Purpose or Objective: Version 9.10 of Pinnacle TPS (Philips Medical Systems) includes Auto-Planning (AP) module. The user defines beams, optimization goals for PTV coverage and threshold doses for each organ at risk (OARs). The AP engine tries to meet the goals and further lower dose to OARs with minimal compromise to the target coverage by multiple optimization iterative loops and by automatically creating objectives and optimization on additional structures. The aim of this study was to evaluate and compare AP plans with different TPS manual ones for liver stereotactic body radiotherapy (SBRT) treatments.

Material and Methods: Ten patients with liver tumour were included in the study. Six plans were created for each patient. Two plans were generated with AP of Pinnacle TPS (version 9.10) using SmartArc technique and two with traditional planning (MP), always with Pinnacle SmartArc, by two different expert medical physicists. Others two experts performed two VMAT plans with Monaco TPS (version 5.0, Elekta) (VM). Dosimetry comparison was done in terms of the PTV coverage, gEUD, OARs (normal liver, kidneys, spinal cord, bowel, heart, rib cage, stomach and major vessels) sparing, as well as homogeneity index (HI), conformity index (CI) and gradient index (GI). Also total monitor units, number of beam segments and beams complexity metrics (plan average beam area BA, plan average beam irregularity PI and plan average beam modulation PM) were evaluated.

Results: Preliminary results of three patients indicated that, for same gEUD (p value = 0.99), there were not significant differences between AP, MP and VM for CI (p = 0.83). Relevant differences were found instead in OARs sparing. In particular, median and mean values of monitor units were respectively 3212 and 3646 ± 1529 for AP, 2930 and 2923 ± 447 for MP and 5006 and 632 ± 120 cc for MP and 659 cc for VM; the mean values were 625 ± 150 cc for AP, 632 ± 120 cc for MP and 673 ± 46 cc for VM.

Conclusion: Analysis of first three patients demonstrated that AP and MP employed much less monitor units respect to VM and showed a minor PI. However, in particular complex cases, AP and MP had more difficulty to spare the organs at risk than VM. Furthermore, there was a significant variability for AP and MP. AP was less human employment time consuming than both manual planning systems. At the congress, results of all ten patients will be presented.

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Clinical experiences with RapidPlan knowledge-based treatment planning
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Purpose or Objective: RapidPlan (RP) knowledge-based treatment planning software has been in clinical use at our institution since November 2014 and, to date, has been used to plan in excess of 100 patients. Models have been created for a variety of treatment sites, and plans have been compared with class-solution based methods of optimising in terms of plan quality and efficiency of planning and delivery.

Material and Methods: A prostate model was generated based on 5-field IMRT plans with three prescribed dose levels (78Gy/71Gy/60Gy), delivered in 37 fractions. Prior to routine clinical use of the model, planning and delivery efficiency were investigated using twenty patients, who were planned first using local objective templates, and then reoptimised using RP-generated objectives. Six planners of varying experience participated, and the same planner performed both optimisations for a patient. The planners timed how long each method took to generate a plan, and also noted how the RP plan compared with the standard plan, and whether further modifications were required after the initial RP optimisation.

Following final adjustments to the model, it was put into routine clinical use for all prostate cases with three dose-levels. Further models were created for cervix patients treated with RapidArc and post-prostatectomy patients; both single dose-level. For all models, a record was kept of situations where RapidPlan was unable to generate an acceptable distribution to allow further investigation and modification of model parameters as required. Additionally, the applicability of the models to situations outside the original scope was investigated.

Results: The results of the double-planning study can be seen in Table 1 & Fig. 1. RapidPlan produced a plan that was of equal or higher quality in 85% of cases, and the planning times were significantly reduced with a median time saving of 70 mins per patient (range 0-240 min). The spread on the timings was much smaller for RP, indicating that the planning times were less dependent on case complexity and planner experience when using RapidPlan. Monitor units were found to be slightly higher with RP (p = 0.03); however, this is unlikely to be clinically significant.

Considerable reductions in planning time were also seen for the cervix and post-prostatectomy models. Continuing evaluation of all models in routine use has indicated that they work well for the majority of the population. The models were also found to give a good starting point for situations outside the initial scope in some instances, e.g. the cervix model was used successfully for both a single dose-level prostate + nodes and a two dose-level endometrium + para-aortic nodes.

Table 1: Results of double-planning prostate IMRT patients

<table>
<thead>
<tr>
<th></th>
<th>Standard</th>
<th>RapidPlan</th>
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</thead>
<tbody>
<tr>
<td>Planning time [min]</td>
<td>80 (IQR)</td>
<td>18 ± 13</td>
</tr>
<tr>
<td>% final plans better</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>MU (mean ± SD)</td>
<td>659 ± 152</td>
<td>695 ± 161</td>
</tr>
</tbody>
</table>

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Material and Methods: Two patient cases, four by localisation, were planned both for S&S and VMAT. The AutoPlanning method (AP) was compared with those obtained with a conventional manual planning method. The plan quality evaluation was based on the dose distributions (HDV and isodose), the dose homogeneity (HI), dose conformity (Conformal Number (NC) and Conformal Index (COIN)) and complexity indexes (Plan Area (PA)) and Monitor Units (MU) number. The agreement between planned and measured doses was evaluated with Gamma index test with criteria of 3% and 3mm; the mean gamma value and the percentage of accepted points were also compared. The dosimetric QA was performed by Octavius 4D device (PTW).

Results: HDV AP plans showed equivalent quality compared to the manual plan. With AP for pelvis case, the median dose for bladder decreased by 6% and 4% for S&S and VMAT techniques respectively. With AP for H&N case, the parotids were better saving: the dose received by 30% of the volume decreased by 12% and 14% for S&S and VMAT techniques respectively; this sometimes causes a deterioration of intermediate risk PTV coverage (PTV 63 Gy). The homogeneity index showed a lower interpatient variation for AP: the standard deviation was 0.006 for S&S with AP compared to 0.009 without AP. The HDV AP plans showed equivalent quality compared to the manual plan. The dose distributions of each plan were verified and validated by a radiation oncologist. The dose distributions of each plan were verified and validated by a radiation oncologist.

Conclusion: RapidPlan has been found to produce good quality plans more efficiently than class-solution based methods in the majority of cases. Continual monitoring of model behaviour is recommended to allow refinement in order to ensure optimum performance for all patients.

Purpose or Objective: The inverse planning for IMRT is variable due to a high number of parameters to be defined by the operator. So the quality of treatment plan depends on the level of operator expertise. The aim of this study was to evaluate the automatic "AutoPlanning" planning tool implemented in Pinnacle v9.10 TPS (Philips) for IMRT Step&Shoot (S&S) and VMAT techniques for three localisations: prostate, pelvis and head and neck (H&N) with integrated boost technique with three dose level.

Material and Methods: Twelve patient cases, four by localisation, were planned both for S&S and VMAT. The AutoPlanning method (AP) was compared with those obtained with a conventional manual planning method. The plan quality evaluation was based on the dose distributions (HDV and isodose), the dose homogeneity (HI), dose conformity (Conformal Number (NC) and Conformal Index (COIN)) and complexity indexes (Plan Area (PA)) and Monitor Units (MU) number. The agreement between planned and measured doses was evaluated with Gamma index test with criteria of 3% and 3mm; the mean gamma value and the percentage of accepted points were also compared. The dosimetric QA was performed by Octavius 4D device (PTW).

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Comparison between a conventional IMRT planning method and a new automated planning method.

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