IHE-RO Technical Committee
Face-to-Face
Oct 21-23, 2015 at 8:30-5:30, Oct 24 8:30-12:00 ET
Austin TX @ ASTRO

Technical Committee Chairs:
Scott Hadley, PhD

IHERO Task Force Co-Chairs
Dick Fraass, Ph.D., FAAPM, FASTRO, FACR
John Buatti, MD

Mission Statement: *The American Society for Radiology 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	10/21/15	10/22/15	10/23/15	10/24/15
Chris Pauer	Sun Nuclear	chrispauer@sunnuclear.com	W	W	W	W
Walter Bosch	Wash. Univ.	bosch@wustl.edu	X	X	X	X
Uli Busch	Varian	Ulrich.busch@varian.com	X	X	X	X
Sven Siekmann	Brainlab	Sven.siekmann@brainlab.com	X	X	X	X
Rickard Holmberg	RaySearch	Rickard.holmberg@raysearchlabs.com	X	X	X	X
Bruce Curran	AAPM	bhcurran@gmail.com	X	X	X	
Bruce Rakes	Mevion	rbrakes@mevion.com	X	X	X	
Jim Percy	Elekta	Jim.percy@elekta.com	X	X	X	
Scott Hadley	UMich	swhadley@med.umich.edu		W		
Eli Stevens	Mobius	elis@doselab.com			W	

X = In person W = via Webex ()

Minutes:

I. Call to Order (Oct. 21, 2015 at 9:00 am CDT) – a quorum was declared.
   a. Review Agenda
   b. Other broad topics to add – Agenda was revised and approved without objections.
   c. Minutes from last meetings – deferred to future meeting.

II. Business
   a. Topic 1: Level Set

i. Updates on IHE-RO activities
    1. Planning, Oversight, Steering Committees – meeting well attended, mainly concerned with Use Case prioritization. TC reviewed cases with Bridget and Adam for presentation to PC on 10/18.

ii. ASTRO, MITA, RO-SSI
    1. RO-SSI members met 10/20/15.
        a. Risk Analysis Group discussion
        b. Error Messages – presentation to manufacturers
        c. Training
        d. RO-ILS – update on incident reports, new data elements

iii. DICOM
    1. DICOM WG-7 meets in Nov 2015 – will concentrate on Sup 147 with attempt to move to Trial Implementation (TI) status with WG-6 in Dec 2015. (WG-6 is concerned that TI *not* be used for production. This has implications for the RXRO profile.)

iv. MITA/AdvaMed
    1. RT vendor activity/advocacy is shifting to AdvaMed (RT Sector meeting held at ASTRO). AdvaMed is a forum to discuss RT industry concerns and provides advocacy re legislative/regulatory/reimbursement issues.
    2. AdvaMed is taking over development of RT2, RT3, RT4 standards
        a. RT2 – Radiation Therapy Readiness Check (in review)
        b. RT3 – beam model standard (Jim Percy is chair)
        c. RT4 – (potential) standard for machine, patient QA
    3. DICOM WG-7 to be hosted (1 day) at AdvaMed in Nov 2015

b. Topic 3: Planning Committee Use Cases – TC Review and Discussion
    i. Chris reviewed IHE-RO Use Cases presented to PC on Oct 18
        1. Delivery Device Integration (covered by TPPC, TPIC, TDPC, TDIC, TDW-II, *IPDW*, *DPDW*)
            a. Treatment Delivery Record Content (TDRC) Profile – discussion on 10/24
            b. What are gaps in QA workflow?
        2. Prescription (RXRO)
        3. RO-HIS Integration
        4. Anonymization
            a. RO Specific Issues?
        5. Brachytherapy
            a. The work item has been approved by TC; A Draft Profile is being developed by the Brachy sub-group. (Content profile is modeled on ARTI.)
            b. There has been a change in leadership of the DICOM Brachy sub-group. Some guidance from the TC will be needed to ensure that the Use Case relevance and direction is maintained.
            c. Content is the most challenging aspect. Representation of brachy plans in TMS is limited at present.
            d. Workflow is relatively straightforward (Could be modeled on TDW-II.)
        6. Profiles nearing completion: QAPV, CDEB, IPDW
        7. Decubitus Positioning option for BRTO-II
        8. Future Profiles DPDW, QRRO
        9. Survivorship Care Plan
            a. What type of questions do we need to ask the PC?
        10. Deformable Registration (not discussed in PC/TC joint meeting)
            a. Consistent implementation of Deformable Spatial Reg IOD – producer/consumer is primary concern. What does it mean to "consume" a DSR object? What is assumed concerning use of rigid transforms, deformation fields?

b. Deformable dose accumulation is a related Use Case

[Lunch break 12:00-12:45pm 10/21/15]

c. Topic 2: IHE-RO Challenges – Review of draft minutes from Joint PC/TC Meeting on Oct 18th. Topic discussed:
    i. Frequency of Testing – It is critical that IHE-RO vendors *commit to participate* in supportive testing with existing products when they are not actively testing new products. Increasing the frequency of Connectathons increases the cost (and reluctance to support) regular participation.
    ii. IHE Membership Fees were discussed.
    iii. Interest has been expressed by the FDA in observing an IHE-RO Connectathon. For this purpose, a venue in the Washington, DC area would be helpful.
    iv. Choice of Connectathon venue can be used to communicate importance/value of IHE-RO testing to vendors and clinical users.
    v. "Virtual" Testing was discussed – Could be used to re-test failed exchanges after a Connectathon. This might require monitoring by a member of the TC, prior approval from IHE Testing & Tools Committee, announcement to IHE-RO Domain (6 month to satisfy anti-trust concerns.
    vi. The TC determined that renewed commitment to regular engagement in IHE-RO development and Connectathon testing is needed among vendors. Continuing efforts by TC and PC chairs are needed to ensure that such a commitment is in place well in advance of the Connectathon.

d. Topic 4: RXRO
    i. Sven reviewed results of the survey of clinicians regarding RT Prescription. (Some apparent confusion in the use of the words *directive, intent,* and *prescription.*)
    ii. Content: What data elements are included in a prescription? Varies by context, treatment technique, workflow step.
    iii. Options for support of various prescriptions components were discussed: e.g., dose objectives, patient setup, patient information, enhanced object definition, treatment directives.
    iv. Summary
        1. A rough workflow to specify how a patient is to be treated is needed. This specification exists in various states.
        2. Working Titles for Actors:
            a. Initial Writer
            b. Initial Updater (reads and writes)
            c. Initial Reader (accepts from Writer or Updater) – TPS
            d. Finalized Writer
            e. Finalized Updater
            f. Finalized Reader
            g. Viewers (multiple types), e.g., Schedule Viewer, Treatment Prep Viewer, Treatment Delivery Viewer, QA Checker Viewer, Post Treatment Viewer, ..
        3. Approval of Prescriptions is out of scope of this Profile.

[Adjourn for the day 10/21 at 5:25pm]
[Resume 10/22 at 8:30am]

v. Topic 5: CDEB review for Public Comment (1 hr)
    1. Chris reviewed rev. 1.7 of the CDEB Profile – updated to define content modules and removed references to Actors and Transactions.
    2. Carry forward conventions for common modules were discussed. Baseline attribute propagation requirements are collected in Section 7.2.2 of TF Volume 3. Exceptional requirements can be documented in a new sub-section under

7.2.2. No exceptions to the baseline propagation rules are envisioned for the CDEB profile.

3. Module requirements can be copied from the TPPC Profile for common modules: Patient, Study, Series, Equipment. SOP Common.
    a. Plan, Frame of Reference, …, have no specific requirements.
    b. Specific requirements are in RT Prescription, RT Fraction Scheme, RT Beams modules
    c. RT Brachy Application Setups module is absent.
4. Optional support for multiple targets was discussed along with corresponding attribute requirements. Multiple dose tracking and cumulative dose reference coefficients were discussed. Specific Rules and references to DICOM content sections were reviewed.
5. Add Table listing Target Multiplicity Options in Section 7.4.3.2.2 RT Prescription Module for Consistent Dose Tracking.
6. ACTION 151002: Chris to incorporate changes and release for TC review as rev. 1.8

vi. Topic 6: DPDW update

1. Uli reviewed open questions regarding the granularity of instructions for setup, imaging, beam delivery.
2. The Treatment Session Manager (synchronizes components) will decompose high-level UPS into atomic commands. This approach accommodates a variety of use cases.
3. Expectation is to release the draft to interested parties for review in 2016.
4. Comprehensive implementation of the DPDW will likely take some time. It may be most valuable in providing design elements for treatment session management, although complete implementation may be difficult.

vii. Topic 8: ROI Template

1. Walter reviewed a draft (10/21) of a DICOM ROI Template Supplement.
2. Background, Description, and Use Case sections of this document were discussed and revised.
3. ACTION 151003: Uli to review the updated draft with Christof Schadt for presentation to WG-6 in Nov 2015.

[Lunch break 12:10-12:45pm 10/22/15]

viii. Topic 9: BRTO-II

1. Sven reviewed rev. 1.0 of the BRTO-II Profile
2. Changes in BRTO-II with respect to BRTO (from Melbourne TC meeting):
    a. CP1395 (Extend RT Structure Set ROI Color)
    b. CP1314 (Add Category Code Sequence to RT Structure Set)
    c. CP1398 (Add FOR Module to RT Structure Set)
    d. Optional support for hi-res ROI contours in RT Structure Set (includes Attached Contours)
    e. Require equidistantly-spaced dose grid points
    f. Define tolerance of 0.01 mm
    g. Eliminate Geometric Planner Actor
    h. Require Software Version to General Equipment Module
    i. Require only Instance Creation Date (R+), Instance Creation Time (R+), and Specific Character Set (O+*, see section …) in SOP Common
3. Interpretation of high-res Structure Sets by low-res applications was discussed. What should a low-res receiver do with off-image-slice contours? It was re-confirmed that valid high-res structure sets can be interpreted in low-resolution mode by ignoring contours that are not on image planes, i.e., do not reference image instances.
4. Re-confirmation of requirement that the dose grid have equidistant axial spacing.

5. The RT Patient Setup Module Content (Section 7.4.3.4.2) has been re-worked to support Decubitus Patient Positions.
6. ACTION 151004: Jim to create Clinical Impact Statement for BRTO-II
7. ACTION 151005: Sven to clean up BRTO-II Profile draft including Use Case description; partial replacement of "O+*" requirements with "– "; addition of Category Code Sequence with requirements as "– " (CP 1314); preparation of draft for review on the next TC teleconference.
8. It was confirmed that an explicit indicator of high-res structure sets is not needed since the use of high-res encoding can be inferred from the presence contours without image instance references and/or the presence of attached contours.
9. DECISION: Consensus that the Frame of Reference Module should be required in RT Structure Sets.

ix. Topic 9.1: RXRO (cont'd)
1. Sven reviewed the RXRO Draft with Scott and the TC.
2. What information must be included? Structured? As notes?
3. ACTION 151006: Sven to update RXRO draft profile
4. ACTION 151007: Scott to review clinical scenarios for displaying prescription information with Dr. Martin and arrange teleconference to discuss with Sven and Dr. Martin.

x. Topic 9.5: BRTO-II / Clinical Impact Statement
1. The group reviewed and revised a draft CIS for BRTO-II profile.
2. Discussion of the scope of the BRTO-II Profile
   a. Contourer – includes high-res option
   b. Dosimetric Planner – high-res option; structure set storage; minimal plan to identify dose
   c. Dose viewer – must be able to select which plan to use and be able to display any PLAN dose
3. Dose viewer could display dose for RT Plan or RT Ion Plan: should this be an option? No. The Dose Viewer must accept dose from *either* RT Plan or RT Ion Plan.
4. Is there a role for QA Plan Checker here? No, this is best handled in a separate (workflow) profile.

[Adjourn for the day 10/22 at 5:50pm]
[Resume 10/23 at 8:30am]

xi. Topic 10.1: Brachytherapy IHE-RO efforts
1. Uli updated the TC on the status of the DICOM WG-7 Brachytherapy Sub-group
2. Chairmanship of this group has passed to Yuri Niatsetski (Elekta, NL).
3. A Brachytherapy Profile has been drafted. It includes content with Use Cases to describe workflow. Detailed specification of attribute requirements still need to be added. (Approx. 5% complete.)
4. First priority is to define the *content* of the RT Plan IOD. "TPPC for Brachy" is needed to assure interoperability of plans.
5. A white paper defining private tags to be used to specify point-based prescription (dose normalization) has been produced.
6. Next teleconference to be held on Nov 18th

xii. Topic 10.2: ION IHE-RO efforts
1. Uli and Bruce R. updated the TC on the status of the DICOM WG-7 Ion Sub-group.
2. A Profile framework (using DICOM Content sections, like TPPC) is in place. No substantive progress yet on detailed specifications.

3. Prioritization: The group is motivated to work on the Profile, but has been busy with 1st Gen RT CPs. The CP effort appears to be nearing completion. The group is also intending to work on Ion plan for 2nd Gen RT.
4. Differences remain among manufacturers in the paradigm used for beam specification (beam depth shaping vs. beam-line device parameters).
5. ACTION 151008: Uli to add a cross-check between BRTO-II and Ion Plan specification to the Ion Sub-group agenda.

xiii. Topic 9.5: QAPV Updates / Public Comment? (2hrs)

1. Chris reviewed QAPV Profile rev.1.23 (updated for Public Comment, DICOM Sup 185 Content Assessment Results IOD).
2. Cross Profile Considerations: Candidate Treatment Plan is of beam types defined in TDPC; QA Assessed and Matched Plans are of beam types in TDPC or TPPC.
3. Move Content Assessment Results Attributes to Volume 3, Chapter 7.
4. Make machine (station) and institution values Required (R+) in the Assessment Requester Sequence.
5. Use Content Assessment Results SOP Class UID from Supplement in Profile.
6. Discussion of how/where to specify requirements for RT Plans that can be checked by QCP Actors:
    a. DECISION: Consensus that vendors specify the types of plans that can be evaluated by their QCP in their DICOM Conformance Statement. It is recommended that TPPC/TDPC Beam Types be used for this specification.
    b. QA plan content requirements (outside RT Beams Module) to be specified in the Content Modules Section.
    c. ACTION 151009: Chris to check whether TPPC/TDPC Profiles cover the requirements of QA plan content.
7. Discussion of QAPV_EQUIVALENT plan relationship to link candidate plan to quality assessed plan. It was re-confirmed that this linkage is required whenever a plan is revised with changes to dosimetry.

[Lunch break 12:10-12:45pm 10/22/15]

xiv. Topic 9.5: BRTO-II (cont'd)

1. Sven reviewed edits to the BRTO-II Profile Draft.
    a. Confirmed consensus of TC is to remove the requirement to support multiple CT image series.
    b. Consensus that testing contouring, planning, dose review shall meaningfully sample all patient positions
        i. Support for decubitus positions is an option for the BRTO-II Profile.
        ii. The orientation of images, structures, plans, and doses must be consistent, with the exception that head-first/feet-first directions may be altered between scans and treatment delivery.
        iii. Image Orientation (Patient) values for image and dose instances in Decubitus patient positions shall be [±1,0,0,0, ±1,0] **or [0,±1,0, ±1,0,0]**.
        iv. Support for Decubitus patient positions will require revision of other profiles: MMRO-* and DCOM.
2. Discussion of data size/complexity constraints:
    a. Number of contour segments per slice to be supported: **1000**
    b. Multi-series image support is **removed**.

3. Further revision of the BRTO-II Clinical Impact Statement. The revised CIS is to be forwarded to the IHE-RO PC.

xv. Topic 11: RO-HIS (ROWE) Discuss next steps
   1. EPIC RadOnc User Group is developing a specification for RO-HIS exchange. (Scott H.)
   2. Rickard presented a white paper "Backing Standards and Profiles for the RO-HIS / ROWE Profiles" (see http://ihe-ro.org/doku.php?id=doc:whitepapers:backing_standards_and_profiles_for_the_ro-his_rowe_use_cases) It outlines the Use Case and outlines candidate profiles including the following:
      a. CPRO – Consistent Patient Identification in Radiation Oncology – uses transactions as IHE-RAD Scheduled Workflow
      b. ECSI – Enterprise Centric Scheduling Interoperability
      c. RTTS – Radiation Therapy Treatment Summaries
      d. Charge Posting – Activity Capture
   3. Use case features discussed
      a. Bi-directional exchange of patient registration and scheduling information
      b. Central repository for notes and reports
      c. Activity Capture
   4. Resources
      a. EPIC RO User Group
      b. DICOM WG-20 DICOM / HL7 integration.
   5. Next steps involve drafting Clinical Impact Statement(s) and begin working through Use Cases.
   6. ACTION 151010: TC Chairs to ensure availability of an active chair for the RO-HIS Working Group (http://wiki.ihe.net/index.php?title=RO_RO-HIS_WorkingGroup).

xvi. Topic 3.5 – DRRO Deformable Registration
   1. Discussion of features of the DICOM Deformable Registration Information Object
   2. The "Source" and "Registered" Frames of References have opposite interpretations in the SRO and DSRO.
   3. The Registered Frame of Reference is identified in the (top level) FoR Module.
   4. As in the SRO, use of an Identity transformation from Registered → Source has value in the DSRO to identify image instances used to create the transformation.
   5. Deformable Spatial transformations are described in DICOM Part 3, Section C.20.3.1.1 Deformable Spatial Registration Module Attribute Descriptions and Part 17, Section O.

[Adjourn for the day 10/23 at 5:50pm]
[Resume 10/24 at 8:30am]

xvii. Topic 11.1: TDIC - EPID Image related
   1. Discussion of post-delivery use of images in QA
   2. QA processes
      a. Machine QA
      b. Pre-delivery plan QA
      c. Post-delivery plan QA (verification of positioning and dosimetry)
   3. How to access verification images in QA system?
   4. How can images be used for these purposes? Fluence/dosimetry assessment, MLC leaf position analysis, ..

xviii. Topic 11.2: TDRC – Treatment Delivery Record Content
    1. What is the value of treatment record?
    2. At what granularity (i.e., frequency) is it practical to record treatment delivery machine parameters?
    3. What other information (outside of RT Beams Treatment Record) would it be useful to capture? E.g., dynamic log files? What is the role of such fine-grained (~10ms) log information? Data volume issues for this information? This high-resolution data is probably not practical to capture in the (beams) treatment record.
    4. Capture of actual physical parameters for treatment approaches that follow real-time position, etc.: gating, tumor tracking, … How to record these processes?
    5. It is expected that the TDD can produce a treatment record at the granularity of the plan (control-point level).
    6. ACTION 151011: Chris to draft a TDRC Profile for further discussion by the TC.
    7. What is needed to enable automatic capture/aggregation/export of RT Beams Record information for patient QA purposes? Content requirements are addressed by CDEB, TDRC, … Is the Beams Treatment Record content being populated? How to *distribute* data for online QA?
    8. ACTION 151012: Chris to explore with PC: is there a QA workflow Use Case?

xix. Topic 14: Transition Update
    1. Chris updated the TC on his status as co-chair.

xx. Topic 15: Review Minutes

xxi. Topic 16: Review Action Items

III. Future Meetings

a. IHE-RO Meetings
    i. IHE-RO TC Meeting – Jan 25-29, 2016 (tentative), Location TBD (Melbourne?)
    ii. IHE-RO TC Meeting – May 9-13, 2016 in Europe (Crawley, UK?)
    iii. IHE-RO TC Meeting at ASTRO Annual Meeting – Sep 28 – Oct 1, 2016 ???, Boston, MA
    iv. IHE-RO Connectathon 2016 – Week of Oct 17th or Oct 24th, location US TBD (Madison, Melbourne, ???)

b. Other meetings through 2015
    i. RSNA Nov 29-Dec 4, 2015, Chicago, IL
    ii. ICCR June 27-30, 2016, London
    iii. AAPM Jul 31-Aug 4, 2016, Washington
    iv. ASTRO Sep 25-28, 2016
    v. DICOM WG-7 Nov 2-6, 2015 in Washington, DC
    vi. DICOM WG-7 May / June 2016
    vii. DICOM WG-7 Aug 4-6, 2016 (after AAPM) in Washington, DC
    viii. DICOM WG-7 Oct 31-Nov 4, 2016
    ix. DICOM WG-6 Nov 9-13, 2015, Washington, DC
    x. DICOM WG-6 Jan 18-22, 2016, Washington, DC
    xi. DICOM WG-6 Mar 7-11, 2016, Washington, DC
    xii. DICOM WG-6 June 10, 2016, Europe
    xiii. DICOM WG-6 Sep 12-16, 2016, Washington, DC
    xiv. DICOM WG-6 Nov 7-11, 2016, Washington, DC

IV. Adjournment – meeting adjourned at 11:10am CDT 10/24/15