Factors Influencing Discharge Destination After Total Hip Arthroplasty: A California State Database Analysis

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Abstract

Introduction: With this growing demand, the length of stay for total hip arthroplasty (THA) procedures has decreased, and as a trade-off, we have seen a higher utilization of extended care facilities (ECFs). Both trends have significant economic implications on the health care system, and predicting the discharge destinations of THA patients would help policy makers plan for future health expenditures. We performed a retrospective data analysis of a large patient database to determine which variables are significant in predicting discharge destinations of THA patients. **Methods:** We used the California Hospital Discharge data set of the year 2010, collected and provided by the Office of Statewide Health Planning and Development. The data set includes information about patient demographics, insurance type, diagnoses and procedures, and patient disposition. The study cohort included 14 326 patients. Discharge to home was the reference category. Discharge to ECF and discharge to home with home care were the 2 additional alternatives. **Results:** In all, 46.9% of patients were discharged home with home health care, followed by 29.6% to ECF, and 23.5% to home without care. Discharge to ECF was more likely for patients with more comorbidities and a higher age. The strongest predictors were Medicaid and black or Asian race. Medicare relative to private payer was a strong predictor of ECF discharge. Male gender was the only factor that lowered the risk of discharge to ECF. The strongest predictor for discharge to home with home care was black race relative to whites. Medicaid lowered the risk of home care, and gender did not matter. **Conclusion:** This study serves to provide insight on which patient characteristics influence discharge destination after THA. Race, insurance, and morbidity were highly significant factors on patient discharge destination to a subacute nursing facility.

Keywords

adult reconstructive surgery, economics of medicine, physical medicine and rehabilitation, biostatistics, geriatric nursing

Introduction

Total hip arthroplasty (THA) procedures have grown in demand in the past decades. Data from the National Inpatient Sample show a 48% increase in total hip replacement cases from 1997 to 2004.[1] Annually, more than 300 000 THA procedures are performed in the United States,[2,3] with a projected 137% increase by the year 2030.[3] The cause of the current increase in demand for total joint arthroplasty (TJA) surgery can be hypothesized to be related to the increasing obesity epidemic, increased longevity, the aging baby boom population, and younger patients seeking surgical treatment in order to maintain a higher quality of life as well as facilitating their return to the workforce.[4]

Joint replacement patients come from a wide socioeconomic spectrum. The majority of patients who have TJAs are white and have a higher than average income.[5] Whites account for the majority of the procedures, with white men 3 times more likely to undergo THA than black men.[6] Skinner et al reviewed 430 726 knee arthroplasties during the years 1998 to 2000 and have shown that the rate of knee arthroplasties performed for white men (4.84 per 1000) was higher than that of Hispanics (3.46 per 1000) and more than double the rate for blacks (1.84 per 1000).[7]

The increasing trend in TJA has contributed to the economic burden of current health care systems already struggling with limited resources. In the United States, MediCare pays roughly

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60% of all costs related to TJA surgery.[8] With a projection of 600 000 hip replacement surgeries and 1.4 million knee replacement surgeries predicted by 2030, the projected incurred cost is unparalleled.[1]

In the recent years, length of stay (LOS) for TJA procedures has decreased. As a trade-off, patients are more likely to be discharged to extended care facilities (ECFs) and home with extended care (HEC) than before. Results from a retrospective study by Hartog et al on THA patients from July 1, 2008, to June 30, 2012, showed a significant decrease in LOS from an average of 5.1 days to 2.9 days.[9] Between 1993 and 2003, the percentage of TJA patients admitted to ECF grew exponentially from 17.1% to 54.6%.[10] As the LOS continues to decrease and more episode of care payment models that bundle both the hospital and the posthospital care costs are evolving, an investigation of the cost-effectiveness of postoperative care is necessary. Predicting the discharge destinations of TJA patients would offer insights and may begin to address these questions.

The purpose of this study was to examine this question on a large population—all patients undergoing THA in California. We took advantage of the California Patient Discharge data collected by the State of California Office of Statewide Health Planning and Development (OSHPD) for the year 2010 and analyzed it statistically to determine which variables are significant in predicting discharge destinations. We hypothesized that patient demographics and socioeconomic profile will influence whether a patient was discharged after a THA to an ECF versus home with extended care or home without any extended care while controlling for clinical severity of the patient.

Methods

Data and Sample

The data used for this study were the California Hospital Discharge data set collected by the California OSHPD. The data included 1 record for each inpatient hospitalization in the state. For each hospitalization, the data set includes information about patient demographics (age, gender, race, and ethnicity), insurance type, diagnoses and procedures, and patient disposition. We obtained data for all hospitalizations in the state of California for 2010. The study cohort included 14 326 patients undergoing hip replacement identified by International Classification of Diseases Ninth revision procedure code 81.51.

Variables

The dependent variable was patient disposition. It was defined as a categorical variable. Discharge to home was the reference category. Discharges to a ECF and discharge to home with home health care (HHC) were the 2 alternatives.

Independent variables included the Charlson Comorbidity Index,[11] which captures patients' medical comorbidities, payer category (private pay, MediCare, MediCal—the California version of MediCaid, and other), race (white, black, Native

American/Eskimo/Aleut, Asian/Pacific Islander, and other race), ethnicity (Hispanic or not), age (defined by 5-year age-groups), and gender. The variables were initially chosen based on our hypothesized significance on discharge destinations. The THA patients often display comorbidities, with the likelihood of more comorbidities present among older patients. Patients aged 65 years and older have a 60% to 88% chance of having at least 1 comorbidity, and among the THA patients it was found that the average number was 2.2 comorbidities for this age-group.[12,13] The Charlson Comorbidity Index serves as an indicator as to whether the patient's extended illnesses affected their discharge destination.

The demographic variables had a large percentage of missing (masked) values, 30% of the observations. These variables are masked by the State of California because of concerns for breach of confidentiality due to small sample sizes (ZIP code areas with small population sizes). Because the percentage of missing variables was relatively high, and because the observations that were missing one of the variables almost always were missing all other demographic variables, we concluded that imputation techniques might not be reliable. As an alternative strategy, we estimated regression models for (1) the full sample, (2) the smaller sample with the full demographic data, and (3) the smaller sample without the demographic variables. Because the estimates for all nondemographic covariates were similar, we concluded that the smaller sample with a complete set of demographic variables is representative of the full population sample, and we present only the estimates for this model in the article.

Average age was 67, with more women, at 59%, receiving surgery than men. Most patients had little comorbidity as indicated by the very low average Charlson Comorbidity Index of 0.46. The Charlson index can range from 0 to 10, and in our sample 99% of patients had values below 2.64. Patients were predominantly white (91.6%) with 3.9% blacks. The majority of patients were non-Hispanic at 94.8%. It should be noted, however, that the race and ethnicity variables were the ones most often masked by the State of California, as discussed earlier. Therefore, the data about racial distribution may not be accurate.

Analyses

We estimated multinomial regression models for THA in which the unit of observation is the patient discharge. The dependent variable is the observed discharge destinations, with discharge to home being the reference category.

For each independent variable, these models provide 2 relative risk ratios (RRRs)—one ratio is the risk of discharge to a ECF divided by the risk of a discharge to home and the other is the ratio of the risk of discharge to home with home care divided by the risk of discharge to home without any services.

All statistical analyses were done in STATA software v-12 (StataCorp LP, College Station, Texas). The study was considered exempt by our IRB because the data sets were received deidentified.

Table 1. Patient Demographics.

Descriptive Statistic: Hip Replacement		
Variable	Mean/ Percentage	Frequency/Standard Deviation
Discharge Destinations		
Home Routine	23.5	3364
SNF	29.6	4242
HHC	46.9	6720
Charlson Index	0.46	0.88
Payer Category		
Private coverage	38.4	5507
Medicare	56.6	8107
Medicaid	2.4	339
Other pay	2.6	373
Race		
White	91.6	13 132
Black	3.9	561
Native American	0.1	8
Asian	1.8	257
Other race	2.6	368
Ethnicity		
Hispanic	5.2	740
Non-Hispanic	94.8	13 586
Age	67.03	
Gender		
Female	59.1	8461
Male	40.9	5865

Abbreviations: HHC, home health care; SNF, skilled nursing facilities.

Results

Table 1 presents descriptive statistics. The majority of patients, 46.9%, were discharged to HHC, followed by 29.6% discharged to ECFs and 23.5% discharged to home. More than half of the patients were insured by MediCare (56.6%), followed by private payers (38.4%). MediCal (California state Medicaid program) accounted for only 2.4% of the patients in our cohort, suggesting that this discretionary procedure (THA) is not typically offered as frequently to those with income-based insurance coverage compared to patients insured by other payers. This observed discrepancy in the prevalence of patients with Medicaid insurance among the study cohort might point to disparity in care. Alternatively, it may point to an access of care problem, but our study was unable to examine this issue.

Table 2 presents the results of the multivariate analysis. It presents the RRR for discharge to ECF and discharge to home with home care relative to discharge to home, and the statistical significance for the ratio being different from 1. If the ratio exceeds 1, the probability of discharge to a location other than home is higher than the probability of discharge to home. The table also presents the 95% confidence interval for the RRR.

Discharge to ECF

As expected, discharge to ECF is more likely for patients with more comorbidities and a higher age ($P < .001$). However, the

Table 2. Predicted Relative Risk Ratios of Discharge to SNF and Home Health Relative to Home Without Home Health for Patients After THA.

	RRR	95% Confidence Interval	RRR	95% Confidence Interval
Home	Reference (base outcome)			
		SNF		HHC
Charlson Severity Index	1.32[a]	1.25-1.41	1.05[b]	1.00-1.12
Types of pay				
Medicare	1.70[a]	1.48-1.95	1.17[c]	1.05-1.31
Medicaid	2.28[a]	1.66-3.13	0.70[c]	0.54-0.91
Other pay	0.79	0.56-1.11	0.55[a]	0.43-0.69
Race				
White	Reference (base outcome)			
Black	2.43[a]	1.86-3.17	1.41[c]	1.12-1.79
Native American	1.58	0.18-13.3	1.24	0.22-6.90
Asian	2.47[a]	1.66-3.68	1.33	0.91-1.95
Other race	1.70[c]	1.15-2.50	1.35	0.97-1.89
Ethnicity				
Non-Hispanic	Reference (base outcome)			
Hispanic	1.48[c]	1.13-1.95	0.83	0.66-1.05
Age	1.54[a]	1.49-1.59	1.07[a]	1.04-1.10
Gender				
Female	Reference (base outcome)			
Male	0.48[a]	0.44-0.54	0.92	0.85-1.00

Abbreviations: HHC, home health care; RRR, relative risk ratios; SNF, skilled nursing facilities.
[a] $.001 > P$.
[b] $.05 > P \geq .01$.
[c] $.01 > P \geq .001$.

strongest predictors are MediCal payer and black or Asian race ($P < .001$). MediCare coverage relative to private payers is also a strong predictor of ECF discharge ($P < .001$). Male gender is the only factor that lowers the risk of discharge to an ECF ($P < .001$), probably reflecting the fact that men are more likely to be married and have a caregiver at home (Table 2).

Discharge to Home Care

Discharge to home care showed somewhat different patterns. The strongest predictor was black race relative to whites ($P < .01$). As with ECF, patients with more comorbidities and a higher age had an increased risk of being discharged home with home care. Unlike ECF discharge, being a MediCal enrollee lowered the risk of being discharged home with home care ($P < .01$) and gender did not matter (Table 2).

Discussion

Discharge destination after THA to a ECF, HHC, or home without HHC is dependent on many factors among which are patient demographic characteristics, social norms, insurance status, patient and care providers preferences, and so on.

This study serves to provide insights into which specific patient characteristics influences discharge destination after THA. In our study, the majority (over 76%) of patients after THA surgery were discharged to an ECF or home with an HHC program. This tendency might be due to the ongoing trend of reducing LOS among TJA patients. As anticipated, older age and patients with more comorbidities had a strong relative risk of being discharged to an ECF or home with an HHC program. Bozic et al identified baseline characteristics among 7818 consecutive patients who underwent TJA at 3 high volume centers. In their study, they showed that older age, higher the American Society of Anesthesiologists (ASA) Physical Status classification system score, MediCare insurance, and female sex increased the risk of discharge to an ECF. These data correlate with our findings in our patient cohort.[10] Bozic et al did not differentiate between ECF, HHC, and discharge home without HHC. As discharge home with HHC is increasing, data on predicting the need and proper utilization of this resource need to be further elucidated.

In our study cohort, THA patients being black or Asian was a highly significant ($P < .001$) factor for patient discharge destination to an ECF. Other minority characteristics (Native American and other races) had relatively less significance in determining discharge destinations. A possible explanation for the low volume of minority patients is due to the lower prevalence of THA procedures in these minority populations as well as a possible lower prevalence of osteoarthritis among black patients compared to white patients.[14] Prior to performing the logistic regression model, tabulation of each variable was done. Of the 14 326 THA patients, 3.9% were black, compared to 0.1% of Native American patients, the least represented in the THA data set. Sociocultural barriers can be cited for these low numbers. In previous studies, African or Hispanic physicians,

despite their underrepresentation in the physician pool, cared for 25% of African and 25% of Hispanic respondents.[15,16] The scarcity of diverse health professionals has been correlated with the perceived effectiveness of the quality of care. Native Americans, with their strong partiality to alternative medicine, would more likely respond to their health needs if consulted by a Native American physician. The situation applies to the other minority populations. Limited understanding of English and health education discourages minorities from receiving advanced surgical treatment.

An interesting finding arose from this study; THA patients covered under MediCal were more likely to be discharged home with an HHC program. An affordable alternative to ECFs while still an effective discharge destination, HHC was the dominant care among the low-income population. California is witnessing an increase in the number of insured low-income families following the passage of the 2014 Affordable Care Act (ACA). By 2016, a projected estimate of 3.4 million people under the age of 65 will be insured, with 1.4 million people enrolled in MediCal.[17] As more and more low-income families are insured, the demographics of THA patients will shift toward the underrepresented, minority population. The qualifications and benefits of discharging patients home with an HHC program will need to be reevaluated, as the likelihood of MediCal insured patients to be discharged home with an HHC program increases under the ACA in the near future.

Compared to white beneficiaries, racial minorities were more likely to be discharged to an ECF or use HHC programs. In comparison to costs, ECFs are inherently more expensive than home care due to capital and staffing requirements.[18] Furthermore, it has been shown that there is an increased readmission rate even among healthy patients who are discharged to an ECF compared to home following total joint arthroplasty.[19]

In a previous study by Munin et al, patients with comorbidities were at risk of requiring postacute care rather than being discharged to home.[20] Further work should detail the types of comorbidities experienced by THA patients and whether patterns of certain illnesses lean toward a specific discharge destination. Another case in point would be to define the hospital identification number (oshpd_id) in which THA procedures were derived from so that regional characteristics can be determined. With the assumption that most patients arrive at a hospital of their geographical convenience, the demographics around the area of the respective hospital would help to clarify the distribution of race, ethnicities, and so on. Knowledge of numbers of THA patients who are being admitted into the hospitals will also clarify what types of services are available in that region. In rural areas, individuals received less intensive care in the institution versus in a home setting and thus may prefer an HHC program rather to be discharged to an ECF.[21]

While this study offers important insights into the discharge destination of THA patients and the factors that contribute to it, several limitations should be noted. This study was limited to the experience of patients in California in 2010. While the data are recent, our findings may not generalize to the rest of the country. Practice patterns may be different in other parts of the country,

and similar studies should be repeated with national data. Further, because of restrictions and masking of some of the OSHPD data (in order to protect patient confidentiality), we were unable to fully explore the implications of all socioeconomic and race variables although our analysis indicated that our results can be generalized to the entire data set. Other data sets, which do not have these limitations, should be pursued in future studies.

Conclusion

This study offers insights on which patient characteristics influence discharge destination after THA. Race, insurance, and morbidity were highly significant factors for patient discharge destination to a subacute nursing facility. These findings are important first steps in beginning to understand the complex relationships between the acute and the postacute care and costs incurred by these patients, a must as we move forward toward bundled payment and episode financing.

Declaration of Conflicting Interests

Funding

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