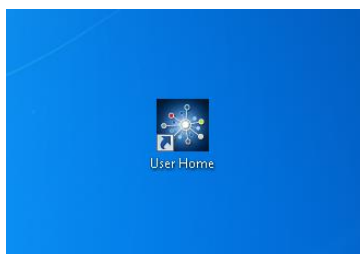


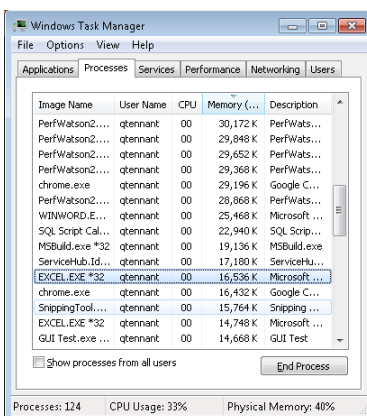
Running Extraction User Interface

Getting Started:

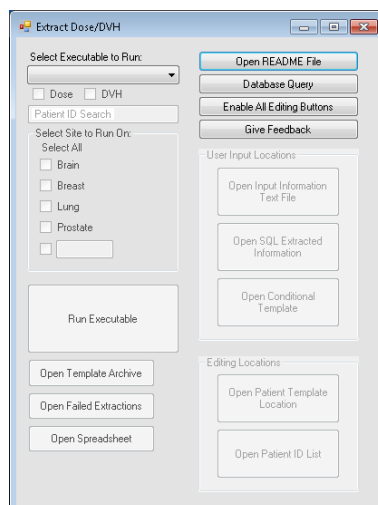
Important: In order to run from the user interface, the computer must have Varian installed natively.



Note: If at any point an excel file is opened and it says you can only open it in read-only then use CTRL+SHIFT+ESC to open task manager, click the Processes tab, find any EXCEL.EXE running and end those processes then try to open the file again



1. Go into \\dc3-pr-files\MedPhysics Backup\Data Extractions\Automation
2. Run the *Extraction Automation GUI Executable*



3. Click the *Open README File* to open this file
4. Click the *Database Query* button to open the *Database Query* GUI
 - a. From here click the *Extract Dose/DVH* button to open the *Extract Dose/DVH* GUI

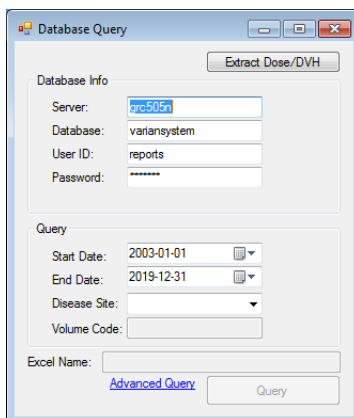
Running Extraction User Interface

5. Click the *Enable All Editing Buttons* button to allow access to all location buttons for testing and checking purposes
6. Click the *Give Feedback* button to open a text document that can be edited for feature suggestions and bug reports

Running Executables:

Database Query:

1. Open the *Database Query* GUI through the *Database Query* button or by running the *Database Query GUI* executable in the Automation folder



2. By default, the Database Info is auto filled. Do not change this information unless necessary.
 - Server: grc505n
 - Database: variansystem
 - User ID: reports
 - Password: reports
3. The Query inputs can be changed to whatever is necessary such as changing the desired start/end date, choosing the disease site, and inputting the Volume Code
 - If you want to find all patients in any site between certain dates then select *All Patients* from the drop down menu and use only a percent symbol, %, as the Volume Code
 - How to find Volume Code:
 - i. Open Varian application
 - ii. Open External Beam Planning from QuickLinks - Treatment Planning – External Beam Planning
 - iii. Open any patient within a known disease site
 - iv. Within the plan structure there should be one along the lines of CTV_x, PTV_x, or GTV_x right click this plan and open properties
 - v. Under Volume there is a Code text box, and this is the volume code to use for that disease site (except if it ends in L or R such as for lung or breast in that case replace the L or R by % when querying)
 - Common Volume Codes:
 - i. Brain = BRAI
 - ii. Breast = SCN%
 - iii. Lung = LUN%
 - iv. Prostate = PROS

Running Extraction User Interface

- If you want to run a Volume Code that just includes a string then use the percent symbol, %, to indicate this (i.e. CHW% will include anything that has CHW with any characters after it)
4. The Excel Name text box will automatically populate with the suggested excel name but this can be changed to anything as long as an excel file with the same name is not currently open
(Warning: make sure this name does not contain invalid file characters: \, /, :, *, ", <, >, and |)
 - The saved file location is in \\dc3-pr-files\MedPhysics Backup\Data Extractions\Automation\SQL Database Spreadsheets

5. Advanced filter queries can be performed by clicking the *Advanced Query* link label

Advanced Database Query:

- Here specific query filters can be applied including Gantry Rotation, MLC Plan Type, Prescribed Dose, and Number of Fractions
 - To use these filters the checkbox must be selected along with all the options for the checked item otherwise the query will fail
 - Selecting these options will also add an indicator to the Excel name which is used for identifying the different excel sheets in the SQL Spreadsheet folder
 - To cancel the advanced query, click the *Cancel* link label
6. Make sure all excel windows are closed before running
 7. When all query options have been selected click the *Query* button to run. An excel window will open and populate with the extracted information. Do not close this window or try to interact with it or it will crash.
 8. After running the excel file will save to the indicated location then close
 9. Open the file and make sure that in the patient ID column that only patient IDs are here (if the zeroes have been removed from the beginning of the IDs then it will be fixed in running patient template creation)

Running Extraction User Interface

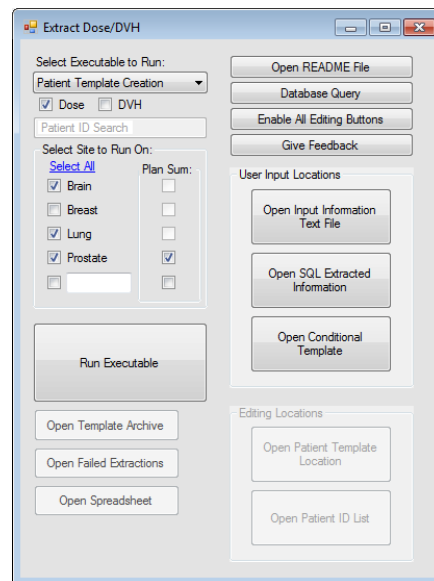
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	PatientID	CourseID	Plan_Nam	Structure	MLCPlanT	Body_Reg	Prescribe	No. Fract	GantryRtn	Plan_CreationDate			
2	32262	4	BRAI	FSRS	GTV_BRAI	BRAINSTEM;							
3	32262	5	BRAI2	5SR	GTV_BRAI2	BRAINSTEM;							
4	47125	1	BRAI	5SR5	HEALTHY BRAIN	GTV_BRAI	INNER CONTROL	MIDDLE CONTROL	OUTER CONTROL				
5	91784	1	BRAI	FSRS	GTV1	GTV2	HEALTHY BRAIN	BRAINSTEM	BODY;				
6	91784	1	BRAI	FSRS	GTV1	GTV2	HEALTHY BRAIN	LENS	LENS	R	CORD	BRAINSTEM;	
7	91784	1	BRAI	FSRS	GTV1	GTV2	HEALTHY BRAIN	LENS	LENS	R	CORD	BRAINSTEM;	
8	91784	1	FSRSPOST	GTV1	GTV2	HEALTHY BRAIN	BRAINSTEM	BODY;					
9	91784	1	FSRSPOST	GTV1	GTV2	HEALTHY BRAIN	BRAINSTEM	BODY;					
10	166784	1	BRAI	FSRS	LENS	LENS	R	HEALTHY BRAIN	GTV_BRAI	TOTAL	GTV1	GTV2;	
11	166784	3	BRAI2	5SR	LENS	LENS	R	GTV_BRAI	TOTAL;				
12	182216	4	BRAI	FSRS	GTV_BRAI	HEALTHY BRAIN;							
13	182216	5	BRAI	FSRS	GTV_BRAI2	Dose 1350	GTV1	Dose 1350	GTV2	HEALTHY BRAIN	INNER CONTROL	MIDDLE CONTROL;	
14	196610	2	BRAI	FSRS	HEALTHY BRAIN	GTV2_BRAI	GTV1_BRAI;						
15	196610	3	BRAI2	5SR	GTV_BRAI3	GTV_BRAI2	GTV2_BRAI;						
16	196610	4	BRAI3	5SR	GTV_BRAI3;								
17	200388	1	BRAI	FSRS	HEALTHY BRAIN;								
18	218803	1	BRAI	5SR5	GTV_BRAI	HEALTHY BRAIN	MIDDLE CONTROL	BRAINSTEM;					
19	218803	1	BRAI	5SR5	GTV_BRAI;								
20	218803	2	BRAI	5SR5	GTV_BRAI2;								
21	218803	3	BRAI	FSRS	BRAINSTEM	GTV_BRAI3;							
22	218803	4	BRAI	5SR5	GTV_BRAI4;								

Patient Template Creation:

1. Open the *Extract Dose/DVH* GUI by running the *Extraction Automation GUI* executable in the Automation folder or by clicking the *Extract Dose/DVH* button from the *Database Query* GUI
2. From the dropdown menu of executables select the *Patient Template Creation* line
3. Check the Dose checkbox, the DVH checkbox, or both below the dropdown menu
4. Select the disease sites within the Site group box to create patient templates for those sites

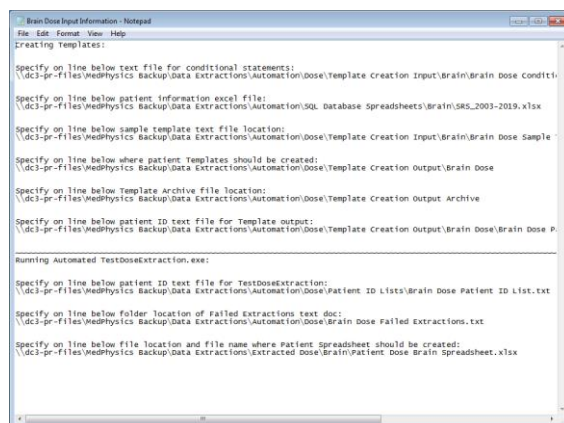
Custom Disease Site:

- Patient templates are created using the extracted database information. As such Custom sites cannot be run to automatically create templates and instead must be created by hand



5. Once the sites are selected then open the input information file locations by clicking the *Open Input Information Text File* which will open all the ones for the selected sites

Running Extraction User Interface

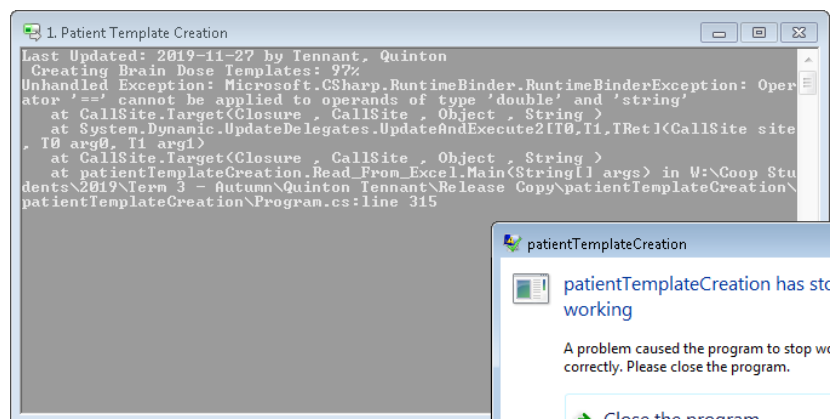


6. Check the file locations are suitable
7. Only Prostate can be created with Plan Sum so select those boxes as needed
8. Click the *Open Conditional Template* button to dictate how the templates should treat certain plan names (this location is taken from the input information text file)

	A	B	C	D	E
1	Input structures that you want to check nurse input for under "Structure 'n'"				
2	Input true or false under each of them making sure every combination is covered.				
3	Input what the output should be given the input conditions of true or false.				
4	This Template can handle up to two structures currently.				
5	Structure 1:	Structure 2:	Outcome:		
6	sSRS	fSRS			
7	T	T	BRAI SRS		
8	T	F	BRAI sSRS		
9	F	T	BRAI fSRS		
10					
11					

9. The names under Structure 1 and 2 are what you want to check the third column (Plan_Name) of the SQL Extracted spreadsheet for
10. The outcome column is used to dictate that for each combination of true (T) and false (F) what the template should input in that place
11. Save the Conditional File if anything is changed
12. The portion of each template that is created is taken from the Sample Template for each site which is in \\dc3-pr-files\\MedPhysics Backup\\Data Extractions\\Automation\\{property}\\Template Creation Input\\{site}
 - If this is edited for any reason then keep the row count the same by replacing any deleted lines with blank space
13. Click the *Run Executable* button to run the patient template creation on the selected properties and selected sites
 - If the executable can't find the structure then it will prompt to select the Input Information text file which can be found in \\dc3-pr-files\\MedPhysics Backup\\Data Extractions\\Automation\\{property}\\Input Information Text Files
 - If the executable runs into a Null error and crashes then open the Patient Information Source and select all rows below the patient list, then right click on the selection and press delete making sure that if you use the scroll bar to scroll up and then down again that it's not possible to scroll below the last patient

Running Extraction User Interface



- If the executable runs into an operand error with equating 'double' and 'string' then enter the SQL extracted file and delete the patients at the end that start with "6000..."
14. Once this has finished running the *Editing Locations* group box is opened allowing viewing of the patient templates that were created and the list of patient IDs that will be run over for the selected sites
 - If you only wish to run on select patients delete the unwanted patient IDs from the patient ID list and make sure any patients that you want to run have a corresponding template in the template location
 15. The *Template Archive* button will also open which is a timestamped collection of past run template creations just in case

*See Appendix: Template Format for how the templates are set up before making edits

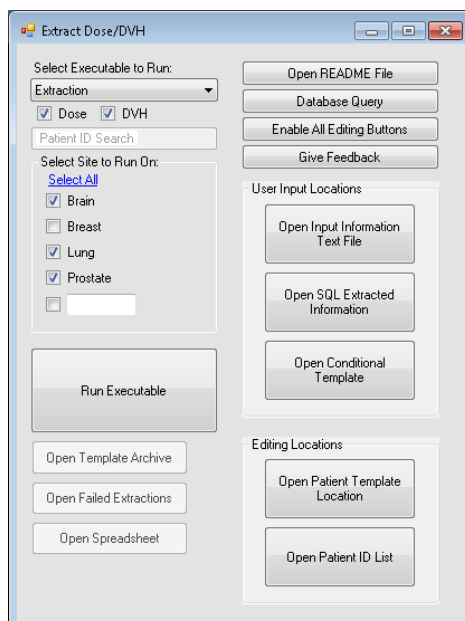
Extraction:

1. Open the *Extract Dose/DVH* GUI by running the *Extraction Automation GUI* executable in the Automation folder or by clicking the *Extract Dose/DVH* button from the *Database Query* GUI
2. From the dropdown menu of executables select the *Extraction* line
3. Check the Dose checkbox, the DVH checkbox, or both below the dropdown menu
4. Select the disease sites within the Site group box to create patient templates for those sites

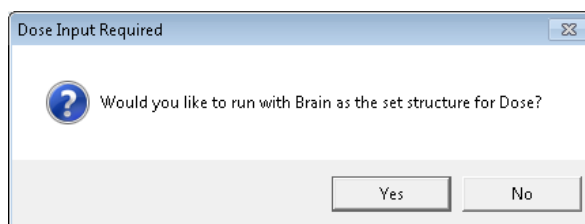
Custom Disease Site:

- For running custom sites select the checkbox next to the empty text box and type the site that you would like to run
- In this case, no input information text file exists and so if the *Open Input Information Text File* button is pressed then it will warn you that it doesn't exist, and you can create a new file with the basic outline for file locations
- Finish the file locations and save the text file making sure that these file locations do exist along with a patient ID list and templates for those patients in the set location

Running Extraction User Interface



5. Click the *Run Executable* button to begin the extraction for the set Dose and/or DVH sites
6. A message box will pop up asking if you want to run with the selected structure



- Click yes if the site and property match what you have selected or no if it does not. The message box will disappear after 7.5 seconds and defaults to yes
- If no is pressed, then it will prompt to select the Input Information text file which can be found in \\dc3-pr-files\MedPhysics Backup\Data Extractions\Automation\{property}\Input Information Text Files

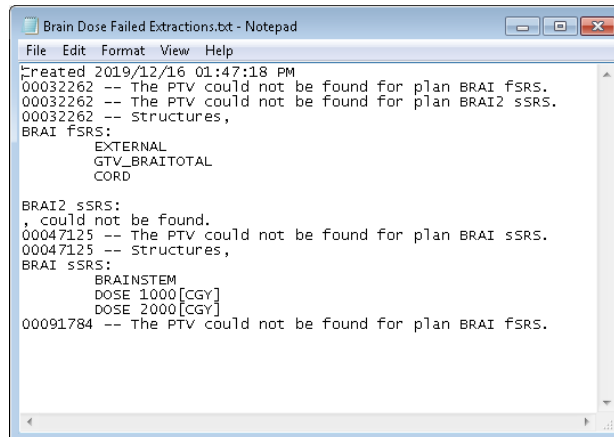
Dose:

- While running the structure spreadsheet for Dose will begin to populate with the extracted data
 - i. **Do Not** exit the excel file or try to interact with it as this will crash the extraction
 - ii. If it does crash, then go into the patient ID list and delete the patients that have been run already then re-run the executable

Patient Dose Brain Spreadsheet.xlsx - Microsoft Excel											
<div>File Home Insert Page Layout Formulas Data Review View Tools</div>											
<div>Calibri 11 Arial</div> <div><div>Font</div><div>Alignment</div><div>Number</div><div>Cells</div></div> <div><div>Conditional Formatting</div><div>Format as Table</div><div>Format as Cells</div></div> <div><div>Insert</div><div>Delete</div><div>Sort & Find</div><div>Filter</div><div>Select</div></div> <div><div>Clipboard</div><div>Font</div><div>Alignment</div><div>Number</div><div>Cells</div></div> <div><div>Conditional Formatting</div><div>Format as Table</div><div>Format as Cells</div></div> <div><div>Insert</div><div>Delete</div><div>Sort & Find</div><div>Filter</div><div>Select</div></div>											
A1											
Patient InformationPlan InformationPrescription											
	Study ID	Date of Birth	Age at Date of Plan Creation	Date of Plan Creation	Plan ID	SRS Target	Dose (Gy)/fx	Number of Fractions	Total Dose (Gy)	Number of Fields (Beams)	Plan Type
1	MAC0222	null	70	11/19/2018	BRAI2 SRS	OTV2	20	1	20	2	VMAT
2	BEH0471	null	80	4/4/2018	BRAI2 SRS	OTV	20	1	20	4	VMAT
3	HOF1966	null	58	5/27/2019	BRAI2 SRS	OTV2	20	1	20	4	VMAT
Ready											

Running Extraction User Interface

- After running a message box will pop up with start and end time for the extraction which will auto close after 30 seconds
- After running the failed extractions text file will also pop up with reasons why each patient failed



- To re-run these patients, change what caused the error message then edit the patient ID list file to only have the patients you wish to retry
 - Run the extraction again
- Common extraction times (these depend more on the number of structures per patient rather than the number of patients):
 - Brain: 0.5 hours for 136 patients
 - Breast: 0.25 hours for 383 patients
 - Lung: 0.5 hours for 166 patients
 - Prostate: 1 hour for 251 patients (with Plan Sum)

DVH:

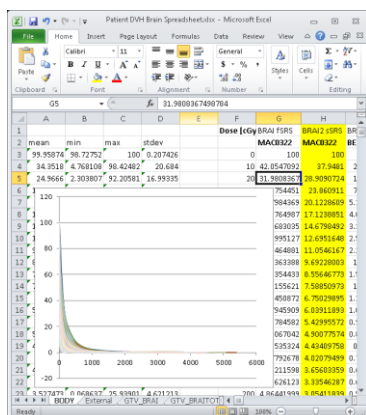
- While running the structure spreadsheet for DVH will start to write columns of dose volume information per patient. Each new structure is placed into a new sheet and above each patient is the plan name and is used to differentiate repeat patients

	A	B	C	D	E	F	G	H
1						Dose [cGy] BRAI fSRS	MACB322	
2	mean	min	max	stdev				
3						0	0.00	
4						10	42.05472	
5						20	31.90384	
6						30	27.17545	
7						40	23.79044	
8						50	21.0765	
9						60	18.68304	
10						70	16.59951	
11						80	14.84649	
12						90	13.39634	
13						100	12.09544	
14						110	10.91056	
15						120	9.940367	
16						130	9.079489	
17						140	8.297046	
18						150	7.60067	
19						160	6.965353	
20						170	6.377927	
21						180	5.849999	

- After it is finished running the first four columns of each sheet will be filled with mean, min, max, and standard deviation in that order

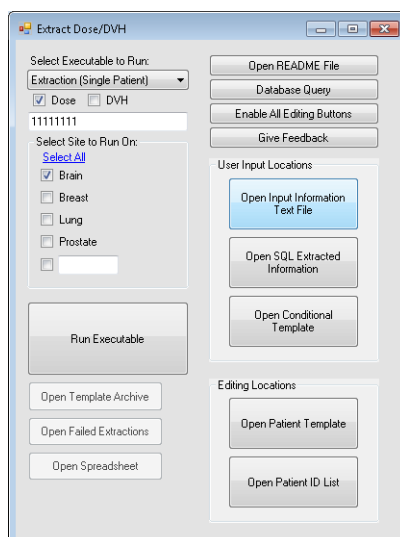
Running Extraction User Interface

- A plot using the columns of data as data series will also be created for each sheet
 - i. If the columns exceed 255 then the chart will be limited to the 255th data column
 - ii. If the plot comes out looking not as expected (for example, random vertical lines and jumps) then right click the plot, choose Select Data, and then click Switch Row/Column as sometimes the auto plotting will take rows as data series rather than the columns



- Extraction times (these depend more on the number of structures per patient rather than the number of patients):
 - i. Brain: 2.5 hours for 128 patients
 - ii. Breast: 3 hours for 383 patients
 - iii. Lung: 4.5 hours for 166 patients
 - iv. Prostate: ~24 hours for 251 patients (with Plan Sum)
7. The *Template Archive*, *Failed Extractions*, and *Spreadsheet* buttons will now be available for the selected structures also

Extraction (Single Patient):

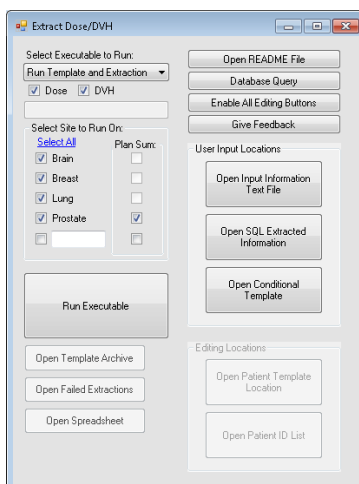


1. If you only want to run a single patient through extraction, then from the drop-down menu select *Extraction (Single Patient)*

Running Extraction User Interface

2. Select either Dose, DVH, or both to run on the individual patient
3. Fill in the *Patient ID Search* box with the desired patient ID
 - If the patient already exists in one of the structures patient ID lists, then it will auto check that structure, but this can be changed
4. From here the input locations and editing locations can both be opened but the *Patient Template* button will now open specifically that patient's template (if it exists)
5. Click the *Run Executable* button to begin running this patient and this will behave the same way for Dose or DVH as the previous extraction

Run Template and Extraction:

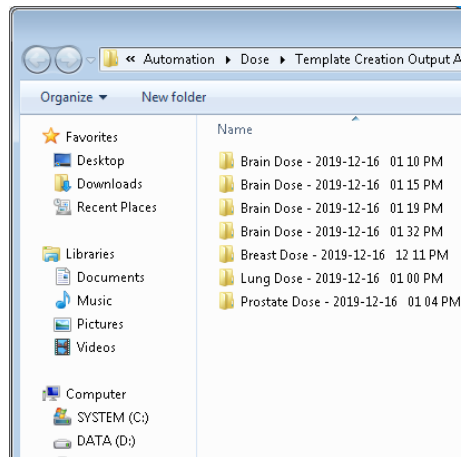


1. If both template creation and extraction is needed to be run without user intervention for correcting patient templates, then select the *Run Template and Extraction* from the drop-down menu
2. From here select either Dose, DVH, or both as needed
3. Select the sites which are to be run and for Prostate and Custom then select if Plan Sum is needed for the template creation
4. From here clicking the *Run Executable* button will create all patient templates for the selected sites and properties and then immediately go into running the extraction over those same sites and properties

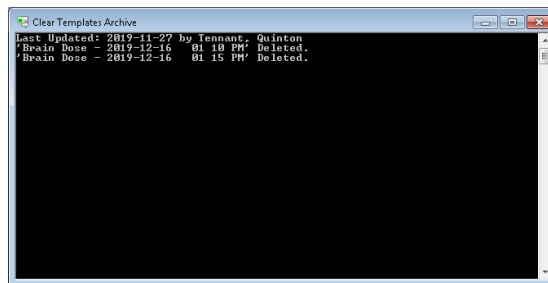
Clear Templates Archive:

1. From running over time, the Template Archive gets full of old templates quickly and so must be emptied occasionally

Running Extraction User Interface



2. To do so select the *Clear Templates Archive* from the drop-down menu
3. Then select either Dose, DVH or both
4. The location for the archive is taken from the General Input Information text file that is found in both the Dose and DVH files
5. Click the *Run Executable* button to clear the archive
6. A window will pop up with the folders that are being deleted



Running Extraction User Interface

Appendix:

Template Formats:

Dose:

```
\\dc3-pr-files\MedPhysics Backup\Data Extractions\Extracted
Dose\structure\Excel Workbook
```

The 1st line in the text file is the location where the Excel file will be saved. The part after the last backslash is what you want the

1 The 2nd line is the name of the course.

```
PELB | PELB PROS ←
```

The 3rd line is composed of 2 parts. The 1st part is what you want the Excel sheet to be labelled as in Excel. The 2nd part, separated from the first by a vertical bar, is the actual name of the plan in Eclipse.

4 The 4th line is the number of structures you want to extract from.

```
BODY | BODY | r_100% r_50%
CTV | CTV_PELBPROS | V_90 v_95 v_100
PTV | PTV_PELBPROS | V_90 v_95 v_100
RECTUM | RECTUM | V_40Gy v_45Gy
```

The 5th to 8th lines are composed of 3 parts. The 1st part is what you want the structure header to be labelled as in Excel. The 2nd part is the actual name of the structure in Eclipse. The 3rd part is the DVH queries that you want to extract.

```
1
Plan Sum | Plan Sum-final | 5000cGy | SCNL_BH | BREL_BH
2
BODY | BODY |
BREL | CTV_BREL |
...
```

For PLAN SUMS, there are extra parameters after the default 2 in the 2nd line. The 3rd parameter is the total prescribed dose. The parameters after the total prescribed dose are OPTIONAL, and you only add them if you want the information about the individual plans in a plan sum outputted in the PLAN SUM worksheet.

DVH QUERY FORMAT

```
wwwxxx_yyyzzz
```

Output metric	Output unit	Input value	Input unit
d – dose v – volume r – volume divided by PTV volume	% – percentage cGy – centigray Gy – gray cc – cubic centimetres	any non-negative number	% – percentage cGy – centigray Gy – gray cc – cubic centimetres

i.e. vcc_99.9%, v%_40Gy, dcGy_3500cc, d%_90%, r_50%

If no units are given:

Volume extraction: input and output units will default to **percentage**.

i.e. v_90 is the same as v%_90%.

Dose extraction: input units will default to **cc** and output units will default to **cGy**.

i.e. d_4000 is the same as dcGy_4000cc.

SPECIAL QUERIES

hi - **Homogeneity Index** $HI = \frac{D_2 - D_{98}}{D_{PD}}$

ui_x/y - **Uniformity Index** $UI = \frac{D_x}{D_y}$ (by default x = 5 and y = 95)

$$UI = \frac{D_5}{D_{95}}$$

ci_x - **Conformity Index** $CI = \frac{V_{RI}}{TV}$ (by default RI = 95)

$$CI = \frac{V_{95}}{TV}$$

gi_x/y - **Gradient Index** $GI = \frac{D_x}{D_y}$ (by default x = 50 and y = 100)

$$GI = \frac{D_{50}}{D_{100}}$$

where D_x is the dose received by x% of the query structure.

D_{PD} is the prescribed dose.

V_{RI} is the volume of the query structure covered by the reference isodose line.

TV is the target volume.

DVH:

\\dc3-pr-files\MedPhysics Backup\Data Extractions\Extracted
DVH\structure\Excel Workbook

The 1st line in the text file is the location where the Excel file will be saved. The part after the last backslash is what you want the

1 The 2nd line is the name of the course.

The 3rd line is the name of the plan as extracted from the database

BRAI fSRS

9 The 4th line is the number of structures you want to extract from.

Running Extraction User Interface

BODY

External

GTV_BRAI

GTV_BRAITOTAL

Brainstem

Healthy Brain

Optic Chiasm

Optic N_L

Optic N_R

14

The following lines are the structures as taken from the sample template found in \\dc3-pr-files\MedPhysics Backup\Data Extractions\Automation\DVH\Template Creation Input