

## Format for ANSWERING REVIEWERS

June 15, 2015

Dear Editor,



Please find enclosed the edited manuscript in Word format (file name: 17363-review.doc).

**Title:** Isolated sacral injuries: Postoperative length of stay, complications, and readmission

**Author:** Vasanth Sathiyakumar, Hanyuan Shi, Rachel V Thakore, Young M Lee, David Joyce, Jesse Ehrenfeld, William T Obrebsky, Manish K Sethi

**Name of Journal:** *World Journal of Orthopedics*

**ESPS Manuscript NO:** 17363

The manuscript has been improved according to the suggestions of reviewers:

**Reviewer No. 3069337**

Well done! good topic, clear statement, detailed MM and complications, discussion representing all aspects.

Thank you so much for your comments.

**Reviewer No. 2705522**

Very well conducted study and a well written manuscript with well documented results to convince your conclusions

Thank you for taking the time to review our paper.

**Reviewer No. 1200726**

The authors investigated differences in postoperative length of stay, complication rates, and 90-day readmission rates for patients with operative isolated sacral fractures. ORIF had a higher complication rate (19.4%) compared to percutaneous fixation (6.3%). There were no significant differences in the number of clinic or ER visits, and length of stay (LOS) of readmission. This study demonstrated a significant difference in LOS between ORIF vs. percutaneous fixation of sacral injuries, with an average difference of \$13,590 based on difference in LOS. Did same surgeon perform ORIF and percutaneous fixation? If not so, the outcome might be different among the surgeons.

Thank you for these comments. The same surgeon did not operate on all patients in our cohort. We therefore expanded on this issue in our Limitation section as follows (Lines 234-236): "In addition, hospital legal procedures, insurance status, and the variations in surgeon-specific complication and readmission rates may affect

discharge planning, LOS, and ultimately total cost."

**Reviewer No. 2837723**

The authors present a retrospective review of sacral fractures treated operatively with either open reduction internal fixation (ORIF) versus percutaneous fixation (perc). In their studies, the authors found a significant difference in length of stay which they then correlated to a difference in inpatient hospital costs. They found a trend which was not statistically significant for lower complication rates in those treated with percutaneous fixation. The main issues which need to be addressed include time from admission until operative fixation. The authors mention that it is standard to sometimes delay operative fixation for the ORIF group, but they do not quantify that in their patient population. It makes inherent sense that those operated on in a more timely fashion will therefore have a shorter total length of stay. I think it is important for the authors to also look into the statistics and see if there was a difference only in time to operation or if there was also a difference in postop days in the hospital. Although mentioned in the weaknesses in the paper, the perc screw fixation group were younger and with a lower BMI. Although this did not reach statistical significance, it would be interesting to see a subgroup analysis of those with complications and see if there was a difference in the groups. Finally, the authors used a fixed model of cost based on an average cost per day of inpatient admission. They admit this is a flawed analysis and does not take into account other costs between the 2 groups (surgical costs, anesthetic costs, ancillary testing). It would strengthen the paper to further break down the costs between the 2 groups rather than relying solely on an average inpatient cost for unrelated diagnoses and treatments.

Thank you for these suggestions. Based on your comments, we did further break down costs into surgical, anesthesia, and ancillary tests. We found significant differences in costs related to anesthesia and surgery for the two groups, but not in ancillary tests. Subsequently, the total costs when adding these three categories together significantly differed between the two groups. We addressed this first in the methods section as follows (Lines 110-113):

The average cost per inpatient day (\$4,530/day) as well as all costs associated with anesthesia, surgery, and ancillary support (i.e. postoperative lab tests, radiography, consults, etc.) was obtained from the institution's patient financial services department.

We then explained these results by amending Table II and expanding the Results section of the manuscript as follows (Lines 134-138):

Furthermore, when breaking down total costs for the patients based on operative approach, anesthesia costs were on average \$1,769 more for ORIF patients compared to percutaneous patients ( $p=0.001$ ), and surgical costs were on average \$4,401 more for ORIF patients ( $p<0.001$ ). Ancillary costs were statistically similar between the groups.

We finally added to our Discussion section when we discuss value-based care (Lines 211-213):

Our results have even demonstrated lower costs associated with anesthesia and surgery for percutaneous patients, highlighting the added value of a percutaneous approach.

We subsequently conducted sub-group analyses for ORIF patients and percutaneous patients by comparing demographics (i.e. age and BMI) for those who sustained complications compared to those who did not. We found no significant differences in terms of age and BMI in each group (ORIF and percutaneous) when comparing those who sustained complications to those who did not. We addressed this in the Results section as follows (Lines 151-153):

When comparing those who sustained complications to those who did not in the ORIF and percutaneous groups, there were no significant differences with respect to age or BMI.

Finally, we did not find a significant difference in the amount of time from admission to discharge (ORIF: 2.4 days vs. percutaneous: 1.5 days,  $p=0.062$ ), but did find a difference in the time from surgery to discharge (ORIF: 6.6 days vs. percutaneous: 4.6 days,  $p=0.045$ ). We reflected this in Table II as well as in the Results as follows (Lines 130-132):

There was no significant difference in the amount of time from admission to surgery for both groups, but ORIF patients stayed significantly longer after surgery (6.6 days) compared to percutaneous patients (4.6 days,  $p=0.045$ ).

We also referred to this in the Discussion as follows (Lines 223-226):

In our study, there was no difference in time to surgery once patients were admitted, but ORIF patients did stay significantly longer after surgery, perhaps highlighting more extensive recovery following an open approach.

## Response to editors

**When you send back, please provide the format of doc, not the pdf. Thank you! Please highlight the changes made to the manuscript according to the peer-reviewers' comments.**

Thank you for this comment. We have attached the Word document (.doc format), with changes highlighted in red addressing the comments below.

**Please provide the institutional review board statement, institutional animal care and**

use committee statement, animal care and use statement, biostatistics, conflict-of-interest statement, data sharing statement files.

Thank you for these suggestions. We have included these statements as follows:

IRB approval: This retrospective study was approved by the Vanderbilt Institutional Review Board, with all data from human subjects appropriately reviewed.

Conflicts of Interest and Sources of Funding: Author William Obrebskey has previously consulted for biometrics and done expert testimony in legal matters. The institution of WTO has received a grant from the Department of Defense. For the remaining authors none were declared.

Compliance with Ethical Standards: This study was authorized by the local ethical committee (Vanderbilt IRB) with a waiver of informed consent and was performed in accordance with the Ethical standards of the 1964 Declaration of Helsinki as revised in 2000. All procedures were in accordance with the ethical standards of the institutional and/or national research committee

Author contributions: Sathiyakumar V, Sethi MK, Joyce D, and Obrebskey WT designed research; Sathiyakumar V, Thakore RV, Shi H performed research; Sethi MK, Obrebskey WT contributed analytic tools; Sathiyakumar V and Ehrenfeld JM analyzed data; Sathiyakumar V, Shi H, and Thakore RV wrote the paper.

Animal care and use: This retrospective study did not involve the use of animals.

Data-sharing: Dataset is available upon request.

**Author contributions:** XXX (family name should be put first in full, followed by middle names and first name in abbreviation with first letter in capital) designed research; XXX performed research; XXX contributed new reagents or analytic tools; XXX analyzed data; XXX wrote the paper. An author may list more than one contribution, and more than one author may have contributed to the same aspect.

Thank you for these instructions. We have fixed our author contributions to reflect these guidelines as follows:

Sathiyakumar V, Sethi MK, Joyce D, and Obrebskey WT designed research; Sathiyakumar V, Thakore RV, Shi H performed research; Sethi MK, Obrebskey WT contributed analytic tools; Sathiyakumar V and Ehrenfeld JM analyzed data; Sathiyakumar V, Shi H, and Thakore RV wrote the paper.

**Abstract (Abstracts for original contributions should be structured into the following**

sections.

**AIM (no more than 20 words):** Only the purpose should be included. Please write the aim as the form of To investigate/study/...

**METHODS(no less than 140 words)**

**RESULTS (no less than 150 words):** You should present P values where appropriate and must provide relevant data to illustrate how they were obtained, e.g.  $6.92 \pm 3.86$  vs  $3.61 \pm 1.67$ ,  $P < 0.001$ ;

**CONCLUSION (no more than 26 words)**

Thank you for these instructions. We have re-formatted our abstract to these specifications as follows:

**AIM:** To investigate inpatient length of stay, complication rates, and readmission rates for sacral fracture patients based on operative approach

**METHODS:** All patients who presented to a large tertiary care center with isolated sacral fractures in an 11 year period were included in a retrospective chart review. Operative approach (open reduction internal fixation vs. percutaneous) was noted, as well as age, gender, race, and ASA score. Complications included infection, nonunion and malunion, deep venous thrombosis, and hardware problems; 90-day readmissions were broken down into infection, surgical revision of the sacral fracture, and medical complications. Length of stay was collected for the initial admission and readmission visits if applicable. Fisher's exact and non-parametric t-tests (Mann-Whitney U tests) were employed to compare length of stay, complications, and readmissions between open and percutaneous approaches.

**RESULTS:** 94 patients with isolated sacral fractures were identified: 31 (30.4%) who underwent ORIF vs 63 (67.0%) who underwent percutaneous fixation. There was a significant difference in LOS based on operative approach: 9.09 days for ORIF patients vs. 6.05 days for percutaneous patients ( $p=0.043$ ), amounting to a difference in cost of \$13,590. 10 patients in the study developed complications, with no significant difference in complication rates between the two groups (19.4% for ORIF patients vs. 6.3% for percutaneous patients). 8 patients were readmitted, with no significant difference in readmission rates between the two groups (9.5% percutaneous vs. 6.5% ORIF).

**CONCLUSION:** There is a significant difference in LOS based on operative approach for sacral fracture patients. Given similar complications and readmission rates, we recommend a percutaneous approach.

**Key words: ?**

Thank you for pointing this out. Our key words include:

sacral fractures, ORIF, percutaneous, complications, readmissions, length of stay

### **Core tip: ?**

Thank you for bringing this to our attention. Our final core tip is as follows:

Few studies in orthopaedics have investigated complication rates, readmission rates, and length of stay differences with respect to surgical approach for patients with sacral fractures. Investigating these issues in an era of rising healthcare costs will help determine cost-effective care. We reviewed patients presenting with isolated sacral fractures at a large, level-I trauma center, and found those treated with open reduction internal fixation stayed nearly 3 days longer compared to patients treated with percutaneous approaches. With similar complication and readmission rates between the two groups, we recommend a percutaneous approach to help lower total hospital costs for more value-based practice.

In order to attract readers to read your full-text article, we request that the first author make an audio file describing your final core tip. This audio file will be published online, along with your article. Please submit audio files according to the following specifications:

Acceptable file formats: .mp3, .wav, or .aiff

Maximum file size: 10 MB

To achieve the best quality, when saving audio files as an mp3, use a setting of 256 kbps or higher for stereo or 128 kbps or higher for mono. Sampling rate should be either 44.1 kHz or 48 kHz. Bit rate should be either 16 or 24 bit. To avoid audible clipping noise, please make sure that audio levels do not exceed 0 dBFS.

Thank you for these instructions. We have recorded our final core tip based on the above specifications.

### **Comments**

#### **(1) Background**

To summarize concisely and accurately the relevant background information so that readers may gain some basic knowledge about your study's relevance and understand its significance for the field as a whole.

#### **2) Research frontiers**

To introduce briefly the current hotspots or important areas in the research field as related to your study.

#### **(3) Innovations and breakthroughs**

To summarize and emphasize the differences, particularly the advances, achievements, innovations and breakthroughs, as compared to other related or similar studies in the literature, which will allow the readers to assimilate the major points of your article. (4)

#### **Applications**

To summarize the practical applications of your research findings, so that readers may understand the perspectives by which this study will affect the field and future research.

#### **(5) Terminology**

To describe concisely and accurately any terms that may not be familiar to the majority of the readers, but which are essential for understanding your article.

## **(6) Peer review**

**To provide the major comments from your peer reviewers that most represent the characteristics, values and significance of your article, and to allow the readers to have an objective point of view regarding your article and research findings.**

Thank you for these instructions. We have formatted our comments following these guidelines as follows:

### **Background**

In an era with rising healthcare costs, avenues to reduce expenses must be explored including costs associated with length of stay, complications, and readmissions. Despite sacral fractures constituting a majority of all pelvic trauma, relatively little data exists exploring differences in these areas based on operative approach. The aim of this study is to investigate inpatient length of stay, complication rates, and readmission rates for sacral fracture patients based on surgical technique to determine the most cost-effective approach in treating these patients.

### **Research frontiers**

No study to date has investigated length of stay, complication, and readmission differences for patients sustaining sacral fracture based on operative approach

### **Innovations and breakthroughs**

Our study is the first of its kind to show a significant difference in length of stay for ORIF vs. percutaneous patients, with ORIF patients on average staying 3 more days in the hospital amounting to a cost of approximately \$14,000 more when compared to percutaneous patients.

### **Applications**

Given similar rates of complications and readmissions, yet an overall decreased length of stay and subsequent hospital-related costs when comparing percutaneous patients to ORIF patients, patients with sacral fractures should be treated with a percutaneous approach. Percutaneous approaches are common techniques now for most major orthopaedic fractures and can be implemented in any major hospital system, providing an avenue for benchmarking quality based on costs.

### **Terminology**

Open reduction internal fixation is a surgical approach used by orthopaedic surgeons in which a fracture is placed in normal, anatomic position with the aid of implants, often necessitating a large incision. Percutaneous fixation is another surgical approach used by orthopaedic surgeons in which a fracture is placed in a normal, anatomic position with pins or other stabilizing devices through the use of x-rays, thereby avoiding the need for large incisions.

### **Peer-review**

**Please add PubMed citation numbers and DOI citation to the reference list and list all authors. Please revise throughout. For those references that have not been indexed by**

**PubMed, a printed copy of the first page of the full reference should be submitted.  
PMID (<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=PubMed>)  
DOI (<http://www.crossref.org/SimpleTextQuery/>) (Please begin with DOI: 10.\*\*)**

Thank you for pointing this out. We have now formatted our references per these guidelines. We are also including the full manuscripts for References #7 and #18, which are not indexed in Pubmed.

**For the figures, decomposable figures are required. It means that the fonts and lines can be edited or moved. It can be made by ppt.**

Thank you for this suggestion. We have include the decomposable figures in a separate Powerpoint file.