Radiation Safety Checklist on Fluoroscopy Exposure in Pediatric Urology Patients: A Pre- and Post-Intervention Analysis

Steven Saweikis (LSU), Christopher Roth (LSU), Ross E. Straughan (LSU)

Background: Fluoroscopy is a vital tool in pediatric urology for diagnostic and therapeutic procedures. However, it poses significant risks for children. Pediatric patients are more sensitive to radiation and have more time to manifest effects of radiation exposure. Despite the importance of adhering to the As Low As Reasonably Achievable (ALARA) principle, inconsistencies in practice and procedural variability often result in unnecessary radiation exposure. Checklists have proven effective in enhancing safety and standardizing care across various medical fields. Implementing a radiation safety checklist tailored explicitly to pediatric urology can reduce fluoroscopy exposure, ensure compliance with best practices, and enhance the long-term safety of this vulnerable population.

Methods: This retrospective cohort study was conducted at Children's Hospital New Orleans from January 6, 2020, to April 19, 2021. A radiation safety checklist was introduced on March 19, 2021, to minimize fluoroscopy radiation exposure during pediatric urology procedures. The study included 175 patients with demographic data collected (race, gender, and age). Data analyzed operating surgeon, type of procedure(s), whether the procedure was performed under fluoroscopy, fluoroscopy time, radiation dose, and checklist compliance. Pre- and post-checklist data were compared to determine the checklist's effectiveness in reducing radiation exposure while maintaining procedural quality and consistency across surgeons and procedure types.

Results: The study included 175 pediatric urology patients who underwent fluoroscopy-guided procedures, with a diverse demographic distribution: 128 White (73.1%), 35 Black (20.0%), 1 Native Hawaiian and Other Pacific Islander (0.6%), 6 Asian (3.4%), and 5 categorized as Other (2.9%). The cohort consisted of 93 females (53.1%) and 82 males (46.9%), with an age range of 10 months to 17 years. 42 of the 175 patients had a checklist performed. The comparison of radiation exposure and cumulative dose between groups with and without checklists revealed no significant differences across most procedures. For stent procedures, the mean radiation exposure (1.49 min vs. 0.39 min) and cumulative dose (7.21 mGy vs. 1.20 mGy) did not show significant variation between the checklist and no checklist groups ($p= 0.3456$ and $p= 0.3331$, respectively). Similarly, for stent plus retrograde pyelogram procedures, no significant difference was found in either radiation exposure ($p= 0.4648$) or cumulative dose ($p= 0.8305$). In retrograde pyelogram only procedures, although radiation exposure approached significance ($p = 0.0686$), the confidence interval (-0.0469 to 1.2251) did not indicate a clear effect. Overall, across all data, no significant differences were observed in radiation exposure ($p = 0.1167$) or cumulative dose ($p = 0.1073$) between the checklist and no checklist groups. These results suggest that the use of checklists did not significantly impact radiation exposure or cumulative dose across the procedures studied.

Conclusion: The introduction of a radiation safety checklist in pediatric urology procedures did not result in a significant reduction in radiation exposure or cumulative dose. Despite its potential for enhancing safety and standardizing care, the checklist did not demonstrate measurable effects on radiation metrics across various procedure types. While checklists are valuable tools for promoting best practices and safety, additional strategies may be necessary to achieve substantial reductions in radiation exposure for pediatric patients undergoing fluoroscopy-guided procedures. Future studies should explore alternative or complementary interventions to optimize radiation safety in this vulnerable population.