



GUIDELINES FOR EXPORTING PLANS FROM TREATMENT PLANNING
SYSTEM FOR CLINICAL TRIALS

PINNACLE VERSION 8.0M

Version 5
October 2009

Table of Contents

Abbreviations & Glossary	3
1. TROG Guidelines for export of plans for QA review in Clinical Trials	4
1.1 Introduction.....	4
1.2 Export from Treatment planning systems	4
1.3 Software required	4
2. The export process	5
3. Exporting a plan from Pinnacle	6
3.1 Setting up the export filter at Pinnacle.....	6
3.2 Checklist for the plan	7
3.3 The export process from Pinnacle: Dicom format	8
3.4 The export process from Pinnacle: RTOG format.....	9
3.5 Checking the file sizes of the exported data.....	10
4. Preparation of data for entry to CQMS and Swan	11
4.1 Anonymisation	11
4.2 Zipping the patient data	13
5. Uploading data for review through Central Quality Management System (CQMS) 14	
5.1 Request for institutional access to the CQMS.....	14
5.2 Entering the CQMS system.....	14
5.3 Upload your digital data.....	15
Acknowledgements	17
Appendix A: Reducing the size of a patient file for export	18
A1. Dicom	18
A2. RTOG	18

Abbreviations & Glossary

ATC	Advanced Technology Consortium
CQMS	Central Quality Management System
Dicom	Digital Communications in Medicine
DRR	Digitally Reconstructed Radiograph
DVH	Dose Volume Histogram
OAR	Organs at Risk
PTV	Planning Target Volume
RTOG	Radiation Therapy Oncology Group
SWAN	TROG Trial review software
TCOO	Trials Central Operations Office
TMC	Trial Management Committee
QA	Quality Assurance
UID	Dicom Unique Identifier

1. TROG Guidelines for export of plans for QA review in Clinical Trials

1.1 Introduction

This manual follows the steps required to export your patient plan from your treatment planning system, to make it ready for uploading into CQMS and SWAN for review.

The TROG recommendation is for the maximum file size to be 50Mb. This has been shown, with the right parameters and settings, to give all the required information.

1.2 Export from Treatment planning systems

There are two main formats used for export: DICOM and RTOG.

- Eclipse will export in Dicom only.
- Pinnacle will export in RTOG and from version 8.0h, in Dicom.
- Xio will export in both RTOG and Dicom.
- Oncentra will export in Dicom only.

In general, Dicom is simpler to use.

The TROG quality assurance review requires CT slices, contours, reference points, plan, dose matrix, dose volume histograms (DVHs) and DRRs.

The US Radiation Therapy Oncology Group (RTOG) is a member of the Advanced Technology Consortium (ATC).. This terminology is used in Eclipse as “ATC Dicom export”.

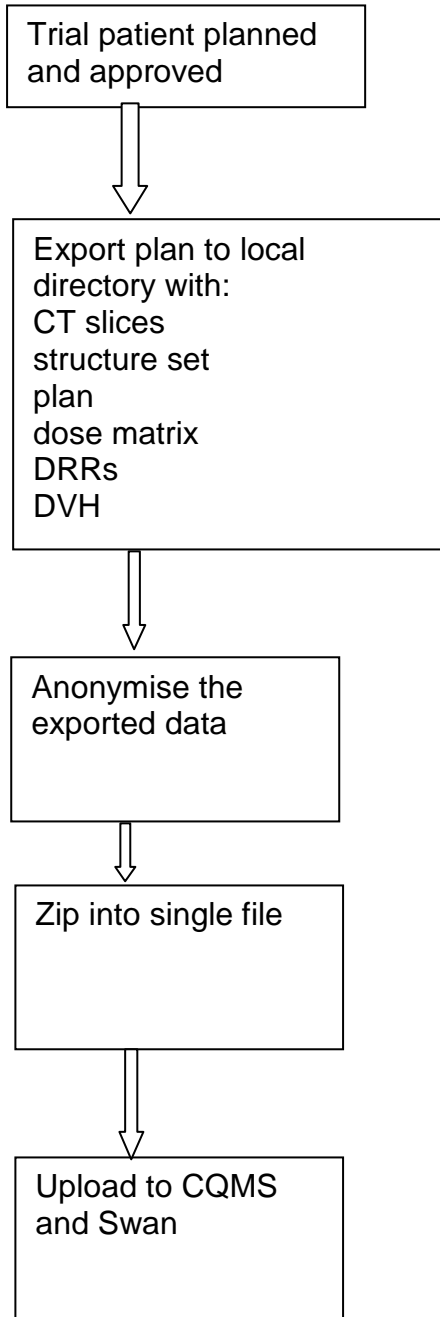
1.3 Software required

All patient files should be anonymised before export. The recommended software is Dicom Shadower, available for download at

http://www.trog-raves.org/HTMLPages/digital_exports.htm

Swan accepts a single file, so all exported files must be zipped together, using Winzip.

2. The export process



3. Exporting a plan from Pinnacle

3.1 Setting up the export filter at Pinnacle

The preferred format for data submission is DICOM, however the RTOG data format can also be used – both methods for Pinnacle have been documented.

Information on setting up the export filter is given in Appendix A.

3.2 Checklist for the plan

- Identify patient and plan
- Estimate the final file size (approx 50kb/CT slice)
 - How many CT slices? More than 80 slices?
 - Are there two phases?
 - Is the dose grid spacing 0.25cm x 0.25cm x 0.25cm?
 - Is the dose calculation volume set to cover?
 - The transverse cross-section
 - all contoured structures
 - 5cm above sup and inf to the field edges
 - for non-coplanar beams, all beams exit through skin surface

3.3 The export process from Pinnacle: Dicom format

- Confirm that the correct patient and plan have been opened.
- Select "Export" from the "File" drop down menu, Figure 1.

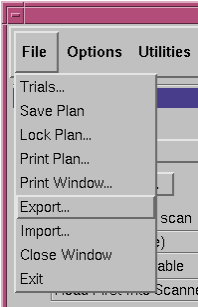


Figure 1: select export from the file drop down menu

- The "Export" window, as shown in Figure 2, will open. Confirm that the correct trial has been selected.

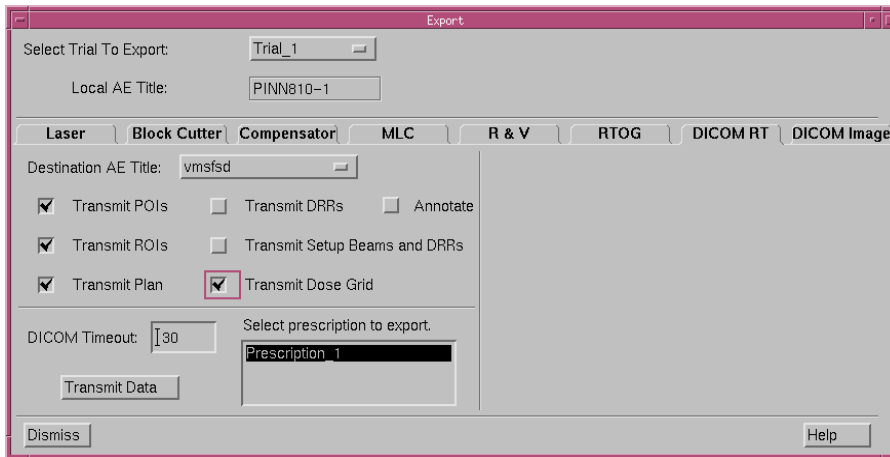


Figure 2: Pinnacle "Export" window.

- To export the plan in DICOM format select the DICOM RT tab.

Identify the correct destination AE title. Each AE title is configured separately on Pinnacle and each one may not support all of the exportable items – if the required export options are not available contact the relevant software support personnel to reconfigure this.

There are typically two AE titles listed on Pinnacle. One is the AE title of the record and verify (RV) system and the other is the AE title of Pinnacle. The AE title will determine where the DICOM data will be stored. The exported data must be readily accessible so that it can be copied, de-identified and submitted to TROG, therefore ensure that the AE title most suitable for your department is selected.

CAUTION – multiple exporting of DICOM data for a particular patient to the RV system (or Pinnacle) could cause confusion when identifying the treatment plan intended for clinical use, ensure appropriate procedures are in place and followed for the exporting of patient data.

- Select all of the items required to be exported, this will include POIs, ROIs, the plan, dose grid and may also include DRRs.

Dose is exported according to the required prescription. If multiple prescriptions are required, the dose and plan for each will need to be exported separately (ROIs and POIs only need to be exported once), Figure 3.

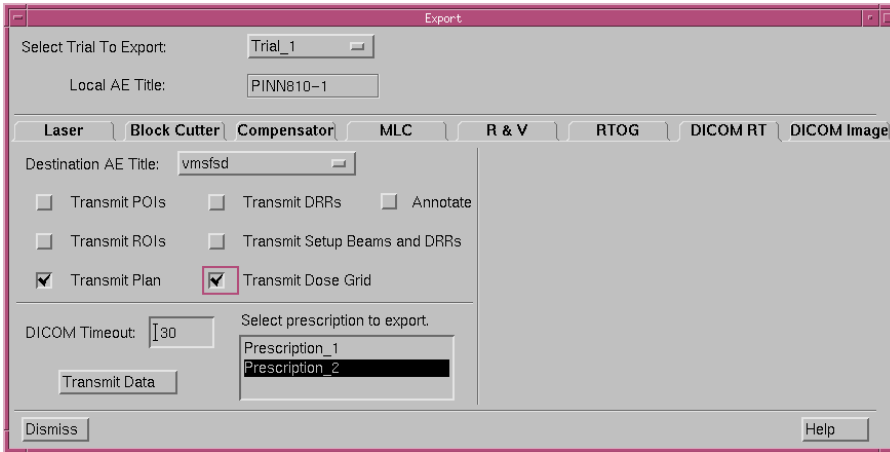


Figure 3: The plan and dose grid need to be exported for each prescription

Exporting CT images in DICOM

- In the same File>Export location choose the DICOM image tab, Figure 4.
- Select the same Destination AE title that was used for the plan export and transfer the images.

Note that the DICOM image export option is only available if the images were originally imported as DICOM.

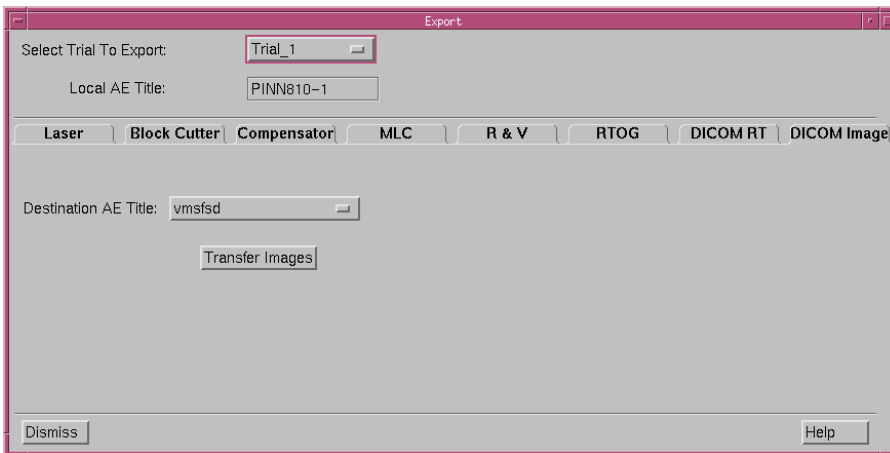


Figure 4: Exporting CT images in DICOM format.

- DRRs are required for plan review, and will be specified in the trial protocol under QA reporting. If no digital export is possible, the DRRs should be exported as screendumps, showing the CT data, contoured ROIs and MLC shapes.

3.4 The export process from Pinnacle: RTOG format

- Confirm that the correct patient and plan have been opened.
- Confirm that DVHs for all relevant structures have been calculated and are selected for display.

- Select "Export" from the "File" drop down menu, Figure 5.

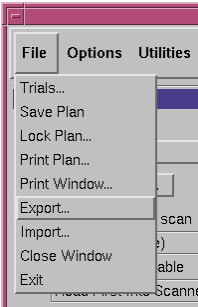


Figure 5: select export from the file drop down menu

- The "Export" window, as shown in Figure 6, will open. Confirm that the correct trial has been selected.

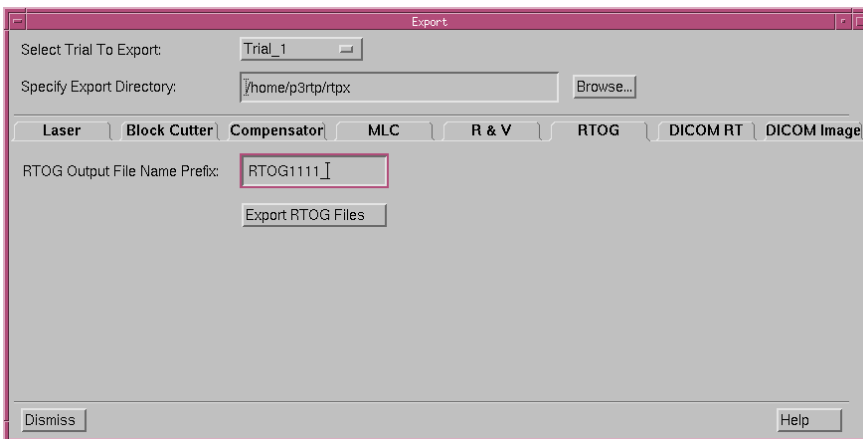


Figure 6: Pinnacle "Export" window.

- To export the plan in RTOG format select the RTOG tab.
- Specify the export directory. This will typically be /home/p3rtp/rtpx which is the SAMBA mounted directory that can be accessed via a Windows PC.
- Enter a valid file name prefix, for example the patient's trial number followed by an underscore (eg RTOG1111_).
- Select "Export RTOG files", this will write multiple files to the identified directory. All of the files will have the same prefix and be indexed starting at 0000 (e.g. RTOG1111_0000). This will export all CT images, the plan, ROIs, POIs, DVHs and dose.

3.5 Checking the file sizes of the exported data

At the directory containing the exported patient data, check the total size.

If less than 50Mb, continue with the anonymisation process in section 4.

If more than 50Mb, consider how to reduce the total size – see Appendix B.

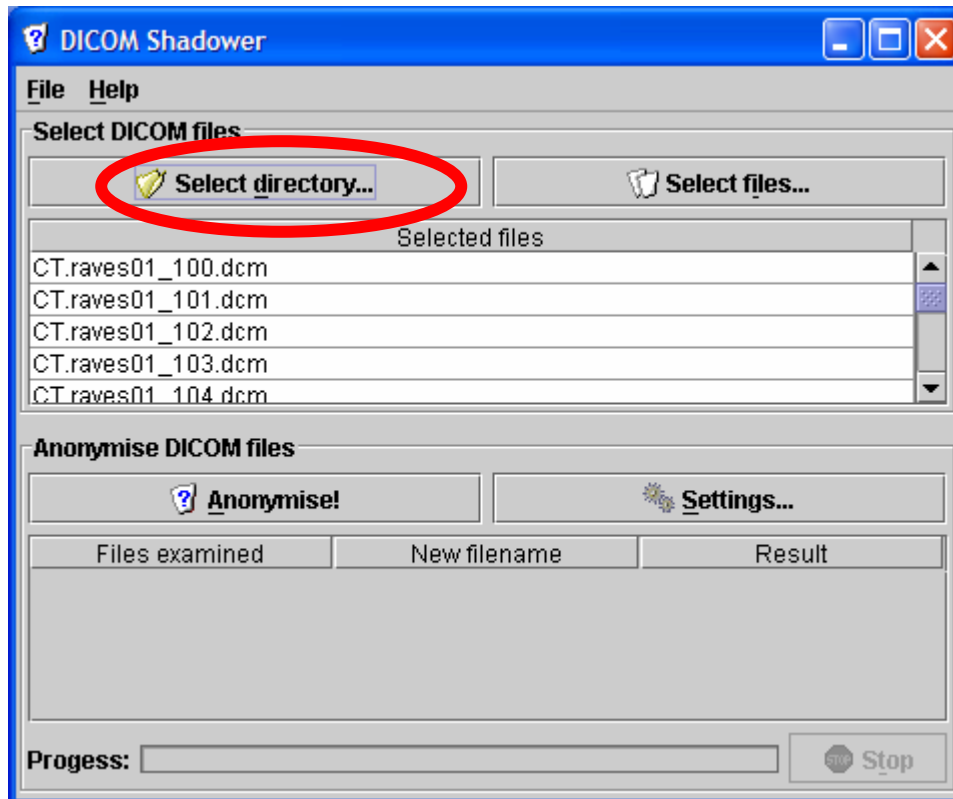
4. Preparation of data for entry to CQMS and Swan

4.1 Anonymisation

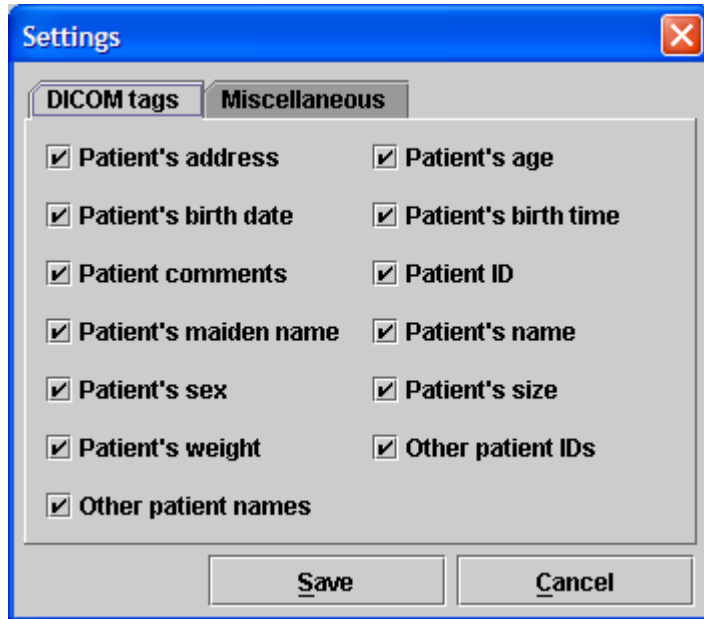
All patient –specific data must be removed by anonymising the data. The recommended software is Dicom Shadower, available for download at

<http://www.trog.com.au/Default.aspx?tabid=297>

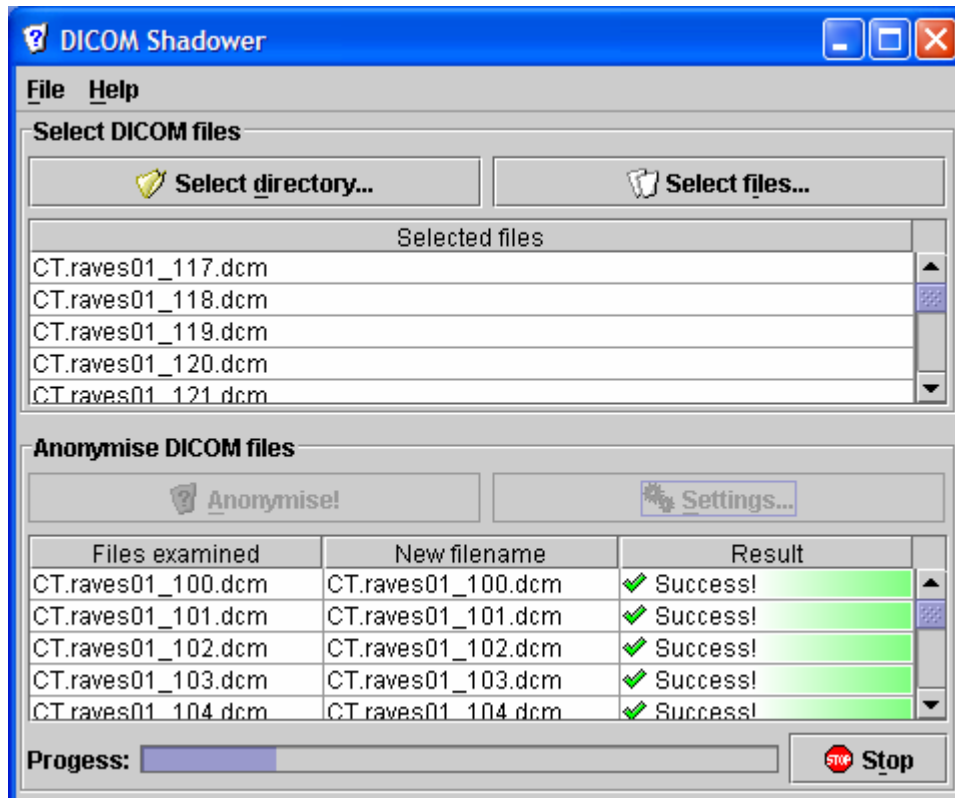
Open Dicom shadower and select the directory with the patient files.



In the Settings option, make sure all patient – specific Dicom tags are checked.

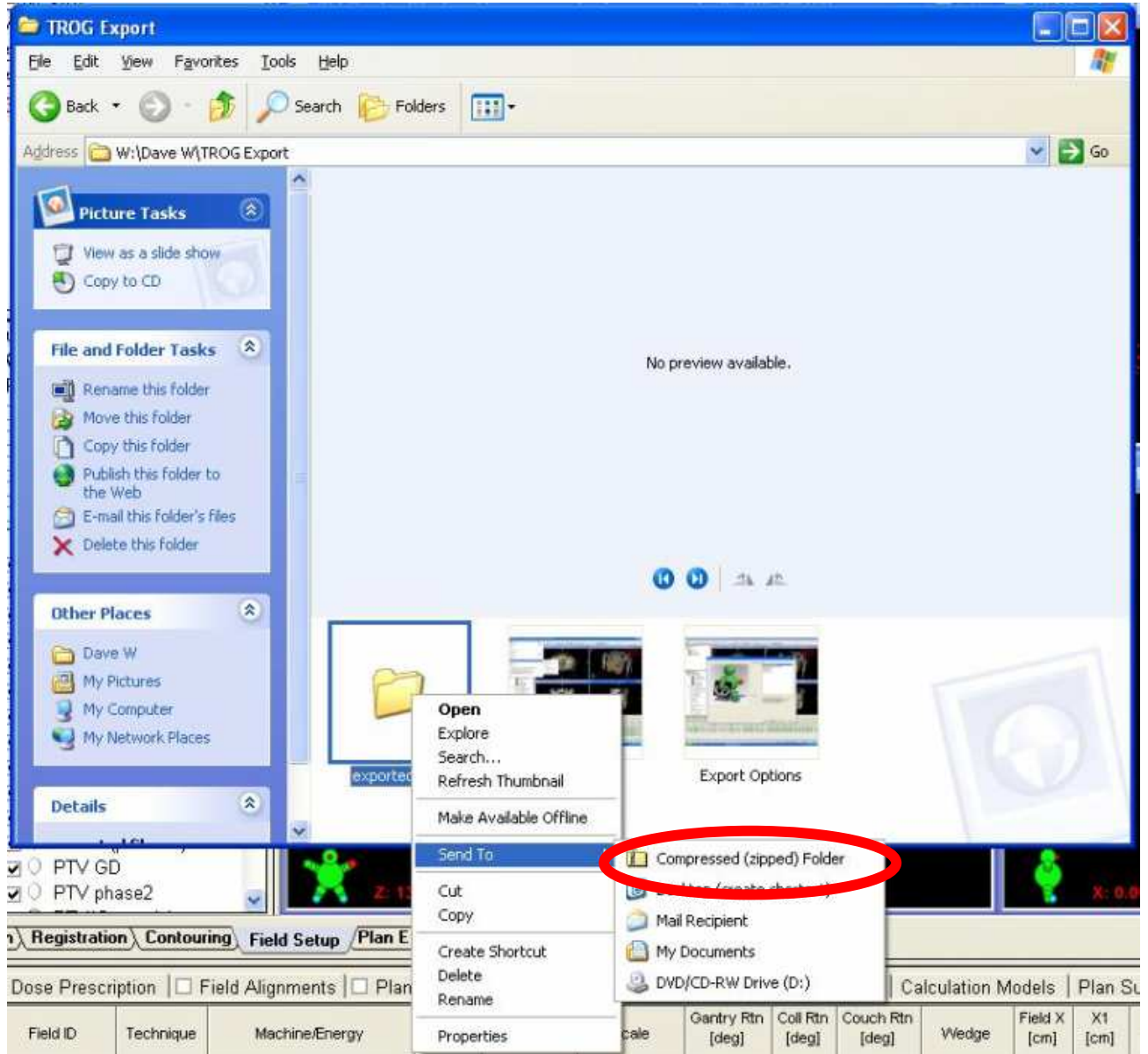


Select Anonymise. Note the filename is unchanged after anonymisation.



4.2 Zipping the patient data

Navigate to the patient folder, right click, Send to..... Compressed (zipped) folder. A zipped folder will be created.



5. Uploading data for review through Central Quality Management System (CQMS)

5.1 Request for institutional access to the CQMS

If you are a TROG member, please send an email to qa@trog.com.au and ask for a username and password.

If you are not a TROG member, please email qa@trog.com.au with this information:

Name

Phone

Fax

Email

Job Title

Site (Hospital)

Department

5.2 Entering the CQMS system

Please visit TROG website (<http://www.trog.com.au/>) and click at the right frame on the CQMS (Figure 1)



Figure 7. TROG website, link to CQMS (red)

- For first time visitors, it is recommended to follow the e-Learning (2nd point), before using the system (Figure 2, green marking "T")

- For data submission, please click on the access to CQMS (Figure 2, red marking “2.”), and wait until a new webpage appears



Figure 8. CQMS page with link to data submission entry (red) and e-Learning (green)

Login with the provided username and password to enter into the system

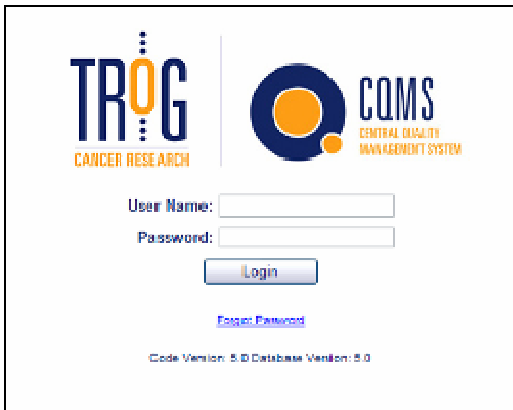


Figure 9. CQMS entry page

5.3 Upload your digital data (DICOM-RT or RTOG format)

Before starting the upload procedure, please make sure:

- All patient data are anonymized (responsibility of the local investigator!)
- All data (CT-image, contours, dose, plan) are packed into a zip file (recommended)

Trials which are open at your centre will be shown under My Trials. This example is uploading data for the 07.01 DCIS trial.

Please click on My Trials / Trial: 07.01 DCIS RTQA checklist (Figure 4)



Figure 10. CQMS desktop interface

- select [Swan upload]

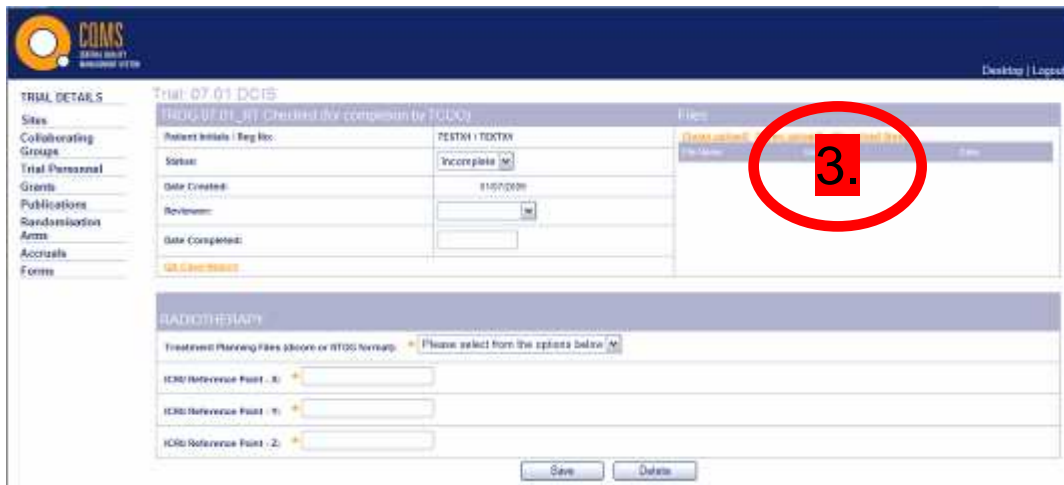


Figure 11. Digital data upload for review [Swan upload]

- Please click on **Browse** and select the zipped file with the information to be submitted
- click on **Upload File** - please note that the uploading can take several minutes.
- Once the data is uploaded (it will be automatically extracted from the zip), all files will be shown at the CQMS window (Figure 6, red [4]).
- Please make sure (again), that all files are uploaded.

Figure 12. Completed digital submission (uploaded files [4], provided information [5])

- Finally, please fill in the Radiotherapy part (Figure 6, red [5]), with the information about the data format and the coordinates of the ICRU Reference point.
- Click on Save to complete the submission.

Acknowledgements

Dave Willis, Peter MacCallum Cancer Centre, for section 5.

Matthew Williams, Wollongong, for Pinnacle information

Appendix A: Reducing the size of a patient file for export

Some clinical plans use a large CT scan set, with image slices more than 5cm from field edges and which may not contribute to the data required for the QA review.

Similarly, the dose calculation volume may cover regions beyond the irradiated volume.

The recommended total limit for the files is 50Mb before zip – this may not be identified until the plan has been exported to a location outside of Eclipse. It is important to measure the folder size before anonymisation.

Initial assessment of a treatment plan before export should include a close look at the

- calculation volume

A calculation volume far beyond the irradiated volume may result in an unnecessarily large dose matrix file (check the file size with the prefix RD).

- scan length

A long scan length is often indicative of a total export package greater than 50Mb.

It is not possible to delete image slices from a Pinnacle plan once it has been generated. The best method of keeping the file size as small as practicable is to export from the CT scanner the minimum number of images required to generate an accurate plan.

A1. Dicom

When using CT images in DICOM format, Pinnacle will export exactly what has been imported, therefore adding or deleting slices from within Pinnacle does not change the size or number of DICOM images it exports.

A2. RTOG

If submitting data in RTOG format there are a two methods available to reduce the number of images.

1. RTOG only: Deleting CT images prior to generating a plan

- Import the CT images into Pinnacle using the standard method.
- In the "Data Set Editor" window, Figure 13, select the slice you wish to delete and select "Delete Current Slice...".

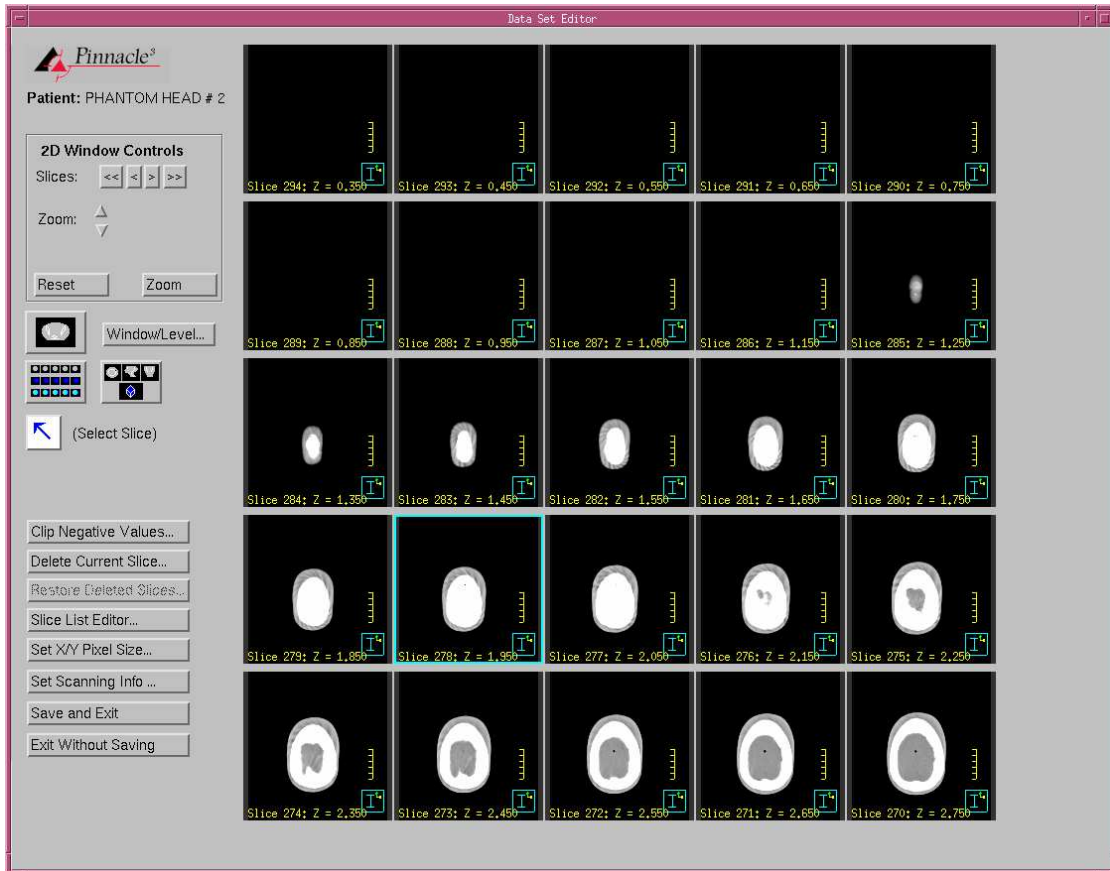


Figure 13: Data Set Editor window displayed on Pinnacle when importing CT images

- A confirmation window will appear, Figure 14, click to confirm deletion.



Figure 14: Delete slice confirmation window.

- Delete all unnecessary slices at the superior and inferior ends of the dataset, then save and exit. Use the modified dataset to generate the plan.

2. RTOG only: Deleting CT slices after a plan has been generated

If a plan has already been generated, an alternate method to reduce the number of images is to use the "QA tools" and "Copy to Phantom"

- Open the original plan. Locate CT slices 5 cm superior and inferior to the field edges, and record the Z co-ordinates of the CT slices. Also note the lateral, ant-post and sup-inf co-ordinates of the isocentre – this is to be used for verification later.
- Select "Export" from the "File" drop down menu and following the procedure detailed previously for exporting DICOM images. Use the destination AE title used by Pinnacle (eg ADACRTP_SCP).
- In the "Patient Select" window, highlight the same patient and select "Images". Add a new dataset and select the DICOM3File format, read the Patient/Exam directory, Figure 15. The exported images should be listed.

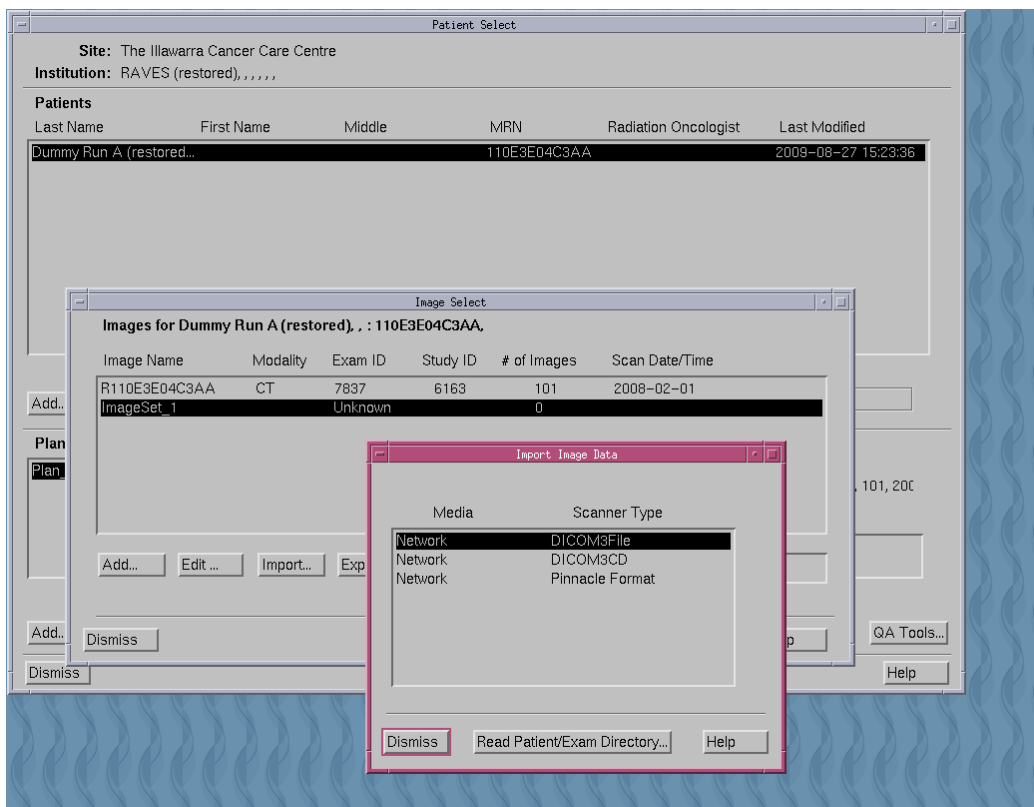


Figure 15: Add a new dataset to the patient

- Follow the import process as detailed in the previous section titled "Deleting CT images prior to generating a plan". Delete all images superior and inferior to the Z co-ordinates that were recorded previously for the most superior and inferior slices required by the plan.
- For the same patient, add a new plan and in the "Edit Plan Data" window select the reduced dataset as the primary dataset and edit the plan name (or add a comment) to readily identify the plan as the phantom, then dismiss the window.

- In the "Patient Select" window highlight the newly created plan and select "QA Tools..." and choose "Save as Phantom" (Figure 16), specify an easily identifiable name for the phantom dataset.

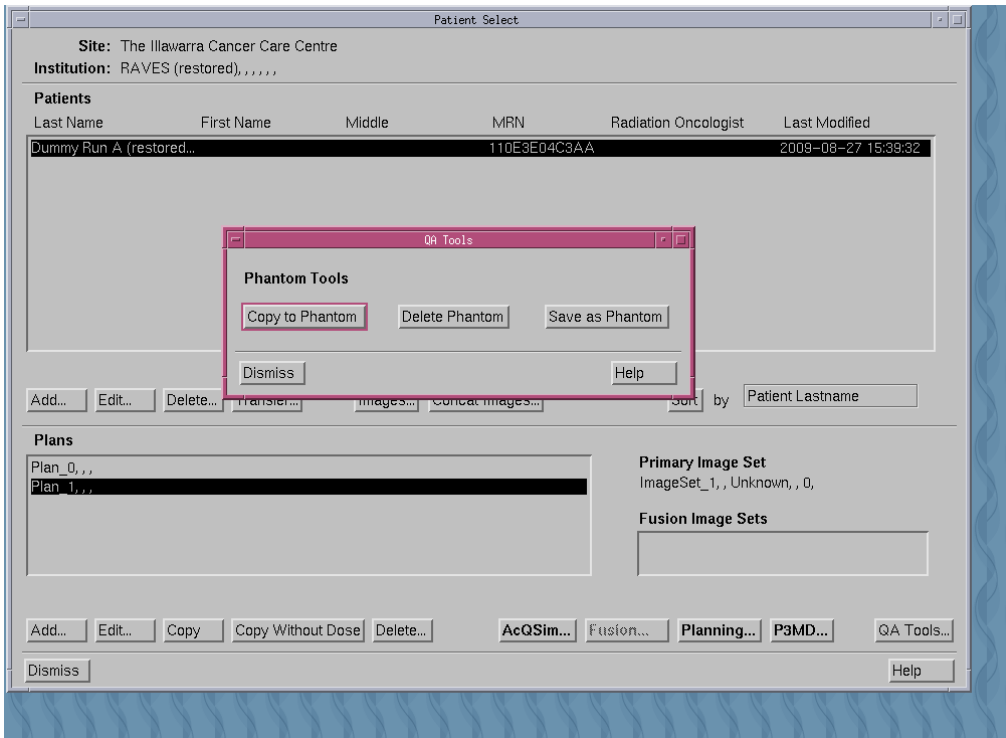


Figure 16: Save the new plan as a phantom.

- In the "Patient Select" window highlight the original plan and select "QA Tools..." and choose "Copy to Phantom", select the phantom dataset that was just created. A new plan will be created with the reduced CT dataset; then dismiss the QA tools window.
- Select the new plan (should be listed after the phantom plan) and edit the plan name or add a comment so that it is readily identifiable as the reduced dataset plan, then enter "Planning..."
- A window will appear when the plan is first opened, Figure 17. Nothing needs to adjusted in this window – dismiss it.

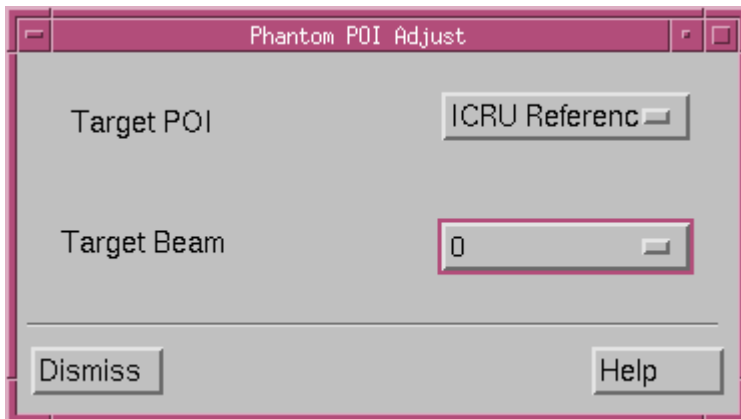


Figure 17: POI alignment tool for aligning co-ordinates system of the original plan with the phantom

- The original plan should now be displayed but using the reduced CT dataset. Confirm that the co-ordinates of the isocentre match between the original plan and the new plan, then recompute doses. Verify that all parameters and doses are consistent with the original plan.
- Save the plan.
- This plan can now be exported using the RTOG method.