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Reinforcing patient safety in Intraoperative electron radiotherapy. Impact of different tools

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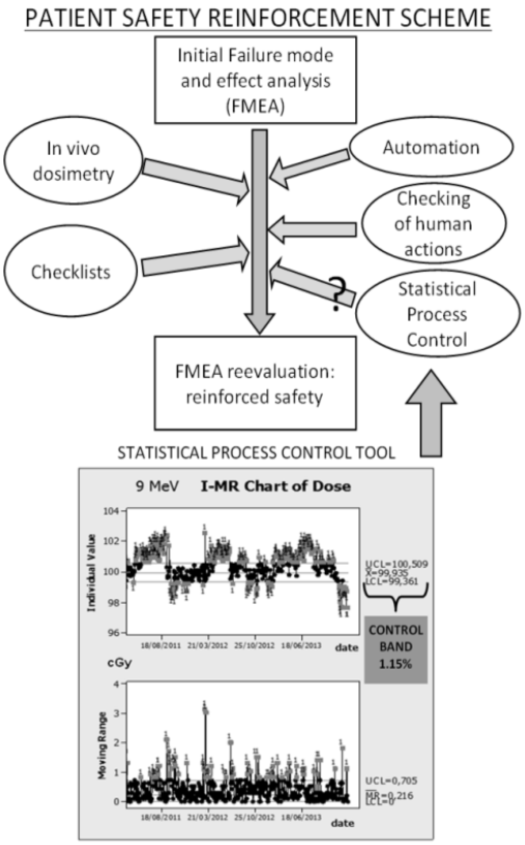
Purpose/Objective: European authorities and scientific societies have advised that patient safety be analyzed and adequately managed. Thus, we present a set of tools and measures we studied in order to reinforce patient safety in Intraoperative electron radiotherapy (IOERT).

Materials and Methods: We performed a Failure mode and effect analysis (FMEA) which was used to centralize all the information regarding patient safety in IOERT. Safety elements included tools such as in vivo dosimetry in 40 valid cases, statistical process control (SPC) of electron beam monitoring, checklists design and implementation, and other insights unveiled by the FMEA like the necessity for checking several actions taken by involved professionals. In vivo dosimetry was performed with reinforced MOSFETs model TN-502RDM-H (Best Medical Canada Ltd., Ottawa, Canada). Electron beam monitoring was carried out with the daily checking device, Daily QA Check 1090 (Sun Nuclear Corporation, Melbourne, USA), which controlled our Elekta Precise linac (Elekta AB, Stockholm, Sweden) used for the IOERT treatments. Our checklists were related to procedures and materials managed by anesthesiologists, surgeons, radiation oncologists, nurses, radiation therapists, and medical physicists. They were divided in blocks and timeouts.

Results: The FMEA was a very fruitful tool to identify all potential risks and allocate measures in order to reduce such risks and reinforce patient safety. In vivo dosimetry confirmed our treatments as correct, with a delivered measured absorbed dose of 93.8% on average (with a standard deviation of 6.7%), compared to an expected dose to the tumor bed between the prescribed dose (90%) and the maximum dose (100%). SPC led to uneasy-to-implement conclusions due to its high sensitivity compared to linac output fluctuations. As an example, absorbed dose delivered with 9 MeV beams would require to be adjusted one quarter of the times they are checked in order to achieve a feasible control band of 1.15% calculated with their SPC. Checklists were feasible and easy to write, but require a strong commitment of the multidisciplinary team to be operative, namely the strict fulfillment of blocks at timeouts. Other necessary elements are double checking of human decisions, also easy to implement, and requests for automation whenever possible, which need engagement of companies to be solved.



Conclusions: FMEA can be the main tool to identify opportunities for patient safety reinforcing, and can produce a central board to which fit risk reduction elements and actions. As examples, these measures and tools can be an in vivo dosimetry program, checklists, checking of human decision-making, and automation of several processes. Nevertheless, SPC needs further research before being integrated. This approach can be extended to other radiotherapy procedures.

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Optimizing the planning parameters to obtain the lowest monitor units in lung stereotactic body radiation therapy

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Purpose/Objective: The increasingly attractive stereotactic body radiation therapy (SBRT) for stage I lung cancer is always accompanied by a large amount of monitor units (MU), particularly with a high dose fraction scheme. The study aims to find the optimal planning parameters in the treatment planning system optimizer to get the lowest monitor unit (MU) in lung SBRT.

Materials and Methods: Fourteen patients suffered from peripheral or central stage I Non-Small Cell Lung Cancer (NSCLC) were enrolled. The upper objective of planning