

AbstractID: 13626 Title: Failure Modes and Effects Analysis Applied to HDR Treatment Planning

Purpose: To apply Failure Modes and Effects Analysis (FMEA) to HDR treatment planning in order to identify the most likely and significant sources of error in the process.

Methods and Materials: We have made a list of 24 failure modes grouped into six categories (imaging, catheter reconstruction, dwell position activity, dose points/normalization, optimization/dose, and evaluation) based on our experience with the Nucletron Plato and Oncentra planning systems. Each mode was then rated on a 1-5 scale for severity, likelihood of occurrence, and probability of escaping detection. An overall ranking is formed from the product of the 3 scores (1-125). Severity was ranked according to potential harm to the patient (notably underdosing was not considered) and was based on the NCI Common Terminology Criteria for Adverse Events handbook v 4.0. The authors assigned scores independently and the resulting rankings were averaged. We have also analysed 36 recent reported medical events related to HDR treatment planning listed on the NRC website and compared with our own rankings.

Results: Failure modes associated with image sets, catheter reconstruction, indexer length and incorrect dose points had the highest ranking in our analysis (scores > 20). The most often cited failure modes in the NRC reports examined were indexer length (17/36) and incorrect dose points (6/36). Several of our high-ranking modes are not associated with reported events.

Conclusion: It is a useful exercise to identify failure modes locally and analyse the efficacy of the local quality assurance program. Comparison with nationally reported failures can help direct the local analysis, but the absence or small number of reports for failure modes with a high score may be due to low detectability. Such modes obviously cannot be ignored.