

Establishing local paediatric fluoroscopic diagnostic reference levels – a journey to benchmarking Australian doses

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Background: Diagnostic reference levels (DRLs) identify the administration of unusually high patient doses and are required for dose optimisation. Data concerning DRLs for paediatric fluoroscopic examinations in Australia is scarce.

Objective: To compare DRLs for paediatric fluoroscopic examinations in a South Australian tertiary hospital to published data and promote the establishment of a national database for benchmarking paediatric doses. To explore relationships between dose area product (DAP), age and fluoroscopy time.

Methods: The study was reviewed and given exemption by the hospital and university ethics boards. Dose data from 365 paediatric patients undergoing five fluoroscopic examinations were retrospectively analysed from a three-year period and age categorised for the development of local DRLs (LDRLs). Shapiro-Wilk's test for normality was conducted. Relationships between DAP, age and fluoroscopy time were explored using scatter plots, Spearman's correlation and regression tests.

Results: LDRLs were significantly lower than published data, possibly reflecting technological and procedural advancements. Each one-year increase in age was associated with 0.77 $\mu\text{Gy}\cdot\text{m}^2$ increase in DAP for barium meal and follow through studies, (95% CI = 0.055, 1.48) ($P = 0.035$), and 1.37 increase in DAP for barium swallow studies (95% CI = 0.61, 2.12) ($P < 0.001$). Low correlation was demonstrated between DAP and fluoroscopy time for micturating cystourethrography studies ($r = 0.35$, 95% CI = 0.15, 0.51, $P < 0.001$) and barium meal and follow through studies ($r = 0.37$, 95% CI = -0.011, 0.65, $P = 0.050$). Age and fluoroscopy time were not significantly related.

Conclusion: This study provides updated Australian paediatric fluoroscopic DRLs, with the intention of promoting a national database for benchmarking paediatric doses.

Is there benefit to concurrent X-ray imaging of the upper limb in paediatrics post FOOSH?

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Objectives: Concurrent X-ray imaging of the upper limb in paediatric patients following a fall on the outstretched hand (FOOSH) is intended to minimise the risk of an undetected concomitant injury and is typically performed on patients aged 0 to 10 years.^{1,2} The purpose of this study was to explore the benefit of concurrent imaging and to identify if age could provide evidence for imaging.

Methods: A 12-month retrospective review of all X-ray examinations of the wrist, forearm and distal humerus of patients aged 0 to 10 years referred from the Logan Hospital Emergency Department was undertaken. The frequency, type and location of radiographic abnormalities and the requested examinations region of interest, referral notation and patients age were recorded. Analysis was by descriptive statistics.

Results: 476 examinations met the studies inclusion criteria, 4.8% (23/476) identified an abnormality outside of the documented region of interest. On review of the admission and treatment notes 1.7% (8/476) were deemed to have detected traumatic abnormalities as a direct outcome of concurrent imaging. No age-related imaging cut offs were identified.

Conclusion: This study demonstrates limited benefit (1.7%) to concurrent upper limb imaging. The results suggest that a thorough physical clinical evaluation of the paediatric upper limb performed by the referrer alone presents as sufficient to accurately guide X-ray imaging. These findings have the potential to positively impact a reduction in the number of x-rays performed on paediatric patients and in turn contribute to limiting radiation dose. Further studies to include additional facilities is required to validate this study.

References

1. Golding L, Yasin Y, Singh J, et al. Imaging of the elbow in children with wrist fracture: an unnecessary source of radiation and use of resources? *Pediatric Radiology* 2015;45(8):1169–73.
2. Roposch A, Reis M, Molina M, et al. Supracondylar fractures of the humerus associated with ipsilateral forearm fractures in children: a report of forty-seven cases. *Journal of Pediatric Orthopaedics* 2001;21(3):307–12.



