



Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Gursanscky, J;Kelly, A-M;Hamad, A;Tagg, A;Klim, S;Ritchie, P;Law, I;Krieser, D

Title:

Outcome of reduction of paediatric forearm fracture by emergency department clinicians

Date:

2023-04

Citation:

Gursanscky, J., Kelly, A. -M., Hamad, A., Tagg, A., Klim, S., Ritchie, P., Law, I. & Krieser, D. (2023). Outcome of reduction of paediatric forearm fracture by emergency department clinicians. *Emergency Medicine Australasia*, 35 (2), pp.347-349. <https://doi.org/10.1111/1742-6723.14162>.

Persistent Link:

<https://hdl.handle.net/11343/340098>

Gursansky Jared (Orcid ID: 0000-0001-7223-4330)
Krieser David (Orcid ID: 0000-0002-7173-6993)
Kelly Anne-Maree (Orcid ID: 0000-0002-4655-5023)

Outcome of reduction of paediatric forearm fracture by emergency department clinicians

Jared GURSANSCKY MD

Paediatric registrar, Western Health, St Albans, Australia

Anne-Maree KELLY MD FACEM

Joseph Epstein Centre for Emergency Medicine Research @ Western Health, St Albans, Australia and Department of Medicine - Western Health, Melbourne Medical School, The University of Melbourne, Parkville, Australia

Ahmad HAMAD

Student, School of Medicine, The University of Melbourne, Parkville, Australia

Andrew TAGG MBBS FRCSEd FACEM

Emergency physician, Western Health, St Albans, Australia

Sharon KLIM BN

Research co-ordinator, Joseph Epstein Centre for Emergency Medicine Research, Western Health, St Albans, Australia

Peter RITCHIE MBBS MPH FACEM

Emergency physician, Western Health, St Albans, Australia

Ian LAW RN, NP, Dip NG (children), MNursSci (NPrac)

Nurse practitioner, Western Health, St Albans, Australia

David KRIESER FRACP

Paediatric emergency physician, Western Health, St Albans, Australia

Corresponding author:

Professor Anne-Maree KELLY

Joseph Epstein Centre for Emergency Medicine Research @ Western Health, St Albans, Australia 3021

Email: anne-maree.kelly@yahoo.com.au

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as doi: [10.1111/1742-6723.14162](https://doi.org/10.1111/1742-6723.14162)

This article is protected by copyright. All rights reserved.

Word count:

Abstract: 100

Main text: 765

Figures: 1 (and 1 supplementary)

Tables: 1

References: 5

Acknowledgements:

The authors wish to thank Dr Ines Pedro Vas for additional data collection.

Conflicts of interest

This research was supported by departmental funds only.

AMK is an editorial board member and section editor of EMA.

ABSTRACT

Objectives: Paediatric forearm fractures are common. Anecdotally, there is a trend towards ED reduction of selected fractures under procedural sedation. We aimed to determine the rate of subsequent operative intervention for fracture re-displacement.

Methods: Retrospective observational study of children with a forearm/wrist fracture undergoing fracture reduction in ED. Outcome of interest was operative intervention for fracture re-displacement within 6 weeks.

Results: Among 176 patients studied, operative intervention occurred in 9 patients (5.1%, 95% CI 2.7-9.4%).

Conclusion: Reduction of paediatric forearm fractures under procedural sedation by ED clinicians is increasingly common and results in a low rate of subsequent operative intervention.

Key words: paediatric, fracture, manipulation, emergency department

INTRODUCTION

Paediatric forearm fractures are common in emergency departments (ED). Previously, displaced fractures were treated definitively by orthopaedic surgeons. Anecdotally, over the last decade there has been a trend for selected fractures to be reduced under procedural sedation in ED by ED clinicians.

Previous studies have found that rates of operative re-manipulation of paediatric forearm fractures (after initial reduction by orthopaedic clinicians) vary from 7-39%.[1] The re-manipulation rate for emergency physicians has been reported as 11%.[2] This variability may be due to a range of both patient and procedural factors.[3]. Additionally, more complex fractures may be referred directly to orthopaedic surgeons. There is little research comparing rates of re-manipulation between fractures reduced by doctors and other health practitioners.[4]

This study aimed to determine the rate of operative intervention for forearm fractures reduced in the ED by ED staff. A secondary aim was to compare the rate of operative intervention by practitioner type (doctor or nurse practitioner/advanced practice physiotherapist).

METHODS

This was a retrospective, observational study by chart review. Patients were identified from the ED clinical database as children aged 2-16 years who presented with a forearm/wrist fracture between July 1 2015 and December 31 2019. Exclusion criteria were fracture type other than uncomplicated closed fracture of the forearm/wrist, no reduction required, reduction by a non-ED clinician, admission to hospital for definitive treatment, planned ED follow-up visit after initial fracture treatment, loss to follow-up and missing x-rays.

Data, collected onto a piloted data collection form, included age, gender, location and characteristics of the fracture, practitioner performing reduction and occurrence of operative intervention within 6 weeks.

Outcome of interest was operative intervention for fracture displacement within 6 weeks of fracture reduction in ED. This was defined as all subsequent manipulation and/or stabilization of the fracture performed under anaesthesia, whether open or closed. Wedging of a cast or application of a moulded cast were not considered operative interventions. The amount of displacement or angulation requiring operative intervention was at the discretion of the clinic orthopaedic surgeon.

Data analysis is descriptive. As this was an exploratory study with no published Australian data to inform it, a formal sample size calculation was not performed.

Ethics approval was by Western Health Low Risk Ethics Panel (QA 2019.63). Patient and/or parent consent was not required.

RESULTS

This study included 176 patients. Sample derivation is shown in Figure 1. Median age was 9 (interquartile range 6-12) and 111 children were male (63.1%). Fracture characteristics are shown in Table 1. The proportion of fractures reduced in ED by ED clinicians increased from 24% in the period to the end of the first quarter of 2018 to 83% in the period from the second quarter of 2018 to the end of 2019. (Supplementary Figure).

Operative intervention within 6 weeks occurred in 9 patients (5.1%, 95% CI 2.7-9.4%). The proportion was not statistically different between doctor-reduced and other practitioner-reduced groups – 8/138 vs 1/38 (5.8% vs 2.6%, effect size 3.2%, 95% CI +/- 8%, $p=0.69$), although the study was underpowered for this analysis.

Inter-rater reliability of data extraction was undertaken for 39 records for the items of gender, bones fractured, interventionist and outcome. Agreement was 100%, 90%, 97% and 97% respectively.

DISCUSSION

Our data support anecdotal reports that an increasing proportion of uncomplicated, closed paediatric forearm fractures are reduced definitively in Australian ED by ED clinicians. Drivers may include the increasing number of specialist emergency physicians and increased skills and experience in paediatric procedural sedation. Access block with its impacts on delays to operating theatre may also contribute. Fracture reduction in ED has previously been shown to reduce delays to care and costs.[5]

Our study found that after fracture reduction in ED by ED clinicians there was a low rate of subsequent operative intervention, irrespective of practitioner type performing the procedure. What is not known, at this time, is whether these fractures require manipulation at all. The CRAFFT Study (<https://crafft-study.digitrial.com/>), currently recruiting in the United Kingdom, may be able to answer this question.

This study has some limitations. Data were collected from one ED, so generalisability to other health services cannot be assumed. Data were collected retrospectively from medical records with the inherent risk of missing data elements. Because the Victorian health system does not share data between health services, it is possible that some patients underwent operative interventions at other health services. This is, however, unlikely because the study site is the paediatric referral centre for the western region of Melbourne.

CONCLUSION

Reduction of paediatric forearm fractures under procedural sedation by ED clinicians is increasingly common and results in a low rate of subsequent operative intervention.

REFERENCES

1. Khan S, Sawyer J, Pershad J. Closed reduction of distal forearm fractures by pediatric emergency physicians. *Acad Emerg Med*. 2010;17:1169-74.

2. Putnam K, Kaye B, Timmons Z, Wade Shrader M, Bulloch B. Success Rates for Reduction of Pediatric Distal Radius and Ulna Fractures by Emergency Physicians. *Pediatr Emerg Care*. 2020; 36:e56-e60.
3. Rimbaldo KM, Fauteux-Lamarre E, Babl FE, Kollias C, Hopper SM. Deformed pediatric forearm fractures: Predictors of successful reduction by emergency providers. *Am J Emerg Med*. 2021;50:59-65
4. Ho CA, Wilson PL. A comparison of fracture reductions performed by physician extenders and orthopaedic residents in the acute pediatric orthopaedic practice. *J Orthop Trauma*. 2010;24:244-9.
5. Betham C, Harvey M, Cave G. Manipulation of simple paediatric forearm fractures: a time-based comparison of emergency department sedation with theatre-based anaesthesia. *N Z Med J*. 2011; 124(1344):46-53.

Figure 1: Sample derivation and outcome

Supplementary figure: Proportion of eligible fractures reduced in ED by ED clinicians over time

Table 1. Fracture characteristics

Feature		N, % (total 176)
Bones fractured	Radius and ulna	98, 55.7%
	Radius only	77, 43.8%
	Ulna only	1, 0.6%
Anteroposterior (AP) displacement	Dorsal	71, 40.3%
	Volar	12, 6.8%
	Not applicable	52.8%
Degree of AP displacement	Missing data	2
	Nil	95, 54.6%
	1-5mm	62, 35.6%
	6-10mm	12, 6.9%
	11-15mm	1, 0.6%
	>15mm	4, 2.3%
Lateral displacement	Radial	69, 39.2%
	Ulnar	13, 7.4%
	Not applicable	94, 53.4%
Degree of lateral displacement	Missing data	1
	Nil	94, 53.7%
	1-5mm	76, 43.4%
	6-10mm	5, 2.9%
AP angulation (N, %)	Dorsal	130, 73.9%
	Volar	43, 24.4%
	Not applicable	3, 1.7%
Degree of AP angulation	0-10 degrees	16, 9.1%
	11-20 degrees	41, 23.3%
	21-25 degrees	44, 25%
	>25 degrees	75, 42.6%
Direction of lateral angulation	Radial	65, 36.9%
	Ulna	29, 16.5%
	Not applicable	82, 46.6%
Degree of lateral angulation	Missing data	2
	≤10 degrees	40, 23%
	11-20 degrees	29, 16.7%
	21-25 degrees	10, 5.7%
	>25 degrees	5, 2.9%
	Not applicable	80, 46%

