

---

# Review of Gynaecological paper

---

*Review of paper [2]*

*Author: Anton Zhitomirsky*

## Contents

<b>1</b>	<b>Summary</b>	<b>2</b>
1.1	GTV . . . . .	2
1.2	CTV . . . . .	2
1.3	PTV . . . . .	2
1.4	Delineation Error . . . . .	2
<b>2</b>	<b>Terminology</b>	<b>2</b>
2.1	Target delineation . . . . .	2
2.2	geometric uncertainty . . . . .	2
2.3	imaging modality . . . . .	2
2.4	planning target volume . . . . .	3

## 1 Summary

Target delineation (2.1) is the largest source of geometric uncertainty (2.2) in radiotherapy which also depend on the imaging modality (2.3). You can apply safety margins to target to produce a planning target volume (2.4) to which treatments are designed. We use delineation uncertainty to determine the margin. However, this isn't analysed for recurrent gynaecological cancers (RGC).

### 1.1 GTV

First, macroscopic disease is delineated on imaging as the gross demonstrable tumour mass, known as the gross tumour volume

### 1.2 CTV

From this, the CTV is derived, to account for potential microscopic spread, although we deliver external beam radiotherapy or brachytherapy boost for recurrent gynaecological cancers, the CTV may be the same as the GTV.

### 1.3 PTV

Residual geometric uncertainties are then accounted for by adding safety margins to the CTV, resulting in the planning target volume (PTV), to which the treatment is planned.

### 1.4 Delineation Error

$$\Sigma_D(d) = \sqrt{\frac{1}{N_0 - 1} \sum_{i=1}^{N_0} (d_i - \bar{d})^2} \quad (1)$$

See paper for method of calculating (1) for each point in a patient.

## 2 Terminology

### 2.1 Target delineation

Delineation is synonymous with contouring of a target volume. The current standard is to define a gross tumour volume (GTV) and a clinical target volume (CTV) and a planning target volume (PTV). The GTV is the part of the tumour that is visible in 3D, however the clinical volume also accounts for microscopic transfer patterns which makes contain as its subset the GTV [5].

### 2.2 geometric uncertainty

a common way to see if the delineated area we predict compared to the true value is accurate. Returns a score based on the geometric pattern chosen [4].

### 2.3 imaging modality

techniques used to create images of the human body for diagnostic and therapeutic purposes. Includes X-Ray, Fluoroscopy, CT Scan, MRI, Ultrasound, ... [1]

## 2.4 planning target volume

The third volume, the planning target volume (PTV), allows for uncertainties in planning or treatment delivery. It is a geometric concept designed to ensure that the radiotherapy dose is actually delivered to the CTV. Radiotherapy planning must always consider critical normal tissue structures, known as organs at risk (ORs). In some specific circumstances, it is necessary to add a margin analogous to the PTV margin around an OR to ensure that the organ cannot receive a higher-than-safe dose; this gives a planning organ at risk volume. [3]

## References

- [1] 2023. URL: <https://www.ccdcare.com/resource-center/radiology-modalities>.
- [2] D Bernstein et al. “An Inter-observer Study to Determine Radiotherapy Planning Target Volumes for Recurrent Gynaecological Cancer Comparing Magnetic Resonance Imaging Only With Computed Tomography-Magnetic Resonance Imaging”. en. In: *Clin Oncol (R Coll Radiol)* 33.5 (Feb. 2021), pp. 307–313. URL: <https://pubmed.ncbi.nlm.nih.gov/33640196/>.
- [3] Neil G Burnet et al. *Defining the tumour and target volumes for radiotherapy*. 2004. URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1434601/pdf/ci040153.pdf>.
- [4] K. Mackay et al. *A Review of the Metrics Used to Assess Auto-Contouring Systems in Radiotherapy*. 2023. URL: [https://www.clinicaloncologyonline.net/action/showPdf?pii=S0936-6555\(23\)00021-3](https://www.clinicaloncologyonline.net/action/showPdf?pii=S0936-6555(23)00021-3).
- [5] C. F. Njeh. *Tumor delineation: The weakest link in the search for accuracy in radiotherapy*. 2008. URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2772050/>.