IHE-RO Technical Committee
Multi-Day Teleconference
July 15-17, 2020 at 9:30-1:30 EDT

Technical Committee Chairs:
Scott Hadley, PhD
Chris Pauer

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	7/15	7/16	7/17
Chris Pauer	Sun Nuclear	chrispauer@sunnuclear.com	X	X	X
Scott Hadley	U. Mich.	swhadley@umich.edu	X	X	X
Jon Treffert	Raysearch Labs	Jon.treffert@raysearchlabs.com	X	X	X
Jill Moton	AAPM	Jill@aapm.org	X	X	X
Walter Bosch	Wash. Univ.	wbosch@wustl.edu	X	X	X
Bruce Curran	AAPM / VCU	bhcurran@gmail.com		X	X
Jim Percy	Elekta	Jim.percy@elekta.com	X	X	X
Bruce Rakes	Mevion	rbrakes@mevion.com	X	X	X
David Wikler	IBA	David.Wikler@iba-group.com	X	X	X
Harold Beunk	ICT	Harold.Beunk@ict.nl	X	X	X
Thomas Schwere	Varian	Thomas.Schwere@varian.com	X	X	X
Bob Pekarek	Accuray	bpekarek@accuray.com	X	X	X
Richard Voegele	Brainlab	richard.voegele@brainlab.com	X	X	X
Stefan Pall Boman	Raysearch Labs	Stefan.p.boman@raysearchlabs.com	X	X	X
Rickard Holmberg	Raysearch Labs	Rickard.Holmberg@raysearchlabs.com	X	X	X
Rishabh Kapoor	VCU/VHA	Rishabh.kapoor@va.gov	X	X	X
Sanjay Bari	Elekta	Sanjay.Bari@elekta.com	X	X	X
Chadd Smith	Henry Ford Health System	chadd.e.smith@gmail.com	X	X	X
John Stamm	EPIC	jstamm@epic.com	X	X	
Tucker Meyers	EPIC	tucker@epic.com		X	X
Stina Svensson	Raysearch Labs	Stina.svensson@raysearchlabscom		X	X
Yury Niatsetski	Elekta	yury.niatsetski@elekta.com			X

Minutes:

I. Meeting was called to order at 9:33am EDT, July 15, 2020. A quorum was present.

II. Level Set
  A. Review Agenda – Order and timing for Topics was reviewed to facilitate discussion with key stakeholders.
  B. Minutes for the June 11, 2020 TC Teleconference were reviewed and approved (with corrected date) without objection.
  C. Updates
    1. IHE-RO Activities
      a. Technical
      b. Planning Committee
        i ASTRO and MITRE have partnered to work on the end of treatment summary use case. Discussion has included data elements and message formatting (they favor FHIR). The 21st Century Cures Act mandates EHR interoperability for sharing of information by August 2022 CMS deadline. There is a push for coordination with XRTS Profile development. TC to discuss whether the ASTRO/MITRE end of therapy use case can be accommodated as a part of XRTS.
    2. AAPM - No update at this time
    3. DICOM
      a. Supp 199 Treatment Record has been approved, will be included in the next edition of the standard. WG-06 continues reading of Supp 160 Setup. Next development effort is Supp 177 Dose.
      b. Recommendation to leverage Innolitics.com for viewing current status of the standard.
    4. Other groups
  D. IHE Domain Coordination Committee
    1. Terms and Actors Topic
      a. New Actors, Transitions and terms need approval from Domain Coordination Committee
      b. XRTS supplement was submitted to IHE DCC for review. Concern expressed regarding use of the term *Prescription*. This term itself may be a source of confusion - in RO this carries dose implications needed for accurate accumulation from multiple sources. May be better to refer to as "RT Prescription", "Radiation prescription", "Planned dose", "Dose prescription"
      c. Standards Knowledge Management Tool (SKMT) Glossary contains IHE terms

III. Vendors: what should ICT priorities be?
  A. Status
    1. Content Validator and UPS Test tool released with latest updates to profiles
    2. Documentation Architecture and Software Design complete
    3. IHE-RO Tools source is available on GitHub.
  B. Questions discussed:
    1. Do AAPM/vendors need a public access mechanism to allow access for incorporation into vendor test tools?
    2. Should we consider adding (IPDW) treatment delivery UPS? – Need further definition before initiating Test Tool development - e.g. TDW 3
    3. Should we invest in usability to aid in automated post-processing?
  C. Vendors encouraged to exercise latest release and report any issues.
  D. Command line interface is currently provided for integration into vendor build/testing pipelines.
    1. CLI documentation should be on Wiki
    2. Output is provided in XML format.
    3. Raysearch is parsing XML output (looking for warnings, errors, etc.)
  E. If there are specific vendor needs not addressed - requested to forward to ICT
  F. Is there a way that ICT can facilitate virtual Connectathon?
    1. Test tools to make Testing more efficient?
      a. Dataset selection (enhanced Q/R)?
      b. Scoring / reporting of results
  G. Should ICT prepare for HL7/FHIR protocol support?

H. Current ICT contract ends at end of this year. Need to define budget/plan for next year.

IV. XRTS

A. The XRTS Profile is relevant to discussion of work of MITRE/ASTRO.

B. EPIC will provide public comments.

C. Rishabh Kapoor showed 2017 survey - HIS information of interest in RadOnc Information System - prescription and completion dose placed high

D. John Stamm – the link to prescription/intent is not currently the highest priority. Information flow from OIS → HIS is of primary concern.

E. Mappings between DICOM and HL7

1. Rishabh presented "Prescription Summary in DICOM and XRTS" (document prepared by Martin von Siebenthal). Topics include:
   a. Status Handling (not represented in DICOM persistent object instances)
   b. Total vs. Fraction Dose (total dose modeled in Prescription)
   c. Dose to Site from all Phases (DICOM Parent Prescription over all Phases can be included)
   d. Different usage of UIDs (DICOM persistent objects vs. HL7 messages)
   e. XRTS Phase = DICOM Prescription + Phase
   f. Treatment Site vs. Prescription Target

F. Two Main Use Cases

1. End of Treatment Summary (EOTS)
2. On-Treatment Visit (OTV)

G. Prescription information is needed to assess/document the progress of therapy.

1. "Planned dose" or "dose prescription may be a better term

H. Other topics

I. Any current public comments to report

V. ROTH

A. Scott reported on input from clinical users regarding use cases:

1. OSH/Previous Treatment/Continuity of Care
   a. Re-treated after completed therapy
   b. Continue therapy a new site
   c. Minimum requirements: RT Plan, Dose/Fx and number of fractions; CT, RT Structures, Tx History with treatment dates
   d. Would be nice: Daily/weekly IGRT instructions and imaging, patient setup notes & photos, immobilization detail for off the shelf or custom immobilization.
2. Export for Archive/Complete History
3. Clinical Trial Export

B. Current emphasis is on content. The Profile specifies a method for exporting a package with a manifest describing the exported content.

1. Manifest references DICOM instances and indicates semantics/relationship among objects.
2. Creator Actor is expected to a Treatment Management System.

C. ACTION 200701: Scott to update Clinical Impact Statement with ROTH Use Case details.

[Adjourn for the day 7/15/20 at 1:30pm ET]

[Resume meeting 7/16/20 at 9:30am ET]

VI. DRRO

A. Stina Svensson gave an update on the DRRO Profile. Requirements for DICOM attribute have been developed for deformed images, deformed structure set and deformed dose.

B. The DRRO is working to create test data / phantom for demonstrating interoperable exchange of deformable spatial registrations.

C. Stefan has updated the Profile draft (latest version is 0.7, dated May 2020). Chris will post on the wiki.

D. DICOM WG-07 should consider implications of deformable dose in Supp 177.

VII. Self-Registration for IHE Product Registry

A. IHE maintains a registry of product Integration Statements for products that conform to IHE Profiles. More information can be found at https://www.ihe.net/testing/ihe_product_registry/ and https://gazelle.ihe.net/content/product-registry
B. ACTION 200702: Stefan to attempt to register an Integration Statement in the IHE Profile Registry and report on experience.

VIII. Scheduling for September and October
A. Sept 17 10:30am teleconference was confirmed.
B. Oct 5-9 meeting to be virtual, 9:30am – 1:30pm ET

IX. TDW-II
A. David Wikler reviewed proposed changes to the TDW-II Profile.
B. An option to retain original treatment records has been added. The presence of a Treatment Record is required when the treatment is a continuation. This option assures that original treatment records are available for the fraction to be continued. This option applies to TMS and OST:
1. TMS shall include in the UPS Input Information Sequence all Treatment Records which were referenced in the Output Information Sequence from previous deliveries received from the TDD for the fraction to be continued.
2. OST shall retain all information from RT (Ion) Beams Treatment Records received from the TDD, including any private attributes, i.e., level 2 Storage SCP conformance.
a. Coercion of Attributes (see DICOM PS3.4, section B.4.1.3), especially, Patient ID, Study Instance UID, Series Instance UID is problematic for managed workflows.
C. Statement regarding a TMS creating a new plan to resume the fraction was removed (as unnecessary).
D. Revisions to the Profile are optional – all previously tested behavior remains acceptable.
E. David will save revised TDW-II Profile as rev. 19.
F. DECISION: Motion that TDW-II rev. 19 be promoted to Trial Implementation status (replacing the current revision). Approved without objection.

X. XRTS (continued) – Prepare for discussion 7/17
A. **CodeX** (**C**ommon **O**ncology **D**ata **E**lements e**X**tensions) is a HL7 FHIR Accelerator**.** The CodeX Ecosystem collects patient data once and re-uses it for many purposes. "Data" are in the form of mCODE, often with CodeX extensions (mCODE++ ?). CodeX community leadership by MITRE Corporation (see http://confluence.hl7.org/display/COD/CodeX+Home).
B. 21st Century Cures Act requires roll out of HL7 FHIR API capability in EHRs in 2022.
C. Radiation Oncology data
1. What standard is to be used to represent/aggregate radiation oncology data?
2. End of treatment summary is likely to be of value. Detailed prescription is not likely to be needed.
a. Total dose
b. Fractions planned
c. Fractions delivered
3. Data model is more important than the messaging format (HL7v2 vs. FHIR)

XI. Connectathon
A. Walter Bosch updated the TC on preparations for a virtual connectathon
1. The IHE-RO Testing Committee has identified technology needed to perform connectathon testing in a distributed mode
a. VPN service with fixed IP addresses
b. Servers with VPN access: Test Archive, Test Tool evaluation
c. Teleconferencing
d. Screen sharing of systems under test for side-by-side comparison of Actors
2. Colby Rogness (AAPM network solutions engineer) is preparing proposal, waiting on pricing
3. Scheduling the availability of judges, vendor participants, and technical support personnel is critical.
4. Trial Run
a. We need to test technology and check test methods before formal testing.

b. Discussion of scheduling an informal test event with all participants *before* the next formal Connectathon. It may be sufficient to perform individual setup tests with each vendor and a few "dry runs" with producer/consumer pairs.
c. Having a sub-channel for peer-to-peer debugging before formal testing is essential.

B. Issues discussed
1. Need a way for vendors to communicate with judges to resolve questions. Proposal to use Microsoft Teams or Slack channels to ask questions of judges and coordinate testing.
2. Suggestion to perform testing in a virtual machine environment – this may be difficult as it requires vendors to export their products.
3. Do we need a cycle of informal testing? – consensus is that this is needed to work out technology issues and testing process, especially scheduling and coordination issues.
4. Pick one profile and do one cycle?
5. Combinations may be daunting?
6. Scheduling by calendar.
a. Allocate a chunk of time per profile?
b. Dedicated time… keep distractions at bay
7. Financial model of how this works? – This is a question for AAPM as Domain Sponsor (IHE-RO WG).

C. DECISION: Technical Committee to plan for a virtual connectathon in lieu of the 2020 face-to-face connectation.

D. Proposed timeline for implementing a virtual connecathon:
1. Settle on a target VPN, screen-sharing, messaging/scheduling platform(s) – Aug 31
2. Target two volunteers to try out a test session – September/October
a. Storing and retrieving data from the Archive is a good initial test for Content Profile Actors.
b. Use UPS Validator and Archive as OST to store treatment records for Workflow (TDW-II) test
c. Involve as many vendors as possible for general connectivity test.
d. Set up and "endpoint" – vendors can test their ability to connect and share screen across the proposed VPN for informal testing
3. Target week of November 16-20, 2020 for the informal testing exercise
a. One Content Profile (BRTO-II) and one Workflow Profile (TDW-II) – at least one Actor per vendor
b. Vendors and judges must agree on timezone / scheduling issue
c. Schedule a "backup/re-test" session, in case re-test is needed after software correction?
d. Doodle poll for each test session – organized according to (a) Profile, (b) Actors, (c) Use case, (d) Vendors, (e) other?
4. Full Virtual Connectathon in early 2021 with the possibility of a second virtual connectathon later in 2021.
a. Coordination/approval from IHE Testing and Tools Committee is needed.

[Adjourn for the day 7/16/20 at 1:30pm ET]
[Resume meeting 7/17/20 at 9:30am ET]

XII. Discuss development priorities with ICT.

A. Virtual Connectathon Support – improve efficiency of the use of tools
1. Dataset management/selection – DICOM data browser, Series/Instance selection, enhanced Q/R
2. Results management – import/export facility already exists

B. Web-based accessed to Test Tools
1. This function is likely to be covered by AAPM infrastructure (Test Tools server)

C. Command Line Tools
1. Working for internal testing at RaySearch
2. ICT has been supporting integration, ongoing use

D. ICT to prepare suggestions for development to be discussed at Aug 11, 2020 IHE-RO Test Tools call.

XIII. TPPC-Brachytherapy

A. Jim Percy and Yuri Niatsetski reviewed the TPPC-Brachy (v 2.7) Profile draft.

B. RT Structure Set Storage and Retrieval Transactions have been added to the Profile to represent applicators and sources. Requirements are specified separately for HDR/PDR, LDR (permanent) and LDR (temporary) Brachytherapy Use Cases.

C. The Brachy Subgroup will continue to work through requirements.

D. Next call is scheduled for July 29, 2020 at 9:00am ET.

XIV. Offline Recording

A. Thomas Schwere presented descriptions of two main Offline Recording Use Cases

1. Deferred Recording of Treatment Artifacts (after TDD crash) – TDD initiates deferred recording, TDD stores recovered treatment record and KOS to the OST; reception of KOS triggers the TMS to reconcile the appropriate treatment session.
    a. Variation: storage of treatment record(s) are rejected by the OST because of mal-formed or missing attributes. Subsequent offline recovery/reconciliation of treatment records for the session,
2. Treating from TDD Local Cache (with TMS unavailable) – TDD queries TMS worklist and fetches treatment delivery instances; the TDD delivers the treatment, after which the TMS becomes unavailable to set the treatment session to completed.

B. Are the Actors in these Use Cases the same as those in the TDW-II Profile?

1. Yes. These use cases describe handling of *exceptional conditions* in TDW-II (and, potientially, other workflow profiles).
2. This behavior could be added as a new Profile (with dependency on TDW-II) or as an Option in the existing TDW-II Profile.

C. DECISION: Requirements for offline recording to be structured as a new Profile: Treatment Delivery Offline Recording (TDOR).

XV. DRRO (continued)

A. Review of version 0.7 of the DRRO Profile Draft.

1. Review wording of Actor Descriptions.
2. Transactions are Actor agnostic – this is ok
3. Figure X.1-1 DRRO Actor Diagram needs clarification. Recommend adding a generic storage (Archive) Actor as in MMRO-III.
4. The Structure Set Retrieval and Dose Retrieval Transactions should be Optional for the Deformable Displayer Actor.
5. Dose Deformer is "headless" (remove Retrieve Images [RAD-16] and Structure Set Retrieval [RO-7]).
6. Add "Spatial Registration-III Retrieval" Transaction (Optional) to Deformable Registrator. Update Actor and Process Flow diagrams.
7. Review remaining "TC" comments.
8. Document was saved as vers 0.7_CP. Chris will forward to Stefan.

XVI. Meeting Schedule

A. IHE-RO TC meetings

1. TC teleconference: Sept 17, 2020 10:30am
2. TC meeting Oct 5-9, 2020 (virtual) 9:30am – 1:30pm ET
3. Pre-Test Nov 16-21, 2020
4. Connectathon, Jan-Feb, 2021
5. TC meeting, Mar 15-19, 2021, (tentatively at AAPM HQ)
6. TC meeting, after AAPM annual meeting July 28-30, 2021, Columbus, OH
7. TC meeting, Sep 20-24, 2021, venue TBD
8. Connectathon, Nov 15-20, 2021, venue TBD

B. Other meetings in 2021

1. AAPM annual meeting, Jul 25-29, 2021
2. ASTRO annual meeting, Oct 24-27, 2021

XVII. Wrap up / Review

XVIII. General Dose

A. Chris is drafting a Content Profile containing Producer and Consumer Actors.
B. Purpose of the Profile is to allow dose to reference images and structure set directly, avoiding the need for a plan, for situations where no RT Plan instance is available.

C. Intent is to use Common Instance Reference Module to reference the related images and RT Structure Set in the RT Dose IOD.

XIX. Meeting was adjourned at 1:29pm ET