requirements and optional recommendations, with the former requiring resolution prior to award of Certification.

Results: To date, 14 institutions have received Novalis Certification, including 6 in Europe, 3 in North America, 4 in Australia and 1 in Asia. An additional 90 certification applications are pending; approximately one half and one third of these are sites in Europe and North America, respectively. Nine of the 14 reviews have resulted in mandatory requirements, however all of these were addressed within three months of the audit report. Individual reviews have produced from 2 to 9 specific recommendations ranging from programmatic to technical in nature.

Conclusion: Novalis Certification is a unique and active peer review program assessing safety and quality in SRS and SBRT, while recognizing high calibre of practice internationally. The standards-based approach is capable of highlighting outstanding requirements and providing recommendations to enhance both new and established programs.

EP-1922
Comparing MLC positioning errors in Clinac and Truebeam Linacs by analysing log files
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Purpose or Objective: Log files contain information about Varian accelerators deliveries of dynamic treatments. This information includes actual and expected leaf positions throughout the treatment. Log files have been proposed by several authors to evaluate leaf position errors. In this study, log files of Clinac (dINRT) and Truebeam (trajectory log files) accelerators have been analyzed to compare leaf positioning errors of dynamic treatments in different generations of clinical linear accelerators.

Material and Methods: More than 30000 log files have been analyzed, coming from four Clinac accelerators (one Trilogy, two Clinac 21EX, one Clinac 2100CD equipped with Millennium 120MLC) and one Truebeam accelerator (Truebeam STx 2.0 equipped with HD 120 MLC) of three different institutions. Analyzed Truebeam log files correspond to VMAT and dIMRT treatments whereas Clinac log files only correspond to dIMRT treatments. Clinac accelerators control system has approximately a 50ms delay (one control cycle time). At each control cycle, MLC controller compares the planned to the actual positions. But in this comparison, the actual position is delayed 50 ms from the planned one. This effect causes that measured positions appear in dynalogs one cycle out of phase with respect to the planned positions. Therefore, error statistics present an error component proportional to leaf speed. A recent research of our group has studied this effect and, as a result, we have proposed to calculate error statistics without time delay effect to evaluate the MLC positioning deviations. In Truebeam accelerators this effect does not exist due to the proactive design of the MLC control system. Leaf positioning RMS errors and 95th percentile errors were calculated to evaluate MLC performance with and without time delay effect. Log files were analyzed using an in-house Matlab program.

Results: In Clinac accelerators, the mean RMS error was 0.35, 0.34, 0.33 and 0.29 mm for each linac. The mean 95th percentile error was 0.62, 0.61, 0.62 and 0.58 mm. Without time delay effect, the mean RMS error was 0.038, 0.042, 0.040 and 0.026 mm for each linac. The mean 95th percentile error was 0.054, 0.057, 0.057 and 0.046 mm. In Truebeam accelerator, the mean RMS error and the mean 95th percentile for VMAT treatments were 0.038 mm and 0.07 mm. For IMRT treatments, the mean RMS error and the mean 95th percentile were 0.027 mm and 0.052 mm.

Conclusion: Truebeam MLC positioning errors are substantially lower than those of Clinac machine models, mainly due to the proactive design of Truebeam control system. However error statistics without time delay effect in Clinac machines, have the same order of magnitude of Truebeam ones.

EP-1923
Regular assessment of isocentre and positioning accuracy in image guided stereotactic radiotherapy
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Purpose or Objective: As the number of stereotactic radiotherapy applications is increasing and image guided techniques are superseeding frame based solutions in cranial as well as in extracranial stereotactic applications the need to include imaging and positioning devices in the regular quality management is obvious. A very common test to check the deviation between the radiation isocentre and the room lasers is the Winston-Lutz test. However, this test lacks significance in combination with image guided stereotactic treatment since the patient is positioned by the image guidance devices rather than by the room lasers. The purpose of this project was, to implement a practical workflow to assess the isocentre and positioning accuracy of image guided stereotactic applications.

Material and Methods: The concept of our approach is based on the Winston-Lutz test except that positioning is done automatically by the image guidance devices rather than by the room lasers. Therefore a pelvis phantom including a metal sphere is roughly positioned on the treatment couch. By the use of an image guidance device (e.g. CBCT, non-coplanar imaging) translational and rotational correction values are acquired and sent to a 6-DOF robotic couch. After the phantoms position is adjusted by movements of the robotic couch, the metal sphere inside the phantom should be positioned exactly at the radiation isocentre of the linear accelerator. The result of the image guided positioning is recorded by portal images. For this purpose a small radiation field (2x2 cm²) is applied from up to 8 different gantry angles. Afterwards the radiation field isocentre, the isocentre position of the metal sphere as well as the deviation is calculated by a software that was developed in-house.

Results: This end-to-end test provides quantitative information on the achievable positioning accuracy of an image guided stereotactic application in the clinical situation. Besides, the deviations of the radiation isocentre from the mechanical isocentres of the gantry, collimator and couch can be analyzed using the same setup. The test is not restricted to a specific image guidance modality.

Conclusion: A regular assessment of all systems included in stereotactic patient positioning is highly recommended. Due to the short execution time this test is suitable for regular assessments in the QA routine.

EP-1924
Implementation of a safety checklist to improve quality and safety of physician plan review process
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Purpose or Objective: The physician review of the treatment plan upon completion by the treatment planner is a critical clinical process, since it is during this exchange where the physician verifies and confirms the treatment intent. Several near misses in our practice raised the awareness of our group regarding the quality and safety of this process. Moreover, there was no standardization of the review process and no additional safety barrier to detect if the prescription defined by the physician matches the treatment intent. Our goal is to use a safety checklist to improve the quality and safety as