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The Effect of Discharge Disposition on 30-Day Readmission Rates After Total Joint Arthroplasty

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ABSTRACT

Previous studies have demonstrated no significant difference in overall functional outcomes of patients discharged to a sub acute setting versus home with health services after total joint arthroplasty. These findings coupled with pressure to reduce health care costs and the implementation of a prospective payment system under Medicare have supported the use of home rehabilitation services and the trend towards earlier discharge after hospitalization. While the overall functional outcome of patients discharged to various settings has been studied, there is a relative dearth of investigation comparing postoperative complications and readmission rates between various discharge dispositions. Our study demonstrated patients discharged home with health services had a significantly lower 30 day readmission rate compared to those discharged to inpatient rehab facilities. Patients discharged to rehab facilities have a higher incidence of comorbidity and this association could be responsible for their higher rate of readmission.

Previous studies have demonstrated no significant difference in overall functional outcomes of patients discharged to a inpatient setting when compared with outcomes of patients discharged home with health services after total joint arthroplasty [1–3]. These findings coupled with pressure to reduce health care costs and the implementation of a prospective payment system under Medicare have resulted in a trend towards decreasing length of stay (LOS) following surgery and the increased use of home rehabilitation services [4,5]. While the overall functional outcome of patients discharged to various settings has been studied, there is a relative dearth of investigation comparing postoperative complications and readmission rates for patients with different discharge dispositions. Understanding the effect of different discharge dispositions on readmission rates is critical in the cost–benefit analysis of post-acute care after total joint arthroplasty. This is particularly important since the introduction of the episode of care payment model, which renders hospitals responsible for all patient care costs for up to 90 days after discharge, including the cost of post-acute care and readmissions [6,7].

The purpose of this study is to understand the effect on discharge disposition on the LOS and readmission rates for patients undergoing elective total joint arthroplasty. To accomplish this, we analyzed and compared the length of stay and the readmission rates for patients undergoing elective total joint arthroplasty, associated with three different discharge dispositions. The discharge dispositions were: 1) home with home health services, 2) inpatient rehabilitation or 3) sub-acute nursing facilities.

Materials and Methods

Using our hospital's administrative database, we identified all patients who underwent elective primary total joint arthroplasty at our institution during a two-year period (2010–2011). We excluded patients who were transferred to another medical facility, left against medical advice, or expired during their index admission. A total of 3533 patients were included in our study group. Patients were grouped according to the type of surgery (THA vs. TKA). Additionally all discharges were grouped into one of three scenarios: 1) Home with Health Services, 2) Inpatient Acute Rehabilitation Facility (IRF), 3) Skilled Nursing Facility (SNF). Complications, as defined by Medicare Severity Discharge Related Groups (MS-DRG) codes, and demographic characteristics (age and gender) were abstracted for each discharge group.

All readmissions within 30 days of the index procedure were reviewed and the readmission interval and reason for readmission were recorded. Readmissions construed to be surgical, such as wound infection or fracture, or medical, such as pulmonary embolus or deep vein thrombosis, were included in the study. We excluded all planned readmissions, such as those for staged bilateral procedures, for our analysis. Descriptive statistics were performed and 30-day readmission rates were compared between discharge dispositions using the Chi-Square test. One-way analysis of variance (ANOVA) with Tukey–Kramer post-hoc pairwise analysis was performed to compare length of stay (LOS) between the groups. Multivariate logistic

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regression analysis was used to evaluate which factors were associated with readmission while controlling for age, gender, and comorbidities. All data analysis was performed using SPSS 20 (IBM, Chicago, IL) and statistical significance was set to $P = 0.05$. We used the average cost to Medicare for readmissions and post-acute after care for patients going directly home with services and patients going to inpatient settings to examine the readmission rates for each setting that would make the total cost favor each strategy. The average cost for a patient discharged home with services was $4000 and the average cost for a patient discharged to an inpatient facility was computed as the average cost of discharge to an acute rehab facility and the average cost of discharge to a sub-acute facility, and was $11,000 in the analysis. The average cost of a readmission was computed using the average cost of a readmission for primary total knee and total hip arthroplasty, and was estimated at $22,000 for this analysis. The analysis was completed using decision analysis software (TreeAgePro, 2013).

Results

The 3533 patients in the cohort included 1865 THAs and 1668 TKAs. Demographic characteristics of each cohort are listed in Table 1. For the THA cohort 65% of patients were discharged home, 11% were discharged to an IRF, and 24% were discharged to an SNF. In the TKA cohort, 59% were discharged home, 9% were discharged to an IRF, and 32% were discharged to an SNF. LOS and comorbidity characteristics of the cohort are listed in Table 2. The average LOS for patients discharged home was 4.30 days in the THA group and 4.31 days in the TKA group, and was significantly lower than LOS for patients discharged to an IRF (5.31 days THA, 4.49 days TKA) or SNF (5.36 days THA, 4.76 days TKA) ($P < 0.001$ and $P < 0.001$ respectively). Additionally, patients going to an IRF had a higher incidence of comorbidity (12.1% THA, 3.9% TKA) than those going home (2.4% THA, 3.1% TKA) or to an SNF (4.2% THA, 3.4% TKA). ($P < 0.001$ THA and $P = 0.001$ TKA). The 30-day readmission rate in the THA cohort was 1.8% and was 3.1% in the TKA group.

In the THA cohort, univariate analysis of 30-day readmission rates between discharge groups revealed patients sent to an IRF had a statistically significantly higher rate of readmission than those going to an SNF or home with health services. (5.1% vs. 1.4% and 1.5% respectively, $P = 0.002$). Multivariate regression analyses for the THA and TKA cohorts are listed in Tables 3a and 3b respectively. After controlling for age, gender, and comorbidities, THA patients sent to an IRF had more than 3 times the risk of readmission within 30 days after surgery. (OR = 3.2, 95% CI 1.14–9.25, $P = 0.027$). In the TKA cohort, patients sent to an IRF trended towards having a higher rate of readmission within 30 days as compared to SNF or home with health services (3.9% vs. 3.7% and 2.7% respectively) but the difference was not statistically significant ($P = 0.469$). Multivariate regression analysis for the TKA cohort revealed a strong association between comorbidity and readmission (OR = 3.8, 95% CI 1.60–9.16, $P = 0.003$).

Table 1
Demographic Characteristics (Age and Gender) of TKA and THA Cohorts by Discharge Facility Type.

Variable	Discharge Facility Type: Inpatient Acute Rehabilitation Facility (IRF)	Skilled Nursing Facility (SNF)	Home With Health Services	*P* Value
Age, mean (SD)				
THA	71.1 (10.8)	65.4 (11.5)	57.0 (11.1)	$P < 0.001$
TKA	69.0 (10.3)	67.9 (9.2)	60.7 (10.2)	$P < 0.001$
Gender (% female)				
THA	128/198 (65%)	291/452 (64%)	529/1215 (44%)	$P < 0.001$
TKA	112/154 (73%)	414/528 (78%)	601/986 (61%)	$P < 0.001$

Table 2
Length of Stay (Days), 30-Day Readmission Rates, and Comorbidity by Discharge Facility Type.

Variable	Discharge Facility Type: Inpatient Acute Rehabilitation Facility (IRF)	Skilled Nursing Facility (SNF)	Home With Health Services	*P* Value
Length of Stay (average, SD)				
THA	5.31 (2.8)	5.36 (2.8)	4.30 (2.0)	$P < 0.001$
TKA	4.49 (1.7)	4.76 (2.0)	4.31 (2.1)	$P < 0.001$
30-Day Readmission Rate (%)				
THA	10/198 (5.1%)	6/452 (1.4%)	18/1215 (1.5%)	$P = 0.002$
TKA	6/154 (3.9%)	20/528 (3.7%)	27/986 (2.7%)	$P = 0.469$
Comorbidity				
THA	24/198 (12.1%)	19/452 (4.2%)	29/1215 (2.4%)	$P < 0.001$
TKA	6/154 (3.9%)	18/528 (3.4%)	31/986 (3.1%)	$P = 0.001$

Fig. 1 shows the readmission rates that would have to be achieved for patients going to inpatient settings to make the extra cost of this care cost-effective. It demonstrates that the readmission rates would have to be significantly higher for patients discharged home for the extra cost of discharge to an inpatient facility to be cost saving. For example, if the readmission rate for inpatient facilities is 0%, then the readmission rates for patients going home would have to be 0.6, or 60%, for the extra cost of sending patients to inpatient facilities to be cost-saving.

Discussion

Since the implementation of Medicare's prospective payment system in 1983, efforts to promote earlier hospital discharge after total joint arthroplasty have been employed as a means to reduce acute care costs [8]. Advances in surgical technique, postoperative pain management, and patient education have been used to facilitate earlier discharge [4]. There has been a resultant increased demand for post acute care (PAC) services where patients can continue to receive the appropriate medical and rehabilitative therapy they require after discharge. Controversy remains regarding the optimum setting where total joint arthroplasty patients should receive their postsurgical rehabilitative care, as numerous studies have demonstrated no significant difference in functional outcomes or patient satisfaction between these various post acute care settings [8–10]. Given these findings, along with the significantly lower costs associated with home rehabilitation programs [11], there have been increased efforts to discharge patients directly home with home rehabilitation services [9].

Both objective and subjective outcome measures of total joint arthroplasty surgery in patients discharged home with health services are similar to those discharged to sub acute settings. However, there has been relatively little study on post operative

Table 3a
THA Cohort Multivariate Logistic Regression Analysis of 30-Day Readmission Rates by Discharge Facility Type.

		S.E.	*Wald*	*df*	*Sig.*	*Adjusted OR*	95% C.I. *Lower*	95% C.I. *Upper*
Gender	0.331	0.359	0.849	1	0.357	1.393	0.689	2.816
Comorbidity	0.349	0.626	0.311	1	0.577	1.418	0.416	4.836
SNF			5.539	2	0.063			
Home	0.324	0.501	0.42	1	0.517	1.383	0.518	3.693
Rehab	1.18	0.533	4.894	1	0.027	3.254	1.144	9.258
Age	0.032	0.017	3.526	1	0.06	1.032	0.999	1.067

Age is a continuous variable in this model. Categorical variables in the model are gender (0=male, 1=female), comorbidity (0=no comorbidity, 1=comorbidity), discharge facility (Home, Rehab, SNF).