AbstractID: 14546 Title: Possible Causes for the Reduced Efficacy of US Based Image Guided Treatment of Prostate Cancer with External Beam Radiation Therapy

Ultrasound systems have been in use to provide image guided radiation therapy for more than a decade. They have been instrumental in changing the treatment paradigm in which it became accepted to take a longer time to visualize the internal organs in order to facilitate more precise treatments. Indeed the first results led to the generation of on-line correction protocols and the notion that it was possible to treat tumors using smaller margins. Prostate treatments were the most popular to be used with this approach, although other organs could be targeted too.

After its introduction questions arose regarding the reliability of this approach. A number of groups reported discrepancies independently of each other as well as providing different explanations. Unfortunately, a consensus as to why exactly these problems occur is lacking.

This paper investigates the causes for the variations observed by
1)Revisiting the original data and conclusions, 2) Re-interpret the data in view of the current state of knowledge regarding intra-fractional motion, 3) Observe how the current updates in technology affect the efficacy, and 4) Introduce newer developments in ultrasound technology pertaining to its use in radiation oncology.

It is the goal of this presentation to elucidate a number of techniques used in the analysis

1) How to compare sets of positioning data and perform robust statistical data-analysis
2) Interpret organ motion to yield margin sizes to compensate for setup and patient motion
3) Learn about the main modes of motion of different organs during treatments
4) Learn the different parameters affecting the measurement using ultrasound to perform absolute positioning
5) Learn about comparing images stemming from different modalities.