Manage TPS in Research and Education

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Objectives:

- Understanding the different requirement for non-clinical
- Gain enough knowledge/skills for own practice

Outline:

- Special Requirement
- Typical setup
- Data Sharing
- Protocol and Template sharing
- Backup/Restore
- Upgrade

- Training Steps
- Clinical Protocol Accreditation and Submission

Why do we need it?

- Education
  - Medical physics graduate students
  - Medical physics residents
  - Medical physics PostDocs
  - Medical residents
- Beta site
  - Site visitors
  - New version/feature trials
- Clinical Research
  - Phantom study
  - Patient research

Special Requirement

- Not for clinical use
- No or limited service support

- Full functionality
- New technique trials
- Mimic/use real clinical environment
- Some degree of isolation from clinical
- Access requirement
  - Large number of users
  - Simultaneous access in limited time
  - Error prevention
  - Crash frequently

Typical Setup

- Vendor supplied the research/education only workstations
  - Typically single workstation/server setup
  - Full functionality
  - No clinical patients can be planned and treated
- Dedicated partial isolation from clinical use
  - institution/department/patients level
  - commissioned machine level
- Mixed use
  - Same commissioned machine
  - Separate plan/trials or course/plans

User management

- Generic account
  - Easy to manage
  - Dedicated user for students
  - Student can easily share
- Individual account
  - Take time to manage users
  - Especially disable user after graduation
  - Student still can access other's plan

Test Plan

- Plan starting point
  - Dicom Image + Contours
  - Partially finished plan
- Plan Evaluation
  - Reference plan
  - Dose constraint
  - Evaluation discussion
- Clean up
  - Delete interim/non-ideal test plan
  - Delete all plans after graduation
  - Disable account or delete account

Backup and Recovery

- Dedicated system
  - System backup after upgrade
  - Sample patient, plan or imaging data
  - User plan can be deleted after completion
  - Eclipse, clone the whole disk after setup
  - Pinnacle, ufsdump/ufsrestore also works
  - User should be responsible backup own plans

- Shared system
  - System backup as part of clinical use
  - only sample patient, plan or imaging data need to backup separately from clinical one
  - User test plan should not be included in clinical backup, individual plan backup can be done be user.

Upgrade

- Dedicated system
  - Typically install fresh new system
  - Restore the commissioned machines
  - Restore the sample patients as needed
- Shared system
  - Test if the backup can be restored to new version
  - Finish clinical upgrade first
  - Create required isolation
  - Restore the machine and sample patient as needed

Patient Data Sharing

- Non-clinical to clinical
  - Not supported
- Clinical to non-clinical
  - Anonymize might be needed

- Same system different version
  - Eclipse
  - Pinnacle
- Different system
  - Pinnacle to Eclipse
  - Eclipse to Pinnacle
  - BrainLab to Pinnacle

- Same institution
  - Redundancy reduction
- Different institution
  - HAPPA issue

Protocol and Template Sharing

- Pinnacle
  - Protocol is a group of script,
  - Can be copied, edited and loaded
- Eclipse
  - Template is xml file
  - Can be exported and imported
  - Be aware of version difference, always double check.

Why do physicists need planning training?

- When short of dosimetrist staff
- Emergency case without dosimetrist support
- Difficult cases that dosimetrist have not time to handle
- New program setup
- Plan check/Chart Check
- Some junior physicist position with job duty as planner

Graduate Student Training Steps

- Didactic Lecture
  - Planning principles
    - Beam setup for comformality and gradient
    - Dose algorithms
    - Optimization algorithms
  - Planning process
    - Imaging, contour, Rx, plan, evaluation
  - Typical approach for disease site
    - Bilateral whole head, Tangential breast, CSI, etc
- Hand-on lab
  - TPS operation
  - Sample patient for typical disease sites

- HDR/SRS/TBI/TSEI planning?
- Commissioning ?

Physics Resident Training Steps

- Phantom study --- find the TPS planning options and limitations
  - TG-119 test case
  - RTOG dry run case
  - RTOG phantom study
- Typical training test case --- clinical planning skill
  - Sequence: prostate, lung, brain, breast, head&neck
  - Case number: how many is enough?
  - planning need to consider simulation and treatment
- Uncommon training test case --- experience to handle difficult cases
  - Metal artifact: like prosthesis, breast expander, dental filling
  - Simulation mistake: arm in beam, non-bladder control, object on patient
  - Dose limiting: pacemaker/ICD, fetus, gonad
  - Electron: small field, large oblique, extended SSD, backscatter for keloid
  - Breast: Flash, breast expander
  - Nose/extremities: water, rice, bolus
- Real life patient plan --- under pressure
  - Simulation error
  - Non-ideal image quality
  - Non-realistic contour
  - Time pressure
  - Compromise of coverage and OAR
  - Interaction with MD
- Projects development --- integrated process
  - New program setup
  - New patient specific QA device
  - RTOG protocol accreditation

Physics Resident Training Steps

- Phantom study --- find the TPS planning options and limitations
  - TG-119 test case
  - RTOG phantom planning
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- Typical training test case --- clinical planning skill
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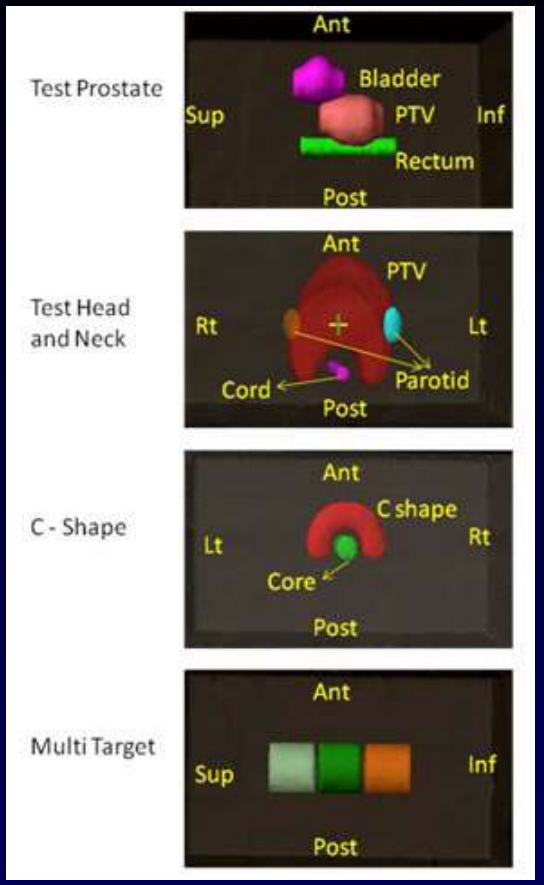
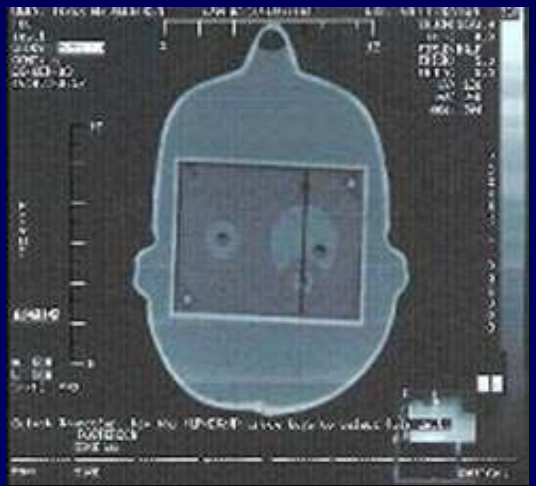




Physics Resident Training Steps

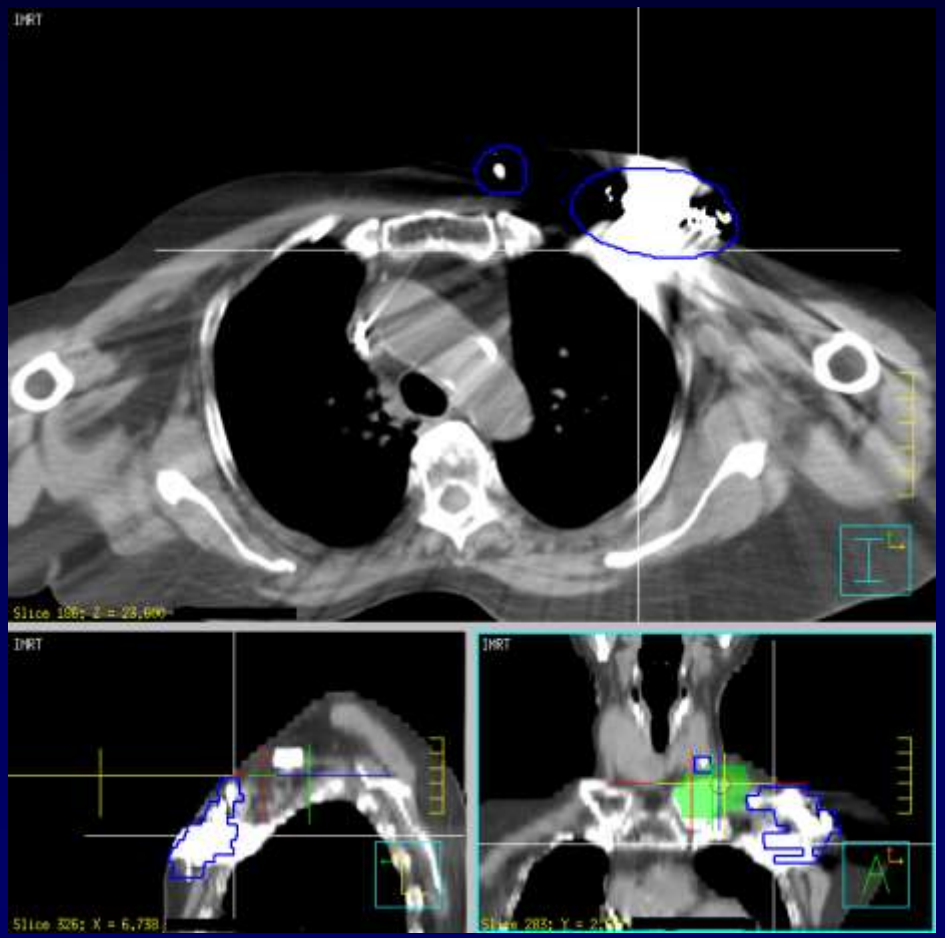
- Uncommon training test case --- experience to handle unusual cases
  - Metal artifact: like prosthesis, breast expander, dental filling
  - Dose limiting: pacemaker/ICD, fetus, gonad
  - Electron: small field, large oblique angle, extended SSD, backscatter for keloid
  - Breast: Flash, breast expander
  - Nose/extremities: water, rice, bolus
  - Simulation mistake: arm in beam, non-bladder control, object on patient, accessory/setup error
  - Treatment consideration: couch kick clearance, electron cone clearance, couch side rail/bar, gantry angle sorting

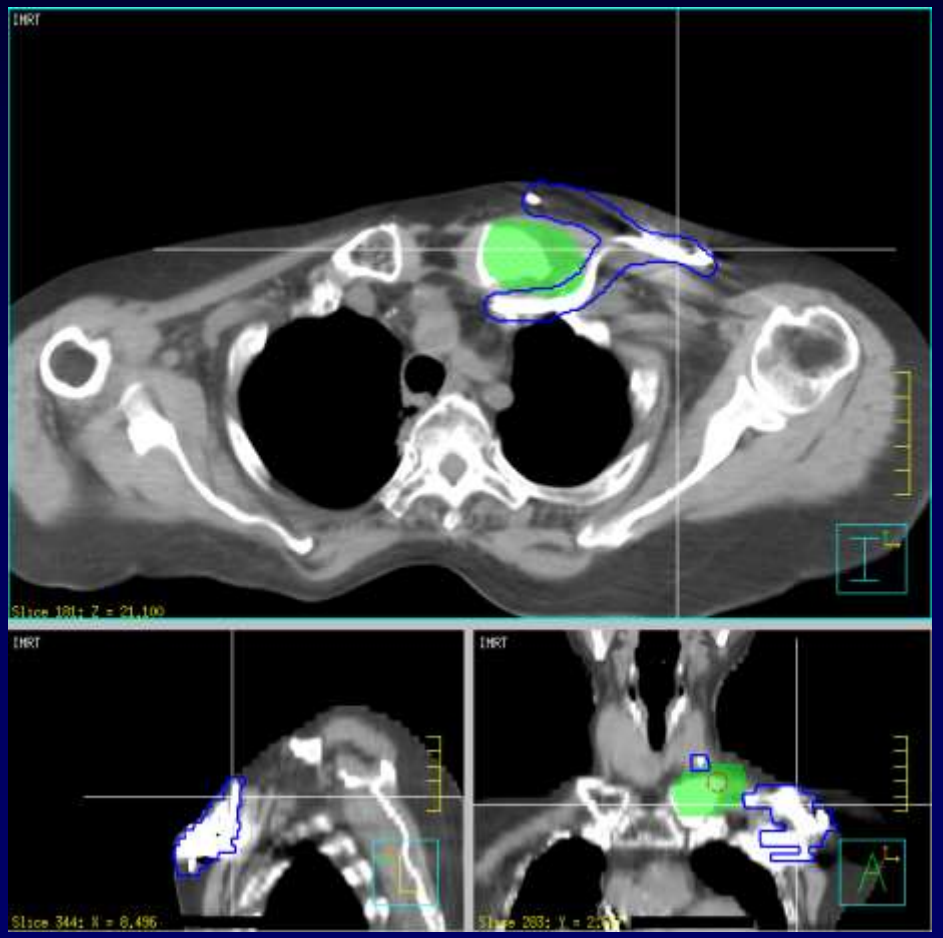
Physics Resident Training Steps

What is the bright object?

Pacemaker.

AAPM TG-34, Management of Radiation Oncology Patients with Implanted Cardiac Pacemakers



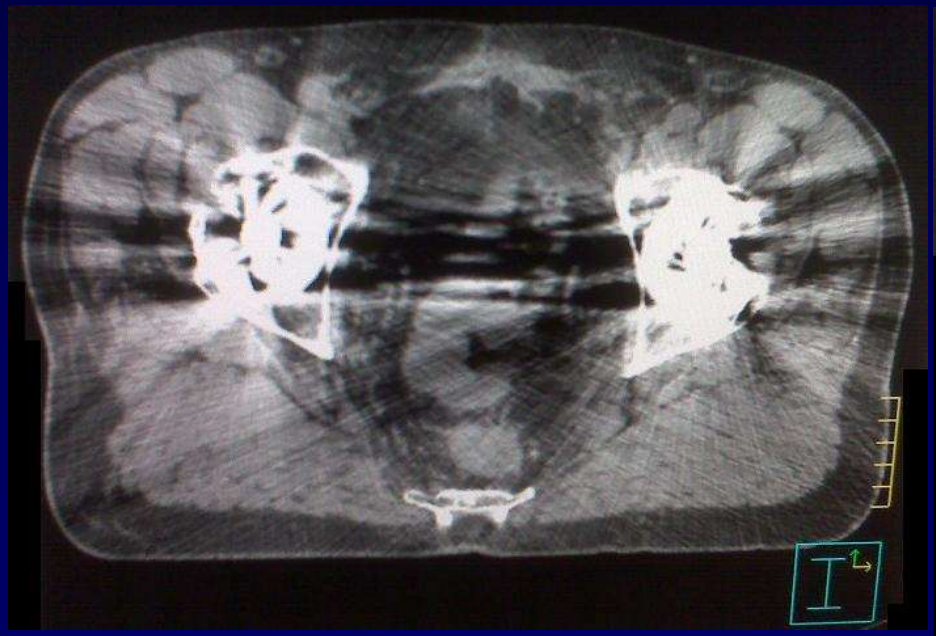


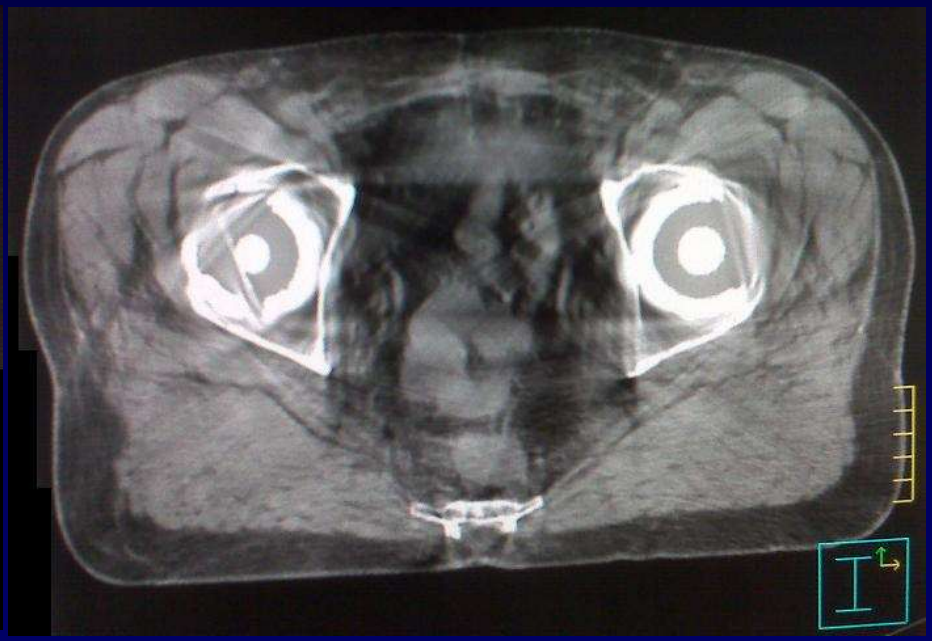
Physics Resident Training Steps

What is the bright object?

Prosthesis.

AAPM TG-63; Dosimetric considerations for patients with HIP prostheses undergoing pelvic irradiation.

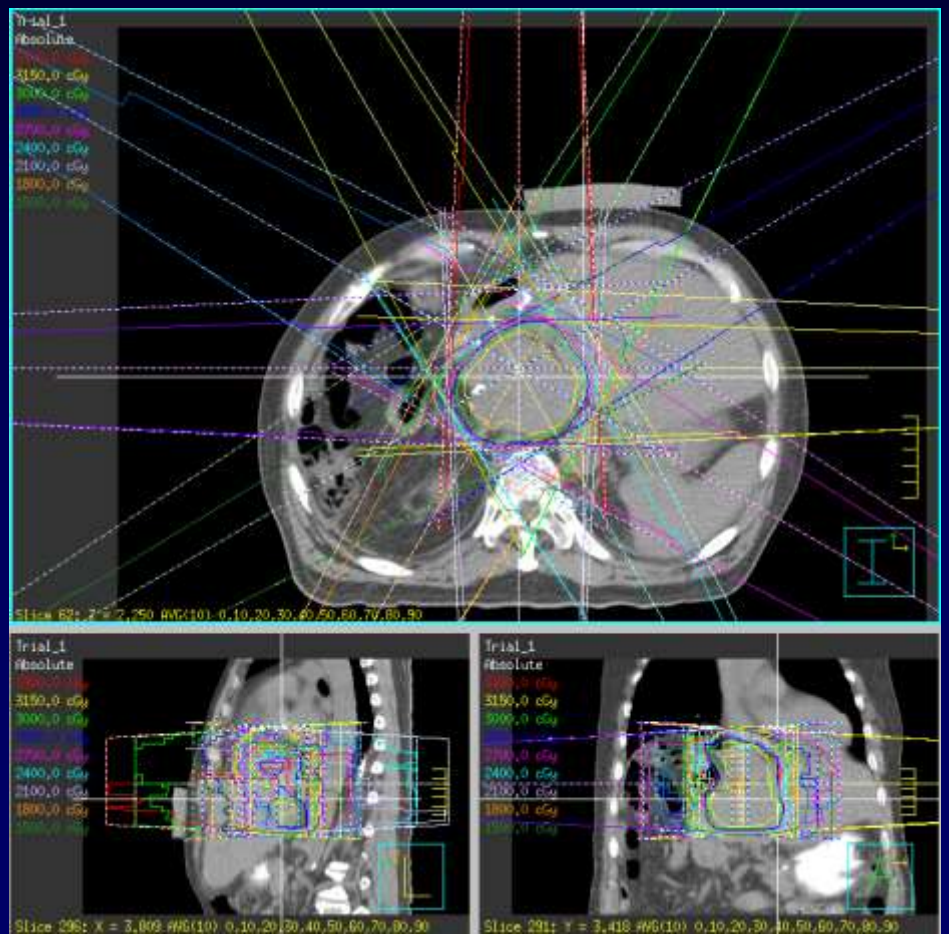
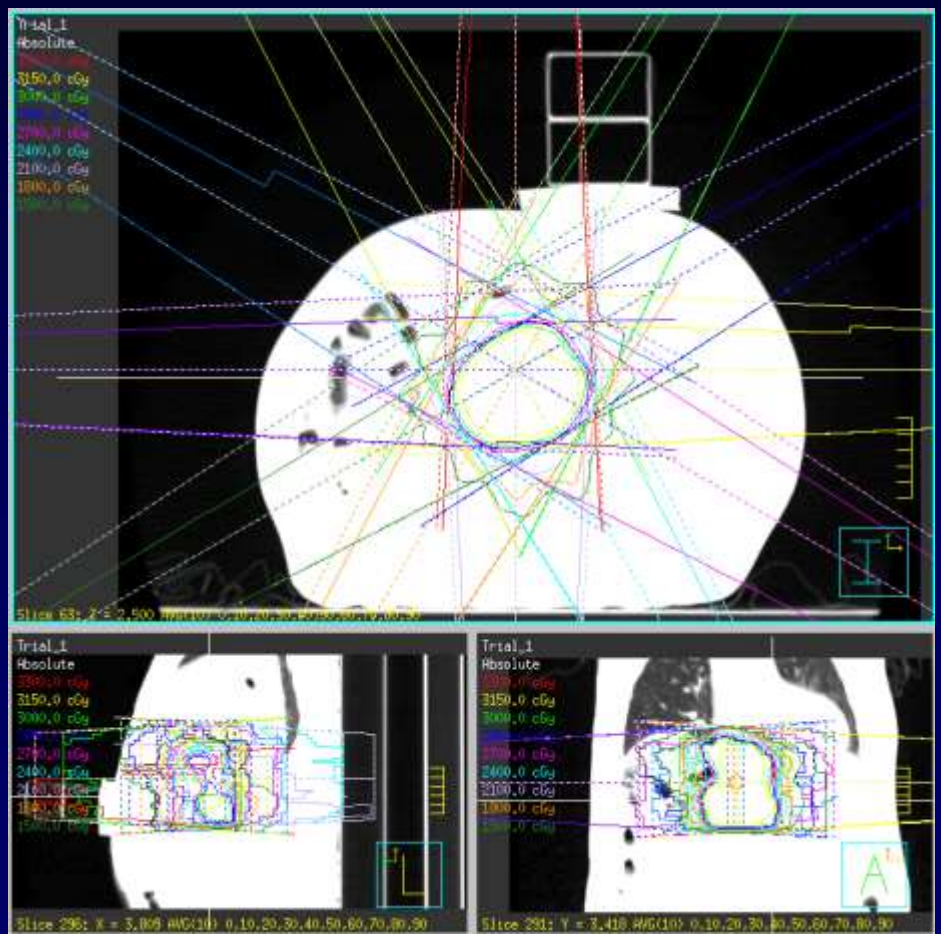




Physics Resident Training Steps

What is the extra object on top of abdomen?

A bolus slab was put on patient abdomen, and RPM tracking reflector was taped on top.

Physics Resident Training Steps

What is the dark area?

Super stuff bolus?

Physics Resident Training Steps

- Real life patient plan --- under pressure
  - Simulation error
  - Non-ideal image quality
  - Non-realistic contour
  - Compromise of coverage and OAR
  - Time pressure
  - Interaction with MD
  - Schedule coordination with physicist and therapist
- Projects development --- integrated process
  - New program setup
  - New patient specific QA device
  - RTOG protocol accreditation
  - Commissioning
  - Upgrade QA

Clinical Protocol Accreditation

- NRG Oncology
  - NSABP
    - The National Surgical Adjuvant Breast and Bowel Project
  - RTOG
    - The Radiation Therapy Oncology Group
  - COG
    - The Children's Oncology Group
- ACOSOG
  - American College of Surgeons Oncology Group
- NCCTG
  - North Central Cancer Treatment Group

Clinical Protocol Accreditation

- ATC
  - The Advanced Technology Consortium
  - ITC
    - Image-Guided Therapy QA Center
    - Washington Univ
  - RTOG
    - Radiation Therapy Oncology Group
  - RPC
    - Radiological Physics Center
    - M.D. Anderson
  - QARC
    - Quality Assurance Review Center
    - University of Massachusetts

Clinical Protocol Accreditation

- Typical RTOG Procedure
  - Facility Questionnaire
    - PART I (General Information for 3D-CRT and IMRT)
    - PART II (IGRT)
    - PART III (Heterogeneity Corrections and Motion Management)
  - RPC OSLD Machine Monitor Results
  - RPC Phantom Dosimetry Test
  - Dry Run Test Case
  - IGRT Credentialing
  - Rapid Review Case
  - Protocol Patient Case

RTOG Data Transfer

- ITC_DICOMpiler.exe can downloaded from itc.wustl.edu, AE Title is ITC_STORESCP
- Setup export filter (DICOM Storage Service) in Eclipse or DICOMAddSCP in Pinnacle
- Export DICOM data as regular patient, include Dicom image, RT image, structure, plan, dose.
- Anonymize and rename to string constructed from Protocol Sponsor, ID, Case Number, Initials
- sftp to ITCsubmit.wustl.edu, each institution has separate sftp account
- Filled out DDSI form to inform ITC the data, http://atc.wustl.edu/forms/DDSI/ddsi.html

RTOG Data Transfer

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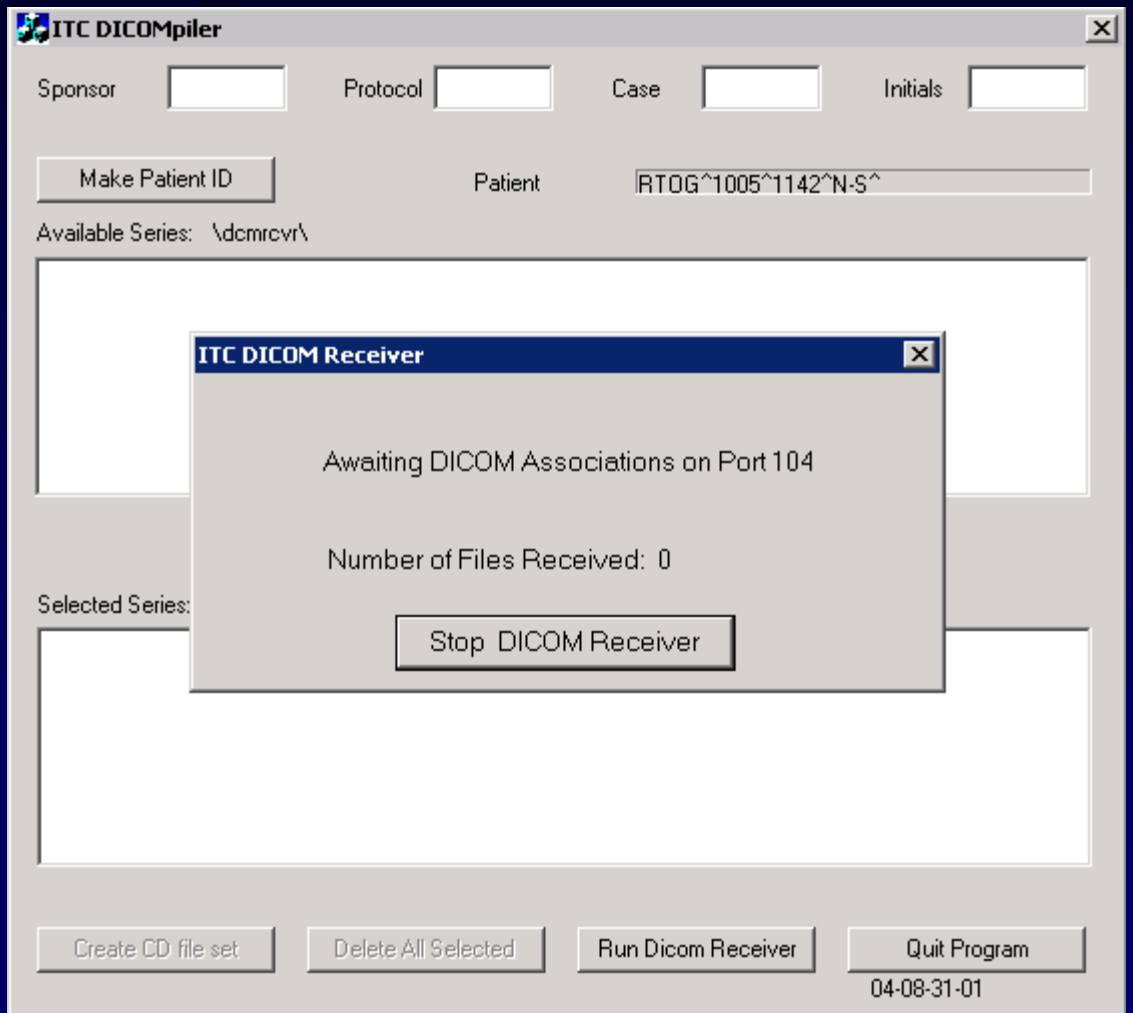
  - AE Title is ITC_STORESCP
  - port 104

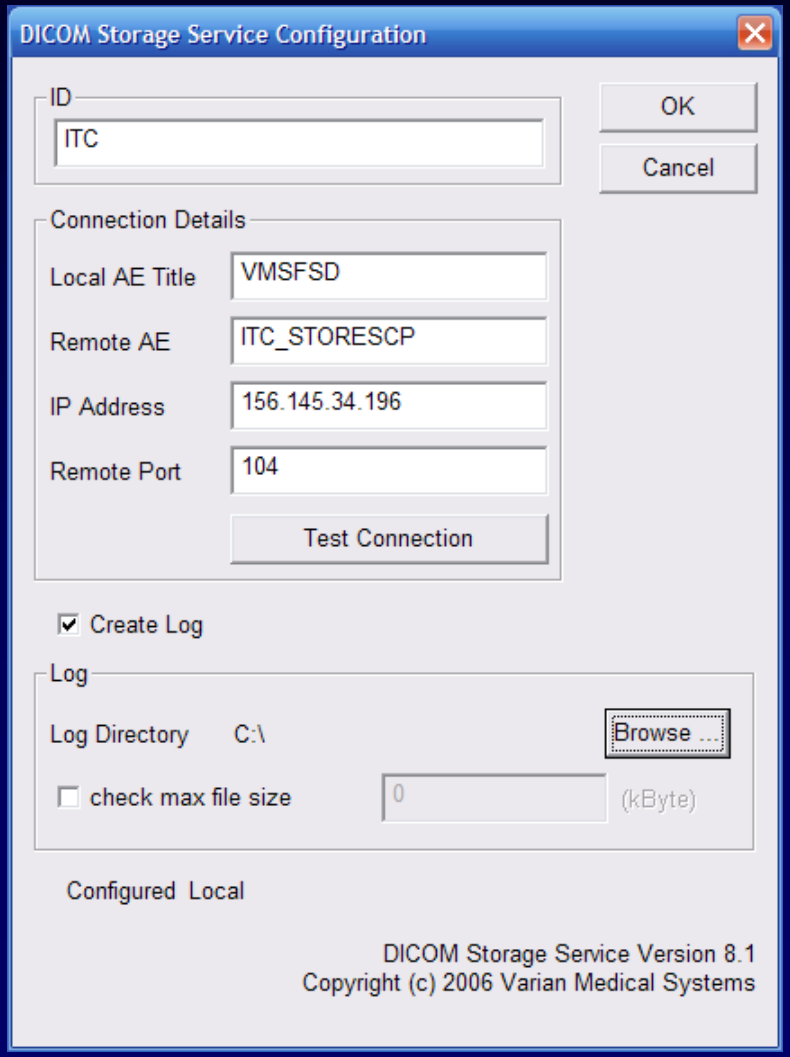


RTOG Data Transfer

- Setup export configuration in Pinnacle
  - Binary directory
    - /usr/local/adacnew/PinnacleStatic/bin/common
  - list all available dicom node
    - DICOMRemoveSCP
  - Add one dicom node
    - DICOMAddSCP -rd ITC_STORESCPCU 156.145.34.196 104
  - Test dicom connection
    - Ping 156.145.34.196
    - DICOMEcho ITC_STORESCP 156.145.34.196 104
    - /usr/local/adacnew/DICOMStatic/bin/common/DICOMSend10 ITC_STORESCP *.dicom

RTOG Data Transfer

- Setup export filter (DICOM Storage Service) in Eclipse



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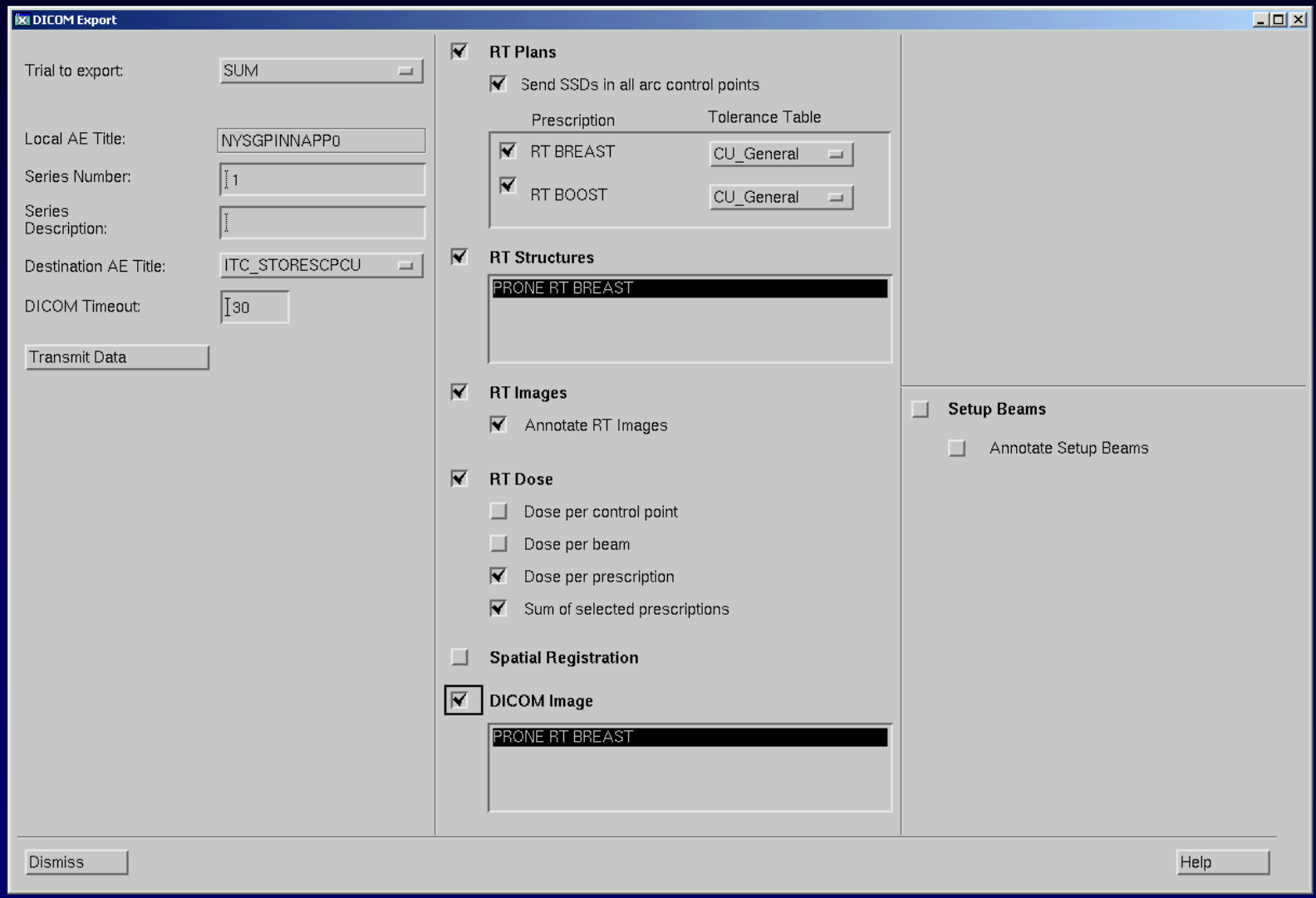

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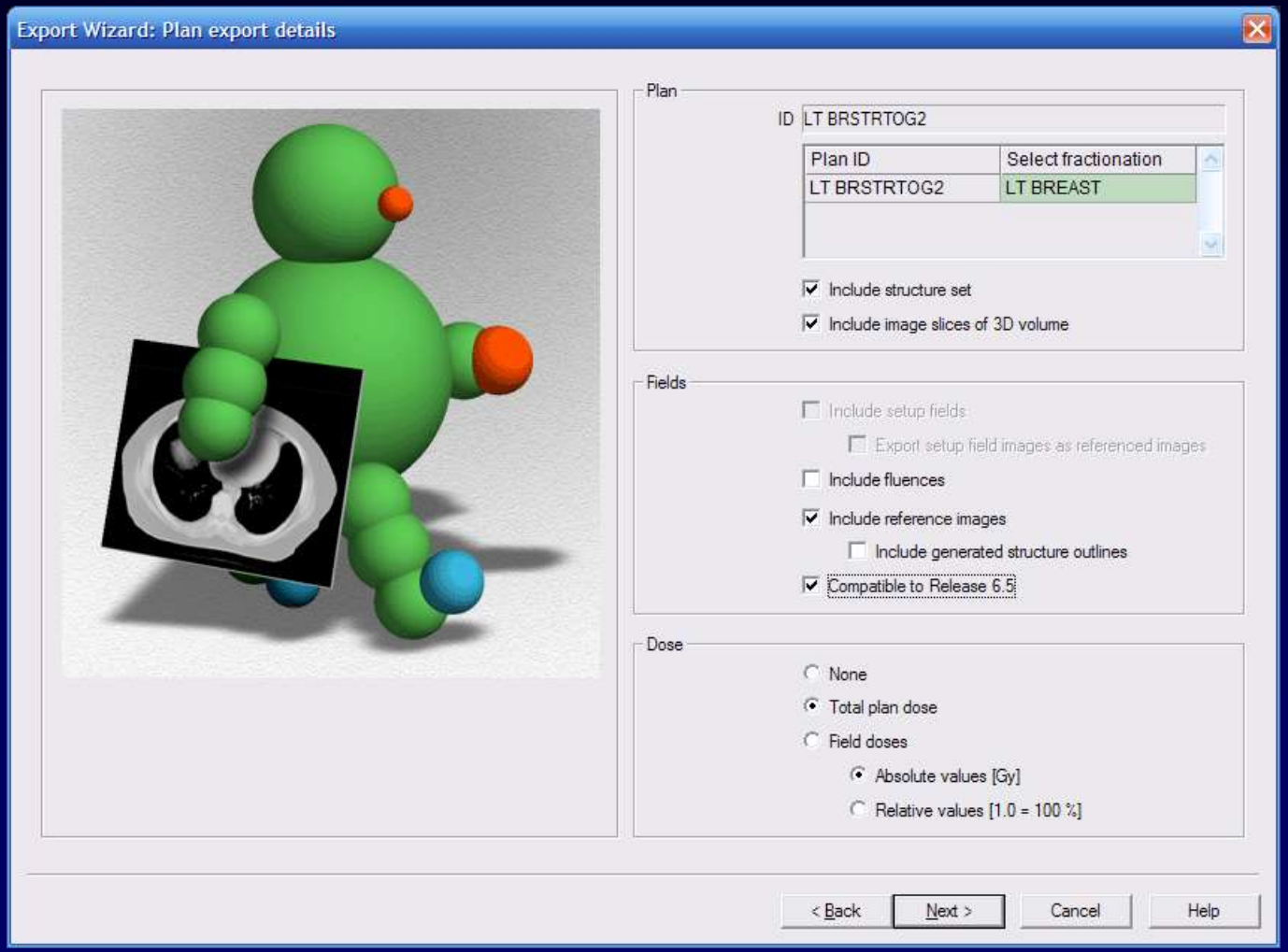

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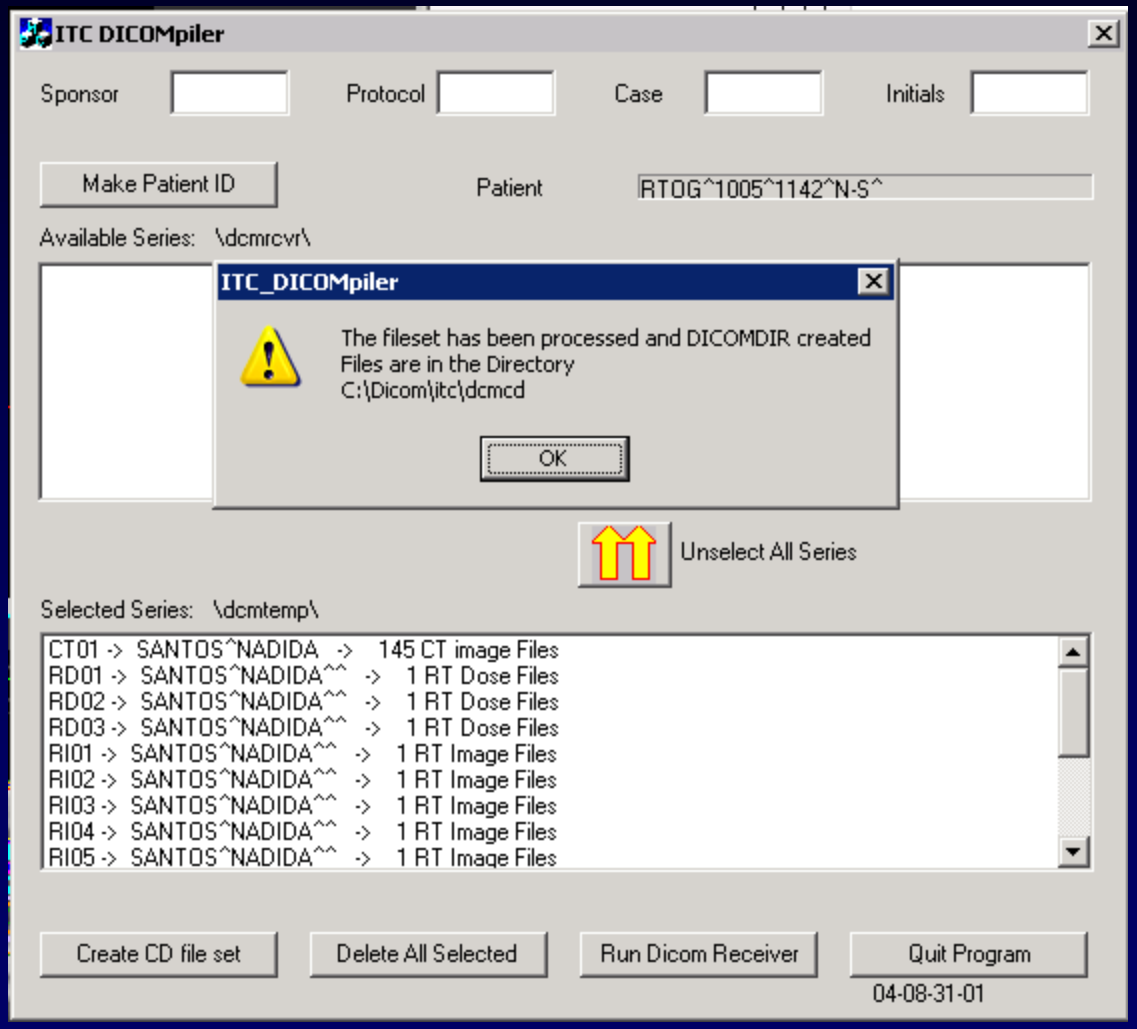

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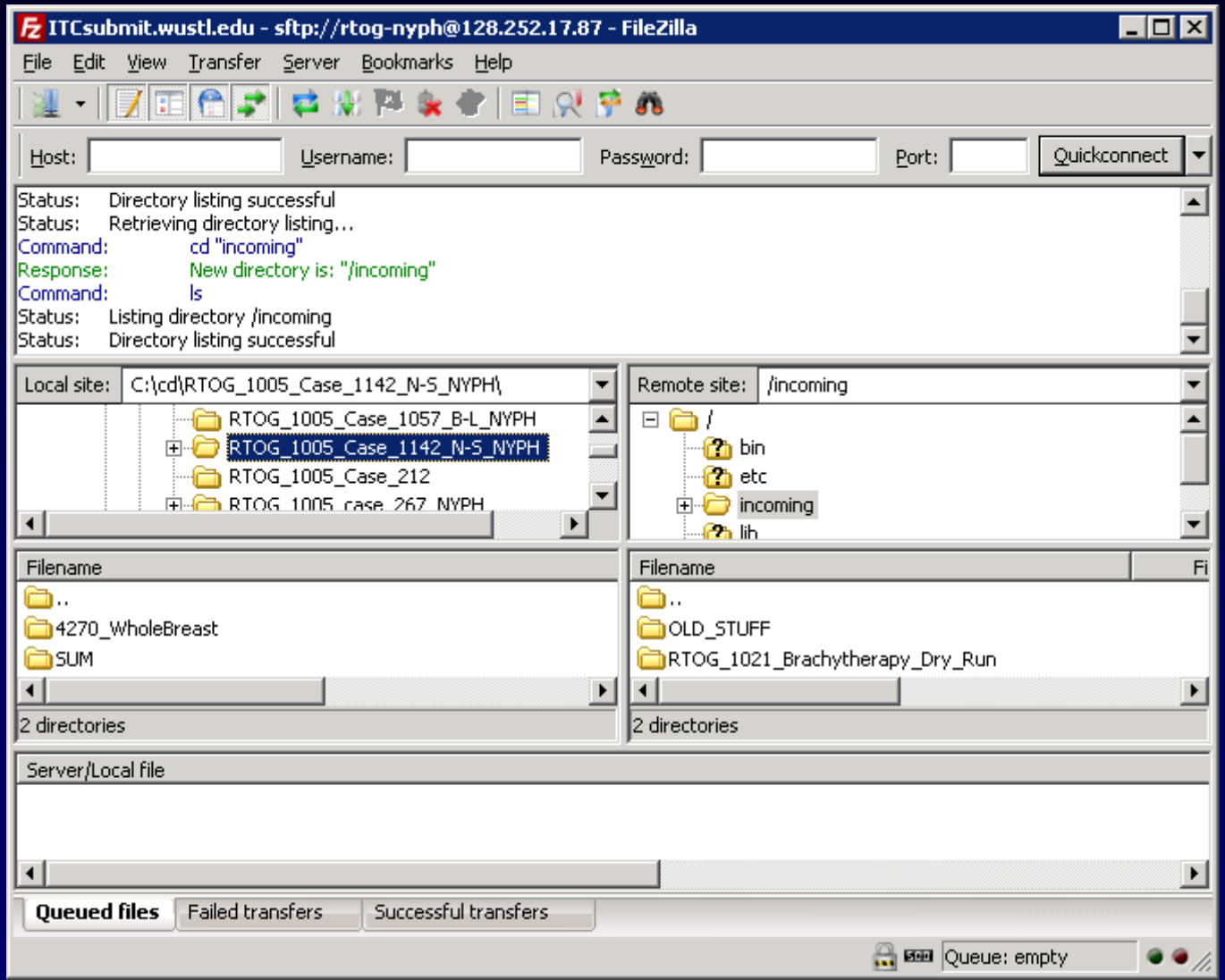
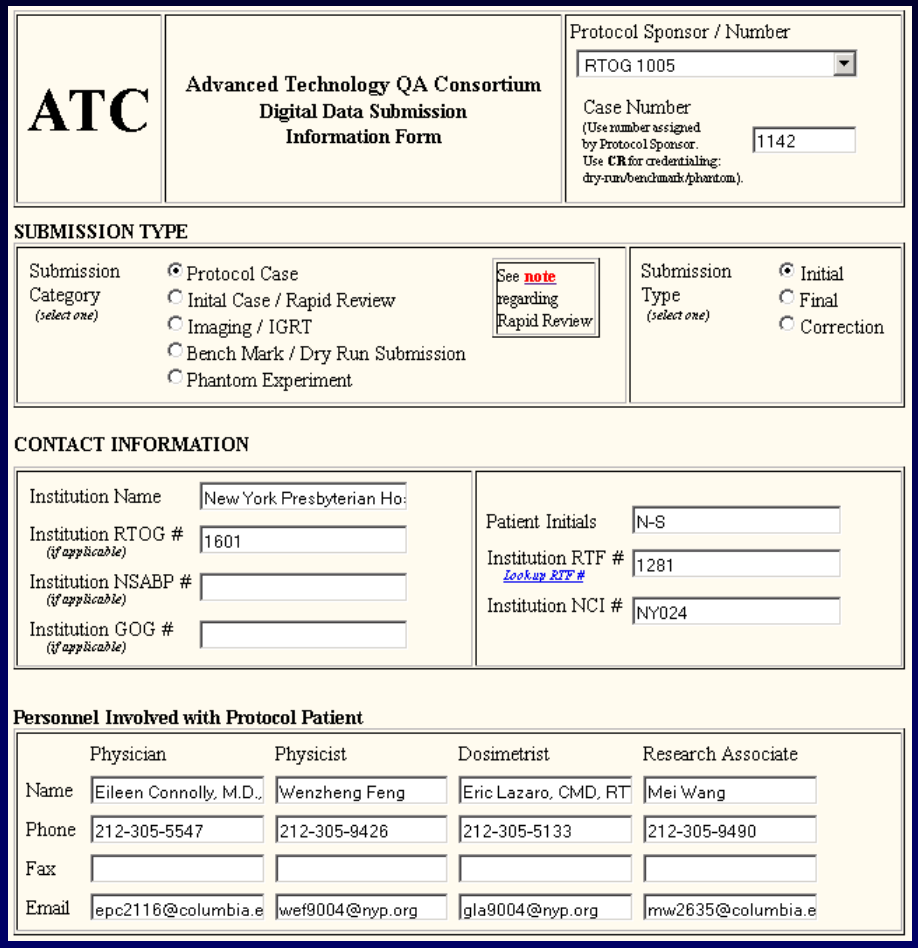


RTOG Data Transfer

- Filled out DDSI form to inform ITC the data, http://atc.wustl.edu/forms/DDSI/ddsi.html



ATC

Advanced Technology QA Consortium
Digital Data Submission
Information Form

Protocol Sponsor / Number: RTOG 1005

Case Number (Use number assigned by Protocol Sponsor. Use **CR** for credentialing: dry-run/benchmark/phantom.): 1142

SUBMISSION TYPE

Submission Category (*select one*):
- (•) Protocol Case
- ( ) Inital Case / Rapid Review
- ( ) Imaging / IGRT
- ( ) Bench Mark / Dry Run Submission
- ( ) Phantom Experiment

See **note** regarding Rapid Review

Submission Type (*select one*):
- (•) Initial
- ( ) Final
- ( ) Correction

CONTACT INFORMATION

Institution Name	New York Presbyterian Ho
Institution RTOG # (*if applicable*)	1601
Institution NSABP # (*if applicable*)	
Institution GOG # (*if applicable*)	
Patient Initials	N-S
Institution RTF # (*Lookup RTF #*)	1281
Institution NCI #	NY024

Personnel Involved with Protocol Patient

	Physician	Physicist	Dosimetrist	Research Associate
Name	Eileen Connolly, M.D.,	Wenzheng Feng	Eric Lazaro, CMD, RT	Mei Wang
Phone	212-305-5547	212-305-9426	212-305-5133	212-305-9490
Fax				
Email	epc2116@columbia.e	wef9004@nyp.org	gla9004@nyp.org	mw2635@columbia.e

SUBMISSION DETAIL

Dose Prescription (Protocol Specific): Gy in 15 concurrent boost t

Dose Delivered Via:
- ( ) AP/PA
- ( ) 3D Conformal RT
- ( ) IMRT
- (•) Simultaneous Integrated Boost
- ( ) SBRT
- ( ) IMAT/VMAT
- ( ) Robotic Arm
- ( ) Helical Tomo
- ( ) LDR Brachytherapy
- ( ) HDR Multi-catheter Brachy
- ( ) HDR Intra-cavitary Brachy
- ( ) Proton Therapy
- ( ) Other (please specify in comments)
- ( ) n/a

Dose Calculation:
- [x] Heterogeneity Corrected
- [ ] Heterogeneity Uncorrected

Submission Method: (•) SFTP ( ) Media

SFTP Login Used for Submission: rtog-nyph

Data Directory Name (for SFTP): /incoming/RTOG_1005_Case_1142_N-S_NYPH

First Treatment Date (Date of Implant)	Jun 17 2013
ITC Digital Data (Submission Date)	Jun 7 2013
Date of CT Series	Jun 3 2013

Radiation Treatment Planning System

Manufacturer:	Philips
TPS:	Pinnacle
Software Version:	9.2
Dose Calc Algorithm:	Adaptive Convolution

COMMENTS

Form completed by: Wenzheng Feng Date: Jun 7 2013

Check DDSI Form

RTOG Data Transfer

- <= 1 week of start of RT
  - Digital Plan and DDSI → sftp to ITC
  - T6 Hard copy isodose distributions for total dose plan → email or mail to ITC

- <= 1 week of RT end
  - T1 RT Summary Form → on-line form to ITC and HQ
  - T5 RT Treatment Record → email to ITC and HQ, mail to HQ

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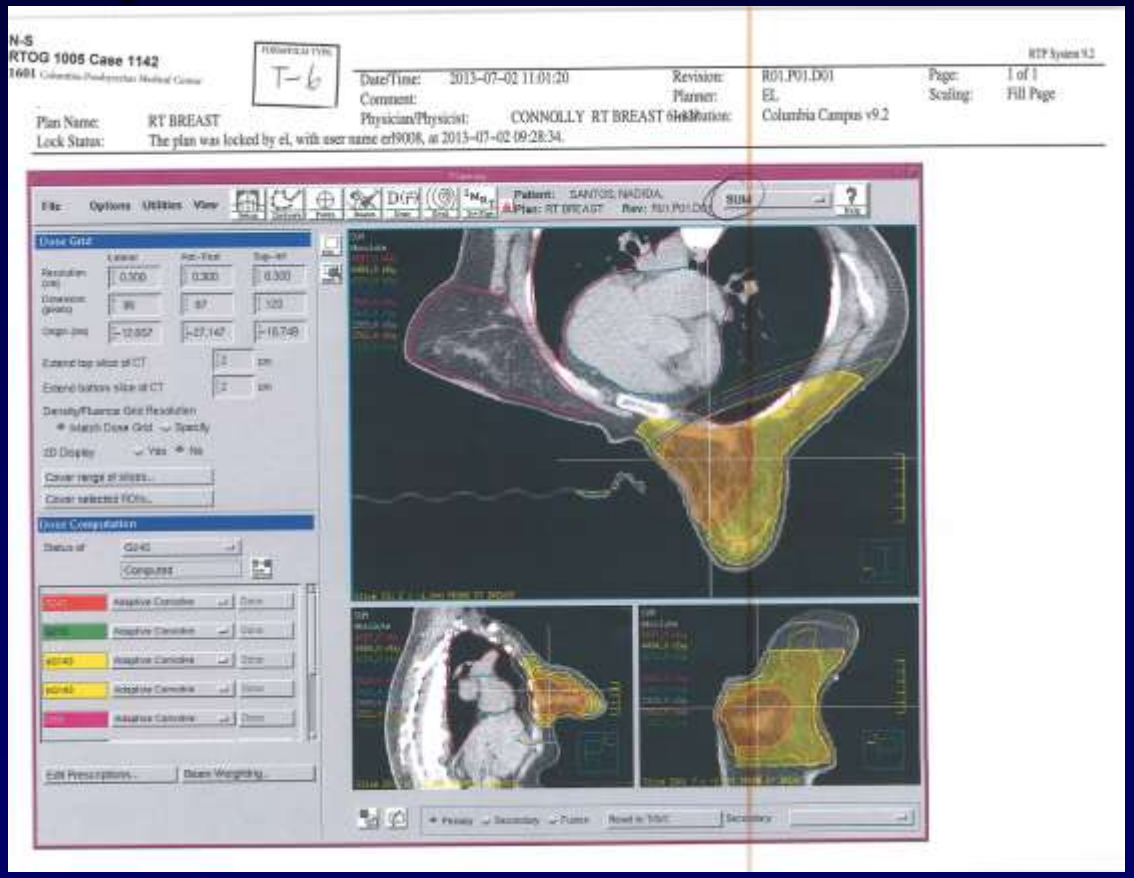

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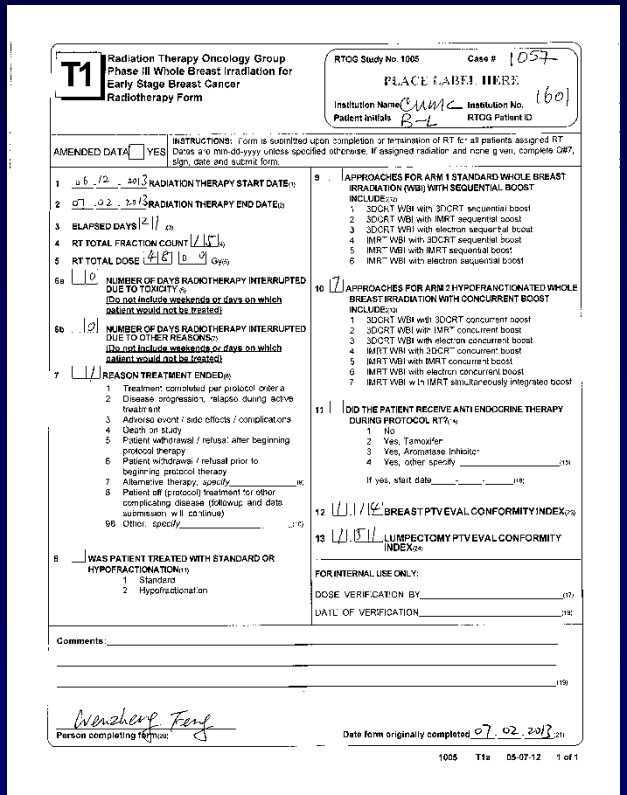


T1 Radiation Therapy Oncology Group Phase III Whole Breast Irradiation for Early Stage Breast Cancer Radiotherapy Form

RTOG Study No. 1005 Case # 1057

PLACE LABEL HERE

Institution Name CUMC Institution No. (601)

Patient Initials B-L RTOG Patient ID

AMENDED DATA ☐ YES

INSTRUCTIONS: Form is submitted upon completion or termination of RT for all patients assigned RT. Dates are mm-dd-yyyy unless specified otherwise. If assigned radiation and none given, complete Q#7, sign, date and submit form.

1 06 . 12 . 2013 RADIATION THERAPY START DATE(1)

2 07 . 02 . 2013 RADIATION THERAPY END DATE(2)

3 ELAPSED DAYS 21 (3)

4 RT TOTAL FRACTION COUNT 15 (4)

5 RT TOTAL DOSE 4 5 0 Gy(5)

6a 10 NUMBER OF DAYS RADIOTHERAPY INTERRUPTED DUE TO TOXICITY (6)
(Do not include weekends or days on which patient would not be treated)

6b 02 NUMBER OF DAYS RADIOTHERAPY INTERRUPTED DUE TO OTHER REASONS(7)
(Do not include weekends or days on which patient would not be treated)

7 1 REASON TREATMENT ENDED(8)
1 Treatment completed per protocol order a
2 Disease progression, relapse during active treatment
3 Adverse event / side effects / complications
4 Death on study
5 Patient withdrawal / refusal after beginning protocol therapy
6 Patient withdrawal / refusal prior to beginning protocol therapy
7 Alternative therapy, specify (9)
8 Patient off (protocol) treatment for other complicating disease (follow-up and data submission will continue)
96 Other, specify (10)

8 WAS PATIENT TREATED WITH STANDARD OR HYPOFRACTIONATION(11)
1 Standard
2 Hypofractionation

9 APPROACHES FOR ARM 1 STANDARD WHOLE BREAST IRRADIATION (WBI) WITH SEQUENTIAL BOOST INCLUDE(12)
1 3DCRT WBI with 3DCRT sequential boost
2 3DCRT WBI with IMRT sequential boost
3 3DCRT WBI with electron sequential boost
4 IMRT WBI with 3DCRT sequential boost
5 IMRT WBI with IMRT sequential boost
6 IMRT WBI with electron sequential boost

10 7 APPROACHES FOR ARM 2 HYPOFRACTIONATED WHOLE BREAST IRRADIATION WITH CONCURRENT BOOST INCLUDE(13)
1 3DCRT WBI with 3DCRT concurrent boost
2 3DCRT WBI with IMRT concurrent boost
3 3DCRT WBI with electron concurrent boost
4 IMRT WBI with 3DCRT concurrent boost
5 IMRT WBI with IMRT concurrent boost
6 IMRT WBI with electron concurrent boost
7 IMRT WBI with IMRT simultaneously integrated boost

11 1 DID THE PATIENT RECEIVE ANTI ENDOCRINE THERAPY DURING PROTOCOL RT?(14)
1 No
2 Yes, Tamoxifen
3 Yes, Aromatase Inhibitor
4 Yes, other specify (15)
If yes, start date ____-____-____(16)

12 1.1 / 14 BREAST PTV EVAL CONFORMITY INDEX(23)

13 1.51 LUMPECTOMY PTV EVAL CONFORMITY INDEX(24)

FOR INTERNAL USE ONLY:

DOSE VERIFICATION BY (17)

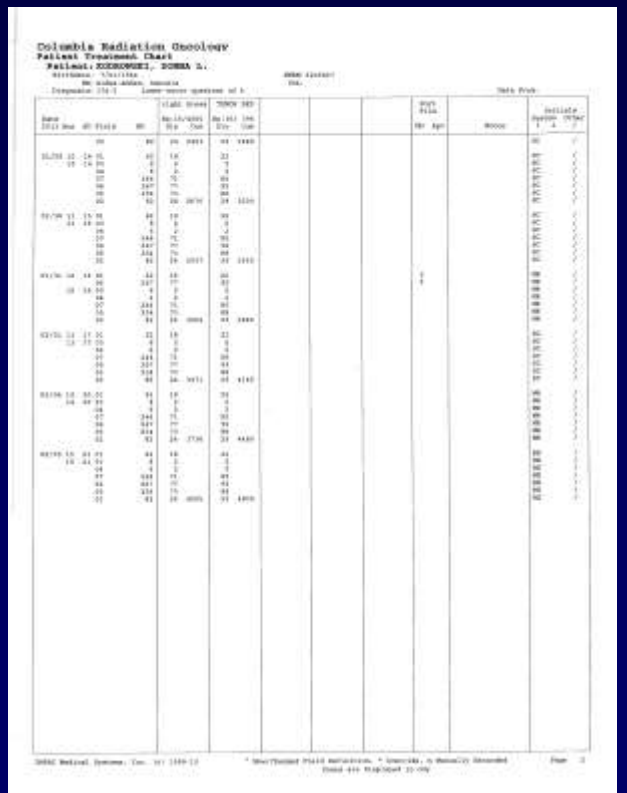
DATE OF VERIFICATION (18)

Comments: (19)

Wenzhen Feng
Person completing form(20)

Date form originally completed 07 . 02 . 2013 (21)

1005 T1a 05-07-12 1 of 1



Columbia Radiation Oncology
Patient Treatment Chart
Patient: [redacted]

Acknowledgment

Residents/Students
- Bertrand H. Biritz
- Lili Zhou
- Zhiqiu Li
- Song Wang
- Xin Wang
- DooKee Cho
- Ximin Du

Resident Directors
- Cheng-Shie Wuu
- Jenghwa Chang

Vendors
- Philips
- Varian

Dosimetrist
- Gladys Aran Cohen
- Eric M. Lazaro
- Khaled Salad
- Phillip Kerr