JULY 12–16
2020 VIRTUAL
JOINT AAPM | COMP MEETING
EASTERN TIME [GMT-4]

Automated planning stage tracking and analysis through an Oncology Information System integrated whiteboard

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INTRODUCTION

Radiation oncology planning processes are inherently complex, and the timing of task completion is difficult to predict. This can pose challenges in terms of scheduling, resource planning, and adherence to departmental workflow protocols. In a recent survey of practice patterns, it was identified that factors which either expedite or prolong the processes of contouring and planning depend on “physician’s ability to provide contours in a timely fashion” and “communications between the physician and dosimetrist” [1-11]. These findings support the idea that smooth flow of information between individuals and/or groups in the clinic can have a direct impact on the timeliness of clinical task completion.

AIM

To develop a low-cost, web-based, application that is integrated with the local Oncology Information System (OIS) to track, record, and evaluate time frames associated with clinical radiation oncology treatment planning processes.

The system identifies common issues/delays and facilitates advanced planning with ability to anticipate scheduling problems.

METHOD

We developed the software using R hosted on a local Shiny web-server implemented at the Seattle Cancer Care Alliance in 2017. The planning process was divided into stages, and time-stamped moves between planning stages were recorded automatically via Mosaiq (Elekta, Sweden) Quality Check Lists (QCLs). Whiteboard logs were merged with Mosaiq-extracted diagnostic factors and were evaluated visually for trend and statistically for significance.

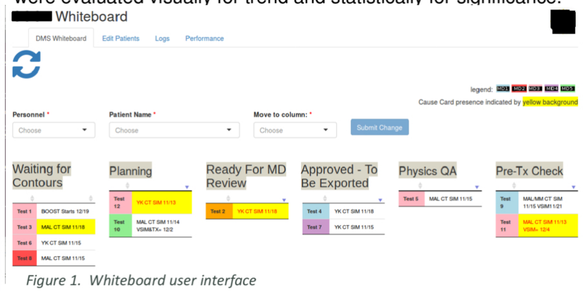

Figure 1. Whiteboard user interface

RESULTS

Since implementation, the whiteboard has become an essential clinical tool for tracking patients and checking planning status. The whiteboard provides graphical presentation of clinical planning status information without adding overhead to existing workflows.

Whiteboard/Mosaiq data show that *treatment intent, number of prescriptions, and nodal involvement were main factors influencing overall time to plan completion*. We found that overall planning time is specific to disease site and that palliative cases take 50% less time to plan than curative ones. Among all sites, nodally involved patients take longer to plan, as did patients with multiple prescriptions.

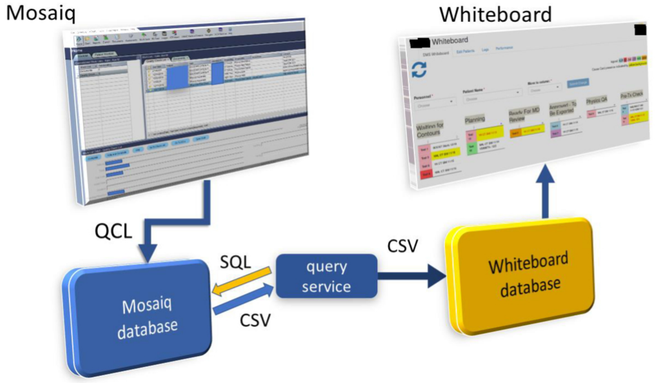

Figure 2. Integration dataflow pipeline between the whiteboard and MQ oncology information system

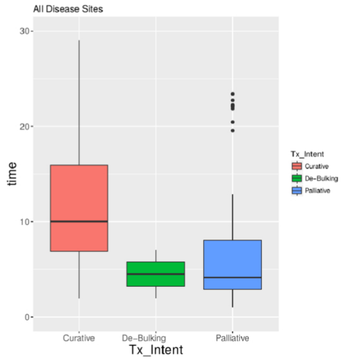

Figure 3. Planning time is significantly lower for palliative cases

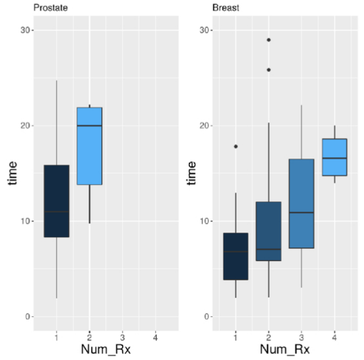

Figure 4. planning time distributions show increase planning time is correlated with increased number of prescriptions

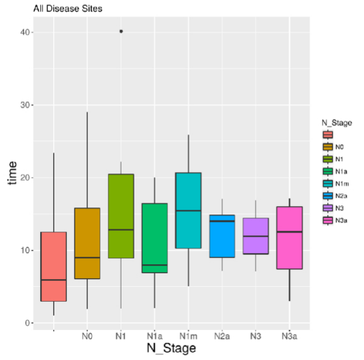

Figure 5. Overall planning time increases with positive node status

Comparison of plan completion times (days) in relation to intent (FIgure 3), and number of prescriptions on initial diagnosis of Prostate and Breast cancer (Figure 4) show a clear trend for overall planning time to increase with increased prescriptions and curative intent. The number of prescriptions can be considered a surrogate for complexity in both contouring and planning tasks.

Boxplot comparison of overall planning time (days) for each type of N-Stage on initial diagnosis (Figure 5) show a trend for increasing planning time with increasing nodal involvement, though the result is stronger in a binary sense. Nodal positive vs negative indicates the need for extra planning time.

The result supports the idea that increased complexity in contouring and planning, as well as additional QA in the physics check stages impacts the planning time in a predictable way.

CONCLUSIONS

This report establishes the utility of low cost, automation driven, real-time task tracking tools in the radiotherapy planning process. The results provide data-driven evidence which adds justification for practice change implementations such as disease-specific therapy start dates and realistic planning time goals.

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ACKNOWLEDGEMENTS

The authors would like to thank UWMC and SCCA information technology staff for their experience and expertise in supporting the infrastructure needed for Whiteboard development. The willingness and grace of the therapists, dosimetrists, and physicists at SCCA for contributions to the workflow and feedback on tool features is gratefully acknowledged. We also thank the physician group and administrative staff for their participation in feedback sessions, guidance, and continuing support of this ongoing effort.

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