Clinical and Economic Burden of Large Segmental Defects in Skeletal Long Bones

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1. Introduction

- Treatment of long segmental defects is challenging and associated with high risks of complications including nonunion, malunion, and infection[1]
- Treatments include vascularized bone grafts, distraction osteogenesis using external fixators and the induced membrane technique (Masquelet Technique)
- **Objective:** Evaluate the patient characteristics, clinical presentation, clinical outcomes, and costs of patients with large segmental defects in skeletal long bones

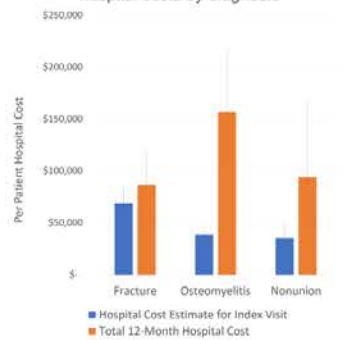
2. Methods

- Patients with osteomyelitis, nonunion, or open fractures treated with bone graft and/or spacers using Masquelet technique or external frames from 2015-2019 were identified from:
  - Premier Healthcare Database (PHD); and
  - IBM® MarketScan® Commercial & Medicaid Databases
- Risks of complications were estimated using logistic regression models
- Hospital and payer costs for index and follow-up periods were estimated using generalized linear models

3. Results

- 904 patients were identified from the PHD (414 fractures, 388 osteomyelitis, and 102 nonunion)
  - Significant variability in surgical operating room time (mean 484.7 minutes, median 266 minutes) and length of stay (mean 11.7 days, median 8 days) were observed
  - 12-month hospital costs ranged from $86,453-$156,818, with osteomyelitis patients being the costliest

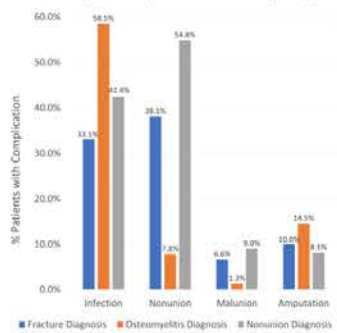
Figure 1: Per patient average hospital costs by diagnosis



3. Results (Cont.)

- 2,884 commercially insured patients
  317 fracture, 1,474 osteomyelitis, 203 nonunion
- 3,007 Medicaid insured patients
  245 fracture, 2,037 osteomyelitis, 198 nonunion
  - 2-year infection rates ranged from 33.1%-58.5% (osteomyelitis)
  - Amputation rates ranged from 10.0%-14.5% (osteomyelitis)
  - 1-year payments ranged from $118,421 to $262,179 for commercial insurance patients and from $68,804-$142,071 for Medicaid patients

Figure 2: Two-year complication rates by diagnosis



4. Discussion

- Patients treated for large segmental defects had high complication rates and costs, particularly patients with osteomyelitis
- Amputation was a concern for all patients, particularly patients with osteomyelitis, of whom 14.5% had amputation
- Comparisons of hospital costs vs. payments highlight the financial uncertainty facing hospitals providing care for affected patients
- Limitations are that claims data lack clinical variables and may have clerical inaccuracies and recording bias, and patients may overlap between the databases

5. Conclusion

- This study provides an accurate baseline understanding of costs and complications for this challenging patient population
  - Our findings identify the high unmet clinical need for these patients
- Innovation in bone healing technology for large segmental defects is critical
- The ideal technology would improve success rates, decrease time to healing, lower risks of complications, amputations and readmissions, and ultimately reduce healthcare burden and costs

References: 1. Norris BL, Vanderkarr M, Sparks C, Chitnis AS, Ray B, Holy CE. Treatments, cost and healthcare utilization of patients with segmental bone defects. Injury Jan 2021

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