Yttrium-90 microsphere therapy, a form of radiation therapy, is an increasingly popular option for care of patients with liver metastases or unresectable hepatocellular carcinoma. The therapy directly delivers Yttrium-90 microspheres via the hepatic artery to specifically targeted disease sites. Following Yttrium-90 microsphere therapy, a vast majority of Yttrium-90 microspheres preferentially lodge in neoplastic tissue due to their embolic size (mean diameter 32 μm) and targeted trans-arterial delivery. Once embolized the microspheres do not migrate but deposits up to 90% of its energy in the first 5 mm of tissue.

Prior to Yttrium-90 microsphere therapy, a 99mTc-MAA examination is conducted to evaluate catheter placement and lung-shunt fraction. The lung shunt fraction and absorbed dose estimates for lung and liver that guide Yttrium-90 administered activity are based on nuclear medicine imaging. A review of the pre- and post-therapy imaging procedures underlying Yttrium-90 microsphere therapy will be presented. Calculation of the lung shunt fraction and dosimetry models to estimate radiation absorbed doses will be discussed. Radiation safety issues will also be reviewed.

Educational Objectives:

1. To understand the imaging sequence for Yttrium-90 microsphere therapy planning and dose calculations
2. To understand calculation of lung shunt fraction and estimation of absorbed dose for lung and liver
3. To become familiar with radiation safety and regulations surrounding Yttrium-90 microsphere therapy