

Purpose:

To effectively mitigate errors in IMRT radiation therapy delivery, all beams, all fractions, for all patients should be checked in vivo, immediately, automatically, autonomously and intelligently for integrity, quality and safety. For this purpose, ADQ or Automatic Dynalog QA, is implemented for instant and automatic patient delivery beam verification.

Methods:

ADQ contains multiple functional modules. DICOM receiver program is developed in C++ to receive DICOM-RT Plans from treatment planning systems, process data and save to database. The verification tool is implemented in MATLAB that automatically validates beam parameters (gantry angle, collimator angle and positions, MLC positions, fluence maps, etc.) between the treatment plans and recorded dynamic MLC log files, generate reports for each treatment session, and send out alert emails for detected urgent problems. Report reviewer is implemented in C++ that enables physicists to review, comment and confirm reports. ADQ programs use own database and Mosaiq R&V database. Simple, automatic and no human intervention is needed unless an error is detected.

Results:

ADQ is running to generate near real-time QA reports for every treatment date. DICOM receiver is running 24 hours to collect plans. Report reviewer deployed through network facilitates easy access to reports. All IMRT beams delivered to the patients are checked for a period of four months to study the reliability, MLC performance, false positive rate and importantly identify true positive. More than 80000 thousand beams from 4 different Linacs were analyzed up-to-date.

Conclusions:

We developed new software tools to improve the RT treatment QA by automatic checking patient treatment beam delivery records for each patient and each treatment session. Report data achieved in database can be easily used for further studies, for example, analysis of MLC leaf failures.