Workflow analysis for frameless Gamma Knife treatments

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

INTRODUCTION

Gamma Knife Icon (GKI) is equipped with an on-board imaging system for cone-beam computed tomography (CBCT) acquisition.

This CBCT system can be used to perform image-guided setup for patients immobilized using a thermoplastic mask.

The mask does not completely restrict patient head from movement.

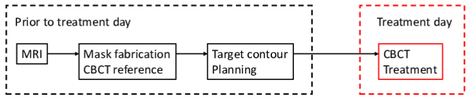
The treatment interruptions can significantly prolong the treatment due to patient movement out of tolerance.

AIM

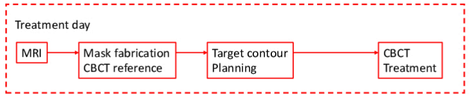
- Investigate the reasons that lead to prolonged treatment time
- Improve the workflow efficiency and patient experience

METHOD

Workflow 1: 29 patients



Workflow 2: 12 patients



47 plans 91 fractions

- Actual treatment time was compared to planned treatment time.
- How long patients can keep their treatment position was analyzed.

RESULTS

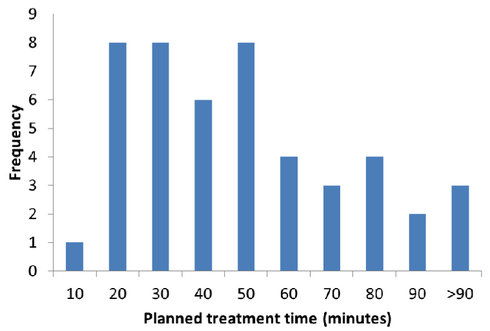


Figure 1. The frequency of planned treatment time.
75% of the planned treatment time were within one hour.
62.5% plans were within 10 to 50 minutes

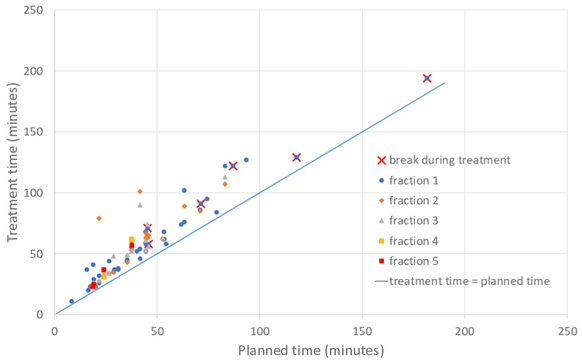


Figure 2. The actual treatment time versus the planned treatment time for masked cases. Major treatment interruptions (more than 10 minutes delay) were more commonly encountered in patients with planned treatment times over >40 minutes (64%).

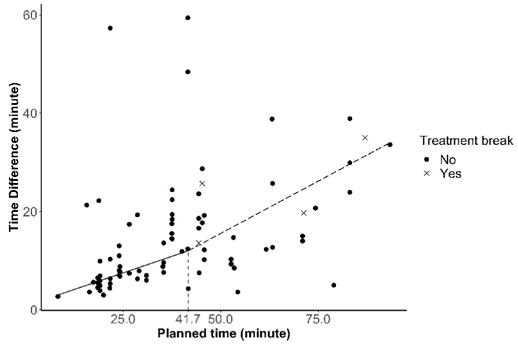


Figure 3. The time difference between the planned and actual treatment time as a function of the planned treatment time. Piecewise linear regression shows that when planned treatment time is greater than 41.7 minutes, the actual treatment time increases more rapidly with the increase of the planned treatment time.

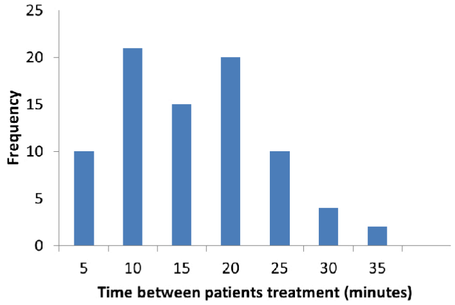


Figure 4. Frequency of time intervals needed to switch patients between treatments. The time transitioning patients varied from less than 5 minutes to 35 minutes with a mean of 15 minutes. Reasons caused delay include patient requesting use of restroom or taking medicine before going to the treatment room and/or therapists documenting previous treatment.

CONCLUSIONS

- Treatment times greater than 41.7 minutes is associated with greater treatment interruptions.
- Consideration of time parameters in selecting fractionation or consideration of planned treatment breaks during the course of treatment may improve patient discomfort and improve efficiency.
- To shorten the time interval between switching patients for treatment: 1. Preparing the next patient for treatment a few minutes before the completion of current patient treatment; 2. Documenting the previous patient treatment after starting a new patient treatment.

ACKNOWLEDGEMENTS

The authors would like to thank Yijian Cao, PhD, Anuj Goenka, MD and Michael Schulder, MD for their helpful discussion.

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