2023 ESTRO Physics workshop

Quality Assurance for online adaptive radiotherapy

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Chairs: Sara Hackett, Sebastian Klüter

With the introduction of different commercial solutions for online adaptive RT, its applications are now rapidly increasing and becoming more and more mainstream in clinical practice. One of the challenges we all have to deal with is finding effective and efficient quality management program to safely use these new techniques in daily practice. As in the online procedure time is a critical factor, a lot of the traditional safety checks are no longer feasible, triggering a debate on their importance. A platform-independent consensus on what this program should look like is however lacking, hence this workshop was initialized as a starting point in trying to reach this.

A total of 24 participants travelled to the beautiful city of Turin for a two-day discussion on this subject. The group was a good representation of different clinics from all over Europe, as well as participants from different vendors active in the field. As initial food-for-thought, a number of speakers were invited to provide their views on different aspects of QA for online adaptive RT. These dealt with the use of risk analysis for quality management (Eric Ford), the role of independent dose calculations (Markus Alber), patient-specific quality assurance (Simeon Nill) and the use of log-file analysis (Bas Nijsten). Already during these presentations, lively discussions emerged among the participants. To further structure discussions, the participants were also asked to prepare debates in small groups on four different topics each with an affirmative and negative team. This proved to be an excellent catalyst for further in-depth discussions on the QA for online adaptive RT.

As the subject “QA for online adaptive RT” is broad and sometimes difficult to generalize among vendors and institutions. However, decisions on QA in the online setting also have implications for standard radiotherapy workflows. As a consequence discussions were still ongoing at the end of the meeting. Some points however already emerged from the discussions:

- Development of an online adaptive QA program should be based on a risk analysis of the adaptive workflow to identify the relevant risks and necessary countermeasures, and to gain insight into the costs versus benefits of the different QA tools.
- There are still a lot of QA tools missing currently, e.g. on synthetic CT, contour integrity, data transfer, etc.
- There is a role for the vendor in providing more of these tools and integrate these in the workflow, or at least open up their interfaces and enable the possibility for exporting relevant data.
- There seems to be a consensus that plan specific measurements can be omitted in certain specific conditions. Plan QA should be treated more as a commissioning tool, and should be performed indication-specific. Guidelines for this plan-class specific commissioning are needed.

- As a result of the above point, commissioning plays an extremely important role in OART, but is hard to generalize as it is often very machine-specific. For commissioning a close collaboration between vendor and users seems beneficial.

A first step after the workshop will be to see if a whitepaper/review article can be written based on the that includes the items discussed. Furthermore, institutes failure mode and effects analyses(FMEA) will be compared and an effort will be made to create a general OART FMEA as a starting point for recommendations concerning guidelines for starting an adaptive program. Finally, further work is needed to try and reach a consensus on methods for online adaptive QA tools, what to check, and what data is needed to support this.

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