

## A Day Late and a Fracture Missed: Delayed Diagnosis of Orthopaedic Injuries in Severely Injured Trauma Patients

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**Background/Purpose:** Critically injured patients maybe at a higher risk for missed or delayed diagnosis for musculoskeletal conditions. Extremity and spine fractures and dislocations are can be overlooked when a patient has life-threatening injuries according to some reports. The goal of our study was to identify risk factors associated with missed orthopaedic injuries in patients with ISS 25 and higher.

**Methods:** A retrospective chart review using the database at a Level I trauma center was used to find patients who (1) sustained an orthopaedic injury of the spine, pelvis, or extremity; (2) had an ISS  $\geq 25$ ; and (3) met criteria for Level I or Level II activation by our emergency department (ED). 390 consecutive patients were identified and charts reviewed. A "missed injury" was defined as an injury that was not identified on initial radiographs, CT scan, or initial examination in the ED. Any injuries without imaging were considered missed after 24 hours. Injuries were categorized into body regions, severity, and treatment (surgery, closed reduction, or conservative). The missed injury group and the group without missed injuries were compared using  $\chi^2$  testing and Student *t*-test for statistical significance of risk factors.

**Results:** Of the 390 patients evaluated, 62 (16%) were found to have 97 orthopaedic injury locations that were missed or had a delay in diagnosis. There were significant differences between the two groups in length of stay ( $P < 0.005$ ), ICU days ( $P < 0.005$ ), ventilator days ( $P < 0.005$ ), and ISS ( $P < 0.02$ ). There was no significant difference between the groups in male:female ratio, discharge outcome (alive or dead), or trauma activation level (I or II). The average time to diagnosis for missed injuries was 5 days (range, 1-38). 19 of these injuries required surgical intervention and 3 were managed with closed reduction or manipulation. The distribution of injuries was disproportionately in the lower extremities (50 lower extremity, 11 spine, 2 pelvis, 34 upper extremity). The most common reasons for a missed injury were lack of physical examination findings, late radiographs, and injury not seen on radiographs but found on CT imaging.

**Conclusion:** Severely injured patients are at a particular risk for a missed or delayed diagnosis because of their inability to communicate the location of pain, and therefore rely heavily on physical examinations and imaging studies. The risk factors for a missed or delayed diagnosis in our patient population were an increased ISS, ICU stay, and overall length of hospital admission and ventilator time. Our study shows an increased risk of missed or delayed diagnosis in distal extremity injuries especially the foot and ankle region. The incidence of missed or delayed diagnosis of spinal fractures has been significantly reduced compared to previous studies with the routine use of the pan CT scan (head, chest, abdomen, pelvis, and spinal reconstructions).