ICRU REPORT 50

Prescribing, Recording, and Reporting Photon Beam Therapy

INTERNATIONAL COMMISSION
ON RADIATION UNITS
AND MEASUREMENTS

3. Absorbed Doses

3.1 From Prescribing a Therapeutic Irradiation to Recording and Reporting

Prescription of treatment remains the responsibility of the radiation oncology team in charge of the patient, and it is not the purpose of this report to make recommendations about treatment prescription itself. However, it is obvious that adoption of the same concepts and definitions for prescribing, recording, and reporting will facilitate the procedure and reduce the risk of confusion.

In order to make exchange of information precise and accurate, it is important that treatments performed in different centers be *reported* in the same way, using the same concepts and definitions.

The following recommendations for reporting are aimed at establishing a set of minimum information items on which there should be general agreement and which should be reported in all cases. This would meet the general goal of the present report, but, of course, any additional information considered as relevant should be added.

Such additional information could be related to:

* A more accurate and detailed description of the dose distribution, *e.g.,* average dose and its standard deviation, dose-volume histograms (DVH), *etc.*
* An accurate description of the dose at different anatomical sites (including Organs at Risk).

Reporting such additional information is encouraged, since it could ultimately contribute to developments and improvements in radiotherapy.

3.2 The ICRU Reference Point

As a general principle, the present system of recommendations for reporting doses is based on the selection of a point within the PTV, which is referred to as the *ICRU Reference Point.*

The ICRU Reference Point shall be selected according to the following general criteria:

(1) the dose at the point should be clinically relevant;
(2) the point should be easy to define in a clear and unambiguous way;
(3) the point should be selected so that the dose can be accurately determined;
(4) the point should be in a region where there is no steep dose gradient.

These recommendations will be fulfilled if the ICRU Reference Point is located:

- *always at the center (or in a central part) of the PTV, and*
- *when possible, at the intersection of the beam axes.*

The dose at the ICRU Reference Point is the ICRU Reference Dose and shall always be reported.

3.3 The Dose Variation Throughout the CTV

Tumor control depends on the dose to the CTV and its variation. However, the variation in CTV dose can only be estimated from the variation in the PTV dose.

A certain degree of inhomogeneity of the absorbed dose throughout the PTV is always present. A dose variation may even be desirable in some instances.

According to the recommendations already published (ICRU Report 50, ICRU [1993]), as a *basic* requirement, the following doses shall be reported:

- the dose at the ICRU Reference Point,
- the maximum dose to the PTV,
- the minimum dose to the PTV.

The PTV and the PRV are fixed volumes related to fixed anatomical structures, and thus allow for an accurate computation of the dose at the center, the maximum dose, and the minimum dose and for the presentation of dose-volume histograms. Such histograms should be reported for the PTV and PRV, when available.

Since the CTV can move in space and can change size and shape, the dose at the center, the maximum and the minimum dose, and the dose-volume histograms cannot be determined with high accuracy. As far as the dose at the center of the CTV is concerned, its value is generally close to that of the dose at the center of the PTV, which thus can be reported as a reasonable estimate of the dose at the center of the CTV.

As far as the maximum dose to the CTV is concerned, its value is generally close to that of the maximum dose to the PTV, which thus can be reported as a reasonable estimate of the maximum dose to the CTV.

As far as the minimum dose to the CTV is concerned, it is by definition, equal to or larger than the minimum dose to the PTV. The minimum dose to the PTV can thus be considered as a lower limit of the possible range of minimum dose values for the CTV.

A dose-volume histogram can be computed for the PTV, since this is a fixed volume. Some parts (close to the border) of the PTV could (for presentation in an average section) be outside the body contour. In such situations, dose distributions, such as dose-volume histograms, must be computed only for that part of the PTV completely enclosed by the average body surface (see Fig. 2.13.).