

**IHE-RO Technical Committee
Face-to-Face
August 2, 2017 at 2:00-5:30,
August 3-4 8:30-5:30,
August 5 8:30-12:00 MDT
Hyatt Regency at the Colorado Convention Center
Executive Board Room
Denver, Colorado**

**Technical Committee Chairs:
Scott Hadley, PhD
Chris Pauer**

**IHERO Task Force Co-Chairs
Bruce Curran, MS, ME, FAAPM, FACMP, FACR, AAPM / VCU Health
John Buatti, MD, University of Iowa**

Mission Statement: *The American Society for Radiation Oncology (ASTRO) has formed a multi-society Task Force to undertake an initiative to promote the Integration of the Healthcare Enterprise (IHE) – Radiation Oncology (RO), fostering seamless connectivity and integration of radiotherapy equipment and the patient health information systems. The Task Force will include members from ASTRO, RSNA, American Association of Physicists in Medicine (AAPM), the American College of Radiology (ACR) and the Medical Imaging and Technology Alliance (MITA). In addition, members of the International community have also been invited to participate in IHE-RO. The IHE-RO Task Force, in close collaboration with radiotherapy product manufacturers, will develop appropriate integration profiles for radiation therapy and setup a demonstration of seamless communication among the full array of radiotherapy products.*

Attendees:

Name	Affiliation	Email	8/2/17	8/3/17	8/4/17	8/5/17
Chris Pauer	Sun Nuclear	chrispauer@sunnuclear.com	X	X	X	X
Scott Hadley	U. Mich.	swhadley@umich.edu	X	X	X	T
Walter Bosch	Wash. Univ.	wbosch@wustl.edu	X	X	X	X
Thomas Schwere	Varian	Thomas.Schwere@varian.com	X	X	X	X
Jill Moton	AAPM	Jill@aapm.org	X	X	X	X
Rickard Holmberg	Raysearch Labs	rickard.holmberg@raysearchlabs.com	X	X	X	X
Rishabh Kapoor	VCU/VHA	Rishabh.kapoor@va.gov	X	X		
Bob Pekarek	Accuray	bpekarek@accuray.com	X	X	X	X
Bruce Rakes	Mevion	rbrakes@mevion.com	X	X	X	X
David Wikler	IBA	David.wikler@iba-group.com	X	X	X	X
Jim Percy	Elekta	Jim.percy@elekta.com	X	X	X	X
Michael Owens	Reflexion	mowens@reflexion.com	X	X	X	
Bruce Curran	AAPM / VCU	bhcurran@gmail.com			X	X

Adam Yock	Vanderbilt	Adam.d.yock@vanderbilt.edu	X			
Peter Balter	MDAnderson	pbalter@mdanderson.org	X			
Anthony Waller	Varian / Velocity	Anthony.waller@varian.com	X			
Matthew Birdsall	Varian / Velocity	Matthew.birdsell@varian.com	X			
Peter Balter	MD Anderson	pbalter@mdanderson.org	X			
Ning Jeff Yue	Rutgers	yuenj@rutgers.edu	X			
Erik Roelofs	Maastro, NL	Erik.roelofs@maastro.nl	X			
Yury Niatsetski	Elekta	Yury.niatsetski@elekta.com	X			
Derek Brown	UCSD	dzbrown@ucsd.edu	X			
Stefan Pall Boman	Raysearch Labs		T	T	T	T
Eric Vinson			T			
Sven Siekmann	Brainlab	Sven.Siekmann@brainlab.com		T	T	T
Martin Von Siebenthal	Varian			T		
Ulrich Busch	Varian			T	T	
Harold Beunk	ICT			T	T	
Jeff West	Elekta			T		
Marianne Plunkett	Hoag	Marianne.plunkett@hoag.org		X		

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X = In person T = via Teleconference

Minutes:

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- I. Call to Order (Aug. 2, 2017 at 2:00 pm MDT) – a quorum was present
 - A. Review Agenda
 - B. Anti-trust rules were announced.
 - C. Review of Minutes was deferred.

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II. Business

A. Review of New/Proposed Use Cases

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- i. Robustness metrics – Adam Yock described the Use Case involving capture of dose uncertainty under a set of perturbations in position
 1. **ACTION 170801**: Walter to send draft of DICOM Sup 177 to TC attendees.
DONE

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ii. Deformable Registration

1. The TC reviewed the Deformable Registration Use Case. Capturing Metadata describing the process of computing the DSRO (“clip box”) is desirable. This could also apply to the rigid.

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- a. UID to an RT Structure Set, 3D Presentation State
 - b. More explicit definition of validity of deformation vector field
 - c. Usage of pre- and post-deformation rigid transformations.
2. Further discussion is needed to identify the Actors to be included in a Deformable Registration Profile. A producer / consumer pair may work, but some discussion of what is involved in “consuming” is needed to enable
 3. **ACTION 170802**: Scott to contact Bruce Curran to solicit champion(s) for this profile from deformable registration vendors.
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- iii. Standard of Prescriptions
 1. RO-SSI wants to set up a working group for Prescription Normalization
 2. RXRO adequately addresses interoperable *representation and communication* of Prescription information.
 3. *Presentation* of prescription information may be addressed by organizations such as IEC, AAMI, AdvaMed, etc.
 4. **ACTION 170803**: Scott to contact RO-SSI to arrange a presentation of RXRO and the DICOM Prescription object to that group and solicit feedback.
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- iv. ROI Templates
 1. The TC reviewed revision 8 of DICOM Sup 196 and discussed the content of the corresponding IHE-RO Integration Profile.
 2. Comments regarding the content of Sup 196 should be directed to DICOM WG-07 via Walter Bosch.
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- v. Consistent Presentation
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- B. Connectathon Discussion
- i. Connectathon logistics information is posted on the IHE-RO wiki at <http://ihe-ro.org>
 - ii. Connectathon dates are Oct 9-14 (½ day TC meeting on Oct 14)
 - iii. **ACTION 170804**: Jill to broadcast registration email to IHE-RO TC. DONE
 - iv. **ACTION 170805**: Jim to arrange hotel meeting room for Saturday, Oct 14)
 - v. Profiles to be tested
 1. BRTO-II
 2. TPPC
 3. MMRO-III – test using MR sagittal, CT, PET
 4. DCOM
 5. TDW-II – packet capture via WireShark
 - vi. **ACTION 170806**: Walter, Scott, Rishabh to review test procedures and test datasets for Integration Profiles to be tested.
 - vii. **ACTION 170807**: Jill to confirm AAPM travel budget for four judges
 - viii. **ACTION 170808**: Chris to email ICT to invite participation and technical assistance at the Connectathon.
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- C. Review of Proposed Use Cases / Profiles
- i. AARO – archive of cases from clinical systems for future retrieval
 - ii. RO History Exchange
 - iii. Survivorship Care Plan – what elements are included?
 1. What is provided to patient?
 2. What modality?
 3. What elements?
 - a. Did patient get RT
 - b. What Modality (IMRT, etc.)
 - c. Summary Data
 - d. Site of Treatment
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- e. Dose per fraction
- f. Cumulative total dose
- g. Number of Fractions
- 105 h. Frequency of treatments
- i. Start and end dates of treatments
- iv. Archive
- v. 4DCT

110 [Adjourn for the day 8/2/17 at 5:30pm MDT]
[Resume meeting 8/3/17 at 8:30am MDT]

- D. Topic 4: Prescription Profile (RXRO)
 - a. No update at this time.
 - 115 b. May restrict attributes based on trial experience.

- E. Topic 5: BRTO-II
 - a. Sven reviewed revision 1.2 of the BRTO-II Profile
 - b. CP for X Indicator – IHE requirement that *an attribute be absent*. This indicator
120 applies only to Type 3 DICOM attributes.
 - i. Proposal to use the X indicator comes from the Ion subgroup.
 - 125 ii. **DECISION:** Consensus of the TC is to create a CP (CP-RO-003) to add the X
indicator to Section 7.1.2 Requirements Definition in the BRTO-II
Supplement. This change will allow use of the X indicator in future Content
Definitions.
 - iii. **ACTION 170809:** Chris to add list of CPs to wiki Profile page to include
affected CP titles and affected Profile(s).
 - 130 iv. **ACTION 170819:** Walter to discuss IHE-RO specific Attribute Presence
requirements with IHE Testing and Tools Committee.
 - c. Discuss off-slice contours
 - i. The TC discussed real-world context for creation of off-slice contours in the
BRTO-II Profile. Use Cases include
 - 135 1. Capping of small volumes
 - 2. Atlas-based segmentation
 - ii. Support for off-slice contours is optional. Testing is limited by availability of
test partners that support the option.

- F. Topic 1: Level Set
 - 140 a. Updates on IHE-RO activities
 - i. Planning
 - ii. Oversight, Steering Committees
 - 145 iii. Domain Coordination Committee – main IHE Committee
 - 1. Yearly report has been filed (7/25/17) and approved. To be presented to
IHE Board on 8/10/17.
 - iv. IHE-RO Web presence
 - 150 1. IHE-RO page on IHE website (www.ihe.net) needs to be updated.
 - 2. Entries on wiki.ihe.net are more current, but still somewhat dated.
 - 3. A webpage showing Connectathon test results with links to Integration
Statements is in development (currently in
<http://sandbox.aapm.org/IHERO/VendorCompliance.asp>)

4. ACTION 170810: Chris to request access to RO domain page on www.ihe.net to enable update domain information at the next DCC meeting.
5. ACTION 170811: Chris to add review of IHE-RO Web Presence to agenda for next TC teleconference.

G. Topic 6: HIS Workgroup

- a. Rishabh reviewed a survey (on surveymonkey.com) prepared by the IHE-RO PC of clinical priorities for various information content to be accessed or exchanged between HIS and ROIS.
 - i. The survey is ready to be sent out. (Nine responses have been received to date.)
 - ii. There is a similar Use Case for exchange of information between HIS and RIS in Radiology.
 - iii. The HIS workgroup has discussed use of HL7 v. 2.5 in the short run, and eventually FHIR (currently in Trial Implementation).
- b. The ROWE (Radiation Oncology Workflow Exchange) Profile draft is being developed, based on the IHE SWF (Scheduled Workflow) Profile.
 - i. It uses HL7 ADT registration messages.
 - ii. Existing IHE-ITI Integration Profiles should be used, where applicable. These include the following:
 1. Patient Administration Management (PAM)
 2. Patient Demographics Query (PDQ)
 3. Patient Identifier Cross-Referencing (PIX)
 - iii. Testing of IHE-ITI Profile implementations likely will require participation in the IHE NA Connectathon. Some Rad Onc vendors are already do so.
- c. Next steps
 - i. Scan existing IHE-RAD and IHE-ITI Profiles for exchange of non-RO specific information.
 1. ACTION 170812: Jeff West to prepare a review of PAM and SWF Profiles for the 9/12/17 IHE-RO HIS committee teleconference.
 - ii. Identify RO-specific information to be transferred from ROIS to HIS
 1. Standard vocabulary is needed for transfer of treatment summary information.
 2. ACTION 170813: Scott to follow up with Robin Stern regarding creation of AAPM Work Group for HIS/OIS information exchange.

H. Topic 7: TPPC – ION Discussion

- a. The Ion subgroup has identified beam types for light ion and carbon ion therapy.
- b. Currently defined Producer / Consumer beam types
 - i. Basic Proton Modulated scanning beam
 - ii. Basic Carbon Modulated scanning beam
 - iii. Proton Modulated Scanning Static MLC beam
 - iv. Proton Modulated Scanning Dynamic MLC beam
 - v. Proton Modulated Scanning Aperture block beam
 - vi. Planned Pitch and Roll in Fixed beam Proton Modulated Scanning beam
- c. The Archive Actor must support all Transactions. However, the content requirement for the Archive Actor are limited to transparent storage. This should be clarified in all content Profiles.
 - i. ACTION 170814: TC to discuss clarification of content requirements for Archive Actors to agenda.
- d. Actor Options were discussed.

e. The Ion subgroup is continuing development of the Profile

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I. Review of Proposed Use Cases / Profiles

- a. ARO – Archive cases from RO Interaction...get it back (“time capsule”)
- i. Scope needs definition: what data are to be preserved? How are data to be used? Re-treatment?
 - ii. There is no standard for internal planning metadata.
 - iii. Is RT Treatment Summary sufficient? Is RT Course needed for this Use Case?

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b. RO History Exchange

- i. Treatment history is needed to interpret plans
- ii. What plans were treated? How many fractions planned? How many fractions treated?
- iii. This profile addresses data collection for dose compositing. This involves *both* treatment planning and delivery information.
- iv. Information objects included are images, structures, (plans), doses, (deformable) spatial registrations, and treatment records.
- v. For each delivered plan, retain images, structures, # fractions planned (for dose scaling), # fractions treated.
- vi. Treatment history includes data from both planning and delivery.
- vii. A mechanism to describe collected information is needed.
- viii. This is a content profile. It defines Producer and Consumer Actors.

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c. 4DCT – respiratory correlated images in Rad Onc

- i. Current usage relies on convention for Series Descriptions
- ii. Multi-frame image IODs could encode breathing phase using a Respiratory Phase Functional Group.
- iii. A Key Object Selection information object could be used to reference image instances for a breathing phase.

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J. QAW Profile

- a. This supplement addresses base automation of clinical plan QA. The goal is to avoid customization in a multi-vendor environment. A method is needed for (a) requesting a QA check and (b) reporting results.
- b. The draft supplement currently contains two Profiles for Planning QA and Delivery QA:
 - i. A Planning Data Supplier Actor provides plan objects to a Planning Analysis Performer. Check results are sent to a Data Store.
 - ii. A Delivery Data Supplier Actor provides fluence measurements (RT Image), as well as planning artifacts to a Delivery Analysis Performer.
- c. Workflow can be managed using Unified Worklist or implicitly by transfer of image, plan, dose objects. An alternative approach uses C-Store of plan artifacts (or KOS instance with references to the objects) to a QA performer.

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K. Marking Isocenter in CT Sim

- a. Discussion of
- b. **ACTION 170815**: Scott to draft Use Case for Marking Isocenter in Simulation.

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L. DPDW Update

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- a. CP 1664 adds UPS progress parameters to convey dynamic information to synchronize Actors. Awaiting approval by WG-06.
 - b. New normalized service has been proposed to WG-06 to communication position information. During initial setup the device position information must be retrieved. The normalize service (N-Get) is better suited than persistent object storage for this purpose.
 - c. IPDW Content requires some refactoring of Section 7 information.
 - d. **ACTION 170820**.. Chris to add IPDW to future agenda
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[Adjourn for the day 8/3/17 at 5:25pm MDT]
[Resume meeting 8/4/17 at 8:30am MDT]

265 M. DICOM Update

- a. The Ion subgroup has made substantial progress on a TPPC-ION Profile. The TC discussed whether the TPPC-ION Profile should be merged into TPPC or kept as a separate Profile. Based on the use of different DICOM IODs in transactions and especially the difference in state (TPPC is in Trial Implement), the TC decided to keep TPPC-ION as a separate Profile. This approach applies to TPPC efforts for brachytherapy, as well.
 - b. Trial Implementation of Sup 147 has now concluded. A number of issues were identified and will be fixed. No major problems were encountered. Letter ballot is anticipated early in 2018. Minor, incremental changes are possible until the Supplement is finalized.
 - c. Consistency between Sup 147 and other prescription-related efforts, e.g., RO-SSI, was discussed briefly. Consistent display of prescription information may be addressed by IHE-RO in the future.
 - d. Sup 175 has gone through Public Comment. Sup 176 is being prepared for Public Comment. Trial Implementation may not be needed for these supplements. Completion of these supplements is possible in 2018.
 - e. Other efforts include Dose (Sup 177), Segmentation Creation Templates (Sup 196).
 - f. The Key Objects Selection (KOS) IOD is a useful tool that should be considered for workflow Profiles.
 - g. An Assertion IOD is in development to represent approvals related to persistent instances.
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N. Connectathon Note

- a. A minor problem with the online Connectathon registration is being corrected.
 - b. Brainlab has graciously offered use of their archive to facilitate testing at the 2017 Connectathon.
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O. AdvaMed and Standards Efforts – contact information is AAMI (Charles Sidebottom)

- a. RT2-Radiation Therapy Readiness Check
 - i. Creating a copy of an approved plan requires reset of approval state. This may be a problem for transfer of a TPPC to TDPC plan, depending on what it means to “copy” and whether this copy involves a dosimetrically relevant modification.
 - b. RT3-Beam Model Standard
 - i. The standard is in active development. Scope is defined and content has been laid out. Currently in XML format.
 - ii. Jim Percy can accept comments.
 - c. RT4-(potential) Standard for Machine, Patient QA
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- 305 P. International Update
- a. ICEC is working to create robust treatment technology for use in low-middle income countries.
 - b. AAPM is a recognized NGO within the IAEA
- 310 Q. Topic 15.5: Multi-isocenter plans
- a. The TC discussed a question from Christof Schadt regarding multi-isocenter plans. Some treatment delivery devices do not support delivery of multiple isocenters in a single plan. Delivery requires workaround to deliver a subset of beams.
 - b. TPPC allows only a single fraction group, but does not require use of a single isocenter in a plan instance.
 - 315 c. Use of multiple plans for multiple isocenters presents problems in relating a single prescription to multiple plans.
 - d. The distance between isocenters has implications for dosimetric overlap and setup uncertainty, verification.
 - 320 e. **ACTION 170816**: Scott to draft a white paper identifying setup and dosimetric issues for handling multi-isocentric treatments.
- R. Topic 13: Tomotherapeutic / Robotic White paper
- a. Bob Pekarek reviewed a white paper discussing use of DICOM RT Plan to exchange tomotherapeutic plans. The approach attempts to fully describe tomo plans using second-generation concepts from Sup 176 implemented using private tags.
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- S. Topic 7.5: TDIC
- a. Thomas reviewed public comment responses (received from David W.) for the TDIC Profile.
 - 330 b. Discussion included
 - i. Identification of DICOM Module Content Definitions (Section 7.4.1.8) for the General Image Module for Base Content, Delivery, ...
 - ii. Requirements for Derivation Codes, Source Image References
 - 335 iii. Bits Allocated: Confirm the need to support 8- as well as 16-bit images.
 - iv. RT Image Label – note that *no semantics* should be encoded (already a DICOM requirement)
 - v. Other requirements (SAD, Gantry Angle)
 - 340 vi. Image Type for kV verification images that include beam aperture? RADIOGRAPH or PORTAL?
 - c. IHE Presence requirements for Referenced Fraction Group Number (300C,0022) and Fraction Number (3002,0029) were discussed. These Type 3 attributes had a Presence requirement of R+ with a Note of “Shall be present if known”. The Presence requirement was changed to RC+ for both, since R+ implies they shall *always* be present.
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- T. Topic 8: Treatment Delivery – Record Content (TDRC)
- a. The TC reviewed rev. 0.6 of the TDRC profile draft.
 - b. An RT (Ion) Beams Session Record instance is created for each treatment session.
 - 350 c. The TC discussed requirements for recording treatments to enable reconstruction and continuation of partial deliveries.
 - i. For TDDs that re-optimize (re-order) beam components prior to delivery, this requires that the TDD record the *actual* parameters for treatment delivery

355 devices. The TDD needs to retrieve the Treatment Records for the fraction in order to resume a prior, partial delivery.

ii. A CP for the TDW-II Profile was discussed. For certain TDDs the previous Treatment Record instances for a fraction are critical to enable resumption of prior, interrupted fractions.

360 iii. ACTION 170817: Chris to complete CP-RO-001 will add requirements for referencing and retrieving treatment record instances for delivery continuations.

d. The TC discussed the use of Treatment Delivery Type (300A,00CE) in RT Plan and RT Beams Session Record IODs.

365 i. Treatment Delivery Type (300A,00CE) = SETUP, may be used to capture table positions in the Treatment record. Setup beams are treated optionally and may involve an image acquisition. There may be multiple (alternative) setup beams, e.g., for a kV pair, MV pair, and CBCT.

370 ii. Treatment Delivery Type (300A,00CE) is R+* in the RT Beams Module in ARTI. The consensus of the TC was that this attribute should be changed to R+ in TPPC and TDPC (TDPC copies requirements from TPPC).

iii. ACTION 170818: Chris to draft a CP for TPPC to change the Presence requirement for Treatment Delivery Type (300A,00CE) in the RT Beams Module to R+.

e. Treatment Delivery Type (300A,00CE) in RT (Ion) Beams Session Record IOD

375 i. The value depends on how the beam was treated on the TDD. It may not be identical to the value in the RT Plan instance received by the TDD.

ii. How is this value used in the TDRC Consumer Actor? The consensus of the TC was that this attribute must be displayed in some manner. Thus, the Presence requirement is R+.

380 f. RT Ion Beams Session Record Attribute Requirements

i. Current Fraction Number (3008,0022) has Presence requirement of RC+ with a Note of "Shall be present if known".

ii. The TC reviewed attribute requirements through Radiation Atomic Number (300A,0304).

385 g. Archive Conformance – See DICOM PS3.4 Section B.4

390 i. "Level 2 (Full). Level 2 conformance indicates that all Type 1, Type 2, and Type 3 Attributes defined in the Information Object Definition associated with the SOP Class, as well as any Standard Extended Attributes (including Private Attributes) included in the SOP Instance, will be stored and may be accessed. The SCP may, but is not required to validate that the Attributes of the SOP Instance meet the requirements of the IOD."

[Adjourn for the day 8/4/17 at 5:25pm MDT]

395 [Resume meeting 8/5/17 at 8:30am MDT]

U. Topic 12: Contours / overlays for DRRs

a. Stefan B. reviewed a white paper on RT Image Annotation that had been presented to DICOM WG-07 at the 2017-06-12 meeting in St. Louis.

400 i. DICOM does not sufficiently model beam aperture contours for RT Images. Alternatives for DRR annotation include

1. Use/Extend RT Structure Set

2. Extend RT Image

3. Use Grayscale Softcopy Presentation State – weak relationship to ROIs

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- a. Graphic Annotation Module defines vector graphics and text annotation.
 - b. Support for “layers” to allow selection of annotation content.
 - c. “Grayscale” refers to the annotated image. Annotations can be in color.
 - 410 d. Managing references between RT Images and Grayscale Presentation State instances requires attention.
 - e. Use of GSPS is likely the preferred approach from DICOM perspective.

415 V. TDRC (continued)

- a. Use Cases for Treatment Records
 - i. Continuation of interrupted partial treatments
 - ii. Treatment Tracking (Nominal Dose)
 - 420 iii. Adaptive Planning including Dose Reconstruction
 - iv. Trend Analysis
 - v. Treatment Verification – Patient Treatment QA
- b. Review of Attribute requirements in RT Ion Beams Session Record Module
 - i. The Treatment Session Ion Beam Sequence contains setup and/or treatment beams administered during a treatment session.
 - 425 1. Each item in this sequence documents administration of a beam.
 - 2. Multiple attempts to administer a given beam may be present in a single RT Ion Beams Session Record instance.
 - 3. If a beam continuation is delivered without beam closure, the attempts are represented as a single administration, i.e., single item in this
 - 430 Sequence.
 - 4. Entries in this Sequence shall document any beam type represented in Treatment Delivery Type (300A,00CE).
 - ii. **QUESTIONS** regarding Treatment Session Ion Beam Sequence
 - 435 1. How is repeated administration of a setup beam to be documented?
 - 2. Can more than one verification image be associated with a single (setup) beam?

W. Topic 20: Review Minutes

440 X. Topic 21: Review Action Items

Y. Topic 20: Future Meetings / Next Agenda

- i. IHE-RO TC Meetings
 - 445 1. Profile Development – Feb 5-9, 2018, Melbourne, FL (Chris to check with SNC)
 - 2. After AAPM Spring Clinical Meeting – April 10-13, 2018, Las Vegas, NV
 - 3. Post-AAPM – Aug 1, 2018 at 2pm through Aug 4, 2017 at noon, Nashville, TN
 - 4. Fall Connectathon – September 17-22, 2018, AAPM HQ
- ii. IHE-RO TC Tcons
 - 1. Third Tuesdays at 11am ET
- 450 iii. Other meetings of interest
 - 1. DICOM WG-07
 - a. Post ASTRO: September 27 (time TBD) – September 30, 2017 (12:00) San Diego, CA
 - 455 b. January 8, 2018 (8:30) – January 12, 2018 (12:00) UTSW, Dallas, TX (tentative) – *may shift to Jan 15-19 due to change in WG-06 schedule*
 - c. March 12-16, 2018, MITA, Washington, DC

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- d. May 14-18, 2018, (tentative) Brainlab, Munich or RaySearch, Stockholm
- e. October 24-27, 2018, post ASTRO
- f. November 12-16, 2018 (tentative) – adjacent to WG-06
- g. December 3-7, 2018, (tentative) Melbourne, FL (Chris to check with Sun)

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- 2. PTCOG May 21-26, 2018, Cincinnati, OH
- 3. AAPM Ann Mtg. Jul 30, 2018 – Aug 2, 2018, Nashville, TN
- 4. AAPM Spring Clinical Mtg . Apr 7-10, Las Vegas, NV
- 5. ASTRO Oct 21-24, 2018
- 6. RSNA Chicago, IL

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III. Meeting Adjourned at 12:00pm 8/5/17