# INTEGRATING THE HEALTHCARE ENTERPRISE – RADIATION ONCOLOGY (IHE-RO)
## Clinical Impact Statement

### Multimodality Image Registration for Radiation Oncology 2014 [MMRO-III]

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**Description:**

The MMRO profile defines the information necessary for the exchange of image registrations between treatment planning systems in radiation oncology.  It requires that these systems support CT, PET, and MRI imaging as a minimum standard of performance.  The profile describes the information required for image registration, contouring and display using multiple image series, and the display of the resultant dose calculation on the different image modalities.

MMRO-III updated the MMRO-II profile by relaxing the restriction that a primary data set needs to be a CT scan. This profile also allows image sets to be arbitrarily registered in any order.

**Rationale for Profile Creation:**

Prior to adoption of the MMRO profile, most treatment planning systems in radiation oncology were not capable of using image registration information performed on another system.  As a result, it was often necessary to redefine the spatial relationship between two image modalities on each system.  This was repetitive and also prone to errors in registration between the two systems that were often disconcerting to clinicians. The MMRO-II profile provides a consistent interpretation of spatial registration information to allow image registrations to be reliably transferred between systems.  In this profile, some of the limitations from MMRO-II (e.g. restricting the primary data set to a CT scan) are removed and more flexibility is allowed for planning and pre-planning use cases.

**Clinical Impact:**

With the incorporation of multiple imaging datasets, including functional imaging (PET, SPECT-CT, etc.), anatomic imaging (MRI, CT), and time based imaging (cine-MR, 4D-CT) into radiation treatment planning, it is of critical importance to have consistent, accurate registration of these datasets. The MMRO-II profile requires that all data sets are registered to the primary data set, which is defined as a CT. However, not all clinical image registration involves CT images. Clinicians may prefer to register MRs to MRs, rather than always registering MRs to the CT. Also, in certain cases, more than one CT may already exist during preplanning and it may not be clear which CT series is to be used as the basis for treatment planning. Thus, at the preplanning phase, it may not be possible to define the "primary" CT. In practice, the "primary" image set may be any volumetric data, set particularly since new applications allow for planning on MR. Therefore, this profile focuses on relaxing the definition of the "primary" data set such that CT is not required.

It should be noted that the purpose of the MMRO-III profile is to enable reliable exchange of spatial registration information among contouring workstations and treatment planning systems.  It does not address the methods used to perform image registration or the quality of registrations produced.  Additionally, the profile addresses rigid spatial registrations only.  Deformable image registration will be addressed by a separate profile in the future.