ICRU

ICRU 91 is a report published by the International Commission on Radiation Units and Measurements (ICRU) in 2013. The report provides recommendations for the use of reference dosimetry protocols for external photon and electron beams in radiation therapy.

Specifically, the report provides guidance on the selection of ionization chambers, beam quality specification, measurement of absorbed dose to water, and determination of the dosimetric quantities for use in the calibration of radiation therapy equipment. The report also includes information on quality assurance procedures and dosimetry traceability.

ICRU 91 is an important reference for medical physicists and radiation oncologists who are involved in the planning and delivery of radiation therapy. It provides guidance for the accurate and consistent measurement of radiation dose, which is essential for ensuring the safety and efficacy of radiation therapy treatments.

ICRU 91, published in 2017, is an international standard for prescribing, recording, and reporting stereotactic treatments. Since its release, there has been limited research published on the implementation and impact of ICRU 91 on clinical practice. This work provides an assessment of the recommended ICRU 91 dose reporting metrics for their use in clinical treatment planning. A set of 180 intracranial stereotactic treatment plans for patients treated by the CyberKnife (CK) system were analyzed retrospectively using the ICRU 91 reporting metrics. The 180 plans comprised 60 trigeminal neuralgia (TGN), 60 meningioma (MEN), and 60 acoustic neuroma (AN) cases. The reporting metrics included the planning target volume (PTV) near-minimum dose (D near − min), near-maximum dose (D near − max), and median dose (D 50 %), as well as the gradient index (GI) and conformity index (CI). The metrics were assessed for statistical correlation with several treatment plan parameters. In the TGN plan group, owing to the small targets, D near − min was greater than D near − max in 42 plans, whereas both metrics were not applicable in 17 plans. The D 50 % metric was predominantly influenced by the prescription isodose line (PIDL). The GI was significantly dependent on target volume in all analyses performed, where the variables were inversely related. The CI was only dependent on target volume in treatment plans for small targets. The ICRU 91 D near − min and D near − max metrics breakdown in plans for small target volumes below 1 cm3 ; the Min and Max pixel should be reported in such cases. The D 50 % metric is of limited use for treatment planning. Given their volume dependence, the GI and CI metrics could potentially serve as plan evaluation tools in the planning of the sites analyzed in this study, which would ultimately improve treatment plan quality [1)].

1)
Conlon D, Connolly J, Galal M, Ahmed I, Foley M, Kleefeld C. Analysis of CyberKnife intracranial treatment plans using ICRU 91 dose reporting: A retrospective study. J Appl Clin Med Phys. 2023 Feb 16:e13932. doi: 10.1002/acm2.13932. Epub ahead of print. PMID: 36794436.