IHE-RO Technical Committee
Face-to-face Meeting
Miami, FL
October 6-8, 2011

Technical Committee Chairs:
Bruce Curran, MS, ME
Stuart Swerdloff, PhD

IHERO Task Force Co-Chairs
Jatinder Palta, Ph.D.
Prabhakar Tripuraneni, M.D., F.A.C.R., F.A.S.T.R.O.

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.*

Hours:

Thursday, 10/6/2011	8:30am – 6:00pm
Friday, 10/7/2011	8:30am – 6:00pm
Saturday, 10/8/2011	8:30am – 12:00pm

Attendance

Name	**Company**	**Email**	**10/6**	**10/7**	**10/8**
Bruce Curran	RI Hosp./ASTRO	bcurran1@lifespan.org	X	X	X
Stuart Swerdloff	Elekta	stuart.swerdloff@elekta.com	X	X	
Walter Bosch	Wash. U./ATC	bosch@wustl.edu	X	X	X
Rishabh Kapoor	U. Florida	rkapoor@ufl.edu	X	X	
Chris Pauer	Tomotherapy	cpauer@tomotherapy.com	X	X	X
Sue Reilly	Elekta	sue.reilly@elekta.com	X	X	X
Koua Yang	Philips	koua.yang@philips.com	X	X	X
Ulrich Busch	Varian	ulrich.busch@varian.com	X	X	X
Norman Trapp	Siemens	Norman.Trapp@siemens.com	X	X	X
Harold Beunk	Nucletron/Elekta	harold.beunk@nl.nucletron.com	X	X	X
Sanjay Bari	Elekta	sanjay.bari@elekta.com	X	X	X
Christof Schadt	Brainlab	christof.schadt@brainlab.com	X	X	X
Stephen Vastagh	MITA	svastagh@medicalimaging.org	X		
David Wikler	IBA	david.wikler@iba_group.com		X	X

Meeting Minutes

I. Call to Order @ 8:40 am

A. Setting of Agenda 10/6/11 @ 9:40am
   1. Profile Review
      a. MMRO – 2 hr offline, 2 hr TC (Sa)
      b. IPDW – 2 hr (Th)
      c. ARTI – 1-2 hr (Fr)
      d. QAPV – 2 hr
      e. TDW (content) – 4 hr (Th)
      f. TDW-II < 1 (Th)
      g. BRTO – 1 hr (Sa)
      h. Structure Set Templates < 1 hr (Sa)
      i. DCOMP < 1 hr
      j. HL7 / CT-Sim < 1 hr (Fr)
   2. Related Activiites and Meeitngs
      a. DICOM WG-7 Update < 1 hr (Sa)
      b. Planning Committee
      c. RT Stakeholders – 1 hr (Fr)
      d. Test Data Group – 1 hr
      e. Independent Testing Lab < 1 hr
      f. NROR
   3. IHE-RO TC Industry co-chair succession
      a. Goal to have co-chair by Dec. 1, 2011
   4. Connectathon / Testing – 2 hr (Fr)
      a. Schedule
      b. Certification of TMS

B. Approval of minutes
   1. TC meeting, Fairfax, VA, Sept. 17-18, 2011 – approved without objection

C. IHE-RO 2011 Connectathon Results have been approved by IHE-RO Planning Committee and are public as of 10/5/11.

II. Business

A. ASTRO/IHE-RO meeting with FDA [10/6/11 @ 8:40am]
   1. Discussion of ASTRO meeting with FDA at the request of Michael O'Hara, Sept. 9, 2011, included approximately 20 FDA staff present (no one at policy level).
   2. Presentations by Ramesh Rengen, Jatinder Palta, Howard Sandler, Bruce Curran,
      a. FDA should work with ASTRO to find new ways to test (interoperability of) radiation oncology products – ASTRO might become an "expert organization" at the request of the FDA

b. As part of device approval process, FDA should require IHE-RO adherence – need peer-reviewed publication of *IHE-RO test process and criteria*
c. FDA should require manufacturers to demonstrate continued IHE-RO adherence as part of post-market surveillance.

3. Summary: FDA does go to organizations for help – regularly consult AAPM. Suggestion that another meeting be held in late winter to include ASTRO, AAPM, and MITA.
   a. ASTRO interest in being a source of expertise
   b. ASTRO wants to contribute to improving patient safety via *Target Safely* – if IHE-RO adherence can be shown to be helpful to FDA in demonstrating interoperability compliance, this effort will be mutually beneficial.
4. A more comprehensive test tool / test data set would facilitate limit testing.

B. IPDW Profile 10/6/11 @ 10:00am

1. Object Retrieval
   a. The UPS Input Information Sequence specifies AE title(s) from which *input* objects are to be retrieved. Storage location(s) are defined by the provider of the TMS Actor, at the discretion of this provider.
   b. CLARIFICATION: The number of AE titles for object retrieval is not explicitly bounded.
   c. Configuration of AE Titles for object retrieval is communicated out of band.
2. Object Storage
   a. UPS does not specify the location to which *output* objects *should* be stored. Where objects shall be stored is defined by provider of the TMS Actor at the discretion of the provider.
   b. DECISION: *Multiple* storage locations for output objects are defined *per SOP Class* by the provider of the TMS Actor at the discretion of this provider. This provider may define that (all) objects are to be stored to the TMS itself, or to one or more archives.
      i. The PDS shall have the capability of configuring AE Titles and corresponding network locations for each SOP class.
      ii. For each SOP Class, there shall be exactly one AE Title configured.
      iii. When the PDS stores an object, it will store it to the AE Title configured for the SOP class of the object.
   c. Configuration of AE Titles for object storage is communicated out of band.

3. Discussion of consistency and safety issues in IPDW [10/6/11 @ 1:35pm]
   a. Cached treatment parameters by PDS – only applicable for the case in which the treatment plan *cannot be* fully represented by the current DICOM standard.
   b. At a minimum, the performing device is required to perform consistency checks on DICOM data elements (as described in minutes of June 2010 IHE-RO TC meeting in Granada), added to draft profile as Appendix A).
   c. A (confidential) hazard analysis specification specifying actual response to inconsistent data must be provided to connectathon judges. Additional checks based on a device's hazard analysis may be performed during a connectathon.
4. Non-Treat Steps

a. The DICOM Patient Positioning Supplement is nearly complete, but not yet ready for trial implementation: Patient Positioning Instruction and Results SOP classes are not finalized.

C. QAPV Profile [10/6/11 @ 3:10pm]
1. QA Advisory Group to Safety Profile is drafting a Position Statement
   a. Vendors will provide QA *metrics* to compare their dose calculation with treatment plan, but are reluctant to commit to specific *values* for judging a plan as life-threatening.
   b. Society group (ASTRO?) to define values for metrics for judging plans as life-threatening.
2. Mechanics of profile is on track, but details of structured report remain to be defined.
3. ACTION: (Bruce) Provide language describing intended use of the QAPV profile.
4. Long discussion on whether overrides should be allowed and under what conditions. Override may or may not involve an additional, optional transaction.
5. QAPV Profile can support two modes of operation:
   a. Real-time analysis of plan to be delivered, *and*
   b. Detailed, attribute-level comparison of plan to be delivered with previously validated reference plan.
6. QA Advisory Group to meet during the week of Oct 10.
7. Goal: QAPV Profile out for public comment by end of 2011.

D. TDW-II Profile [10/6/11 @ 5:00pm]
1. Harold is drafting TDW-II Profile with changes to reflect incorporation of Supps 74 and 96 into the DICOM standard.
2. MMRO, ARTI, TDW Profiles to be released in TF Version 4.
3. ACTION: Harold to complete update of profile

E. IHE-RO BBS
1. ACTION: Bruce to request restructuring of BBS threads as: Profiles, Meetings, Working Groups, Reference Documents, Testing

F. Test Data Group
1. ACTION: Schedule meeting in St. Louis (Jan 2012?) to develop test data objects to include Bruce, Walter, Rishabh, Lakshmi
2. ACTION: Identify datasets needed (Profiles? Options? Limits to be tested?)

G. National Radiation Oncology Registry (NROR)
1. Data extraction from TMS, TPS for NROR Pilot Project

H. IHE-RO Planning Committee meeting, Oct. 4, 2011
1. Use case / profile development timeline – primarily limited by vendor bandwidth
2. How to help clinical community understand the meaning of connectathon results?
3. How to market IHE-RO to ASTRO membership?
4. In general, physicians do not feel the pain of interoperability problems.
5. Publication opportunities needed by academic physicists involved in IHE-RO.

I. IHE-RO TC Co-chair Succession
   1. Stuart Swerdloff announced his resignation as IHE-RO TC industry co-chair, effective 10/8/11
   2. ACTION: Bruce to solicit nominations with goal to have new industry co-chair by Dec. 1, 2011.

[Adjourn for the day 10/6/11 @ 6:00pm]

J. DICOM WG-7 Update [10/7/11 @ 8:50am]
   1. Main effort is development of 2nd Generation RT objects (Supp 147) – expected to go to public comment by end of 2012
   2. Trial Implement sub-group has discussed Segmentation Properties IOD, expects to continue examining other IODs
   3. Physician Intent / Prescription IOD
      a. Interest has been expressed within ASTRO in standardizing prescription data (L. Marks, vice-chair of ASTRO Clinical Affairs and Quality Council).
      b. ASCO has created Oncology extensions to HL7; ASTRO EMR committee has asked HL7 for permission to create Radiation Oncology Lexicon for HL7
      c. ACTION: (Uli) Ask Stephen Vastagh to arrange Webex to get clinical feedback on 2nd Gen RT Prescription object(s), as well as complementary efforts in HL7.
      d. ACTION: Bruce to provide information on appropriate invitees for Webex.
      e. ACTION: (Uli and Bruce) to write short white paper as background for meeting

K. Structure Name Templates
   1. Walter and Rishabh are working on XML schema for template
   2. ACTION: Walter to draft profile for review in Feb 2012 meeting

L. TDW (Content) [10/7/11 @ 9:45am]
   1. ACTION: (Uli) Add to agenda for Nov 2011 WG-7 meeting: Precision of Values, esp. for 2nd Gen RT objects with VR of FL, OF.
   2. Discussion of Content issues for treatment delivery
      a. Plan content specific to delivery (beyond planning) for communication from TPS to TMS
      b. Need to recognize difference between clinical and QA plans
      c. Discussion of Image Content issues (see Uli's slides on BBS thread for this meeting)
      d. Anticipated Profiles:
         i. Plan and Record Content for Treatment Delivery
         ii. Imaging and Positioning Content for Treatment Delivery
   3. Review of *TDW+ Plan Content Details_2011-1007.xls* (based on ARTI content spreadsheet) – See spreadsheet for detailed changes (color-coded). A summary appears below.
      a. Changes in RT Beams Module – edits in Basic Static beam type for now – applicability to beam types to be examined later
         i. **Tolerance Table Number (300C, 00A0) –** add as R+*
         ii. **Treatment Delivery Type (300A,00CE)** – change Attribute Note: To be displayed in "real-world" terms

iii. **Accessory Code (300A,00F9) –** Add as O+* "shall not be ignored if present; shall not be encoded if not used by the machine" in the following sequences:
    1. Wedge
    2. Compensator
    3. Bolus
    4. Block Tray (assume single ID per block tray – may be multiple blocks – need to define behavior of TMS, TDD with respect to ID verification) – "Issue if blocks individually encoded. TBD Only allow single Block tray in IHE-RO" → **Strengthen Note 1 (TBD)**
    5. Applicator
    6. General Accessory – ADD this sequence

iv. **Source to Block Tray (300A,00F6) –** update Attribute Note

v. **Isocenter Position (300A,012C)** – make R+* (is R+ in ARTI)

vi. **Source to Surface Distance (300A,0120)** – make R+ (is R+* in ARTI)

b. Changes in RT General Plan Module

i. **Plan Intent (300A,000A)** – add as R+ "Shall be present" <u>for both ARTI and TDW+</u>

ii. **Plan Geometry (300A,000C)** – add as R **"Shall be PATIENT"** <u>for both ARTI and TDW+</u>

c. Changes in RT Prescription Module

i. **Dose Reference Sequence (300A,0010)** – add as R+* "Shall be present" <u>for both ARTI and TDW+</u>

ii. **Dose Reference UID (300A,0013)** – add as R+* "Shall be present" <u>for both ARTI and TDW+</u>

iii. **Dose Reference Description (300A,0016)** – add as R+* "Shall be present" <u>for both ARTI and TDW+</u>

d. Changes in RT Tolerance Table

i. **Tolerance Table Sequence (300A,0040)** – add as R+* "Shall be present" <u>for TDW+</u>

ii. **Tolerance Table Label (300A,0043)** – add as R+ "Shall be present" <u>for TDW+</u>

iii. **{Tolerance Value} (Tolerance Value Tag)** – add as R+
    1. If a tolerance value is inapplicable for the treatment being delivered, the TDD shall be able to ignore this value.
    2. If a Tolerance Value is not supplied, and is not specified in a default or pre-configured Tolerance Table, the TDD shall handle this condition in a safe manner.
    3. If a pre-configured Tolerance Table is available and selected by the Tolerance Table Label, but a Tolerance Value supplied does not agree with the internal table value, the value supplied shall be used as an override of the default value. If the supplied Tolerance value is not used by the TDD, the TDD must handle this in a safe manner and inform the user.

e. RT Patient Setup Module – No Additional Requirements

f. Changes in RT Setup Module

i. > Fixation Device Sequence (300A,0190) – add as O+* "If present, shall not be ignored" <u>for TDW+</u>

ii. >> **Fixation Device Type (300A,0192)** – add …
iii. >>**Accessory Code (300A,00F9) –** Add as O+* "shall not be ignored if present" for TDW+ → **More information may be required.**
iv. > Shielding Device Sequence (300A,01A0) – Add as O+* "Shall not be ignored if present" for TDW+
v. >> **Shielding Device Type (300A,01A2)** – add …
vi. >>**Accessory Code (300A,00F9) –** Add as O+* "shall not be ignored if present" for TDW+
vii. > Setup Device Sequence (300A,01B4) – Add as O+* "Shall not be ignored if present" for TDW+
viii. >> **Setup Device Type (300A,01B6)** – add …
ix. >>**Accessory Code (300A,00F9) –** Add as O+* "shall not be ignored if present" for TDW+
x. **(Further work needed)**

g. Changes in RT Fraction Scheme Module
i. **Number of Fractions Planned (300A,0078)** – add as R+ "Shall be non-zero" for ARTI
ii. **Referenced Beam Sequence (300C,000A)** – add as R+* "Shall be present" for ARTI
iii. **Beam Dose (300A,0084)** – add as R+ "Shall be present" for ARTI
iv. **Beam Dose Specification Point (300A,0084)** – add as R+ "Shall be present" for ARTI
v. **Beam Meterset (300A,0086)** – add as R+ "Shall be present" for ARTI
vi. Beam Dose Depth …

M. Testing of ARTI TMS Actor [10/7/11 @ 4:00pm]
1. The requirement to consume plans from 3+ producers for *all* beam types makes it impossible to pass a TMS Actor.
2. Alternatives discussed
a. Eliminate TMS Actor – treat it as a beam consumer for one or more beams techniques
b. Make some beam types optional for a TMS – cannot specialize TMS, e.g., for Ions or Brachy
c. Make all beam types optional for a TMS
d. Use validated plan datasets to test TMSs
3. PROPOSAL: Re-structure Actor currently known as TMS to have 13 optional transactions; with their variants (bolus, physical wedge, compensator) – approved for balloting without objection

4. Proposals for extending ARTI profile to support additional Plan Consumers were discussed
a. Rename TMS and Plan Review to General-Purpose Plan Consumer (non-TPS consumer; only does plan import) – one actor for TMS and Plan Review [2 votes]
b. Define separate Plan Review Actor [2 votes]
c. Create new profile for comprehensive plan reviewer [4 votes]
d. Create new ARTI profile [3 votes]

[adjourn for the day 10/7/11 @ 6:00pm]

5. Continued discussion of re-structuring ARTI plan consumer [10/8/11 @ 8:40]
    a. Consensus:
        i. Re-structure TMS Actor in ARTI Profile to make all transactions optional
        ii. Use of validated test data in the absence of (producer) test partners.
        iii. Limited number of consumers as test partners remains problematic.
    b. For further consideration:
        i. Should we re-define a more generic plan consumer Actor in ARTI, i.e., one without overloaded TMS semantics?
        ii. If yes, this should be a new content Profile that addresses robust communication of TP information from planning to delivery.

N. BRTO Profile Issues (current version 1.7) [10/8/11 @ 9:40am]
1. Inconsistencies identified
    a. An inconsistency has been identified in the BRTO Profile text: Requirements on ROI Interpreted Type (3006,00A4) and ROI Interpreter (3006,00A6) data elements appear in the comment for Referenced ROI Number (3006,0084).
    b. Unclear language regarding copying of Frame of Reference UID from CT series to RT Structure Set.
    c. Inconsistent treatment of RT Structure Set in section A.2. There is a module overview for RT Dose and RT Plan, but not RT Structure Set.
2. ACTION: (Bruce) Create a Change Proposal to include the following editorial changes. TF to be revised to version 1.8.
    a. In Table A.3-13, change "RT ROI Interpreted Type (3006,00A4)" to "R+*" from "O+*". It is not expected that this change will alter any existing test results.
    b. In comment to Referenced ROI Number (3006,0084), remove the words "and ROI Interpreter"
    c. Edit wording of Table A.1-1 add a note to the Referenced Frame of Reference Attribute row for RT Structure Set indicating that the copy is to *Referenced* Frame of Reference UID.
    d. In table A.3-4, add a note that the Frame of Reference information is in the *Referenced* Frame of Reference UID attribute.
    e. Reword the text at the beginning of section A.2 to indicate that this section only specifies *changes* in module requirements with respect to the DICOM standard.

O. Review of MMRO Profile Supplement [10/8/11 @ 10:10am]
1. Profile was re-formatted as a Supplement by Norman, reviewed by Sue and Bruce.
    a. Add note to Forward explaining history of the Profile.
    b. Add note to Closed Issues indicating structural change in DICOM and Profile
    c. Change dependencies of transactions references.
    d. Abbreviate "Multi-modality Image Registration for Radiation Oncology" to MMRO throughout document.
    e. Correct errors in Figure X.1-1
    f. Clean up references to other TFs
    g. Editorial changes (move figure references, re-order sections) for clarity/consistency.

h. Change “transform” to “resample” (in reference to structure set contours)
i. Restructure to match template form
j. Reference DICOM 2011 standard (2009 also has needed changes in Referenced Image Series in Spatial Registration IOD)
k. General clean up of documentation.
l. Clarification: RT Structure Set produced by the MMRO Registered Contourer is to be defined in the Frame of Reference of the *Base* (CT) image series. (Applications may resample to other Frames of Reference, but this behavior is outside the scope of the MMRO Profile.)
m. Referenced Image SOP classes (0008,1155) extended to allow MR, PET
n. ROI Generation Algorithm extended to include RESAMPLED defined term.

2. Real-world hazard (safety issue) has been identified in which the same Frame of Reference is used for multiple series between whose acquisitions the patient is moved.
   a. ACTION: Create New Profile (MMRO-II 2011)
      i. Make Referenced Image Sequence (0008,1140) required (“R”) in RO-12 Spatial Registrations Stored and RO-13 Utilize Spatial Registration Registrations Transactions. The Referenced Image Sequence (0008,1140) would nominally contain all instances in the Series used for registration.
      ii. Add STRONG Safety paragraph indicating that a hazard exists in applying Spatial Registration to image series that are not explicitly referenced via Referenced Image Sequence (0008,1140).
      iii. Re-write the shared Frame of Reference paragraph including a safety statement.
      iv. Note: this change invalidates the MMRO (2008) test tools.
      v. Issue warning to vendors who have passed the MMRO Profile indicating that a safety concern has been identified.
   b. ACTION: Bruce to consult with Steve Moore regarding IHE-RAD handling of this concern.

P. Patient Registration Profile Development
1. See RadOnc-CTSim_Strawman documents (10/7/11) in “Patient Registration Workflow Profile” thread on BBS.

Q. Proposal in AAPM for development for an emerging technology test lab – to include a device section
1. IHE-RO test laboratory?

R. RT Stakeholders Group (ASTRO/AAPM/MITA/AdvaMed)
1. Working Groups – drafting white papers
   a. QA – how to accelerate development and dissemination of QA procedures for new devices
   b. Training – better methods of training users
   c. Error Messages – adequate messages to users and developers, includes logging, consistent format/presentation of errors and warnings, frequency of warnings
   d. Usability – usability standards for TP, QA devices, XBRT devices, Brachy devices; consistent presentation of safety information; IEC standard in development

e. Nomenclature – consistent terminology

S. Information for Imaging and Positioning
   1. Uli is undertaking preparatory work for a Profile

III. Face-to-face Meetings:
   A. IHE-RO Test Committee Meeting – tentatively, Jan 2012 in St. Louis (details TBD)
   B. **IHE-RO TC Meeting –** Feb 6, 2012 8:30am – Feb. 10, 2012 5:00pm, N. California
   C. **Domain Pre-Testing & TC Meeting**
      1. April 12-20, 2012, Washington University, St. Louis, MO (start 8:30am on April 12, finish 12:00pm on Apr. 20, 2012)
      2. Tentatively do testing April 12 (setup), 13, 14, 16 and TC meeting April 17-20.
      3. Emphasis on QAPV Profile
      4. May include formal (re-)testing of incompletely tested applications
         a. ACTION: Bruce to confirm with IHE Testing and Tools Cmte.
         b. ACTION: Vendors wanting to be re-tested should send list of Profiles and Actors to Bruce.
   D. Connectathon 2012 tentatively Sept 2012, ASTRO HQ, TC Meeting following
   E. ASTRO 2012 – Boston, MA (TC meeting tentatively Oct 31 – Nov 3, 2012)
   F. **Connectathon 2013 tentatively May 2013, ASTRO HQ, TC Meeting following**

IV. IHE-RO Future Teleconferences (require 7-day advance notice):
   A. IHE-RO TC Teleconferences – currently scheduled for 2nd Thursday of each month at 1:30pm Eastern Time
   B. QAPV Advisory Group – Oct 13. 2011
   C. DPDW – TBD

V. Adjourn 10/8/11 @ 12:12pm