

# Acute Blood Loss Anemia in the Octogenarian Total Knee Arthroplasty, Estimated Blood Loss and Transfusions Rates

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**Financial disclosure:** The authors above do not have any financial gain, conflicting interest, or commercial agreements or interest related to the publication to this manuscript.

**Introduction:** Acute blood loss anemia is an expected morbidity after a total knee replacement. The purpose of this study is to quantify the rates of blood transfusions in the octogenarian population after a total knee replacement and its association with the surgeon's estimated blood loss (EBL).

**Methods:** This is a retrospective review of the senior orthopedic surgeon's charts. All patients were 80 years of age, or older at the time of surgical intervention. All patients with the diagnosis of primary osteoarthritis were included.

**Results:** A total 74 total knee arthroplasties were considered, in a total of 64 patients. Overall, 53% patients had an uneventful stay without a blood transfusion. The rates of transfusions increased with EBLs of 200, 250, and >250 ml with rates of 43%, 80%, and 55 % respectively. The average hematocrit of all patients that were transfused was 33.98, compared to 38.20 for the patients that were not transfused.

**Conclusion:** 47% of patients required a blood transfusion during their hospital course regardless of the EBL estimated by the surgeon during surgery. The average hematocrit was found to be lower in the group that was transfused.

**Publication Indices:** Pubmed

**Keywords:** Arthroplasty ■ Octogenarian ■ Blood Transfusion

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<http://dx.doi.org/10.1016/j.jnma.2015.12.011>

## INTRODUCTION

Acute blood loss anemia is an expected morbidity after a total knee replacement. Previous studies have considered tourniquets, surgical time, preoperative hemoglobin levels and other factors, that influence the rates of blood transfusions after a total joint arthroplasty.<sup>1,6,7,14-16</sup> Blood transfusions are vital to the hospital course of these patients, especially in the elder population. A blood transfusion can further extend a patient's hospital stay and delay participation in physical therapy. At the same time, it remedies acute blood loss anemia and provides hemodynamic stability in this patient population. To our knowledge no research paper has looked at estimated blood loss (EBL) alone and its association with

blood transfusion rates in the octogenarian population after a total knee arthroplasty. The purpose of this study is to quantify the rates of blood transfusions in the octogenarian population after a total knee replacement and its association with the surgeon's EBL.

## METHODS AND MATERIALS

Data for this study was obtained through the retrospective review of the senior orthopedic surgeon's charts in private practice. IRB was not applicable because the research involved the collection and study of existing data and documents. In addition, the information was recorded by the investigator in such a manner that subjects cannot be identified directly, or through identifiers linked to the subjects. All patients were 80 years of age or older at the time of surgical intervention. The operative report and discharge summaries were used as the primary source of information for all consecutive total knee arthroplasties in patients that met the age inclusion criteria. All patients with the diagnosis of primary osteoarthritis were included. Secondary arthritis, previous major surgical interventions, such as high tibia osteotomy and fractures were excluded. All surgical interventions were performed between 1994 and 2011. There was a total of 156 patients, who met the criteria of age 80 and above at the time surgery. However only 64 patients were included. Patients whose clinical charts were incomplete were excluded from the study.

All but one patient had a tourniquet applied during the surgical procedure. The senior orthopedic surgeon's protocol included the release of the tourniquet and establishing hemeostasis during the procedure prior to closing the incision. This was consistent throughout all the cases. The use of drain was determined intra-operatively. All patients received postoperative deep vein thrombosis prophylaxis enoxaparin, or warfarin for patients with renal impairment.

Postoperative CBC's were obtained in the post-anesthesia care unit, postoperative day 1, 2, and 3 if the patient remained in the hospital. The hematocrit level was used in combination with the signs including vitals, orthostatic

hypotension, and symptoms such as headaches, dizziness, weakness and preoperative co-morbidities such as heart disease to determine transfusion.

## RESULTS

A total 74 total knee arthroplasties were considered in a total of 64 patients. The majority of patients were female. There were 56 females and 8 males. Five patients underwent sequential bilateral total knee arthroplasty under one anesthesia setting and another five patients returned at a later date for a contralateral knee arthroplasty. The age ranged from 80 to 93 years of age with an average age 84 years old. The average EBL was 186 milliliters (ml) for each patient having a single joint replacement under one anesthesia setting. This cohort included one patient, whose knee replacement was performed without tourniquet due to a prior history of a femoral popliteal vascular surgical bypass. His EBL was 500 ml. Patients with bilateral knee replacements under one anesthesia setting had EBL that averaged 350 ml, with one patient EBL recorded as minimal.

Most patients had minimal blood loss with their surgery. The second most recorded EBL was found to be 100 ml. Fourteen patients had an EBL of 250 ml or greater, four of which had sequential bilateral knee arthroplasty. A single patient had an EBL of 30 ml and another patient had an EBL of 50 ml.

Overall, 53% patients had an uneventful stay without a blood transfusion during their hospital course. Meanwhile, 47% were transfused. All patients who had sequential bilateral total knee arthroplasty under one setting were transfused during their hospital course (See [Figure 1](#)).

In the study, 33% of patients had a surgical EBL recorded as minimal. Moreover, 38% out of these patients with minimal blood loss were transfused. As single patient had an EBL of 30 ml, while another patient loss 50 ml, the latter received a blood transfusion.

There were thirteen patients whose EBL was recorded as of 100 ml, 46% of these were transfused. Furthermore, 25% of the patients, who's EBL was noted to be 150 ml were transfused. The rates of transfusions increased with EBL's of 200, 250, and >250 ml with rates of 43%, 80%, and 55 % respectively. In total, eleven patients had a drain placed during the procedure. Of these, 64% of the patients were transfused during their hospital course.

Current literature supports pre-operative hematocrit and hemoglobin levels as one the most important factors determining likelihood of blood a transfusion after a major joint replacement.<sup>15,16</sup> In this study, pre-operative hematocrit ranged from 26.4 to 45.0. When grouped together, the average hematocrit of all patients that were transfused was 33.98, compared to 38.20 for the patients that were not transfused. Conversely, the average hematocrit for the patients that underwent sequential bilateral total knee replacement was 39.7. However, they were all transfused.

## DISCUSSION

The elder population is one of the fastest growing populations in the US. In addition, the world's population aged 80 and over is projected to increase 233 percent over the next 30 years.<sup>2,5</sup> Hence, quality of life of this elder population has become extremely important. Total knee arthroplasty have been proven to be a safe and cost effective surgical option in patients limited by the pain and sequela of primary osteoarthritis.<sup>3,4</sup> As the number of patients requiring joint replacement increases, studying all factors that affect these patients' hospital course and delivering the most cost effective treatment is extremely important. Among these factors, acute blood anemia and its management remain at the pinnacle in this group. Octogenarians are at higher risk for major cardiac complications that can be exacerbated by acute blood anemia.<sup>8</sup> Intra-operative tourniquets, pre-operative donation, auto transfusion, and cell savers are among the tools that the orthopedic community has used to address these complications. However the effectiveness and cost analysis of some of these methods remain a topic of debate. The latest studies support the use of Tranexamic acid (TXA) in the modern total knee arthroplasty. Intravenous and more recently topical TXA has been shown to be effective in reducing blood loss and the need for transfusion after joint replacement.<sup>18-21</sup>

**Figure 1.** Estimated Blood Loss Transfusion Rates.

Estimated Blood Loss	Patients Transfused	Percentage of Patients Transfuse
Minimal	8/21	38%
100	6/13	46%
150	3/12	25%
200	3/7	43%
250*	4/5	80%
>250*	5/9	55%

*Patients with sequential bilateral total knee replacements were included.*

*Table does not include a patient who had an ebl of 30 ml, and another patient who had an ebl of 50 ml, the latter which was transfused.*

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