Clinical use of the software for the automation of treatment field parameters verification prior to radiation delivery

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Abstract

Purpose:

• Verification of treatment field parameters by therapists take place prior to every or first fraction. Such verification or field timeout should be completely independent from record-and-verify system.

• Currently treatment field time out is performed manually via reading treatment parameters from linac screen and comparing them to treatment plan.

• We evaluate clinical use of software allowing automation of field timeout.

Methods:

• The program for timeout (RTeye) automation extracts information from linac's screen and compares it with the information extracted from the treatment plan

Results:

• The software has friendly user interface and is easily included in clinical work flow.

• Automated field time out using RTeye software definitely cuts timeout time to 2-3 sec per fields versus 10 sec, if done manually.

Conclusions:

• Field timeout automation is practicable and fits well into clinical workflow. It improves patient throughput and is expected to improve patient safety.

Introduction

• Verification of treatment field parameters by therapists take place prior to every or first fraction. Such verification or field timeout should be completely independent from record-and-verify system.

• Treatment field verificaiton is performed manually by therapists via reading treatment parameters from linac screen and comparing them to treatment plan. Treatment plan data is, typically, read from a printout, a write-up from the printout, or an electronic printout.

• Field timeout is an important safety step. It is required by The Joint Commission and performed in many centers in the United States.

• We evaluate the software allowing automation of field timeout for the clinical use.

• Those parameters, which are not available on linac screen, e.g. bolus or MLC segments, are conveniently highlighted for the therapist to check.

## Why do we need automation of field parameters verification timeout?

• Automatic timeout is not prone to human errors

• Automatic timeout in many cases can be performed faster than the manual timeout

• The therapist can focus on their direct duty, working with the patient, prior and during the treatment

• Automatic timeout procedure allows a single therapist to perform the verification of treatment parameters.

• Not time consuming can be easily done prior to every fraction, thus, greatly increase patient safety

Screenshot of the software used:
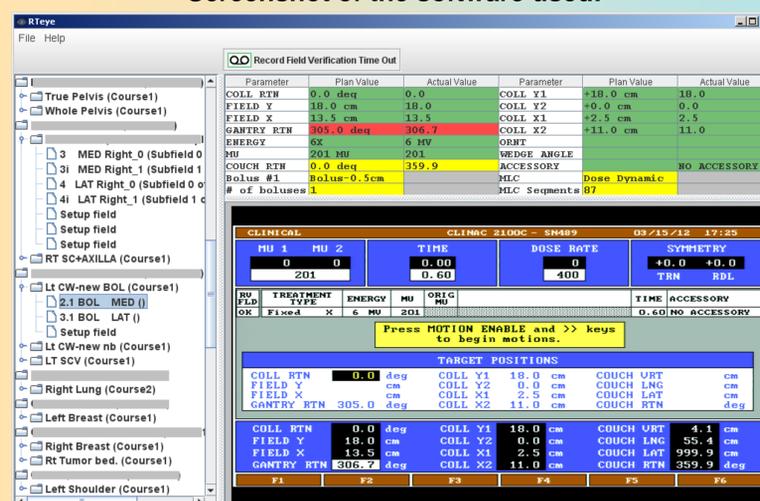
Clinical implementation and results

Basically, conventional EMR workflow is used, except the plan printouts from the treatment planning system (TPS) are also stored for RTeye access.
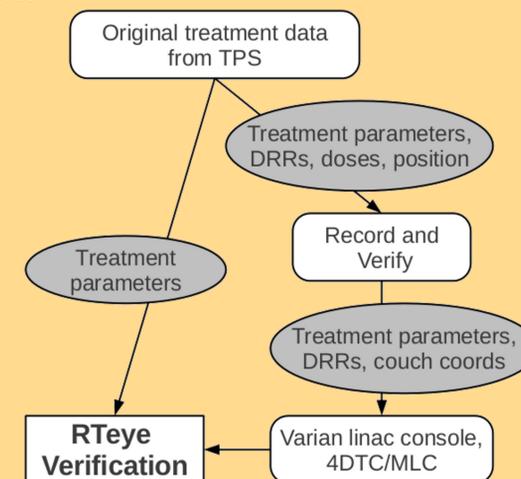
• The software has friendly user interface and is easily included in clinical work flow. Therapist find it intuitive and easy to use.

• With the error rate in our clinics being extremely low, we don't have data showing that automated timeout provides higher safety than manual

• RTeye definitely cuts timeout time to 2-3 sec per fields versus 10 sec, if done manually.

More information can be found at www.rteye.org

Conclusion

• Field timeout automation is practicable and fits well into clinical workflow. It improves patient throughput and is expected to improve patient safety.

• In the current workflow PDFs are uploaded during second check. We believe that it may be more practical to upload plans after planning is complete and verify during physics second check.

• RTeye use was adopted on all Varian linac at Health Quest

Conflict of interests

S. Kriminski and I. Lysiuk are co-owners in RTcheck, LLC; also, application is submitted to United States Patent and Trademark Office

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Materials and Methods

Treatment field timeout involves three steps: (1) extraction information from the plan printout, (2) extraction information from the linac screen and (3) comparison of the extracted information. These steps are elucidated below:

(1) Plan printouts from Eclipse treatment planning system (Varian Medical Systems, Palo Alto, CA) are stored in a PDF format. Information in these PDFs is stored in form of text rather than as images, and, therefore, is easily extracted.

(2) Information from the Varian linac's screen is extracted using video signal splitter and VGA2USB converter (Epiphan Systems, Ottawa, CA). Acquired image farther requires character recognition. For Varian linacs (pre TrueBeam models), position of the symbols to be recognized does not change, thus, allowing the following, rather simple recognition process.

(3) A user friendly program, RTeye, is developed for Java environment by RTcheck, LLC (Poughkeepsie, NY). It outputs parameters extracted at the steps (1) and (2) to the user (e.g. radiation therapist) and alerts him/her about a mismatch.

All beam data are displayed side by side on the screen. The color coding is used to reflect clinic specific tolerance levels, green for exact match, red for unacceptable discrepancy, and yellow for small differences. All field verifications can be recorded to a log file, for periodic review.

The program also outputs auxiliary information, e.g. bolus, which is not well alerted by or can be omitted in the record and verify system.