AbstractID: 1341 Title: Implementation of a Newborn Tomographic Computational Model for Dose Assessment in Pediatric Radiology

Establishment of organ doses from diagnostic exams is a key component to quantifying the radiation risks from medical exposures and for formulating corresponding dose-reduction strategies. Radiation transport models of human anatomy provide a convenient method for simulating radiological exams. In this study, a newborn tomographic computational model was implemented in Monte Carlo simulations to calculate newborn organ doses from computed radiography (CR) and fluoroscopy exams. The newborn tomographic model was constructed from segmented CT data of a 6-day-old female cadaver with a recorded mass of 3.83 kg. The CT data has an in-plane pixel resolution of 0.586 mm × 0.586 mm and slice thickness of 1mm. With a rectilinear array of 512 × 512 × 485 voxels, the newborn tomographic model is represented by a matrix of over 127 million individual voxels. Each voxel has a tag belonging to one of 66 segmented regions. All Monte Carlo simulations were performed using EGSnrc due to its versatility in handling large voxel arrays. Simulations were run for 16 different CR projections. Detailed dosimetry was also done for 5 videotaped voiding cystourethrogram (VCUG) fluoroscopy studies. The mean total effective dose for all radiographic projections was found to be ~4 μSv. For the VCUG simulations, the total effective doses ranged from 0.77 to 3.22 mSv. The newborn tomographic computational model has proven to be an effective tool in evaluating organ doses in pediatric radiology. Future research will include organ doses for pediatric computed tomography.