Purpose: Imaging centers are increasingly seeking means to track radiation dose from computed tomography (CT). Many of these methods are based on the dose-length product (DLP) reported on image-based dose sheets, such as RADIANCE, an open-source dose extraction software. We compare dose estimates from RADIANCE to those computed by eXposure, a commercial product which computes organ doses using Monte-Carlo simulations.

Methods: We review dose estimates for 1936 single-phase, unenhanced head CT examinations performed in 2010 at our institution. The estimated whole-body effective dose (ED) is derived from the total study DLP by multiplying the ICRP 60-based k factor of 0.0021. For the same set of studies, ED is derived from the organ doses computed via Monte-Carlo simulations using MIRD Adult and Age 15 phantom, average scanner model and ICRP 60 tissue weighting factors. ED estimates from both methods are compared.

Results: The average ED derived from total DLP is 1.84 0.44 mSv, while the average ED derived from the organ doses is 2.01 0.3 mSv. ED estimates derived from the organ doses were 1.91 0.28 mSv for male patients and 2.11 0.29 mSv for female patients. According to the literature, adult female heads are 10% smaller on average than adult male heads. We hypothesize that the 11% higher ED estimate in the female patients reflects this head size differential between genders. A common adult head phantom is used for head CT acquisitions, and higher dose estimates in adult females may reflect a longer-than-necessary scan length.

Conclusions: Estimating whole-body effective dose using DLP is practical in the current clinical setting. For head CT exams, DLP-based ED estimates appear concordant with organ dose-based estimates. The data additionally suggests that dose savings may be achieved by optimizing scan length and mA for female patients.