

- This talk is an Instance. It is not unique, but the object referencing it is. It is but one of many Instances which are part of a Series of Instances, and, I quote “*which series contains Instances that are referenced elsewhere in this Instance*” .
- The Content Label, defined in the Presentation State Module, is:
Image Registration and DICOM – when two worlds collide.
- Please pay careful attention as I may make reference to the Referenced Frame of Reference a few times though not all Instances of the references will reference the Frame of Reference – and they will not be unique.



- Main image modalities
 - CT
 - MR (multiple flavors)
 - PET/ NM
 - Ultrasound
 - SC etc
- Main RT Objects
 - Structure Set
 - Plan/ Brachy Plan
 - RT Image
 - Dose
 - Treatment Record

- CT/MR(S), CT/CT, MR/MR, CT/PET, CT/ Ultrasound etc
 - target localization pre- and post- treatment
 - Boost planning
 - Rigid and Deformable methods
- Functional imaging
 - Special requirements e.g. SUV, filters etc.
 - Slope/intercept problem?
- Tomotherapy
- Cone-Beam CT
- Daily Ultrasound localization
- Combined external and brachytherapy planning



- 4D Planning
 - Time series
 - 3D dose distributions
- Respiratory Gating
- Port film verification
 - Port/ simulator films
 - DRR
 - EDIP
 - patient imaging systems etc
- IMRT QA
 - Film
 - EPID
 - 2D Dose Planes – calculated/ measured



- Traditionally we have transformed MR(S)/CT/PET etc. to coordinate system of treatment planning CT
- Future we need to transform target and other volumes defined in primary (initial planning CT) coordinate system to secondary (subsequent treatment imaging modality) – could be u/s, cone-beam CT, traditional CT etc.
 - This is the most commonly requested feature CMS receives



- 4x4 transformation matrices
- Multiple references and cross-references
 - Inverse transforms?
- Transformation method
 - Fiducial points, correlation, MI
 - Rigid/deformable
- Mechanism to identify transformed data (not the original that is referenced by the transformation matrix).



Does the proposed supplement fulfill the preceding clinical requirements?

- Hard to tell - the basics appear to be covered in the inimitable (read – confusing, ambiguous) DICOM manner.
 - Massive sledgehammer to crack the proverbial nut!
 - Document is clearly a works-in-progress
 - Why two separate IODs – Spatial Registration and Spatial Fiducials?
 - Arguably existing contour objects could be utilized for fiducials.
 - I may have calculated the transformation via fiducials and want to transmit both to compliant systems
- Not clear (to me) if appropriate cross (back) references are covered?



Does the proposed supplement fulfill the preceding clinical requirements?

- There seems unhealthy emphasis on Fiducials
 - Fiducial matching is known to be the least reliable
 - Contour matching is also problematic
 - Why would anyone want to know the coordinates of the fiducials used in the matching process???
- If fiducial parameters are covered, why not include algorithmic parameters related to the more commonly used volumetric methods of registration e.g. MI, cross-correlation etc.

