

Treatment for Septic Nonunion Is Associated with Disproportionately High Health Care Utilization and Hospital Costs Compared to Aseptic Nonunion

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Purpose: Fracture-related infections are a devastating complication, amplifying the complexity of treatment when comorbid with nonunion. Cost data are needed to quantify the burden of disease and justify the development of better preventative, diagnostic, and treatment algorithms for these complicated problems. The purpose of this study was to quantify the impact of septic nonunion on overall cost of fracture care.

Methods: This was a retrospective review of all adult patients undergoing operative treatment of AO/OTA 31, 32, 33, 41, 42, and 43 fractures between 2012 and 2020 at a single Level II trauma center. Eligible patients were identified by CPT code and classified into primary uncomplicated fracture repair, aseptic nonunion, and septic nonunions on the basis of ICD-9 and -10 codes, operative report review, and microbiology reports. Exclusion criteria included pathologic fractures, patients with a healed fracture presenting with infection, and less than 1-year follow-up. The primary outcome was the total cost of treatment for all hospital-based episodes of care associated with the fracture, including direct and indirect costs.

Results: 117 patients with uncomplicated fracture healing, 82 with aseptic nonunion, and 44 with septic nonunion were included. The median cost of treatment for hospital episodes of care associated with treatment of septic nonunion was \$148,318 (interquartile range [IQR] 87,241-256,928), \$45,230 (IQR 31,510-68,030) for treatment of aseptic nonunion, and \$33,991 (IQR 25,609-54,590) for uncomplicated fracture healing. Total days of hospitalization were significantly longer for the septic nonunion group (median 21.5 days, IQR 10-48.5) compared to the aseptic nonunion group (median 3 days, IQR 2-6) and uncomplicated group (median 4 days, IQR 2-6), $P < 0.001$. Total number of procedures performed at our institution was also significantly higher for patients in the septic nonunion group (median 5 procedures, IQR 2-5 [excluding original fracture treatment]) compared to the aseptic nonunion group (median 1, IQR 1-2 [excluding original fracture treatment]) and uncomplicated group (median 1, range 1-4), $P < 0.001$. The hospital made a profit on all patients with commercial insurance, but lost money on all patients with Medicare or Medi-Cal insurance, regardless of diagnosis.

Conclusion: Septic nonunion of lower extremity long bone fractures is associated with a fivefold increase in the hospital-associated cost of care compared to treatment for an uncomplicated lower extremity long bone fracture, and far exceeds the additional costs of care associated with aseptic nonunion. These results demonstrate the outsize burden of septic nonunions on the health care system and provide further evidence for the importance of developing improvements in the prevention, diagnosis, and treatment of this adverse complication.