An electronically configurable checklist program for quality control of RT treatment planning

K.-H. Grosser, A.-C. Schulte, W. Harms
St. Claraspital, Department of Radiation Oncology, Basel, Switzerland

Purpose

To assess efficacy of an adaptive checklist program to facilitate plan review for physicists.

Material and methods

In radiotherapy pre-treatment plan review is fundamentally important to patient safety and treatment plan quality. If errors in treatment planning propagate through the clinical process, this could result in the inappropriate delivery of a therapeutic dose of radiation that could cause harm to the patient. Our planning workflow essentially follows a standard workflow in radiation therapy (see Fig. 1). A critical control point in this workflow is the ‘Planning Approval’ process, which is carried out by physicists. To reduce the error rate we developed an adaptive electronic planning approval checklist as part of our quality assurance. We applied this program to more than 600 treatment plans produced with the Eclipse treatment planning system (VARIAN). Because we wanted to optimize the checklist continuously, the program was set up to be adaptive with respect to the plan type and to allow the addition of new checklist items. All evaluated cases were documented in a database.

Results

The checklist program was introduced into clinical routine in October 2012 and was used in this version until the end of 2015. In total 638 plans were checked. With the help of this checklist program 303 errors in 190 treatment plans were detected. Most errors were classified as minor errors (i.e. incorrect target volume nomenclature). However, 29 dose-related errors have also been found.

Conclusion

A planning approval checklist is a valuable tool to reduce the error rate of treatment plan validation to almost zero. One drawback is that our checklist must be processed manually up to now. The next step is to implement a semi-automatic checklist. Such checklists have already been reported in the literature for different treatment planning systems. VARIAN Aria and Eclipse allow the implementation of scripts based on C++ using Eclipse Scripting API with access to the database. In our experience 80% of the checklist items can be checked automatically.

To avoid change the source code every time the checklist has to be expanded, an XML or EXCEL interface is useful. Another advantage is: the lower the amount of time needed, the higher the acceptance for checklists.

References

Kapre L. Patterns: Analysis of Stopping Events in a “Go-Fly” Electronic Quality-Checklist Oriented Radiation Medicine Department. J. Radiation Oncology Biology Physics 81-3 (2005) 629