In order to facilitate communication and consistency in radiotherapy it is necessary to define unambiguous procedures for the specification of both target volume and dose delivery. Although such a statement is obvious, still a large diversity has been observed among the procedures applied in the various radiotherapy institutions or even in the same institution. In order to use common procedures more widely, the International Commission on Radiation Units and Measurements, ICRU, updated in Report 50 definitions and recommendations for target volume and dose specification. New volumes have been defined: the Gross Tumor Volume, GTV, the Clinical Target Volume, CTV, the Planning Target Volume, PTV, the Treated Volume and the Irradiated Volume. For dose reporting three levels have been described: level 1: only the dose at a reference point and its variation along a central beam axis are available; level 2: the dose distribution can be computed for plane(s); level 3: the dose distribution can be computed for volumes. At any level the dose at the ICRU Reference Point and the maximum and minimum dose to the PTV should be reported. In addition, this information could be supplemented by, e.g., isodose plans, dose-area/volume histograms, and other information, when available, at levels 2 or 3.

The recommendations given in ICRU Report 50 are in principle relatively easy to implement and are already in use in a large number of radiotherapy institutions and applied in various protocols of clinical trials. Despite its widespread use, these concepts have limitations. First, according to the ICRU, the dose should be specified at a reference point centrally located in the PTV. From a radiobiological point of view, the mean dose to the cancer cell population is the parameter which is best correlated with tumor response. Although the ICRU also mentions the specification of the mean dose to the PTV, such a procedure is conceptually not correct because the PTV contains margins for setup uncertainties that do not contain tumor cells. Furthermore, no indications are given how to quantify the margin to derive the PTV from the CTV. Consequently it will be difficult to take into account more detailed insight in the 3-D movement of the CTV, or better knowledge of uncertainties in patient positioning. Also for new developments like deliberately chosen non-uniform dose distributions over the target volume brought on by IMRT, the ICRU recommendations are no longer valid and other concepts for the reporting of dose distributions have to be explored.

For the time being, the ICRU Report 50 recommendations seem to be a useful compromise between current clinical practice and new developments in most institutions, although improvements with respect to the incorporation of margins, both in the target volume and in organs at risk are required. In the future the ultimate goal should be to deliver and specify the dose to a moving CTV with well-known variations in position with respect to the treatment beam. These recommendations should include probability based dose specification procedures and be extended to reporting doses in a series of patients.