

Compliance with Radiotherapy Planning Constraints in Cervical Cancer at Royal Surrey

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Introduction

- In 2019, the radiotherapy department at St Luke's cancer centre received a new Varian Ethos[®] treatment machine. This provides the capability of offering automated online adaptive radiotherapy (oART), delivering a bespoke plan based on the daily patient anatomy.
- The cervix was selected as a treatment site which would most benefit from this due to the large movements which must be accounted for with current manual planning methods.
- A retrospective audit was required to determine whether the planning constraints were still appropriate when preparing plans on the new automated system. The audit would then establish a baseline set of results from retrospective manually produced clinically acceptable plans to measure the performance of the new automated system.

Methodology

- The radiotherapy record and verify system (ARIA) was used to identify 42 patients treated with 50.4Gy in 28 fractions between Jan 2019 and Apr 2021.
- A script was designed to automate extraction of the relevant patient dose statistics which were then tabulated in Excel.
- Clinical constraints were based on the INTERTECC trial [1] and more recently the EMBRACEII trial [2]. These detailed 2 types of constraint:
 - Mandatory = must always be met
 - Optimal = should be met 70% of the time
- The percentage that each statistic was met was calculated for the patient population and compared to the set standards within the clinical protocol.

Conclusions

- This audit has identified that the current radiotherapy planning constraints in the clinical protocol are not routinely met.
- Best clinical practice is heavily dependant on individual patient anatomy and priority is given to target coverage.
 - As a result of this, surrounding organs often received doses exceeding the written constraints due to clinical preference.
- This has identified that tumour coverage must be priorities within the new automated planning system to achieve comparable long term patient outcomes.
- We suggest a similar audit should be completed once the automated system has been put into clinical use to ensure plan quality remains high.

Results

Mandatory Constraints

- There are 15 mandatory constraints for organ doses in the current clinical protocol.
- These were met 100% of the time for only 8/15 of the constraints as shown in Figure 1.
- The bone marrow met 0/3 constraints.

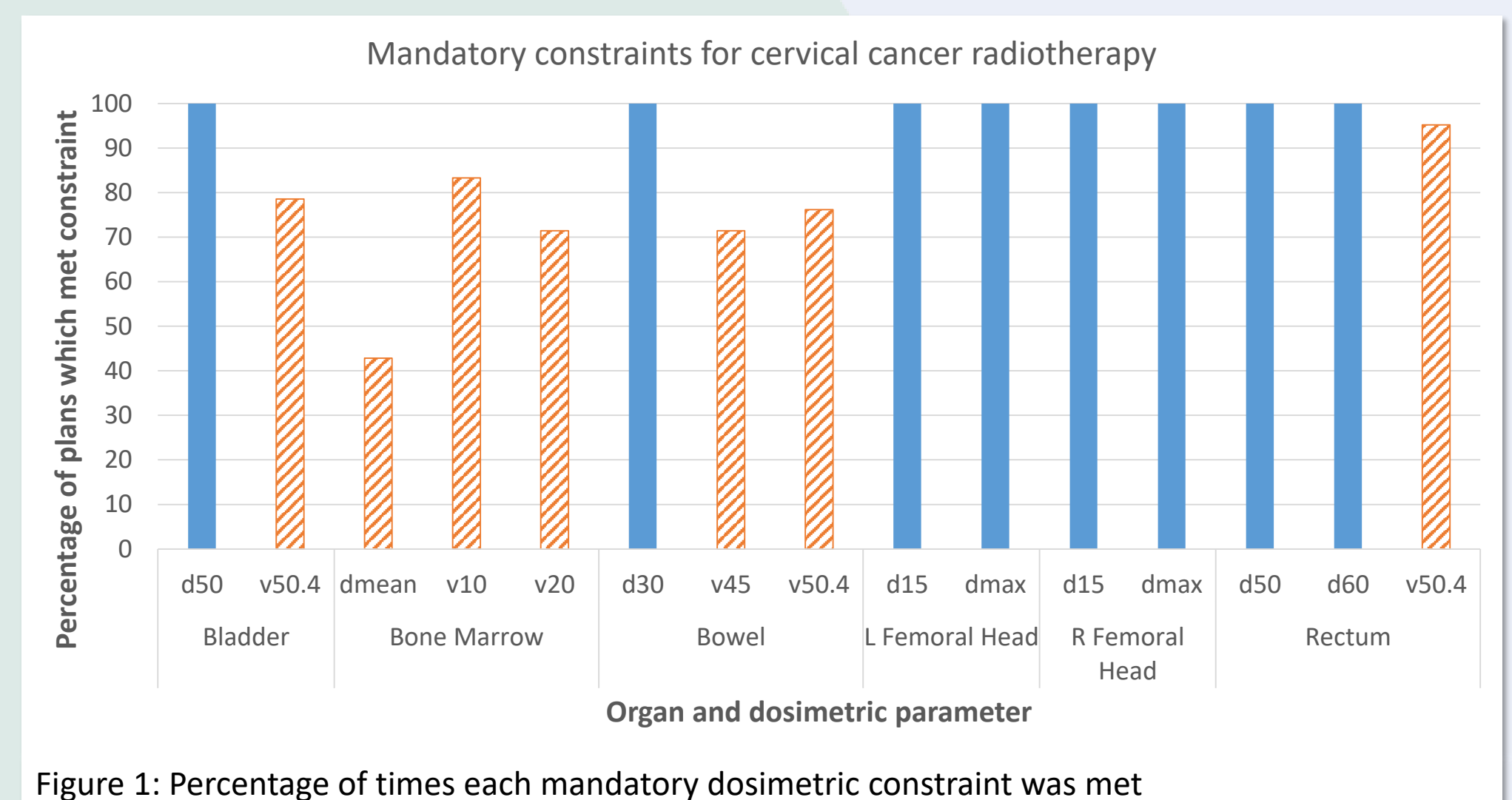


Figure 1: Percentage of times each mandatory dosimetric constraint was met

Optimal constraints

- There are 15 optimal constraints for organ doses.
- Only 4 of these achieved the required 70% standard as show in in Figure 2.
- Only the femoral heads consistently achieved over 70%, all other organs failed to achieve the 70% pass rate.

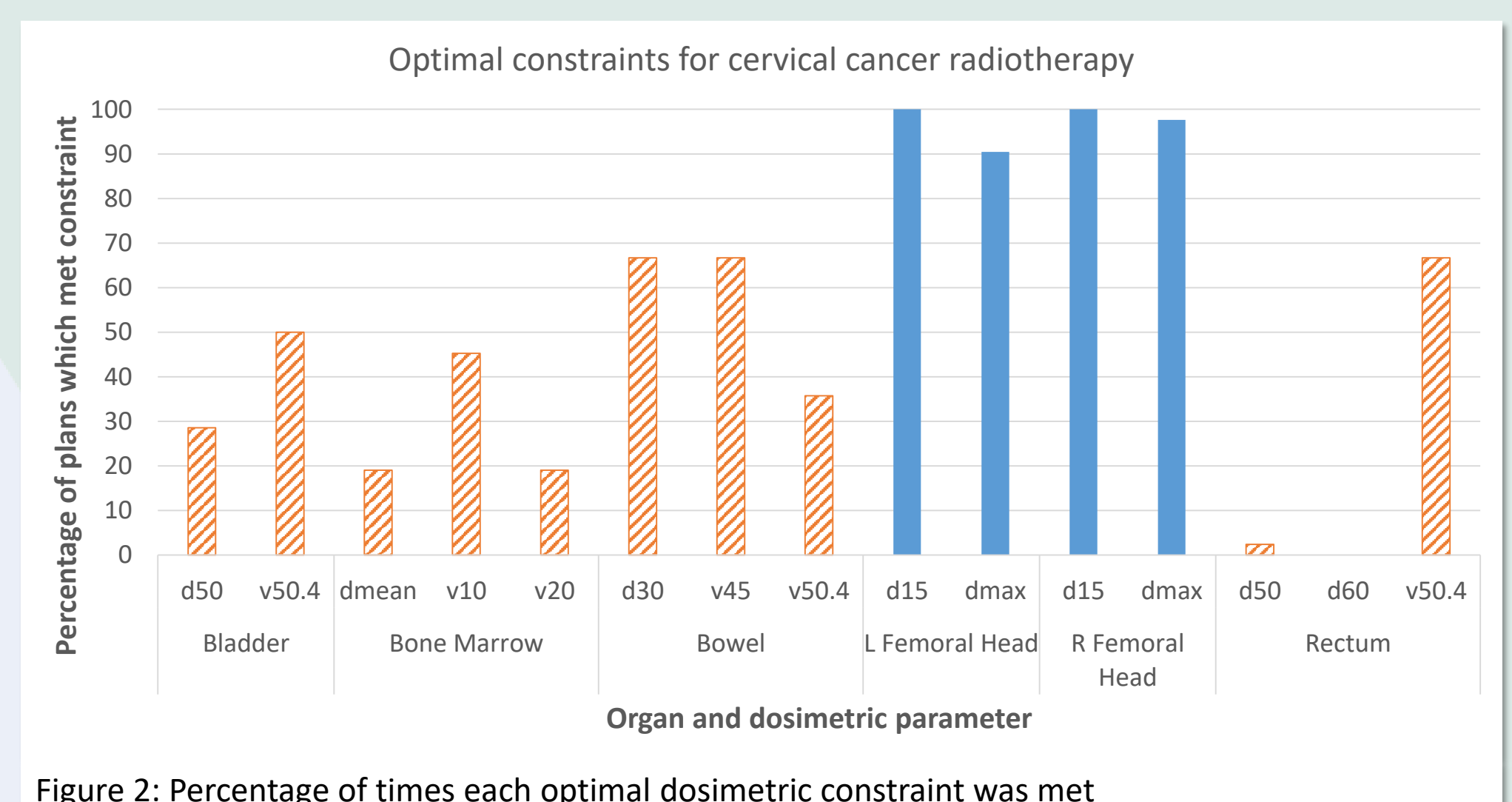


Figure 2: Percentage of times each optimal dosimetric constraint was met

References

- Williamson CW. Et al. *Positron Emission Tomography-Guided Bone Marrow-Sparing Radiation Therapy for Locoregionally Advanced Cervix Cancer: Final Results From the INTERTECC Phase II/III Trial*. *International Journal of Radiation Oncology* 2022; 112: 169-178.
- Potter R. et al. *The EMBRACE II study: The outcome and prospect of two decades of evolution within the GEC-ESTRO GYN working group and the EMBRACE studies*. *Clinical and Translational Radiation Oncology* 2018; 9: 48-60.