SCIENTIFIC ARTICLE

Evaluation of Factors Driving Cost Variation for Distal Radius Fracture Open Reduction Internal Fixation

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Purpose Distal radius fracture open reduction and internal fixation (ORIF) represents a considerable cost burden to the health care system. We aimed to elucidate demographic-, injury-, and treatment-specific factors influencing surgical encounter costs for distal radius ORIF.

Methods We retrospectively reviewed adult patients treated with isolated distal radius ORIF between November 2014 and October 2016 at a single tertiary academic medical center. Using our institution's information technology value tools—which allow for comprehensive payment and cost data collection and analysis on an item-level basis—we determined relative costs (RC) for each factor potentially influencing total direct costs (TDC) for distal radius ORIF using univariate and multivariable gamma regression analyses.

Results Of the included 108 patients, implants and facility utilization costs were responsible for 48.3% and 37.9% of TDC, respectively. Factors associated with increased TDC include plate manufacturer (RC 1.52 for the most vs least expensive manufacturer), number of screws (RC 1.03 per screw) and distal radius plates used (RC 1.67 per additional plate), surgery setting (RC 1.32 for main hospital vs ambulatory surgery center), treating service (RC 1.40 for trauma vs hand surgeons), and surgical time (RC 1.04 for every 10 min of additional surgical time). Open fracture was associated with increased costs (RC 1.55 vs closed fracture), whereas other estimates of fracture severity were nonsignificant. In the multivariable model controlling for injury-specific factors, variables including implant manufacturer, and number of distal radius plates and screws used, remained as significant drivers of TDC.

Conclusions Substantial variations in surgical direct costs for distal radius ORIF exist, and implant choice is the predominant driver. Cost reductions may be expected through judicious use of additional plates and screws, if hospital systems use bargaining power to reduce implant costs, and by efficiently completing surgeries.

Clinical relevance This study identifies modifiable factors that may lead to cost reduction for distal radius ORIF. *(J Hand Surg Am. 2018;■(■):■−■. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Cost, distal radius, fracture, open reduction internal fixation/ORIF, payments.

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Distal radius fractures are common injuries.[1] More than 640,000 cases were reported in the United States adult population in 2001, and the incidence of distal radius fractures has been on the rise over the past 30−40 years.[1] Likewise, the incidence of operative treatment for these fractures has also increased over time,[2,3] and the decision to provide treatment with open reduction and internal fixation (ORIF) over other options may be more likely amongst those with a hand surgery training background.[4] In light of these trends, the growing costs associated with distal radius ORIF are of concern.[4,5] ORIF has been shown to be more expensive than other treatment alternatives, with 61% of all fracture care payments attributed to the surgical encounter itself.[5,6] Other estimates have suggested that 82% of the total direct costs for operatively treated distal radius fractures are attributed to the surgical encounter.[7] More than $170 million were attributed to distal radius fracture care in 2007 for the Medicare population alone, which is projected to double if ORIF utilization increases to 50% of fractures.[5] With 4.3% growth in US health care spending in 2016 alone and a total of $3.3 trillion in expenditures,[8] it is clearly imperative to derive strategies to improve the value of care and reduce unnecessary spending.[9] Although the costs of distal radius fracture ORIF may be higher in relation to other treatment options, it is critical to acknowledge that surgery for distal radius fractures represents a very small proportion of overall US health care expenditures, and furthermore is indicated in many cases to maximize patient outcomes and value.[10−12]

Despite prior studies raising concerns about distal radius fracture treatment costs,[13] the main drivers of cost variation for the distal radius ORIF surgical encounter are not clear. Specifically, it remains unknown whether demographic-, injury-, or treatment-specific factors contribute to variations in total direct costs for distal radius ORIF. Investigation within this realm may elucidate modifiable factors that influence cost, therefore highlighting opportunities to reduce costs for distal radius ORIF—the most expensive component of distal radius fracture care. We aim to identify demographic-, injury-, or treatment-specific factors that influence total direct costs for distal radius ORIF.

METHODS

This institutional review board−approved retrospective cost analysis included adult patients (≥18 years of age) treated for a distal radius fracture with ORIF between November 2014 and October 2016. Treatment was performed at a tertiary academic medical center by 4 fellowship-trained orthopedic hand or trauma surgeons at a main hospital operating room (OR) setting or at a separate orthopedic ambulatory surgery center (ASC). Exclusion criteria included simultaneous treatment for other orthopedic injuries (including any lower extremity injury, or other upper extremity injury), injuries to other organ systems (visceral, spine, or head injuries), patients with prior wrist surgeries, bilateral distal radius fractures, and patients undergoing treatment of a distal radius malunion, isolated percutaneous pinning, or external fixation. The presence of ipsilateral acute carpal tunnel syndrome, distal ulnar fracture, open fracture of the distal radius or ulna, or supplemental pinning in addition to ORIF with plate and screw fixation were not criteria for exclusion.

Patients were identified by an electronic procedural code search for distal radius ORIF (Current Procedural Terminology [CPT] 25607, 25608, and 25609). Patient baseline characteristics and descriptive data for each surgical encounter were collected from the electronic medical record. Chart review was performed to record data for injury-specific variables including the number of fracture parts based on CPT coding (25607, 25608, and 25609), treatment of ipsilateral distal ulna fractures (25240, 25651, 25652, and 25545), irrigation and debridement for open fracture (11010, 11011, and 11012), and treatment of acute carpal tunnel syndrome with carpal tunnel release (64721 and 29848). Manual chart review of the operative notes rather than reliance on CPT coding alone was also performed to identify these additional procedures, because some are not mutually billable and would not be identifiable by coding alone (eg, 25606 may not be separately billable with 25607). Treatment-specific data were recorded, including surgical time, anesthesia type (general anesthesia vs regional/surgical block), implant manufacturer, number of screws and plates used, surgical setting (main OR vs ASC), and treating surgical service (orthopedic hand vs trauma).

Our institution has developed an item-level database and set of information technology tools that facilitate collection of specific costs and payments for various health care services. This "Value-Driven Outcomes" (VDO) tool prospectively allocates care costs and payments to individual patient encounters by determining costs of direct patient care, as previously described.[9,14] VDO costing methods yield total direct costs incurred by the hospital system for implant and nonimplant supplies used for patient