Development of Robust margin-less Patient Specific Stereotactic Radiotherapy Treatments

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A PhD studentship is available starting from October 2017 to investigate and develop a novel way to plan and deliver stereotactic radiotherapy.

Radiotherapy (RT) is a very efficient and effective cancer treatment with its effectiveness directly related to the accuracy by which the therapeutic dose is delivered to the treatment target. In fact the continuous strife for ever better RT treatments is linked to the more precise and accurate placement of the dose, with minimum spillage to the surrounding healthy tissue, irrespective of the location of the tumour. Thus dose conformity to the tumour is of paramount importance.

The quest for increased targeting accuracy becomes of primary importance when treating intracranial tumours stereotactically (stereotactic radiosurgery/radiotherapy, SRS/SRT). This kind of treatments is of increased complexity that amplifies the effects of associated uncertainties, both spatial and dosimetric. For example, SRS/SRT utilise small beams, which are onerous in terms of dosimetric precision (small field dosimetry) with an increased demand for spatial accuracy, usually sub-millimetre. As such the safe and efficient clinical implementation of such techniques is challenging.

The aim of this research project is twofold:

Firstly, to investigate the feasibility of a new method for the planning of fractionated intracranial treatments (SRT) that forgoes the accepted notion of the PTV safety margin. This offers the potential of a reduced target size, which should reduce the dose spillage to the surrounding healthy tissue. Target localisation uncertainties during treatment would be accounted for during planning by including the patient dependent intrafraction motion as an additional optimisation parameter, following robust planning principles, which is patient specific and will thus lead to more personalised treatments.

Secondly, a new quality assurance (QA) system for the dosimetric evaluation of SRT plans will be investigated. This will feature “end-to-end” QA methods for the dosimetric verification of SRT plans in a patient specific way. As such, the SRT plan will be recalculated and measured using an anthropomorphic phantom that respects the patient specific anatomic details. The aim is to evaluate the benefits of this new method against current routine practice using geometrically shaped phantoms and to investigate the feasibility of developing a new clinical protocol for the planning and dosimetric evaluation of SRT treatments.

A funded PhD studentship is available for 3.5 years for excellent UK and EU candidates, starting in October 2017. The project is a collaboration between the Department of Physics at the University of Warwick and the University Hospitals Coventry and Warwick NHS Trust.

Candidates should hold or expect to hold a 1st (or high 2.1) in Physics or a related subject area.

The Physics department is proud to be an IOP Juno Champion and a winner of an Athena Swan Silver Award, reflecting our commitment to equal opportunity and to fostering an environment in which all can excel.