Involving physicians in IMRT planning by interactive plan navigation
B. S. Müller1, T. Bortfeld2, J. Efstathiou2, H. A. Shih3, D. Craft2
1Klinikum rechts der Isar Technische Universität München, Department of Radiation Oncology, Munich, Germany
2Massachusetts General Hospital Harvard Medical School, Department of Radiation Oncology, Boston, USA

Purpose/Objective: To demonstrate the feasibility of physician driven IMRT planning with a multicriteria optimization (MCO) treatment planning system. The long term objective is to involve physicians at an earlier stage of the treatment planning process in order to increase planning efficiency and allow physicians to more naturally express their clinical intentions.

Materials and Methods: This treatment planning study is based on data of 10 prostate and 12 central nervous system (CNS) cases, previously treated at Massachusetts General Hospital with a clinically approved MCO-IMRT treatment plan, created by dosimetrists. MCO Pareto surfaces were recalculated using identical beam geometries as in the clinical plans. Physicians navigated to their preferred trade-offs and created a deliverable plan (Figure 1). For each patient two plans, the clinically delivered and the physician navigated plan, are evaluated with regard to dosimetric parameters. Spearman’s correlations assessed correlations between volumes of PTV-stomach overlap and duodenal overlap exceeded 20cc, 3D-CRT plans could not be created (Spearman’s rho: 0.79, p=0.001). Where PTV-duodenal overlap exceeded 98% of duodenal V55Gy constraint (usual limit <1cc) in order to achieve coverage in at least 98% of the PTV received ≥95% of the prescription dose (PD). For VMAT planning to 59.4Gy, areas of PTV overlap with the stomach and duodenum received ≥80% of the PD, and 95% of the non-overlapped PTV received ≥95% of the PD, as per the SCALOP II protocol. The Wilcoxon signed-rank test was used to compare dosimetric parameters. Spearman’s correlations assessed correlations between volumes of PTV-duodenal and PTV-stomach overlap, and dosimetric parameters.

Results: Overall plans generated by dosimetrists versus physicians were comparative without marked differences. However, evaluation of individual treatment plans demonstrate different focuses of planning target volumes (PTV) and organs at risks (OAR) and between OARs, but not in a consistent way. While most of the evaluated quantities do not show significant deviations, general differences were found for the brainstem (p(D1)=0.029) in CNS, where the physician allowed higher values of D1, and for high dose regions of bladder (p(D1)=0.024, p(V65)=0.003) and rectum (p(D1)=0.005 , p(V65)=0.009), where the physician chose more OAR sparing in exchange for a lower PTV coverage (volume of 98%-isodose: p(V65)27)=0.007). The full statistical evaluation and a blinded plan comparison survey of both plans are ongoing. After some introduction to the system, both physicians felt comfortable navigating and exploring the planning possibilities. A learning curve was observable throughout the study: physicians developed strategies and navigation times were reduced (prostate: from 30 to 5 minutes, CNS: case specific variations 15-20 minutes). Recorded physicians statements such as: ‘it is great to see the trade-offs’ and ‘isn’t that interesting how much this dose is decreasing for a small increase in the other?’ highlight that physicians put great value on being able to navigate their own plans.

Conclusions: Physician driven planning by Pareto surface navigation is feasible. Generally physicians insight into the planning process is of great value. With respect to clinical decisions and planning efficiency the gain appears to be case and anatomical site dependent.

EP-1322
3D-CRT, VMAT and dose escalation for pancreatic radiotherapy planning
P. Junnil1, L. Murray1, H. B. Musunuru2, J. Lilley3, S. Wilson1, A. Crellin1, D. Sebag-Montefiore3, G. Radhakrishna2
1St James’s Institute of Oncology, Department of Radiotherapy Planning, Leeds, United Kingdom
2St James’s Institute of Oncology, Department of Clinical Oncology, Leeds, United Kingdom
3University of Leeds, Leeds Institute of Cancer and Pathology, Leeds, United Kingdom

Purpose/Objective: To compare 3D-CRT and VMAT pancreatic radiotherapy planning, and to assess the feasibility of dose escalation.

Materials and Methods: Fourteen pancreatic 4D-CT datasets were planned using: i) 5-7 field 3D-CRT, prescribing 54Gy in 30 fractions, ii) double arc VMAT, prescribing 54Gy in 30 fractions and iii) double arc VMAT, prescribing 59.4Gy in 33 fractions. For 3D-CRT planning and VMAT planning to 54Gy, at least 98% of the PTV received ≥95% of the prescription dose (PD). For VMAT planning to 59.4Gy, areas of PTV overlap with the stomach and duodenum received ≥80% of the PD, and 95% of the non-overlapped PTV received ≥95% of the PD, as per the SCALOP II protocol. The Wilcoxon signed-rank test was used to compare dosimetric parameters. Spearman’s correlations assessed correlations between volumes of PTV-duodenal and PTV-stomach overlap, and dosimetric parameters.

Results: It was necessary to exceed the duodenal V55Gy constraint (usual limit <1cc) in order to achieve coverage in six 3D-CRT plans. There was a strong correlation between the volume of PTV-duodenal overlap and duodenal V55Gy (Spearman’s rho: 0.79, p=0.001). Where PTV-duodenal overlap exceeded 20cc, 3D-CRT plans could not be created without exceeding duodenal constraints. All duodenal constraints were met in all VMAT 54Gy and 59.4Gy plans.