Principal Investigator's Report
Advanced Technology QA Consortium
ATC Steering Committee Meeting
Bethesda, MD. – April 3, 2006

James A. Purdy, Ph.D.

Supported by NIH U24 grant CA81647,
"Advanced Technology QA Center"

ATC Web Site

http://atc.wustl.edu

- ATC Steering Committee
  - Minutes/Presentations
  - Priorities
  - Timelines
- Protocols
  - Facility Questionnaires
  - Credentialing Guides
  - Data submission Forms
  - Data submission checklists
  - QA Guidelines (by protocol)
  - Protocol text
- Publications
- Resources

- ATC concept dates from April 1992 when 3DQA Center was established at WU-St. Louis to provide QA for support of RTOG 3DCRT trials.
- Two NIH funded ATC Centers created in 1998 (3-year grant)
- Since 2001, grant (5-year) functions as QA Consortium capitalizing on existing infrastructure and strengths of national QA programs
  - Image-Guided Therapy Center (ITC – Washington University in St. Louis and UC Davis)
  - Radiation Therapy Oncology Group (RTOG)
  - Radiological Physics Center (RPC, M.D. Anderson Cancer Center)
  - Quality Assurance Resource Center (QARC)
  - Resource Center for Emerging Technologies (RCET – Univ. Florida Gainesville)

ATC'S OVERALL GOALS

- To facilitate the conduct of NCI sponsored advanced technology radiation therapy clinical trials that require digital data submissions.
- Effort includes coordination of QA activities,image/RT digital data management, RT QA, and clinical trials research & developmental efforts.
- We strongly believe that advanced medical informatics can facilitate education, collaboration, and peer review, as well as provide an environment in which clinical investigators can receive, share, and analyze volumetric multimodality treatment planning and verification (TPV) digital data.
- Our ultimate goal is to improve the standards of care in the management of cancer by improving the quality of clinical trials medicine.

ATC'S SPECIFIC OBJECTIVES

- **COORDINATION EFFORT AMONG QA CENTERS**
  - **Eliminate duplication of developmental effort and facilitate sharing of QA resources among cooperative groups.**
  - **Develop appropriate and uniform QA procedures and criteria for advanced technology trials across all cooperative groups.**

ATC'S SPECIFIC OBJECTIVES

- ATC SERVICE EFFORTS
  - Assist clinical trial cooperative groups in protocol development
    - Credentialing requirements
    - Target volume definitions
    - Quality assurance procedures
    - Data submission instructions
  - Manage and facilitate
    - Credentialing of institutions
    - Protocol digital data submission
    - QA review of submitted data
    - Analysis of volumetric treatment planning data

ATC'S SPECIFIC OBJECTIVES

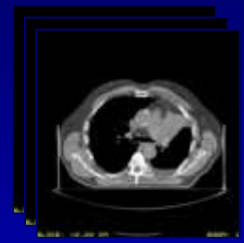
- ATC DEVELOPMENTAL EFFORTS
  - Electronic data exchange of digital planning data between protocol participating institutions and ATC QA Centers.
  - Web-based software tools to facilitate protocol digital data submissions and QA reviews by Study Chairs, RTOG Dosimetry Group, RPC, and QARC.
  - Archival treatment planning & QA databases that can be linked with the cooperative group's clinical outcomes database

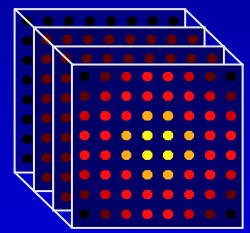
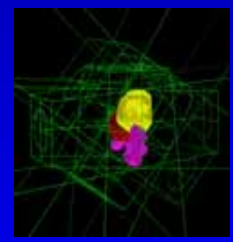
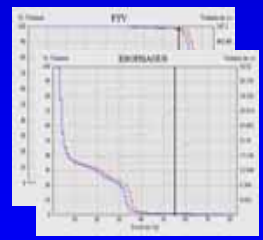
Continuing to Stress Good Communications among ATC Participants

- **Meetings (with minutes)**
  - ATC Meeting - RTOG, Phoenix, Jan. 19, 2005
  - ATC Meeting - RTOG, Philadelphia, June. 23, 2005
  - ATC Meeting - COG, Dallas, Oct. 27, 2005
  - ATC Meeting - RTOG, Miami, Jan. 19, 2006
- **Monthly ATC Teleconferences (with minutes)**
- **Bi-Monthly RTOG/ITC/RPC Teleconferences**
- **RTOG IGRT Steering Committee Teleconferences**
- **caBIG Teleconferences**

Data Objects for 3DCRT/IMRT Clinical Trials

- **Data Objects**
  - **Volumetric, digital images**
  - **Contours**
  - **3-D dose distributions**
  - Treatment plan
  - Treatment verification images
  - DVHs
- **Challenges**
  - Heterogeneous treatment planning systems
  - Proprietary data formats




Typical Data Set per Patient ~ 100 MB

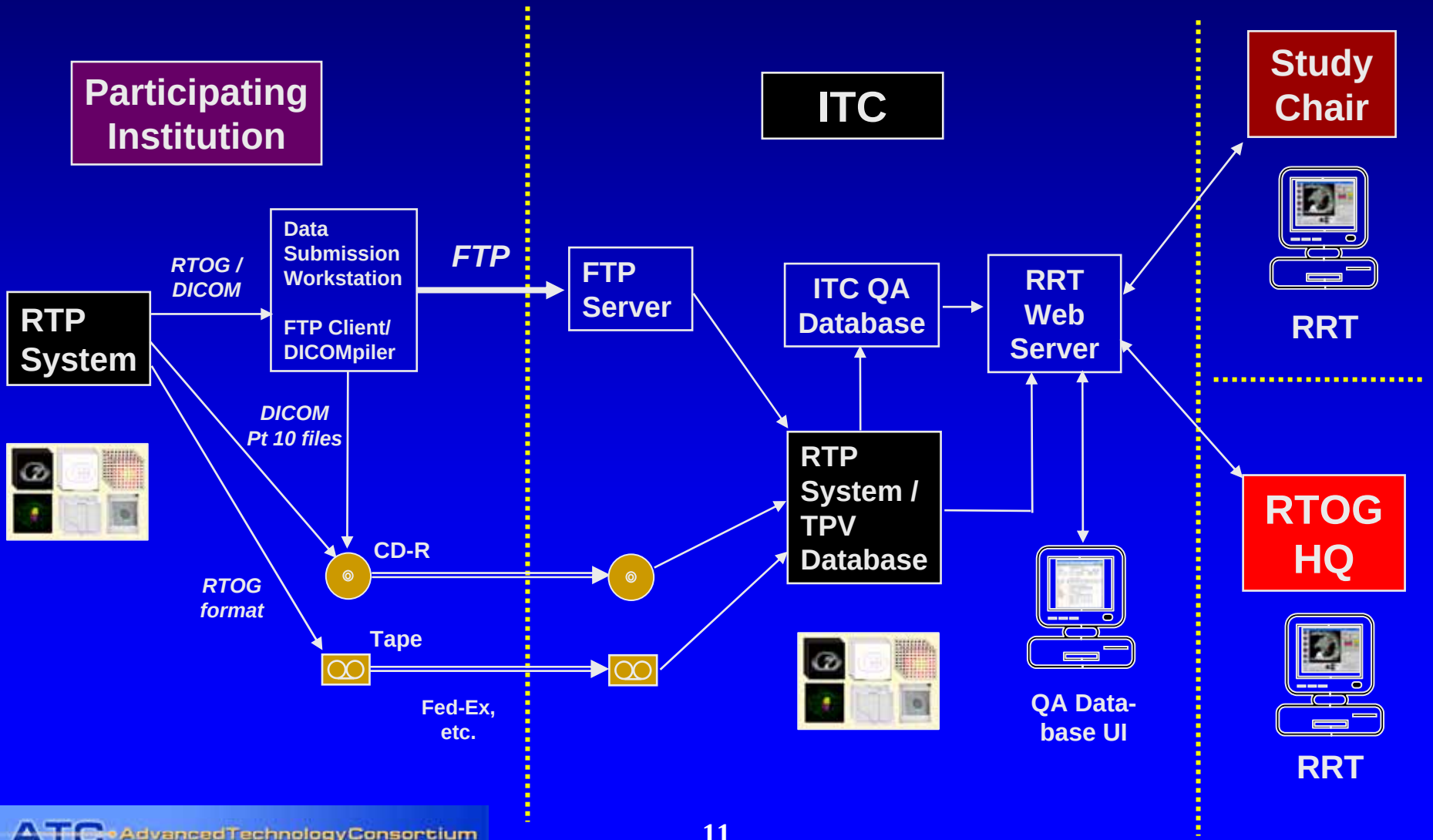
Technology Requirements Needed to Participate in ATC Supported Clinical Trials

- ATC Compliant Treatment Planning Systems (Apr. 2006) (http://atc.wustl.edu)
- ITC provides direct and ongoing assistance to TPS vendors for their DICOM implementation
  - Vendors submit DICOM datasets to ITC via FTP/media
  - ITC imports datasets into pseudo-protocols per vendor
  - Vendors evaluate correctness of data transfer using ITC's Remote Review Tool (RRT)
  - For RT Plan validation, screen captures are sent back to vendor

Treatment Planning Systems			Exchange Format	Treatment Modality				
Vendor	System	Version*		3DCRT	IMRT	Seed Brachy	HDR Brachy	Protons
CMS	Focus/XiO	3.1	R	✓	✓	✓		
Elekta	RenderPlan 3D		R	✓				
	PrecisePlan	2.01	D	✓	✓			
Nomos	Corvus		R		++			
Nucletron	Helax TMS		R	✓	✓			
	TheraPlan Plus		R	✓				
	PLATO RTS	2.62	D	✓				
	PLATO BPS	14.2.6	D				✓	
Philips	Pinnacle^3		R	✓	✓			
	AcqPlan	4.9	R	✓				
Rosses Medical	Strata Suite CTPlan	4.0	R			✓		
RTek	PIPER	2.1.2	R			✓		
Varian	BrachyVision	6.5 (Build 7.1.67)	D				✓	
	Eclipse	7.1	D	✓	✓			
	VariSeed	7.1	D			✓		

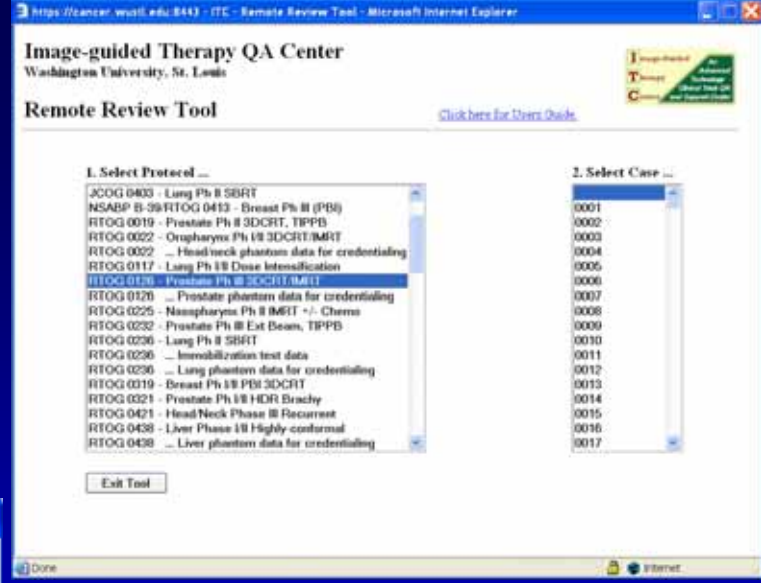
D = DICOM RT Objects R = RTOG Data Exchange Format

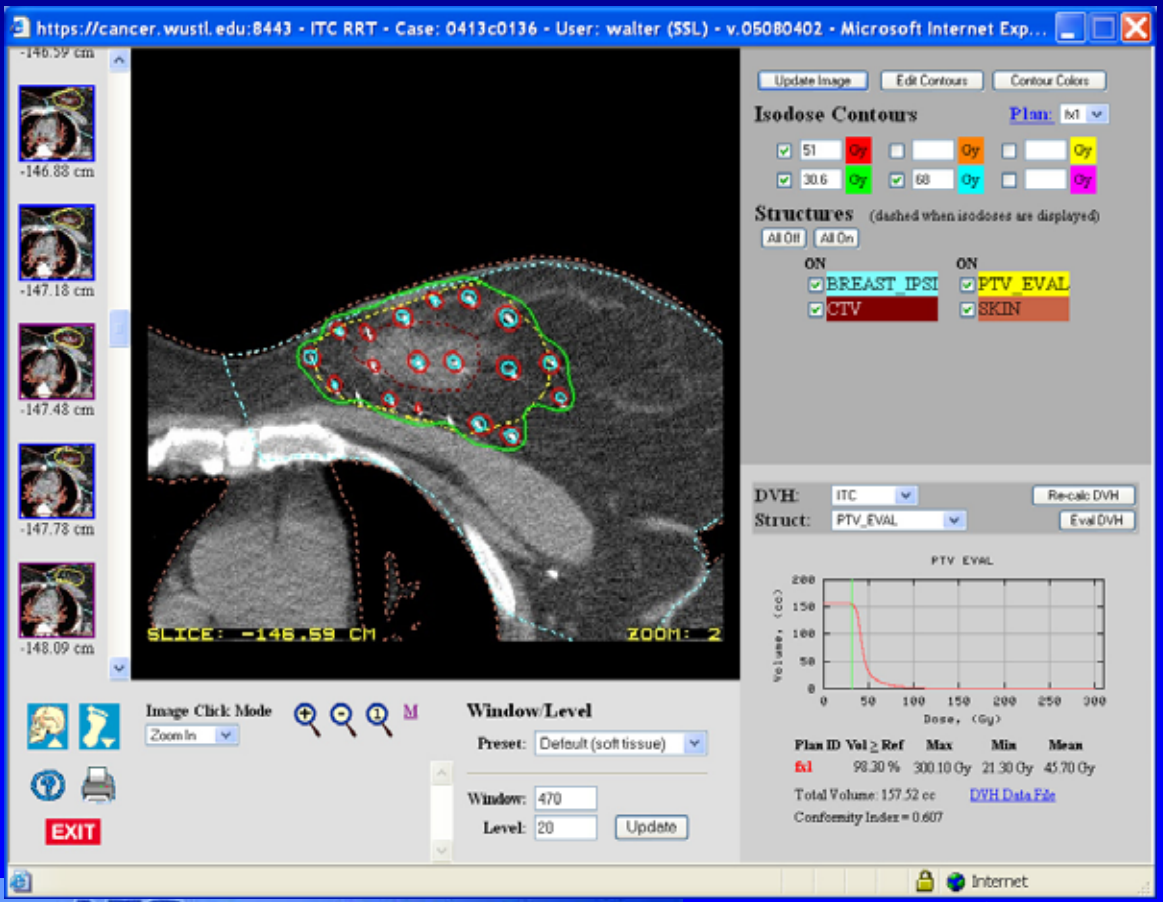
ATC Method 1: Digital Data Submissions to ATC (Currently in use for all ATC-supported protocols.)



ITC Remote Review Tool

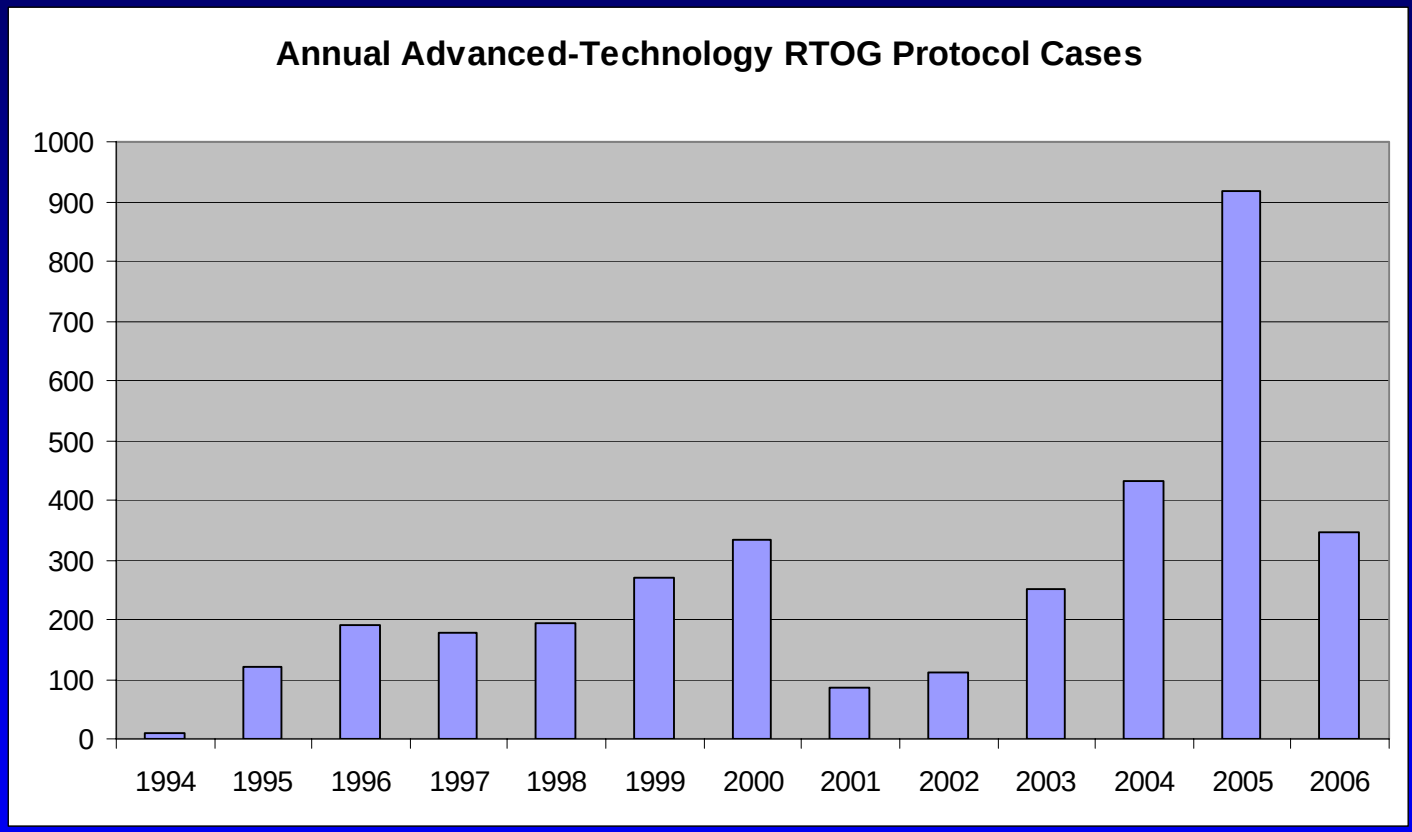
- Secure web server (cancer.wustl.edu)
- Uses standard web browser

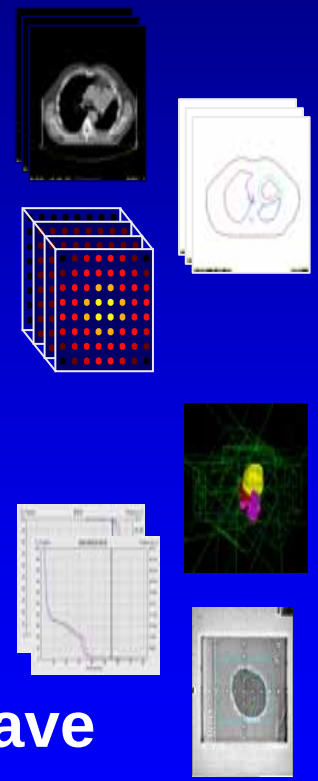




- CT images
  - Structure contours
  - Iso-dose curves
- Contour editor
- Measurement tool
- Dose statistics
- Plan summary

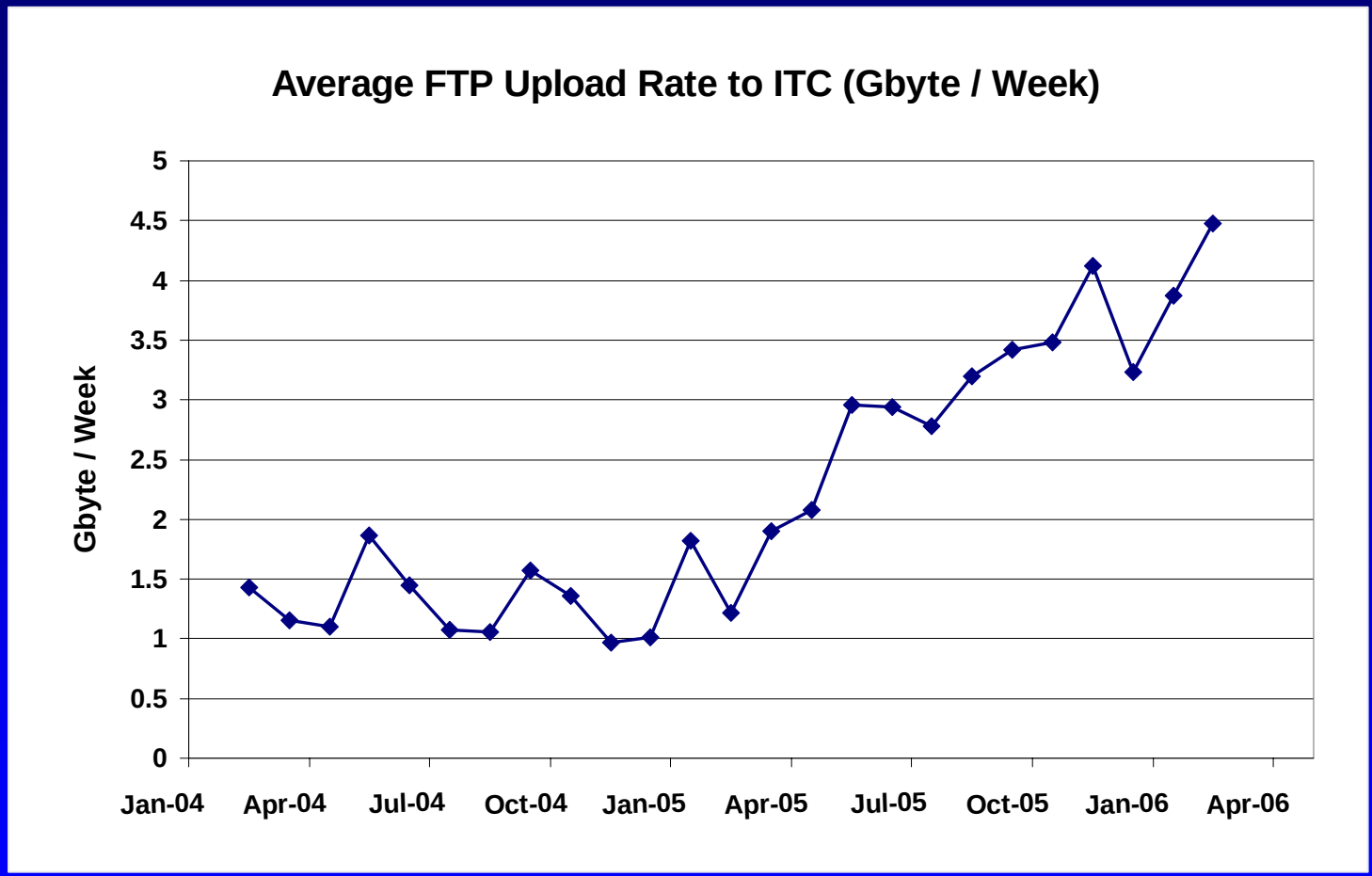
Mar. 23 2006: 3442 Complete Digital Data Sets Submitted Over 12+ Year Period using ATC Method 1*





- **15 commercial treatment planning systems** have implemented ATC compliant export capability
- **365 institutions** able to submit data

Weekly FTP Submission to ITC



What's driving this increase?

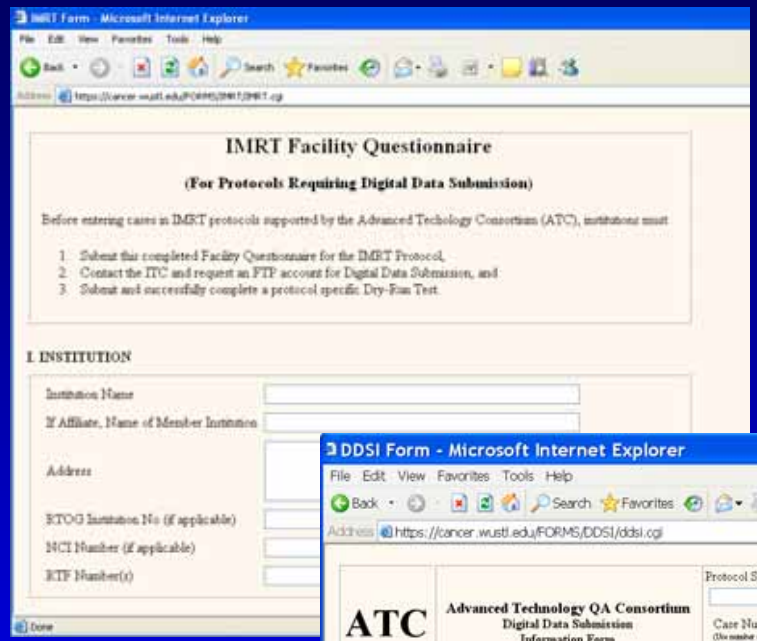
- **RTOG Protocol Study Chairs recognizing importance of digital data (PTV, 3D dose distribution)**
- **NSABP B39/RTOG 413 demonstrates value of ATC coordinated approach**
  - Multiple cooperative groups
  - Multiple QA Centers
  - Multiple P.I. reviewers

COORDINATION - SERVICE
Credentialing of Institutions

- Facility Questionnaire
- Knowledge Assessment Form (RPC)
- Benchmark / “Dry-run” Tests (ITC)
- Phantom Dosimetry Test (RPC)
- Repositioning reproducibility Test for SBRT
- Rapid review of initial cases
- NCI IMRT Requirements

ATC Online Forms

- **Facility Questionnaires**
  - Institution
  - Key personnel (physician, physicist, dosimetrist, RA)
  - Information on IMRT treatment planning and delivery systems
  - IMRT Experience
  - QA procedures
- **Online Digital Data Submission Information (DDSI) Form**



Benchmark ("Dry Run") Test

- **Intended to demonstrate…**
  - Understanding of protocol requirements (Tumor/target volumes, Organs at Risk, Dose prescription)
  - Digital data exchange capability
- **Identical to actual case for planning and submission excepting verification films and actual treatment.**
- **Serves as an educational resource to nation's clinical trial cooperative groups and participating institutions.**

Incorrect Contouring for RTOG 0319 (Breast, PTV incorrect

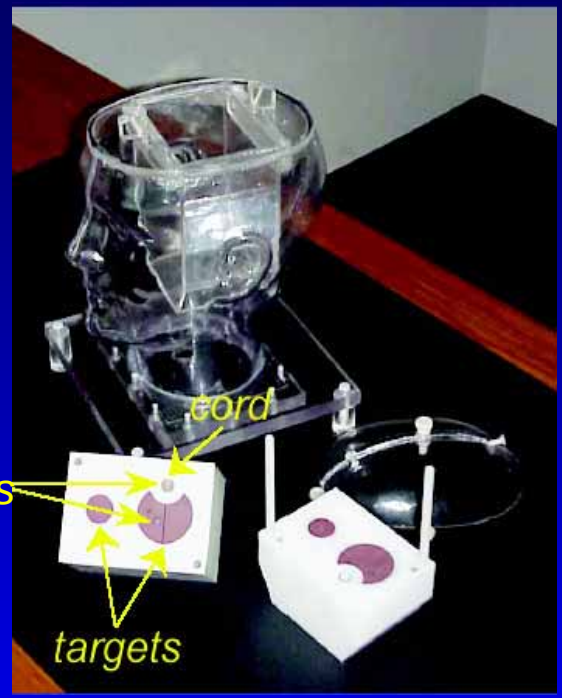
Corrected contouring after feedback from ITC

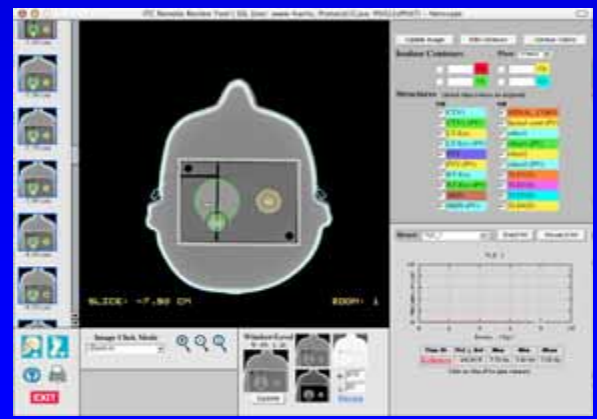
RTOG 0022 Dry-Run Test

- **18 institutions passed the Dry-Run requirement**
  - 1 institution achieved no deviation
  - 17 institutions achieved minor deviation
- **Parotid sparing**
  - 13 institutions achieved no deviation
  - 5 institutions achieved minor deviation
- **Number of submissions it took to meet credentialing guidelines**
  - 1 submission: 6 institutions
  - 2 submissions: 9 institutions
  - 3 submissions: 3 institutions

RPC IMRT Phantom Test

- **RPC tests ability of each RTOG institution to deliver IMRT by asking facility to:**
  - Scan RPC phantom (CT, MRI, etc.)
  - Generate an IMRT plan according to defined protocol
  - Deliver treatment to phantom
  - Return phantom and dosimeters to RPC for evaluation.
  - Submit digital planning data to the ITC
  - RPC uses ITC Remote Review Tool to analyze data
- **RPC has considerable experience with H&N phantom, which to date has been irradiated 163 times at 128 institutions. Roughly one-third of first time irradiations fail to comply with the institution's own treatment plan using criteria of ±7%, ±4 mm. Repeat irradiations at institutions that fail initially show an improved pass rate.**





RPC IMRT Phantom Test

Int. J. Radiation Oncology Biol. Phys., Vol. 63, No. 2, pp. 577–583, 2005

0360-3016/05/$–see front matter

ELSEVIER

doi:10.1016/j.ijrobp.2005.05.021

PHYSICS CONTRIBUTION

DESIGN AND IMPLEMENTATION OF AN ANTHROPOMORPHIC QUALITY ASSURANCE PHANTOM FOR INTENSITY-MODULATED RADIATION THERAPY FOR THE RADIATION THERAPY ONCOLOGY GROUP

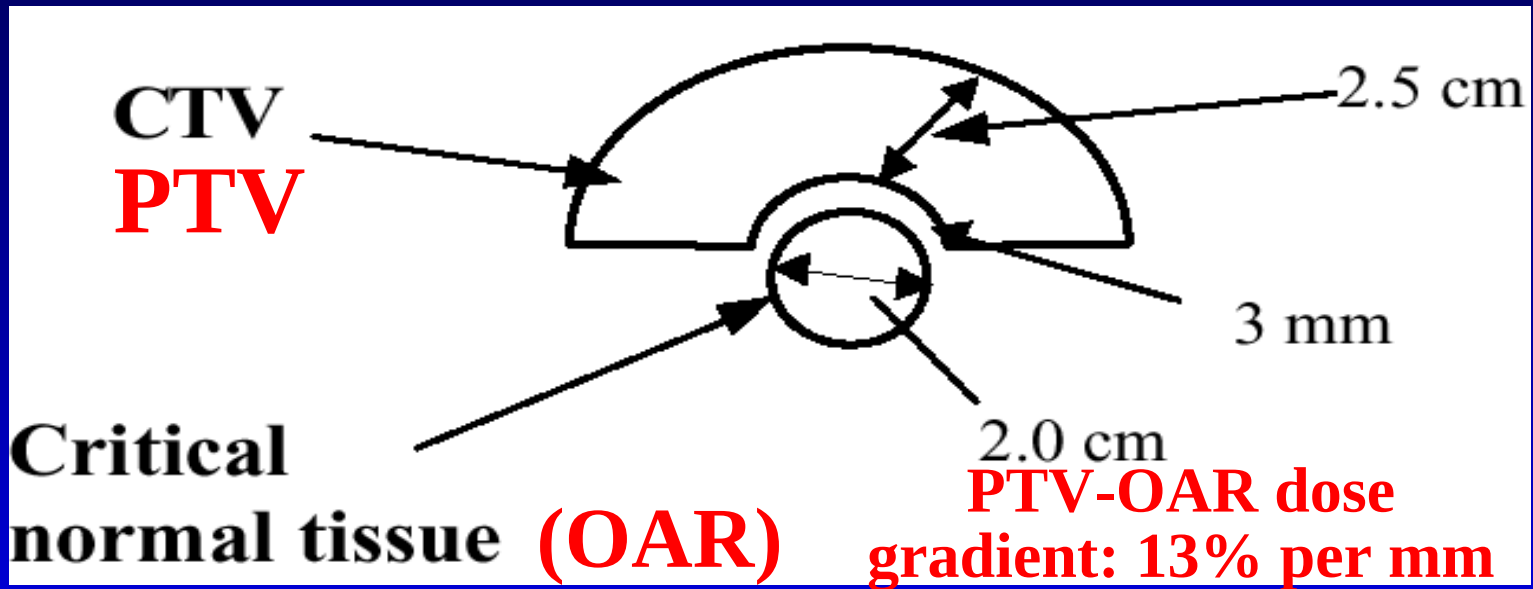
ANDREA MOLINEU, M.S.,* DAVID S. FOLLOWILL, PH.D.,* PETER A. BALTER, PH.D.,* WILLIAM F. HANSON, PH.D.,* MICHAEL T. GILLIN, PH.D.,* M. SAIFUL HUQ, PH.D.,† AVRAHAM EISBRUCH, M.D.,‡ AND GEOFFREY S. IBBOTT, PH.D.*

*Department of Radiation Physics, The University of Texas M. D. Anderson Cancer Center, Houston, TX; †Department of Radiation Oncology, University of Pittsburgh Medical Center, Pittsburgh, PA; ‡Department of Radiation Oncology, University of Michigan Medical Center, Ann Arbor, MI

Purpose: To design, construct, and evaluate an anthropomorphic phantom for evaluation of intensity-modulated radiation therapy (IMRT) dose planning and delivery, for protocols developed by the Radiation Therapy Oncology Group (RTOG) and other cooperative groups.

A. MOLINEU *et al.* Anthropomorphic QA phantom for IMRT. Int. J. Radiation Oncology Biol. Phys., Vol. 63, No. 2, pp. 577–583, 2005

NCI BENCHMARK (www.QARC.org)



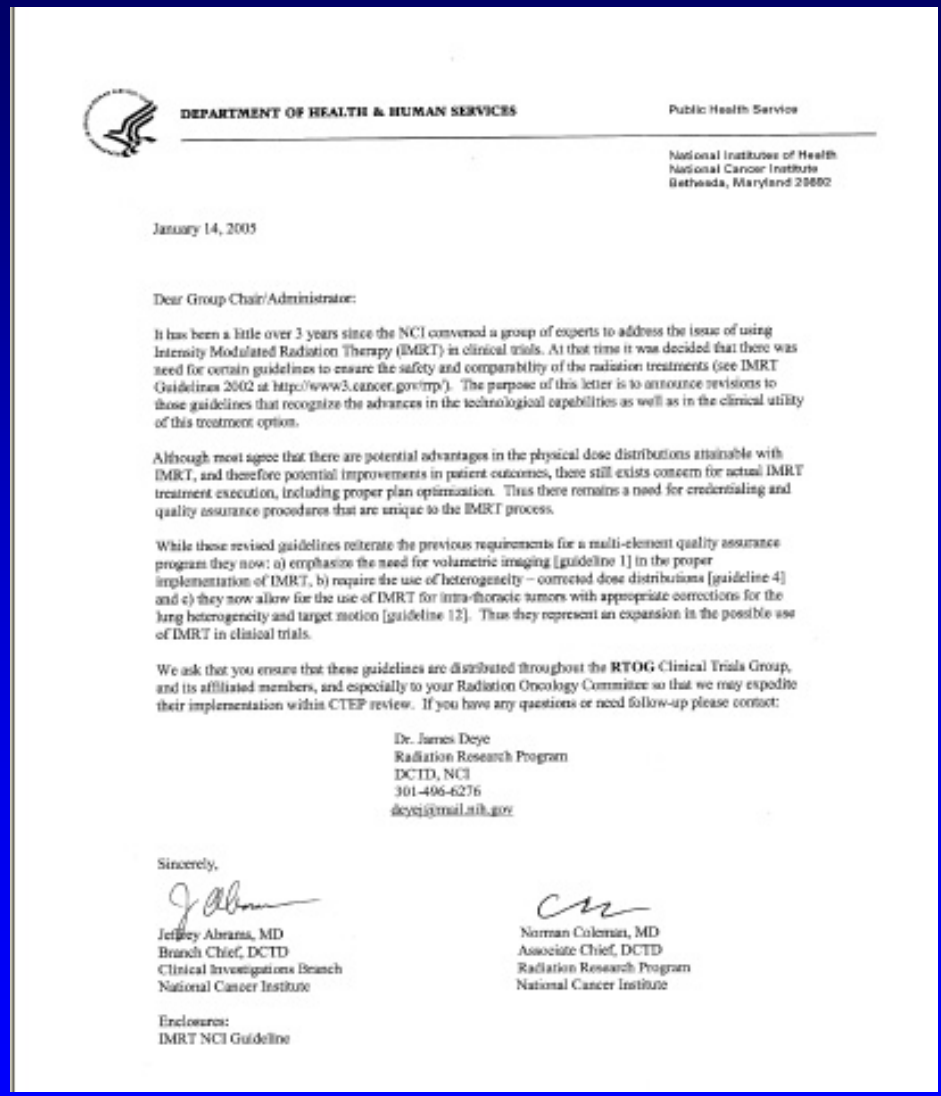
Geometry: PTV 180° around NT; PTV & CNT 5 cm long

Dose Goals: Prescribed dose of 200 cGy per fraction to 100% of PTV and not more than 120 cGy, (60%) of prescribed dose, to more than 5% of OAR.

- Constraint on OAR has priority over PTV coverage(i.e., 60% to no more 5% of the CNT shall be achieved to accomplish PTV coverage; PTV coverage may be sacrificed if necessary.
- Maximum dose to any point within the irradiated volume should be no more than 120% of the prescribed dose.

NCI IMRT PROTOCOL REQUIREMENTS

- 2002: guidelines for IMRT use in clinical trials were established to ensure the safety and comparability of these radiation treatments.
- 2005: NCI announced revisions in these guidelines allowing use of IMRT for intra-thoracic treatments.
- 2006: specific guidelines for use of IMRT for intra-thoracic treatment protocols with the goal that they are clear enough to be consistently applied within all of the cooperative groups.



DEPARTMENT OF HEALTH & HUMAN SERVICES — Public Health Service

National Institutes of Health
National Cancer Institute
Bethesda, Maryland 20892

January 14, 2005

Dear Group Chair/Administrator:

It has been a little over 3 years since the NCI convened a group of experts to address the issue of using Intensity Modulated Radiation Therapy (IMRT) in clinical trials. At that time it was decided that there was need for certain guidelines to ensure the safety and comparability of the radiation treatments (see IMRT Guidelines 2002 at http://www3.cancer.gov/rtp/). The purpose of this letter is to announce revisions to those guidelines that recognize the advances in the technological capabilities as well as in the clinical utility of this treatment option.

Although most agree that there are potential advantages in the physical dose distributions attainable with IMRT, and therefore potential improvements in patient outcomes, there still exists concern for actual IMRT treatment execution, including proper plan optimization. Thus there remains a need for credentialing and quality assurance procedures that are unique to the IMRT process.

While these revised guidelines reiterate the previous requirements for a multi-element quality assurance program they now: a) emphasize the need for volumetric imaging [guideline 1] in the proper implementation of IMRT, b) require the use of heterogeneity – corrected dose distributions [guideline 4] and c) they now allow for the use of IMRT for intra-thoracic tumors with appropriate corrections for the lung heterogeneity and target motion [guideline 12]. Thus they represent an expansion in the possible use of IMRT in clinical trials.

We ask that you ensure that these guidelines are distributed throughout the **RTOG** Clinical Trials Group, and its affiliated members, and especially to your Radiation Oncology Committee so that we may expedite their implementation within CTEP review. If you have any questions or need follow-up please contact:

Dr. James Deye
Radiation Research Program
DCTD, NCI
301-496-6276
deyej@mail.nih.gov

Sincerely,

Jeffrey Abrams, MD
Branch Chief, DCTD
Clinical Investigations Branch
National Cancer Institute

Norman Coleman, MD
Associate Chief, DCTD
Radiation Research Program
National Cancer Institute

Enclosures:
IMRT NCI Guideline

RTOG ATC Closed Protocols (Mar. 23, 2006)

Protocol	Description	Institutions Credentialed	Cases Accrued
9406	Ph I/II 3DCRT Prostate Dose Escalation	54	1084
9311	Ph I/II 3DCRT Lung Dose Escalation	27	180
9803	Ph I/II 3DCRT GBM Dose Escalation	46	210
0022	Ph I/II 3DCRT/IMRT Oropharynx	35	69
0225	Ph I/II 3DCRT/IMRT Nasopharynx	36	68
0319	Ph I/II 3DCRT Partial Breast	31	58

BLUE = closed protocols

RTOG ATC Supported Open Protocols (March 23, 2006)

Protocol	Description	Institutions Credentialed	Cases Accrued	Accrual Goals
0117	Ph I/II 3DCRT/chemo Lung	47	38	73
0126	Ph III 3DCRT/IMRT Prostate	127 (55 IMRT)	841 (172 IMRT)	1520
0232	Ph III Ext Beam + TIPPB Prostate	64	194	1520
0234	Ph II Adv. H&N Randomized Trial of Surgery Followed by Chemo	42	12	230
0236	Ph II SBRT Lung	7	38	52
0321	Ph I/II HDR/Ext Beam Prostate	15	91	110

WHITE = open protocols

RTOG ATC Supported Open Protocols (March 23, 2006)

Protocol	Description	Institutions Credentialed	Cases Accrued	Accrual Goals
0418	Ph II IMRT +/- Chemo post-op Endom. or Cervical Ca	55	0	92
0421	Ph III 3DCRT/IMRT Locally Rec, Prev Irradiated H&N Ca	37	6	240
0438	Ph I 3DCRT Highly Conf. RT Liver Mets	1	0	18
0521	Ph III localized High Risk Prostate Ca: Androgen Suppress with RT vs. RT Chemo&Prednisone	55	4	600
0522	Phase III 3DCRT/IMRT Stage III/ IV H&N Ca	41	7	720

WHITE = open protocols

NSABP/RTOG ATC Supported Open Protocols (March 23, 2006)

Protocol	Description	Institutions Credentialed	Cases Accrued	Accrual Goals
NSABP B39 RTOG 0413	Phase III Partial Breast Irradiation	277(228/153/32)	1014 (332/106/51)	3000

WHITE = open protocols

CDRP-ATC

Institution	RTF #	Awarded site / mentor	Physician	Physicist	External Beam	Brachytherapy	Credentials
Rapid City Medical Center, Rapid City, South Dakota	1175	Awarded site	Dan Petereit	Ed Cytaki	Pinnacle	HDR-Nucletron Variseed-prostate seeds	0126 (IMRT), 0413 3D, Pending (0225)
Riverview UW Cancer Center, Madison, WI	2850	Mentor site	Michael Ritter	Jeffrey Limmer	Pinnacle	LDR-Cs Pinnacle Variseed-prostate seeds	0126 (IMRT), 0225, 0236
Sanchez Cancer Center, Laredo Medical Center,	2905	Awarded site	Bobbie Bains	Jessica Guajardo	Prowess,	Nucletron Plato	None
Cancer Ther & Research Center-Grossman (UTHSC San Antonio, TX)	1192	Mentor Site	Charles Thomas	Bill Salter	Prowess for 3D Corvus for IMRT	Prowess	0232
Daniel Freeman Memorial Hospital, Inglewood, CA	1322	Awarded site	Michael Steinberg	Eric Frank	AcQPlan	Variseed, HDR-Brachvision ABICUS	0232, 0413 Mammo, 0321, Pending(0413 Multi)
USC/Norris Comprehensive Cancer Center	1966	Mentor Site	Oscar Streeter	Melvin Astrahan	Pinnacle	Varian Cad Plan	None
UPMC McKeesport Hospital, McKeesport, PA	1789	Awarded site	Dwight Heron	Chuck McCoy	Eclipse, Pinnacle	Prowess	None
Washington Univ. Medical Center	1075	Mentor Site	Jeff Michalski	Dan Low	CMS -3D, Eclipse -IMRT	Nucletron, Variseed	0117, 0126 (IMRT), 0225, 0232, 0236, 0413 Multi, 0413 Mammo
New Hanover Regional Medical Center, Wilmington, NC	1948	Awarded site	Pat Maguire	Scott Urquhart	Pinnacle	Variseed	0232
Univ. of North Carolina Hospitals	2608	Mentor Site	Joel Tepper	Kathy Deschesne	PLUNC – in house sys.	Plato – HDR	0117, 0126 (Grandfathered)
Singing River Hospital Regional CC, Pascagoula, MS	2298	Awarded site	vacant	Dennis Wood	Eclipse	LDR ROCS, HDR Brachvision Variseed – prostate seeds	None
University of Alabama, Birmingham, AL	2582	Mentor Site	Sharon Spencer	Richard Popple	Eclipse	ROCS, Eclipse	0126 (IMRT), 0225, 0413 3D

JCOG ATC Supported Open Protocols (March 23, 2006)

Protocol	Description	Institutions Credentialed	Cases Accrued	Accrual Goals
JCOG 0403	Phase II Study of SBRT in Patients with T1N0M0 Non-Small Cell Lung Cancer	13	67	165

WHITE = open protocols

COG/CALGB/ACOSOG/ECOG QARC ATC Supported Open Protocols (March 1, 2006)

Cooperative Group	Protocol	Cases Reviewed (as of 3/1/06)
COG	ACNS0121	7
COG	ACNS0126	5
COG	ACNS0331	12
CALGB	99809	1
ACOSOG	Z5031	1
ECOG	E2303	2

WHITE = open protocols

Other ATC Cooperative Group Interactions

- NCIC (RCET) – Supporting MA.20 with ATC Method 3 (2D data only). Will begin implementation/testing of ATC Method 2 (v2.4) when available.
- NABTT
- EORTC
- TRANS-TASMAN RADIATION ONCOLOGY GROUP (TROG)

Peer Reviewed Publications: Clinical Trials Supported by the ATC

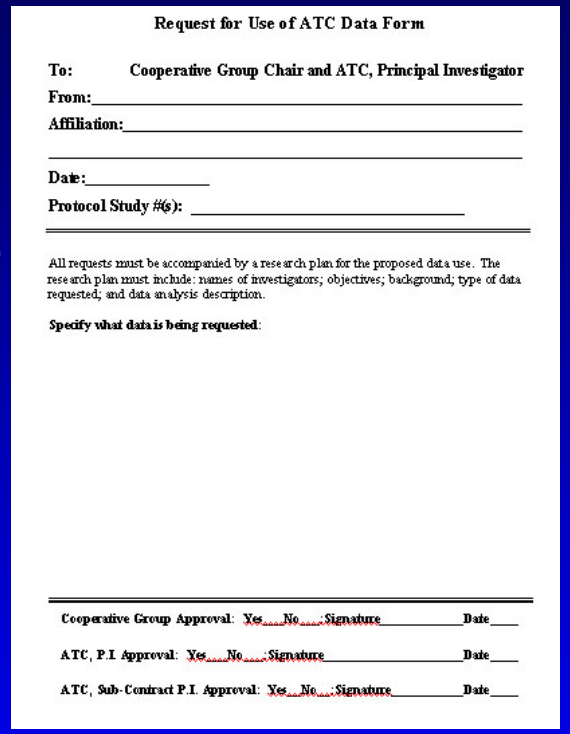
1. Michalski, J.M., Winter, K., Purdy, J.A., Parliament, M.B., Wong, H., Perez, C.A., Roach III, M., Bosch, W., and Cox, J.D.: Toxicity After Three-Dimensional Radiotherapy for Prostate Cancer on RTOG 9406 Dose Level V. Int J Radiat Oncol Biol Phys, 62(3):706-713, 2005.
2. Bradley, J., Graham, M., Winter, K., Purdy, J., Komaki, R., Roa, W., Ryu, J., Bosch, W. and Emami, B.: Toxicity and Outcome Results of RTOG 9311; a Phase I/II Dose Escalation Study using Three-Dimensional Conformal Radiotherapy in Patients with Inoperable Non-Small Cell Lung Carcinoma. Int J Radiat Oncol Biol Phys, 61 (2):318-328, 2005.
3. A. MOLINEU et al. Anthropomorphic QA phantom for IMRT. Int J Radiat Oncol Biol Phys, Vol. 63, No. 2, pp. 577–583, 2005

Secondary Analysis of Multi-Institutional Clinical Trials Data Supported by ATC

- **RTOG 9406 – NIH R01 Grant: Tucker/Thames (M.D. Anderson)**
- **RTOG 9311 – NIH R01 Grant: Bradley/Deasy (WU)**
- **RTOG 9406 – Publication: Roach, M., Winter, K., Michalski J.M., Cox, J.D., Purdy, J.A., Bosch, W., Lin . X., and Shipley, W.S. Penile bulb dose and impotence after three-dimensional conformal radiotherapy for prostate cancer on RTOG 9406: Findings from a prospective, multi-institutional, phase I/II dose-escalation study. Int. J. Radiation Oncology Biol. Phys., 60(5): 1351–1356, 2004.**

Proposed Guidelines
Requests-ATC Supported Protocol Data

1. Requests submitted on "Request for use of ATC Data" form.
2. Data that has not been previously published in a peer-reviewed publication may be released but must be approved by the group chair, the ATC P.I., and the appropriate ATC sub-contract P.I.
3. Copy of research plan for the analysis must be received and reviewed by Group chair or his/her designate, ATC P.I., and ATC subcontractor P.I. before data are released. Research plan must include: names of investigators; objectives; background; type of data requested; and analysis plan. Approval by all three P.I.'s is required.
4. Recognition (and possible involvement) of the cooperative group and appropriate ATC member on authorship line and in the acknowledgements of any subsequent publication is required.
5. Funding for preparing the data may be requested by the ATC and/or the Cooperative Group.



Request for Use of ATC Data Form

To: Cooperative Group Chair and ATC, Principal Investigator

From: _____

Affiliation: _____

_____

Date: _____

Protocol Study #(s): _____

All requests must be accompanied by a research plan for the proposed data use. The research plan must include: names of investigators; objectives; background; type of data requested; and data analysis description.

Specify what data is being requested:

Cooperative Group Approval: Yes___ No___ Signature_____ Date___

ATC, P.I Approval: Yes___ No___ Signature_____ Date___

ATC, Sub-Contract P.I. Approval: Yes___ No___ Signature_____ Date___

caBIG In Vivo Imaging Workspace

- **ATC is one of the funded participants in the caBIG *In Vivo Imaging Workspace*.**
- **ATC members are participating in the following Special Interest Groups (SIGs):**
  - **Testbed SIG**
  - **Standards and Interoperability SIG**
  - **Software SIG**
- Abstract: *The Advanced Technology QA Consortium (ATC)*, has been accepted for a poster presentation for the caBIG™ 2006 Annual Meeting..

Develop, Test, and Implement ATC Method 2 technology

- ATC Method 2 software is being developed by RCET; includes NetSys/WebSys client and server for secure data upload, download, archiving of volumetric imaging and radiotherapy treatment planning data, a web-based Rapid Image Viewer (RIV) tool, and web-based tools for server administration.
- Software is implemented on a test server at the ITC, and has been undergoing rigorous testing by ITC personnel. Test conducted include:
  - Examination of user interface behavior;
  - Systematic comparison of submitted/retrieved copies of 16 representative test data sets (in DICOM and RTOG Data Exchange format) from nine different treatment planning system vendors.

Develop, Test, and Implement ATC Method 2 technology

- Evaluation tests of version 2.3 of the ATC Method 2 software identified improvements in the usability of software over the previous version, and provided general suggestions for further improvement.
- Tests also identified specific input that led to failure of the WebSys client, usability issues in the RIV tool, database changes needed to support case identifiers in ATC trials, and corrections needed in handling certain DICOM objects.
- Test results have contributed to improvements in version 2.4 of this software in preparation for its use to support clinical trials.
- Version 2.4 is expected to be ready for testing beginning April 2006.
- The NCIC Clinical Trials Group (CTG) has agreed to participate in the new round of testing.
- Abstract submitted to AAPM

Implement ATC Method 1 Technology - QARC

- ATC Method 1 was ported to a Linux workstation at QARC.
- 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 QARC QA process.
  - QARC software was adapted to support RRT invocation directly from the QARC database user interface.
- System now in use for 5 COG, CALGB, and ACOSOG protocols; 27 cases from 15 institutions received & reviewed.
- Project demonstrated that ATC Method 1 can be implemented at other QA centers. However, the effort required was greater than anticipated as the tools must be tailored to each individual QA center's computer infrastructure/QA process.
- Abstract submitted to AAPM

ATC Integrating with Industry

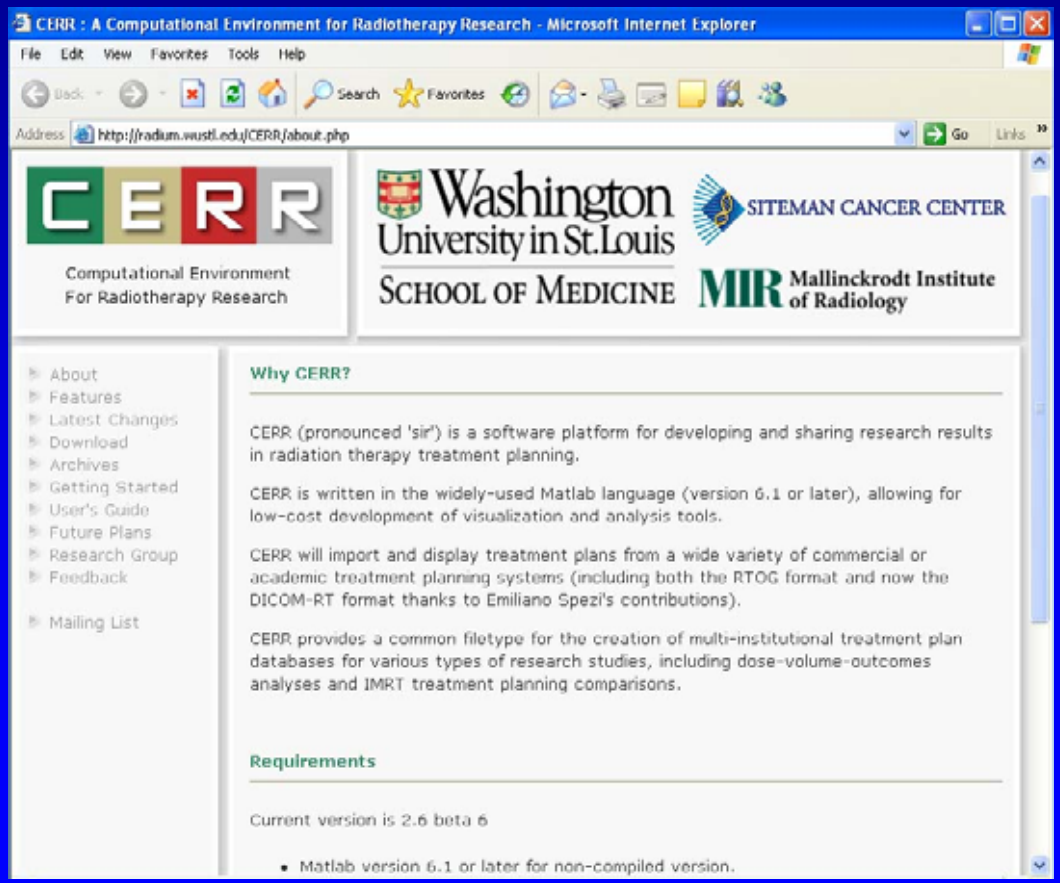
- CMS (ATC Method 1, FOCAL)
- Varian (Provided Eclipse TPS to RPC)
- Hermes
- Cedara
- IMPAC
- TeraMedica (RT PACS at UC Davis)

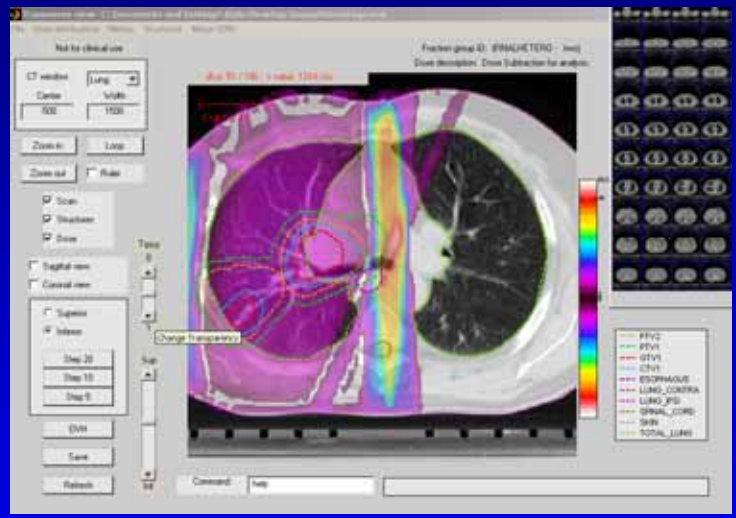
TeraMedica

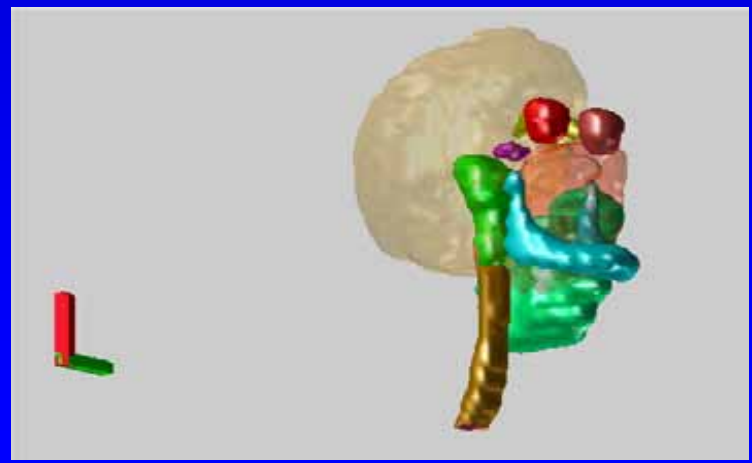
- **ITC is evaluating the use of TeraMedica Evercore as an archive for clinical trials images and RT data.**
  - Evercore v4.0 is now installed on a test server at ITC.
  - Upload/download testing with ITC DICOM test suite is underway.
  - ITC is working with TeraMedica developers to specify a programming interface (API) for object retrieval.

Encouraging Other Groups to Develop Software Tools

- CERR (Computational Environment for Radiotherapy Research)







Encouraging Other Groups to Develop Software Tools

- MINERVA (Modality Inclusive Environment for Radiotherapeutic Variable Analysis) - INL
- PEREGRINE Monte Carlo

- Dose display for an molecular targeted radioisotope therapy plan.
- Dose distribution of an ^{90}Y treatment is overlaid on the CT images of the patients.
- Axial view is chosen.

ITC / WUCON Network Re-configuration

- **Re-configuration is necessitated by changes in Internet connectivity at ITC.**
- **ITC to be integrated into WU Radiation Oncology secure network (part of WU Clinical Operations Network).**
- **Network security policy at WU (and submitting institutions) requires secure upload of patient data.**
- **ITC plans to migrate from FTP to SFTP for data submission**
- **SFTP uses SSH server with restricted accounts:**
  - Non-interactive login with restricted command set
  - Limited file access (user locked into chroot “jail”)
- **Broadly available clients**
  - Windows: Filezilla, WinSCP, WSFTP (recent versions)
  - Linux: sftp, gftp

SFTP Migration Timeline

DATE	MILESTONE
3/1	Server hardware ordered
3/27	Initial publicity to RTOG, NSABP, etc., and on ATC web site
4/21	Software (email, www, SFTP) installed in new servers
4/28	Second notice to protocol participants
5/1	Test SFTP server ready for user configuration tests
5/8	Final tests on production SFTP/HTTPS server
5/15	New email/public web server in production
5/26-29	Move ITC servers and desktops to WUCON private network
6/30	If ITC transition to WUCON is complete, disconnect WUSTL

ATC Challenges/Opportunities

- Increasing protocol workload at ITC
- ITC / WUCON Network Re-configuration
- RT Protocols increased use of imaging
  - PET (quantitative) data import & image fusion QA
  - Image-Guided RT (EPID, MV and kVp Cone beam CT, Helical Tomotherapy megavoltage CT)
  - 4-D CT (several 100 MB)
- Adaptive Radiation Therapy (Daily Confirmation/Adjustment using On-Board Imaging)
- ATC compliant stereotactic radiosurgery or radiotherapy RTP systems

ATC Challenges/Opportunities

- Increased use of ATC Method 1 at QARC
- Successful implementation of ATC Method 2 at ITC and NCIC
- Move of ATC software developmental effort toward integration with industry informatics efforts
- caBIG compliant software
- QARC Grant Renewal 2006
- RTOG Grant Renewal/ATC Grant Renewal 2007

SUMMARY AND CONCLUSIONS

- Strategic planning for the new grant period. (decrease ATC software development effort, focus more on integrating with industry, increase coordination and service role, move to increase effort in outcome analysis).
- Need to develop strategy to prioritize which protocols should utilize ATC resources as we transition to time when we can eventually be able to meet all cooperative group needs (within reason/budget constraints).
- It should be recognized that key elements of ITC-RTOG QA paradigm are based on a volunteer effort. This is becoming more and more problematic.
- Development of new technologies used in to cooperative group studies are a challenge/opportunity for ATC.
- Publication record of ATC members needs to be improved.