[1]Cancer Treatment Centers of America, Radiation Oncology, Newnan GA, USA
[2]Landauer Medical Physics, Radiation Oncology, Newnan GA, USA

Purpose or Objective
Nomograms are well established in Low Dose Rate (LDR) Brachytherapy to estimate the number of seeds for a prostate volume. This concept can be applied to High Dose Rate (HDR) Brachytherapy to provide a second check of the dose calculation and assess plan and implant quality. In 2011, Pujades et al. published findings on the use of a nomogram in LDR and HDR prostate brachytherapy at 2 separate institutions in Valencia, Spain. This work seeks to provide updated patient data to validate the use of nomograms in HDR brachytherapy and provide a linear fit correlation from the perspective of another institution.
Material and Methods
The HDR prostate brachytherapy treatment plan data were collected from February 2014 through September 2017, including several monotherapy and boost prescriptions from a single institution, Cancer Treatment Centers of America Southeastern (CTCA SERMC). The Ir-192 HDR source and the Varian VariSource™ iX Afterloader were used in conjunction with the Varian BrachyVision (versions 10.0, 11.0, and 13.6) for treatment planning and dose calculation. All treatment plans were evaluated based on American Brachytherapy Society consensus guidelines for HDR prostate brachytherapy. The air kerma strength, S_k, (μGy-m^2/h) and total treatment time, T, (sec) were recorded and normalized by the prescription dose, Rx, (Gy). The normalized total air kerma strength was then plotted against the CTV treatment volume, V, (cm^3).
Results
The resulting linear regression line of the data from our institution was compared against the data from the two different institutions, Institution A and Institution B, published by Pujades et al. as shown in Table 1.

Table 1: Parameters obtained from the lines of best fit for 3 separate institutions

Institution	Linear fit $(T\times S_k)/Rx = a\times V+b$	R^2
Institution A (Pujades et al.)	$a = (5.8\pm0.8)\times10^{-2}\ cm^{-1}$ $b = (1.7\pm0.3)\ cm^2$	0.888
Institution B (Pujades et al.)	$a = (6.3\pm0.5)\times10^{-2}\ cm^{-1}$ $b = (1.7\pm0.14)\ cm^2$	0.940
CTCA SERMC	$a = (5.43\pm0.11)\times10^{-2}\ cm^{-1}$ $b = (2.058\pm0.053)\ cm^2$	0.8698

The standard deviation of the best fit line for CTCA SERMC was found to be 0.329 cm^2. Out of 375 HDR prostate plans, all plans were within 3 standard deviations and 98.7% of the plans were within 1 standard deviation of the line of best fit.
The line of best fit for our institution crossed the line of best fit for Institution B at 41.15 cm^3, demonstrating the plans calculated and evaluated at our institution were hotter for treatment volumes up to 41.15 cm^3 and cooler beyond that point. This aligned with the conclusion by Pujades et al. that Institution B accepted higher overdose volumes in general.
Conclusion
Based on these data, this nomogram is being used clinically at CTCA SERMC as a safety check of the dose calculation. The data points from all recent HDR prostate brachytherapy plans are evaluated against this nomogram. Those that fall outside 3 standard deviations of the best fit line are investigated before treatment delivery. Future work will consider additional factors such as D95, V150, and V200 in an attempt to develop an institution-independent nomogram.

EP-2185 Evaluation of the CK-11 version for the Cyberknife M6
D. Schmidhalter[1], D. Henzen[1], M. Malthaner[1], E. Herrmann[1], S. Angelmann[1], H. Hemmatazad[1], S. Stieb[1], M.K. Fix[1], P. Manser[1]
[1]Inselspital- Bern University Hospital- and University of Bern, Division of Medical Radiation Physics and Department of Radiation Oncology, Berne, Switzerland

Purpose or Objective
In August 2017 the Cyberknife 11 (CK-11) version including the treatment planning system (TPS) Precision™ v.1.1 was installed at our institution. The upgrade process itself as well as the performance of the new hard- and software was evaluated in our clinical environment within the framework of a Ramp and Monitor program. In this work we report our experiences made while performing the upgrade, the time and resources needed as well as the impact of this upgrade to clinical routine. In addition we evaluated the performance of Precision™ and compared it with MultiPlan™.
Material and Methods
In order to evaluate the performance of Precision™ a total of 4 plans were chosen covering all 3 collimator types (Fixed, Iris and MLC) as well as all dose calculation algorithms (Raytracing (RT), finite-pencil-beam (FSPB) and Monte Carlo (MC)). The following operations were performed 3 times per plan within MultiPlan™ as well as within Precision™ and the time needed to perform these operations was quantified: open and save a plan, optimize a plan, calculate a dose distribution (RT, FSPB and MC) and time reduction. A speedup-factor was calculated giving the ratio between the time quantified within MultiPlan™ and the time quantified within Precision™.
Results
The upgrade was scheduled for 10 days in total including 6 days of downtime. The successful installation of the new hard- and software was done during the first 5 days followed by 2 days of quality assurance (QA) in order to approve the new system for clinical use. The remaining 3 days were used for training and go-live. 5 days were needed in order to perform the commissioning of the MC algorithm for the InCise™ MLC.
For our institution, the 5 most important new features in CK-11 are the following: Possibility to perform deformable image registration (DIR) between CT and MR, improved auto-segmentation tools, MC dose calculation option for the InCise™ MLC, the availability to take into account prior dose distributions within the planning process when retreating patients and the automatic startup-option for the Cyberknife.
In comparison to MultiPlan™ the performance of Precision™ was increased by a speedup-factor of 3.4 (2.5 - 4.4) to open and save a plan, 1.5 (1.1-2.2) to optimize a plan, 7.3 (7.2-7.4) to calculate an MC dose, 1.7 (1.6-1.8) to calculate a Raytracing dose, 3.3 (3.1 - 3.4) to calculate a FSPB dose and 5.5 (0.6-14.1) to perform a time reduction while dosimetric results keep the same.**Conclusion**
The CK-11 upgrade was performed successfully and in time. The CK-11 version offers clinical benefits due to improved segmentation quality (DIR), saving time in the treatment planning process (auto-segmentation, improved TPS performance) and more accurate dose calculation (MC for InCise™ MLC).

EP-2186 An analysis of the clinical performance of Eclipse for PBS proton therapy treatment planning
S. Rosas[1], M. Belosi[1], N. Bizzocchi[1], P. Morach[1], S. Zepter[1], D. Weber[1], A. Lomax[1], J. Hrbacek[1]
[1]Paul Scherrer Institute, Zentrum für Protonentherapie ZPT, Villigen, Switzerland