BACKGROUND ON TG 244 and Monaco Academy

In 2014, Task Group 244 of the AAPM published an important new guideline: AAPM Medical Physics Practice Guideline 5.a.: Commissioning and QA of Treatment Planning Dose Calculations — Megavoltage Photon and Electron Beams. You can find a link to this publication here.

This particular Medical Physics Practice Guideline (MPPG) includes recommendations to "validate the dose for IMRT/VMAT/helical delivery plans through comparison of the individual beams and/or composite measurements with TPS calculations. In addition, the MPPG recommends the establishment of a routine QA program that validates dose calculation consistency through recalculation of reference plans for photon and electron beams."

MPPG provided six sample datasets (DICOM CT and RT Structure Sets) and made them available for download along with specifying the target prescriptions and basic/minimal sets of plan metrics and objectives to ensure that high-quality and *clinically relevant* plans are used for this vital testing of the TPS.

For this year's Monaco Academy, one of the six datasets provided by TG 244 to create an advanced, challenging, and comprehensive set of plan metrics and per-metric score functions (i.e. scoring objectives) to allow for quantifying plan quality. ProKnow's online and real-time scoring mechanism will be used to score submissions.

Note: ProKnow's anatomic contours are higher quality (e.g. smoother and not "blocky") than the structure sets published by the AAPM, so you will want to use ProKnow as your one-stop-shop for TG244 data.

GENERAL GOALS OF THIS STUDY
The goals of this study are to:
1. Quantify the relative capabilities of different planners, planning systems, and delivery modalities to create a highly conformal dose to the target volumes,
2. Study the variability across all submitted plans, and
3. Determine, document, and distribute the "best practices," i.e. to share tips and techniques with the community.

WHO SHOULD PARTICIPATE
The plan challenge is part of the Monaco Academy and is open to all Elekta and Monaco users.

TARGET PRESCRIPTION & FRACTIONATION
The prescription and fractionation details for this specific TG244 plan study are as follows:
• PTV70 = 70 Gy, PTV63 = 63 Gy, and PTV56 = 56 Gy
• Simultaneous Integrated Boost, 35 fractions

PLAN QUALITY SCORING
The plans will be scored based on target coverage and organ-at-risk sparing defined by a collection of specific metrics, each with its own score function.
ProKnow plan studies will use a scoring method and plan metrics that are far more advanced, comprehensive, and challenging than the defaults suggested in the TG244 tables of plan objectives. The "Plan Metric Summary" is available on the plan challenge portal containing the detailed description of each metric and score function.

The ProKnow system will provide immediate scoring feedback for you so that you can concentrate on creating your best plan without the hassle of extracting your metrics and estimating your scores manually.

HOW TO PARTICIPATE
Use the tools of the ProKnow plan study system to:

1. Register for the plan study through this
https://proknowsystems.com/organizations/join/61a6b7f6c400061e6542eb1fdcffc2e9

2. SIGN IN to ProKnow. ProKnow (http://www.proknowsystems.com)

3. DOWNLOAD the required data, which will be a zip file containing the necessary CT images and RT Structure Set. TG 0244 3 Dose Level HN plan

4. UNZIP the data to get all the DICOM source files.

5. IMPORT the images and structures into your TPS.

6. CREATE YOUR PLAN and CALCULATE THE DOSE using Monaco.

7. EXPORT your plan and dose as DICOM RT Plan and DICOM RT Dose, respectively.

8. UPLOAD your RT Plan and RT Dose to ProKnow.

9. GENERATE YOUR PLAN SCORE, which will be calculated in "real time" by the ProKnow site. Results will be displayed as a summary table and with per-metric "drill down" analysis of each metric result.

10. CONTINUE TO EDIT your plan (if you wish) to optimize your score.

11. When ready, SUBMIT your results to the study. You can remove and/or replace a submission if the ProKnow data collection phase is open.

NOTE: Once the study statistics are "released" by ProKnow, you can INTERACTIVELY STUDY YOUR RESULTS VS. THE POPULATION. Even after the study data collection phase is closed, you can continue to upload different plans and score them to see how they compare to your original submission and vs. the population.

STATISTICAL ANALYSIS & PERFORMANCE VS. POPULATION
Each participant will be able to return to their ProKnow portal at any time to interactively study their individual results vs. the population, not only for the plan composite score, but also for any individual metric component. This feature will be turned "on" either: 1) After the study data collection phase is over and ProKnow has "released" the results, or 2) if your study manager requested that ProKnow leave the statistical analysis "open" during data collection.

SPECIAL INSTRUCTIONS FOR PLANNING
Editing or Adding Contours
Feel free to add or edit contours if that is part of your normal plan optimization technique. Your new contours will not be uploaded to ProKnow, only your plan and dose. Only the original structures will be used in the scoring (i.e. to calculate DVH data, etc.).

Downloaded CT and Structure Set Data
The initial ProKnow download required to get started will be a zip containing all the CT images and RT Structure Set in DICOM format. (Note: The downloaded file should end with *.zip so if your browser removes that file extension, you will need to add it back.) Once downloaded, unzip the data to render the source DICOM files that you will need to import into your TPS.

General Requirements for Your Plan and Dose
We do have several minimum requirements for the plan and dose you will create and upload.
1. We require that dose grid resolution meet a minimal requirement of less than or equal to 3 mm spacing in each dimension (e.g. 4 mm grids are far too coarse to give accurate DVH curves).
2. Set the extents of the dose grid (i.e. the bounding box inside of which you will calculate dose) to cover all of the critical anatomy, but it does not need to cover all of the CT images. Cropping the dose calculation grid to include all critical anatomy but not the volume outside (particularly, superiorly and inferiorly to critical anatomy) will cut down on the size of the RT Dose file and speed up both the upload process and the calculation of your scores.

3. Use your professional judgment and DO NOT design any impractical treatment plans or plans that result in long treatment times. VMAT plans should ideally use three arcs or less, IMRT should use 9 unique beam geometries. Do not exceed normal tolerances.

ONLINE HELP & FAQS
Frequently Asked Questions (FAQs)
We provide a document with common FAQs here:
https://blog.proknowsystems.com/resources/faqs/

Searchable Database of Questions
We have a searchable database of questions that you can access here:
https://proknowsystems.com/contact

All Other Questions
If you have questions that are not addressed in the documents or searchable topics specified above, you can submit your questions from the online widget also provided on this page:
https://proknowsystems.com/contact or email any of the following:

Raniel.sarmiento@elekta.com
William.Starbuck@elekta.com