Purpose: To evaluate how the sample-volume dependence of well-type chambers affects the current clinical determination of Y-90 microsphere activity.

Methods: A Y-90 standard activity solution from the NIST SRM program was used for all measurements. Ionization current measurements were made in a Standard Imaging IVB1000 well chamber and a Capintec 12-atm dose calibrator with Sirtex Medical's glass shipping vial and plastic v-vial for volume levels from 1mL to 5mL in 1mL increments. A calibration coefficient was calculated for each volume level and the percent difference from the 5mL calibration coefficient was calculated. To evaluate how the differences in calibration coefficients between the volume levels affect the delivered activity, a theoretical prescription level of 2.4GBq was assumed. Using the appropriate calibration coefficients and the source measurement methods suggested by Sirtex Medical, the actual activity that would be delivered and percent difference from 2.4GBq were calculated.

Results: The largest variation in calibration coefficient for each chamber and vial configuration was between the 5mL and 1mL volume levels. The largest difference of 45% was seen in the IVB1000 well chamber with the shipping vial and the smallest difference of 1.3% was seen in the 12-atm dose calibrator with the v-vial. These differences translated into 11.3% and 0.3% differences, respectively, from the theoretical 2.4GBq prescription. A 2.6% difference from the 2.4GBq prescription was found for the Capintec 12-atm with the shipping vial held in the dipper holder, which represents the current clinical measurement geometry.

Conclusions: Based on the results, the IVB1000 would not be recommended for the current activity determination methods as proposed by Sirtex Medical for microspheres. The 2.6% difference determined for the currently used measurement geometry may be resolved with calibration and measurement with the v-vial.