

## **Purpose**

A cone-beam CT (CBCT) system was implemented on a Varian Trilogy linac in our department in May 2005. Weekly CBCT quality assurance has been performed. The purpose of this work is to present clinical CBCT performance and determine parameters that are predictive of reduced performance.

## **Method and Materials**

From July 2005 to February 2006, a quality assurance program was conducted on a weekly basis to include both image quality and geometrical characteristics of the system. Cone-beam CT software version 1.2 was used during this study. Both large scan volume 'half-fan' and small scan volume 'full-fan' CBCT scans were included for analysis. Parameters checked as part of our quality assurance procedures were: constancy of Hounsfield units (HU) for different materials, image uniformity, high contrast spatial resolution, low contrast resolution, and spatial linearity. Data was analyzed globally using the descriptive statistics of mean and range to give an overall statement of CBCT performance and was analyzed in a time-ordered fashion using process behavior charts to identify predictive parameters.

## **Results**

Geometrical accuracy was within 1 mm for both scan types and was reproducible throughout the study period. The average and (minimum, maximum) data for image uniformity, average HU difference for 7 materials, and high contrast spatial resolution were as follows: large scan volume; 73.7 HU (-21.2, 103.8), 0 HU (-32, 39), 0.55 mm (0.45, 0.63) and for small scan volume; 92.1 HU (49.7, 116.1), -1 HU (-32, 26), 0.48 mm (0.45, 0.56). For image uniformity, action levels by time-ordered process behavior analysis were identified.

## **Conclusion**

Apart from a single data point, the Varian CBCT system was stable over the study period. Image uniformity was predictive for a mis-performing CBCT system.