Reimbursement for Complex Carpal Trauma

John C Dunn, MD[1], John P Scanaliato, MD[1], Clare K Green, BS[2], Peter Charles Rhee, DO[3], Leon J Nesti, MD, PhD[4]
1. William Beaumont Army Medical Center TX, 2. George Washington University School of Medicine DC, 3. Mayo Clinic, Rochester, MN, 4. Uniformed Services University, Bethesda, MD

Objectives: To compare Relative Value Unit (RVU)-based reimbursement of operative fixation of complex carpal trauma versus primary operative fixation of distal radius fractures.
Design: Database review.
Setting: National Surgical Quality Improvement Program (ACS-NSQIP) database
Intervention: Surgical treatment of complex carpal trauma and distal radius fracture.
Main outcome measurement: Mean and median total work Relative Value Unit (wRVU), surgical time, wRVU/minute, reimbursement/minute, reimbursement/surgical case.

Results: The 139 patients who underwent fixation of complex carpal trauma and 222 patients who underwent fixation of distal radius fractures were included in this study. The mean wRVUs were 10.56 for the complex carpal trauma group and 12.46 for the distal radius fracture group. Complex carpal trauma cases were an average of 31 minutes longer than distal radius fracture cases. Mean wRVU/minute (0.19 vs 0.14) and median wRVU/minute (0.18 vs 0.11) were higher for distal radius fracture cases than for complex carpal trauma cases (percent difference: mean 34%, median 62%). Lastly, the mean ($378.85) and median reimbursement ($383.29) per surgical case for complex carpal trauma was lower than that of the mean ($447.19) and median reimbursement ($516.08) of distal radius fractures.

Conclusions: Despite longer operative times and increased procedural complexity, surgical treatment of complex carpal trauma is reimbursed significantly less than surgical treatment of distal radius fractures. The authors advocate a threefold plan. First, the ACS may consider developing more clear guidelines on the definition of a hand surgeon. Second, hand surgeons must insert themselves into hospital policy making, particularly with call and consult management discussions. Finally, considering the three components of the RVU calculation (physician work, physician expertise, and liability), the management of complex carpal trauma is under-recognized and reimbursed. As such, the authors recommend consideration of these injuries to be recompensed commiserate with arthroplasty and orthopaedic trauma.

Level of Evidence: IV; Economic Analysis
Keywords: Complex carpal trauma, relative value unit, wRVU, reimbursement, distal radius fracture
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INTRODUCTION

Perilunate dislocations and fracture-dislocations are devastating injuries. Fraught with poor patient outcomes, injuries within these two spectra require surgical intervention owing to the inherent instability associated with closed treatment.[1] Surgical fixation of these injuries, however, is not without risk, and patients face high rates of early-onset arthritis, non-union, instability, and loss of motion, which oftentimes demand additional surgical procedures.[2] Complex wrist trauma is best managed by those with specific training in hand and upper extremity surgery.[3–7] Despite the technically demanding nature of these surgical cases and the limited access to capable surgeons, the work relative value units (wRVU) awarded remain limited.

Under fee-for-service reimbursement models, physician compensation is largely determined through the use of Relative Value Units (RVUs).[8–10] Each medical service provided by a physician has a unique Current Procedural Terminology (CPT) code, which in turn is assigned a corresponding number of RVUs. RVUs are assigned by the Relative Value Scale Update Committee (RUC). The RVU Scale Updated Committee (RUC) formed in 1991 and is staffed by 32 volunteer physicians, to make recommendations to CMS and the RBRVS.[11] RVUs for every CPT code are cataloged within the Medicare Physician Fee Schedule and are updated annually.[8,11] The RVUs published by CMS are widely used by many payers to determine reimbursement as well as by health care organizations to distribute bundled or capitated payments among providers.[8]

RVUs are composed of three separate components: practice expense, professional liability, and physician work, with physician work comprising the largest proportion of the three components. Work RVUs (wRVUs) account for the technical skill, time, and overall effort required for a given procedure.[8,11] It therefore follows that a higher wRVU value should indicate increased procedural complexity; however, multiple studies have suggested that RVUs may not always accurately reflect the technical demand or operative time of surgical procedures.[12–16] Within the field of orthopaedics, primary total knee and hip arthroplasty have been shown to reimburse at higher rates than their corresponding revision or conversion total joint arthroplasty, despite shorter mean operative times and lower procedural complexity.[17–19] A similar trend has been noted when comparing intramedullary nailing of acute femoral shaft fractures with the treatment of femoral shaft non-unions, the latter of which are considered to be more technically demanding procedures.[20] It has become apparent that a discordance exists with respect to reimbursement and case complexity, and that certain specialties within orthopaedics are reimbursed at much higher rates for arguably more straightforward elective and/or emergent cases.

Table 1: Analysis of Reimbursement Rates Between Operative Fixation of Complex Carpal Trauma (CPT 25440, 25670, 25685, 25695) and Operative Fixation of Distal Radius Fracture (CPT 25606, 25607, 25608, 25609)

	Complex Carpal	Distal Radius	% Diff	*p*
N (%)	139 (38.50%)	222 (61.50%)	N/A	N/A
Mean total RVU	10.56 (0.43)	12.46 (2.18)	-17.99%	$p < 0.001$
Mean surgical time (min)	105.89 (55.58)	75.40 (30.47)	28.79%	$p < 0.001$
Median surgical time (min)	97 (55.58)	67 (30.47)	30.93%	$p < 0.001$
Mean wRVU/min	0.1419 (0.11)	0.1897 (0.08)	-33.68%	$p < 0.001$
Median wRVU/min	0.1101 (0.11)	0.1786 (0.08)	-62.23%	$p < 0.001$
Mean reimbursement rate/min ($)	5.09 (4.05)	6.81 (2.70)	-33.79%	$p < 0.001$
Median reimbursement rate/min ($)	3.95 (3.76)	6.41 (2.70)	-62.28%	$p < 0.001$
Mean reimbursement/case ($)	378.85 (15.34)	447.19 (78.26)	-18.03%	$p < 0.001$
Median reimbursement/case ($)	383.29 (15.34)	516.08 (78.27)	-34.64%	$p < 0.001$

The purpose of this study is to compare wRVU-based reimbursement of operative fixation of complex carpal trauma versus primary operative fixation of isolated distal radius fractures, two procedures that differ greatly by complexity. We hypothesize that despite decreased technical demand and shorter operative times, operative fixation of distal radius fracture will reimburse at a higher rate than operative fixation of complex carpal trauma.

METHODS

Retrospective cohort study of National Surgical Quality Improvement Program (ACS-NSQIP) [21] 2015 to 2018:

- Isolated complex carpal trauma
  - 25440: repair of scaphoid nonunion
  - 25670: open treatment of radiocarpal or intercarpal dislocation
  - 25685: open treatment of trans-scaphoperilunar type of fracture dislocation
  - 25695: open treatment of lunate dislocation
- Isolated distal radius fracture
  - 25606: percutaneous fixation for distal radius fracture or epiphyseal separation
  - 25607: open treatment of extraarticular distal radial fracture
  - 25608: open treatment of intraarticular distal radial fracture with internal fixation of two fragments
  - 25609: open treatment of intraarticular distal radial fracture with internal fixation of three or more fragments).

Patients undergoing secondary concurrent surgery for other injuries were removed to capture a pure cohort of distal radius fractures and complex carpal trauma only. The NSQIP variable "WorkRVU" was used in isolation, and the additional and/or concurrent CPT RVU values were not included in calculations and analysis. Reimbursement rate ($/min) was determined by multiplying the RVU per minute by a CMS-defined rate of $35.8887/RVU. Analysis was performed in the standard fashion.

RESULTS

Overall, a total of 432 cases were identified: 169 (39.1%) patients underwent operative fixation of complex carpal trauma and 263 (60.9%) underwent operative fixation of distal radius fractures (Table 1). A total of 30 patients who underwent operative fixation of complex carpal trauma and 41 who underwent operative fixation of distal radius fractures were excluded from analysis as they underwent multiple surgical procedures. The mean wRVUs were 10.56 for the complex carpal trauma group and 12.46 for the distal radius fracture group, a 17.99% difference ($p < 0.0001$). The mean and median surgical times were 105.89 and 97 minutes for the complex carpal trauma group versus 75.40 and 67 minutes for the distal radius fracture group, a 28.79% and 30.93% difference, respectively ($p < 0.0001$). Mean and median RVU/minute were 0.1419 and 0.1101 for the complex carpal trauma cohort and 0.1897 and 0.1786 for the distal radius fracture cohort, a 33.68% and 62.23% difference, respectively ($p < 0.0001$). Mean and median reimbursement rate/minute was $5.09 and $3.95 for the complex carpal trauma cohort and $6.81 and $6.41 for the distal radius cohort, a 33.79% and 62.28% difference, respectively ($p < 0.0001$) that results in reimbursement rates 1.34 and 1.62 times higher for distal radius procedures. Finally, the mean and median reimbursement per surgical case was $378.85 and $383.29 for complex carpal trauma and $447.19 and $516.08 per distal radius fracture, a 18.03% and 34.64% difference, respectively ($p < 0.0001$) that results in reimbursements 1.18 and 1.35 times higher for distal radius procedures.

DISCUSSION

This investigation offers a critical analysis of physician reimbursement for complex carpal trauma in the context of increasing reliance on RVUs to determine compensation despite evidence that these metrics are not an accurate reflection of surgical procedures. We found that surgical management of complex carpal trauma pays significantly less than surgical management of distal radius fractures despite higher complexity and significantly longer surgeries. The solution to these RVU discrepancies may be multifaceted and likely includes both increasing the wRVU granted for complex carpal trauma and better defining the role of hand surgeons in communities.

Table 2. Comparison to Published Reimbursement Rates:
Operative Fixation of Complex Carpal Trauma (CPT-25440, 25670, 25685, 25695),
Operative Fixation of Distal Radius Fracture (CPT-25606-25609),
Native IM Nail of Femoral Shaft Fracture (CPT-27506)[20],
Repair non-union femoral shaft w/o graft (CPT-27470)[20],
Repair non-union femoral shaft w/ graft (CPT-27472)[20],
Primary THA (CPT-27130)[19], Revision THA (CPT-27134)[19],
Primary TKA (CPT-27447)[18] Revision TKA (CPT-27487)[18]
Single-component revision TKA (CPT-27496)[16] Double-component revision TKA (CPT-27487)[16]

	Mean Total RVU	Mean Surgical Time	Mean RVU/min	Mean reimbursement per min ($)	Mean reimbursement per case($)
Complex Carpal Trauma	10.56 (0.43)	105.89 (55.58)	0.1419 (0.11)	5.09 (4.05)	378.85 (15.34)
Distal Radius Fracture	12.46 (2.18)	75.40 (30.47)	0.1897 (0.08)	6.81 (2.70)	447.19 (78.26)
Native Femur IM Nail	19.7 (0.60)	97.4 (44.7)	0.244 (0.106)	8.74 (3.80)	707.1 (21.4)
Femur Non union w/o graft	17.23 (0.36)	135.8 (80.9)	0.169 (0.102)	6.07 (3.65)	618.4 (12.9)
Femur Non union w/ graft	18.88 (0.51)	164.5 (80.1)	0.147 (0.090)	5.27 (3.22)	677.5 (18.4)
Primary THA	21.24 (0.53)	94 (38)	0.26 (0.1)	9.33	877.12
Revision THA	30.27 (0.03)	152 (75)	0.249 (0.12)	8.93	1358.32
Primary TKA	22 (1.3)	94 (36)	0.26 (0.1)	9.33	877.12
Revision TKA	27 (0.05)	149 (61)	0.22 (0.1)	7.90	1176.43
Single-component revision TKA	21.12	100.44 (51.66)	0.267 (0.132)	9.58	962.22
Double-component revision TKA	27.11	144.29 (58.27)	0.223 (0.104)	8.00	1,154.32

Similar discordance between case complexity, operative time, and physician reimbursement has been observed across orthopaedics, although complex hand injuries reimburse far below simpler elective cases from other orthopaedic subspecialties (Table 2). Recently, Malik et al found that orthopaedic surgeons are reimbursed significantly less for the operative treatment of femoral shaft nonunions compared to primary intramedullary nailing, a far simpler and expeditious surgical procedure.[20] In the arthroplasty literature, multiple studies have demonstrated higher reimbursement rates for primary total knee arthroplasty versus revision,[18] primary total hip arthroplasty versus revision,[17] and single-component versus double-component total knee revisions.[16] When extrapolated out to a year of operating room usage, the disparity is alarming: the projected annual cost difference for an orthopaedic surgeon performing exclusively primary versus revision total knees or total hips is $137,008.70 and $113,052.28, respectively. This discrepancy incentivizes primary operative interventions at a higher rate than more complex and time-consuming revision procedures, which are more likely to be referred to sub-specialists given their complexity. Subsequently, there is a discrepancy between the reimbursement for any surgeon performing a straightforward primary procedure versus a trained subspecialist performing a more complex one, a trend that is highly relevant in hand surgery.

The American College of Surgeons (ACS) mandates hand call coverage for facilities caring for a certain acuity of injury; however, there is no such requirement for those with training in arthroplasty, sports surgery, shoulder and elbow, foot and ankle, or oncology. An American Society for Surgery of the Hand (ASSH) task force has made clear definitions of hand trauma centers, which include availability of a hand surgeon for 24/7/365 replantation, a specific list of on-call physicians, and the naming of a director for data gathering and reporting.[23] THE ACS also requires that level II trauma centers are required to have hand surgery.[25] Despite these requirements, any orthopaedic or plastic surgeon without a fellowship in hand surgery may be considered a hand surgeon; as such, it is not uncommon, for non-hand surgeons to cover hand call or be responsible for hand consults at level II and III facilities, many of whom may be ill-prepared to manage complex carpal trauma. To further these organizational challenges, hand surgeons have a smaller foot-print within large hospital systems than their other orthopaedic colleagues as a higher percentage of a hand surgeon's cases may be performed at an ambulatory surgery center. For this reason, hand surgeons may be less likely to be involved in hospital policy making – including the determination of call and consult policies.

Our findings emphasize the discrepancies between complex carpal trauma and distal radius fractures; while complexities inherent to the operative treatment of carpal trauma are well known, the techniques of operative treatment of distal radius fractures are becoming increasingly complex as well.[26] The margin of error for the treatment of distal radius fractures is incredibly narrow[27] and the intricacies of these fractures can be difficult for non-specialists to recognize and appropriately treat. Nationally, as compared to non-hand surgeons, hand surgeons are more likely to choose internal fixation of distal radius fractures, owing to their comfort with the complexity of the injury.[28,29] Hand surgeons also treat the vast majority of the complex, multi-fragmentary, intra-articular distal radius fractures and are more likely to perform

concomitant procedures (carpal tunnel release, TFCC repair, or ulnar fixation), which implies that not only do hand surgeons accept more difficult cases but they also better understand what additional procedures are required to optimize a patient's function.[29]

To remedy these discrepancies, the authors recommend clear definitions of a hand surgeon which would include both completion of an accredited hand fellowship and membership in the ASSH. This initiative would ensure that level II facilities, which require hand surgery coverage, have appropriate care for complex carpal injuries. Often at community facilities, distal radius fractures, which reimburse well and are generally short, are managed by non-hand surgeons, while poorly compensating complex carpal trauma may be referred to a hand surgeon and thus not treated properly in a timely fashion (Table 1). Because of this, the authors recommend that individual hospitals consider identifying all injuries from the distal radius to the fingertips, as ones that are best referred to the hand surgeon to ensure clear, concise, efficient, and universal consult appropriation. Additionally, to incentivize hand surgeons to appropriately treat complex injuries, an adjustment in the wRVU compensation may be considered.

Our study contains limitations. First, we only evaluated the wRVU component on a single Medicare rate and did not consider other expenses or components which may affect reimbursement. 30-day outcomes data were not included in analysis, as this was beyond the objective of the study.

CONCLUSION

This, study clearly demonstrates discrepancies in reimbursement between complex carpal trauma and less technically demanding cases. Considering the findings of this analysis, the authors advocate a threefold plan. First, the ACS may consider developing more clear guidelines on the definition of a hand surgeon. Second, hand surgeons must insert themselves into hospital policy making, particularly with call and consult management discussions. Finally, considering the three components of the RVU calculation (physician work, physician expertise, and liability), the management of complex carpal trauma is under-recognized and reimbursed. As such, the authors recommend consideration of these injuries to be recompensed commiserate with arthroplasty and orthopaedic trauma.

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