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| **Reported by (Name):** | **Bruce Curran** |
| **Organization:**  | **DICOM Working Group 7 (Radiation Oncology)** |
| **Position Title:** | **Member, WG-7** |
| **Activity:** | **Meetings (3-4/year) + assignments as WG member** |
| **Meeting Dates:** | **2/25/2013 – 3/1/2013 (Rosslyn, VA)****8/8/2013 – 8/10/2013 (Indianapolis, IN)****11/18/2013 – 11/22/2013 (Rosslyn, VA)****+ 8-12 TCONS / year** |
| **Meeting Location:** |
| **Payment $:** | **~ $ 1900.00 (just submitted)** |
| **Reasons for Attending or not Attending** | **Could not attend 2/25 meeting due to clinical and AAPM conflicts. Attended last 2 meetings** |
| **Issues from Previous Meetings or Year:** | 1. **WG-7 has been working for several years on a major revision to the DICOM structure for RO objects. This work will be divided into 3-4 supplements, the first of which covers prescription, anatomy, and support for new RO modalities. This supplement is in review readings by the DICOM review committee (WG-6), is currently about 1/3 through that process and expects to be ready for a public comment session in 2014.**
2. **Work is also underway on several educational sessions, for medical physicists, software engineers, and the general RO community on the changes resultant from the new structure. A slot has been requested for the AAPM 2014 meeting.**
3. **The remaining supplements (Patient Positioning, Brachytherapy, and Ions) are already in planning and discussion. The Patient Positioning supplement is already considerably structured, though not likely to be released before 2015-6.**
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| **General Description of Activities of the Organization and/or Meeting:** | **Develops DICOM standards in areas of radiation oncology. WG-7 is predominantly software engineers (vendors), with clinical input from AAPM and the ATC. Sub-groups have greater clinical participation at present (Ion – PTCOG and MGH, Brachytherapy – GEC-ESTRO, AAPM)** |
| **Issues for AAPM:** | **See above.** |
| **Budget Request ($):** | **$ 3500.00 (3 meetings, one of which may be in Europe to meet with IEC 62C)** |

**DICOM Working Group Seven**

(Radiation Therapy)

 **August 8-10, 2013**

# Opening

The Chair called the meeting to order at 9:00 am USA Eastern Time. Self–introductions followed. First time attendees for an in-person meeting included Barry and the Oncology Qwl representatives who introduced themselves.

The agenda was reviewed and approved.

The antitrust rules were reviewed by the Secretary.

# Subgroup / Other Reports

## DICOM Conference Bangalore

Ulrich Busch, Christof Schadt, and Stephen Vastagh reported on the DICOM Conference in Bangalore on March 2013. The presentations are available at <http://dicomconference.org/dicom-conference/presentations/>. There were 267 attendees at the meeting. Special emphasis was placed on promoting telemedicine (remote diagnosis and other) but high speed internet is not yet available in many places. IHE may help with profiles of different domains. Presentations on Supplement 147 and Supplement 160 have been done by U. Busch and C Schadt to illustrate use and further development of the standard in a complex modality and also bring WG-07 to the attention of the audience.

## Experimental Implementation Subgroup (WG07-EI)

Chair: Walter Bosch.

The subgroup is waiting for assignment of tags before proceeding with a larger effort. Concern was expressed about who will be able to access the trial implementations. It was discussed that WG-07 members interested in the trial implementation should contact Walter Bosch for related data and information.

## Brachytherapy Subgroup

Chair: Henk van Dijken.

H. Van Dijken reported that the group is working on change proposals. He also reported on a meeting with the AAPM Brachytherapy Group and with a member of the ESRTRO Brachy Group. Henk is planning a meeting with Larry DeWerd of the AAPM group. Current CP in work in CP-1203 (see ftp server).

## Supplement 160 (Patient Positioning and Workflow)

Chair: Christof Schadt.

Work on Supplement 160 is somewhat dormant at the moment. Thomas Schwere from Varian is cleaning up the document and in the process to develop a first draft. After supplement 147 is near a final state, further progress can be made on Supplement 160, also in the context of the closely related supplement DPDW of IHE-RO.

## Ion Subgroup

Chair: Stewart Swerdloff, Vice-Chair: Michael Moyers.

The ion subgroup met June 2-3, 2013. The current goals of the ion subgroup are to support new techniques implemented since 2005 (not many) and supplement 147. Many new members of the subgroup were present at the meeting so Uli Busch briefed the subgroup on the status of second generation Sup 147.

The sub-group addressed five change proposals (CPs) for first generation Standard and some of these were accepted. The accepted CPs need to be prepared for WG-07 review.

The plans to meet in Hokkaido, Japan early in 2014.

## IHE-RO

IHE-RO Technical Committee Co-Chair: Chris Pauer.

Chris reported that the IHE-RO planning committee and technical committee sometimes are not always working on the same use cases. A new clinical advisory committee was created to prioritize use cases.

Washington University is now providing support for prototyping connectivity tests.

## Dose Reporting (WG-28 etc.)

WG-07 Liaisons: Mark Pepelea, Bruce Curran

Mark reported on the proceedings of WG-28.

The Group discussed the new AAPM TG 246 whose charge is to define how the patient absorbed dose can be calculated. It was recommended that WG-07 should monitor the work of AAPM TG-246 concerning determination of exposures from fluoroscopy and interventional radiology procedures. Currently TG-246 is working on data collection so if the dose calculation model changes in the future the exposures can be updated.

There was much discussion about whether imaging dose should be recorded and used in therapeutic planning. U. Busch stated, that along various inputs (last time at the DICOM Conference in Bangalore) a fist stage of Dose Reporting using Structured Report as specified by TID 10001 "Projection X-ray Radiation Dose" or Baseline Template TID 10011 "CT Radiation 720 Dose" (also along IHE Radiation Exposure Monitoring (REM) is now perceived as safe path for RT vendors to choose for imaging dose reporting.

# WG-07 Joint Meeting with IEC / IHE-RO Representatives

Alan Cohen was introduced; he was a representative of IEC.

Michael Moyers, also representing IEC, made a short presentation of the basics of the IEC organization and its standards as they relate to RT. That presentation is a good resource to understand the organization of IEC Working group interesting for RT and also get overview over the process.

Allen Cohen outlined the overall direction of the IEC 62C Committee and coordination with relevant diagnostic imaging committees or IEC 62B. The imaging and image guidance components of RT safety standards are already covered in 62B.

There was an extended technical discussion of coordinate systems. The IEC 61217 coordinate system is relevant to the C-arm technology, while some other technologies have native coordinate systems. The DICOM coordinate system is different from that of the IEC. The translation of DICOM coordinate system into the IEC 61217 coordinate can be derived in respect to the orientation of axis from the IEC specification. However, there is no deterministic calculation possible, since the patient is not deterministically aligned against the device; rather, the DICOM formalism links detected position of the patient via isocenter coordinates (in first generation) to the device. Therefore the DICOM formalism enables safe transformation between the two coordinate systems, but only if the DICOM attributes are well-understood and applied.

Allen further noted that interoperability is now an issue. Modalities change rapidly. IEC’s goal is to develop safety requirements.

More discussion followed. Some particular items of intersection between the organizations and standards include:

a. coordinate systems

b. ranges of parameters

c. saving data requirements

d. motions (manual versus automatic moves)

e. compliance with standards

WG-07 stated, that in this case it would be useful to establish a liaison or observer between DICOM and IEC. It has to be determined, how this can be achieved, since IEC “members” are countries, rather than representatives of organizations . However, it should be possible in any case to attend the IEC meetings in an observer role.

A follow-up meeting would be desired at ASTRO, on September 26. WG-07 will discuss this option in an upcoming TCon. For any follow-up meeting attendance by IEC 62C WG-1 Officers Geoffrey Ibbot and Claus-Peter Hoeppner is desirable.

The Group thanked M. Moyers and A. Cohen for their presentations and comments.

# Other WGs / Supps

## Sup 167

WG-07 maybe should be monitoring work performed on Supplement 167: X-Ray 3D Angiographic IOD Informative Annex (WG-02) because it deals with 3D Reconstruction of C-Arm based X-Ray imaging.

Specific topics are:

Image to equipment registration
See also C.7.6.21 Image - Equipment Coordinate Relationship Module.

Volumes

C. Schadt reported on WG-02 meeting in Munich and stated that WG-02 asked if they should supply data for WG-07.

There was more discussion about why Supp 167 is needed and what problem is it aiming to solve.

HOMEWORK: Jim Percy volunteered to take a look at the Supp 167 and report on applicability to WG-07

# Supplement 147 (Second Generation RT)

## Introduction and Status Summary

The last distributed version of the draft prior to the meeting was Revision 41 – Draft 8. U. Busch and C. Schadt have done some work prior to meeting to clean-up the document. The goal is now to prepare the document for start of final reading before public comment at WG-06 meeting the week of August 12 – August 16, 2013.

Looking ahead expecting a successful execution of the reading, the public comment phase is expected to start sometimes next year. U. Busch proposed 6 month public comment period (rather than the usual 3 month). This was accepted by members present.

## Issues

### Issue 208 - Radiation Dose Value

The attribute "primary dose value indicator" was moved to a lower level to allow multiple primary targets.

Value is given in dose per meterset. Later on, for guidance document some use cases should be added.

### Issue 211 - Issues from Review

All items of this issue have been reviewed and declared closed.

### Issue 207 - Definitions

There was much discussion about the definition and description of "verification control points." There is a need to include several use cases to clarify the explanation.

For each of the following terms, the definitions were clarified.

a) Nominal energy

b) Fraction, Fractionation scheme

c) RT Radiation Set

d) RT Radiation

e) Treatment RT radiation set

f) Meterset

g) Radiation Dose Point

h) RT course

i) Treatment Phase

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### Issue 165 - Diagrams

Several new diagrams had been inserted into the draft including:

RT Dose Image Module

RT Dose Module

RT Dose Histogram IOD

Will be updated to include radiation records and fix some nomenclature.

### Issue 209 - Segmentation Annotation

There was much discussion concerning registration and frames of reference. Further discussion concerned different frames of reference for changing contours for a single conceptual volume or a conceptual volume composed of a combination of two or more other conceptual volumes. A question was asked that when if a system combines two or more volumes or a combination involves objects of different frame of references, does the system save how the objects were registered or combined? If the answer is yes, then should this registration or combination instructions also be saved? This may be accomplished using the reference conceptual volume combination description and conceptual volume constituent reference sequence and index. We do not intend to store further information.

A clarification note needs to be added in especially respect frame of reference conditions; Bruce volunteered to take a stab at writing the note.

### Issue 213 - Dosimetry Objective Tolerances

The group discussed considerations C. Schadt brought up with respect to tolerances for constraints: is there value and sufficient clarity in eventually specifying how ‘hard’ or ’soft’ a constraint is? Tolerances could be considered to be soft constraints, but then it will be very dependent upon clinical staff and TPS algorithms etc. It was decided that additional tolerances should not be added at this time. These should be expressed by physician annotation.

### Issue 205 - Phase-Time Relationships

Discussion to clarify intent and use of phases. Need to consider both time (days) and number of fractions in each phase. Courses of treatment involving several radiation sets may be delivered without reference to phases but phases help delineate the fraction schemes during planning.

The need of a composite / intent prescription was identified.

### Issue 163 - Applicators

M. Moyers gave a brief presentation of white paper on the topic; this was followed by discussion. This provided a good basis to differentiate between accessory holding devices, and devices actually defining apertures.

## Breakout Sessions

The group broke into several subgroups to discuss and propose solutions to outstanding issues.

## Input from Breakout Sessions

The discussions and proposals from the breakout sessions were discussed and incorporated into the drafts. The following issues were discussed.

### BLDs and Applicators

Applicators will be defined only as holding devices for accessories. Apertures and blocks were added to the list of BLDs

### Segment Annotation

The purposes of alternate segmented property type code sequences were discussed and re-clarified. The examples were adapted accordingly.

### Verification Control Point Sequence

Radiation dose value described as cumulative dose for cumulative meterset.

### Physician Intent

The breakout subgroup created a physician intent sequence to enable multiple intents. The RT prescriptions now reference physician intents. An intent index must be present but information about the intent is not necessary.

## Future Development of Supplement 147

Supplement 147 will be submitted to WG-06 meeting the week of August 12 – August 16, 2013 for final reading prior to public comment. Some minor cleanup will be done by U. Busch and C. Schadt prior to that meeting, but this will not change the substance any more.

The line-by-line reading for Public Comment is expected to take two or three WG.06 meetingfor the entire whole document. During this phase no further work by WG-07 on Supplement 147 will be performed.

The following revisions will be posted on the server.

Revision 41

* The current document, including all changes with change bars since the last WG-06 meeting and including the changes of that meeting

Revision 42

* Version submitted to WG-06 for reading
* Change bars taken out
* This version will be prepared in a form as specified for final reading. Therefore the history list and issue list will be removed. Those lists can be found in Revision 41.
* A separate document containing a combined issue and history list recording the changes during theWG-06 reading will be maintained on the ftp server ion the same directory as the supplement itself.

These documents will be posted on the server during the week of August 12 - 19, 2013.

It was discussed that further small corrections (typos) – where they are not-substantive, will be done without change bars to ensure efficient and undisturbed reading.

WG-07 stated, that were no more open issues in Sup 147 and therefore document is ready for WG-06 line-by-line reading.

## Discussion about promotional and educational outreach

There was a discussion of a possible face-to-face meeting for developers of second generation at ASTRO.

There was also a discussion about the possibility of producing a guidance document that includes why various objects were produced. C. Schadt showed a draft document he had started for this purpose. C. Pauer suggested that examples be put into such a document. There was a suggestion to put the document on Google Docs.

M. Moyers suggested presenting to a general radiotherapy audience at AAPM or ASTRO. There was a discussion about what would be appropriate. B. Curran will talk to organizing committees. For physicians the emphasis would be on prescriptions, conceptual volumes, and larger array of equipment. For physicists the emphasis would probably be on workflow. Maybe invitations should be sent to major institutions developing software. B. Curran suggested ESTRO as another potential meeting. W. Bosch volunteered Washington University to hold a workshop. A counter proposal was to hold a workshop in conjunction with RTOG or another clinical trial meeting. Another counterproposal was to hold the workshop in conjunction with an IHE-RO connectathon.

# CPs

U. Busch noted that approved CPs immediately become part of the standard even though they have not yet been included in the set of the latest published edition of the Standard. E.g.: the latest published Edition is 2011. There are many CPs and Supplements approved since 2011. They are part of the Standard already, before integrated into the next Edition.

## Notification of Approved CPs

The following CP have been added to DICOM Standard 2011

cp1248

cp1276

cp1277

## CPs in Voting Package

The following CPs have been finalized and included in the next Voting Package. Major items of change included in each of the CPs were described.

cp1293 - Remove Invocation Statement For Scheduled Parameters (RT37)

U. Busch described some changes introduced in the CP. The CP will become final text as such.

cp1292 - Concept Code For Beam Delivery Instruction (RT36)

This CP added treatment a delivery type to improve the use of standard coding instead of private coding. It was suggested that a CID is be started which can contain various codes for scheduled parameters in upcoming UPD use cases.

cp1291 - Additional Derivation Codes For Dose Composition (RT35)

This CP provided for annotation stating that doses can be composed of prior doses. GE has recommended some changes. There was modest discussion about the most appropriate way to change the CP. This CP may need to be moved to a new voting package.

cp1268 - Additional Registration Input Information

This CP allowed defining a bounding volume with which to use information for determining a transformation between images. GE has reservations on this CP. There was much discussion about this CP including requirements for the bounding volume such as including the volume to be closed. The CP will be pursed further though.

cp1289 - Note on transitivity of registrations (RT33)

There were no comments on this cp.

## Awaiting Further Discussion at WG-07 Meeting

cp1203 - PDR pulse details in RT Brachy Session Record

This CP is progressing in the Brachy Subgroup and there is no need for discussion by WG-07 at this time.

cp1290 - Correct ROI Physical Property Value for Elemental Composition (RT34)

The elemental composition sequence can have more than one property including physical density in addition to elemental fraction.

cp1288 - Add templates and code definitions for QAPV support (RT32)

Currently on hold. Some work still needs to be done along proceedings of QAPV.

cp1287 - Add Structure Classification Code to RT Structure Set (RT31)

Examples have been provided by W. Bosch and B. Curran in Supp 147. As requested by WG-06, those are not included as well in the Rational of that CP. With such addition, ready to go forward.

cpRT40\_01 - Range of Angular Values using IEC Geometry Definitions

This CP has not yet been shown to WG-06. It addresses that IEC coordinates may be too restricted for DICOM use or may not be available for a particular system. One example is a gantry that rotates from -5o to 365o. Has been reworked to add the text to Part 17. At that same time, by that CP a section a Part 17 for General Radiotherapy topics is introduced.

cpRT39\_01 - Unflattened energy prescription

This CP has not yet been shown to WG-06 and is still under discussion concerning best method to use.

cpRT38\_01 - Correct Type of Wedge Position Sequence

CP443 had been approved but did not get into the published standard. A request was made of the manufacturers for comments on backwards compatibility. It was recommended to clarify that CP443 is part of standard. If it is not, then submit this new cp to WG-06.

## New CPs

The following CPs have been submitted for review by WG-07.

cpRT41\_01 - RT Dose Scope definition for Delivery-related doses

This proposed CP introduces that an RT Dose Summation Type indicating that the dose was calculated based on a Treatment Record. This may go to WG-06 for review but may return to WG-07.

cpRT43\_01 - RT Image Attribute Completion

This proposed CP adds some missing attributes for RT Image, which have been introduced lately to Beams but got overlooked to add them to RT Image as well.

cpRT44\_01 - Treatment Time in RT Plan

This CP would add a calculated treatment time and treatment time limit to be used with a beam delivery. There was discussion whether this was useful or not and how it could be used. One comment was made that some manufacturers for scanning proton beams use a time limit between control points (each energy layer) as a safety backup to meterset. This CP will be submitted to WG-06 to obtain an official number and work will then proceed to work out the details.

cp1314 - Add Category Code Sequence to RT Structure Set

This CP will make some coding facilities available in the RT Structure Set IODs that are currently available in Segmentation IODs. Some "transcoding" may be necessary. There was much discussion about how these changes could be used.

cp1315 - Common Instance Reference Module is mandatory in VL Whole Slide Microscopy IOD

This CP was from another working group to allow the user to validate the registration between different frames of reference. There was moderate discussion on the utility and impact of this proposed CP.

# Future Meetings

A request was made for a teleconference the week after the WG-06 meeting in August to update the committee. The date and time selected was Monday August 26, 2013 10:00-11:00 EDT.

The next face-to-face WG-07 meeting will be held November 18 - 22, 2013 but the location was not yet decided.

A meeting of WG-07 during April of 2014 was desired.

A meeting in conjunction with the AAPM annual meeting July 24-26, 2014 San Antonio, Texas is desired.

# Adjournment

The meeting was adjourned at 12:00 p.m. August 10, 2013.