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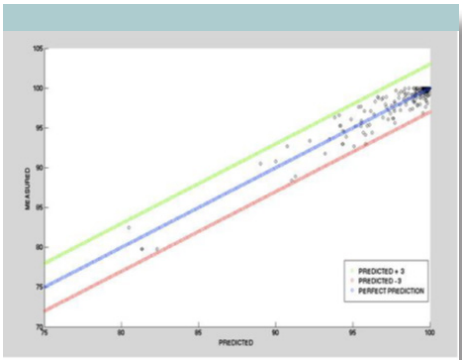

Virtual QA with High Predicted Accuracy for IMRT Treatment Plans

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Provisional Pending

REFERENCE MEDIA
Smith et al. J Bio Med, 2015, 389 (2) – 15.

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Brief Description
The course of radiation treatment of cancer patients has three major phases: 1) Diagnostic and Prescription; 2) Simulation and Quality Assurance; and 3) Delivery. In Simulation and Quality Assurance (QA), a specific plan on how to deliver the prescribed radiation to the tumor is developed. Penn scientists have developed a software-based virtual Intensity Modulated Radiation Therapy (IMRT) Quality Assurance model extracts features associated with failure modes (between the treatment planning system and the linear accelerators) and uses machine learning to learn from pass plans in order to accurately predict the gamma passing rates. This method could save on the time and cost of QA, and reduce the number of replans needed.

Problem
The current most widely used technique to deliver radiation to tumors is Intensity Modulated Radiation Therapy (IMRT). Due to potential disparities between the software used to develop the plan and the actual delivery of radiation, each plan is measured on the linear accelerators (Linacs) using different types of detectors before the plan is delivered to the patient. This is costly and time consuming, as each QA procedure takes hours and uses valuable Linacs machine life.

Solution
The algorithm developed allows use of an "off-line" method that virtually builds a database of treatment plans, collects the gamma passing rate for each plan, and extracts features associated with failure modes between the treatment planning system and the Linacs.

Advantages
- Potential for improved efficiency and high predicted passing rates over current measurement-based IMRT QA.
- Reduced number of replans
- Data demonstrates that virtual QA can identify plans that can be delivered with acceptable disagreements.
- Higher utilization of Linac machine life for patient treatment.

Applications
- Radiation planning