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Letters to the Editors

Response to Letter to the Editor: Acute Kidney Injury After First-Stage Joint Revision for Infection: Risk Factors and the Impact of Antibiotic Dosing

In Reply:

We thank the authors for their response to our article. Although we acknowledge that there are many other risk factors that may contribute to acute kidney injury (AKI), we believe that our study contributes to the growing body of knowledge of potential complications associated with performing 2-stage exchange arthroplasty for the treatment of periprosthetic joint infection (PJI). In this study, we evaluated common risk factors and potentially modifiable factors that may be addressed prior to or during the first-stage spacer placement for PJI treatment. Thus, although it would be ideal to evaluate every possible risk factor associated with AKI, this study still provides valuable information that orthopedic surgeons can use when treating PJI patients undergoing 2-stage exchange arthroplasty.

The authors note that preoperative medications were not included in the multivariable logistic regression analysis. In our study, we evaluated comorbidities such as chronic hypertension, diabetes mellitus, chronic kidney disease, and cardiovascular disease, which are very prevalent in the total joint arthroplasty patient population. It is assumed that patients who are taking perioperative angiotensin receptor blockers or angiotensin-converting enzyme inhibitors are on these medications to treat the comorbidities that we evaluated. Thus, we indirectly determined that these preoperative medications are most likely risk factors for developing postoperative AKI based on the comorbidities studied. Future studies evaluating the risk of developing AKI by investigating these specific medications could be performed to validate this.

The authors also indicated that AKI is associated with postoperative anemia and stated that we did not take postoperative hemoglobin levels into consideration. However, we found that hemoglobin drop (the difference between preoperative and postoperative hemoglobin levels) was an independent predictor of AKI (Table 5). Thus, the findings from our study corroborate with other studies in the literature, and orthopedic surgeons should be cognizant of minimizing blood loss during the first-stage surgery by utilizing meticulous surgical dissection, electrocautery, and medications such as tranexamic acid.

Finally, we acknowledge that data about blood transfusions and hypotension requiring administration of vasopressors would greatly enhance the analysis of the study. Of note, there were no cases of sepsis or acute myocardial infarction in our study population during the first 48 hours of the hospital stay where we assessed AKI in patients. It is imperative to conduct further studies on this topic to highlight that performing 2-stage exchange arthroplasty in PJI patients is not benign and that associated complications, such as AKI, may have significant consequences.

Jeffrey A. Geller, MD
Gregory J. Cunn, MD
Thomas A. Herschmiller, MD
Taylor S. Murtaugh, MD
Center for Hip and Knee Replacement
Department of Orthopaedic Surgery
New York-Presbyterian at Columbia University Medical Center
New York, NY

Antonia F. Chen, MD, MBA*
Department of Orthopaedic Surgery
Brigham and Women's Hospital
Harvard Medical School
Boston, MA

*Reprint requests: Antonia F. Chen, MD, MBA, Department of Orthopaedic Surgery, Brigham and Women's Hospital, Harvard Medical School, Boston, MA.

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Letter to the Editor on "Choices, Compromises, and Controversies in Total Knee and Total Hip Arthroplasty Modifiable Risk Factors: What You Need to Know"

To the Editor:

The review article "Choices, Compromises, and Controversies in Total Knee and Total Hip Arthroplasty Modifiable Risk Factors: What You Need to Know" by Edwards et al [1] was an excellent summary of 10 modifiable factors that potentially improve outcomes and reduce complications. Unfortunately, the authors did

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not include another important modifiable factor, bone health. Poor bone health can be addressed preoperatively and is associated with increased risk of intraoperative and postoperative complications such as subsidence and fracture.

Osteoporosis is common in the older adults undergoing arthroplasty and likely contributes to the increasing incidence of periprosthetic fracture, reported to be 0.3%-5.5% after primary total joint arthroplasty and as high as 30% after revision arthroplasty [2,3]. Rates of aseptic loosening, which is the second most common cause of revision after total hip arthroplasty (THA) and total knee arthroplasty (TKA), may also be increased in osteoporosis [4,5]. Osteoporosis has been associated with increased subsidence after cementless THA and may affect component positioning in computer-navigated TKA [6,7]. Furthermore, many surgeons believe that osteoporosis is an important factor when planning surgery such as THA. For example, at the 2018 American Orthopedic Association Annual Meeting, 75% of orthopedic surgeons reported that they consider osteoporosis when deciding surgical technique, while at the same time only 5% actually measure bone density [8]. A report of European Surgeons is similar [9].

Failure to consider bone health and measure bone density or correct Vitamin D deficiency is widespread, a situation described as a "crisis" in osteoporosis care [10]. Indeed, the most recent data find less than 5% of hip fracture patients receive medications to reduce risk of subsequent fracture despite clear documentation of efficacy [11]. Some of this failure to prevent subsequent fracture is based on patient reluctance to receive medications, but substantial blame rests with the medical community for failure to evaluate and recommend therapy. Similar failure should not occur before arthroplasty surgery.

Indeed, the American Orthopedic Association's Own the Bone quality improvement program recommends secondary fracture prevention after fragility fracture but more recently has developed recommendations for bone heath optimization before orthopedic surgery [8]. Specifically, at the time of scheduling surgery, all patients are suggested to supplement with vitamin D_3 2000-5000 IU and calcium 1200 mg daily. Using evidence-based bone mineral density measurement guidelines, patients aged 50+ undergoing surgery are assessed for risk factors and, when indicated (Table 1), a dual X-ray absorptiometry is performed. Those patients with osteoporotic bone mineral density based on the World Health Organization criteria (T-score ≤ -2.5) or with high 10-year fracture risk assessment tool-estimated fracture risk (hip $\geq$3%, major fracture $\geq$20%) are referred for further bone health optimization which is often performed by fracture liaison service personnel. At that time, assessment for secondary causes of osteoporosis is performed. If pharmaceutical medications are indicated, they may be initiated before surgery following consultation with the orthopedic surgeon and/or a metabolic bone disease specialist. Pharmaceutical treatment includes antiresorptive agents (eg, bisphosphonates and denosumab) and anabolic agents (teriparatide and abaloparatide). When medical treatment is indicated preoperatively, the authors usually recommend use of anabolic agents based upon limited data demonstrating superiority in fracture risk reduction combined with such therapy being intuitively logical in the setting of orthopedic procedures. The optimal duration of such treatment before surgery is unknown although bone formation is stimulated within 1 month and mechanical effects on bone strength occur rapidly. An additional consideration is assessing fall history, and, if indicated, preoperative physical therapy is recommended to optimize strength and balance.

Table 1
Indications for DXA in Patients Aged 50 Years and Older.

Women >65 y
Men >70 y
Inflammatory arthritis
Glucocorticoid use (>5 mg prednisone)
Diabetes mellitus
History of fracture after age 50 y
Greater than 9.3% risk of major fracture based on fracture risk assessment tool (FRAX)

DXA, dual X-ray absorptiometry.

In summary, we concur with the recommendations by Edwards et al regarding correcting modifiable factors before surgery, but also urge all arthroplasty surgeons to consider bone health and, when appropriate, initiate diagnostic and treatment protocols before surgery.

Paul A. Anderson, MD*
James T. Bernatz, MD
Department of Orthopedics Surgery and Rehabilitation
University of Wisconsin UWMF Centennial Building
Madison, WI

Neil C. Binkley, MD
University of Wisconsin Osteoporosis Clinical Research Program
Madison, WI

Robert D. Blank, MD, PhD
Department of Endocrinology, Metabolism, and Clinical Nutrition
Medical College of Wisconsin
Milwaukee, WI

*Reprint requests: Paul A. Anderson, MD, Department of Orthopedics Surgery and Rehabilitation, University of Wisconsin UWMF Centennial Building, 1685 Highland Ave, 6th floor, Madison, WI 53705-2281.

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Response to Letter to the Editor on "Choices, Compromises, and Controversies in Total Knee and Total Hip Arthroplasty Modifiable Risk Factors: What You Need to Know"

In Reply:

We appreciate the insights provided by Dr. Anderson and his colleagues in their "letter to the editor" regarding our review of modifiable risk factors to consider before pursuing elective total joint arthroplasty (TJA). The authors present some very cogent arguments for considering overall patient bone health as a modifiable risk factor before proceeding with TJA. Metabolic bone quality is important when considering surgical candidacy and implants and has been largely ignored by joint arthroplasty surgeons.

Despite the success and utility of the "Own the Bone" initiative, there is not enough information currently to guide preoperative bone density thresholds for joint arthroplasty. The authors even explicitly state "the optimal duration of such treatment prior to surgery is unknown," which makes it difficult for the surgical team to determine when meaningful enhancement of bone quality is achieved. The authors recommend bone density screening in all patients over age 50 years. However, current recommendations from the National Osteoporosis Foundation include screening of women older than 65 years and men older than 70 years.

Questions arise in terms of quality of life trade-offs in delaying surgery for an indeterminate amount of time to undergo expensive pharmaceutical supplementation as well the additional medical costs associated with delaying surgery [1]. Although vitamin D repletion may potentially improve infection rates and can be accomplished in a matter of weeks to months, delaying joint arthroplasty to allow for a quantitative improvement of bone mineral density would seem fraught with difficulty. Furthermore, there is a paucity of data correlating poorer patient-reported outcomes and component survivorship based solely on preoperative bone quality. Detection of osteoporosis may make a surgeon more likely to use a cemented femoral stem for hip arthroplasty but probably does not make much difference in technique of knee replacement. It should be noted that other institutions that utilize optimization protocol calculators currently do not endorse metabolic bone quality variables (e.g. vitamin D, calcium, and dual energy x-ray absorptiometry scores) when risk-stratifying patients [2]. The reasons are likely twofold: one, because of the lack of data guiding threshold levels that dictate surgical outcomes, and two, because metabolic bone health usually improve when other variables are addressed, such as smoking cessation, glycemic control, and anemia correction.

The authors also mentioned considering preoperative physical therapy, but we do not believe this is cost-effective in the current climate of value-based care. Kwok et al [3] performed a systemic review of the available literature and discovered little support for "prehabilitation" in preparation for a scheduled total knee arthroplasty. In addition to this study, the American Academy of Orthopedic Surgeons evidence-based guidelines recommend that there is limited evidence supporting the fact that supervised exercise before total knee arthroplasty improves pain and physical function after surgery [4]. However, it is important to note that this does not replace the prior recommendation from the American Academy of Orthopedic Surgeons Clinical Practice Guideline on treatment for knee osteoarthritis that strongly supports that patients with symptomatic osteoarthritis of the knee participate in self-management programs, strengthening, low-impact aerobic exercises, and neuromuscular education and engage in physical activities consistent with national guidelines.

Even with the lack of compelling data specifically correlating bone health to TJA outcomes, we agree with the reviewers that bone health is an underappreciated variable that warrants consideration during the surgical planning process. At this time, however, we would temper the recommendation for all patients to undergo testing and treatment unless certain risk factors are present or until future prospective studies can demonstrate improved outcomes when specific vitamin D, calcium, and bone density thresholds are achieved.

Paul K. Edwards, MD*
Simon C. Mears, MD, PhD
Jeffrey B. Stambough, MD
Sara E. Foster, PA-C
C. Lowry Barnes, MD
Department of Orthopaedic Surgery
University of Arkansas for Medical Sciences
Little Rock, AR

*Reprint requests: Paul K. Edwards, MD, Department of Orthopaedic Surgery, University of Arkansas for Medical Sciences, 4301 West Markham Street, Slot 531, Little Rock, AR 72205.

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Letter to the Editor on "When Should Complete Blood Count Tests Be Performed in Primary Total Hip Arthroplasty Patients?"

To the Editor:

I read with interest the article on complete blood count after elective primary total hip arthroplasty [1], and would like to

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