INSTITUTE NEWS

3rd July, 2020

Institute of Population Health Bulletin

Blogs from institute colleagues

Staff profile *by* Mark Warren, Lecturer in School of Health Sciences

I'm a registered Therapeutic Radiographer and Lecturer in the School of Health Sciences. Therapeutic radiographers are responsible for the planning and delivery of accurate radiation treatments, mainly for cancer. My clinical specialism includes planning and guiding radiation treatments for lung cancer.

In September 2018, I was awarded the College of Radiographers' Doctoral Fellowship, and started part time work on my PhD. I've been working with colleagues in Clinical and Molecular Cancer Medicine and clinicians at the Clatterbridge Cancer Centre to test a new technique for monitoring lung tumour motion during radiation treatment.

The overall aim is to develop treatments to reduce side effects, and design new trials to improve cure rates. Lung cancer is the third most common cancer and it is responsible for 21% of cancer deaths in the UK. It is common for patients to have advanced disease when they are referred, and the drop in cancer referrals during the pandemic may lead to more patients being diagnosed in later stages of disease.

Radiotherapy is commonly used to treat lung cancer in the later stages. High doses of radiation are given to the tumour daily over 5-6 weeks. Knowing the exact location of a lung tumour when giving the radiation is a problem, because tumours move as the patient breathes. Four-dimensional computed tomography (4D-CT), a type of x-ray image, currently gives us the best information about lung tumour position and motion. 4D-CT is used to plan

radiation treatment one week before radiation treatment starts, but the soft tissue contrast (the ability to tell the tumour from healthy tissue) is not clear enough, and the full extent of tumour motion during breathing is not shown.

Immediately before daily radiation treatment, we make partial targeting adjustments using images from a CT scanner in the treatment room. The image quality here is poor: some tissues like bone are clearly seen, but the tumour and its motion is not.

To reduce the chance of missing the tumour, a margin of surrounding healthy tissue is treated to high radiation doses. Lung tumours are often close to critical organs, so side effects such as pain during swallowing and breathing difficulties are more likely.

A new type of treatment machine is able to take Four-Dimensional Magnetic Resonance Images (4D-MRI). This is a different imaging method, with sharper contrast than 4D-CT, and can be used more often and for longer.

This may allow us to see better where the tumour is, and to take steps immediately before treatment to avoid delivering radiation to healthy tissue. Also, 4D-MRI can give us a partial picture of the tumour motion in real-time during radiation delivery. This is impossible with 4D-CT, meaning we could stop the radiation treatment if the tumour moves outside an expected position.

Over the last two years, I've been working with Clatterbridge to develop these new techniques on their clinical MRI scanners. As the lockdown ends, we will recommence our clinical study. We are asking patients having radiotherapy for lung cancer to attend for additional 4D-MRI, they will continue to have the current standard of care. The additional 4D-MRI will be used to test accuracy, and monitor tumour motion changes over time. This will allow us to determine likely improvements in dose to critical organs.

New treatments with additional and extended imaging can place increased burden upon lung cancer patients, who can be quite ill. Therefore, we are also making a qualitative assessment of the patient experience during 4D-MRI. Patients will be asked how we can improve comfort during imaging, as well as how to improve information giving ahead of future trials.

If you want to know more about my work, here is a link to my talk for the Cancer Research UK Allied Health Professionals Academy, Manchester May 2020: https://www.youtube.com/watch?v=Fzrli3xelWU