procedures on the medical abstract forms as well as on the commercial abstracting services data tapes was the International Classification of Diseases, Ninth Revision, Clinical Modification, (ICD-9-CM) [10].

The unit of analysis was the individual patient hospitalized in 1994. As consistent with previous related research [6], this study included adults aged 18–64 years who were formally admitted to the inpatient services of a short-stay hospital surveyed in 1994 for observation, care, diagnosis, or treatment. The pediatric (age 0 to 17 years), elderly (age $\geq$ 65 years), and obstetric patients with normal deliveries were excluded from the analysis. The pediatric patients were excluded because the ACS conditions applicable to children were different from those applicable to adults. We will analyze and publish the results of our pediatric survey separately after consultation with pediatricians and medical experts regarding the ACS conditions relevant to them. The elderly population were excluded due to Medicare coverage which pays for a significant amount of outpatient medical care costs and provides adequate reimbursement levels for most physicians to accept Medicare patients. Previous research on ACS conditions indicated insignificant association between income level and hospital admissions for ACS conditions among elderly patients [1,5]. Obstetric patients with normal deliveries were excluded because normal delivery was not considered as an illness.

Measures

In this study, we selected measures of individual and hospital characteristics associated with hospitalization. The purpose was to find out which factors were significantly related to variations in hospitalizations for ACS conditions. The dependent variable examined in this study was discharge diagnoses grouped as ACS conditions or non-ACS conditions. The primary diagnosis was used for classification of the hospitalization for medical conditions. The selection of diagnoses for ACS conditions was based on the listing of ICD-9-CM codes for ACS conditions developed by Billings et al [1,5]. A medical advisory panel of internists and pediatricians, including experts on access barriers, developed a diagnostic framework for analyzing hospital use patterns [1]. Using the Delphi approach, they grouped hospital admissions into ACS conditions and marker conditions, the diagnoses for which the provision of timely and effective outpatient care is likely to have little impact on the need

Table 1. Definitions, means, standard deviations, and distributions of variables used in the analysis (n = 125,621)

Variables	Description	Distribution No. (%)	Mean (SD)	Range
Ambulatory care sensitive condition*	1 = with	14,899 (11.9)		
	0 = without	110,722 (88.1)		
Age (yr)	The age of the patient on the birthday prior to admission to the hospital inpatient service.		40.27 (13.36)	18–64
Gender	1 = male	46,794 (37.3)		
	2 = female	78,827 (62.7)		
Race	1 = white	71,646 (57.0)		
	2 = black	19,153 (15.2)		
	3 = American Indian/Eskimo	834 (0.7)		
	4 = Asian/Pacific islander	2,431 (1.9)		
	5 = other	6,638 (5.3)		
	9 = not stated	24,919 (19.8)		
Marital status	0 = married	28,685 (22.8)		
	1 = other, including single, widowed, divorced, separated, unknown and, not stated.	96,936 (77.2)		
Length of stay (d)	The total number of patient days accumulated at time of discharge by patients discharged from short-stay hospitals during a year.		5.08 (7.99)	1–383
Geographic region	1 = Northeast, includes Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania.	33,460 (26.6)		
	2 = Midwest, includes Michigan, Ohio, Illinois, Indiana, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas	34,888 (27.8)		
	3 = South, includes Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.	37,832 (30.1)		
	4 = West, includes Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Hawaii, and Alaska	19,441 (15.5)		
Principal expected source of payment	0 = no charge	928 (0.7)		
	1 = workmen's compensation	2,217 (1.8)		
	2 = Medicare	11,346 (9.0)		
	3 = Medicaid	24,040 (19.1)		
	4 = other government payments, including Title V.	2,589 (2.1)		
	5 = Blue Cross	18,745 (14.9)		
	6 = other private/commercial insurance	47,274 (37.6)		

Table 1. Continued

Variables	Description	Distribution No. (%)	Mean (SD)	Range
	7 = self-pay	8,854 (7.0)		
	8 = other	6,826 (5.4)		
	9 = not stated	2,802 (2.2)		
Secondary source of payment	1 = with expected secondary source of payment	10,107 (8.0)		
	0 = without secondary source of payment	115,514 (92.0)		
Hospital ownership	The type of organization that controls and operates the hospital			
	1 = proprietary: hospitals operated by individuals, partnerships, or corporations for profit.	11,903 (9.5)		
	2 = government: hospitals operated by state and local government.	14,174 (11.3)		
	3 = nonprofit: hospitals operated by a church or another not for profit organization.	99,544 (79.2)		
Number of beds	1 = 6–99	13,934 (11.1)		
	2 = 100–199	21,959 (17.5)		
	3 = 200–299	28,520 (22.7)		
	4 = 300–499	39,028 (31.1)		
	5 = 500 and over	22,180 (17.7)		

* The specifications for ambulatory care sensitive conditions are listed in Appendix A; SD = standard deviation.

for hospital admission. While there were significantly higher admission rates in low-income areas than in high-income areas for ACS conditions, there were insignificant variations in hospital admissions between low- and high-income areas for marker conditions. Appendix A lists the specific ACS conditions and their ICD-9-CM codes.

The independent variables used in this study were individual demographics, hospitalization, and hospital characteristics. Specifically, individual demographics included age, gender, race, and marital status. Hospitalization included sources of payment and length of hospital stay. Sources of payment included both principal and secondary sources of payment for inpatient care. Hospital characteristics were number of beds in the hospital, hospital ownership, and geographic region including Northeast, Midwest, South, and West. Table 1 provides the operational definitions of the measures used in the analysis.

Analysis

The analytical strategy used in this study was to examine patient and hospital factors associated with hospital admissions for ACS conditions. First, descriptive statistics (i.e., means, standard deviations, frequency and proportions) of the measures used and the 10 most common ACS conditions by individual demographics and hospital characteristics were generated to provide a profile of the general characteristics of the patients hospitalized in 1994 (Tables 1 and 2). Next, bivariate statistical comparisons were performed to test the differences between the patients in the ACS condition group and non-ACS condition group in specific demographics and hospital characteristics. Chi-square tests were used for categorical independent variables and Student's *t*-tests for interval or

Table 2. Demographic and hospital characteristics associated with the top ten ambulatory care sensitive conditions

Variables	Bacterial pneumonia No. (%)	Angina No. (%)	Diabetes No. (%)	Congestive heart failure No. (%)	Asthma No. (%)
Total	2077	1919	1615	1582	1545
Age (yr)					
18–25	132 (6.4)	4 (0.2)	178 (11.0)	12 (0.8)	194 (12.6)
26–35	365 (17.6)	36 (1.9)	269 (16.7)	59 (3.7)	337 (21.8)
36–45	515 (24.8)	323 (16.8)	374 (23.2)	183 (11.6)	400 (25.9)
46–64	1065 (51.3)	1556 (81.1)	794 (49.2)	1328 (83.9)	614 (39.7)
Sex					
Male	1044 (50.3)	1135 (59.2)	806 (49.9)	833 (52.7)	425 (27.5)
Female	1033 (49.7)	784 (40.9)	809 (50.1)	749 (47.4)	1120 (72.5)
Race					
White	1120 (53.9)	1215 (63.3)	774 (47.9)	750 (47.4)	769 (49.8)
Black	417 (20.1)	245 (12.8)	458 (28.4)	442 (27.9)	392 (25.4)
American Indian/Eskimo	15 (0.7)	8 (0.4)	5 (0.3)	6 (0.4)	16 (1.0)
Asian/Pacific islander	21 (0.1)	26 (0.2)	14 (0.9)	22 (1.4)	17 (1.1)
Other	86 (0.6)	77 (4.0)	76 (4.7)	73 (4.6)	92 (6.0)
Not stated	418 (20.1)	348 (18.1)	288 (17.8)	289 (18.3)	259 (16.8)
Marital status					
Married	426 (20.5)	530 (27.6)	334 (20.7)	344 (21.7)	296 (19.2)
Other	1651 (79.5)	1389 (70.4)	1281 (79.3)	1238 (78.3)	1249 (80.8)
Length of stay (d)*	6.55 (6.8)	3.50 (5.5)	4.71 (5.1)	6.52 (7.2)	4.22 (3.5)
Geographic region					
Northeast	559 (26.9)	535 (27.9)	365 (22.6)	368 (23.3)	535 (34.6)
Midwest	646 (31.1)	586 (30.5)	468 (29.0)	457 (28.9)	448 (29.0)
South	612 (29.5)	515 (26.8)	565 (35.0)	559 (35.3)	386 (25.0)
West	260 (12.5)	283 (14.8)	217 (13.4)	198 (12.5)	176 (11.4)
Principal source of payment					
No charge	12 (0.6)	12 (0.6)	45 (2.8)	14 (0.9)	12 (0.8)
Workmen's compensation & other government payments	54 (2.6)	38 (2.0)	35 (2.2)	37 (2.3)	32 (2.1)
Medicare	284 (13.7)	268 (14.0)	233 (14.4)	420 (26.6)	145 (9.4)
Medicaid	422 (20.3)	218 (11.4)	322 (20.6)	316 (20.0)	218 (11.4)
Blue Cross/other private commercial insurance	968 (46.6)	1128 (58.8)	657 (40.7)	603 (38.1)	720 (46.6)
Self-pay	203 (9.8)	127 (6.6)	200 (12.4)	92 (5.8)	170 (11.0)
Other & not stated	134 (6.5)	128 (6.7)	113 (7.0)	100 (6.3)	110 (7.1)
Hospital ownership					
Proprietary	180 (8.7)	144 (7.5)	213 (13.2)	189 (12.0)	117 (7.6)
Government	276 (13.3)	184 (9.6)	237 (14.7)	166 (10.5)	185 (12.0)
Nonprofit	1621 (78.1)	1591 (82.9)	1165 (72.1)	1227 (77.6)	1243 (80.5)
Number of beds					
6–99	296 (14.3)	250 (13.0)	183 (11.3)	158 (10.0)	179 (11.6)
100–199	351 (16.9)	365 (19.0)	275 (17.0)	246 (15.6)	244 (15.8)
200–299	501 (24.1)	454 (23.7)	428 (26.5)	414 (26.2)	382 (24.7)
300–499	600 (28.9)	589 (30.7)	484 (30.0)	488 (30.9)	50.8 (32.9)
500 and over	329 (15.8)	261 (13.6)	245 (15.2)	276 (17.5)	232 (15.0)

*Means and standard deviation are provided.

Table 2. Continued

Chronic obstructive pulmonary disease No. (%)	Kidney/urinary infection No. (%)	Hypertension No. (%)	Dehydration-volume depletion No. (%)	Gastroenteritis No. (%)
1100	1076	824	681	640
13 (1.2)	205 (19.1)	6 (0.7)	67 (9.8)	85 (13.3)
41 (3.7)	215 (20.0)	49 (6.0)	120 (17.6)	155 (24.2)
108 (9.8)	235 (21.8)	199 (24.2)	161 (23.6)	164 (25.6)
938 (85.3)	421 (39.1)	570 (69.2)	333 (48.9)	236 (36.9)
480 (43.6)	254 (22.8)	399 (48.4)	280 (41.1)	248 (38.8)
620 (56.4)	831 (77.2)	425 (51.6)	401 (58.9)	392 (61.3)
762 (69.3)	585 (54.4)	418 (50.7)	383 (56.2)	392 (61.3)
126 (11.5)	176 (16.4)	203 (24.6)	119 (17.5)	71 (11.1)
1 (0.1)	11 (1.0)	2 (0.2)	4 (0.6)	1 (0.2)
3 (0.3)	27 (2.5)	10 (1.2)	7 (1.0)	10 (1.6)
24 (2.2)	56 (5.2)	43 (5.2)	21 (3.1)	28 (4.4)
184 (16.7)	221 (20.5)	148 (18.0)	147 (21.0)	138 (21.6)
241 (21.9)	218 (20.3)	263 (31.9)	136 (20.0)	163 (25.5)
859 (78.1)	858 (79.7)	561 (68.1)	545 (80.0)	477 (74.5)
6.01 (6.0)	4.89 (5.0)	2.79 (2.5)	4.80 (5.9)	3.65 (5.6)
252 (22.9)	260 (24.2)	191 (23.2)	170 (25.0)	191 (29.8)
379 (34.5)	326 (30.3)	230 (27.9)	205 (30.1)	172 (26.9)
347 (31.6)	368 (34.2)	323 (39.2)	215 (31.6)	207 (32.3)
122 (11.1)	122 (11.3)	80 (9.7)	91 (13.4)	70 (10.9)
5 (0.5)	8 (0.7)	10 (1.2)	3 (0.4)	4 (0.6)
27 (2.5)	35 (3.3)	28 (3.4)	21 (3.1)	15 (2.3)
250 (22.7)	156 (14.5)	55 (6.7)	110 (16.2)	54 (8.4)
222 (20.2)	215 (20.0)	97 (11.8)	112 (16.5)	105 (16.4)
468 (42.6)	488 (45.4)	496 (60.2)	468 (42.6)	364 (56.9)
59 (5.4)	95 (8.8)	71 (8.6)	33 (4.9)	58 (9.1)
69 (6.3)	79 (7.3)	67 (8.1)	43 (6.3)	40 (6.3)
101 (9.2)	111 (10.2)	94 (11.4)	67 (9.8)	65 (10.2)
126 (11.5)	161 (15.0)	102 (12.4)	105 (15.4)	69 (10.8)
873 (79.4)	804 (74.7)	628 (76.2)	509 (74.7)	506 (79.1)
147 (13.4)	185 (17.2)	83 (10.1)	112 (16.5)	117 (18.3)
252 (22.9)	193 (17.9)	130 (15.8)	109 (16.0)	123 (19.2)
254 (23.1)	266 (24.7)	212 (25.7)	168 (24.7)	158 (24.7)
328 (29.8)	297 (27.6)	280 (34.0)	202 (29.7)	159 (24.8)
119 (10.8)	135 (12.6)	119 (14.4)	90 (13.2)	83 (13.0)

Table 3. Comparison of ACS condition prevalence among subgroups of individusal and hospital characteristics

Variable		No.	ACS percentage	Non-ACS percentage	*p* value
Age*		125,621	46.23	39.47	< 0.01
Sex	Male	46,794	14.1	85.9	< 0.01
	Female	78,827	10.5	89.5	
Race	White	71,646	11.3	88.7	< 0.01
	Black	19,153	16.0	84.0	
	American Indian /Eskimo	834	9.7	90.3	
	Asian/Pacific islander	2,431	7.6	92.4	
	Other	6,638	10.1	89.9	
	Not stated	24,919	11.3	88.7	
Marital status	Married	28,685	11.4	88.6	< 0.01
	Other	96,936	12.0	88.0	
Length of stay*		125,621	5.09	5.08	< 0.01
Geographic region	Northeast	33,460	12.0	88.0	< 0.01
	Midwest	34,888	12.6	87.4	
	South	37,832	12.2	87.8	
	West	19,441	9.6	90.4	
Principal source of payment	No charge	928	15.0	85.0	< 0.01
	Workmen's Compensation	2,217	3.4	96.6	
	Medicare	11,346	19.2	80.8	
	Medicaid	24,040	11.8	88.2	
	Other government payments	2,589	12.5	87.5	
	Blue Cross	18,745	11.8	88.2	
	Other private insurance	47,274	10.2	89.8	
	Self-pay	8,854	14.6	85.4	
	Other	6,826	10.3	89.7	
	Not stated	2,802	10.9	89.1	
Hospital ownership	Proprietary	11,903	12.0	88.0	< 0.01
	Government	14,174	13.6	86.4	
	Nonprofit	99,544	11.6	88.4	
Number of beds	6–99	13,934	13.7	86.3	< 0.01
	100–199	21,959	11.9	88.1	
	200–299	28,520	12.7	87.1	
	300–499	39,028	11.5	88.5	
	500 and over	22,180	10.2	89.8	

*Data are expressed as mean and the *p* values are based on Student's *t*-test; the remaining variables are expressed as percentages and the *p* values are based on chi-square test. ACS = ambulatory care sensitive.

ratio variables (Table 3). Finally, logistic regression was then applied to determine the independent effects of individual demographic and hospital factors in relation to hospitalizations for ACS conditions (Table 4).

The categorical variables were coded as sets of dummy variables in the logistic regression. Race was re-coded as *white* (default category), *African American, Asian/Pacific islander*, and *other* (including American Indian/Eskimo, other races, and those "not stated"). Marital status was re-coded as *married* (default category) and *unmarried* (including single, widowed, divorced, sepa-

Table 4. Logistic regression results of individual and hospital characteristics associated with ambulatory care sensitive condition discharges

Independent variables	Discharges with ambulatory care sensitive conditions		
	β	(SE)	Odds ratio (95% CI)
Age*	0.04*	(0.00)	1.04 (1.040, 1.043)
Sex			
Female			1.00
Male	0.10*	(0.02)	1.10 (1.06, 1.14)
Race			
White			1.00
Black	0.49*	(0.02)	1.63 (1.55, 1.71)
Asian	– 0.23*	(0.08)	0.79 (0.68, 0.93)
Other	0.01	(0.02)	1.01 (0.97, 1.06)
Marital Status			
Married			1.00
Non-married	0.08*	(0.02)	1.08 (1.03, 1.13)
Length of stay	– 0.02*	(0.00)	0.98 (0.98, 0.99)
Geographic Region			
West			1.00
Northwest	0.25*	(0.03)	1.28 (1.20, 1.36)
Midwest	0.30*	(0.03)	1.35 (1.27, 1.43)
South	0.24*	(0.03)	1.27 (1.19, 1.36)
Principal source of payment			
Private insurance			1.00
No charge	0.37*	(0.10)	1.44 (1.19, 1.74)
Workmen's compensation	– 0.22*	(0.06)	0.80 (0.72, 0.89)
Medicare	0.45*	(0.03)	1.56 (1.48, 1.66)
Medicaid	0.33*	(0.03)	1.39 (1.32, 1.46)
Self-pay	0.46*	(0.03)	1.59 (1.48, 1.70)
Other and not stated	0.06	(0.04)	1.07 (0.99, 1.15)
Secondary source of payment	– 0.12*	(0.03)	0.89 (0.83, 0.95)
Hospital ownership			
Proprietary			1.00
Government	0.24*	(0.04)	1.27 (1.17, 1.37)
Nonprofit	0.04	(0.03)	1.04 (0.98, 1.11)
Number of beds			
6 –99	0.46*	(0.03)	1.58 (1.47, 1.69)
100 –199	0.33*	(0.03)	1.40 (1.31, 1.49)
200 –299	0.35*	(0.03)	1.41 (1.34, 1.50)
300 –499	0.20*	(0.03)	1.22 (1.15, 1.29)
≥500			1.00
Intercept	– 4.54		
–2 Log likelihood	91,485.22		
Sample size	125,621		

* $p < 0.01$, two-sided; SE = standard error of mean; CI = confidence interval.

rated, unknown, and those "not stated"). Principal source of payment was re-coded as *no charge, Medicare, Medicaid, workmen's compensation* (including other government payments), *private insurance* (including Blue Cross and other private/commercial insur-

ance) (default category), *other* (including those "not stated"), and *self-pay*. Secondary source of payment was grouped as those who had expected secondary source of payment and those who did not (default category). The dependent variable was coded as discharge with ACS condition or discharge without ACS condition (default category).

After performing analysis with and without excluding missing values, the results were mainly consistent for both conditions. Due to the fact that including missing values as another category did not bias the result, it allowed other variables for which there were no missing values to be more truthfully reflected. Thus, we decided to present the model with missing values but included them as another category and this also improve the robustness of the model.

RESULTS

Table 1 provides the definitions and descriptive statistics of the variables used in the analysis. Among the 125,621 adult patients discharged included in the analysis, 11.9% were discharged with ACS conditions and 88.1% with non-ACS conditions. The mean age of the patients was 40.3 years, ranging from 18 to 64 years. Nearly two-thirds (62.7%) of them were women and 22.8% were married. White patients accounted for 57% of the patients, followed by African Americans (15.2%), Asian/Pacific islanders (1.9%), American Indians/Eskimos (0.7%), other (5.3%), and not stated (19.8%). The average length of stay was 5.08 days ranging from 1 to 383 days. The majority of the patients (52.5%) had private insurance (either Blue Cross or other private/commercial insurance) as the expected principal source of payment. Public insurance (including Medicare, Medicaid, workmen's compensation, and other government payments) accounted for 32% of patients' principal expected source of payment. Seven percent of the patients were classified as self-pay. The remaining were other (5.4%), not stated (2.2%), or no charge (0.7%). Eight percent of the patients had an expected secondary source of payment, (Table 1).

In terms of hospital characteristics, nonprofit hospitals accounted for 79.2% of the hospitals followed by government (11.3%) and proprietary (9.5%) hospitals. There were more patients from the South (30.1%) represented in the sample than from other regions including the Midwest (27.8%), the Northeast (26.6%), and the West (15.5%). The bed distributions of the hospitals were: 11.1% of the hospitals had 6–99 beds, 17.5% had 100–199 beds, 22.7% had 200–299 beds, 31.1% had 300–499 beds, and 17.7% had 500 or more beds.

Table 2 shows the list of the 10 most prevalent ACS conditions. These conditions were bacterial pneumonia, angina, diabetes, congestive heart failure, asthma, chronic obstructive pulmonary disease, kidney /urinary infection, hypertension, dehydration-volume depletion, and gastroenteritis. The 10 conditions accounted for 88% of the total ACS hospital discharges. The table also provides the demographic and hospital characteristics associated with each of these conditions. For example, in terms of age, the most common diagnoses among the 18–25 age group were kidney/urinary infection (n = 205), asthma (n = 194), and diabetes (n = 178). The most common diagnoses among the 26–35 and 36–45 age groups were bacterial pneumonia (n = 365 and 515), asthma (n = 337 and 400), and diabetes (n = 269 and 374). The most common diagnoses among the 46–64 age group were angina (n = 1556), congestive heart failure (n = 1328), and bacterial pneumonia (n = 1065). Other variables were similarly interpreted.

Table 3 shows the comparison of patients discharged with ACS conditions versus those discharged with non-ACS conditions in terms of demographic and hospital characteristics. ACS patients were significantly older than non-ACS patients (46.23 *vs* 39.47 years of age, $p < 0.01$). Men were more likely than women to be discharged with ACS conditions (14.1% *vs* 10.5%, $p < 0.01$).

When compared with other races, African Americans were the most likely to be discharged with ACS conditions and Asian /Pacific islanders the least likely (16% *vs* 7.6%, $p < 0.01$). Hospitals in the Midwest and South were more likely to have patients discharged with ACS conditions than those in the Northeast ($p < 0.01$). Medicare patients (19.2%) were the most likely to have ACS conditions, followed by patients with no fee (15%), and self-pay (14.6%). Patients discharged from government hospitals (13.6%) were more likely to have ACS con-ditions than those discharged from either proprietary (12.0%) or nonprofit (11.6%) hospitals. Smaller hospitals were more likely to have patients with ACS conditions than larger hospitals (13.7% in hospitals with 6–99 beds versus 10.2% in hospitals with 500 or more beds, $p < 0.01$).

Table 4 presents the results of the logistic regression model associating patients' demographic (i.e., age, gender, race, marital status), hospitalization (i.e., length of stay, principal and secondary expected sources of payment), and hospital characteristics (i.e., ownership, geographic region, number of beds) with ACS conditions. The odds ratios (OR) can be used to show the direction and significance levels of the effects of the explanatory variables. An OR greater than one indicates that in comparison with the reference group, the patients in the associated group have higher probability of having ACS conditions. An OR less than one indicates that in comparison with the reference group, the patients in the associated group have lower the probability of having ACS conditions.

Significant individual factors associated with having an ACS condition included age, gender, race, and marital status. Specifically, controlling for other demographic and hospital factors, as age increases by one year, the odds of having ACS condition increases 4% (OR = 1.04; CI = 1.040, 1.043). Men had a 1.10 times of odds in favor of ACS conditions than women (CI = 1.06, 1.14). The odds of having ACS condition for African Americans were 1.63 times of those for whites (CI = 1.55, 1.71). Asians, however, were less likely than whites to have ACS conditions (OR = 0.79; CI = 0.68, 0.93). In comparison with those who were married, those who were not married were more likely to have ACS conditions (OR = 1.08; CI = 1.03, 1.13).

Individuals' insurance status was also significantly and independently associated with discharge with ACS condition. Specifically, compared with patients with private insurance, those without insurance (i.e., self-pay) were 1.59 times more likely to have ACS conditions (OR = 1.59; CI = 1.48, 1.70). Patients with Medicare or Medicaid were also significantly more likely to be discharged with ACS conditions. Those with a secondary source of payment were less likely to have an ACS condition than those without a secondary source of payment. Patients with shorter length of stay were more associated with ACS condition related discharges than those with longer hospitalization (OR = 0.98; CI = 0.98, 0.99).

In terms of hospital related factors, the geographic location, hospital ownership, and number of beds were all independently associated with patients discharged with ACS conditions. Hospitals from the Northwest, Midwest, and South were more likely to discharge patients with ACS conditions than those from the West. The odds of patients with ACS conditions in government hospitals were 1.27 times for those in proprietary hospitals (CI = 1.17, 1.37). Smaller hospitals were more likely to discharge patients with ACS conditions than larger hospitals. For example, the odds of patients having ACS conditions in hospitals with 6–99 beds were 1.58 times of that for hospitals with 500 or more beds (CI = 1.47, 1.69) after controlling for patient and other hospital related factors.

DISCUSSION

Using 1994 NHDS data, we found that about 12% of the hospitalized patients were

discharged with ACS conditions, or conditions that are sensitive to the provision of timely and effective outpatient care. The leading ACS conditions included bacterial pneumonia (14%), angina (13%), diabetes (11%), congestive heart failure (11%), and asthma (10%). These findings can serve as national benchmarks against which regional results can be compared.

The results of our study are consistent with existing results of studies on hospitalization for ACS conditions. The finding that African Americans were more likely to be discharged with ACS conditions than whites is consistent with the fact that after adjustment for age and health status, African Americans had significantly fewer ambulatory visits than their white counterparts [6,11]. The finding that the uninsured and Medicaid patients were more likely to be admitted for ACS conditions than privately insured patients corroborates the study by Weissman et al with data from Massachusetts and Maryland [4]. Insurance alone is not sufficient to assure access to primary or outpatient care. Low Medicaid reimbursement for outpatient care severely limits the availability of providers willing to accept Medicaid patients [1]. To the extent that insurance status serves as a proxy for income, the results of this study are also consistent with those by Billings et al based on New York data, and Bindman et al using California data [1,5,6].

In addition to the insurance/income-ACS discharge linkage, we found that a host of hospital and patient factors were significantly and independently associated with increased likelihood of hospital admissions for ACS conditions. Hospitals likely to have a higher rate of patients discharged with ACS conditions were governmental, relatively smaller in terms of beds, and situated in a non-West region. Hospital choice may be endogenous with government hospitals more likely to attract certain patients (e.g., uninsured, publicly insured). In the West, with greater HMO penetration, appeared to have greater emphasis on primary care than in the rest of the nation. Patients likely to be discharged with ACS conditions were older, male, African American, unmarried, without insurance, or without an expected secondary source of payment. These are population groups most likely to face access barriers to ambulatory and primary care. These results indicate that certain demographic characteristics and socioeconomic disadvantage are significant barriers to the receipt of appropriate health services [12].

The findings of this study are significant for several reasons. First, the study is an efficient way of identifying access barriers to ambulatory care experienced by population groups. To be sure, hospital admission rates for patients with ACS conditions alone are not sufficient proof that the provision of ambulatory care is inadequate since some hospitalizations for ACS conditions occur in all areas just because some ACS conditions are less manageable than others [2]. However, for areas with consistently high ACS admissions, we can be confident that problems exist with the provision of ambulatory care. Using regularly collected hospital discharge data at the national, state, and community levels, providers and decision makers can easily assess in a timely manner the needs of the population and the extent of access barriers faced by special population groups. The wide availability of hospital discharge data makes it easy and convenient to calculate preventable hospitalization rates.

Second, implications of the study on the current policies are obvious. Policy makers, in their attempt to reduce access barriers and determine the appropriate allocation of resources, can identify and target vulnerable population groups to achieve maximum impact. Policy makers can also use the study outcome to focus on areas that show the greatest deficiency in primary care access. Nevertheless, simply identifying troublesome patterns of medical resource use does not deal with the underlying factors creating them.

That requires a commitment to addressing the root causes of the patterns we can see so clearly [7].

Third, analysis of hospital discharges for ACS conditions can help evaluate the effectiveness of interventions aimed at improving access to care. Many communities have developed programs to improve access to care for the underserved population. The efficacy of these programs need to be monitored to justify the investment in resources. Trend analysis can be conducted to measure progress over time. Analysis can also be conducted for comparisons across communities.

Fourth, reducing hospital admissions for ACS conditions through improved access to ambulatory care for special population groups not only improves population health status but is also more cost efficient. Although the costs of improving primary, ambulatory care access are likely to be substantial, money spent at the outpatient level is usually significantly less than that spent at the hospital setting for tertiary care.

There were a number of limitations with this study. First, the cross-sectional nature of the data, although useful in defining and describing relationships, did not provide definitive conclusions about the specific causes associated with hospitalizations for ACS conditions. A longitudinal study or case-control design would provide more valid conclusions. Second, the study merely identified those individual and hospital factors available in the hospital discharge dataset that were significantly correlated with ACS discharges. Factors not contained in the dataset could also affect preventable hospitalization rates, including variations in disease prevalence, health care seeking behavior, and physician practice style [6]. Third, the hospital discharge data did not contain individual identifiers that could be used to identify repeated hospitalizations of the same patients. As there were systematic differences in readmission rates among population groups, estimation biases were likely to occur.

REFERENCES

1. Billings J, Zeitel L, Lukomnik J, et al. Impact of socioeconomic status on hospital use in New York City. *Health Aff (Millwood)* 1993;12:162-73.
2. Hrdy SA, Hoppe PM, Bouda DW. Nebraska outpatient care quality assessment. *Nebr Med J* 1993;36-41.
3. Epstein AM, Stern RS, Weissman JS. Do the poor cost more? A multihospital study of patients' socio-economic status and the use of hospital resources. *N Engl J Med* 1990;322:1122-8.
4. Weissman JS, Gatsonis C, Epstein AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. *JAMA* 1992;268:2388-94.
5. Billings J, Zeitel L, Lukomnik J, et al. Analysis of variation in hospital admission rates associated with area income in New York City. NY: United Hospital Fund of New York, 1994.
6. Bindman AB, Grumbach K, Osmond D, et al. Preventable hospitalizations and access to health care. *JAMA* 1995;274:305-11.
7. Caper P. The microanatomy of health care. *Health Aff (Millwood)* 1993;12:174-7.
8. National Center for Health Statistics. Development of the Design of the NCHS Hospital Discharge Survey. Vital and Health Statistics. PHS Pub. No. 1000, Series 2-No. 39. Public Health Service. Washington, DC : U.S. Government Printing Office, September 1970.
9. SMG Hospital Marketing Group, Inc. Hospital Market Database. Chicago: Healthcare Information Specialists, 1989.
10. International Classification of Disease, Ninth Revision, Clinical Modification. C.P.H.A. Ann Arbor: Edwards Bro, 1986.
11. Kleinman JC, Gold M, Makuc D. Use of ambulatory medical care by the poor: another look at equity. *Med Care* 1981;19:1011-29.
12. Casanova C, Starfield B. Hospitalizations of children and access to primary care: a cross-national comparison. *Int J Health Serv* 1995;25:283-94.

APPENDIX 1:

Listing of ICD-9-CM Codes for adult ambulatory care sensitive conditions.

Immunization Preventable Conditions (033, 390, 037, 045)

Grand mal Status and Other Epileptic Convulsions (345)

Convulsions "B" (7803)

Severe ENT Infections (382, 462, 463, 465, 472.1)*
- Diagnosis 382 excludes any cases with myringotomy with insertion of tubes (20.01)

Pulmonary Tuberculosis (011)

Other Tuberculosis (012, 013, 014, 015, 016, 107, and 018)

Bacterial Pneumonia (481, 482.2, 482.3, 482.9, 483, 485, and 486)

Asthma (493)

Angina (411.1, 411.8, and 413)*
- Excludes all angina cases with a surgical procedure (86.99)

Cellulitis (681, 682.3, 683 and 686)*
- Excludes Cellulitis cases with a surgical procedure (86.99)

Skin Grafts with Cellulitis (DRG 263 and DRG 264)

Diabetes A (250.1, 250.2, and 250.3)

Diabetes B (250.8 and 250.9)

Diabetes C (250.0)

Gastroenteritis (558.9)

Kidney and Urinary Infection (590, 599.0, 599.9)

Dehydration - Volume Depletion (276.5)

Nutritional Deficiencies (260, 261, 262, 268.0, and 268.1)

Dental Conditions (521, 522, 523, 525, and 528)

Chronic Obstructive Pulmonary Disease (491, 492, 494, 496, and 466.0)
- Diagnosis 466.0, Acute Bronchitis, only with secondary diagnosis of 491, 491 or 492, 494 or 496.

Congestive Heart Failure (428, 402.01, 402.11, 402.91 and 518.4)
- Excludes all CHF cases with the following surgical procedures: 36.01, 36.02, 36.05, 36.1, 37.5 or 37.7.

Hypertension (401.0, 401.9, 402.00, and 402.10 and 402.90)
- Excludes all hypertension cases with the following surgical procedures: 36.01, 36.02, 36.05, 36.1, 37.5 or 37.7.

Pelvic Inflammatory Disease (614)
- Excludes cases with a surgical procedure of hysterectomy (68.3-68.8).

Hypoglycemia (251.2)

與門診照護敏感情況相關之病人與醫院因素

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背景 門診照護敏感情況指的是能以及時與有效的門診照護來預防疾病的產生或控制慢性病以降低住院機率的診斷，本研究所探討的門診照護敏感情況包括了細菌性肺炎、心絞痛、糖尿病、鬱血性心衰竭、氣喘、慢性阻塞性肺病、腎或尿道感染、高血壓、脫水及腸胃炎10種情況。本研究之主要目的爲探討出院病人之門診照護敏感情況之盛行率，以及評估與門診照護敏感情況相關之病人與醫院因素。

方法 研究資料來自1994年美國國家醫院出院調查研究 (1994 National Hospital Discharge Survey)，統計方法先以雙變項統計分析 (bivariate analysis) 方法比較門診照護敏感情況與非門診照護敏感情況在人口與醫院變項之差異，再以羅吉斯複迴歸分析探討病人人口因子與醫院因子對門診照護敏感情況之相關。

結果 研究結果顯示出院病人之門診照護敏感情況之盛行率爲 12%，公立、較小床位規模以及坐落於非西區之醫院有較高比率之門診照護敏感情況的出院病人，年齡、性別、種族、婚姻狀況、有無保險以及有無第二醫療保險則爲顯著與門診照護敏感情況相關之病人因素。

結論 從本研究之結果顯示有系統的收集國家、州及社區之人口資料，醫療資源提供者與政策決策者將可容易且及時地評估不同人口醫療照護的需求及就醫的障礙。（**中台灣醫誌 2000;5:1-15**）

關鍵詞

相關因子，門診照護敏感情況，醫院因素，病人因素，盛行率

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