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RO-ILS Medical Physicist 2024 Great Catch

Physics pre-treatment chart review is an important safety barrier to prevent errors from reaching the patient and can catch a myriad of issues.[1] Pre-planning peer review has been advocated to improve safety, and may involve target and normal structure evaluations by dosimetrist, physicist and physician team members.[2] While many facilities peer review contours for higher risk cases such as stereotactic radiosurgery, stereotactic body radiation therapy and retreatments, not every contour for every patient undergoes peer review. For non-peer reviewed contours, the physics pre-treatment chart review is an important additional review which could catch any contouring issues that may have been missed.

In this RO-ILS event, an attentive medical physicist identified an upstream error that could have resulted in a geometric miss to the wrong spinal region.

- A patient with spine metastasis was scheduled to receive 18 Gy x 1 to C6.
- Diagnostic PET/CT was needed to identify the metastasis and was fused to the treatment planning CT scan.
- The radiation oncologist requested that a deformable registration be performed because of extreme differences in patient positioning between diagnostic PET/CT and treatment planning CT.
- Deformable registration resulted in an inferior shift of the vertebrae such that the metastasis appeared to be located at T2 on the treatment planning scan.
- The physician contoured using only the PET/CT and a treatment plan was created targeting T2 which was approved.
- The error was caught during the physics second check.

GREAT CATCH PHYSICS!

This near miss event highlights some important takeaways:

1. Physicists must have sufficient time allocated to perform a thorough plan check given their overall plan review workload and other responsibilities in the clinic.
2. Complex image fusions, especially deformable registrations, should be independently verified for accuracy prior to initiating contouring/treatment planning. Deformable registration requires knowledgeable staff to confirm the results (e.g., the person performing the fusion needs to correctly verify spine alignment).
3. Physicians should not rely solely on fused diagnostic images to identify the target volumes. The contoured vertebral body should have been cross verified with diagnostic radiology reports and images. Practices should consider an independent alignment confirmation between the diagnostic CT and planning CT.

SAFETY CHECK

- **Who verifies the accuracy of fusions in your facility? If fusions are verified, is the verification completed before contouring?**
- **Is the location of the contoured lesion verified against the radiology report, pathology report or the prescription? Is there an independent verification process to confirm targeting of the correct vertebral body(ies)?**
- **On average, how much time do your physicists have for a plan review? Is this time sufficient to perform a thorough review such that this error would have been caught?**

Medical physicists are the cornerstone of radiation oncology safety programs and therefore RO-ILS celebrates all physicists on November 7 for International Day of Medical Physics. In the three years RO-ILS has been releasing great catches, physicists' abilities to identify contouring errors were highlighted in both 2022 and 2023. With the importance of safety check processes in identifying errors, it is critical that staff have sufficient bandwidth to accomplish their responsibilities and help avert potentially disastrous consequences.

Just as medical physicists are safety leaders at their local facilities, the **American Association of Physicists in Medicine (AAPM)** has taken on a key leadership role nationally. AAPM partnered with the American Society for Radiation Oncology to develop RO-ILS and has co-sponsored the program for over a decade. Together, the sponsors and supporters enable U.S.-based practices to participate in the RO-ILS program for free, allowing shared learning and quality improvement. RO-ILS thanks AAPM for their generous contribution to RO-ILS and the field.

References

1. Ford, E, Conroy L, Dong, L, et al. Strategies for effective physics plan and chart review in radiation therapy: Report of AAPM Task Group 275. Med Phys. 2020 Jun;47(6):e236-e272.
2. Chera, BS, Potters, L, Marks, LB. Restructuring Our Approach to Peer Review: A Critical Need to Improve the Quality and Safety of Radiation Therapy. *Pract Radiat Oncol.* 2020 Sep-Oct;10(5):321-323.