Topic: QUALITY MANAGEMENT FOR RADIOTHERAPY SERVICES IN UGANDA

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Abstract

This study evaluated the impact of transitioning from two-dimensional (2D) radiotherapy based on cobalt-60 to advanced linear accelerator (linac)–based technologies on radiotherapy quality and treatment safety at the Uganda Cancer Institute (UCI). From 1995 to 2021, radiotherapy at UCI was delivered exclusively using cobalt-60 units. Between 2021 and 2023, three advanced linear accelerators equipped with three-dimensional treatment planning systems (TPS) were installed and commissioned, enabling the introduction of three-dimensional conformal radiotherapy (3DCRT), intensity-modulated radiotherapy (IMRT), and volumetric modulated arc therapy (VMAT).

With a current daily patient throughput of 210–280, the increased workload has placed significant demands on pre-treatment patient-specific QA, treatment quality and routine machine QA protocols. The investigation analyzed treatment parameters and dosimetric data from 2,244 patients: 1,164 for manual recalculations, 423 for independent TPS verification, 493 for in-vivo dosimetry (IVD), and 164 for clinical target volume (CTV) to planning target volume (PTV) margin evaluation. Treatment time calculation accuracy improved from 82.8% to 93.2% within ±5% between 2018 and 2020. Furthermore, approximately 85% of IVD measurements were within the accepted 5% tolerance. In end-to-end dosimetry audits, measured doses in the targets agreed within 2.1% of TPS calculations across all test plans.

However, setup errors and machine calibration inconsistencies accounted for target dose deviations of up to 6.1% in some cases of the test plans. These findings underscore the need for improved patient setup and immobilization techniques, use of better (advanced) radiotherapy technology and established framework for sustained quality improvement to ensure enhanced radiotherapy treatment quality and safety at the Uganda Cancer Institute.