Data Sharing Landscape

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Standards & Standards Organizations

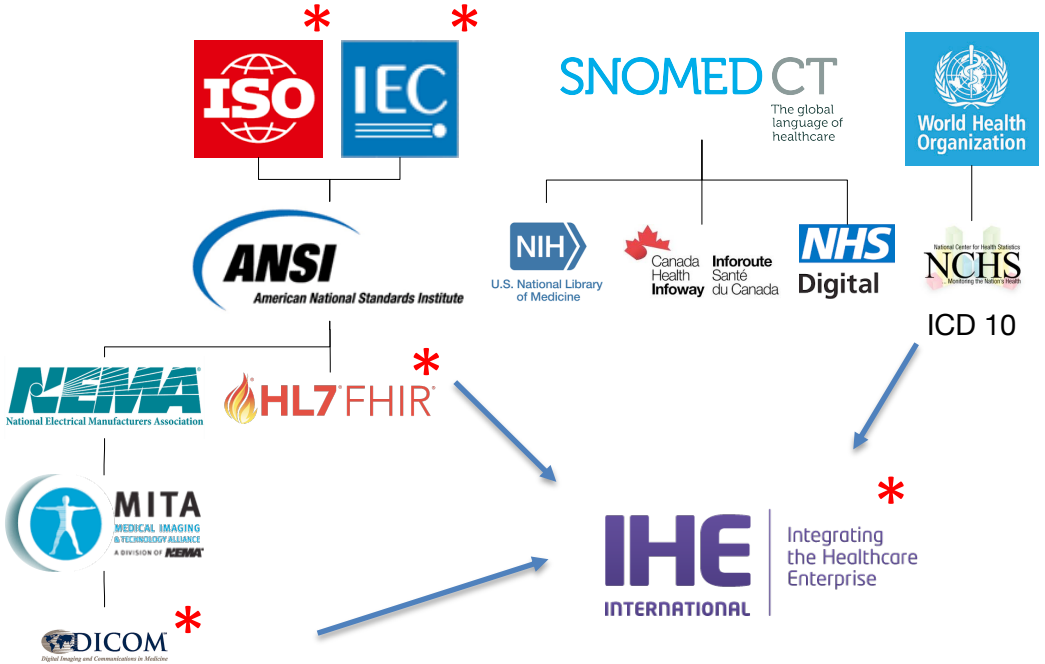
International Level

Countries join ISO, IEC, SNOMED CT…

National Level

In US Standards Orgs Belong to ANSI

At all levels Standards are drafted.



* AAPM member Involvement

Health Level 7

- Health Level 7 (HL7)
  - ANSI accredited Standards Development Organization
- Different messages can be sent
  - ADT Admit, Discharge, Transfer
    - Name, DOB, Hospital ID#
  - SIU Scheduling Information Unsolicited
    - Appointments
  - CDA Clinical Document Architecture
    - Meta Data with RTF, Word Document, PDF

HL7 & FHIR

- Fast Healthcare Interoperability Resource
  - Under Development…
  - Standardizes the exchange and not just content
  - API focused on pulling data/results when needed

- Health Level 7 (HL7)
  - Is Document focused
  - Created when needed and then static after that
  - Exchanged and stored but can suffer from “bit rot”

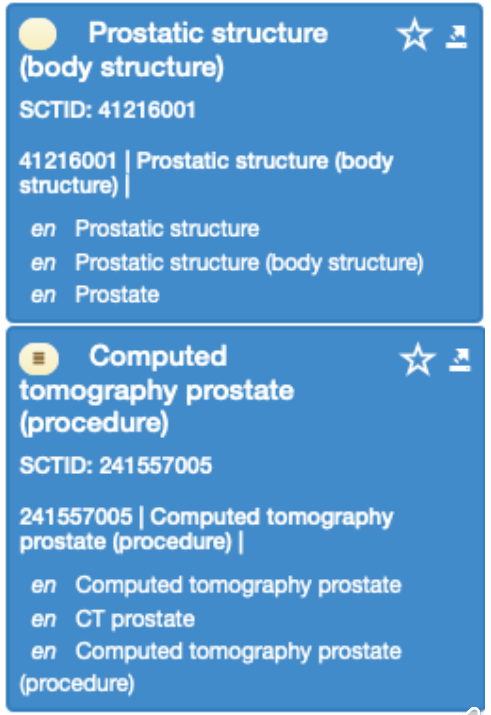
SNOMED CT

SNOMED CT
The global language of healthcare

- Standard Nomenclature in Medicine Clinical Terminologies
  - An Ontological Foundation
  - Coding of Common Terms
  - Translated into multiple languages
- Full Coding of Anatomy

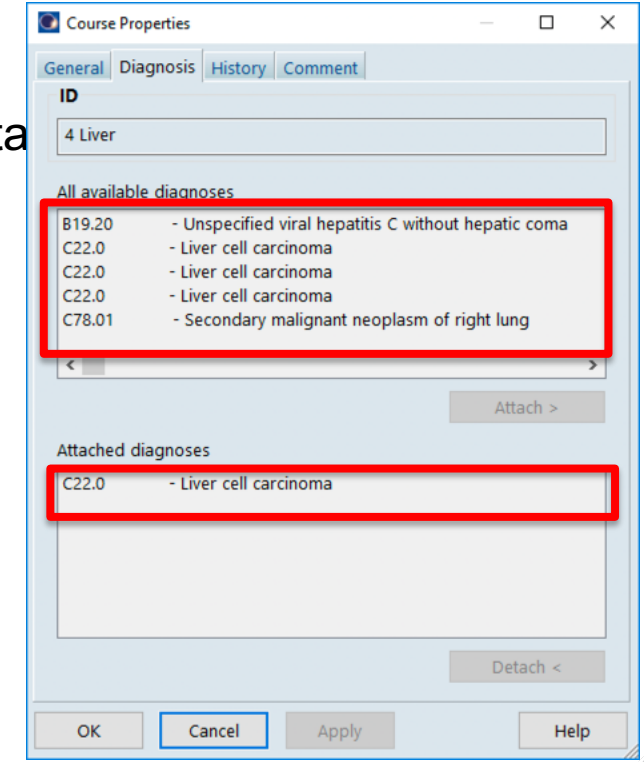
SNOMED Browser

https://browser.ihtsdotools.org/

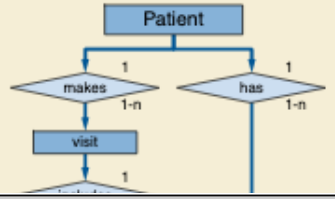


IDC 10 and Staging

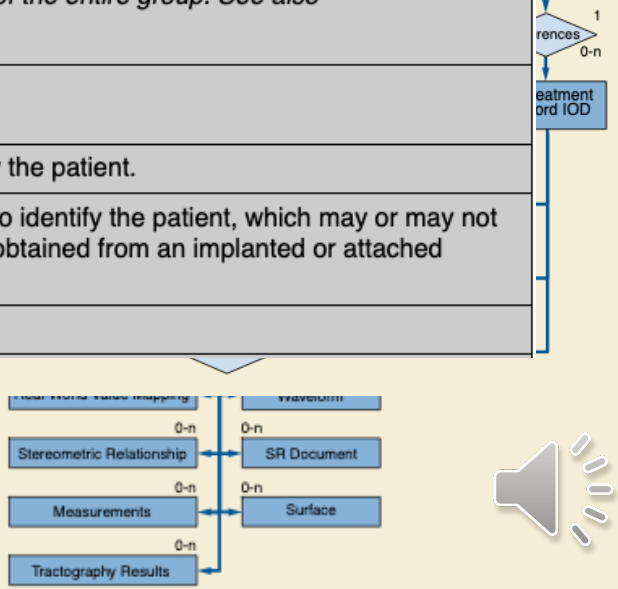
- International Disease Classification Version 10
  - WHO and National Center for Healthcare Sta
  - Diagnosis Coding
  - ICD-O (oh not zero)
    - Site and histology
- American Joint Committee on Cancer
  - TNM Staging
  - https://cancerstaging.org/



DICOM Standard NEMA MITA

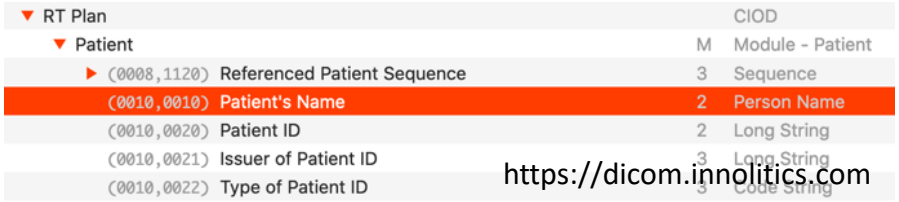


Attribute Name	Tag	Attribute Description
Patient's Name	(0010,0010)	Patient's full name
Patient ID	(0010,0020)	Primary identifier for the patient. ***Note*** *In the case of imaging a group of small animals simultaneously, the single value of this identifier corresponds to the identification of the entire group. See also Section C.7.1.4.1.1.*
Include Table 10-18 "Issuer of Patient ID Macro Attributes"		
Other Patient IDs	(0010,1000)	Other identification numbers or codes used to identify the patient.
Other Patient IDs Sequence	(0010,1002)	A sequence of identification numbers or codes used to identify the patient, which may or may not be human readable, and may or may not have been obtained from an implanted or attached device such as an RFID or barcode.
>Patient ID	(0010,0020)	An identifier for the patient.



The Importance of Coding Data

- What is “Coding data”
- Attaching a computer indexable code to each data element
- Advantages
  - Well defined
  - Immutable to updates to the standard
  - Allows mapping of data
  - Translated into different languages



https://dicom.innolitics.com

Table 3
Partial List of Database Elements with HL7 and DICOM Mapping

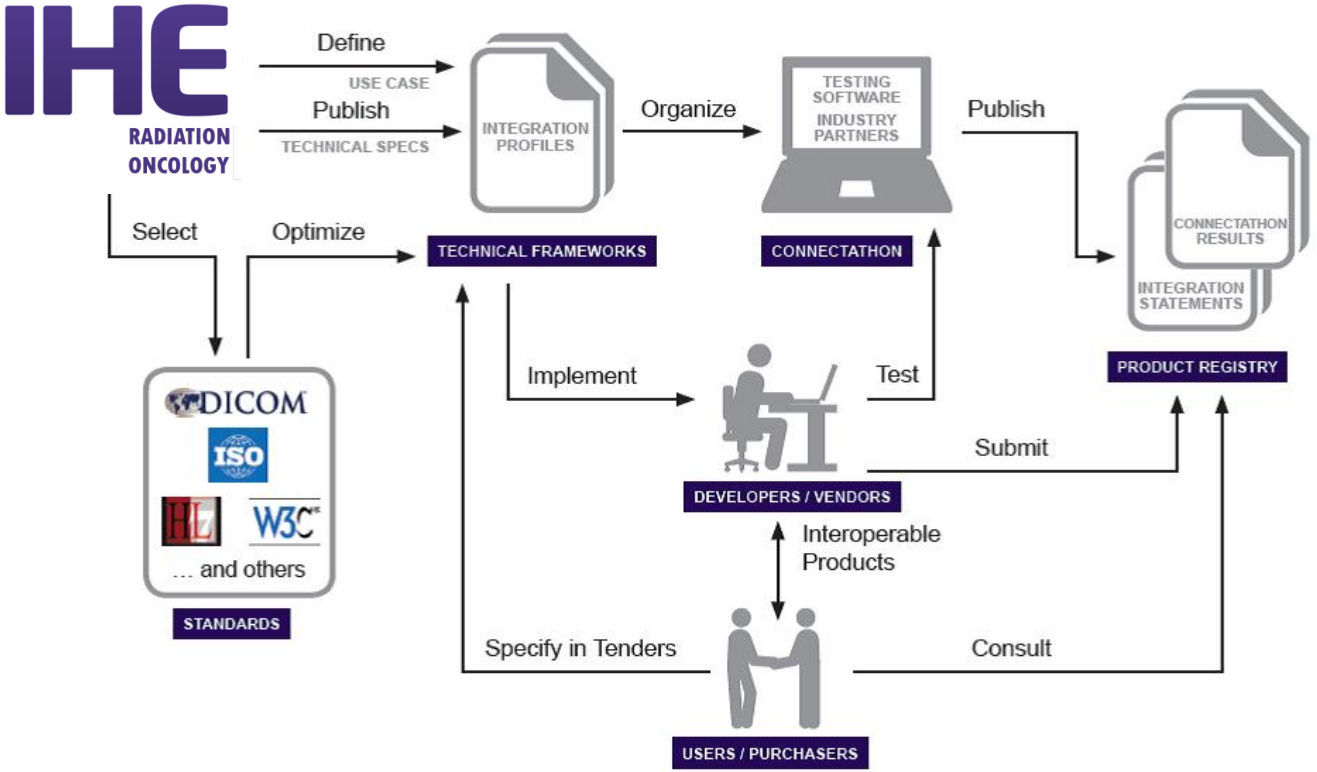
Data Name	HL7 Segments	DICOM Tags
Patient name	PID-5	(0010,0010)
Primary patient identification	PID-4*	(0010,0020)
Patient’s date of birth	PID-7	(0010,0030)
Requested procedure—name	OBR-4†	(0040,1001) (0032,1060)
Requested procedure—code	OBR-4‡	(0032,1064)
Current Procedural Terminology procedure code	OBR-4§	(0040,1400)

https://pubs.rsna.org/doi/pdf/10.1148/radiographics.20.3.g00ma18883

IHE History

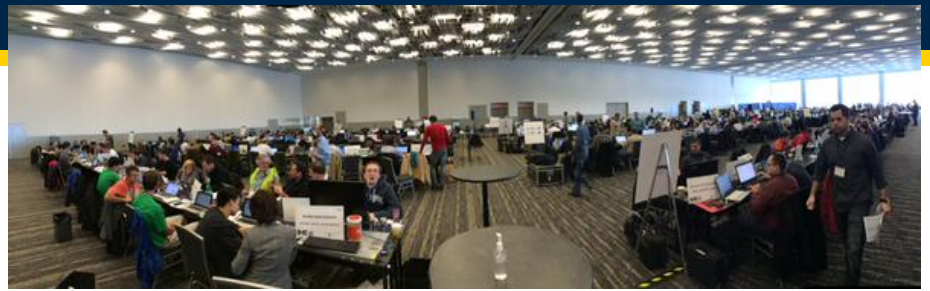
- IHE RSNA Collaboration
  - 1990's: RSNA instrumental in DICOM promotion / adoption; system interoperability required use of the HL7 standard
  - 1997: Progress toward producing turnkey devices able to "plug and play" with existing standards– required definition of specific use-cases and specific architectures
  - 1998: Engagement with the Healthcare Information and Management Systems Society (HIMSS) to establish momentum and direction for system *interoperability* — ….. the IHE effort was initiated

How IHE-RO Functions



Connectathon

- IHE NA Connectathon (annual since 1999)
  - Radiology and 9 other domains
  - >100 vendors, >550 engineers
  - Cleveland Convention Center



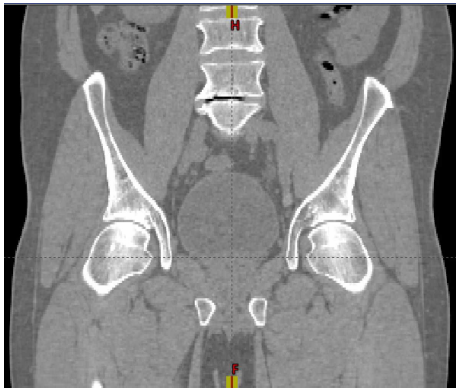
- IHE-RO Connectathon (since 2007)
  - Radiation Oncology Domain
  - 5-8 vendors
  - Stockholm Sweden
  - October 2019

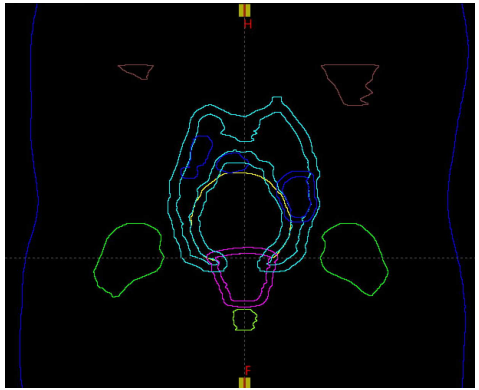
Results are public
https://www.aapm.org/IHERO/VendorCompliance.asp

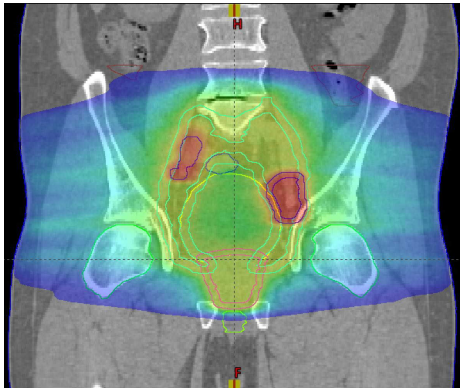
Basic Radiotherapy Objects II (BRTO II)

Connectathon Testing!

- CT, Structures Dose!





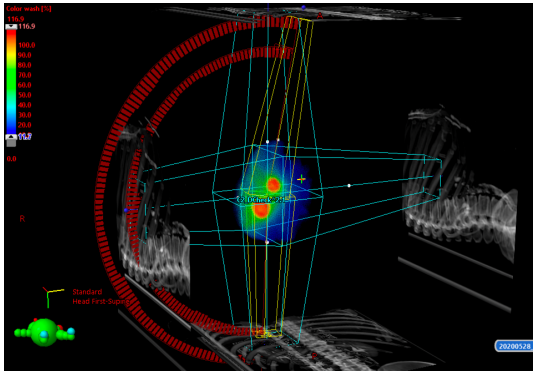


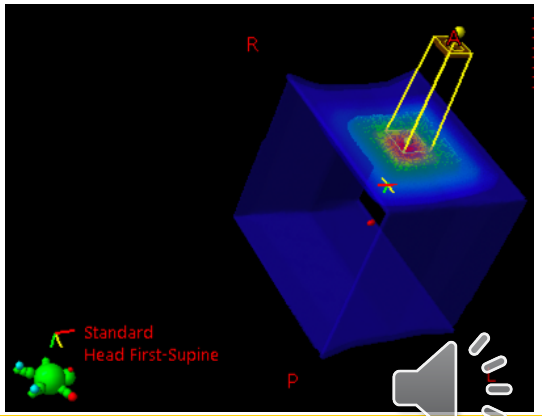
Treatment Plan Plan Content (TPPC)

Connectathon Testing!

- Exchange of Plan Details for
- CT, Structures, Dose and Planned Beams for

  - Basic Static Beam
  - MLC Static Beam
  - Arc Beam
  - MLC Fixed Arc Beams
  - MLC Variable Beams
  - Hard Wedged Beam
  - Virtual Wedge Beam
  - Motor Wedge Beam
  - Static Electron Beam
  - Step & Shoot MLC Beam
  - Sliding Window MLC Beam
  - Photon Applicator Beam
  - Photon Applicator Arc Beam

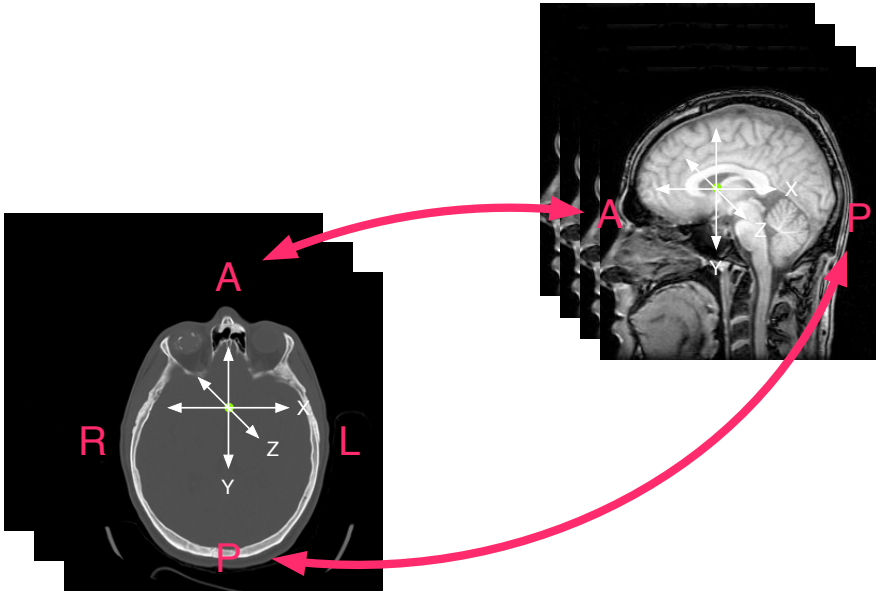




Multi-Modality Image Registration III

Connectathon Testing!

- Proper Storage/Retrieval of Images from Archive
  - CT, MRI and PET retrieved as DICOM retaining all attributes…
  - Maintains patient orientation
  - Ant⇔Ant, Post⇔Post, Left⇔Left, Right⇔Right (feet/head)
  - 6DOF Spatial Registration Object (SRO)

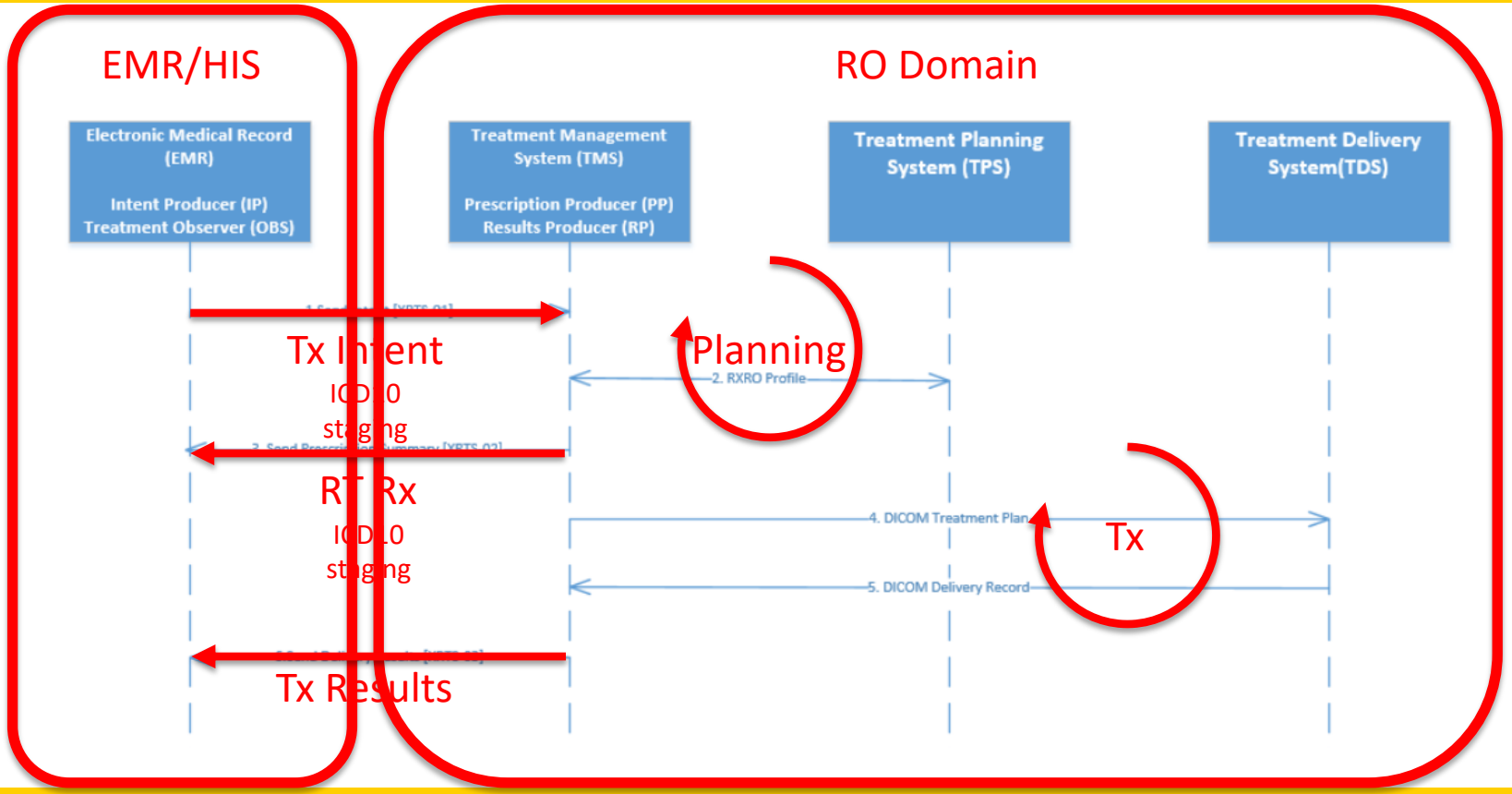


Multimodality Image Registration II & Deformable Image Alignment

- MMRO Exchange of CT, MRI and Structures with a …
  - Spatial Registration Object (SRO)
  - DICOM Rigid Transformation
  - Must Display Images fused with Structure set
- DDRO Exchange of CT, MRI and Structures with a …
  - Deformable Alignment Object
  - DICOM Deformation Map
  - Must Display Images fused with Structure set

Exchange with EMR/HIS “XRTS”

Drafting!



DICOM Prescription RXRO

Public Comment/Drafting!

- Basic Physician Intent
  - Treatment Site & Code
  - Diagnosis Code – ICD 10
  - Treatment Intent Type / Therapeutic Goals
  - Narrative – Free Text
    - Staging info & Technique e.g. SBRT, VMAT….?
  - No Dose information
- Enhanced Physcian Intent
- Planning Directive

DICOM Prescription RXRO

Public Comment/Drafting!

- Basic Physician Intent
- Enhanced Physician Intent
  - Target definition e.g. PTV
  - Rx Dose for PTV
    - dose/fx
    - Nfx
    - Total Dose
- Planning Directive

DICOM Prescription RXRO

Public Comment/Drafting!

- Basic Physician Intent
- Enhanced Physician Intent
- Planning Directive
  - Full details…
  - Rx for all targets
  - Dose limits for all OARs

SMPC for Reirradiation Patients

Advances in Radiation Oncology (2019) 4, 559-565

advances
in radiation oncology

www.advancesradonc.org

Scientific Article

The Special Medical Physics Consult Process for Reirradiation Patients

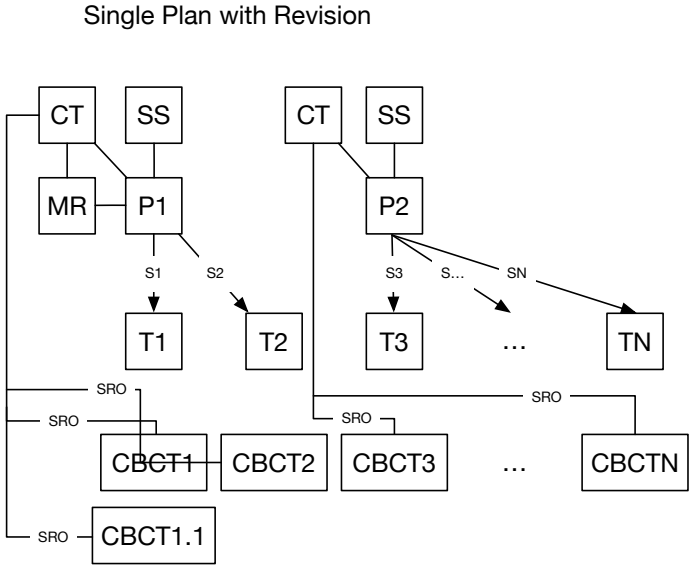
Kelly C. Paradis PhD*, Charles Mayo PhD, Dawn Owen MD, Daniel E. Spratt MD, Jason Hearn MD, Benjamin Rosen PhD, Rojano Kashani PhD, Jean Moran PhD, Daniel S. Tatro CMD, Whitney Beeler MD, Karen Vineberg CMD, Dylan C. Smith MS, Martha M. Matuszak PhD

University of Michigan, Ann Arbor, Michigan

K.C Paradis et al. (2019). The Special Medical Physics Consult Process for Reirradiation Patients. *Advancesradonc*, *4*(4), 559–565. http://doi.org/10.1016/j.adro.2019.05.007

3 Actors

1. Outside Hospital Plan and History Exchange
   - CT, Structures and Dose with Tx Records
   - Continuation or Retreatment situation
2. Clinical Trial Record Exchange
   - CT, Structures and Dose with Tx Records
   - Registered images for Planning
   - Treatment Imaging with IGRT
3. “Archive” Export
   - Document as much as you can.



What you can do?

- Know ….
  - What information is needed by the cancer registry or clinical trial team
  - Required from ethical/institutional review board
- Engage …
  - In the clinical trial design process within your institution
  - Purchase process of RO and EMR software
  - Standards development and implementation
- Encourage
  - Data encoding in your systems, Rx each tumor, ICD-10, AJCC Staging…
  - The use of data availability statements