

Title: Towards individualised CT protocols: Stratifying radiation dose by DLP, weight and sex in North Indian healthcare facilities

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Abstract: Regardless of patient characteristics, current CT imaging techniques usually use standardised radiation settings, which could lead to needless radiation exposure, especially in smaller or lighter patients. Based on unique patient characteristics, this one-size-fits-all method falls short of optimizing the crucial balance between radiation dose and diagnostic image quality. The clinical problem addressed is the lack of evidence-based, patient-specific CT protocols that consider body habitus and sex-related anatomical differences to minimize radiation exposure while preserving diagnostic accuracy. This study aimed to quantify the relationships between radiation dose, as assessed by dose-length product (DLP), patient body weight, and sex across different CT scanner models, to develop individualised protocol recommendations for optimal radiation dose management. Methods A retrospective analysis was conducted on CT scan data of 900 adult patients who underwent head, chest, or abdomen-pelvis CT examinations across 10 different multi-detector CT scanners. The correlation between dose-length product (DLP) and body weight was assessed using Pearson's correlation coefficient. Mean dose-length product values were compared between males and females using an independent-samples *t*-test and across CT scanner models using a one-way ANOVA. Linear regression analysis was performed to establish predictive relationships between DLP and patient characteristics, with facility-specific correction factors developed for dose standardisation. Sex-specific regression models were created, and facility-specific correction factors were calculated to standardize dose comparisons across patient populations. Results We found a strong positive correlation between DLP and patient body weight ($r = 0.61$, $p < 0.001$), and this correlation varied across CT scanner models ($r = 0.53$ - 0.71). Mean dose-length product was markedly higher in male patients than in females ($p = 0.002$). A range of DLP differences was noted for the same examination type across multiple CT scanners (up to 46% difference in mean DLP). In some scanners, dose-length product **values exceeded the recommended diagnostic reference levels**.

Keyword: Dose-length product , Body-weight

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