

AbstractID: 13838 Title: A coverage probability based method to estimate patient-specific planning organ-at-risk volumes for the small bowel to account for organ motion during radiotherapy

Purpose: The small bowel (SB) is a critical organ-at-risk (OR) in radiotherapy (RT) of several major pelvic and abdominal tumour sites. Due to its large size, its complex shape and the considerable inter-patient variation in its mobility, there are at present no method to derive planning OR volumes (PRVs) that can account for individual patterns in SB motion. The aim of the present work was therefore to develop a patient-specific planning concept for the SB which both has a high sensitivity in predicting SB voxels and is specific, meaning that it does not contain many voxels which will never be visited by the SB. **Method and materials:** Our method considers the variability in SB wall (SBW) position between a number of initial/pre-therapy CT-scans and uses this variability to estimate a 'soft margin' around the SBW instances, such that patients with a mobile SBW would get a broader estimated 'soft margin' than patients with a less mobile SBW. The 'soft margin' is used to estimate a coverage probability (CP) matrix of the SBW from where patient-specific PRVs are generated by applying various CP thresholds. The patient-specific PRVs, as generated from 2-5 CT-scans, were evaluated by their sensitivity and specificity with respect to the PRVs generated from all 10-11 available CT-scans in three patients. **Results:** The sensitivity and specificity of the patient-specific PRVs depended on the number of included CT-scans and the applied CP-threshold. With three included CT-scans and a threshold of 0.03, an average sensitivity of 94-96% and specificity of 86-97% was obtained in the three patients. **Conclusion:** Based on a few CTs, our planning concept generates patient-specific SB PRVs which are highly sensitive and specific in detecting future SBW voxels.