

**IHE-RO Technical Committee
Face-to-Face
July 19-20, 2021 9:00-13:00 EST
August 2-3, 2021 9:00-13:00 EST**

**Technical Committee Chairs:
Scott Hadley, PhD
Jon Treffert**

**IHERO Working Group Co-Chairs
Bruce Curran, MS, ME, FAAPM, FACMP, FACR, AAPM / VCU Health
Bridget Koontz, MD, Medical Director, RO Services, Duke Regional**

Mission Statement: *The American Association of Physicists in Medicine (AAPM) sponsors a multi-society Task Force to undertake an initiative to promote the Integration of the Healthcare Enterprise (IHE) – Radiation Oncology (RO). Originally formed by the American Society for Radiation Oncology (ASTRO), it fosters seamless connectivity and integration of radiotherapy equipment and the patient health information systems. The Technical Committee of IHE-RO will undertake use cases defined by 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 | 7/19 | 7/20 | 8/2 | 8/3 |
|-----------------------|----------------|--|------|------|-----|-----|
| Chris Pauer | Sun Nuclear | chrispauer@sunnuclear.com | X | X | X | X |
| Scott Hadley | U. Mich. | swhadley@umich.edu | X | X | X | X |
| Jon Treffert | Raysearch Labs | Jon.treffert@raysearchlabs.com | X | X | X | X |
| Jill Moton | AAPM | Jill@aapm.org | X | X | X | X |
| Walter Bosch | Wash. Univ. | wbosch@wustl.edu | X | X | X | X |
| Bruce Curran | AAPM / VCU | bhcurran@gmail.com | X | X | X | X |
| Jim Percy | Elekta | Jim.percy@elekta.com | X | X | X | X |
| Bruce Rakes | Mevion | rbrakes@mevion.com | X | X | X | X |
| Harold Beunk | ICT | Harold.Beunk@ict.nl | X | X | X | X |
| Bob Pekarek | Accuray | bpekarek@accuray.com | X | X | X | X |
| Richard Voegele | Brainlab | richard.voegele@brainlab.com | X | X | X | X |
| Stefan Pall Boman | Raysearch Labs | Stefan.p.boman@raysearchlabs.com | X | X | X | |
| Sanjay Bari | Elekta | Sanjay.Bari@elekta.com | X | X | X | X |
| Rishabh Kapoor | VCU/VHA | Rishabh.kapoor@va.gov | | X | X | X |
| Stina Svensson | Raysearch Labs | Stina.svensson@raysearchlabs.com | X | | | |
| Anthony Waller | Varian | Anthony.Waller@varian.com | X | | | |
| Naveen Kumar | Philips | naveen.kumar.lakshmana@philips.com | X | | X | |
| Martin von Siebenthal | Varian | martin.vonsiebenthal@varian.com | | | X | X |
| David Wikler | IBA | David.Wikler@iba-group.com | | | X | X |
| Thomas Schwere | Varian | Thomas.Schwere@varian.com | | | X | X |

Minutes:

I. Meeting was called to order 7/19/21 at 9:07am ET. A quorum was present at 9:14am ET.

II. Meeting Scope

A. Review Agenda

35 B. Minutes from the June 17, 2021 TC teleconference were reviewed and approved without objections.

III. Topic 1: Committee Updates

A. DRRO

- 40 1. Anthony Waller provided an update on phantom datasets he has created for DRRO testing. Datasets include CT data for phantom pairs (with and without) deformation, as well as an RT Dose representing coincident beams. There are five phantom pairs exercising different scenarios involving frames of reference and image position and orientation.
- 45 a. All vendors working on deformable registration are included in the group.
b. Datasets are shared via Box.com. Vendors exchange Deformable Spatial Registration objects.
c. Exchange of data has greatly improved interoperability. All vendors have (at least partially) working implementations.

B. Test Tools Update

- 50 1. Demcon FHIR Test Infrastructure
- a. Demcon proposal approved by TC on June 17, 2021
b. Development started June 21, 2021 and is being tracked in Demcon Jira
c. The timeline has been delayed by approximately two weeks from original proposal. (Oct 2021).
d. A demonstration of the basic UI functionality was given on July 1, 2021
- 55 i. The FHIR server (in Docker) can be controlled from Test Tool
ii. Subscription for update notifications from online test servers (HAPI) was demonstrated
iii. Next sprint is to focus on specifics of XRTS Actors and Transactions
- e. A clarification of Use Cases was expected from XRTS subgroup is a work in progress.
2. Demcon Test Tools Support
- 60 a. UPS Validator issue is under review (probable floating point equality issue)
b. Content Validator support for TPPC-Ion Profile
- i. Preliminary testing by Bruce Rakes was largely successful.
ii. The profile is still under development: there may be minor changes.
iii. Proposal to encourage informal testing at the next Connectathon
iv. Test data is needed (BRTO-II conformant CT and RT Structure Set)
v. Updates of Profile to be incorporated.

65 C. Connectathon Update

1. AAPM VPN
- a. Active accounts are those with signed agreements as of July 1, 2021
b. Bandwidth test results: 1-2 MB/s FTP, ~1 MB/s DICOM C-MOVES
- 70 2. 2021B Connectathon
- a. Nov 8-10 (M-W) and 16-18 (Tu-Th), 2021, wrap-up meeting Nov 22, 2021 9am-12pm ET
b. Testing proposal has been submitted to IHE Testing & Tools for presentation on July 21, 2021 (along with report/results from 2021A Connectathon).
3. Testing Committee Work
- 75 a. Guidance for data labeling for data producers
b. Updated testing guides BRTO-II, TPPC
c. Alternative to GTM for concurrent / plenary session
4. 2021B Connectathon Scope
- 80 a. Formal Testing: BRTO-II, MMRO-III, TPPC, TDW-II
a. Informal Testing: XRTS, TPPC-Ion

II. In-Person vs Virtual Testing

- a. Advantages (no travel, access to additional support personnel, multi-week schedule) and disadvantages (timezone spread, limits informal interactions, limited social opportunities) of virtual/online testing were discussed.
- 85 b. Hybrid testing (both modes at once) would not work well.
c. Offline resolution of issues: Can we use (Zoom) break-out rooms? Other communications channels for offline problem resolution?
d. Availability of critical resources:
- i. Judges (volunteers, mostly with clinical responsibilities)

- III. 2022 Connectathon
 - a. TC Consensus: budget for In-Person Connectathon
 - b. Tentative timeframe: Nov 2022

- 95
- D. Planning and IHE
 - 1. Jon is working on IHE-RO public communication

IV. Topic 2: BQAW

- 100
- A. Chris Pauer showed the draft of a variation of the BQAW that uses RESTful services (RBQAW). This Profile has RESTful versions of each of the BQAW Actors. Alternative Transactions supported by these Actors are the following: RBQAW Raw Data Storage, RBQAW RT Image Storage, RBQAW Content Assessment Results Storage, RBQAW Encapsulated PDF Storage, RBQAW Key Object Selection Document Storage, RBQAW CT Image Storage, and RBQAW Structure Set Storage.
 - 105 B. It is anticipated that the internal payload requirements are essentially the same as those of the original BQAW Profile. The Transactions differ only in object transport.
 - C. Chris to investigate
 - 1. What are the implications of supporting RESTful services? Use of DICOMweb?
 - 2. Does the RESTful approach meet the requirements of the Profile.
 - 110 3. Can this approach be incorporated as a “RESTful Option” to existing Actors?

V. Topic 3: DOSE (Abbreviated Dose Reference)

- A. This Profile supports reporting of dose distributions (and/or DVHs) in situations that are not supported by the DICOM RT Plan.
 - 115 1. Dose Summation Type (3004,000A) Defined Terms
 - a. NO_PLAN_BEAM
 - b. NO_PLAN_FRACTION
 - c. NO_PLAN_ENTIRE
 - 2. DICOM cp_RT177 is currently in development. This CP does the following:
 - 120 a. Adds Dose Summation Type Defined Term of UNKNOWN_RTPLAN
 - b. Adds Entity Long Label
 - c. Adds Plan Overview Sequence containing plan parameters
 - 3. Question whether this Profile (and the DICOM CP) support reporting of dose for situations such as radiopharmaceutical (so-called “theranostic” dose).
 - 125 B. Further work IHE-RO is pending completion of the DICOM CP.

VI. Topic 4: Future Meetings

- A. AAPM
 - 1. AAPM Summer Meeting (July 25-29) is virtual
 - 130 2. AAPM Spring Clinical Meeting (Mar 2022) – no IHE-RO meeting.
 - 3. AAPM 2022 Annual Meeting - July 10-14, 2022
- B. IHE-RO
 - 1. IHE-RO TC (virtual) Sept 20-21 and Sept 27-28, 2021
 - 2. IHE-RO TC (virtual) Jan 31-Feb 1 and Feb 14-15, 2022
 - 135 a. Decide on 2022 Connectathon mode and venue
 - 3. IHE-RO TC (in-person) July 13, 2022 (mid-day) – July 16, 2022 (noon)
 - 4. IHE-RO TC (virtual) Sept 19, 2022 TBD (tentatively, Alexandria)
 - 5. IHE-RO Connectathon – Nov 14-19, 2022 TBD (tentatively, DC)

140 VII. Redundancy in Wiki Content on wiki.ihe.net and www.ihe-ro.org

- A. IHE-RO Technical Committee calendar, agenda, and minutes, currently
 - 1. <http://www.ihe-ro.org/doku.php?id=start>
 - 2. https://wiki.ihe.net/index.php/Radiation_Oncology_Technical_Committee

145 [Meeting adjourned for the day 7/19 at 12:57pm ET]
[Meeting resumed 7/20 at 9:00am ET]

VIII. DOSE Profile Clinical Impact Statement

A. Chris Pauer presented a draft of a CIS for the DOSE Profile

- 150 1. Specifies how RT Dose can reliably indicate a related RT Structure Set in the absence of an RT Plan that provides linkage. Use cases include situations where an RT Plan is unavailable or cannot be readily interpreted.
- 155 2. The document was reviewed and revised with the TC. Chris will continue work in preparation for presentation to the PC.

IX. Topic 5: Review of CP for TPPC (and BRTO-II)

A. Jim Percy reviewed a draft CP for the TPPC Profile that removes requirements for the Beam Dose

Specification Point (300A,0082) in the Referenced Beam Sequence of the RT Fraction Scheme Module.

B. This attribute has been retired in the DICOM Standard.

- 160 1. Could not be specified at the Control Point level.
2. Reference point does not work for multiple targets

C. Current DICOM Standard provides a Dose Reference Sequence in the Prescription Module

- 165 1. Dose Reference Structure Type
- a. POINT = dose at specified POI
- b. VOLUME = dose at specified ROI
- c. COORDINATES = dose at specified coordinaes
- d. SITE = dose at “clinical site”

D. Discussion regarding high-level requirements for dose references, i.e., that there be at least one dose reference for each target. There are such requirements in the CDEB Profile, but not currently in the TF.

170 E. The proposed CP removes the requirement for the Beam Dose Specification Point (300A,0082) to be present. It does not prohibit its continued use.

F. **ACTION 210701**: Jon to distribute the CP for vote by the TC Aug 2-3, 2021.

X. Topic 6: Discussion of current Tools

175 A. Box and DropBox

1. Size limits in DropBox personal accounts have motivated a move to Box for the DRRO Subgroup data files. This limit makes access to shared documents difficult for several TC members.
2. DECISION to maintain shared documents in the AAPM Box.com account.
3. **ACTION 210702**: Jill to invite TC members to access IHE-RO folder on the AAPM Box account.

180 B. Test of Zoom and Google Meet

1. Use of Google Meet appears as a replacement for GoToMeeting for group meetings and troubleshooting was tested by the group.
2. Both Zoom and Google Meet appear to work concurrently. Some attention to which audio devices are connected/muted is needed. Use of a separate computer or tablet is helpful.

185 [Meeting adjourned 7/20/21 at 10:57pm ET]

[Meeting resumed 8/2/21 at 9:00am ET]

XI. Topic 7: TDW II review

190 A. David Wikler reviewed the TDW-II Profile with the TC in preparation for Final Text. Thomas Schwere has provided a detailed review.

- 195 1. Resolved issues include (1) Progress update when no beam is selected and (2) Optional reason for discontinuation.
2. Summary Definitions of Actors were revised:
- a. Treatment Delivery Device (TDD) – *updated*: A system that delivers therapeutic radiation to a patient. (*Patient imaging and positioning is out of band for this Profile.*)
- b. Treatment Management System (TMS) – *no change*
- c. Object Storage (OST) – *added definition*: A system that supports storage and retrieval of DICOM instances.

- 200 3. Figure 9.1-1: TDW-II Actor Diagram was updated
4. Appendix A – remove and check if similar to Appendix B in Introduction
5. Requirements for resumption of partial treatment
- 205 a. Discussion of RT Beams Delivery Instruction with CONTINUATION with a modified RT (Ion) Plan and RT (Ion) Beams Treatment Record.
b. A new or modified plan shall not be delivered with a ‘CONTINUATION’ in the Treatment Delivery Type (300A,00CE).
c. This is clearly a problem for the Retain Original Treatment Records Option, but appears to be a more general interoperability issue.
210 d. ACTION 210801: David to discuss with TMS vendors the addition of language prohibiting using CONTINUATION if a new Treatment Plan is generated.
e. Removed extraneous language.

XII. Topic 8: TDOR review

- 215 A. Thomas Schwere reviewed revision 3 of the TDOR Profile.
1. This Profile reuses the TMS, TDD, OST Actors from TDW-II. It uses TDW-II Transactions and adds two new Transactions: (1) Create “Record Treatment Session” and (2) Send UPS Notification.
 2. Use Cases
 - 220 a. Deferred Recording
 - i TDD crashes after starting delivery (or fails to store treatment records), recovers treatment records
 - ii Follow up with Treatment Recording Process Workflow (includes creation of Record Treatment Session)
 - b. Treating from TDD Local Cache (exceptional workflow)
 - 225 i TMS crashes (fails to respond when TDD attempts to set UPS Session is set IN PROGRESS), TDD switches to local mode (requires elevated privilege)
 - ii Follow up with Treatment Recording Process Workflow (includes creation of Record Treatment Session)
 - c. ADD USE CASE: Continue treating a Session already set IN PROGRESS after TMS crashes
 3. IHE Requirements for DICOM Content in Normalized objects are in Section 7.5 Service Definitions. They are organized according to Service Groups. This is consistent with the way DICOM Attribute requirements are defined for Normalized Objects.

230 a. The only TDOR-specific requirement is for the Treatment Session UID.
 4. The order of Store Treatment Delivery Results [RO-63] and Create “Record Treatment Session” UPS Workitem [TDOR-01] Transactions may be problematic for TMS to receive unsolicited (out of context) Treatment Record. This is especially true if TMS and OST are implemented as a single entity.

235 a. Consensus to reverse the order of these steps as follows: N-CREATE “Record Treatment Session” UPS Workitem first, followed by C-STORE of Treatment Delivery Results, followed by N-SET of UPS Input Readiness State.
 - i This approach creates the context for receipt of Treatment Record Instances by the TMS prior to storage of the records.
 - 240 ii It appears to be independent of assumptions about integration of TMS and OST.

b. ACTION 210802: Thomas to create revision 0.4.

XIII. Topic 9: Vote on CP to TPPC/BRTO-II

- 245 A. Jim Percy reviewed CP-RO-001 which retires Reference Dose Specification Point for Reference Dose Ref UID in the BRTO-II and TPPC Profiles.
- 250 1. Open Issue: Is retirement of (removal of IHE-RO requirements for) Beam Dose Specification Point (300A,0082) in BRTO-II and TPPC problematic for any TPS or TMS Actors in the TPPC or BRTO-II Profiles?
 2. DECISION: CP-RO-001 was approved for Public Comment.

[Meeting adjourned 8/2/21 at 12:56pm]

XIV. Topic 10: XRTS Update

A. Profile status update was presented by Martin von Siebenthal.

1. Actors

- a. Treatment Summary Provider
- b. Treatment Observer
- c. RO Resource Repository (FHIR Server) – may be combined with FHIR server in IHE Central Infrastructure

2. Use Cases

- a. Transfer of End of Treatment Summary (from ROIS to EHR)
- b. On Treatment Visit Monitoring of Treatment Progress
- c. External System Monitoring of Treatment Progress for Dose Tracking

3. Process Flow

- a. Includes optional subscription for Treatment Summary Updates by the Treatment Observer
- b. Treatment Summary Provider updates FHIR Resources in the RO Resource Repository

4. FHIR Constraints in IHE Profiles are specified similar to DICOM content requirements

5. XRTS Resources – have been added to mCode implementation guide

- a. Patient
- b. Radiotherapy Volume
- c. Teleradiotherapy Phase / Brachradiotherapy Phase
- d. Radiation Course Summary

6. FHIR Profiles define a set of constraints on FHIR Resources that can be used to the content of updates

- a. The HL7 US Core, HL7 mCODE, and HL7 Codex RTTD profiles are referenced by XRTS
- b. Implementation Guide (IG) Hierarchy
 - i HL7 FHIR = base standard
 - ii HL7 US Core Profile = Profiles on Patient, Diagnosis, Procedures
 - iii HL7 mCODE = minimal elements for Delivered Course Summary
 - iv HL7 Codex RTTD = Delivered Phase Summary, Planned Course and Phase Summary, Prescription
 - v IHE-RO XRTS = Supplement can reference Codex RTTD IG directly or (if needed) adds a possibly thin IG on top
 - vi Vendor IGs

7. Review of content requirements

- a. Patient Name (Last Name, First Name): use HL7 US Code
- b. Patient Identifier – define search parameters for existing Patient Resources
- c. Treatment Intent (of a Procedure)
- d. Need terminology for “adjuvant”, “neoadjuvant”: is this “concurrency”? “treatment role”? “pre-op”? “post-op”?
- e. Diagnosis Code – ICD-10?

B. XRTS Sub-group Meeting Schedule

- 1. Proposal to move meeting days to later in the week to avoid conflicts with IHE-RO and DICOM WG-07 meetings on Mondays and Tuesdays.

C. Test Tools Progress

- 1. Harold Beunk reported on progress at Demcon. The tool subscribes, updates, retrieves from a Repository. A proxy is used to validate and verify FHIR messages. The Test Tool runs as a Windows application. The FHIR server (HAPI Repository) runs in a Docker container.
- 2. A demonstration of the first prototype of the Test Tool is scheduled for the IHE-RO Test Tools call Aug. 5, 2021 at 11:00am ET.

D. Test Plan for November 2021

- 1. Distribution of Test Tools to Connectathon Participants
- 2. Installation of Test Tools to

E. Recommendation for access to FHIR tools outside of IHE-RO

- 1. Discussion of costs/benefits of sharing access to FHIR tools.

- 310 2. Access to Test Tool software (download) versus online (VPN) access to test server.
- a. Cost for provisioning of test server accounts.
 - b. Alternative: time-limited version of test tools for distribution to non-commercial participants
 - c. ACTION 210803: Harold to provide cost estimate for time-limited release.
 - d. ACTION 210804: Walter to estimate provisioning cost for server access

315 XV. Topic 11: Profile proposal – Treatment Planning Segmentation Content

- A. Richard Voegele discussed a proposed Profile to address DICOM CP 2006.
1. Proposed name “HD Structure Set Content (HDSS)”
 2. Two approaches to defining Actors were discussed: (a) Content-based (HD RT Structure Set Producer and HD RT Structure Set Consumer) and (b) Application-based (HD Contourer and HD Registrator).
320 Consensus to emphasize Content.
 3. Safety issues exist for legacy (non-HD) applications: how to safely handle HD Structure Set data?
 4. ACTION 210805: Richard to draft a Clinical Impact Statement for the HDSS Profile.

325 XVI. Topic 12 TDRC-Ion

- A. Bruce Rakes reviewed revision 0.3 of the TDRC-Ion Profile
1. Support for multiple beam types (other than spot scanning). It was noted that TPPC-Ion only supports spot-scanning beam techniques. Consensus to proceed with TDRC-Ion development without restricting beam types for now.
 2. Cross-Profile Actor Mappings – removed Profiles *in development*: IPDW, DPDW, BQAW.
 - 330 3. Number of Fractions Planned (300A,0078) on RT Ion Beams Session Record Module has Type R+. Check whether TPPC-Ion requires this attribute.
 4. RT Ion Beams Session Record Module Attributes
 - a. Attribute requirements are different for setup beams and treatment beams. Treatment record is important for recording table positions for setup images.

335 XVII. Topic 12: TDIC/TPIC – discussion deferred to next TC meeting

XVIII. Topic 8 Offline Review Profile (new) – discussion deferred to next TC meeting

340 XIX. Reminder: IHE-RO TC August Teleconference (8/19/21) is cancelled.

XX. Meeting was adjourned 8/3/21 at 1:02pm ET