

Radiation Dose Reduction in the Pediatric Interventional Cardiovascular Laboratory: A Quality Improvement Study

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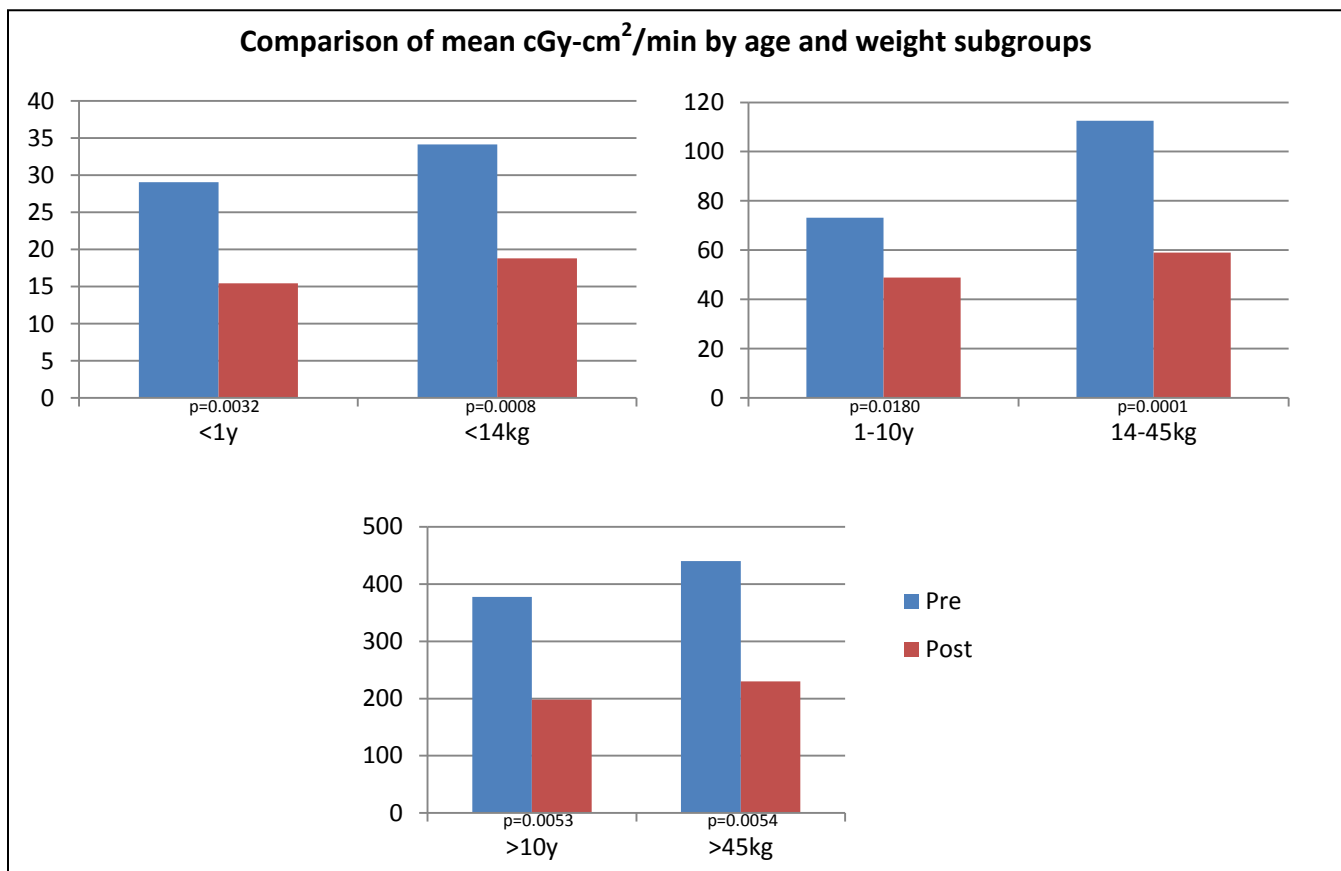
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Objective: To determine the radiation dose reduction for patients and providers following the introduction of technical and clinical practice changes in a pediatric cardiac catheterization lab.

Background: Reducing exposure to ionizing radiation is important to minimize its potential adverse effects in keeping with the ALARA "As Low as Reasonable Achievable" principles. As part of a Quality Improvement project, broad-based changes to the x-ray system settings and clinical practice were implemented following a 30 day trial and education period. These included: weight based reductions in preset fluoroscopy and angiography frame rates, more consistent use of collimators and safety shields, and increased use of stored fluoroscopy and virtual magnification when appropriate.

Methods: All cardiac catheterization procedures at our center 6 months before and 8 months after institution of the above changes were included. Electrophysiology and hybrid procedures, pericardiocentesis and biopsies were excluded. Patient demographic and radiation data including fluoroscopic time, mGy, and $\text{cGy}\cdot\text{cm}^2$ were collected over the 14 month period from Oct 2011 to Dec 2012. Subgroup analysis was performed by both weight (0-14kg, 14.1-45kg, 45.1-90kg) and age (0-12m, 13m-10y, >10y).

Results: A total of 353 procedures (164 before; 189 after) were analyzed. Procedure mix (48% interventions pre; 52% post) and fluoroscopy times (18.3 ± 13.6 pre; 19.8 ± 14.1 post, $p=0.38$) were not significantly different between the 2 groups. The mean cumulative skin dose per minute of radiation fluoroscopy time (in air Kerma area product/ minute) decreased significantly from 91.30 ± 166.23 to 58.42 ± 98.79 $\text{cGy}\cdot\text{cm}^2/\text{min}$ ($p=0.02$). Subgroup analysis revealed statistically significant reductions across all age and weight subgroups (see graphs). In addition there was a 46% reduction in physician deep dose equivalent radiation exposure (mrem) between years 2011 and 2012.



Conclusions: Implementation of technical and clinical practice changes can result in a marked reduction in both patient and provider radiation exposure during pediatric cardiac catheterization procedures.