Plan Overview

A Data Management Plan created using DMPTuuli

Title: Basics of Research data management

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Template: Research data management plan for students

Project abstract:

Background

The utilization of magnetic resonance imaging (MRI) in radiotherapy treatment planning (RTP) has been steadily increasing during recent years. The advantage of MRI compared to computed tomography (CT) imaging is the superior soft tissue contrast. Therefore, the treatment region and the surrounding healthy tissues can be delineated more effectively in the MRIs compared to CT images. This improves the treatment outcomes and reduces the complications in healthy tissues.

In RTP of the brain, the current method of utilizing the MR image information is to co-register them with CT images. This reduces the cost-efficiency of the RTP process and increases the uncertainty in treatment targeting. Recent advancements in the development of MRI-only -based RTP methods have enabled the transformation of MRI images into synthetic CT (sCT) images. However, the dose calculation accuracy of the MRI-only based method has to be evaluated compared to clinically used CT-based RTP methods.

The aim of the current study is to validate the dose calculation accuracy and patient positioning accuracy of a commercially available, AI-based MRCAT Brain (magnetic resonance for calculating attenuation) algorithm into routine clinical workflow. The algorithm has been designed specifically to generate sCT images from brain MRI data.

Methods

To validate the dose calculation accuracy, the MR images of each patient will be converted to sCT images using the MRCAT Brain algorithm. The sCT images will be imported into the treatment planning system, and co-registered into corresponding CT images with existing, clinically accepted radiotherapy (RT) plans. The sCT-based RT plans can then be produced using identical planning parameters compared to CT-based plans. The dose distributions of the sCT- and CT-based plans are compared in planning target volumes (PTV) and relevant healthy tissue regions. Additionally, the segmentation performance of the sCT images can be compared to CT images using conventional medical image analysis tools.

Aim of the Study

The study enables the use of sCT images in radiotherapy planning of the brain in routine clinical workflow. The results also increase the cost- and resource efficiency of the RTP process as CT scans will no longer be required in RT of gliomas and brain metastases. The communication between the radiotherapy unit and the algorithm developers may also enable further development of sCT generation algorithms, and their application into additional anatomical sites. Overall, the current study increases the potential of MRI-only RTP of the brain. As a result, this improves the ability to treat patients with more adaptive RT techniques, which could improve the treatment outcomes of RT.

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Basics of Research data management

Research data

List of research data:

Research data type	Contains personal details/information*	I will gather/produce the data myself	Someone else has gathered/produced the data	Other notes
Original image data	x		x	
Anonymized image data			x	
Dosimetric data	x	x	x	
Anoymized dosimetric data		x	x	
Dosimetric comparison datasets		x		

Processing personal data in research

Does your data contain personal data?

- My data does not contain personal data

The research data consists of anonymized magnetic resonance imaging, computed tomography and synthetic computed tomography images data of previously clinically treated radiotherapy patients, and the corresponding dosimetric data related to the clinical radiotherapy treatment plans. The dosimetric comparison datasets are produced based on the anonymized data.

Who is the data controller?

- Student

The student is the data controller for the anonymized data and the dosimetric comparison datasets. The original image and dosimetric data are controlled by Turku University Hospital.

Permissions and rights related to the use of data

Who has collected the data you use in your research?

- I have collected the data
- I use data which is collected by someone else

The anonymized image data and dosimetric data have been collected as part of the routine clinical radiotherapy planning workflow by the University of Turku personnel.
The anonymized dosimetric data, and the dosimetric comparison datasets have been generated and collected by the student.

If you use data that you have collected by yourself you may need separate permissions to use the data you collect or produce, both in research and in publishing the results. If you are archiving your data, remember to ask the research participants for the necessary permissions for archiving and further use of the data. Also, find out if the repository/archive you have selected requires written permissions from the participants.

If you use data that someone else has collected: do you have the necessary permissions to use the data in your research and to publish the results? Are there copyright or licencing issues involved in the use of the data? Note, for example, that you may need permission to use the images or graphs you have found in publications.

The study was approved by the Ethical Committee of the Hospital District of Southwest Finland (reference code: Dnro 116/1801/2017, approval date: 21 November 2017, renewal date: 2 November 2020).

Storing the data during the research process

Where will you store your data during the research process?

- I won't use university's data storage services

If you don't use University's data storage services tell, where are you going to store your data and specify how you will ensure data security and file backups?

The original image and dosimetric data are stored in the servers of Turku University Hospital Department of Radiotherapy.
The anonymized data and the dosimetric comparison datasets are stored in Google Drive repository of the student. Backups of the anonymized data and dosimetric comparison datasets are also storaged in the file server of server Turku University Hospital Department of Radiotherapy.

Documenting the data and metadata

Can you describe what has happened to your research data during the research process? Data documentation is essential when you try to track any changes made to the data.

- To document the data, I will use A readme file linked to the data that describes the main points of the data

The image and the dosimetric data are saved in DICOM file format. The dosimetric comparison datasets are saved either in .txt or .xlsx formats. The DICOM metadata can be accessed later by the user by using a standard DICOM image viewer tool. the .txt and .xlsx files contain description of the data.

If you don't use any of the above mentioned, describe, how you document your research process?

How will you keep your data in order and intact, as well as prevent any accidental changes to it?

- Version control: I will plan before starting the research how I will name the different data versions and I will adhere to the plan consistently
- I will keep the original data files separate from the data I am using in the research process, so that I can always revert back to the original, if need be

Metadata is a description of you research data. Based on metadata someone unfamiliar with your data will understand what it consists of. Metadata should include, among others, the file name, location, file size, and information about the producer of the data. Will you require metadata?

- I will not store my data into a public archive/repository, and therefore I will not need to create any metadata.

Data after completing the research

What happens to your research data, when the research is completed?

All anonymized data will be stored for 15 years by the student.

If you will store the data, please identify where and for how long?

The anonymized data will be stored to the students Google Drive repository. Backup for the data will be stored locally to the file server of Turku University Hospital Department of Radiotherapy.