Improving Dose Prescriptions for Safety, Reporting, and Clinical Guideline Consistency
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ICRU-83: Guidelines and Compliance in IMRT
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ICRU: International Commission on Radiation Units and Measurements
- 1978, ICRU-29: Dose specification for reporting external beam therapy with photon and electron beams.

Dose Prescription & Outcome
Dische et al, Radiother Oncol, 29, 287-293, 1993
Need for Dose Specification

The Need for Accurate Specifications in Clinical Radiation Therapy
An Introduction
Anders Brahma
From the Department of Medical Radiation Stcohkholm, Sweden
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Variations in doses in 803 patients among institutions

Institution 1
Institution 2
Institution 3
Institution 4
Institution 5

IMRT Dose Prescription: ICRU 83

- \( D_{95} \) is defined as Maximum dose
- \( D_{50\%} \) is Mean/median dose, prescription dose and very close to reference dose (ICRU-50)
- \( D_{98\%} \) considered as minimum dose in PTV
- HI = \((D_{2\%}-D_{98\%})/D_{50\%}\)
- Definition of sub volume with overlaps
\[ \sum_{i,j,k} w_{ijk} (D_{\text{opt}} - D_{\text{cal}})^2 = \text{minimum} \]

- \( w_{ijk} \): weight for constraint of an organ

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ICRU-83 DVH Parameters

- \( D_{95\%} \): close to ICRU reference point dose
- \( D_{95\%} = 60 \text{ Gy} \)
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ICRU-Definitions

- \( D_{95\%} \), \( D_{95\%} \)
- PTV (ECE), PTV (CME), PTV (CME), PTV (CME)
Minimization

Gradient, Newtonian optimization

Stochastic optimization

Iteration, Search routine

Concept of Dose Prescription

What should be the dose tolerance?

Dose Among Institutions

Das et al., Pr. Radiat Oncol, 7, e145-e155, 2017
**Target Volume Variations Among Institutions**

![Graph showing target volume variations among institutions.](image)

**Variability Among Treatment Techniques**

![Graph showing variability among treatment techniques.](image)

**Outcome and Clinical Trials**

![Graph showing outcome and clinical trials.](image)
Conclusions

- Adoption of target volume nomenclature is extremely poor and variable even after ICRU-50 (1993) for 3DCRT
- ICRU-83 adoption is poor indicated in large variability in dose prescription/delivery in IMRT and even in academic institutions
- Head & Neck and pelvis have better uniformity in dose prescription compared to other disease sites
- Clinical trials should emphasize the need for uniformity in dose prescription for a meaningful treatment outcome
- Mere ±10% dose difference has shown significant outcome difference
Thanks