A Failure Mode and Effects Analysis of deep inspiration breath-hold for left-sided breast cancer radiation therapy

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1. Background/Aim

The goal of radiation therapy is to safely deliver the correct dose to the correct localization. Failure mode and effects analysis (FMEA) is a step-by-step approach for identifying all possible failures in a process and their impact on the process outcome. FMEA should identify the potential failures, how likely they can be detected and how severe their consequences might be. The aim of this study was to assess the possible failure modes and analyze their consequences and effects in deep inspiration breath-hold (DIBH) for left-sided breast cancer radiation therapy.

2. Methods

The FMEA was developed by a multidisciplinary team including all healthcare professionals involved in patient’s radiotherapy process. Each step of the patient pathway for DIBH radiation therapy was defined and four major process steps were created (Figure 1). For each process step 4–16 potential failure modes and effects were identified.

3. Results

RPNs for all process steps are presented in figure 2. RPNs were ranked from highest to lowest. Online imaging registration and patient positioning correction during treatment delivery, patient positioning and immobilization and patient preparation and coaching for deep inspiration breath-hold had the highest RPN 378, 210 and 168, respectively. Treatment planning check by a second medical physicist, patient positioning and set up instructions in the oncology information system had the lowest RPN score 10 and 32, respectively.

4. Conclusion

TG–100 recommends that FMEAs can be used as a tool for risk and hazard analysis. An FMEA evaluation of deep inspiration breath-hold for left-sided breast cancer radiotherapy treatment can identify significant improvements in processes and increase in quality and safety of treatment delivery. Process steps with the highest RPNs must be addressed and new procedures must be introduced to minimize possible failures.

References


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