

AbstractID: 5305 Title: Moving from measurements toward independent computer calculations for patient-specific IMRT QA

### **Purpose**

A medical physicist's time and resources are always balanced between many clinical obligations. It would be advantageous for physicists to forgo measurements of IMRT plans in lieu of independent computer calculations. In this work, we investigate the appropriateness of independent computer calculation monitor unit checks of IMRT treatment plans in place of physical measurements before treatment delivery.

### **Method and Materials**

This study consists of one academic and one community institution with active IMRT programs. Each institution followed their in-house IMRT procedures for treatment planning and quality assurance. The independent computer calculation software was common between the institutions (IMSure QA program; Standard Imaging, Middleton, WI). The treatment sites considered were prostate and head and neck. Process behavior charts were used as the quality assurance tool for investigation. A correspondence between the measurements and IMSure calculations was established by using time-ordered data to demonstrate that IMRT measurements and IMSure calculations were predictable and independently stable processes. Quantitative justification for discontinuing measurements in place of computer calculations was achieved once process stability was established.

### **Results**

Natural process limits were determined to be  $\pm 1.8\%$  for prostate case measurements and  $\pm 1.5\%$  for the corresponding IMSure calculations. Limits for the head and neck cases were larger at  $\pm 7.1\%$  for measurements and  $\pm 12.1\%$  for the corresponding IMSure calculations. We found that that stable process behavior limits could be calculated in as few as 15 cases for prostate but head and neck cases required at least 25 data points before the two processes showed concomitant stability.

### **Conclusion**

Process behavior charts as a part of an IMRT quality assurance program can provide a quantitative justification for when it is appropriate to discontinue measurements in lieu of independent computer calculations. The number of cases that need to be measured depends on treatment site and the individual quality assurance program.