

Target surrogates have been extensively used in radiation therapy, especially imaging guided radiation therapy and radiosurgery, for the purposes of target localization and treatment verification. A wide variety of surrogates have been used including gold markers (seeds or coils), surgical clips, long-lasting contrast agents, brachytherapy seeds, and electro-magnetic markers. This course will review different types of applications of target surrogates in radiation therapy and discuss the issues related to marker implantation, such as patient complication, marker migration, dropping, deformation, minimum numbers of fiducials, and timing between the implantation and planning imaging acquisition. Application for specific treatment sites, such as prostate, lung, liver, pancreas, and breast will be addressed. Issues related to image guidance techniques with target surrogates will be discussed. Planning target volume (PTV) margin requirements for implanted marker guided setup will be discussed for each individual site. Marker applications in verifying the accuracy of respiratory gated treatments will also be discussed. Quality assurance with respects to marker stability during the whole course of radiation therapy, deformability with specific implantation sites, and geometrical accuracy will be addressed.

*Learning objectives:*

1. Attendees will learn how to assess the quality of marker placement.
2. Attendees will learn how to set up QA programs for treatment with implanted target surrogates.