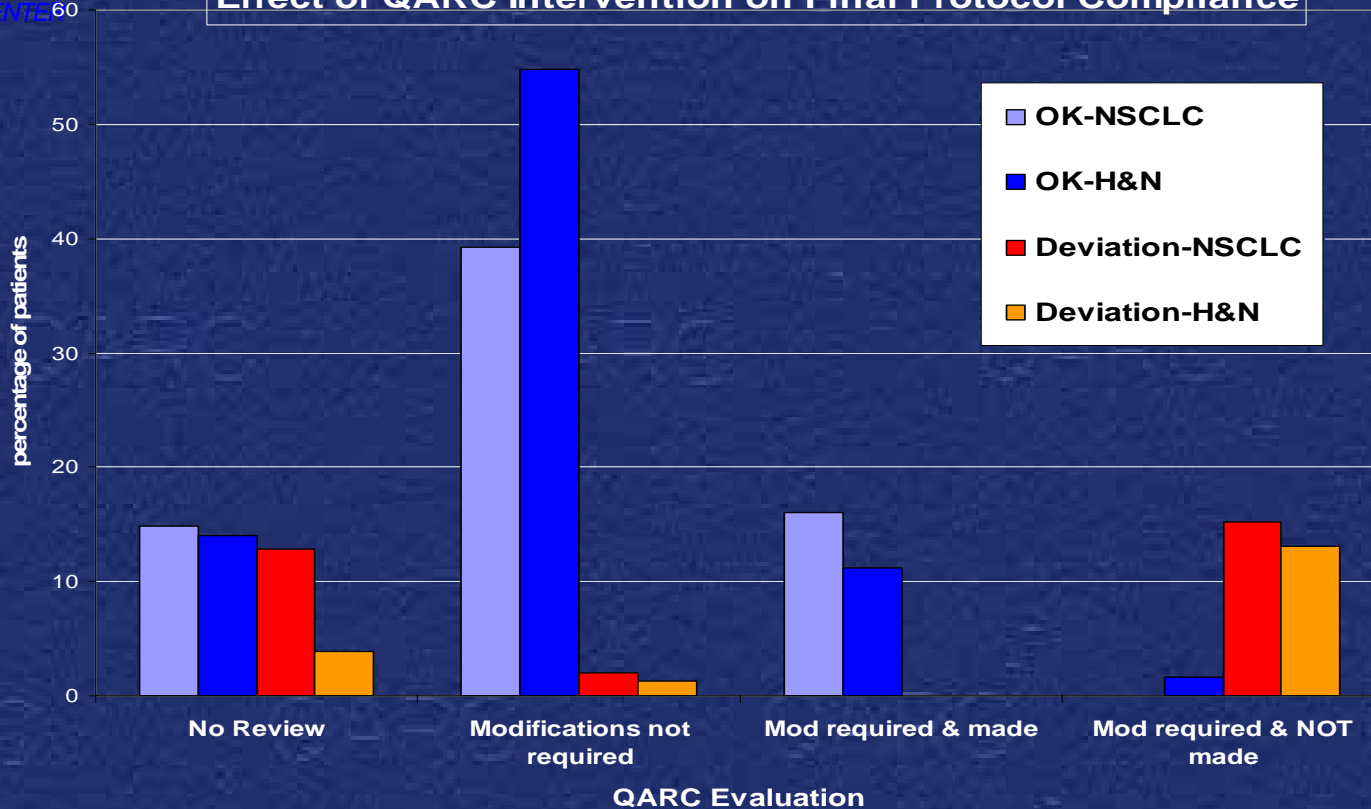


**Effect of QARC Intervention on Final Protocol Compliance**



## Dosimetry Interventional Reviews

<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>
<b>468</b>	<b>474</b>	<b>1054</b>	<b>1501</b>	<b>1210</b>

## Total Dosimetry Reviews

<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>
<b>1662</b>	<b>2259</b>	<b>2073</b>	<b>2849</b>	<b>4613</b>

## EFC4690-Head and Neck Trial

**121 deviations at final review (of 426 patients)**

**42 target volume definition deviations**

**28 dose or dose uniformity deviations**

**50 both volume and dose deviations**

**64% of  
deviations due  
to dose**

**Active**  
**Protocols**

ACOSOG	6
CALGB	12
COG	62
ECOG	19
PBTC	4
SWOG	12
Industry	4

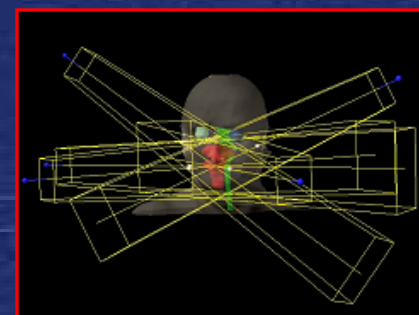
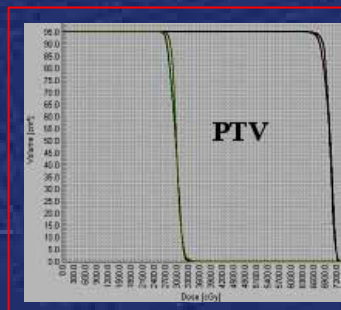
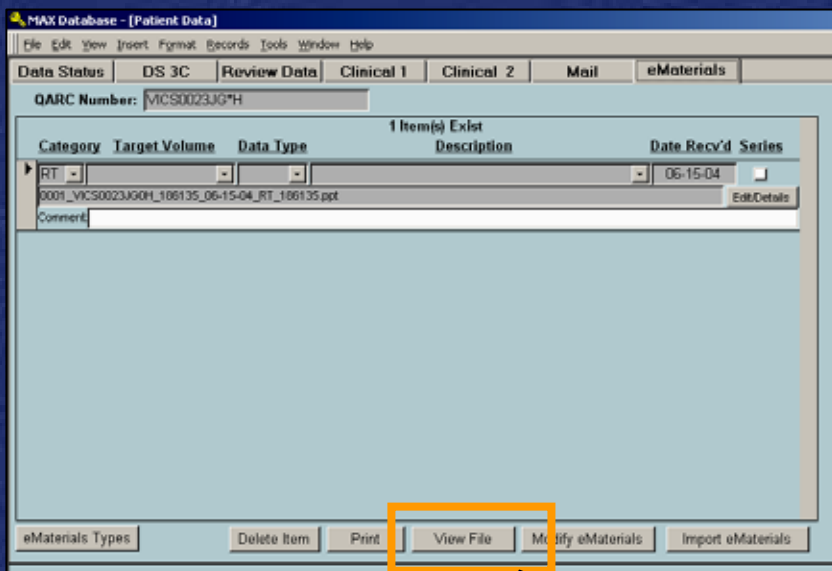
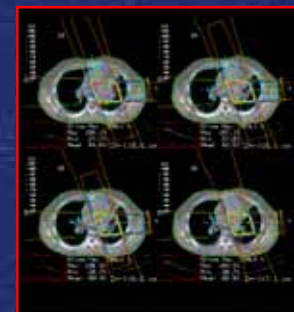
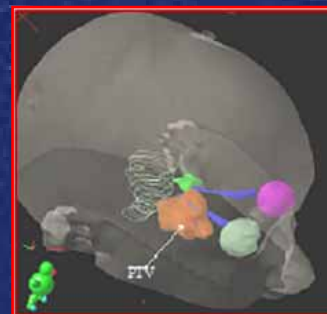
**Total : 119**

**Physics Reviews of Protocols in**  
**Development**

	<u>2003</u>	<u>2004</u>	<u>2005</u>
ACOSOG	2	3	1
CALGB	2	2	1
COG	14	15	20
ECOG	3	4	2
SWOG	8	6	5
Industry	--	2	3
<b>Total</b>	<b>29</b>	<b>32</b>	<b>32</b>

# Screen Captures

- **Imaging Import Wizard** –  
 Transfers RT image data received as jpegs, bitmaps, etc. into PowerPoint files. PowerPoint file linked to patient record in MAX database.



**View File**

# Progress in Digital RT Data Acquisition and Review

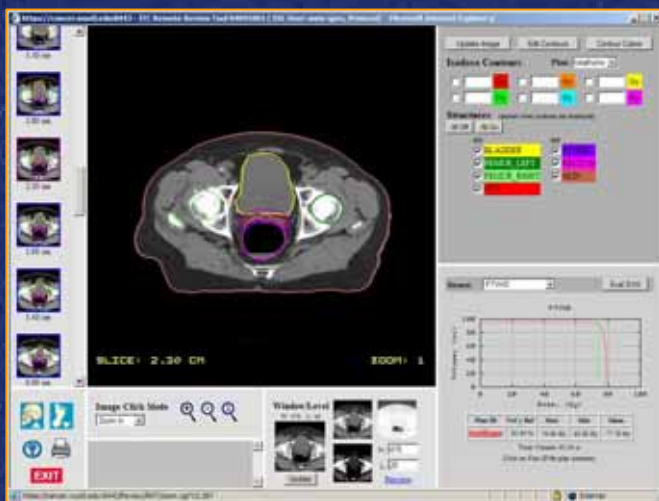
Eclipse Workstation

ITC's Remote Review Tool at QARC

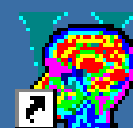
ATC Tools on QARC workstation

CERR (modified by QARC)

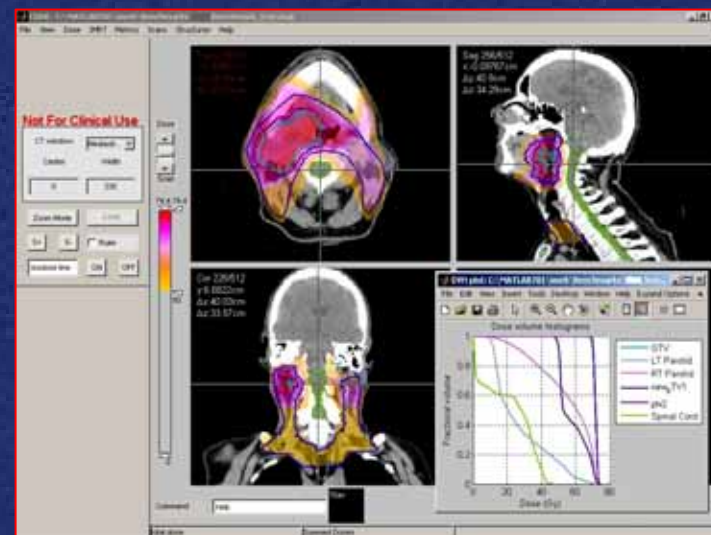
DICOM RT  
or RTOG  
format



Remote Review Tool



Eclipse



CERR

## Collaboration with ATC during current grant cycle

### ➤ **Credentialing**

- 3D
- IMRT
- Prostate Brachytherapy

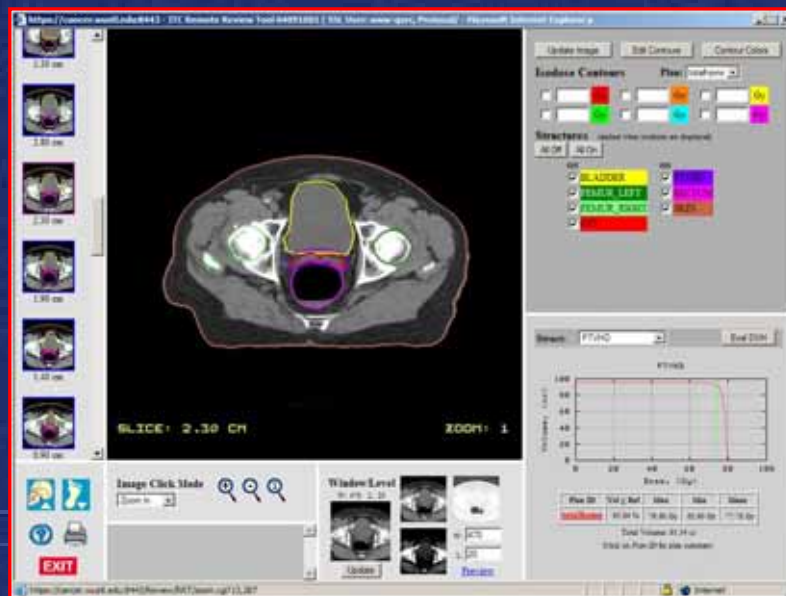
### ➤ **Digital Data Transfer**

- ACOSOG Z0070: Digital data submission encouraged using ITC
- Testing of Web-based uploading of RT data and imaging



## Collaboration with ATC during current grant cycle

- **Digital Data Submission using ITC tools at QARC**
  - Initially 8 COG institutions invited to submit patient data on 3 COG protocols while QARC staff were being trained to import data
  - Currently all institutions encouraged to submit RT data on 3 COG, 1 CALGB, and 1 ACOSOG protocols
  - 27 patient RT data sets received from 15 institutions



Remote Review Tool  
screen

## Collaboration with ATC during current grant cycle

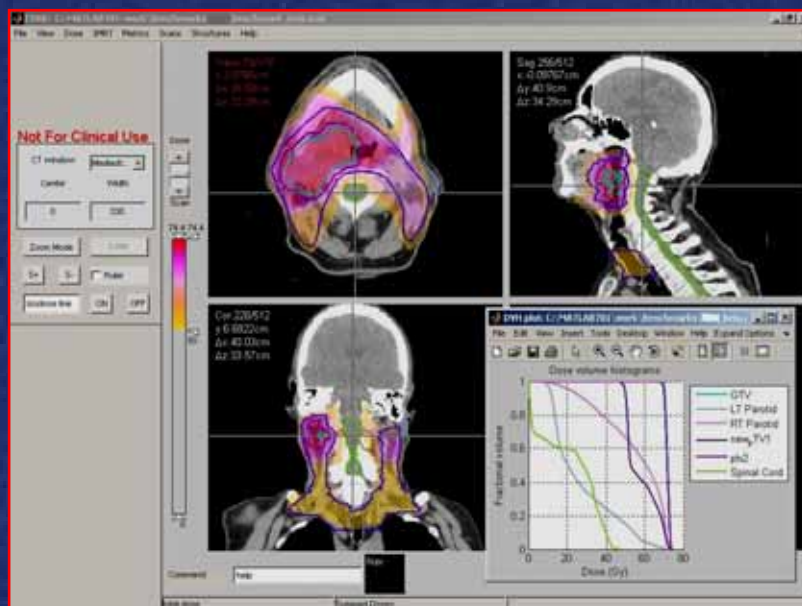
### ➤ **Digital Data Transfer**

- **Digital Data Submission using** Workstation and 2 monitors were installed at QARC
- Agreement was reached to install ITC's Remote Review Tool (RRT) at QARC.
  - Linux server was purchased in June, 2004.
  - System functions as web-based tool with local access only.
  - Remote Review Tool software installed remotely by ITC personnel  
(Walter Bosch and John Matthews).
  - FTP site established at QARC; data archiving established at QARC.
  - Modifications to import procedures for QARC utility.
  - Link in QARC's database to the Remote Review Tool for viewing directly from patient record in QARC's database.



# Digital Data Submission and Review using CERR at QARC

- **CERR**: A Computational Environment for Radiotherapy Research
- Open source code (Matlab)
  - J. Deasy/ E. Spezi modified by **K. Ulin**
- Not designed to be protocol specific, templates not required
- Sagittal and coronal planes available for dose review



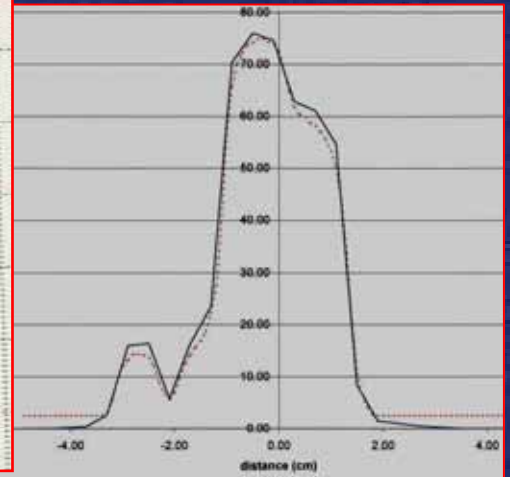
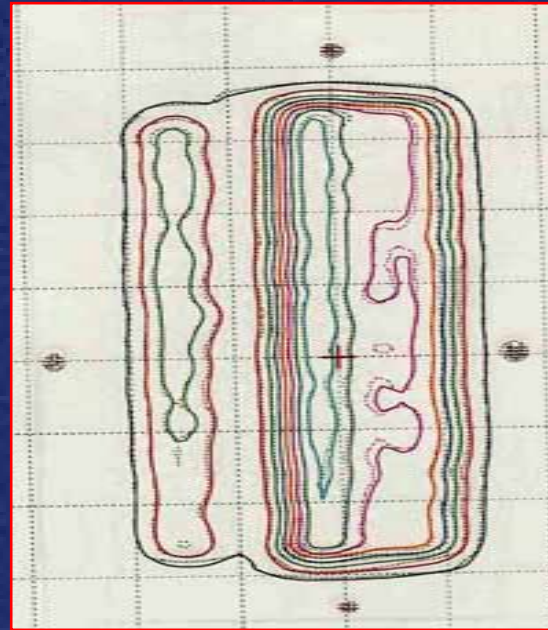
CERR screen

# QARC Benchmarks

	<b>reviewed</b>		<b>total</b>
	<u>2004</u>	<u>2005</u>	<u>reviewed</u>
3D	87	76	465
Prostate brachytherapy	2	0	43
TBI	4	8	110
COG "package"	44	44	1200
CAX Blocked, Wedged Flds, Irreg, CSI	(11 X 4)	(11 X 4)	(300 x 4)
IMRT	27	70	133
Mixed Modality	0	0	88
Stereotactic (questionnaires)	7	0	65
Image Fusion	--	6	26
Proton	--	1	1
CT-based Head&Neck	---	48	53
<b>total:</b>	<b>171</b>	<b>253</b>	<b>2184</b>

# IMRT Benchmark

Verify by measurements in a phantom that the delivered dose agrees with the calculated dose



Currently: 124 approved; 9 on hold

79% approved on first submission

# NCI Guidelines for IMRT

in all clinical trials groups

(developed in 2002; revised in 2005)

Every Institution must complete either:

➤ QARC IMRT benchmark

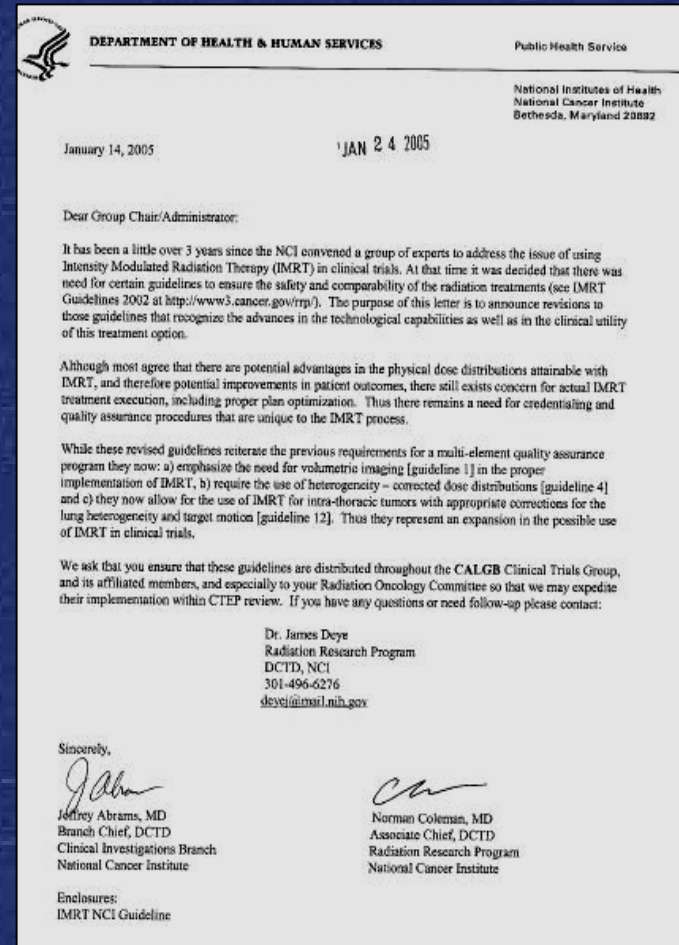
OR

➤ IMRT phantom from RPC

(required primarily by RTOG)

Reciprocity with RPC for IMRT credentialing

Currently RTOG protocols moving to acceptance of QARC benchmark,  
i.e. not requiring phantom measurements



# CT/MR Fusion Benchmark

- Currently 31 benchmarks  
 received from 10 software systems.
- Acceptability criteria established  
 based on results of the first 17 submissions.

Registration Method	# of Benchmarks	Average Error (mm)
automatic	16	1.6
automatic and manual	3	2.3
manual	8	1.7
match points	4	1.6
Overall	31	1.7
1 S.D.		1.9

# ***QARC Digital Image Management System***



# QARC Digital Image Management System - Overview

- QARC has evolved its IT infrastructure to create an environment that can successfully manage digital DICOM imaging through...
  - developing sophisticated image transfer software (Dicommunicator)
  - evolving a comprehensive patient database into a full multi-institutional PACS
  - adapting IT environment to accommodate the different interpretations of the DICOM standard presented by various PACS vendors

# Dicommunicator

- Dicommunicator software is installed at remote institutions to help CRAs submit digital imaging to the Quality Assurance Review Center (QARC) in Providence, RI
  - Users can either email imaging directly to QARC, or burn to CD and submit
- Dicommunicator is also a core component for managing digital imaging at QARC
  - Used to import imaging into QARC PACS Archive and link to patient record
  - Used as a viewer for patient reviews

# Dicommunicator - Remote

- Originally developed and donated to COG by Dr. Keith White of Primary Children's Medical Center in Salt Lake City, UT
- Collaboration with QARC since 1999
- Allows the CRA to 'Pull' or 'Push' DICOM imaging from PACS to local system
- Anonymizes / Encrypts images before they are sent via email or burned to a CD
- Helps the CRA keep track of which studies have been sent to QARC

# Accomplishments

- 25 total “Fully Functional” institutions
- 7 Pending Installations
- Full Functionality with 8 major PACS manufacturers
  - Agfa, Fuji, GE, Integrad Web, Kodak, Philips, Siemens, Stentor
- Over 12,000 digital DICOM studies have been archived in the QARC PACS

# Dicomcommunicator At QARC

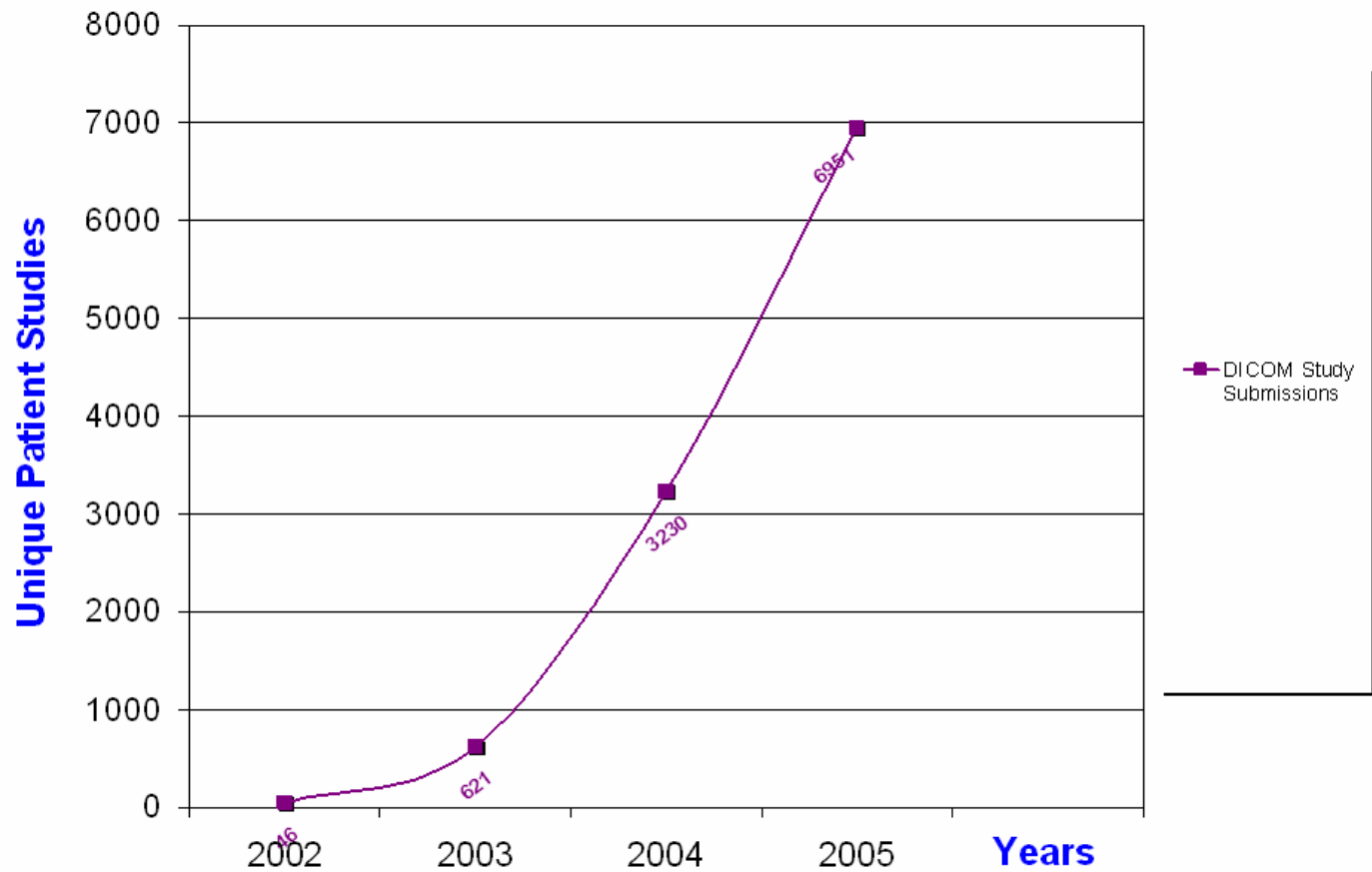
- Dicomcommunicator development and support at QARC have become a critical component in managing digital imaging
- Software is used at QARC to import imaging into PACS archive and link to patient database
  - Imaging can be imported from any media or transmission vehicle (eg CD, DVD, email)
- Physicians can review DICOM imaging directly from the patient record in the QARC database

# Trends

- QARC has seen a dramatic and steady increase in digital versus analog data submission in recent years
- Consistent submission of DICOM studies via Dicomcommunicator, saving institutions time and money
- Shift of work from institution to QARC
  - Imaging is generated by many different PACS manufacturers, each enlisting their own interpretation of the DICOM standard
  - QARC often needs to “manipulate” images to view / import them into the QARC PACS



## QARC DICOM Study Submissions



# Dicommunicator .NET web viewer

- QARC CRA can post anonymized, digital DICOM imaging to a secure web server for access by reviewers off-site
- Physicians can authenticate into the imaging area of the QARC website using an assigned username and password
- Each user is given an access key to view imaging for those protocols s/he is reviewing
- Physicians use the Dicommunicator .NET web viewer to remotely review the imaging using the provided image navigation and manipulation tools
- Dicommunicator .NET web viewer has been developed by Keith S White, MD

Quality Assurance Review Center - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Recycle Bin Mail Print Mail News RSS Options

Address <http://www.qarc.org/> Go Links >>


Google Search ABC Check Look for Map AutoFill Options

# QARC

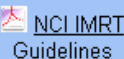
QUALITY ASSURANCE  
REVIEW CENTER

## Quality Assurance Review Center

- Home
- History
- Mission
- Benchmarks
- ACOSOG
- CALGB
- COG
- ECOG
- PBTC
- SWOG
- Sanofi
- RT Forms
- Digital Data
- Industry
- Links
- Staff



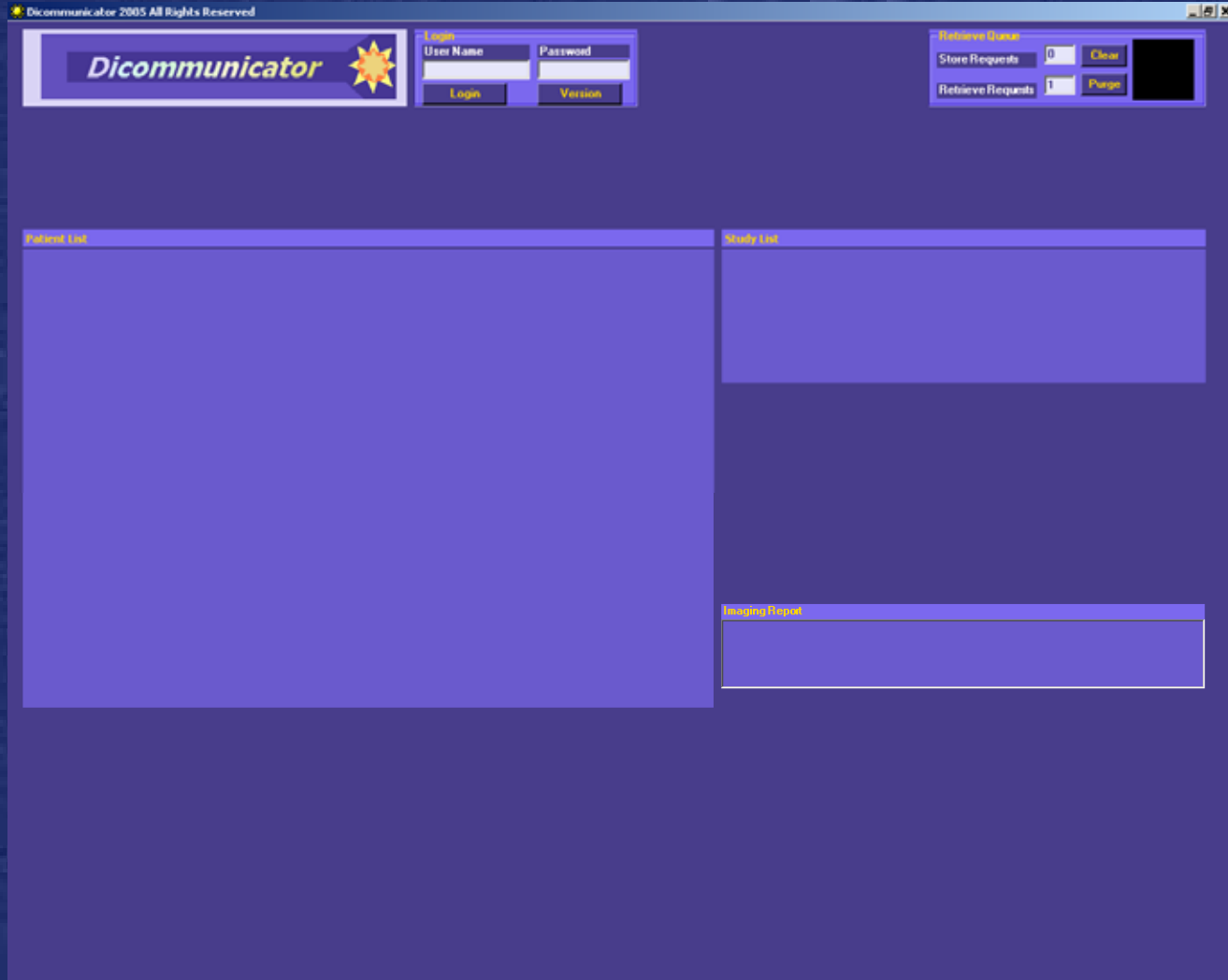
**Quality Assurance Review Center**  
272 West Exchange Street, Suite 101  
Providence, RI 02903-1025  
Phone: (401) 454-4301  
Fax: (401) 454-4683

 [NCI IMRT Guidelines](#)

Welcome to the Quality Assurance Review Center (QARC). We are a research program within the [University of Massachusetts Medical School](#) providing radiotherapy quality assurance and diagnostic imaging data management services. This is a nationally and internationally recognized program serving the [National Cancer Institute](#) (NCI) sponsored cooperative groups and the pharmaceutical industry for over three decades.

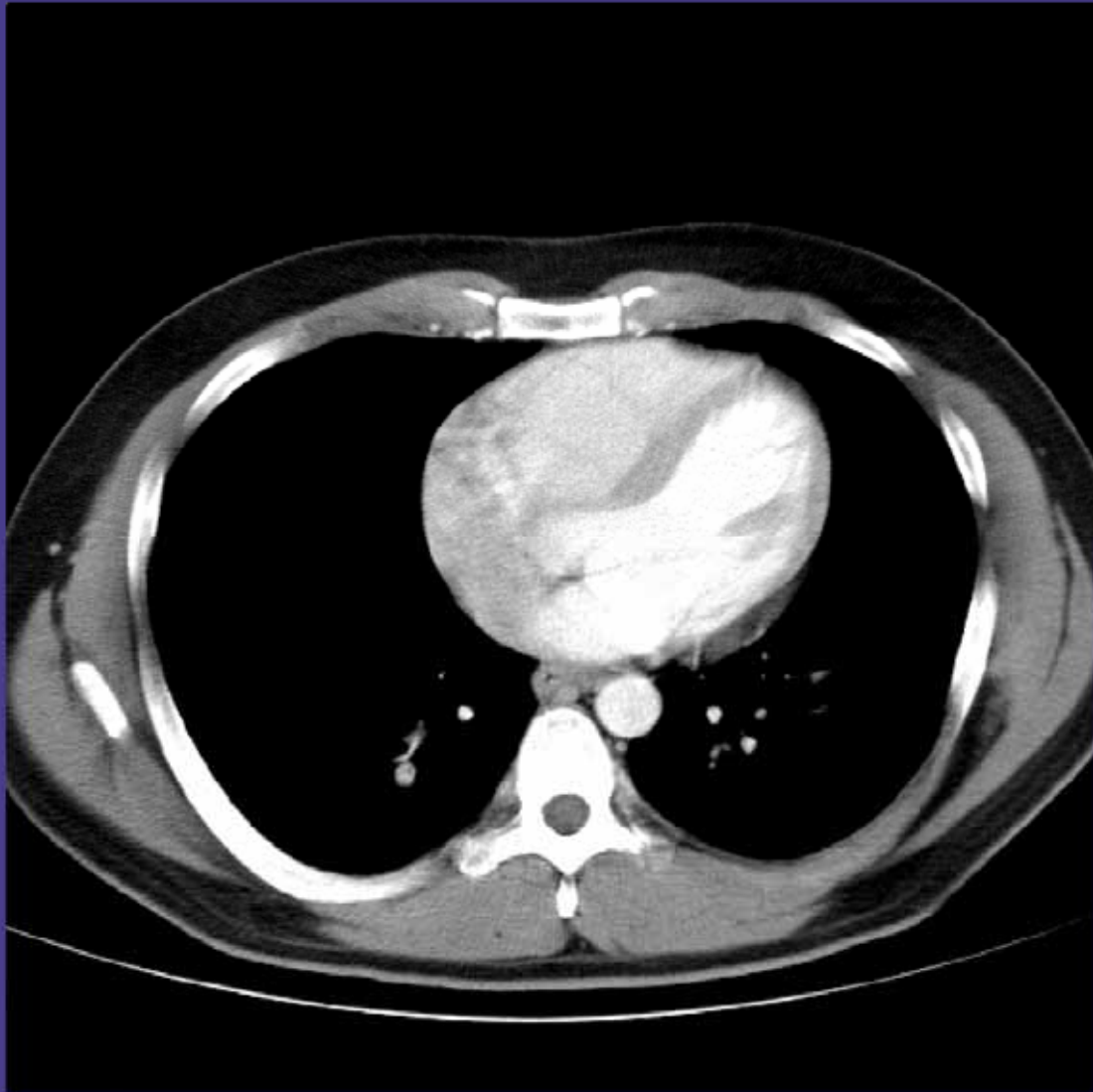
Internet

<http://www.qarc.org>



**Dicommunicator .NET Login Screen**

Single Viewer



**Communication Views**

Patient Name  
Patient ID

**Display Control**

Study Description (1/1)  
08/28/02 SCAN ABDOMINO-PEL

Accession Number (1/1)  
RA200221861301

Page 1 of 1

Series  
Series: 7835

Presets Hanging Format  
T:1

**Tool Box**

Mouse Tool Scope  
Win/Lev Series

**Functions**

Send Images View Report  
Copy

**Navigation**

Back  
DualDisplay

# Dicommunicator .NET Web Viewer