Purpose:
We use cardinal angle and beam eye view images with DRRs to register a patient at every treatment position. This process is time consuming; moreover, every treatment position is not amenable to imaging. This study is to assess the combined robotic positioner and gantry movement accuracy at a treatment position relative to zero yaw image registration so that additional imaging at the new location can be avoided.

Methods:
A Styrofoam phantom 30 cm x 30 cm x 30 cm with beekleys embedded in such a way that they could easily be distinguished on a DRR. The phantom was CT scanned with a 2.5 mm slice thickness and a 50 cm field of view. Treatment planning DRRs were created at numerous table and gantry angles. The phantom was subsequently set up in the treatment room with both table yaw and gantry at zero. The table was loaded with 200 lb weight in order to replicate a typical patient. Image registration was carried out using cardinal angle images and the DRRs. The robotic positioner and gantry were then moved to a new treatment position. The accuracy of the move was evaluated using the beam eye view image, the orthogonal images at the new position and the DRRs for this location. The process was repeated for numerous table and gantry positions as predetermined during treatment planning.

Results:
The accuracy was found better than a 1.0 mm for all moves except near treatment position with table yaw 90° and Gantry angle between 180° to 270°, where the accuracy was still better than 1.7 mm.

Conclusions:
As such, the system can be clinically used for patient registration, but we are in the process of further improving the setup accuracy for all clinically relevant robotic positioner and gantry movements without additional imaging.