

# Implementation of ATC Method 1 for Clinical Trials Data Review at the Quality Assurance Review Center

Walter R. Bosch<sup>1</sup>, John W. Matthews<sup>1</sup>, Kenneth Ulin<sup>2</sup>, Marcia M. Urie<sup>2</sup>, Jeffrey Yorty<sup>2</sup>, William L. Straube<sup>1</sup>, T. J. FitzGerald<sup>2</sup> and James A. Purdy<sup>1,3</sup>  
<sup>1</sup>Washington University School of Medicine, St. Louis, MO,  
<sup>2</sup>Quality Assurance Review Center, Providence, RI,  
<sup>3</sup>UC Davis School of Medicine, Sacramento, CA  
 Supported by NCI Grant U24 CA 81647

## Abstract

**Purpose:** To develop the capability at the Quality Assurance Review Center (QARC) to receive and review digital radiation therapy treatment planning data (TPD) for clinical trial case review.

**Method and Materials:** A system of software ("ATC Method 1") developed at the Image-guided Therapy QA Center (ITC) as part of the Advanced Technology QA Consortium (ATC) to receive, process, and review volumetric TPD for clinical trials was ported to a Linux workstation at QARC. The system includes an FTP server for receiving TPD (in DICOM or RTOG data exchange format) from protocol participants, utilities for importing TPD into a local file format, and the web-based Remote Review Tool (RRT) for QA of ROIs, isodoses, DVHs, and dose statistics. (Proprietary software components were used by special arrangement with CMS, Inc.)

**Results:** Software installation and maintenance were performed remotely at QARC by ITC personnel, with weekly teleconferences to coordinate the development effort. ITC software was adapted to better support the QARC QA process. RRT enhancements include selectable DVHs, distance measurement tool, and image grayscale presets. QARC software was adapted to support RRT invocation directly from the QARC database user interface. The system is in use for six COG, CALGB, ACOSOG, and ECOG protocols; 28 cases from 15 institutions have been received and reviewed (3/1/06).

**Conclusion:** Widespread use of new treatment modalities such as IMRT, makes use of 3D datasets essential for complete evaluation of ROI delineation and assessment of agreement of dosimetric parameters with protocol requirements. This project demonstrates that ATC Method 1, successfully used in support of RTOG trials for many years at ITC, can be implemented at other QA centers. The effort required, however, was significant and tools must be tailored to each individual QA center's computer infrastructure/QA process.

## Introduction

The purpose of this work was to develop the capability at the Quality Assurance Review Center (QARC) to receive and review digital radiation therapy treatment planning data (TPD) for multi-institutional clinical trial case review. This process involves the transfer of digital data representing volumetric CT images, critical-structure and target-volume contours, as well as three-dimensional dose distributions from commercial treatment planning systems used by participating institutions. Visualization and analysis tools are used by QA center staff to evaluate the consistency of ROI delineation and the conformance of dosimetric parameters with protocol requirements.

## Methods And Materials

A system of software ("ATC Method 1") developed at the Image-guided Therapy QA Center (ITC) as part of the Advanced Technology QA Consortium (ATC) to receive, process, and review volumetric TPD for clinical trials was ported to a Linux workstation at QARC. This system includes an FTP server (with a separate, virtual file system for each user) for receiving TPD (in DICOM or RTOG data exchange format) from protocol participants, as well as graphical utilities for importing TPD into a local file format and performing data integrity QA on the imported data. (Proprietary software components were used by special arrangement with CMS, Inc.)

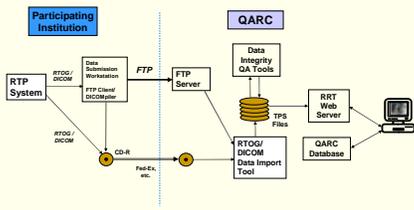


Figure 1. Schematic representation of the submission and review of digital TPD from institutions participating in clinical trials at QARC.

The system includes the web-based ITC Remote Review Tool (RRT) for visualization and dosimetric analysis of ROIs (normal structures and target volumes), isodose curves on CT images, as well as DVHs, and dose statistics.

## Results

After an initial configuration of the Linux workstation, software installation and maintenance were performed remotely at QARC by ITC personnel.

Weekly teleconferences were held to coordinate the development effort and train QARC physics and dosimetry staff in the use of the ATC Method 1 software. These meetings also guided the process of adapting ITC software to better support the QARC QA process. Among these adaptations were several enhancements of the Remote Review Tool. These include (1) the option to select among DVHs submitted by protocol participants or those re-calculated using the RRT, (2) an interactive distance measurement tool, and (3) image grayscale presets. QARC software was also adapted to support invocation of the RRT for protocol case data directly from the QARC database user interface.



Figure 2. Data import tool user interface as seen on remote desktop at ITC.



Figure 3. Top-level user menu for processing incoming digital TPD.

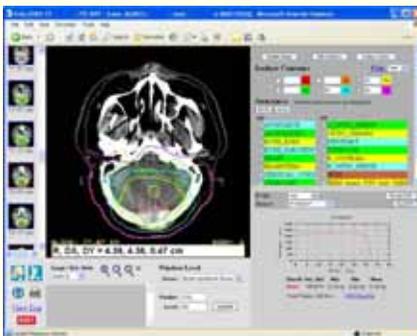


Figure 4. Remote Review Tool running on QARC ATC Method 1 workstation.

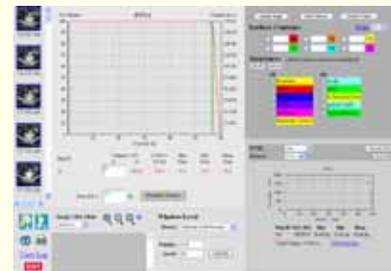


Figure 5. Remote Review Tool Interactive DVH Display.

This system of software is currently in operation at QARC and has been used to facilitate the submission (via FTP or CD-ROM) and review of a total of 41 case data sets from 20 institutions. Digital RT data has been received and reviewed for cases on the following clinical trial protocols:

Cooperative Group	Protocol	Cases Reviewed (as of 7/19/06)
COG	ACNS0121	10
COG	ACNS0126	5
COG	ACNS0331	16
COG	ACNS0423	1
CALGB	99809	1
CALGB	80101	1
ACOSOG	Z5031	1
ECOG	E2303	5
ECOG	E3303	1
<b>TOTAL CASES</b>		<b>41</b>

Table 1. Cooperative-group clinical trial protocols for which digital TPD have been received and reviewed at QARC using ATC Method 1.

## Discussion

The widespread use of new treatment modalities such as IMRT, makes the use of 3D datasets essential for complete evaluation of ROI delineation and assessment of agreement of dosimetric parameters with protocol requirements. Additionally, the acquisition of volumetric imaging and dosimetry greatly increase the value of clinical trials data for retrospective analysis.

## Conclusions

- ATC Method 1 has been used successfully to support digital data submission and review for RTOG trials for many years.
- ATC Method 1 has been successfully adapted to provide important QA tools to QARC.
- The effort required to support this project has been significant.
- Tools for data import and data integrity QA must be tailored to accommodate differences in
  - the design of clinical trials protocols,
  - the QA process used to evaluate protocol data, and
  - the individual QA center's computer infrastructure.

This work has been supported by NIH U24 Grant CA81647 and NCI-H Grant 5U10CA02951.