Funded PhD Position at the University of Zurich – Medical Physics and Radiation Research

We are seeking a doctoral student to investigate Monte Carlo based uncertainty analysis of cancer induction for low- to high-dose cancer risk and to further develop a nanodosimter

Description

The treatment of a first primary cancer with radiation can cause the induction of a second primary cancer, an unwanted, detrimental side-effect of the radiation exposure. Research on secondary cancer risk is becoming more important as radiotherapy cure rates for primary cancers increase. In an individual radiotherapy patient, it is generally impossible to establish with certainty the cause of a second cancer. Consequently, epidemiological studies attempt to quantify the risk of second cancer incidence from exposure to radiation, along with the corresponding uncertainties in that risk. Typically such epidemiological studies rely on statistical approaches and large cohort sizes are needed in order to obtain sufficient statistical power in the findings. Even larger cohorts are necessary when the risk is obtained as a function of second tumor dose; the so called dose-response relationship for second tumor induction. Yet with large cohort sizes, epidemiological studies must take into account uncertainties that arise from all variables in the study, such as the amount of radiation exposure delivered to normal tissues. Most current epidemiological studies predict a linear dose-response relationship for second cancers after radiotherapy. However such epidemiological studies do not take into account dosimetric and location uncertainties of the second tumors.

Goal

This PhD-project, a collaboration between the University of Zurich (UZH) and the Swiss Federal Nuclear Safety Inspectorate (ENSI), was initiated with the aim to study how the widely-used epidemiological method of assigning a point dose to an organ can lead to a biased, incorrect ranking of the quality of fit for candidate dose-response models. In this project it will be possible to determine the extent to which the predominance of linear dose response models for second cancer incidence may be an artifact or bias caused by the use of simplistic, indeed inadequate, dose reconstruction methods. If such artifacts or bias effects can lead to the incorrect shapes for the dose-response relationship for second tumor induction, the implications could be profound for clinical radiotherapy.

Potential extension of the research plan with an experimental study in nanodosimetry: Currently a feasibility study at UZH is investigating a new design of a nanodosimetric device. Based on the results of this feasibility study, which are expected in May 2019, a further development of the nanodosimeter can be included into this research project.

We are particularly looking for candidates with a MSc in physics. Ideally, the candidates will also have a basic understanding of experimental dosimetry and Monte Carlo simulations of radiation. Oral and written English language skills are mandatory. German language skills are not required, but of advantage.

Please send your complete application electronically to Prof. Uwe Schneider. We request a letter of motivation, and your CV plus transcripts of BSc and MSc grades or equivalent.

Contact Details

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