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Insurance status and the transfer of hospitalized patients: an observational study

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Abstract

Background—There is little objective evidence to support concerns that patients are transferred between hospitals based upon insurance status.

Objective—To examine the relationship between patients' insurance coverage and inter-hospital transfer.

Design—We analyzed data from the 2010 National Inpatient Sample.

Patients—All patients aged 18–64 years discharged alive from U.S. acute care hospitals with one of five common diagnoses (biliary tract disease, chest pain, pneumonia, septicemia, skin or subcutaneous infection).

Measurements—For each diagnosis, we compared the proportion of hospitalized patients who were transferred to another acute-care hospital based upon insurance coverage (private, Medicare, Medicaid, and uninsured). We used logistic regression to estimate the odds of transfer for uninsured patients (reference category- privately insured) while adjusting for patient and hospital level factors. All analyses incorporated sampling and post-stratification weights.

Results—Among 315,748 patients discharged from 1051 hospitals with our five diagnoses, the percentage of patients transferred to another acute-care hospital varied from 1.3% (skin infection) to 5.1% (septicemia). In unadjusted analyses uninsured patients were significantly less likely to be transferred for three diagnoses ($p < .05$). In adjusted analyses, uninsured patients were significantly less likely to be transferred than privately insured patients for the four diagnoses: biliary tract disease (Odds Ratio (OR) 0.73 (95% Confidence interval (CI) 0.55–0.96)); chest pain (OR 0.63 (CI 0.44–0.89)); septicemia (OR 0.76 (CI 0.64–0.91)); and skin infections (OR 0.64 (CI 0.46–0.89)). Women were significantly less likely to be transferred than men for all diagnoses.

Limitations—This analysis relied on administrative data and lacked clinical detail.

Conclusions—Uninsured patients (and women) were significantly less likely to undergo inter-hospital transfer. Differences in transfer rates may contribute to healthcare disparities.

Introduction

Hospitals and physicians are generally expected to treat patients in need of emergent medical care without consideration of patient race, ethnicity, sex, or ability to pay for required services. Originally enacted in 1986, the Emergency Medical Treatment and Active Labor Act (EMTALA) [1] stipulates that once a patient enters the emergency department, the hospital (and staff) must provide a medical screening exam and must treat and stabilize any patient identified with an “emergency medical condition” until the patient is stable for discharge irrespective of the patient’s ability to pay for services. Notably, EMTALA does not clearly define what does or does not constitute an “emergency medical condition,” how much care must be provided, and when a patient is stable for discharge [2,3]. While the application of EMTALA to the emergency department and the decision whether to admit an acutely ill patient is fairly well defined, the appositeness of EMTALA to the decision to discharge or transfer a patient who has already been admitted remains an active area of debate [4,5].

In the more than two-decades since the passage of EMTALA, there has been persistent concern that patients are often transferred between hospitals for non-medical reasons (e.g., provider convenience, patient financial status, race), but the existing data are actually quite limited with virtually all studies focusing on the pre-hospital or emergency-department settings. In a landmark study from 1984 Himmelstein and Woolhandler found evidence that patients transferred from 14 private hospital emergency departments (EDs) to a public hospital were predominantly uninsured [6]. Schiff et al and Kellermann also found evidence of patients transferred between EDs for economic factors [7-9] More recent reports have demonstrated associations between an array of patient characteristics (e.g., sex, age, race, insurance status) and the likelihood of transfer amongst patients with trauma in the pre-hospital setting[10-13]. However, we are unaware of any contemporary analyses that have examined the relationship between insurance coverage and inter-hospital transfer among patients who have already been admitted; if such evidence were found, this would suggest a new and previously understudied gap in EMTALA.

We used 2010 data from the National Inpatient Sample (NIS) to examine the relationship between patients’ insurance coverage and whether patients were or were not transferred between hospitals. In particular, we hypothesized that uninsured patients would be more likely to be transferred by their admitting hospital to another acute-care hospital, reflecting the desire of admitting hospitals relieve themselves of less profitable patients as rapidly as possible.

Methods

Data Sources

We used 2010 discharge data from the Nationwide Inpatient Sample (NIS) which is available for purchase from the Agency for Healthcare Research and Quality (AHRQ)[14]. Each year of the NIS contains data from approximately 8 million hospital admissions from 1,051 U.S. hospitals. The NIS is generated from states participating in AHRQ’s Healthcare Cost and Utilization Project and the NIS approximates a 20% sample of U.S. hospitals. The

NIS does not contain unique patient identifiers, making it impossible to track individual patients across hospitalizations or time. We therefore analyze discharges and not individual patients. The NIS undergoes extensive preprocessing at AHRQ to reconcile variations in variable coding by individual states and definitions across individual states and insure consistency of coding and variables in the final data set made available from AHRQ. Excluded from the NIS are short-term rehabilitation hospitals, long-term non-acute care hospitals, psychiatric hospitals, and alcoholism/chemical dependency treatment facilities. The NIS also does not include individuals hospitalized under “observation” status.

The NIS data contains elements abstracted from the universal billing form 92 (UB-92) hospital discharge abstract and is similar to other commonly used administrative data sources such as Medicare Part A (MedPAR) data. Data elements include patient demographics, primary and secondary diagnoses as captured by ICD-9-CM codes, insurance type (categorized as Medicare, Medicaid, private, uninsured, no charge, other), and discharge disposition (categorized as routine, short-term hospital, skilled nursing facility, intermediate care facility, another type of facility, home health care, against medical advice, or died). The NIS has been used extensively in prior health services research [15]. Weights for the NIS are provided by AHRQ to allow researchers to calculate nationally representative estimates.

We identified all discharges of adults ages 18 to 64 years of age at hospital admission. We excluded all patients age 65 years and older because virtually all of these patients are insured by Medicare; inclusion of this population would add little to our efforts to evaluate the relationship between variation in insurance coverage and inter-hospital transfers. We excluded all patients who did not have Medicare, Medicaid, Private, or Uninsured as their primary payer (categorized as “other” in the NIS) as this group constitutes a very heterogeneous group of patients with varying insurance coverage. We also excluded patients who died or left against medical advice as they did not have the chance to be transferred.

We then identified condition-specific cohorts using each patient’s primary admission diagnosis. Diagnoses were identified using AHRQ’s clinical classification software (CCS) coding [16, appendix A]. These codes amalgamate closely related ICD9-CM codes into clinically meaningful categories. We excluded pregnancy-related diagnoses, psychiatric diagnoses, and orthopedic diagnoses because of our interest in focusing among general medical conditions. We also excluded “diabetes mellitus with complications,” “device complication,” and “other complication” because we felt these categories to be vague and heterogeneous in our experience as clinicians. After applying these exclusions, we selected the five most common diagnoses for further study: biliary tract disease; chest pain; septicemia; skin and subcutaneous tissue infections (skin infection); pneumonia.

After identifying our five cohorts, we linked each discharge (and admitting hospital) to the Hospital Weights file provided by AHRQ. This file includes an array of hospital-level data including hospital ownership and financial status (for-profit, not-for-profit, government owned), teaching status, and bed size [17]. These fields were complete for all but 11 of the 1051 hospitals.

Variables

Our outcome of interest was each patient's discharge disposition; specifically, whether a patient was transferred to another acute care hospital at the end of their observed admission. Patients who were transferred to long-term acute care, inpatient rehabilitation, and skilled-care facilities were not considered to have been transferred for purposes of our analysis.

Our primary independent variable of interest was each patient's insurance status as captured by the primary payer field in the NIS. To make coding uniform across all states contributing to the NIS, AHRQ contractors condense numerous insurance sub-categories into four general groups: 1) Medicare includes fee-for-service and managed care Medicare patients; 2) Medicaid includes fee-for-service and managed care Medicaid patients; 3) Private insurance includes Blue Cross, commercial carriers, and private HMOs and PPOs; and 4) Uninsured includes "self-pay," "charity care," and "under-insured." We excluded patients whose primary payer was coded as "other."

Explanatory patient level variables included each patient's age in years, sex (male/female), race (categorized as White (non-Hispanic), Black, or Hispanic, and other), comorbidity and quartile of median household income for the patient's ZIP code of residence. The dataset provided by AHRQ includes 29 comorbid conditions identified using methods developed by Elixhauser et al. [18] We calculated the number of comorbid conditions for each patient by summing the total number of conditions at the individual patient level. We then analyzed this calculated number to present the mean total number of conditions for each diagnosis.

Explanatory hospital level variables included hospital teaching status (major or non teaching), hospital ownership (for profit, not for profit, government), location (rural, urban), and bed size. Bed size is a combined variable created by AHRQ which includes total number of beds, location, and teaching status into three categories (small, medium, and large) [18]. We calculated an additional hospital level variable for our analysis which was the percent of all admissions that were uninsured in each hospital.

Statistical Analysis

First, we compared the demographic characteristics (age, sex, race), presence of key comorbid conditions, mean number of comorbid conditions, and insurance coverage of patients who were and were not transferred to another acute care hospital using Rao-Scott chi-square test for all categorical variables and t-tests for continuous variables (PROC SURVEYFREQ and PROC SURVEYMEANS). Second, we described the proportion of patients transferred across different types of hospitals (e.g., stratified by teaching status, for-profit status, bed size, etc.) (PROC SURVEYFREQ). All analyses were conducted separately for each of our five study diagnoses.

Third, we examined the odds of patient transfer to another acute care hospital on discharge from the admitting hospital while controlling for differences in patient demographics, comorbidity, hospital characteristics using weighted analyses (PROC SURVEYLOGISTIC). Reported models included primary payer, age, sex, race, median household income in ZIP code of residence, hospital teaching status, hospital ownership, hospital bed size, and percent of patients admitted to the hospital who were uninsured. We selected ten comorbid

conditions to include in these models (chronic lung disease, congestive heart failure, depression, diabetes (complicated), diabetes (uncomplicated), fluid/electrolyte imbalances, metastatic cancer, obesity, renal failure, weight loss). Again, analyses were conducted separately for each of our study diagnoses.

Data were analyzed using SAS 9.3 software (SAS Inst, Cary, NC) to allow use of sampling and post-stratification weights, yielding nationally representative estimates for the US population. We included sampling strata information (the STRATA statement), hospital information (CLUSTER statement), and individual discharge weight information (WEIGHT statement). We followed analytic procedures as recommended by AHRQ for subpopulation analyses [20]. In particular, the DOMAIN statement was used to indicate included and excluded observations. For all statistical analyses, the threshold for significance was .05.

We conducted an array of sensitivity analyses to insure the robustness of our results and test key assumptions. In the main analyses, we assumed that missing data was missing completely at random. The most common missing information was race/ethnicity information (11% of the total sample). In sensitivity analyses we: a) categorized missing race/ethnicity data into an “other” category; b) included all comorbid conditions; c) only included patient information; d) only included insurance status information; e) and included patients who left against medical advice or died.

We conducted separate sensitivity analysis for each of the five diagnoses to estimate the possible influence of an omitted binary confounder on our estimate of the effect of insurance status (specifically, the effect of uninsured versus privately insured) [21]. We estimated the influence under the following assumptions: (1) the association between the omitted confounder and the diagnosis of interest was the same as the estimated association between that diagnosis and insurance status for uninsured and privately insured; (2) the omitted confounder is more prevalent among uninsured, with the association between the omitted confounder and insurance status (uninsured versus privately insured) given by an odds ratio of 1.5.

The University of Iowa institutional review board approved this study (Institutional Review Board # 200612722).

Reproducible Research Statement: Study protocol, statistical code, and results: Available from Dr. Hanmer (janel.hanmer@gmail.com). Data set: Available at http://www.hcup-us.ahrq.gov/tech_assist/centdist.jsp

Results

Our analysis consisted of 315,748 discharges. The number of discharges across our five diagnoses ranged from 55,863 (biliary tract disease) to 69,303 (skin infection)(Table 1). Overall 2.6% of patients were transferred to another acute care hospital ranging from 1.3% for skin infections to 5.1% for septicemia. In the total sample, 21.4% of patients were insured by Medicare, 22.2% by Medicaid, 42.3% by private insurance, and 14.0% were uninsured.

Table 1 provides descriptive statistics for our five cohorts and provides comparison of patient demographics, select comorbidities, and socioeconomic measures for patients who were and were not transferred within each cohort. The mean age of patients who were and were not transferred was clinically similar for all five diagnoses. Women were significantly less likely to be transferred than men (all five diagnoses). The transfer rates of women were 35% to 40% less than the transfer rates of men. For example, 1.4% of women and 2.3% of men with biliary disease underwent transfer while 4.3% of women and 7.0% of men with septicemia underwent transfer. Patients classified as non-Hispanic White were more likely to be transferred than patients classified as other race/ethnicities in four diagnoses. Patients residing in ZIP codes with the lowest income quartile were more likely to be transferred in three diagnoses and those in the highest income quartile were less likely to be transferred in four diagnoses. The mean number of comorbid conditions among patients who were transferred was significantly greater in the biliary tract disease and skin infection cohorts as compared to patients who were not transferred, but similar among the other three cohorts.

In unadjusted analyses (Table 1), patients who were uninsured were less likely to be transferred for all five diagnoses. The distribution of insurance status between those transferred and not transferred was statistically different ($p<0.05$) in three conditions (biliary disease, chest pain, skin infection).

In our analysis of patient transfer according to varying hospital organizational/structural characteristics (Table 2) we found that major teaching hospitals transferred a lower percentage of patients than non-teaching hospitals for all diagnoses. The proportion of patients transferred was inversely related to hospital bed size for all diagnoses. Rural hospitals were more likely to transfer patients than urban hospitals. In examining hospital ownership, government-owned hospitals tended to transfer a higher percentage of patients while not-for-profit hospitals tended to transfer a lower percentage of patients.

In adjusted analyses (Table 3) that accounted for patient and hospital level factors, uninsured patients were statistically significantly less likely to be transferred when compared to privately insured patients in four of five diagnoses (biliary tract disease, chest pain, septicemia, skin infection); the odds ratio for the remaining diagnosis, pneumonia, also suggested reduced likelihood of transfer for uninsured patients (OR 0.85; 95% CI 0.69-1.05; $p=.13$), but was not statistically significant. We also found that the odds of inter-hospital transfer was significantly lower for women (compared to men) for all five diagnoses (Table 3).

The direction and significance of the findings reported were consistent across all sensitivity analyses. We found that the associations between insurance status and the diagnoses remain unchanged even after adjusting for an unmeasured confounder which is more prevalent in the uninsured patients (Appendix B).

Discussion

In an analysis of all-payer administrative data from a representative sample of community hospitals in the United States, we found that uninsured patients were significantly less likely

to be transferred to another acute care hospital when compared with privately insured patients after adjusting for patient demographics, comorbid conditions, and hospital-level factors. We also found evidence that women were significantly less likely to be transferred. In total, these results suggest that non-medical factors (i.e., insurance coverage, sex) may play an important role in determining which hospitalized patients are transferred to another acute care hospital.

A number of our findings warrant discussion. First, we will focus on the lower rate of transfer of uninsured patients. Prior research investigating the interplay between insurance and patient transfers has focused primarily on emergency departments and trauma patients. For example, a post-EMTALA study by Kao et al found evidence of increasing efforts by community hospital emergency departments to transfer uninsured patients to Stanford University Hospital between 2001-2006; interestingly, this study focused on transfer “requests” rather than completed transfers [22]. A post-EMTALA study published in *Health Affairs* provided a series of case studies where community-based hospitals and physicians provided incomplete evaluation and treatment of uninsured patients before transferring patients to a public hospital emergency department (Denver Health) for further treatment [23]; each case highlighted gaps in EMTALA regulations. Studies from the trauma literature in the post-EMTALA era have had conflicting findings but most have found that uninsured patients are significantly more likely to be transferred when compared to privately insured patients in the pre-hospital setting[10-13]. There has also been evidence of increased inter-hospital transfer of uninsured neonates compared to insured neonates [23]. We are unaware of any prior studies that have focused on the interplay between insurance coverage and inter-hospital transfer of adult patients who have already been admitted to the hospital.

We were surprised by our finding that uninsured adults hospitalized for a variety of common medical diagnoses are *less* likely to undergo inter-hospital transfer than privately insured patients, given prior research focusing on emergency departments and trauma settings. We expected that uninsured patients would be more likely to be transferred even after gaining hospital admission to the hospital. Our expectation was based upon our assumption that for both hospitals and physicians, an uninsured (or underinsured) patient represents a case where the costs of providing care are unlikely to be recouped. Thus, we expected that hospitals and providers would transfer these patients as soon as EMTALA requirements of evaluation and stabilization had been fulfilled.

Clearly, our expectation was incorrect since we found that uninsured patients were less likely to be transferred. In retrospect, we suspect that we ignored the complex dynamic between transferring and receiving hospitals. While transferring hospitals would be predicted to want to transfer underinsured patients, receiving hospitals go to increasingly great lengths to avoid accepting underinsured patients. Hospitals commonly perform a financial screening for all but the most emergent admissions and we suspect that these screenings may serve as the barrier that results in the lower transfer rate for underinsured patients that we observed[25]. While we suspect that the lower transfer rate of uninsured patients is primarily a reflection of an unwillingness of hospitals to accept such patients when transfer is requested, other possibilities should be considered. For example, it is

possible that differences in patient preference or patient complexity could play a role, however we are unaware of any data that would support this.

Second, it is important to address the lower rates of transfer we observed for women. While it is relatively easy to see an economic motivation for the lower transfer rates we observed for uninsured patients, economic factors are unlikely to account for the lower transfer rates we observed for women. Prior studies have demonstrated differences in preferences for medical care by race/ethnicity and sex, [26-28] but we are unaware of prior studies that have demonstrated differences in preferences for hospital transfer. More concerning is the possible role of implicit or explicit bias among providers and administrators that might play into the differential transfer rates that we observed [29, 30]. Providers may be less likely to initiate transfer of female patients for any number of reasons. For example, providers might take signs or symptoms in women less seriously than in men; this has been noted in prior research for women with chest pain [31-33]. Further analyses are needed to better understand the cause of the differences that we observed.

In considering our findings, it is also important to carefully review some of the key details of EMTALA. Enacted in 1986, EMTALA requires hospitals to provide an initial medical screening to all patients who present to their ED- thus, hospitals without an ED are exempted. EMTALA goes on to mandate that if a given patient is noted to have an emergency medical condition, the patient must be treated until the patient is stabilized (or transferred if the admitting hospital lacks required expertise for stabilization) [2, 34, 35]. However, there remains uncertainty over how to apply EMTALA to patients beyond the initial ED evaluation. In particular, there continues to be uncertainty over when acute stabilization has been achieved and how much care an admitting hospital is required to provide under the auspices of EMTALA [36]. Our results suggest that insurance coverage continue to play an important role in which patients get transferred and which do not; this is not surprising given that EMTALA does not cover non-emergency care.

It is important to note that our analysis does not examine the downstream impact of differing transfer rates. If we presume that patients who undergo transfer are generally transferred to hospitals with high quality or to received technologically sophisticated treatments, we could interpret our findings as an indication of a disparity; privately insured patients and men receiving better care than uninsured patients and women respectively. An alternative possibility is that transferred patients are at risk of receiving costly interventional procedures, excessive treatments, and diagnostic testing with little measurable benefit; if this were the case, privately insured patients and men might paradoxically be exposed to greater risk. While we are aware of a few studies looking at patient-level factors associated with inter-hospital transfer (most notably race in myocardial infarction) [37-39], we are not aware of many analyses that have examined the relationship between insurance status, transfers, and utilization of costly and highly reimbursed procedures. Untangling this relationship is complicated by the well known fact that patients who are transferred tend to have greater measured and unmeasured complexity when compared to patients who are not transferred [40]. Nevertheless, it remains an open question whether the difference in transfer rates that we have found truly results in worse outcomes for the non-transferred populations.

Our analysis has a number of limitations that warrant brief mention. First, our study relied upon administrative data so we lacked detailed information about patient preferences that may have contributed to the decision whether or not to transfer an individual patient. Likewise, we lacked detailed clinical information and can not exclude the possibility that our findings were the result of unmeasured differences in severity across groups. That said, there is no obvious reason why such factors would explain our findings.

These data also lack information about admissions to observation units, information about pre-hospital triage, and information about the hospital to which a patient is transferred. Analyzing data with patient identifiers across different healthcare settings (emergency rooms, observation units, inpatient admissions) may be able to unveil information about these limitations. Limitations in the NIS data did not allow us to track patients across hospitalizations and thus we were unable to investigate whether the lower transfer rates resulted in decreased access to potentially necessary procedures or increases in mortality; such investigation would be an important area for further study.

In sum, our analysis shows that uninsured patients age 18-64 were significantly less likely to be transferred from one acute care hospital to another when compared to privately insured patients in four of five common diagnoses. We also found that women were significantly less likely to be transferred than men for all five diagnoses. These findings suggest that non-medical factors influence the transfer of hospitalized patients between acute care hospitals and provide insight into the potential causes of health disparities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Appendix A: ICD-9 Codes for each primary diagnosis

Biliary tract disease

57400 57401 57410 57411 57420 57421 57430 57431 57440 57441 57450 57451 57460

57461 57470 57471 57480 57481 57490 57491 5750 5751 57510 57511 57512 5752

5753 5754 5755 5756 5758 5759 5760 5761 5762 5763 5764 5765 5768 5769 7933

Chest pain (nonspecific)

78650 78651 78659

Pneumonia (except that caused by tuberculosis or sexually transmitted disease)

00322 0203 0204 0205 0212 0221 0310 0391 0521 0551 0730 0830 1124 1140 1144

1145 11505 11515 11595 1304 1363 4800 4801 4802 4803 4808 4809 481 4820 4821

4822 4823 48230 48231 48232 48239 4824 48240 48241 48242 48249 4828 48281

48282 48283 48284 48289 4829 483 4830 4831 4838 4841 4843 4845 4846 4847 4848

485 486 5130 5171

Septicemia (except in labor)

0031 0202 0223 0362 0380 0381 03810 03811 03812 03819 0382 0383 03840 03841

03842 03843 03844 03849 0388 0389 0545 449 77181 7907

Skin and subcutaneous tissue infections

0201 0210 0220 0311 03285 035 0390 6800 6801 6802 6803 6804 6805 6806 6807 6808

6809 68100 68101 68102 68110 68111 6819 6820 6821 6822 6823 6824 6825 6826 6827

6828 6829 684 6850 6851 6860 68600 68601 68609 6861 6868 6869

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Table 1
Demographics, Socioeconomic Measures, and Comorbid Conditions for Hospitalized Patients with Five Diagnoses Who Were and Were Not Transferred

All values were estimated using sampling and post-stratification weights and hospital clusters, yielding nationally representative estimates for the US population with appropriate standard error estimates. Characteristics were compared for patient who were and were not transferred to another acute care hospital using the Rao-Scott chi-square test for categorical variables and t-tests for continuous variables.

	Biliary Tract Disease Unweighted n = 55863 Weighted n = 278604			Chest Pain Unweighted n = 68214 Weighted n = 341651			Pneumonia Unweighted n = 64923 Weighted n = 323746			Septicemia Unweighted n = 57445 Weighted n = 284925			Skin and Subcutaneous Infection Unweighted n = 69303 Weighted n = 346732		
Unweighted number of observations	No- Transfer n=54911	Transfer n=952	P	No- Transfer n=66666	Transfer n=1548	P	No- Transfer n=63219	Transfer n=1704	P	No- Transfer n=54479	Transfer n=2966	P	No- Transfer n=68419	Transfer n=884	P
Age (mean)	43.1	46.6	<0.001	50.7	51.3	<0.001	49.2	50.1	<0.001	49.0	50.1	<0.001	45.1	46.1	<0.001
Female (%)	68.7	57.0	<0.001	51.0	41.4	<0.001	52.2	44.2	<0.001	50.8	44.8	<0.001	44.0	37.3	<0.001
Race/Ethnicity															
Non-Hispanic White	55.0	59.8	<0.001	50.5	62.2	<0.001	57.8	62.9	<0.001	57.5	61.0	0.002	60.5	59.1	0.169
Black (%)	11.6	8.8		23.3	17.4		17.7	12.8		18.1	15.2		14.1	13.0	
Hispanic (%)	18.7	11.6		11.3	7.0		8.4	5.3		9.6	7.4		10.1	9.8	
Other/Unknown (%)	15.2	19.8		14.7	13.4		16.1	19.0		15.8	16.4		15.2	18.0	
Median household income for the patient's ZIP code of residence															
1 st quartile (%) (lowest income)	27.6	32.0	<0.001	34.8	33.2	0.77	35.2	40.2	<0.001	31.5	32.7	0.041	33.0	41.4	<0.001
2 nd quartile (%)	25.1	31.5		24.2	25.0		25.4	28.4		24.9	26.2		25.2	26.9	
3 rd quartile (%)	24.1	20.7		21.7	23.1		21.4	17.0		22.7	21.5		21.9	18.7	
4 th quartile (%) (highest income)	20.9	12.5		15.7	15.8		15.0	10.3		18.1	15.9		16.7	10.1	
Comorbid Conditions															
Congestive Heart Failure (%)	1.9	5.0	<0.001	0.1	0.1	0.84	11.4	15.9	<0.001	11.8	15.2	<0.001	4.7	7.4	<0.001
Diabetes Mellitus (without complications) (%)	12.2	18.7	<0.001	26.6	28.1	0.152	21.8	19.2	0.010	22.3	23.1	0.34	22.8	27.6	0.002

Unweighted number of observations	Biliary Tract Disease Unweighted n = 55863 Weighted n = 278604			Chest Pain Unweighted n = 68214 Weighted n = 341651			Pneumonia Unweighted n = 64923 Weighted n = 323746			Septicemia Unweighted n = 57445 Weighted n = 284925			Skin and Subcutaneous Infection Unweighted n = 69303 Weighted n = 346732		
	No-Transfer n=54911	Transfer n=952	P	No-Transfer n=66666	Transfer n=1548	P	No-Transfer n=63219	Transfer n=1704	P	No-Transfer n=54479	Transfer n=2966	P	No-Transfer n=68419	Transfer n=884	P
<i>Diabetes Mellitus with complications (%)</i>	1.7	3.0	0.004	3.7	3.7	0.94	4.9	6.4	0.004	9.6	8.8	0.20	7.3	10.5	<0.001
<i>Obesity (%)</i>	18.1	16.7	0.26	19.6	20.3	0.52	14.5	10.4	<0.001	14.9	13.9	0.179	22.4	20.8	0.27
<i>Renal Failure (%)</i>	2.7	6.9	<0.001	6.7	5.1	0.032	10.5	10.6	0.87	17.9	20.4	0.001	7.0	10.5	<0.001
Total number of comorbid conditions (mean)	2.5	3.4	<0.001	4.5	4.4	0.21	4.7	4.7	0.60	5.3	5.4	0.144	3.6	4.1	<0.001
Payer															
<i>Private (%)</i>	54.3	49.5	<0.001	42.3	51.1	<0.001	39.1	39.2	0.177	36.1	37.8	0.102	39.7	35.4	<0.001
<i>Medicare (%)</i>	9.4	18.6		19.5	19.9		26.9	28.9		31.6	32.2		18.9	26.8	
<i>Medicaid (%)</i>	20.6	21.2		22.2	18.8		22.9	21.7		23.3	21.9		22.0	25.2	
<i>Uninsured (%)</i>	15.3	9.7		15.6	11.6		10.7	9.4		8.5	7.3		18.9	11.9	

Table 2
Percentage of Patients Transferred based upon Hospital Characteristics and Payer

All values were estimated using sampling and post-stratification weights and hospital clusters, yielding nationally representative estimates for the US population with appropriate standard error estimates. Standard errors are included in parentheses after the percentage.

Biliary Tract Disease					
	All Insurance N = 55501	Private N = 30152	Medicare N = 5245	Medicaid N = 11488	Uninsured N = 8404
Percentage Transferred, Overall	1.7 (0.1)	1.6 (0.1)	3.3 (0.3)	1.7 (0.1)	1.1 (0.1)
Teaching Status					
Major Teaching	0.7 (0.1)	0.7 (0.1)	1.3 (0.3)	0.9 (0.1)	0.4 (0.1)
Non-teaching	2.3 (0.1)	2.1 (0.1)	4.7 (0.4)	2.4 (0.2)	1.6 (0.2)
Hospital Ownership					
For-profit	1.8 (0.2)	1.5 (0.2)	3.4 (0.7)	2.0 (0.4)	1.0 (0.3)
Not-for-profit	1.6 (0.1)	1.5 (0.1)	2.9 (0.3)	1.5 (0.2)	1.2 (0.2)
Government	2.1 (0.3)	2.1 (0.4)	5.2 (1.1)	2.1 (0.5)	0.9 (0.3)
Bed Size *					
Small	3.5 (0.3)	3.0 (0.3)	6.6 (1.1)	3.6 (0.6)	3.1 (0.6)
Medium	2.0 (0.2)	1.8 (0.2)	4.0 (0.6)	2.4 (0.3)	1.3 (0.3)
Large	1.2 (0.1)	1.1 (0.1)	2.4 (0.3)	1.2 (0.1)	0.6 (0.1)
Hospital Location					
Urban	1.2 (0.1)	1.2 (0.1)	2.0 (0.2)	1.2 (0.1)	0.6 (0.1)
Rural	4.9 (0.4)	4.1 (0.4)	9.5 (1.1)	5.9 (0.8)	3.7 (0.6)
Chest Pain					
All Insurance N = 67550	Private N = 28639	Medicare N = 13196	Medicaid N = 14971	Uninsured N = 10426	
Percentage Transferred, Overall	2.3 (0.1)	2.6 (0.2)	2.3 (0.2)	1.9 (0.2)	1.7 (0.2)
Teaching Status					
Major Teaching	1.1 (0.2)	1.3 (0.3)	1.0 (0.2)	1.0 (0.2)	0.7 (0.2)
Non-teaching	3.2 (0.2)	3.5 (0.3)	3.4 (0.3)	2.8 (0.4)	2.7 (0.3)
Hospital Ownership					
For-profit	3.0 (0.5)	3.2 (0.5)	3.2 (0.6)	2.3 (0.5)	3.0 (0.6)

Biliary Tract Disease				
	All Insurance N = 55501	Private N = 30152	Medicare N = 5245	Medicaid N = 11488
<i>Not-for-profit</i>	1.9 (0.2)	2.2 (0.2)	1.8 (0.2)	1.8 (0.3)
<i>Government</i>	3.2 (0.5)	4.7 (1.0)	4.1 (0.7)	2.1 (0.4)
Bed Size *				
<i>Small</i>	5.5 (0.5)	6.0 (0.6)	6.3 (0.7)	5.0 (0.9)
<i>Medium</i>	3.3 (0.4)	4.3 (0.5)	2.9 (0.5)	2.6 (0.4)
<i>Large</i>	1.4 (0.2)	1.5 (0.2)	1.4 (0.2)	1.3 (0.2)
Hospital Location				
<i>Urban</i>	1.9 (0.2)	2.3 (0.2)	1.9 (0.2)	1.7 (0.2)
<i>Rural</i>	4.8 (0.6)	5.4 (0.7)	5.1 (0.7)	4.2 (0.6)
Pneumonia				
	All Insurance N = 64230	Private N = 25152	Medicare N = 17272	Medicaid N = 14714
Percentage Transferred, Overall	2.6 (0.1)	2.6 (0.1)	2.8 (0.2)	2.5 (0.2)
Teaching Status				
<i>Major Teaching</i>	1.1 (0.1)	1.1 (0.1)	1.3 (0.2)	1.1 (0.2)
<i>Non-teaching</i>	3.6 (0.1)	3.5 (0.2)	3.7 (0.2)	3.5 (0.3)
Hospital Ownership				
<i>For-profit</i>	3.0 (0.3)	3.3 (0.4)	3.3 (0.4)	2.5 (0.4)
<i>Not-for-profit</i>	2.2 (0.1)	2.2 (0.1)	2.3 (0.2)	2.3 (0.2)
<i>Government</i>	3.8 (0.3)	4.2 (0.5)	4.6 (0.5)	3.0 (0.5)
Bed Size *				
<i>Small</i>	6.0 (0.3)	5.6 (0.4)	5.9 (0.5)	6.8 (0.6)
<i>Medium</i>	2.6 (0.2)	2.6 (0.2)	3.0 (0.3)	2.4 (0.3)
<i>Large</i>	1.7 (0.1)	1.8 (0.1)	1.8 (0.2)	1.4 (0.2)
Hospital Location				
<i>Urban</i>	1.8 (0.1)	1.9 (0.1)	1.9 (0.2)	1.6 (0.1)
<i>Rural</i>	6.1 (0.4)	6.2 (0.4)	5.8 (0.4)	6.0 (0.5)
Septicemia				
	All Insurance N = 56759	Private N = 20566	Medicare N = 17962	Medicaid N = 13220
				Uninsured N = 4790

Biliary Tract Disease				
	All Insurance N = 55501	Private N = 30152	Medicare N = 5245	Medicaid N = 11488
Uninsured N = 8404				
Percentage Transferred, Overall	5.1 (0.1)	5.3 (0.2)	5.2 (0.3)	4.8 (0.3)
4.4 (0.4)				
Teaching Status				
Major Teaching	3.1 (0.3)	3.1 (0.3)	3.0 (0.4)	3.2 (0.4)
2.6 (0.5)				
Non-teaching	6.8 (0.3)	7.2 (0.4)	6.9 (0.4)	6.4 (0.4)
5.9 (0.5)				
Hospital Ownership				
For-profit	6.5 (0.6)	7.6 (0.8)	5.9 (0.6)	6.3 (0.9)
4.0 (0.9)				
Not-for-profit	4.8 (0.3)	4.3 (0.3)	5.0 (0.4)	4.4 (0.3)
4.4 (0.4)				
Government	5.7 (0.6)	6.3 (0.9)	5.8 (0.8)	5.3 (0.9)
4.8 (1.0)				
Bed Size *				
Small	9.1 (0.6)	8.9 (0.9)	9.0 (0.8)	9.9 (1.1)
7.4 (1.0)				
Medium	5.6 (0.4)	5.7 (0.5)	6.0 (0.6)	5.0 (0.5)
4.9 (0.7)				
Large	4.2 (0.3)	4.5 (0.3)	4.1 (0.4)	3.8 (0.3)
3.7 (0.5)				
Hospital Location				
Urban	4.3 (0.2)	4.6 (0.2)	4.3 (0.3)	4.1 (0.3)
3.3 (0.4)				
Rural	10.8 (0.8)	11.6 (1.1)	10.3 (0.8)	10.0 (0.9)
11.4 (1.4)				
Skin and Subcutaneous Infection				
All Insurance N = 68362				
Private N = 27245				
Medicare N = 13025				
Medicaid N = 15190				
Uninsured N = 12902				
Percentage Transferred, Overall	1.3 (0.1)	1.1 (0.1)	1.8 (0.1)	1.4 (0.1)
0.8 (0.1)				
Teaching Status				
Major Teaching	0.6 (0.1)	0.5 (0.1)	0.8 (0.1)	0.9 (0.2)
0.5 (0.1)				
Non-teaching	1.7 (0.1)	1.6 (0.1)	2.4 (0.2)	1.9 (0.2)
1.1 (0.1)				
Hospital Ownership				
For-profit	1.7 (0.2)	1.5 (0.2)	2.4 (0.4)	2.0 (0.4)
0.8 (0.2)				
Not-for-profit	1.1 (0.1)	0.9 (0.1)	1.5 (0.1)	1.3 (0.1)
0.7 (0.1)				
Government	1.7 (0.2)	2.0 (0.4)	2.3 (0.4)	1.7 (0.4)
1.1 (0.3)				
Bed Size *				
Small	3.0 (0.2)	2.7 (0.3)	4.0 (0.4)	3.3 (0.5)
2.1 (0.4)				
Medium	1.2 (0.1)	1.1 (0.1)	1.7 (0.3)	1.4 (0.2)
0.7 (0.2)				

Biliary Tract Disease				
	All Insurance N = 55501	Private N = 30152	Medicare N = 5245	Medicaid N = 11488
				Uninsured N = 8404
Large	0.8 (0.1)	0.7 (0.1)	1.2 (0.1)	1.0 (0.2)
0.5 (0.1)				
Hospital Location				
Urban	1.0 (0.1)	0.8 (0.1)	1.4 (0.1)	1.2 (0.1)
0.6 (0.1)				
Rural	3.0 (0.3)	3.1 (0.3)	3.7 (0.4)	3.2 (0.5)
1.8 (0.3)				

* Bed size categories are based on hospital beds, and are specific to the hospital's location and teaching status using methods developed at the Agency for Healthcare Research and Quality. Bed size assesses the number of short-term acute beds in a hospital.

Table 3
Adjusted Odds of Transfer from the Initial Admitting Hospital to Another Acute Care Hospital for Insurance Status and Sex
Odds ratios and 95% confidence intervals from multivariate logistic regression using sampling and post-stratification weights and hospital clusters, yielding nationally representative estimates for the US population with appropriate standard error estimates. The models included the socio-economic information, hospital characteristics, and comorbid conditions described in the text. Complete model results available from the authors upon request.

	Biliary Tract Disease	Chest Pain	Pneumonia	Septicemia	Skin and Soft Tissue Infection
Payer					
<i>Medicare</i>	1.49 (1.20-1.84) (p <0.001)	0.90 (0.76-1.07) (p 0.24)	1.01 (0.86-1.19) (p 0.92)	0.91 (0.80-1.05) (p 0.20)	1.23 (0.99-1.52) (p 0.055)
<i>Medicaid</i>	1.31 (1.06-1.62) (p 0.011)	0.87 (0.69-1.08) (p 0.21)	1.04 (0.88-1.22) (p 0.66)	0.94 (0.82-1.08) (p 0.40)	1.32 (1.03-1.70) (p 0.030)
<i>Uninsured</i>	0.73 (0.55-0.96) (p 0.024)	0.63 (0.44-0.89) (p 0.009)	0.85 (0.69-1.05) (p 0.13)	0.76 (0.64-0.91) (p 0.002)	0.64 (0.46-0.89) (p 0.007)
<i>Private</i>	Reference	Reference	Reference	Reference	Reference
Sex					
<i>Female</i>	0.70 (0.61-0.80) (p <0.001)	0.67 (0.58-0.76) (p <0.001)	0.73 (0.66-0.82) (p <0.001)	0.79 (0.72-0.85) (p <0.001)	0.72 (0.62-0.84) (p <0.001)
<i>Male</i>	Reference	Reference	Reference	Reference	Reference