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Preoperative body mass index and physical function are associated with length of stay and facility discharge after total knee arthroplasty☆

Matthew G. Prohaska [a,1], Benjamin J. Keeney [a,b,*,2], Haaris A. Beg [b,3], Ishaan Swarup [c], Wayne E. Moschetti [a,b], Stephen R. Kantor [a,b,4,5], Ivan M. Tomek [a,b,6,7]

[a] Department of Orthopaedics, Dartmouth-Hitchcock Medical Center, 1 Medical Center Drive, Lebanon, NH 03756, USA
[b] Geisel School of Medicine, Dartmouth College, 1 Rope Ferry Road, Hanover, NH 03755, USA
[c] Department of Orthopaedic Surgery, Hospital for Special Surgery, 535 E. 70th Street, New York, NY 10021, USA

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ABSTRACT

Background: Hospital length of stay (LOS) and facility discharge are primary drivers of the cost of total knee arthroplasty (TKA). We sought to identify modifiable patient factors that were associated with increased LOS and facility discharge after TKA.
Methods: Prospective data were reviewed from 716 consecutive, primary TKA procedures performed by two arthroplasty surgeons between 2006 and 2012 at a single institution. Preoperative body mass index (BMI), Veterans RAND-12 (VR-12) physical component score (PCS), and hemoglobin level were collected in addition to other adjusters. Multivariate linear and logistic models were constructed to predict LOS and facility discharge, respectively.
Results: After adjustment, higher BMI was associated with increased LOS in a dose–response effect: Compared to normal weight (BMI <25) overweight (25–29.9) was associated with longer LOS by 0.32 days ($P = 0.038$), class-I obesity (30–34.9) by 0.33 days ($P = 0.024$), class-II obesity (35–39.9) by 0.67 days ($P = 0.012$) and class-III obesity (>40) by 1.15 days ($P < 0.001$). Class-III obesity was associated with facility discharge (odds ratio = 2.08, $P = 0.008$). Poor PCS was associated with increasing LOS: compared to PCS ≥ 50, PCS 20–29 was associated with a LOS increase of 0.40 days ($P = 0.014$) and PCS < 20 with a LOS increase of 0.64 days ($P = 0.031$).
Conclusion: Patient BMI has a dose–response effect in increasing LOS. Poor PCS was associated similarly with increased LOS. These associations for of BMI and PCS suggest that improvement

☆ Investigation performed at the Department of Orthopaedics, Dartmouth-Hitchcock Medical Center, Lebanon, New Hampshire, USA.

* Corresponding author at: Dartmouth-Hitchcock Medical Center, One Medical Center Drive, Hinman Box 7541, Lebanon, NH 03756-0001, USA.
E-mail addresses: MProhaska@Gmail.com (M.G. Prohaska), Benjamin.J.Keeney@Hitchcock.org, Benjamin.J.Keeney@Dartmouth.edu (B.J. Keeney), Haaris.Beg@NYUMC.org (H.A. Beg), SwarupI@HSS.edu (I. Swarup), Wayne.E.Moschetti@Hitchcock.org (W.E. Moschetti), Stephen.Kantor@NewLondonHospital.org (S.R. Kantor), TomekI@APDMH.org (I.M. Tomek).

[1] Dr. Prohaska was an Orthopaedics resident at Dartmouth-Hitchcock Medical Center during the conception and analysis of this manuscript. He is now an attending orthopedic surgeon in private practice in St. Johnsbury, Vermont, USA.

[2] Dr. Keeney reports paid consulting work by Berkley Medical Management Solutions (Kansas City, MO, USA) on matters related to worker's compensation insurance data with no particular focus on orthopedics.

[3] Dr. Beg was a medical student at the Geisel School of Medicine at Dartmouth College during the conception and analysis of this project. He is now an Internal Medicine resident at NYU Langone Medical Center in New York, New York, USA.

[4] Dr. Kantor was an attending orthopedic surgeon and faculty member at Dartmouth-Hitchcock Medical Center and Dartmouth College during the conception and analysis of this project. He is now an attending orthopedic surgeon at New London Hospital in New London, New Hampshire, USA.

[5] Dr. Kantor reports an educational consultancy and separate research support from DePuy-Synthes.

[6] Dr. Tomek was an attending orthopedic surgeon and faculty member at Dartmouth-Hitchcock Medical Center and Dartmouth College during the conception and analysis of this project. He is now an attending orthopedic surgeon at Alice Peck Day Memorial Hospital in Lebanon, New Hampshire, USA.

[7] Dr. Tomek reports an educational consultancy for Smith and Nephew, which concluded during the revisions process.

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preoperatively, by any amount, may potentially translate to decreased LOS and perhaps lower the cost associated with TKA.

1. Introduction

Osteoarthritis (OA) of the knee is a significant source of pain and disability, and total knee arthroplasty (TKA) is an effective treatment that relieves pain and restores function after non-operative modalities fail [1–3]. Changing population demographics and increasing obesity contribute to an increasing incidence of knee OA [4–6]. Lifetime risk of being diagnosed with severe knee OA is more than 13% in males and 18% in females and approximately half of these individuals will undergo a TKA [7]. Current projections estimate that 1,375,574 TKA procedures will be performed in 2020, up from the 719,000 procedures performed in 2009 [8,9].

Although TKA is a cost-effective procedure, it is also costly [10–13]. With reimbursement lagging behind the rate of expense inflation [8,14], cost containment is a major issue [15]. Hospital length of stay (LOS) [16] and discharge to an inpatient facility [17] are among the most costly aspects of TKA, and they are potentially modifiable. Across various study types and locations, authors have identified increasing age [18–26], female sex [18,20,22,23,25], preoperative use of walking aids [20,21,24,26], high body mass index (BMI) [23,27], low preoperative physical function [20,21,26], and low preoperative hemoglobin (Hb) [21,22,26,28] as predictors of increasing LOS. In other investigations, increasing age [29–32], female sex [29–32], high BMI [27], presence of medical comorbidities [32], low preoperative health-related quality of life (HRQoL) survey score [17], and low preoperative physical function [30] were predictive of discharge to an inpatient facility. However, there is variation among the reported associations, especially in regard to BMI, and little published in respect to preoperative patient-reported physical function. We hypothesized that in a cohort of consecutive, unilateral, primary TKA patients high BMI and low preoperative patient-reported physical function would predict increased LOS and discharge to an inpatient facility. Furthermore, we hypothesized that additional patient characteristics, female sex, older age, and preoperative anemia, are also independently associated with prolonged LOS and institutional discharge.

2. Patients and methods

This study included a consecutive cohort of TKA patients between January 2006 and June 2012 at a single, tertiary, academic center by two fellowship-trained joint reconstruction orthopedic surgeons. Institutional Review Board (IRB) approval was obtained prior to obtaining data. Using internal databases linked to the electronic medical record (EMR) systems, patients were selected by date and Current Procedural Terminology (CPT) code for primary TKA (27447). Patients undergoing bilateral procedures, simultaneous and staged within one year, were excluded. Concomitant arthroplasty or ligament repair on the ipsilateral extremity was the only other exclusion. No patients were admitted prior to the date of surgery. All patients obtained appropriate medical clearances prior to surgery.

We identified each patient's demographic information including age at surgery, sex, BMI, number of medical comorbidities, and smoking status (never smoked, currently smoking, former smoker). Modifiable variables, such as BMI and smoking status, were collected at the preoperative visit. BMI was grouped into categories based on the World Health Organization (WHO) classification: normal (<25 kg/m^2), overweight (25–29.9), class I obesity (30–34.9), class II obesity (35–39.9), and class III, morbid, obesity (>40) [33,34]. In addition to inpatient perioperative details (dates of surgery, admission, and discharge to ascertain LOS, surgeon, and discharge disposition), we collected preoperative Hb values. Hb was considered low based on the WHO classification of anemia: <12 g/dL for females and <13 g/dL for males [35]. Discharge disposition was dichotomized into either home or inpatient facility. The specific discharge dispositions and their assigned category are shown in Table 1.

Table 1
Discharge disposition and categorization.

Discharge disposition	Home	Inpatient facility	% of total
Custodial care	1		0.14
Home	48		6.70
Home with visiting nurse	509		71.09
Acute rehabilitation		24	3.35
Skilled nursing facility (SNF)		76	10.61
Stand-alone rehabilitation facility		9	1.26
Swing bed		41	5.73
General rehabilitation		6	0.84
Rehabilitation center		2	0.28
	558 (77.93)	158 (22.07)	716 (100.00)

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