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Effective Dose and Cancer Risk Estimates from Computed Tomography Procedures for Diagnosis of Renal Disease

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Abstract
The ionizing radiation employed during computed tomography (CT) imaging can result in damage to tissue, increasing the risk of cancer and genetic mutation caused by chromosomal damage. The absorbed dose, measured in Gray (Gy) describes the total radiation energy absorbed per unit mass of tissue. However to achieve a more accurate measure of radiation exposure the effective dose (ED) is considered. This is the sum of doses delivered to each organ in relation to its radio-sensitivity and susceptibility to cancer risk and genetic mutation(1). This research was conducted to determine the effective radiation dose (ED) delivered during computed tomography examinations including those to diagnose renal disease.

A Retrospective review with the guidance of a Radiologist, of CT dose reports for patients referred for CT evaluation of the brain, chest and abdomen. 180 patients age 30 and under were targeted. A sample size of 60 was chosen at 3 facility using the formula {n= (zα/2)2 σ2/ E2} where n is sample size, zα/2 is the significance level, σ is the standard deviation with E the margin of error. The following equations were used to determine the ED;

Dose Length Product {DLP} (mGy/cm) =SCAN LENGHT (cm) * Computed Tomography Dose Index {CTDI} (mGy)

ED (mSv) = DLP (mGy/cm) * K (AAPM correction factor) (mSv mGy–1 cm–1)

The result showed that there were variations of effective dose among facilities conducting CT examinations of similar anatomic areas ranging from 8.03 mSv to 23.2 mSv. In excess of 50% of the cases reviewed reported normal radiological findings. This raises the issue of diagnostic efficacy, was there a need for a CT scan to be done?

It can therefore be concluded that there is a need to manage and document effective dose delivered to patients during CT procedures as accumulated radiation exposure increase the risks for cancers and other genetic anomalies.

Speaker Biography:
Barrington Brevitt is a PhD candidate at the University of the West Indies (UWI), Mona Campus, Jamaica doing research in Applied Physics. He is also pursuing a Post Graduate Certificate in University Teaching and Learning. He currently possesses a Diploma in Sports Therapy, BSc in Diagnostic Imaging and an MSc in Medical Physics. Barrington is currently employed as a Senior Medical Physicist at the Kingston Public Hospital and as an adjunct assistant lecturer at UWI. He is actively involved in radiation therapy treatment planning, diagnostic and therapeutic quality assurance and staff training. Barrington has been involved in the medical use of radiation for the past 13 years; he has a passion for radiation protection and has published 4 research papers. He has participated in many local and international conferences as well as technical workshops and training with the IAEA and Varian.

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