

Influence of Water Equivalent Diameter (D_w) Variability Inside the Scan Area On Size-Specific Dose Estimates (SSDE)

A. Abuhaimed¹ and C. Martin²

¹The National Centre for Applied Physics, King Abdulaziz City for Science and Technology, Riyadh, Saudi Arabia.

²Department of Clinical Physics, University of Glasgow, Glasgow, UK.

INTRODUCTION

Size-specific dose estimates (SSDE) is used to assess doses absorbed by patients of specific sizes from CT scans. SSDE is based on applying a correction factor to volume CT dose index ($CTDI_{vol}$) that is measured in head and body phantoms of specific sizes. The correction factor is calculated from published data based on size of the scan area for the patient. The size is reported in terms of water equivalent diameter (D_w) of the area.

AIM

The purpose of this study is to investigate influence of D_w variability inside the scan area on SSDE estimation.

METHOD

D_w values were assessed for 351 phantoms developed from CT images of pediatric and adult patients. Six scan areas in the trunk were investigated: chest, abdomen, pelvis, chest-abdomen, abdomen-pelvis, and over all the trunk (CAP). D_w was assessed for each slide inside these areas using a MATLAB code developed in house, from which minimum and maximum D_w over the area were calculated for each phantom.

RESULTS: Generally, D_w variability for adults was larger than that for pediatric patients. The smallest and largest variabilities were for the abdomen and abdomen-pelvis scan areas, respectively, and the variability was found to increase with patient size as shown in the figures below. For all scan areas, D_w variability was in the range of 1.3 – 13.5 cm for pediatric and 1.6 – 16.3 cm for adults, with the average values being 6.2 cm and 7.9 cm, respectively. These variabilities can lead to variations in SSDE estimation by up to 58% and 75%, respectively, across the scan areas, and 21% and 29%, on average.

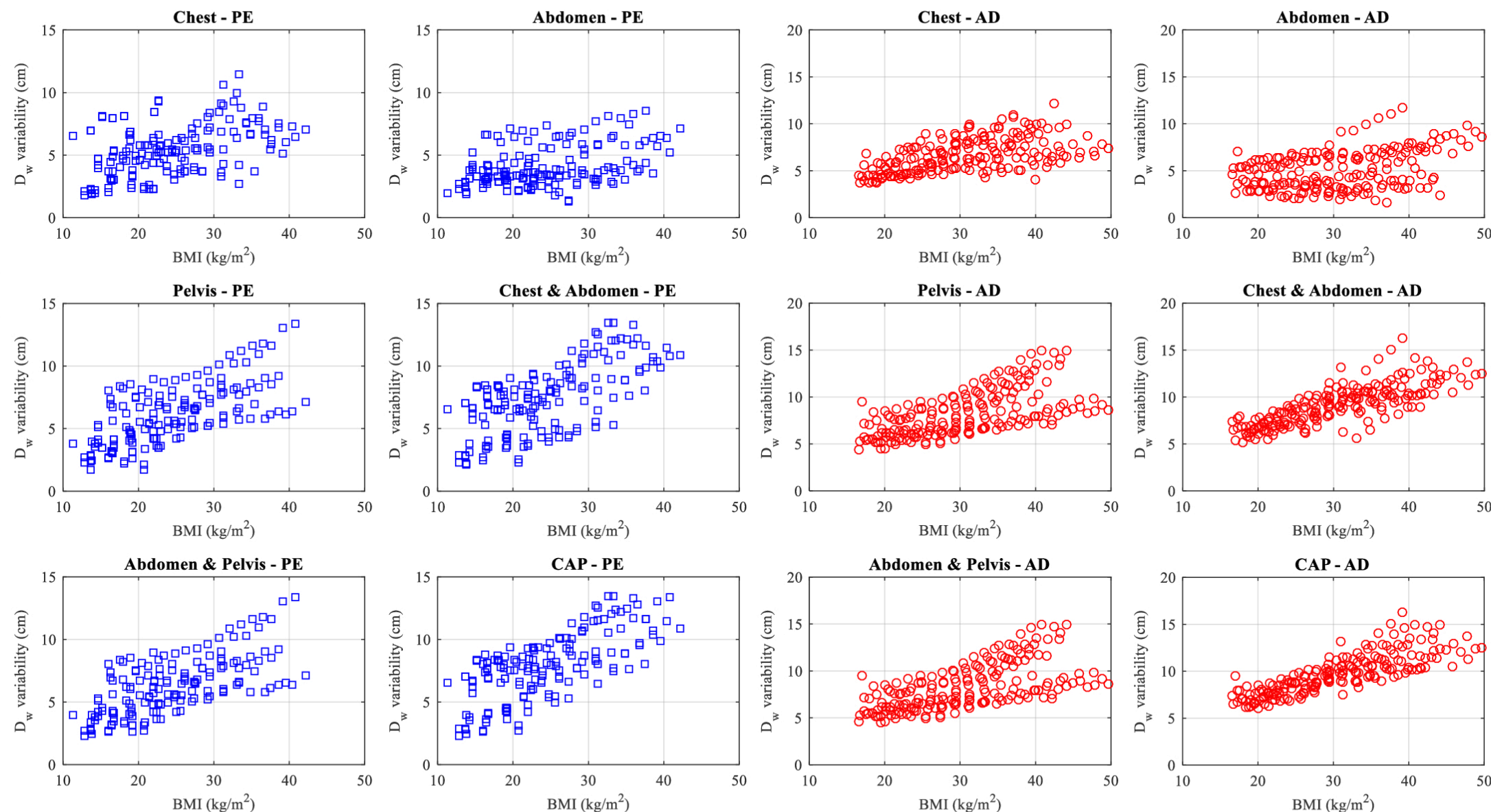


Figure 1: Variability of D_w values for the pediatric phantoms.

Figure 2: Variability of D_w values for the adult phantoms.

CONCLUSIONS

Large variations in D_w values inside the scan areas studied were noticed for some sizes, particularly for large patients. Normally, D_w mean is used for SSDE estimation, but such variations should be taken into consideration to avoid any significant over or underestimation for patient dose.

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CONTACT INFORMATION

All authors declare that there is no conflict of Interest