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My name's Greg Wheeler. I'm a Paediatric Radiation Oncologist and I also, as part of my job, run an adult Late Effects Clinic, which is predominantly for patients who were paediatric patients.

So the complications of radiotherapy in the long term really depend on the age of the child - obviously the younger the child, the worse the outcomes - also the dose of radiation. So we give radiation in things called GRAY, and that's just the unit we use. If we give above about 16 to 20 GRAY, that's when we start to see growth effects. So the area that we treat doesn't grow as well as it should have, and you can often see those areas when these kids become adults. So obviously if we treat children before their pubertal growth spurt, that growth effect will be far more marked than, say, a teenager whose growth effects may be manifest just by not being able to bulk up muscles in that area.

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It also depends on the effect of concurrent chemotherapy. So for instance, the cardiac effects from radiation - which we'll come to later - are worsened if you're given concurrent Doxorubicin or Adriamycin- based chemotherapies. It also depends on the associated surgical trauma. So patients that have had surgical trauma in a particular area of their body with impaired recovery from that, will be affected by the radiation.

So we think of radiation effects in a few different spheres. Obviously the first one I've mentioned is growth and development, and that sort of carries through to many areas of the body. So if we treat the brain, then the growth and development of the brain is affected, and we get neurocognitive impairments. So pretty much, if we treat a kid before the age of 12, they'll have an IQ drop, depending on the volume of the brain treated and depending on the dose every year up until 12. Once they reach 12, the IQ appears to be fairly stable, but ongoing after that - and both in kids who are treated before 12 and kids treated after 12 - there can be impacts on short term memory and concentration. And these children often need special consideration in exams to allow extra time to sit their exams, and they'll also need extra time to study and go over their notes.

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Other effects in the brain can be, for instance, hearing - high tone hearing loss is common in children who have high dose radiotherapy to the ears.

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We also think in terms of other organs as they're growing, so as I mentioned before, if we give a decent dose of radiation to the heart, then that can affect the growth of the heart and also can affect its ability to pump under stress when they get older.

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We would recommend that girls that have had mediastinal radiation, especially if they've had Adriamycin-based chemotherapy, that they are followed up by a cardiologist during their pregnancy and have regular

	<p>echocardiograms, both during their pregnancy and in the immediate postpartum period.</p>
00:03:10	<p>Other effects from growth can be, for instance on kidney – we can reduce kidney function. We can affect bony growth and that can cause asymmetry and obvious problems with back pain and posture depending on where the growth effects are.</p> <p>We often find that children that have had radiotherapy to the back of their neck can get tension headaches due to the erector spinae muscles being hypo-plastic and working a lot harder.</p>
00:03:37	<p>The other effects that we think about commonly are the glandular effects. And so, above about 20 to 30 GRAY, we can have effects on the glands that we treat. So for instance, in the head and neck region, if a significant area of the parotid glands or sub mandibular glands get a high dose of radiotherapy, then there can be xerostomia and dry mouth.</p> <p>Similarly, if the lacrimal gland is in the treatment field, a dry, gritty eye is common. And if the pituitary gland is in the field, we can often see, in increasing order of dose, growth hormone abnormalities, thyroid hormone, ACTH and puberty hormones. And obviously they're managed as any hormone deficiency would be.</p>
00:04:21	<p>Similarly, there can be scarring and intimal thickening of the blood vessels and this can cause increased risk of strokes, increased risk of cardiac disease as mentioned, and reduced exercise tolerance.</p>
00:04:31	<p>The other thing that we are very concerned about with radiation effects, and fortunately it's one of the rarer side-effects, is causing second malignancies. And depending on the series that you look at, that can be between 2 and 5% excess risk through their life. The groups that are particularly vulnerable are patients that have had brain radiation, and they, fairly commonly, up to about 20%, can develop meningiomas – and often we don't need to treat them, we just need to observe them and resect if they cause local problems or pressure.</p>
00:04:59	<p>Young women who have had mediastinal radiation are at increased risk of breast cancers, and they are managed as normal.</p> <p>In a similar way, scatter radiation of the thyroid gland can increase the risk of thyroid malignancies, and these are fairly common but fortunately the mortality from this is very low.</p> <p>Basically, radiation to any part of the body can increase a cancer developing just in that area.</p>
00:05:26	<p>The long term side effects of radiation, as you've probably gathered, are quite broad-ranging and depend enormously on the area that we've treated and the dose. I suppose the important thing is, is that most of what we do in the Late Effects Clinic is basically general practice work through the prism of having had radiation in the past. And so, whilst it's quite scary to have a patient walk into your room and say "I've had this radiotherapy and this chemotherapy" in fact what the follow-up is, is pretty simple. It's the same things that we look at in a normal healthy patient, just with the added antenna of knowing that they've had this treatment.</p> <p>So for instance, we're very cognisant of heart health, so we are rigorous with blood pressure, smoking cessation and anti-cholesterol medications. The neuroendocrine complications are managed like any neuroendocrine complication and need for replacement. We do prefer, for instance, in thyroid cancers or thyroid malignancies, that these patients have an over replacement of their thyroxine so that their TSH is</p>

	supressed and they don't have the TSH driving their tumour.
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	I suppose in the simplest form, radiotherapy ages the part of the body that we treat. And so, the hard thing about looking after these patients is thinking about that ageing process in an earlier fashion.
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	So for instance, if you have a 30 year old that comes in with chest pain and shortness of breath, who's had a history of mediastinal radiation, then the antenna for considering cardiovascular disease is much higher than obviously a 30 year old who has had no risk factors. So for instance, you'd need to think of a 30 year old in that situation as being the same as a 60 year old who would walk through your doors otherwise.
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	And so, I suppose that's where our Late Effects Clinic's main role is, is giving you a plan and to raise the antenna of the things that we're worried about, because ultimately, what we're asking you to do for our Late Effects patients is not significantly different from what you normally do to your patients – it just may happen earlier or just with an extra focus. The GPs that come and visit our clinic often say that this is just like their clinic room, except with a different cohort of patients.
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	So I suppose the most important thing is that you are going to see patients in your clinics that have had cancer treatment, either as an adult or a child. And although you may be the one who is doing the long term care and follow-up, it's important that if you have any questions or worries, that you contact your local Cancer Service Late Effects Clinic, or you contact the main centres around the country because we're more than happy to give advice over the phone, and if need be, we bring those patients in to see us.
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	Thanks for listening.
END OF TRANSCRIPT	

Disclaimer: The information in this video is considered to be true and correct at the date of publication, however, changes in circumstances after the time of publication may impact on the accuracy of this information. The video is not intended to replace clinical judgement.

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