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Minutes

DICOM WORKING GROUP SEVEN (RADIOTHERAPY)

Meeting Location	Online Meeting		
Dates and Times	August 03-06, 2020		
	Monday - Thursday		9:00 – 13:00 EDT
Presiding Officers	Christof Schadt, Co-Chair Jim Percy, Co-Chair		
Secretary	Shayna Knazik, MITA		

Participants

Name & Role	Affiliation	Mon	Tue	Wed	Thur
Walter Bosch, Voting	AAPM	X	X	X	X
Bruce Curran, Voting	AAPM	X	X	X	X
Yulong Yan, Voting	AAPM	X	X	X	X
Bob Pekarek, Voting	Accuray	X	X	X	X
Christof Schadt, Co-Chair	Brainlab	X	X	X	X
Jim Percy, Co-Chair	Elekta	X	X	X	X
Scott W. Hadley, Observer	IHE-RO	X			
Bruce Rakes, Voting	Mevion	X	X	X	X
Shayna Knazik, Secretary	MITA	X	X	X	X
Stefan Pall Boman, Voting	RaySearch		X	X	X
Rickard Holmberg, Observer	RaySearch	X	X	X	X
Chris Pauer, Voting	Sun Nuclear	X	X	X	X
Ulrich Busch, Voting	Varian	X	X	X	X
Kari Jyrkkälä, Voting	Varian	X	X	X	X
Hansen Chen, Guest	Philips	X	X	X	X
Francisco Nunez, Guest	Philips	X	X	X	
Justin Turon	Philips		X	X	X
Kumar Lakshmana	Naveen		X		
James Beck	Accuray		X		
Jon Treffert	RaySearch			X	X

Actual Week Schedule

	Monday	Tuesday	Wednesday	Thursday
Session 1 09:00-09:55	Setup, Administrative, Opening General Discussion CP RT159	CP RT 160 Supp 213	Teams	Sup 213
Session 2 10:00-10:50	Supp 213	Supp 213	Supp 213	Sup 213
Session 3 11:10-12:00	Supp 213	Supp 213	Supp 213	Sup 213
Session 4 12:05-13:00	Supp 199 CP RT 158	Supp 213	Supp 213	Sup 215

Topics

Administrative

1. Introductions, identified participants.
2. Shayna Knazik reminded the group of anti-trust rules and DICOM Patent Disclosure Policy.
3. Reviewed the agenda and revised as needed.
4. Review of meeting minutes.

Subgroup reports

- € Brachy subgroup work on development of an IHE-RO Profile.
- € Ion Subgroup (Bruce Rakes) is working on radiation and treatment record.
- € Motion Management (Bob Pekarek) is organizing a meeting.
- € IHE-RO (Chris Pauer) had F2F meeting in July.
 - XRTS is in development for public comment. 21st Century Cures is driving use of FHIR. Related effort (CODEX).
 - The IHE-RO Test committee is preparing VPN infrastructure for informal testing in November, with the goal of formal testing early in 2021.
 - ROTH treatment history is being developed to support continuity of care (related to RT Course efforts).
 - An DRRO Profile draft is in preparation.
- € ADVAMED (Jim Percy)- no meetings at this time
- € IEC (Jim Percy)- upcoming IEC WG review of committee draft of IEC 62083 (TPS Standard) on Aug 21, 2020
- € WG-28 - public comment on Cone Beam CT Radiation Dose SR (Supp 214)

Organizational

Discussion of using Teams for collaboration on different topics.

An ad hoc Google Docs account has been used as a work environment for WG-07 meetings, but this is ad hoc for each meeting.

Teams provides online meeting capabilities.

Microsoft Teams appears to work for text editing. Still need to evaluate formatting capabilities.

Shayna to set up a Teams Channel for WG-07 use as a work environment. Persistent documents to be stored on the FTP server.

Need to have multiple owners of the Channel.

On Thursday the group switched to using Teams. The current layout was presented and the potential options were discussed Teams can be used for:

- Maintaining the Correction Proposals and the overview list
- Maintaining the Meetings list, agendas and meeting minutes
- Putting “tribal knowledge” into a OneNote
- Using channels for specific work, e.g. discussion on dose and Supplement 177

It was agreed that for now the work on Supplement will still be continued offline and not with Teams. Further tests shall be done to evaluate whether editing a Supplement in Teams will have effects on the formatting.

General Discussions

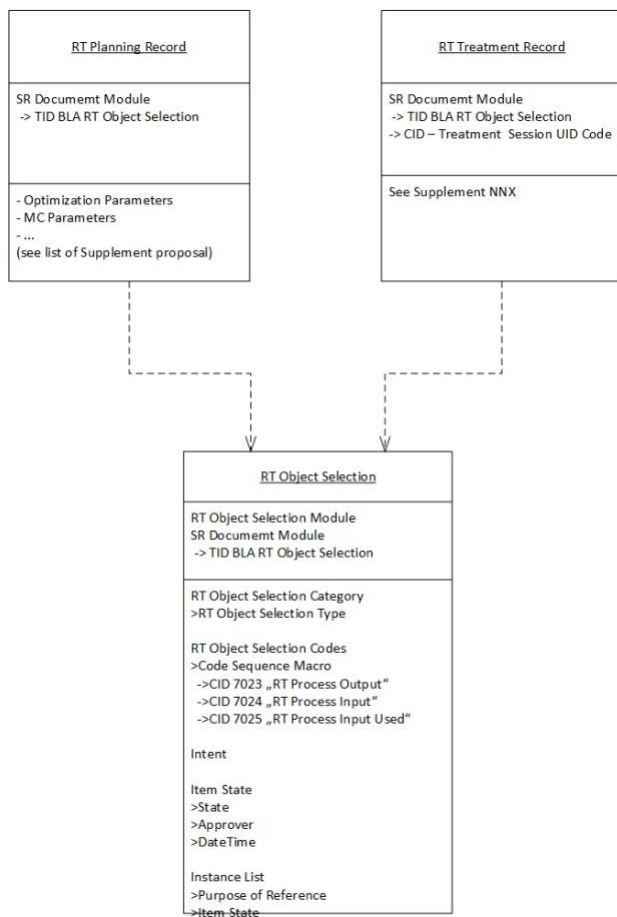
Planning Record/Treatment Record vs. Key Object Selection

cp RT159 KOS extension

- Annotate references
 - CONTAINS CODE
 - Purpose of Reference
- Add Treatment Session UID for recording artefacts - in conflict with Treatment Session Record?
- Make KOS TID 2010 extensible?

Discussion of mechanisms for referencing DICOM Instances with additional meta information. I.e., a list of instances with indication of why they are included (selection) or representing some additional property (state), e.g., approval status.

- Top-level container for patient data is still the RT Course
- Normalized objects are better for workflow management.
- Composite IOD is needed for offline (detached) usage. Need to determine if one has the latest version. ("C-FIND-LATEST")
- Existing KOS does not appear to be adequate for RT use cases. One approach may be to extend the KOS IOD (RT Object Selection) by removing limitations and adding RT-specific information.
- Define Extensible TID for RT Object selection
- Include coded reason for selection
- Plan Record and Treatment Record can use Enhanced KOS/RT Selection to reference instances.



Christof will present cp_RT159 (Add properties to KOS) to WG-06 at the next meeting to determine whether to extend KOS or develop new RT Selection IOD. Based on this discussion, WG-07 will decide whether to proceed with creation of a TID.

Correction Proposals

cp RT158 Incorrect action code for Treatment Machine Name

Part 15 de-identification code for Treatment Machine Name is not correct.

Action Code should be "X/Z" (rather than "X") since Treatment Machine Name (300A,00B2) is Type 2.

cp RT160 RT Record Set Corrections

Clarification of wording and correction of typos.

CP was reviewed and approved for reading by WG-06.

Supplements

Supplement 213 - Enhanced RT Image

This Supplement is the next for reading with WG-06 for PC. (V. 4 is after the last meeting, V. 5. documents Uli's work, V. 6 is for this meeting.) Scope and Field of Application has been re-written. Three IODs are defined: Enhanced RT Image, Enhanced Continuous RT Image, RT Patient Position Reference Acquisition.

Per-frame Functional Groups Sequence is not needed for each frame for multi-frame image streams. The existing per-frame Functional Groups Sequence requires an item for each frame. Sub-sampling of parameters would be more appropriate for video acquisitions.

Uli reviewed edits in V. 6 of the document [8/4/20 9:00am ET].

- The group reviewed and revised the Scope and Field of Application of the Supplement. This Supplement addresses X-ray imagers. Others are out of scope.
- Decision to use integers to represent image pixel value in both Enhanced RT Image and Enhanced Continuous RT Image. Floating Point Image Pixel Module was replaced by Image Pixel Module in both IODs.
- Use Modality = RTIMAGE for Enhanced RT Image and Enhanced Continuous RT Image. Use Modality = PLAN for RT Patient Position Reference Acquisition.
- Explicitly forbid the use of Overlay Plane, Curve, and VOI LUT Modules.
- Functional Group Macros
- Imaging Source Coordinate System: origin at source, z-axis aligned with central axis and oriented from image receptor to the source
- Beam Modifier Coordinate System is aligned with the Image Source Coordinate System.
- Image Receptor Coordinate System: origin at the Equipment Frame of Reference
- Beam Modifying Devices: Definition Distance; added Beam Modifier Coordinates Presence Flag
- RT Photon Imaging Request Geometry Macro: Imager Source and Receptor locations specified using Matrix-based (absolute) or (native) Parameter-based (absolute or relative) macros.
- TODO: change "RT *Photon* Imaging Request..." to "RT *Projection* Imaging Request..."
- Imaging Aperture Mode: TREATMENT_FIELD, RELATIVE, CUSTOM
- Need to specify the location of the Imaging Plane to determine the Image Pixel dimensions

Further discussion of image pixel dimensions/resolution [8/5/20 10:00am ET]

- Pixel Spacing (0028,0030) specifies physical distance between pixel centers. In the case of Enhanced RT Image or Enhanced Continuous RT Image SOP classes, Pixel Spacing is defined as that of the (physical) Image Receptor or the (reconstructed) Image Plane. Decision to define geometry with respect to reconstructed Image Plane. TODO: Uli to revise Pixel Spacing in Pixel Measures Macro.
- Z-axis orientation: z-axis aligned with central axis of divergent beam

Radiation Generation Parameters

- Attributes in kV Radiation Image Acquisition Request Parameters Macro
 - Categorized Imaging Energy Codes (settings)
 - Lowest imaging energy = image acquisition using the lowest energy possible
 - Default imaging energy = image acquisition using the default energy
 - TODO: Kari to investigate IEC requirements for recorded imaging parameters
- Attributes in MV Radiation Image Acquisition Request Parameters Macro

- Supports photon and proton beams; includes nominal, min, max energy.

Exposure Time

- Start, Stop Cumulative Meterset (if acquired during therapeutic beam delivery)
- Cumulative Exposure Time

Annotation of Enhanced RT Images

- The primary annotation Use Case is drawing contours on DRRs. Also want to display anatomic orientation indicators on projection images.
- Open issue #3 suggests use of Presentation State for annotations.
 - Separate IOD (e.g., Presentation State) – eliminates the need to create duplicate instances of an RT Image.
 - The Blending Presentation State IOD is very powerful and should be capable of representing annotations. It is not clear how much effort is required to implement simple curves with this IOD.
 - The Graphic Annotation Module can represent polylines and text overlaid on images. Embedding the Graphic Annotation Module in an Enhanced RT Image may be an alternative.
- Prototype implementations of Presentation State will be helpful in evaluating options. Yulong to investigate.

Guidance is required for imaging devices that are not attached to the linac or mounted to a fix position in the room. Then a registration from the imaging device FOR to the Treatment Delivery Device Equipment Frame of Reference is required. This is not directly an issue of the IODs in Supplement 213, but some text to guide the implementers should be available.

- Anticipated extensions for Positioning workitem codes using Optical, Ultrasound, Spatial Fiducials, etc. are highlighted in blue in the supplement. They will be removed for PC.
- Clarified attribute name and description of Baseline Parameters RT Radiation Sequence.
- Acquisition Initiation Parameters are specified in a Content Item Macro using TID SUP213T01
- Rename “2D Photon Imaging” to “Projection Imaging”.

Relating RT Images to Planning images

- Add reference to Spatial Registration relating verification images to planning images?
- Can use General Reference Module
- The scope of the RT Image is limited to a single FOR.

Other issues discussed

- Approval status – where recorded?
- Include Frame VOI LUT Module (U) to specify window/level on frame level.
- Include Frame Extraction Module (U)
- Check Enhanced CT Module of additional parameters
- RT Accessory Devices are referenced by index.
- Referenced Position Reference Instance Sequence references planning CT, fiducial, etc.

Uli will extract Codes to Teams for review by the WG.

Supplement 199 - RT Radiation Records

This Supplement reached FT at the last WG-06 meeting.

There was feedback after adding the document to the Standard:

- RT Radiation Record Set vs. RT Radiation Set Record, See E-Mail 1 in appendix
- RT Dose Contribution Module, Meterset to Dose Mapping Sequence, Radiological Dose Effect Macro - include in mapping sequence or on same level? See E-Mail 2 in appendix
- Typo. See E-Mail 3 in appendix

E-Mail 1:

The scoping was discussed, a new text is proposed for the IOD:

The RT Radiation Record Set IOD references the set of RT Radiation Record Instances of a radiotherapy treatment that has been performed using a single RT Radiation Set SOP Instance and its referenced RT Radiation Instances.

RT Radiation Record Set Module (C.36.20):

The RT Radiation Record Set Module contains treatment-modality-independent information about a set of RT Radiation Records.

Todo: the title of PS3.3 C.36.10.1.1: There is no RT Radiation Record Set Usage attribute. It should be RT Radiation Set Usage.

E-Mail 2:

The error is in the record. Thus, move the macro outside the mapping table.

E-Mail 3:

check back with David, whether this can be fixed for 2020d

See the resulting CP RT160 on the ftp server.

Supplement 215 – RT Ion Radiation Objects

WG-07 reviewed/revised version 18 of the supplement. The following topics were discussed:

- Analog Range Shifter Setting Sequence
 - setting(s) are defined using a TID (contains coded values for one or more parameters). It is not yet clear what parameters will be needed for this purpose.
 - Decision *not* to include unstructured attribute or TEXT entry in the TID.
 - TID is extensible. Baseline contains parameters in mm, deg, and index (unitless).
- Use “Ion Modulated Control Point Sequence” for Ion Modulated Scanning Beam IOD.
- Re-use Source Roll Angle and RT Beam Limiting Device Angle from C-arm Radiation? (BLD rotates with respect to base beam?). This needs further discussion.

Future WG-07 Meetings

- Aug 18, 2020 9am-12pm ET, Virtual, Supp 213
- Aug 24, 2020 9am-12pm ET, Virtual, Supp 213
- Sep 14-15, 2020 9am-1pm ET, Virtual, Supp 177
- Sep 23-24, 2020 9am-1pm ET, Virtual, Supp 177
- Oct 12-15, 2020, 9am-1pm ET, Virtual, Supp 160, 213, 177 (*)
- Nov 30-Dec 3, 2020, 9am-1pm ET, Virtual,

(* Review/reconsider in Sep 2020)

Adjournment

Meeting was adjourned Aug 6, 2020 at 1:06 pm ET

Prepared by Walter Bosch

Submitted by Shayna Knazik

Reviewed by Counsel Peter Tolsdorf