

Effect of Insurance Type on Fracture Care Delay

Michael W. Sim, MD, Peter Elsisy, MD, Samuel C. Kim, MD, Khaled Bahjri, MD, MPH, and Montri D. Wongworawat, MD

ABSTRACT

Delays in evaluating wrist and hand fractures can lead to corrective rather than primary treatment.

We conducted a study to determine if insurance status affects management of wrist and hand fractures. We hypothesized that patients who had to fulfill authorization requirements (AR) to see an orthopedist would have longer delays in orthopedic evaluation and higher rates of corrective osteotomy when compared with patients who had direct access (DA). We retrospectively reviewed the charts of patients seen at an orthopedic clinic over a 4-year period. Evaluation delay and rate of corrective osteotomy were assessed.

Of 916 patients, 549 had AR and 367 had DA. There was a significant ($P < .001$) delay in orthopedic evaluation of AR patients (mean, 21 days; SD, 20 days) vs DA patients (mean, 16 days; SD, 16 days). The age-adjusted odds ratio of corrective

osteotomy in the AR group was statistically significant ($P = .03$) at 2.05 (95% confidence interval, 1.07-3.91).

Requiring authorization to see an orthopedist introduces delay and a higher rate of corrective osteotomy among AR patients.

Wrist and hand fractures are common orthopedic injuries that are usually diagnosed in an emergency department or urgent care clinic and referred to an orthopedic surgeon for definitive management. These injuries often heal within a short time.¹⁻⁴ When orthopedic evaluation is delayed, however, they can heal in malunion or nonunion and may require corrective osteotomy, which has a morbidity rate higher than that of primary treatment modalities.⁴ Ideally, displaced fractures should be reduced, fixated, and allowed to heal primarily.

Corrective osteotomy is a secondary treatment in which a malunited fracture is cut and the bone is allowed to heal realigned. Indications for corrective treatment in malunited wrist and hand fractures include pain or functional limitations (eg, painful or limited movement of forearm), loss of range of motion of the joint, and decreased grip strength,⁵ all of which can affect level of daily functioning.

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who had to fulfill authorization requirements (AR) to see an orthopedist would have longer delays in orthopedic evaluation and higher rates of corrective osteotomy when compared with patients who had direct access (DA).

MATERIALS AND METHODS

Study Design and Protocol

After obtaining institutional review board approval, we reviewed the medical records of patients seen at the senior author's (M.D.W) orthopedic hand clinic between July 1, 2005 and June 30, 2009. Of all the patients seen during that period, those with distal radius, metacarpal, middle phalanx, and proximal phalanx fractures ($n = 916$) were identified and selected for study, and patients without such fractures were excluded. Patients whose orthopedic evaluation was delayed more than 120 days after injury were also excluded to eliminate the possibility of including cases referred for osteotomy unrelated to access issues. Insurance status of each enrolled patient was then determined and categorized as either authorization required (AR, $n = 549$) or direct access (DA, $n = 367$). Although testing our hypotheses on patients without insurance would have been interesting, we excluded these patients to concentrate on the impact of insurance type on fracture care. Our study population patients were initially evaluated in an emergency department or urgent care clinic

Dr. Sim is Resident Surgeon, University of Michigan Health Systems, Ann Arbor, Michigan.

Dr. Elsisy is Orthopedic Surgeon, Arrowhead Orthopedics, Redlands, California.

Dr. Kim is Resident Surgeon, Loma Linda University Medical Center, Loma Linda, California.

Dr. Wongworawat is Professor, Department of Orthopaedic Surgery, Loma Linda University Medical Center.

Address correspondence to: Montri D. Wongworawat, MD, Department of Orthopaedic Surgery, Loma Linda University, 11406 Loma Linda Drive, Suite 218, Loma Linda, CA 92354 (tel, 909-588-6444; fax, 909-558-6118; e-mail, dwongworawat@llu.edu).

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and either were referred to our clinic or were sent to their primary care providers before being evaluated by us. Outcome measures evaluated in the sample were time (number of days) from injury to initial orthopedic evaluation and surgeon recommendation for corrective osteotomy. Age and sex data were also collected to adjust for possible confounders.

Identification of Study Population

Patients with distal radius, metacarpal, middle phalanx, and proximal phalanx fractures were identified using the *International Classification of Diseases, Ninth Revision (ICD-9)* codes listed in Table I. Diagnosis descriptions were reviewed to identify and select patients with malunions or nonunions (733.81, 733.82) of only those fractures listed in Table I. ICD-9 codes 813 are for both radius and ulna fractures, so we focused only on those that included distal radius fractures (813.40, 813.42, 813.44). We also excluded 816.02 (fracture of distal phalanx) from the 816 codes because distal phalanx malunion is seldom clinically significant enough to warrant treatment.

Variables

The primary independent variable was patient insurance status (AR or DA). AR patients were defined as those whose insurance coverage required authorization by a primary care physician to see a specialist; DA patients did not require

preauthorization. Patients without insurance were excluded from the study to avoid possible confounding factors. The 2 dependent variables were time from injury to initial orthopedic evaluation and surgeon recommendation for corrective osteotomy. Charts of study patients were reviewed to determine whether each case met the surgeon's threshold for needing corrective osteotomy, mainly determined by patients' amount of pain and functional limitations. For patients who refused the procedure, whether the procedure was performed was not a measured outcome.

Statistical Methods

The first outcome variable, time from injury to initial orthopedic evaluation, was analyzed as a continuous variable measured in days. Evaluation delay was assessed with independent *t* test analysis, with log transformation of the nonparametrically distributed injury-to-visit time data. The second outcome, recommendation for corrective osteotomy, was analyzed as a dichotomous variable. The odds ratio of corrective osteotomy was assessed with a multivariate logistic regression model adjusted for confounders. Statistical significance was defined as $P < .05$.

RESULTS

Of the 916 patients in the study population, 549 (355 men, 194 women) were in the AR group, and 367 (232 men, 135 women) were in the DA group. There was no statistical difference between the groups

with respect to sex ($P = .65$), but there was a significant ($P = .02$) age difference: mean (SD) age was 22 (18) years for the AR group and 27 (21) years for the DA group.

Mean (SD) time from injury to initial orthopedic evaluation was 21 (20) days for the AR group and 16 (16) days for the DA group ($P < .001$).

Corrective osteotomy was recommended for 37 of the 549 AR patients (6.7%) and 13 of the 367 DA patients (3.5%) ($P = .04$). As there was a significant difference in age between the groups, an age-adjusted odds ratio for corrective osteotomy was calculated at 2.05 (95% confidence interval, 1.07-3.91; $P = .03$) for AR patients.

DISCUSSION

Numerous investigators have evaluated the effects of insurance status on various outcomes, including access, delay, treatments rendered, prognosis, and outcome. Example effects are less access to surgical subspecialty care, differences in rates of cardiac catheterization for non-ST elevation myocardial infarction and unstable angina, different rates of revascularization and amputation for limb ischemia, and more advanced cancer stages at time of diagnosis secondary to delayed diagnosis based on insurance status.⁶⁻¹⁸

Our conducting this study was motivated by our experience in treating patients with wrist or hand fractures presented for initial orthopedic evaluation after significant time delays that often involved insurance hurdles. Our aim was to evaluate the effect of insurance type on delayed orthopedic evaluation and need for corrective treatment.

We narrowed our study population to patients with wrist or hand fractures, because in their case, delayed care often results in morbidities, such as pain, stiffness, and poor function. Furthermore, wrist and hand fractures heal more rapidly than lower extremity inju-

Table I. International Classification of Diseases, Ninth Revision codes used to identify the study population

Code	Description
733.81	Malunion of fracture
733.82	Nonunion of fracture
813.40	Fracture of lower end of forearm, unspecified
813.42	Other fractures of distal end of radius
813.44	Fracture of radius with ulna, lower end
815.00	Fracture of metacarpal bones, closed
815.10	Fracture of metacarpal bones, open
816.00	Fracture of one or more phalanges of hand, closed
816.01	Fracture of middle or proximal phalanx
816.10	Fracture of one or more phalanges of hand, open

ries do, with callus often forming in 2 to 3 weeks; in these cases, the need for early treatment and mobilization is of paramount importance.¹⁻⁴ The outcome of needing corrective treatment was used as another endpoint to further evaluate whether delays translated into a difference in type of treatment rendered, primary or corrective. Furthermore, because recommendations for corrective procedures are not always accepted by patients, the recommendation rather than the actual surgery was used as the primary outcome. The threshold for needing corrective surgery was based on the senior author's experience, as this recommendation is based on clinical judgment, but the factors mainly included pain and functional limitations rather than degree of angular deformity of the malunion. Although this retrospective, single-surgeon model may be considered a limitation, decisions to recommend corrective osteotomy were not biased by the knowledge that they would become part of such a study. Therefore, interventional bias was minimized by our retrospective study design.

Patients whose insurance had authorization requirements experienced delays in orthopedic evaluation—a finding consistent with many reports in the literature. Sabharwal and colleagues,¹⁹ who found a significant delay in definitive orthopedic care for children who had extremity injuries and public (vs private) insurance, concluded that public insurance induces delay in orthopedic care and recommended a multidisciplinary approach to improving access for these patients. Skaggs and colleagues¹⁵ found that children with Medi-Cal insurance had significantly less access to timely orthopedic care. In a similar study, Hwang and colleagues¹² reported significantly limited access to urologic care for children with Medi-Cal than for those with private insurance. In 2004, Kocher and colleagues,¹³ who studied 196 patients

to identify risk factors associated with a delayed diagnosis of slipped capital femoral epiphysis, identified Medicaid insurance as an independent risk factor. Moreover, in our literature review, we were unable to find any studies suggesting the null hypothesis—that insurance status does not correlate with timeliness of medical care access. In agreement with the literature, our findings show that authorization requirements for orthopedic evaluation induce a delay in access to care in patients with wrist and hand fractures.

In evaluating our second hypothesis, we found that AR patients (vs DA patients) had twice the risk for requiring corrective osteotomy. Various studies have found a relationship between insurance status and clinical outcomes. Bratton and colleagues⁷ reported higher rates of complicated appendicitis with longer hospital stays in Medicaid patients. Cho and colleagues⁹ found that cardiac catheterization rates depended on insurance type. In 2007, Skaggs and colleagues¹⁷ reported an orthotic treatment delay based on insurance status and suggested the delay may have contributed to lowering treatment success. Chen and colleagues⁸ and Martin and colleagues¹⁴ correlated insurance status with delayed diagnosis and higher stage at diagnosis of various types of cancer. In our study, AR patients had a higher incidence of requiring corrective treatment.

Interesting for further study are the functional differences experienced by patients who undergo corrective osteotomy. Several investigators have found that corrective osteotomy for distal radius malunion produced favorable outcomes as measured by Disabilities of the Arm, Shoulder, and Hand score, grip strength, clinical and radiographic outcomes, and Fernandez scale score.^{20,21} The main focus of our study, however, was to determine if patients required surgical intervention; this intervention was

expected to influence outcome. In other words, patients who were recommended osteotomies were given this recommendation in the hope of making their outcomes as functional as possible.

CONCLUSION

Requiring authorization to see an orthopedic surgeon significantly delays initial evaluation and introduces a higher risk for requiring corrective treatment. Minimizing delay in initial orthopedic evaluation may lower rates of corrective osteotomy—increasing the rate of primary treatment of fractures and providing better clinical outcomes.

AUTHORS' DISCLOSURE STATEMENT

The authors report no actual or potential conflict of interest in relation to this article.

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