

## **Low dose rate prostate brachytherapy quality assurance and treatment evaluation**

Most medical events in prostate seed brachytherapy may be attributed to physician or physicist error, but human failures resulting in patient harm often can be attributed to inadequate mechanisms to prevent failures from propagating to the patient. Quality assurance (QA) of permanent seed brachytherapy is particularly important because this modality, unique to radiotherapy, leaves a permanent record of the implant quality within the patient.

This symposium aims to review the properties of permanent LDR brachytherapy that have made it so successful and the challenges that have prevented the full realization of its theoretical advantages. The temporal interplay between radioactive decay, resolution rate of procedure-induced edema, and cellular processes will be discussed along with their effect on the design and evaluation of LDR prostate brachytherapy. Recent recommendations of AAPM TG-137 on prostate brachytherapy treatment planning and dose reporting will be reviewed.

An analysis of actual medical events and typical errors, for example seed strength in the plan versus the strength ordered versus the strength implanted, will help focus on critical components of the process map. A methodology to score failure modes and effects via the product of Likelihood x Severity x Undetectability will allow users to score procedural steps dynamically. Quality control steps such as second checks or calibrations will be seen as vital in keeping the scores below a level of concern.

Finally, the physicist has a responsibility to offer suggestions to improve dosimetry when systematic trends are evident and to identify and report errors.

Learning objectives:

1. Discuss recent developments and insights in LDR prostate brachytherapy
2. Identify critical physics components and their impact on QA and treatment evaluation
3. Highlight factors that require special attention in the planning and execution of implants
4. Demonstrate implementation of QA practices in an LDR prostate brachytherapy program