ITC Assists Developers of ATC Compliant DICOM Export for Clinical Trials

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Abstract

Purpose: The Image-guided Therapy QA Center (ITC) as part of the Advanced Technology QA
Consortium (ATC) has played a key role in assisting treatment-planning system (TPS) developers in verifying that their DICOM implementations (CT, RT Structure Set, RT Dose, RT Plan, and RT Image) match ATC's conformance statement. This presentation will review lessons learned in this important effort.

Methods and Materials: ITC hosted a series of DICOM Implementers' Workshops to assist
TPS vendors in implementing RT objects needed for clinical trials. A system of software (ATC Method 1) developed by ITC to receive, process, and review volumetric treatment planning data for advanced technology clinical trials was used to assist vendors in their implementation of DICOM export. ATC's DICOM conformance statement specifies requirements for using DICOM RT objects in these clinical trials. ITC's DICOM file reader converts incoming data to an internal format for efficient display and review using the ITC web-based Remote Review Tool (RRT). The RRT was used by TPS developers to visualize/compare submitted images, structure sets, and dose distributions, thus greatly facilitating their DICOM implementations.

Results: Interactions with developers have exposed several problems in interpretation and implementation of the DICOM standard resulting from the complexity of DICOM RT objects and differences in design/capabilities of TPSs. Examples of problems seen include CT/Structure/Dose mis-registration and Dose-calculation discrepancies. To date, 6 TPSs have released ATC-compliant DICOM export software. ITC has received DICOM data matching the ATC conformance statement from a total of 15 TPSs. ITC has worked with 8 additional TPS developers.

Conclusions: The ITC web-based Remote Review Tool has proven to be of great help in assisting developers in verifying implementations. More effort is needed by vendors to make digital data submission for clinical trials a simpler process.

Over the years, ITC has conducted a series of Data Exchange Technical Workshops for TPS Vendors:
- Mar. 10, 1995, St. Louis: Implementation of RT objects
- Sep. 10-11, 1999, St. Louis: Implementation of RT objects (prostate brachy)
- Mar. 16-17, 2001, St. Louis: Implementation of DICOM 3.0 standard
- May 3, 2003, St. Louis: Implementation of DICOM 3.0 standard
- Apr. 14, 2004, St. Louis: Implementation of DICOM 3.0 standard (followed by ATC meetings)

The slides for the most recent workshop are available at:
http://itc.wustl.edu/home/news/ATC_dicom_workshop/ATC_dicom_workshop_IDHS05.htm

In addition ITC hosted and participated in the Apr 24-28, 2006 meeting of the HE-RO Technical Committee in St. Louis, MO. This HE-RO meeting was to set constraints on the RT objects that will be used in a demonstration of DICOM interoperability that is to take place at this year's ASTRO meeting (Philadelphia, November 5-9, 2006).

The proportion of data submitted to the ITC for ATC-supported protocols using DICOM continues to rise. Currently, half of all submitted data sets are sent as DICOM RT objects, with the other half in RTDG Data Exchange format.

Efforts to facilitate the export of ATC-compliant DICOM RT data from commercial TPSs have established the collection and evaluation of volumetric imaging and treatment planning data as an essential tool for QA of advanced technology clinical trials. The ITC is now contributing its experience to the ASTRO HE-RO initiative (Integrating the Healthcare Environment: Radiation Oncology). This cooperative effort involving both clinicians and equipment vendors is expected to further benefit clinical trials by increasing the interoperability of TPS components and the uniformity of DICOM RT objects they produce.

Conclusions

- ITC has been a pioneer in the design of DICOM RT objects.
- We feel that ITC's efforts have moved DICOM forward in the field of Radiation Therapy digital data exchange.
- ITC is committed to continue to help vendors with their DICOM implementations.
- DICOM is rapidly becoming the most common format for digital exchange of treatment planning data in ATC-supported clinical trials.