Purpose: Develop a reproducible QA methodology for commissioning gated RapidArc SBRT and patient treatment. Metrics used for patient specific QA, namely distance-to-agreement (DTA) and gamma index, are examined to determine if standard values used for IMRT are applicable for displacement-gated treatments.

Methods: Methods followed that used for IMRT patient-specific QA. Slabs of solid water with 1.5 mm radio-opaque markers were placed on a Respiratory Gating Platform (Standard Imaging), and the phantom was aligned to markers placed on its stationary base. Treatment plans were based on 4D and planning CTs acquired while the phantom was moved sinusoidally. Gating parameters were determined by fluoroscopic imaging prior to treatment. 3D square fields, RapidArc plans with spherical targets (1-10 cm diameter), and patient plans were delivered to the moving phantom with a 1 mm gating aperture. Dose distributions were measured with Kodak EDR2 film and compared to distributions planned with Eclipse v8.9 using RIT 113v5.2 software to determine the mean DTA.

Results: For square fields the DTA averaged over the different field sizes was 3.4 mm in the direction parallel to the motion and 2.7 mm perpendicular. The average 2D DTA was 3.8 mm. For the gated RapidArc treatments, the average DTAs were 3.4 mm parallel to the motion and 1.9 mm perpendicular. The 2D DTA was 3.0 mm. There was a trend for the DTA for small targets to be larger than for large targets. For the patient plan the 2D DTA for the gated treatment was 2.6 mm, and 0.3 mm with the phantom static.

Conclusions: A repeatable QA method for gated RapidArc SBRT has been implemented. With a fluoroscopic gating aperture of 1 mm, use of a gamma index criterion of (3%, 3 mm) and a DTA of 3 mm is valid for small targets with gated delivery.