

Does Discharge Disposition After Primary Total Joint Arthroplasty Affect Readmission Rates?

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Abstract: We reviewed 90-day readmission rates for 9150 patients with a primary total hip or knee arthroplasty performed between April 2001 and December 2004. Patients with an American Society of Anesthesiologists score of 3 or greater or with perioperative complications were excluded. We correlated the readmission rate with discharge disposition to either skilled nursing facilities (SNFs) or Home. Of the 9150 patients identified, 1447 were discharged to an SNF. After statistically adjusting for sex, age and American Society of Anesthesiologists scores, total hip arthroplasty and total knee arthroplasty patients discharged to SNFs had higher odds of hospital readmission within 90 days of surgery than those discharged home (total hip arthroplasty: odds ratio = 1.9; 95% confidence interval, 1.2-3.2; $P = .008$; total knee arthroplasty: odds ratio = 1.6; 95% confidence interval, 1.1-2.4; $P = .01$). Healthy patients discharged to SNFs after primary total joint arthroplasty need to be followed closely for complications. **Keywords:** total hip, total knee, skilled nursing, readmission, complications.
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The creation of the prospective payment system under Medicare was the driving force behind the practice of early discharge from hospitals [1]. Since then, numerous papers have noted that there is little difference in functional outcome between patients discharged home and patients who are sent to skilled nursing facilities (SNFs), even after total hip arthroplasty (THA) [1,2].

Because patients are being discharged earlier through the use of SNFs and aggressive home rehabilitation protocols, we need to ask if there is a difference in the relative rates of 90-day hospital readmission between patients who are discharged home with Home Health and Physical Therapy and those discharged to a SNF after an uncomplicated primary total joint arthroplasty.

To answer this question, we conducted a retrospective study of the effects of discharge disposition (home vs SNF) on 90-day hospital readmissions for all THA or knee joint arthroplasty procedures performed in our health plan's hospitals in Southern California between April 2001 and December 2004.

Materials and Methods

The patients were identified using the Kaiser Permanente Total Joint Replacement Registry. Patient age, sex, and American Society of Anesthesiologists (ASA) score were abstracted from the Registry database. Discharge disposition, admitting and discharge *International Classification of Disease, Ninth Revision* diagnosis, hospital length of stay (LOS), complications, and hospital readmissions within 90 days of the surgery were obtained from the hospital database. Inclusion criteria included all primary total knee arthroplasty (TKA) and THA procedures performed at Kaiser Permanente Southern California hospitals within a 3-year period (2001-2004). We excluded patients with ASA scores greater than or equal to 3 to control for differences in comorbidities. Patients with complications during the initial hospital stay were also excluded from the study because complications during the initial hospitalization could predispose patients to subsequent hospital readmissions. Fig. 1 displays the final sample after applying the study inclusion and exclusion criteria.

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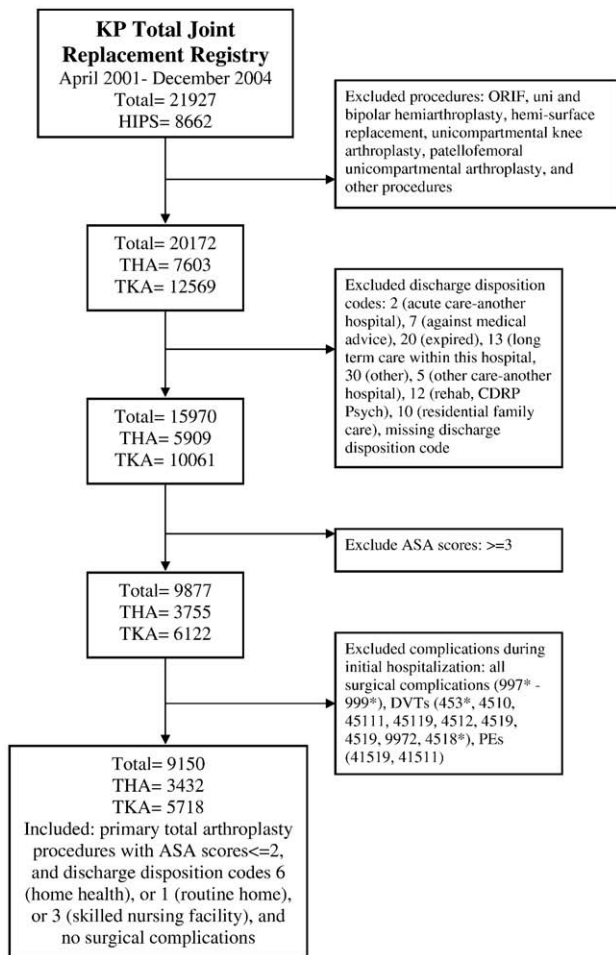


Fig. 1. Study inclusion and exclusion criteria.

Author S.B. evaluated all hospital readmission discharge codes to identify hospital readmissions related to the total joint procedure (Table 2). All diagnoses that could be related to the index procedure were further coded as 'surgical' or 'medical' complications based on whether the complication was primarily related to the procedure itself (eg, anemia) or to a comorbidity (eg, myocardial infarction) (Table 4). Readmissions due to any event that could not be construed as related to the index procedure were excluded (eg, diagnosis of bladder cancer).

Descriptive statistics consisted of means and SDs for continuous variables and frequencies and percentages for categorical variables. χ^2 and Fisher exact tests were used to evaluate categorical variables. The Mann-Whitney test was used to compare group ages, initial LOS, and ASA scores. Multivariate logistic regression was used to estimate adjusted odds ratios (ORs) for each of the covariates (patients' age, sex, and ASA score) in determining hospital readmission within 90 days of the total joint procedure. All reported *P* values are 2-sided and are considered to indicate statistical significance if *P* value is less than .05. The statistical

Table 1. Patient Demographics, Distribution of ASA Scores, and Mean LOS for Initial Hospitalization by Disposition at Discharge

	Discharged Home	Discharged to SNF	Total
Age, mean (SD)			
THA	63 (12)	73 (10)	65 (12)
TKA	66 (9)	73 (9)	67 (10)
Sex (% female)			
THA	53	73	58
TKA	63	68	64
ASA score			
THA (%)			
ASA 1	8	3	7
ASA 2	92	97	93
TKA (%)			
ASA 1	5	3	5
ASA 2	95	97	95
Initial hospitalization LOS, mean (SD)			
THA	3.62 (0.91)	3.46 (0.98)	3.61 (0.92)
TKA	3.62 (0.94)	3.72 (1.3)	3.63 (1.0)

software package SPSS 14.0 (Chicago, IL) was used to analyze the data.

Results

The cohort consisted of 3432 THAs and 5718 TKAs. Of the 3432 THAs, 2840 were discharged home and 592 to an SNF. For TKAs, 4863 were discharged home and 855 to an SNF. Skilled nursing facility patients were significantly older (73 vs 63; $P < .001$), had a higher ASA scores (THA: ASA 2 97% vs 92%, $P < .001$; TKA: ASA 2 97% vs 95%, $P < .05$), and were more predominately female ($P < .001$). Total hip arthroplasty SNF patients had a shorter initial hospital LOS than those discharged home ($P = .002$). The average LOS was 3.6 days for both THA and TKA (Table 1).

Readmission rates after THA in this cohort were 2.9%, and for TKA 3.5%. Patients discharged to an SNF had a higher rate of hospital readmissions within 90 days than patients discharged home (TKA 4.4% vs 3.3%, $P = .10$; THA 5.2% vs 2.4%, $P < .001$). Although hospital readmissions for surgical reasons did not differ

Table 2. Readmissions and Complications for Total Arthroplasty Procedures by Disposition at Discharge

	Discharged Home	Discharged to SNF	Total
Readmitted			
THA	69 (2.4%)	31 (5.2%)	100 (2.9%)
TKA	162 (3.3%)	38 (4.4%)	200 (3.5%)
Reason for readmissions			
Surgical complication			
THA	51 (1.8%)	17 (2.9%)	68 (2%)
TKA	119 (2.4%)	20 (2.3%)	139 (2%)
Medical complication			
THA	19 (.7%)	14 (2.4%)	33 (1%)
TKA	49 (1%)	18 (2.1%)	67 (1.2%)

Table 3. Multivariate Logistic Regression Adjusted ORs for Readmission in Patients Discharged to SNF Discharged as Compared to Patients Discharged Home

	<i>B</i>	SE	Wald	<i>df</i>	Sig.	Adjusted OR	95.0% CI for OR	
							Lower	Upper
THA								
Males vs Females	-0.121	0.224	0.294	1	.588	0.886	0.571	1.374
Age	0.000	0.009	0.002	1	.966	1.000	0.981	1.018
ASA 2 vs ASA 1	-0.079	0.407	0.038	1	.846	0.924	0.416	2.053
SNF vs Home	0.664	0.251	7.027	1	.008	1.943	1.189	3.176
TKA								
Males vs Females	0.098	0.150	0.431	1	.511	1.103	0.823	1.479
Age	-0.031	0.007	17.937	1	.000	0.969	0.955	.983
ASA 2 vs ASA 1	-.283	0.369	0.587	1	.443	1.327	0.644	2.734
SNF vs Home	-.488	0.193	6.396	1	.011	1.629	1.116	2.377

Age is a continuous variable in this model. Categorical variables in the model are sex (0 = female, 1 = male), ASA (ASA 1, ASA 2), discharge group (0 = home, 1 = SNF). *B* indicates logistic coefficient; Wald, statistics tests the significance of each covariate in the model; Sig., significance level.

significantly between patients discharged to home vs SNF, THA and TKA patients discharged to SNF had higher rates of readmissions due to medical complication (THA $P < .001$, TKA $P = .006$) (Table 2).

The adjusted ORs for THA and TKA patients indicate that the odds of hospital readmission within 90 days of surgery is higher for patients discharged to SNFs than those discharged home (THA: OR = 1.9; 95% confidence interval [CI], 1.2-3.2; $P = .008$; TKA: OR = 1.6; 95% confidence interval, 1.1-2.4; $P = .01$) (Table 3).

Discussion

The creation of prospective payment system under Medicare was the catalyst for a drive toward earlier discharge after hospitalization [1]. Recent advances in tissue-sparing surgical techniques, postoperative pain management, preoperative patient education, and an emphasis on early ambulation have all contributed to a trend toward earlier discharge. Patient expectations of early recovery and rapid return to an active lifestyle, as well as the shortage of acute care beds in many hospitals have also contributed to this trend.

Several studies have compared functional outcomes for patients discharged to a subacute setting vs home [1-5] and found little difference in functional outcomes between the groups [2,7]. The authors concluded that their results supported the continued use of home-based rehabilitation [7].

However, functional outcome studies do not specifically address the issue of postoperative complications. Buntin et al [3] noted that patients who are discharged to a subacute setting after lower extremity joint arthroplasty have an 18% higher chance of being either dead or institutionalized 120 days after discharge.

The aim of this article was to look more closely to see if patient transfer to an SNF is an independent variable associated with a higher risk for serious postoperative complications. We defined a serious complication as one that required readmission to the hospital within 90 days of discharge. We selected 90-day readmission rates as Phillips et al [6] looked at Medicare data and found that the incidence rates of complications continue to be elevated for as long as 3 months after surgery.

To avoid the selection bias identified by Buntin that favors admission to SNF for patients who are sicker and therefore predisposed to complications [3], only elective patients with an ASA score of 2 or less were included [3]. We also excluded patients who had complications during their acute hospitalization and were therefore predisposed to readmission at the time of discharge. Our large cohort is representative of a community-based patient population.

Our results indicate that after statistically controlling for age, sex, and ASA score, patients who are discharged to a skilled nursing unit have higher odds of hospital readmission within 90 days of THA and TKA than those discharged home (THA: OR = 1.9;

Table 4. Comparison of Complication Rates in Current Orthopedic Literature

	MI (%)		PE (%)		Infection (%)		Dislocation (%)
	THA	TKA	THA	TKA	THA	TKA	THA
Bini et al	N/A	0.30	0.15	0.16	0.41	0.71	0.087
Mahomed et al	N/A	0.80	0.90	0.80	0.24	0.40	3.10
Mantilla et al	0.40	0.40	0.70	0.70	N/A	N/A	N/A

MI, indicates myocardial infarction; N/A, not applicable; PE, pulmonary embolism.

95% CI, 1.2-3.2; $P = .008$; TKA: OR = 1.6; 95% CI, 1.1-2.4; $P = .01$). For both procedures, readmissions are more commonly due to medical complications rather than surgical complications.

The overall rate of readmission to an acute care hospital in this selected cohort was 2.9% for THAs and 3.5% for TKAs. Our readmission rates are comparable to those published elsewhere [5,7,8] (Table 4).

The fact that patients that are discharged to SNFs tend to be female, older, and more likely to have a higher ASA score is not surprising, and it is consistent with other articles [4,5,7].

Studies that look at clinical outcomes based on retrospective data have clear limitations, and our article is no exception. Controlling for patient selection is complicated. Using ASA scores may not be an accurate proxy for health status. Further, discharge and readmission criteria across our medical centers can vary greatly. We assume that all significant postoperative events result in readmission; in other words, we assume that there is no reporting bias between the SNF group and patients discharged home. The quality of care between rehabilitation centers or nursing homes can vary greatly, as can the care delivered by Home Health and Physical Therapy. Further, minor complications that do not lead to readmission are not captured for either group.

We also could not control for ambulatory status before discharge. It is possible that it is a patient's ambulatory status that predisposes a total joint patient to transfer to a SNF and that nonambulatory patients are more likely to develop medical complications leading to readmission. This may be particularly true as medical, and not surgical, complications predominate. Lastly, these data largely reflect skilled nursing or rehabilitation services provided in facilities that are separate and removed from the primary hospital. Thus, the data may not apply to inpatient rehabilitation facilities, although Buntin et al saw little if any difference in outcomes between these 2 types of subacute settings in their report [3].

Conclusion

In conclusion, after controlling for ASA score, age, sex, and hospital complications, the odds of complications and hospital readmission are higher for elective patients who are discharged to an SNF after lower extremity joint arthroplasty and a short LOS (average, 3.6 days) than those discharged home. This association is statistically significant and warrants further study. Regardless of the cause, however, these patients need to be followed carefully while in the SNF.

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