Purpose: Different treatment planning systems (TPS) use different treatment optimization and leaf sequencing algorithms. This work compares nasopharyngeal carcinoma (NPC) IMRT plans optimized with four commercial TPSs to investigate the plan quality in terms of target conformity and delivery efficiency.

Methods: Five nasopharyngeal carcinoma cases were planned with the Corvus, Monaco, Pinnacle and Xio TPSs by experienced planners using appropriate optimization parameters and dose constraints to meet the clinical acceptance criteria. Plans were normalized for at least 95% of PTV to receive the prescription dose (Dp). Dose-volume histograms and isodose distributions were compared. Other quantities such as Dmin (the minimum dose received by 99% of CTV/PTV), Dmax (the maximum dose received by 1% of CTV/PTV), D100, D95, D90, V110%, V105%, V100% (the volume of GTV/CTV/PTV receiving 110%, 105%, 100% of Dp), conformity index (CI), homogeneity index (HI), the Dmax of spinal cord, brain stem, nerves and lens, the volume of receiving 30Gy (V30) and the mean dose to parotids (Dmean) were evaluated. Total segments and MUs were also compared.

Results: While all plans meet target dose specifications and normal tissue constraints, the maximum GTVCI of Pinnacle plans was up to 0.43 and the minimum of Corvus plans was only 0.17, these four TPSs PTVCI had comparable and no difference. The GTVHI, CTVHI and PTVHI of Pinnacle plans are all very low and show a very good dose distribution. Corvus plans provided the lower, better protection of normal tissue. The Monaco and Pinnacle plans require significantly less segments and MUs to deliver than the Corvus plans.

Conclusions: To deliver on a Varian linear-accelerator, the Pinnacle plans show a very good dose distribution. Corvus plans provided the lower, better protection of normal tissue. The Monaco and Pinnacle plans have faster beam delivery.