

## Radiographic Outcomes of Humerus Fractures in Low- and Middle-Income Countries

*Derek Leo Jones, BS; Zachary H. Birner, BS; Paul S. Whiting, MD*

*University of Wisconsin, Madison, Madison, WI, United States*

**Purpose:** The Surgical Implant Generation Network (SIGN) intramedullary nailing system was developed for use in resource-limited settings to effectively treat femoral, tibial, and humeral fractures. With more than 300,000 nails implanted worldwide since 1995, SIGN has greatly improved the global care of long-bone fractures. While satisfactory clinical and radiographic results following fixation of femoral and tibial shaft fractures with the SIGN nail have been reported in the literature, the efficacy of SIGN nail fixation for humeral shaft fractures has not been investigated in a large-scale study.

**Methods:** We performed a retrospective analysis of closed humeral fractures treated in low- and middle-income countries using a standard SIGN nail. Humeral fractures were selected at random from the SIGN Online Surgical Database (SOSD). Cases with inadequate orthogonal postoperative radiographs or those involving the proximal or distal humeral metaphysis were excluded. Additional cases were reviewed to achieve the a priori minimum sample size of 500. Fractures were classified according to the AO/OTA classification system. Additional demographic variables available in the SOSD were also recorded. As previously described, a digital onscreen protractor was used to measure deviation from anatomic alignment (DFAA) in the coronal and sagittal planes using the AP and lateral radiographs, respectively.

**Results:** A total of 906 humeral fractures in the SOSD were reviewed. After application of inclusion and exclusion criteria, 503 humeral fractures with adequate orthogonal postoperative radiographs were included in the final analysis. A sample case is shown in Figure 1. Average coronal plane DFAA was 3.7°, with 76.5% of fractures within 5° of anatomic alignment. Average sagittal plane DFAA was 3.3°, and 81.6% of fractures had a DFAA <5°.

**Conclusion:** The SIGN nail achieves satisfactory postoperative alignment in humeral fractures in more than 75% of cases. Further investigation of cases with malalignment may further elucidate appropriate surgical indications.



The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.