Evaluation of segment-edge inconsistencies in intensity modulated radiation therapy dose distributions.

A recent development in radiation oncology is to modulate the intensity of radiation beams in order to conform more closely to the target and improve sparing of normal tissues. However, modulating the radiation necessitates moving the jaws and multileaf collimators across the target, which increases dosimetric errors due to (i) finite linear accelerator accuracy and (ii) uncertainty in modeling the linac beam within the treatment planning system. Measurements of clinical beams have demonstrated cold junctions within the target. The goal of this project is to (i) identify the cause of the inconsistencies; (ii) evaluate the quality of leaf edge and tongue and groove modeling in the treatment planning system and (iii) investigate optimization techniques and linac quality assurance which minimise the edge inconsistencies.

This project would suit a Radiation Oncology Medical Physics Registrar enrolled in the UWA MSC (Medical Physics) course. To work in a medical environment the student would be expected to have good communication skills. The project would require the student to have, or develop, computer programming skills. Most measurements will need to be performed outside business hours.

Supervisor: Simon Woodings

Development and implementation of an intensity modulated treatment technique for total body irradiation

Total Body Irradiation is a radiation oncology technique used for the treatment of advanced lymphoma or leukemia patients. Combined with chemotherapy, TBI is intended to kill white blood cells and the bone marrow that produces white blood cells. At many centres, including RPH, the treatment is planned and delivered using traditional methods. With CT-based planning and beam modulation it is expected that better dose uniformity across the whole body could be achieved and doses to the key organs at risk – the lungs and kidneys – could be reduced. This project would involve working with CT datasets, modeling and verifying the use of advanced 3D treatment planning systems at
extended treatment distances, and working closely with clinical staff to implement a safe and effective treatment system.

This project would suit a Radiation Oncology Medical Physics Registrar enrolled in the UWA MSC (Medical Physics) course. To work in a medical environment the student would be expected to have good communication skills. The project would require the student to have, or develop, computer analysis and programming skills. Most measurements will need to be performed outside business hours.

Supervisor: Simon Woodings and Dr Yvonne Zissiadis

Optimisation of conformal high-dose-rate brachytherapy for cervical cancer

Brachytherapy has been successfully implemented for the cure of cervical cancer since the early 20th century. For 70 years, the Manchester system has been applied world-wide. But with the advent of CT and MR 3D imaging and high-dose-rate brachytherapy, cervix treatments can now be planned to give personally-optimised treatments. Potential optimization includes better conformality of dose to the target, interstitial boosts for lateral disease and/or adaptive planning to spare organs at risk. The goal of this project is to evaluate and introduce customized patient treatments using existing patient data and using the brand new Oncentra Brachy planning system and GE CT scanners available in the Royal Perth Hospital Radiation Oncology Department.

This project would suit a Radiation Oncology Medical Physics Registrar enrolled in the UWA MSC (Medical Physics) course. To work in a medical environment the student would be expected to demonstrate maturity and have good communication skills. The project would require the student to have, or develop, computer analysis and programming skills.

Supervisors: Gavin Keane and Dr Serena Sia

CMS Monaco montecarlo vs Philips Pinnacle SmartArc treatment planning system for volumetric modulated arc therapy

At Genesis Cancer Care WA, we have at our disposal two of the world-leading planning systems for VMAT, which is a highly advanced method of delivering better treatments, faster. This project will involve comparing and contrasting the relative merits of the two systems, including developing metrics for assessing plan quality, comparing inverse optimization in a variety of clinical scenarios, creating protocols to support the best use of the systems, measuring dose distributions and assessing calculation accuracy, and improving clinical practice. The project will begin with compiling information from previous evaluations of each system.
This project would suit a Radiation Oncology Medical Physics Registrar enrolled in the UWA MSC (Medical Physics) course. To work in a medical environment the student would be expected to have good communication skills. The project would require the student to have, or develop, computer analysis and programming skills and familiarity with Unix operating systems. Most measurements will need to be performed outside business hours.

Supervisors: Peter Mc Loone and Simon Woodings

CMS electron montecarlo vs Philips Pinnacle treatment planning system for tin foil electron treatments of skin cancer.

Perth Radiation Oncology (Genesis Cancer Care WA) has a proud tradition of tin foil electron treatments for squamous cell carcinoma of the nose. This novel treatment results in high rates of cure, low rates of complications and excellent cosmesis relative to competing therapies.

The CMS electron montecarlo planning system is potentially a great leap forward in the accuracy of electron dose calculations. However, incorporating the 0.3-mm-thin tin foil into a CT scan with metal-artifacts and typical resolution 1 mm will prove a significant challenge. This project will explore whether tin foil treatments can be accurately modeled and delivered using the CMS electron montecarlo system, and whether this is an improvement on the existing planning system.

This project would suit a Radiation Oncology Medical Physics Registrar enrolled in the UWA MSC (Medical Physics) course. To work in a medical environment the student would be expected to have good communication skills. The project would require the student to have, or develop, computer analysis and programming skills and familiarity with Unix operating systems. Most measurements will need to be performed outside business hours.

Supervisors: Peter Rampant and Simon Woodings