The Cost and Utility of Post-Reduction Radiographs After Closed Reduction of Pediatric Wrist and Forearm Fractures

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Introduction

Formal radiographs are frequently obtained after reduction of closed pediatric wrist and forearm fracture performed under mini C-arm fluoroscopy. However, their utility has not been clearly demonstrated to justify the increased time, cost, and radiation exposure.

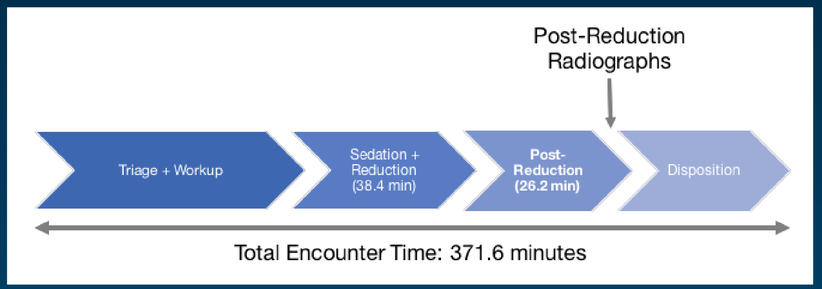
We hypothesized that formal post-reduction radiographs do not affect the re-reduction rate of pediatric wrist and forearm fractures. We further sought to determine the time, monetary, and opportunity costs associated with obtaining these radiographs.

Methods

- Following Institutional Review Board approval, 119 consecutive patients presenting to our urban, Level I pediatric trauma center from April 2015 – September 2015 with isolated, closed wrist and forearm fractures that required sedation and reduction.
- All patients were treated with a standard protocol, including sedation and reduction using mini C-arm fluoroscopy, followed by formal post-reduction radiographs
- Demographic and injury variables were collected, with re-reduction and surgery.

Methods

- Time intervals for sedation, awaiting x-ray, and total encounter periods were noted, as were total direct and variable indirect costs from our institution's cost accounting database. Marginal time and monetary costs were calculated, and opportunity costs were calculated for the time spent obtaining the post-reduction radiographs.



Results

- Of 119 patients, none required re-reduction after initial reduction using sedation and mini C-arm fluoroscopy.
- Post-reduction radiographs required an average of 26.2 minutes beyond end of sedation (7.3% of the encounter time & cost).
- The direct cost of the x-ray was 2.6% of the encounter cost.
- With our institution's annual volume, this time could have been used to see an additional 656 patients per year.

Intervention	DR/DU	BBFA	Overall	Significance
# re-reductions	0	0	0	P = 1
# surgery	3 (3.8%)	8 (20.5%)	11 (9.2%)	* (P = 0.012)
Timing				
Total ER time (min)	379 ± 64	357 ± 67	372 ± 98	P = 0.230
Sedation time (min)	39 ± 3	38 ± 4	38 ± 15	P = 0.721
Sedation-XR time (min)	**26** ± 27	**27** ± 14	**26** ± 19	P = 0.740
Sedation as % of total	***6.8%***	***8%***	***7.3%***	P = 0.400

Significance

- **Post-reduction formal radiographs did not result in changes in management** (in the form of re-reduction), and that their use consumes 7.3% of the encounter time and cost.
- With the proliferation of digital fluoroscopy, with high-quality, real-time, point of care images that can be saved to the medical record, this final step may be unnecessary, as its use has been shown elsewhere to improve quality of reduction, decrease the need for operative treatment, decrease radiation exposure, and allow for a shorter consultation time.
- As wrist and forearm fractures account for up to half of pediatric fractures (and cost up to $2 billion annually), any meaningful improvement may have a substantial impact on health economics.
- **Pediatric patients with isolated, closed wrist or forearm fractures do not routinely need formal radiographs after reduction under mini C-arm fluoroscopy.**