



ELSEVIER

Contents lists available at ScienceDirect

## The Journal of Arthroplasty

journal homepage: [www.arthroplastyjournal.org](http://www.arthroplastyjournal.org)

Health Policy &amp; Economics

## The Association of Anemia and Its Severity with Cardiac Outcomes and Mortality After Total Knee Arthroplasty in Noncardiac Patients



Jad S. Chamieh, MD<sup>a</sup>, Hani M. Tamim, MPH, PHD<sup>b</sup>, Karim Z. Masrouha, MD<sup>a</sup>,  
Said S. Saghieh, MD<sup>a</sup>, Muhyeddine M. Al-Taki, MD, FACS<sup>a,\*</sup>

<sup>a</sup> Division of Orthopaedic Surgery, Department of Surgery, American University of Beirut Medical Center, Beirut, Lebanon

<sup>b</sup> Biostatistics Unit, Clinical Research Institute, Department of Internal Medicine, American University of Beirut Medical Center, Beirut, Lebanon

## ARTICLE INFO

## Article history:

Received 2 September 2015

Received in revised form

28 September 2015

Accepted 27 October 2015

Available online 10 November 2015

## Keywords:

total knee arthroplasty

anemia

cardiac arrest

death

myocardial infarction

perioperative care

## ABSTRACT

**Background:** The purpose of this study is to assess whether an association exists between preoperative anemia and postoperative cardiac events or death in patients undergoing unilateral primary total knee arthroplasty (TKA) with no prior cardiac history.

**Methods:** Data from the 2008–2012 American College of Surgeons National Surgical Quality Improvement Program database were analyzed. Patients aged  $\geq 18$  years undergoing unilateral primary TKA were included. We divided the patients into 4 groups: no anemia, any anemia, mild anemia, and moderate-severe anemia. Associations between anemia and different characteristics as well as cardiac outcomes and death were studied, after adjusting for all potential confounders.

**Results:** In the nonanemic group, the occurrence of myocardial infarction, cardiac arrest, and death were 61 of 34,661 (0.18%), 23 of 34,661 (0.07%), and 30 of 34,661 (0.09%), respectively. The numbers in the anemia group were 23 of 6673 (0.34%), 9 of 6673 (0.13%), and 14 of 6673 (0.21%). These were not statistically different. The anemic group had higher odds for respiratory and renal morbidities and for receiving transfusions.

**Conclusion:** We found no association between preoperative anemia or its severity and myocardial infarction, cardiac arrest, or death up to 30 days postoperatively. This could potentially lower the bar for safe preoperative hematocrit levels for elective TKA, theoretically increasing the percentage of anemic patients undergoing the procedure. This, however, is at the expense of potential respiratory and renal insults.

© 2016 Elsevier Inc. All rights reserved.

Total joint arthroplasty has been increasingly performed over the past 3 decades owing to its symptomatic relief and significant improvement in quality of life [1]. An exponential increase in the number of these procedures is anticipated in light of an aging population and the natural history of osteoarthritis [2]. Total knee arthroplasty (TKA) rates vary among peoples and socioeconomic

status with an overall incidence of 8.7 per 1000 [3], anemia being prevalent preoperatively in around 24% of those undergoing the procedure [4]. As the cutoff values for transfusion have been already established (7g/dL for noncardiac patients) [5], current practice is to avoid lower hemoglobin (Hb) values postoperatively as anemia has been associated with diminished functional recovery after joint arthroplasty [6]. Furthermore, the literature describes anemia as an independent risk factor for morbidity and mortality, affecting the rates of allogenic blood transfusions [7–11] and acting as an independent risk factor for cardiovascular morbidity in the general population [12,13]. Consequently, orthopedic surgeons tend to defer operating on anemic patients especially since TKA is generally elective.

Few studies in the literature dwell on this topic. Mantilla et al. [14] determined that preoperative anemia is not a dominant risk

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to <http://dx.doi.org/10.1016/j.arth.2015.10.035>.

\* Reprint requests: Muhyeddine Al-Taki, MD, FACS, Division of Orthopaedic Surgery, Department of Surgery, American University of Beirut Medical Center, Cairo Street, P.O. Box: Riad El-Solh 1107 2020, Beirut, Lebanon.

<http://dx.doi.org/10.1016/j.arth.2015.10.035>

0883-5403/© 2016 Elsevier Inc. All rights reserved.

factor for myocardial infarction (MI) and death 30 days after total hip or knee arthroplasty. Carson et al. [15] showed that liberal transfusion as opposed to a restrictive strategy did not reduce mortality or the occurrence of MI in hip surgery. However, to the best of our knowledge, there have not been any studies published on this topic concerning patients with no cardiac history.

The aim of this study is to reveal whether an association exists between preoperative anemia and postoperative cardiac events or death in patients with no prior cardiac history undergoing unilateral primary TKA. As we expect the percentage of anemic patients undergoing TKA to be far less than 24% [4], understanding the effects of preoperative anemia in these patients may assist with risk stratification and decrease the threshold for operation.

## Materials and Methods

### Study Design

Data from the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) database were analyzed. It includes over 240 variables collected on surgical patients from various centers worldwide and has information on 30-day morbidity and mortality along with other various demographics. Specially trained personnel at every collaborated institution collect medical information and log it into the deidentified databank [16]. For this study, the 2008 through 2012 databases were used and included approximately 2 million patients. In accordance with our institutional guidelines (which follow the US Code of Federal Regulations for the Protection of Human Subjects), institutional review board approval was not needed or sought because data were collected as part of a quality assurance activity and are deidentified. Inclusion criteria were set as patients aged  $\geq 18$  years undergoing unilateral primary TKA, current procedural terminology code 27447. Patients undergoing revisions or simultaneous bilateral surgeries were not included as they would have different or duplicate current procedural terminology codes. Patients were also excluded if they had history of MI, cardiac surgery or procedure, angina, dyspnea, congestive heart failure or if they were transfused within 72 hours preoperatively. This study design generated 41,334 patients for analysis.

### Preoperative Anemia

Anemia was defined according to the 2011 World Health Organization criteria [17]. Normal Hb concentration is described as  $>130$  g/L for males or  $120$  g/L for nonpregnant females. Mild anemia is described as  $110 < \text{Hb} < 129$  for males and  $110 < \text{Hb} < 119$  for nonpregnant females, whereas moderate anemia as  $80 < \text{Hb} < 109$  and severe anemia as  $\text{Hb} < 80$ . We observed no instances of pregnant females in our population; hence, their anemia cutoffs were not relevant. The ACS-NSQIP database contained only hematocrit (Hct) values, so Hb was converted to Hct using the equation  $\text{Hb} = 0.334 \times \text{Hct}$ , as is generally accepted and defined by Nijboer et al [18] study on paired Hct and Hb values. The no-anemia group had 34,661 subjects, whereas the anemia group had 6,673. They were further subdivided into mild anemia ( $N = 5,172$ ) and moderate-severe anemia ( $N = 1,501$ ).

### Outcomes

Cardiac events were defined as MI and/or cardiac arrest up to 30 days postoperatively. MI, as described by the NSQIP database, was defined on an electrocardiogram as an ST segment elevation of  $>1$  mm in 2 or more contiguous leads, new left bundle branch block, new Q wave in 2 or more contiguous leads, elevation of troponin

levels 3 times above the reference range, or a physician's diagnosis of MI, occurring intraoperatively and up to 30 days postoperatively.

Cardiac arrest was established as an absence of cardiac rhythm or the presence of a chaotic rhythm (ventricular tachycardia, ventricular fibrillation, pulseless electrical activity) resulting in cardiac arrest requiring cardiopulmonary resuscitation, occurring intraoperatively and up to 30 days postoperatively [16].

Other morbidities assessed in our study were wound, respiratory, urinary, central nervous system (CNS), thromboembolism, sepsis, transfusion requirement, and return to the operating room. Composite morbidity included cardiac, wound, respiratory, urinary, CNS, thromboembolism, and sepsis. Full details of these morbidities are included in Table 1.

### Statistical Analysis

Descriptive statistics were carried out by calculating the number and percent for categorical variables, whereas the mean and standard deviation were calculated for continuous variables. Associations between the exposure (anemia) and the different characteristics and outcomes were assessed using the chi-square test, independent sample *t* test, or analysis of variance, as appropriate.

To control for potentially confounding effects of patients' characteristics when assessing the association between anemia and outcomes, we carried out multivariate logistic regression analyses. Variables considered as confounders were demographics or medical histories believed to be of clinical relevance. These included gender, age, body mass index, diabetes mellitus, smoking, history of severe chronic obstructive pulmonary disease, alcohol intake in the previous 2 weeks, ascites within 30 days, esophageal varices, hypertension requiring medications, gangrene, peripheral vascular disease, acute renal failure, current dialysis, transient ischemic attack, previous cerebrovascular accident, paraplegia, quadriplegia, hemiplegia, impaired sensorium in the previous 48 hours, CNS tumor, disseminated cancer, open wound, surgical wound class, steroid use, bleeding disorders, chemotherapy, radiotherapy,  $>10\%$  weight loss in the previous 6 months, systemic sepsis within 48 hours, prior operation within 30 days, high creatinine ( $>106.08$

**Table 1**  
Definition of Morbidities.

Morbidity	Definition
Cardiac	Myocardial infarction Cardiac arrest
Wound	Wound surgical site infection Organ surgical site infection Wound dehiscence
Respiratory	Pneumonia Reintubation Failed weaning
Urinary	Renal failure Renal insufficiency
CNS	Coma Neurological deficit Cerebrovascular accident
Thromboembolism	Pulmonary embolus Deep vein thrombosis
Sepsis	Sepsis Shock
Transfusion requirement	Transfusion of $\geq 1$ units of pRBCs during the procedure and up to 72 h afterward
Return to operating room	Return to the operating room within 30 d for any major surgical procedure
Composite morbidity	Cardiac, wound, respiratory, urinary, CNS, thromboembolism, sepsis

pRBCs, packed red blood cells.

Download English Version:

<https://daneshyari.com/en/article/4060068>

Download Persian Version:

<https://daneshyari.com/article/4060068>

[Daneshyari.com](https://daneshyari.com)