IHE-RO Technical Committee
Face-to-Face
July 17, 2019 2:00 – 5:30 CDT
July 18-19, 2018 at 8:30-5:30 CDT
5 **July 20 8:30-12:00 CDT**

Technical Committee Chairs:
Scott Hadley, PhD
Chris Pauer

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

15 **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,*
20 *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.*

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Attendees:

Name	Affiliation	Email	7/17	7/18	7/19	7/20
Chris Pauer	Sun Nuclear	chrispauer@sunnuclear.com	X	X	X	X
Scott Hadley	U. Mich.	swhadley@umich.edu	X	X	X	X
Walter Bosch	Wash. Univ.	wbosch@wustl.edu	X	X	X	X
Jill Moton	AAPM	Jill@aapm.org	X	X	X	X
Thomas Schwere	Varian	Thomas.Schwere@varian.com	X	X	X	X
Bob Pekarek	Accuray	bpekarek@accuray.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
Bruce Curran	AAPM / VCU	bhcurran@gmail.com	X	X	X	
Tucker Meyers	EPIC	tucker@epic.com	X	X		
Chelsea Wezensky	EPIC	cwezensk@epic.com	X	X		
Sophie Connor	EPIC	seconnor@epic.com	X	X		
Michael Owens	Reflexion	mowens@reflexion.com	X	X	X	X
Richard Voegele	Brainlab	richard.voegele@brainlab.com		T		
Christof Schadt	Brainlab	christof.schadt@brainlab.com		T		
Chien Nguyen	Sumitomo Heavy Industries, Ltd.	Nguyen.cong.chien@shi-g.com	X	X		
Jon Treffert	RaySearch Labs	Jon.treffert@raysearchlabs.com	T	T	T	T
Jun Duan	Duke U. Med Ctr	Jun.duan@dm.duke.edu	X			

Name	Affiliation	Email	7/17	7/18	7/19	7/20
Zheug Jin	Northwest Med. Physics	zjin@nmpc.org	X			
Erli Chen	Cheshire Med. Ctr.	echen@cheshire-med.com	X			
Xin Yang	Sun Yat-Sen Univ. Cancer Ctr.	yangxin@sysucc.org.cn	X			
Shabbir Bambot	Fischer Imaging Inc	sbambot@fischermti.com	X			
Yan Ren	Emory	Yan.ren@emory.edu	X			
Huiqiao Xie	Emory	xiehuiqiao@gmail.com	X			
Seetha Ayyalasomayajula	NYU Lagone Med. Ctr	Seetha.ayyalal@gmail.com	X			
Savvas Morris	St. Vincent Health	Savvas.moris@stvin.org	X			
Marianne Plunkett	Hoag Cancer Ctr.	Marianne.plunkett@hoag.org	X			
Mehryar Garakani		Mehryan.garakani@yahoo.com	X			
Michael Gossman	Tri-State Regional Ctr.	Chief.gossman@aol.com	X			
Nrusingh Biswal	U. of Maryland	Nrushingh.biswal@gmail.com	X			
You Zhang	UT Southwestern	zhangyounju@gmail.com	X			
Chadd Smith	Henry Ford	Csmith14@hfhs.org		X		
JiaJin Fan		JiaJin.fan@inova.org		X		
Sanjay Bari	Elekta	Sanjay.Bari@elekta.com		T		
Miha Ulcar	Cosylab	Miha.ulcar@cosylab.com		X		
Rok Stefanic	Cosylab	Rok.stefanic@cosylab.com	X	X	X	
Kratika Bandi	Accuray			T		
Marcel Szal	Memorial Med. Ctr. Las Crusas	marcesium@aol.com			X	
Keunchul Lee	Riverview MC, Red Bank, NJ	Keunchul.Lee@hackensackmeridian.org			X	
Ahmet Gorkem Ekmekci	ICT				T	
Harold Beunk	ICT				T	

X = In person, T = Via teleconference

Minutes:

    I. Call to Order at 2:00pm – a quorum of TC members was present.
        A. Welcome and introduction of participants
        B. Reminder of the anti-trust rules under which the group operates

    II. Chris Pauer presented an overview of the IHE Radiation Oncology Domain (IHE-RO), including the identification of Use Cases, development of Integration Profiles to specify how data standards are used to solve clinical problems, formal testing of products at Connectathons to demonstrate adherence to Profiles, and publication of Integration Statements to document successful testing.

    III. Time for New Attendees – Comments? Suggested Use Cases? Feedback? Questions?
        A. Comments?
            1. What are the costs when a new feature is created to meet a Profile?
            2. Can advocate through AAPM, ASTRO, …
        B. Suggested Use Cases?
            1. Can we produce a PDF document that has the basic information needed for proof of treatment, QA, etc.
                a. Precise, consistent document
                b. Should reflect current state of patient
                c. Some overlap with Survivorship Care Plan
                d. The ROTH Profile defines a collection of DICOM objects describing treatment
                e. Should reflect the *actually delivered* plan and number of fractions.
                f. More than PDF? Yes…
                g. Clinical trial, registry implications
            2. Where does the full patient information live? OIS? HIS?
            3. Treatment record for Proton therapy?
        C. Feedback?
            1. Have a single place for Profile info that clinicians can look at to see the status. Report on the adherence of Products?
            2. Publish IHE-RO status before major industry meetings.
            3. Concise status of Profiles, including how many products have been tested
        D. Questions?
            1. How/where are IHE-RO interoperability test results publicized?
            2. How to address requirements of the "Quality Index"?
                a. Coding diagnosis
                b. Patient identification – Timeout: right patient, right site
                c. Pain Scale
                d. Medication Reconciliation
                e. Misadministration reporting
                f. Having all of this in one place
                g. What is the content?
                h. Reimbursement Model driven
                i. IHE-RO should monitor this

    IV. Review Agenda
        A. Specific Constraints
            1. HIS Profile discussion on Thursday
            2. Add TPPC-Brachy on Thursday AM
            3. ICT Test Tool Demo Friday at 8:30am
            4. TDD Simulator Availability on Friday

    V. Minutes from TC Teleconference June 20, 2019 were approved without objection.

    VI. The TC reviewed the status of Profiles

A. The ARTI, BRTO, MMRO-II and TDW Profiles are in Final Text, but are no longer being tested.
   1. DECISION: The ARTI, BRTO, MMRO-II and TDW are to be *retired*, upon publication of their successors with the IHE Domain Coordination Committee. Passed without objection.
   2. ACTION 190701: Chris to ask Mary Jungers to mark the ARTI, BRTO, MMRO-II and TDW Profiles as retired and update Profile status on wiki.

B. Four-D Image Import (FDII) – ACTION 190702: Scott Hadley and Michael Owens to request guidance from IHE-RAD (Change Proposal group).
C. QRRO – ACTION 190703: Chris to contact Stefan Boman to see if he has capacity to work on this Profile.
D. ROIT is waiting for progress on DICOM Supp 199 (currently at reduced priority in WG-07).
E. TDIC – awaiting addition of DICOM REG for registration to TDD.
F. TDPC – Trial Implementation, not yet tested
G. TDW-II – status updated on wiki

VII. Priorities for this TC meeting are HIS and RXRO

[Adjourn for the day 7/17/19 at 5:30pm]
[Resume meeting 7/18/19 at 8:30am]

VIII. Topic 3: Level Set
   A. Updates on IHE-RO activities
      1. Planning
      2. Oversight, Steering Committees
      3. Domain Coordination Committee – BRTO-II Profile has been submitted for publication for Trial Implementation
   B. AAPM
      1. Invoices for IHE-RO Connectathon fee have been distributed.
      2. Bruce Curran has been added to DICOM Standards Committee as AAPM representative.
   C. DICOM WG-7 Update
      1. Supp 175 has been published as Final Text
      2. Next meeting is in Chicago 7/29 – 8/3
   D. AdvaMed and Standards Efforts – Jim Percy reported on status of RT3 and RT4
      1. RT3-Machine Characteristics Standard
         a. Review deadline has been extended to July 28, 2019 – comments should be communicated to Jim.
      2. RT4-(potential) Standard for Machine, Patient QA

IX. Topic 4: Consistent Dose in External Beam (CDEB)
   A. The CDEB (Content) Profile addresses information (in the RT Plan IOD) that is needed for dose tracking and reporting.
      1. Dose Reference Sequence – includes requirement for at least one Dose Reference with Dose Reference Type = TARGET.
      2. The Profile defines two modes of operation: single-target and multi-target.
      3. Clarifies that Beam Dose is *dose per fraction.*
   B. Christof Schadt discussed Use Cases for the CDEB Profile
      1. Dose reference information in RT Dose has multiple uses:
         a. Nominal dose used for dose tracking
         b. Actual point dose used for quality assurance

2. Christof reviewed updated wording for (a) dose tracking and (b) QA Use Cases in Section X.4.2.
3. The group discussed several aspects of Dose References, including Dose Reference Type (TARGET, OAR), dose reference
   a. The Dose Reference UID can be used to group dose references across multiple plans.
   b. Dose references can be defined for VOLUME, SITE, or COORDINATE.
   c. Dose Reference Type may be TARGET or OAR.
   d. Dose Values may be actual or nominal.
   e. How is the *Primary* Dose Reference indicated? Dose Reference is identified *per Beam*. (In 2nd Gen (Supp 175), the primary dose indicator is defined per Radiation instance.)
   f. There must always be one Target labeled as *Primary* for a Beam.
   g. Dose Reference in the Fraction Group Sequence
   h. The OIS needs to know the contribution of a Beam that is delivered.
4. Handling of *multiple targets* was called out as an open issue in Oct 2014. It is not clear that this needs to be handled via separate Actors. All Consumers must be able to discriminate doses for multiple targets.

C. Christof will re-work the CDEB Profile with Actors that handle multiple targets for discussion at the next TC Tcon.

X. Topic 5: HIS
A. HL7 message structure for encoding radiation therapy information sent to an HIS. Tucker Meyers reviewed a data model outline in file data-model-outline 20190717.pdf.
   1. Definition of Phases?
      a. Difference in understanding of "phase" for physician and therapist
      b. DICOM allows one phase to treat multiple sites
      c. Fraction number (ordinal) vs. fraction count (cardinal)
   2. Approval Status and Delivery Status are explicit at both Site and Phase level.
      a. Prescription status is one of {Not Approved, Rejected, Approved, Superseded}
      b. Delivery status is one of {Not begun, In progress, Complete, Completed Early}
      c. OIS status updates to HIS includes timestamp. Any status update must be included in next message sent. HIS can infer OIS status *as of last update time*.
   3. Questions about revisions
      a. When a prescription is revised, does it come with the same sites/phases (same UIDs) or new ones?
      b. How should phase revisions work?
         i. Changing UIDs?
         ii. What happens to fraction counts, dose accumulation, etc.
   4. Actors and Transactions
      a. It may be necessary to define new transactions for some messages
   5. Miscellaneous
      a. Session Results (Treatment Record) may or may not be created if a session is cancelled before any therapeutic dose is given.
      b. Updates may be out of order for the case of completion of partial fractions.
      c. Procedure codes (CPT)
      d. "Phase" is probably more useful as a clinical concept than "Fraction Group" as a grouping for treatments. Multiple fraction groups may be treated concurrently in a Phase.
   6. Technical concerns regarding End of Treatment Note – when created? Generally, at completion of a Course.

XI. Topic 8: Minimum Data Elements integration / co-effort

    A. The TC reviewed the ASTRO Minimum Data Elements draft. All of the data elements identified in this document are included in the HIS Profile data model.

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XII. Topic 6: Test Tools Sub Group

    A. Demo of UPS Validator Test Tool is scheduled for Friday 7/19 at 8:30 am.

XIII. Topic 7: Scanning Tank Profile

195   A. Needed for interoperable exchange of water tank data and intercomparison of scan data.

XIV. Topic 8.5: Radiation Oncology Treatment History (ROTH)

    A. Possible Use Cases for this Profile include

        1. Portability of treatment/re-treatment

200   a. Continuity of Care

            b. Treatment in flight (transfer to another hospital)

            c. Prior dose for re-treat

        2. Research / Review

            a. Cross-facility chart review

205   b. Clinical trial / Registry – what plan(s) were actually treated?

    B. Deliverables – select artifacts for plans actually treated

        1. Phase-level history: List of Images/Structure Sets/Plans/Doses/Fx Planned, Fx Delivered

        2. Session-level history: Treatment records, Verification images, …

    C. ==ACTION 190704==: Chris to start draft of ROTH Profile text.

210   D. ==ACTION 190705==: Chris to update Clinical Impact Statement for ROTH with input from Scott Hadley

XV. Topic 9: Prescription Profile (RXRO) – Preview

    A. The RXRO Profile has not yet been published for Public Comment.

215   B. The TC started editing version 0.12 of the Profile.

        1. Actor Definitions are still needed in Appendix A.

[Adjourn for the day 7/18/19 at 5:15pm]

[Resume meeting 7/19/19 at 8:30am]

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XVI. Topic 10: ICT Test Tool Demo

    A. Gorkem provided a demo of the UPS Validator prototype software. The session was recorded. The MP4 video file can be retrieved from https://drive.google.com/file/d/1kkKfpIvX0tJD6Q5-FKQu33dAvyWHN8tx/view?usp=sharing

225   1. Two instances were executed: one running as a TMS & OST, the other as a TDD. Gorkem reviewed configuration options and demonstrated a simulated plan delivery. Results are saved as XML (will be rendered as HTML in the final version of software). A log file (TXT) and UPS instances are saved in the test directory.

        2. The User Manual provides instructions for installation and use.

230   3. The tool currently supports only normal completion and cancellation before delivery. Partial delivery and completion will be supported.

        4. Initial release is expected near the 3rd week of Aug. Users are urged to provide feedback to ICT as soon as possible.

    B. Test Tool Licensing

235   1. Time-limited licensing of Test Tools was discussed. This is preferable to feature-limited licensing for distribution of Test Tools beyond paying connectathon participants.

2. Access to tools could be provided to non-connectathon participants. Policy and pricing to be determined.
3. The cost of licensing support in software and administrative cost of providing keys must be assessed.
4. Next Test Tools Subcommittee call is August 8.

C. <mark>ACTION 190706</mark>: Walter to send link to pretest data to Harold Beunk.

XVII. Topic 11.5: Test data for informal CDEB, TDRC testing

A. CDEB testing needs multi-target, multi-isocenter datasets (CT, RT Structure Set)
1. Multiple brain mets case (copy from TPPC)
2. Lung case

B. TDRC
1. RT Plan
2. CBCT (Planning CT can act as surrogate CBCT)

XVIII. Topic 19: TPPC – Ion

A. Bruce Rakes reviewed version 0.13 (2019-06-10) of the TPPC-ION Profile document with changes from Ion Subgroup meeting at PTCOG 2019. Topics discussed include the following:
1. Presence requirements and specific rules for all Attributes listed in Chapter 7 were reviewed.
2. Variable Aperture MLC Beam was defined.
3. Force Meterset Weight = Meterset
4. Scan Spot Meterset Weight
5. Re-painting is represented explicitly using multiple spots or control points.
6. Number of Block Slab Items – present if and only if there are multiple slabs in a block
7. Multiple apertures in a block – workaround for the DICOM limitation of a single aperture: use Accessory Code (300A,00F9) in Ion Block Sequence for single block slab, or the Accessory Code (300A,00F9) inside the Block Slab Sequence (for multiple block slabs) in the Ion Block Sequence to associate "blocks" for multiple apertures. Added Notes 1,2,3 in Secion 7.4.4.9.2.2
8. Changes were captured in version 0.14 (2019-07-19) of the Profile.

B. <mark>ACTION 190707</mark>: Bruce Rakes to clean up v. 0.14 and update TPPCI-ION Profile document on ihe-ro.org wiki.

C. <mark>ACTION 190708</mark>: Chris to update Chapter 7 Spreadsheet to reflect changes from Ion Subgroup.

[Lunch break 7/19/19 12:30-2:00pm]

XIX. Topic 9: Prescription Profile (RXRO)

A. The TC reviewed and revised version 0.13 of the RXRO Profile document.

B. Defined terms for information subsets: Treatment Intent, Treatment Prescription, Treatment Directive

C. Open Issues identified
1. What Coding Schemes should be specified in the Profile for the following?
   a. Treatment Site
   b. RT Diagnosis
2. Use Case 2: Allow dosimetric objectives for Targets only?
3. Bolus information is currently handled using Prescription Notes
4. Content Date and Time are Type 1 in Radiotherapy Common Instance Module.
5. Rename Actors:
   a. Basic Treatment Intent Producer & Consumer
   b. Enhanced Treatment Intent Producer & Consumer

c. Planning Intent Producer & Consumer
    D. ==ACTION 190709==: Chris to check and harmonize Actor names in version 0.14 and save as version
290   0.15 for next Tcon.

  XX. Topic 12: Profile Updates on IHE Website – Descriptions of active Profiles were updated for posting
       on the IHE website.

295 XXI. Topic 16: AAPM – Updated IHE-RO Charge for AAPM Committee Tree

  XXII. Topic 18: Treatment Planning – Image Content (TPIC)
       A. Thomas reviewed version 1.3 of the TPIC Profile
           1. TDIC has been extended with a Spatial Registration Transaction
300   2. Base content for TDIC has been moved to TPIC
           3. Uses the latest (2019a) DICOM standard – Source Image Sequence was moved from the
               General Image Module into the General Reference Module.
           4. Changed Actor names.
           5. Review content requirements.
305   6. Removed requirements for Diaphragm Position (3002,0034)
       B. Changes were saved as version 1.3 (2019-07-19).
       C. ==DECISION==: The TPIC Profile was promoted to Trial Implementation without objection.
       D. ==ACTION 190710==: Chris to upload version 1.3 (2019-07-19) to the wiki, update status, and
           publish with the IHE Domain Coordination Committee.
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  XXIII. Future Meetings / Next Agenda
       A. IHE-RO TC Meetings
           1. Fall Connectathon – Oct 7-11, 2019, Stockholm (confirmed)
                                   Oct 12, 2019 Connectathon wrap-up (½ day)
315   2. Profile Development – Dec 9-13, 2019, Reflexion, Hayward, CA (awaiting confirmation)
                                   Alexandria, VA (alternative)
           3. After AAPM SCM – April 7-10, 2020, Minneapolis, MN (3½ days)
           4. After AAPM Annual Meeting – July 15-17, 2020, Vancouver, BC, Canada
                                   (Wed 8:30am – Fri 5:30pm)
320   5. Profile Development – Sep 28-Oct 2, 2020, Alexandria, VA (tentative)
           6. Fall 2020 Connectathon – Nov 16-20, 2020, Place TBD
                                   Nov 21, 2020 Connectathon wrap-up (½ day)

           a. IHE-RO TC Tcons
325   i. Regular schedule: third Thursdays, 10:30am-12:00pm ET.
               ii. No teleconferences scheduled in Apr, Jul, Sep, Nov 2020.

           b. Other meetings of interest
               i. DICOM WG-07
330   1. July 29 – Aug 2, 2019, Brainlab, Chicago

                   2. Aug 26-30, 2019, Washington, DC

                   3. November 18-22, 2019 (tentative) - Melbourne, FL (or MITA, Washington)
               ii. PTCOG
               iii. AAPM   July 12-16, 2020, Vancouver, BC
335   iv. ASTRO   Sept. 15-18, 2019, Chicago, IL
                                Oct 25-28, 2020, ???
               v. RSNA   Dec 1-6, 2019, Chicago, IL

340 *[Adjourn for the day 7/19/19 at 5:35pm]*
[Resume meeting 7/20/19 at 8:30am]

XXIV. Topic 9.5: TPPC-ION: Public Comment
    A. The TC reviewed comments and changes in version 0.14 of the TPPC-ION Profile document.
345   B. Scan Spot Meterset Weights (300A,0396) values equal the MU values of primary dosimeter.
    C. DECISION: The TPPC-ION Profile was approved for Public Comment with no objections and one abstention.
    D. ACTION 190711: Chris to publish version 0.14 of TPPC-ION on ihe-ro.org wiki and forward to IHE Domain Coordination Committee for Public Comment.
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XXV. Topic 14: IPDW
    A. Thomas reviewed version 2.1 Draft3 (2019-01-19) of the IPDW Profile with the TC.
      1. Radiation Tasks are used to group UPSs.
      2. Two-level Worklist Query: A first-level query is for all treatment sessions (identified by
355   Session UID) for a day. A second query is then performed to find all plans for a scheduled session.
      3. Scheduled Protocols: DICOM Supp 160 defines codes for treatment protocols.
      4. Imaging-only Task are supported.
      5. Positioning Procedure codes are supported.
360   6. Safe handling – Procedures with un-supported workitem codes or un-supported parameters are canceled automatically. Non-performed procedures are canceled.
      7. Deviation from Scheduled Procedures – a new PS is created by PDS (Replaced Procedure Step) after canceling the original PS.
      8. Re-performing of Procedures (e.g., new KV imaging after patient moves) – Should this be a
365   *new* PS, or a re-performing of an existing PS? Some variety of perspectives. Re-use of existing PS, adding subsequent instances to Output Information Sequence, is less "chatty". Alternatively, creating new PS at the PDS (with reference to original PS) is preserves explicit relationship with output objects. More discussion is needed.

370 XXVI. Topic 17: Basic QA Workflow Review
    A. Chris reviewed version 0.10 (2019-07-17) of the BQAW Profile draft and discussed changes with the TC.
      1. Planning Data Provider – exports planning dataset for QA analysis
      2. Delivery Data Provider – exports treatment dataset for QA analysis
375   3. Manifest that lists objects in dataset and serves as a trigger for performing QA (Key Object Selection or UPS)
    B. Use Raw Data IOD to encapsulate proprietary log files. How should the Raw Data IOD be specified in an IHE Profile?

380 XXVII. Topic 21: Review Minutes

XXVIII. Topic 22: Review Action Items

XXIX. Topic 18: Future Meetings / Next Agenda
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XXX. Adjournment – the meeting was adjourned 7/20/19 at 12:00pm

For more information specific to the IHE-RO Technical Committee, visit www.ihe-ro.org.