Petitions Committee

Oral evidence: Funding for research into brain tumours, HC 554

Tuesday 24 November 2015

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Watch the meeting

Members present: Helen Jones (Chair); Steve Double; Jim Dowd; Oliver Dowden; Paul Flynn; Ben Howlett; David Mackintosh; Paul Scully

Questions 60-109

Examination of Witnesses

Witnesses: **Professor Garth Cruickshank**, University Hospitals Birmingham NHS Foundation Trust, **Professor Geoff Pilkington**, University of Portsmouth, and **Professor Tracy Warr**, Brain Tumour Research Centre, University of Wolverhampton, gave evidence.

Q60 Chair: First, I welcome our first panel of witnesses, Professor Cruickshank, Professor Pilkington and Professor Warr. We are very pleased to have you here this afternoon and we are grateful to you for coming. We know you are all extremely busy, so we are thankful for your taking the time out. I shall kick off. You may find that just one of you wants to answer particular questions or all of you might want to come in.

We have figures that show that the incidence of brain cancer is going up and we wondered if you had any evidence on the reasons for this? Is it because we are just better at diagnosing it, is it due to a change in registration practice or is the incidence really going up? Can anyone enlighten us on that?

Professor Pilkington: Garth may want to, because he is at more of the clinical forefront.

***Professor Cruickshank*:** We are living longer, so we are probably surviving long enough to have these kinds of tumours. I think that is one issue. The other thing is—classically of cancer in general—that the reporting is that much better, and of course with the initiatives of the NCIN and so on, recording more about what is going on means that we have a clearer idea of the denominator in this. Those are factors, but I think the general opinion now is that there is an increasing incidence, and that has come from both the American figures and the Scandinavian figures and that is fairly clear. If you take out those other factors, there is a slow-rising incidence. Why that is, nobody knows.

Professor Pilkington: It appears to be age-related, so there seems to be an increase in the elderly population, but not in the paediatric sector. There may also be some regional

differences and different types of tumour being diagnosed, plus the fact that the registration system changed a few years ago and so more cases will be being picked up. Therefore that will be reflected in the figures we see subsequently, but at the moment it is still relatively early days.

Chair: Do you have anything to add to that, Professor Warr?

Professor Warr: The only thing that I would pick up on is Garth's point that we do not know what is causing the increase and that puts us in a position where we cannot launch a public health or education initiative to prevent the incidence rising, so you have to concentrate on better treatment.

Q61 Chair: I see. It is interesting that you said, "We do not know". That leads me to something else I wanted to ask you. We have had evidence from Professor Pilkington, very useful written evidence, about the lack of support for research in this area and particularly the lack of funding for PhD and post-doctoral students, so that we did not build up the quality of research. We would like to hear from all of you what steps you think could be taken to remedy those deficiencies and, in particular, is there any particular area that you think money should be directed at as a first step, just to kick us off?

Professor Warr: It is a very complex disease and a lot of the general non-site specific translational work from other tumours cannot be applied to brain tumours because of the complexity not only in location and particularly delivery of therapeutics. I am sure Professor Cruickshank will talk better about that. It is a very heterogeneous disease, tumours that are classified as the same subtypes of a different genetic profile, a different fingerprint, if you like. There will be pockets of resistance in there. There is a whole gamut of research that needs to go on from the very basic translational research, where we identify new targets and we understand how therapeutics could work in a functional way.

We need to have better models for testing, preclinical models, both in the laboratory and in vivo animal models. We need routes to translate findings from the laboratory quickly and efficiently into trials. A very multidisciplinary approach needs to be taken where we bring on colleagues, chemists for drug design and physicists for drug delivery. Bioinformatics: we are able to generate an awful amount of information now from biological screens that needs to be processed. I think all the way through from the laboratory right through to implementing new ideas in the clinic, you cannot isolate one particular area that should be preferentially funded.

Chair: Yes. But we might have to, that was the question.

***Professor Pilkington*:** I would like to take that a little bit further forward. I would like to discuss what we mean by brain tumour research as a definition, because clearly there are a number of different forms of research and they require different funding streams. If we take it right from a basic level, we have what is called basic science, which would include working on genes and proteins and so on; then applied science, which might mean the biological behaviour that is inherent in the expression of those genes; then we go into translational, where we can use either animal models or in vitro tissue culture models and so on and then finally into clinical trials, so there are a number of different areas there.

This is quantitative research, so this is generation of original data from new experiments. But there are also other forms of research like qualitative research, which might be focused more on quality of life through questionnaires, nursing and some epidemiological studies and so on. They would require different types of funding, so at the final end of this stream with clinical trials, those turn out to be pretty expensive, whereas the qualitative work at the other side is relatively inexpensive.

If we go back, I started working on brain tumours in 1971. Between 1971 and 1993 we were not doing too badly and then we started to go downhill, I suppose, somewhere in the middle of the 1980s and the funding streams went down. Up until then, we had the Medical Research Council, the Cancer Research Campaign and what was then the Imperial Cancer Research Fund, the two of which joined up and became CRUK in due course. But it was not that difficult to get grant funding from those bodies in times gone by and then it became much more difficult. The charity sector started to grow from the early 1990s and I think without the charity sector today there would be very little, if any, meaningful brain tumour research in the UK.

What we need to look at, as Tracy has already alluded to, is the complexity of the disease. If you are a young, bright-eyed, bushy-tailed young researcher coming on board, you would go first where there is money, so there is much more money in many of the other forms of cancer research. There is also, the complexity of the system: the brain is a very complex organ, so we see lots of different forms of cell, over 120 different types of tumour. In fact, when the World Health Organisation new classification of tumours comes in next May, we will see that escalate quite considerably because of the molecular profiling data that is coming through. It can scare some people off and the lack of security for young researchers is paramount in the discussions that we are having today. They are different tumours, the prognosis and outcome is different, the life years lost is longer than any other cancer; we are talking about something of the order of 21 years against 13 for breast cancer. The socioeconomic impact is incredibly profound and the ages affected range right the way through from even before the child is born to patients in their 80s, 90s and so on.

Limited funding exists for dedicated researchers and this has led to missing rungs in the ladder. I am talking more specifically about the basic science and the applied science and the translational science when I say that we just do not have a tenure track system running in this country. If you compare parallels with overseas, with the United States and with some of the wealthier and more active countries in mainland Europe, they have a far more flourishing system because there is some security of tenure for young researchers moving up that ladder. We need to put those rungs back in the ladder and we need to have a mechanism, not just to provide for a three-year grant that will facilitate a single research programme and at the end of that three-year grant the person will move on.

I have had 30 PhD students in my labs over the years. I have examined 35 or thereabouts. Very few of them are in gainful employment in neuro-oncology. Some of them lead their own groups in the United States, in Norway and places like that, but sadly, we lose most of them because that funding structure has not been present. That is very important for the scientists. The other thing, which Garth will probably talk about a little bit more, is the split in time between time in the laboratory for clinicians, funding streams for clinicians into the laboratory and that is another issue that we need to take quite seriously.

Chair: Thank you. Do you want to add to that, Professor Cruickshank, particularly about the timing in labs?

Professor Cruickshank: Yes. The reason why we are focusing on brain tumours is because there is an issue to do with targeting here. There is an idea that there is cancer and this is just part of cancer. For many years I sort of assumed that myself. I thought, "Something that has improved breast cancer has to have a spinoff into brain cancer". We are learning. When you look at the figures for what is happening with breast cancer, for example, we are seeing substantial improvements. We are not seeing that in brain cancer and that is the problem. That suggests to me that we are dealing with something that is quite complicated. Of course in the way that we have applied new therapies and we have applied research, it has always been as a second cousin to the cancer, so we are taking what is available in drugs that have been tried elsewhere and trying that in brain tumours, so these are non-targeted drugs. They are not designed specifically for the brain or access to the brain and so on.

We are dealing with something that is almost a Cinderella compared with other cancers. That is an important point, because it was brought out at the American meeting just recently, that we have to think a little bit more about the specifics of what we are dealing with if we are not going to waste a huge amount of money just trying to copy what has been done in one cancer and translate it into another. That presents a very important point: how do we attract people into this kind of work when it seems very niche? That is where it comes down to people like myself and Geoff to go out and sell it to the young people of this world: that, as medical students and researchers and so on, they have to do that. There is a huge educational element, a role that we have to play and we are not being allowed to play this role quite as much as we were before because of constraints on medical training and so on.

There are at least a couple of issues there that are very important, but the focus on the idea that brain cancer is a difficult thing to do. It is very interesting if you talk to the people who deal with brain tumour patients, it is often the physiotherapists who do all the talking to them. The skills that are required demand not only your skill at whatever it is you do, but a caring skill, which is very specifically applied to someone who has deteriorating mental function and that is what frightens people off.

Chair: Thank you. Having warmed you up a little bit, I shall now bring in some of my colleagues. Oliver Dowden.

Q62 Oliver Dowden: We have heard a lot of very moving stories from brain tumour patients and their families. What is it like looking after people who have these brain tumours?

Professor Cruickshank: It prompts the question, why do you do medicine anyway? I guess it is because I am nosey, I like people and I like looking after people and I, as well as them, get something out of it. They often come to me not knowing anything about this disease and you have to try to explain as hopefully, but as realistically, about what is going on here and what you have to do about it. It is patients who present all the problems, they give you the concepts of what you need to do to take the process further. By giving them

more information, by empowering them again at a time when they have lost any control of what is going on, that is a very important part of our role.

What is it like to look after them? You get to know patients. I see them regularly with their tumours and I know that sometime or other they are going to deteriorate, so there is a process of getting to know them, there is a process of managing and looking after them. To an extent, it is a bit like a marriage almost, in the sense I can have the same conversation with my wife that started Tuesday and finishes on Friday because I see her only three times in the week or something. You are carrying on that through your outpatient process, you get to know them very well and they trust you because you know them and they know you. At some point or other your role changes and you are going to have to say to them, "I am afraid your disease has come back" and you have to then start talking to them about cancer and death and how they are going to manage that. That is a difficult role, but importantly, patients trust you to be able to do that and it is the development of that trust that I find part of the professional satisfaction of the job, if that is the right expression.

Professor Pilkington: I am not a clinician, but I see quite a lot of patients—hundreds and hundreds of patients over my career. Increasingly, patients are becoming more empowered of course by access to the internet. They are looking for something that, sadly, is not there from the clinical front. I get lots of cold calls, referrals from different clinicians and from charities and so on. We have open days and we have open sessions. I speak to the families quite often. Increasingly, our role as scientists goes beyond the ivory towers work to reaching out to try to inform patients and perhaps to demystify some of the science. In that context, over the last 12 months we have had an artist in residence who has come in on a Leverhulme Trust grant to try to get visual impact on the way we communicate with patients and I think that has been useful.

But it is quite often not just the patient you are communicating with, it is also their family and their friends and so on. Siblings, for example, are very badly affected by their brother or sister being diagnosed with a brain tumour. The nearest and dearest to patients, where the patient has perhaps come to terms with the disease and come to terms with their lot, you are dealing more with the husband, the wife, the partner than you are with the actual patient, and quite often that is a more difficult and more challenging role in terms of communication. Then, depending upon the diagnosis, this can either manifest as being very calm and relaxed about the process after a while, or it can be that the quality of life has been impacted on to a dreadful extent and they become very angry or very upset and they are looking for something outside.

The more that we can communicate within the research sector with patients to inform them what we are doing and to try to give them some hope—although this should not be false expectation, but reasonable, evidenced hope—that we are doing things within a laboratory environment, the better. That is increasingly part of our remit. I do not know whether Tracy wants to comment on that.

Professor Warr: Yes, I would exactly echo that. I think we have a responsibility, especially when we are taking research funding that has been raised by charities and patients and carers, to inform families what we are doing with that research. I am always inspired by the altruism of patients who come to our research laboratory and they realise that a cure or a treatment is not going to be found in time to help themselves or their

particular family members. They want to know, "What can we do? How can we help? Can I donate you a tissue? How else can I support you and help facilitate the research?" Again, for the younger members of the research team, the PhD students and the post-docs, I think it is very important for them to interact with the patients and get an understanding of the reasons why they are doing this, so that interaction is a very good thing.

Q63 Oliver Dowden: One of the things that relates to this, one of the things that came up a lot in previous evidence sessions was the challenges of diagnosis at the GP level. Do you have any observations on why you think it is so challenging to diagnose, because certainly a lot of the people that we spoke to felt very frustrated that they had been to see their GP, they had what they thought were fairly clear symptoms of brain tumours and that there was some gap in the diagnosis? I wonder whether you could comment on that.

Professor Cruickshank: I think that is very significant. The frightening figure that Mike Richards brings up for brain tumours is 67% are having their diagnosis through A&E and that is when they get their first scan. That implies that there is something going wrong in the system, if you think they may have been to see their GP several times beforehand. There is something very odd going on here, in which the GP is not recognising there is a problem, but the family and the patients certainly are. This is a very difficult issue. It is to do with perhaps the changes in the way that primary care works, the fact that patients often see several different doctors. I think it is also to do with the fact that symptoms are quite difficult as well. For example, the idea that all people with a brain tumour would have a headache is wrong; we know that only about 40% of them do. They may have a range of other odd symptoms that are often difficult to pick out. If you see a patient and you say, "I do not know what is going on here. Come back in two weeks' time" in a cycle or in a process in which six weeks is critical between whether you can treat them and you cannot treat them, two weeks lost is another nail in the coffin, if you want to put it like that. If they then see another doctor who then says, "I still do not know what is going on" then you are into a real set of problems here.

We have thought very hard about this and I know with kids, for example, with the HeadSmart process—the idea of trying to recognise symptoms that might prompt having an early scan, because you do not have a brain tumour until you have had a scan. What could we do to get a scan earlier for those patients? There is an initiative obviously coming from Suspected Cancer in which we say, "Right, we are prepared to have 5% normal scans, as opposed to only 3%" so that is a step in the right direction. But we are still left with this area of uncertainty for the GPs as to who and when they should get a scan. The way forward is for us to try to come up with a way of dealing with this that is more straightforward and simple for them. The Suspected Cancer guidelines are two sides of A4; it is too long when you are a GP. We need things that are quite simple and straightforward, like in someone who is 50 years old, "Is this the first headache you have ever had? If it is, then you should probably get a scan." "Is this different from your normal headaches?" "Yes, it is." "Then maybe you should get a scan." "Do you have more than one symptom that could be attributed to the CNS? Then you should have a scan." That means we are going to scan quite a lot of people and that is going to cost a lot of money. That is going to eat into the £25 million that has been ascribed for diagnostic

purposes for Suspected Cancer and we have to think whether that is the best thing for us to be able to do.

But unfortunately, until you have a scan, we do not know what you have, and that is the truth of it. We can play around with algorithms and maybe even computer games can help us with this, that sort of IT development, but it is still a difficult issue. I have a lot of sympathy for general practice, among all the other things they have to deal with, picking out these cases that are relatively rare. A GP would maybe see two, maybe three in the whole of their lifetime as a GP, so it is very difficult.

Q64 Oliver Dowden: How significant is early diagnosis in terms of outcome? Unfortunately, from a lot of the evidence we have heard, it appears that it is a very difficult disease that frequently has very low survival rates. How big an impact does the early diagnosis have on this?

Professor Cruickshank: This is a difficult one to answer, because you really need a statistician and an epidemiologist sitting in front of you, rather than a professor of neurosurgery. But the way I understand it is quite simple, that there is a graph of what happens to these patients and you may have what they call lead bias, in other words, if you are diagnosed two or three weeks or two or three months earlier, the curve is parallel to the normal curve and you do not get any gains. However, the way you know whether this is useful or not is if you look at a population of patients with this sort of disease and you say, "Is there any evidence that intervention does any good for these patients?"

There is a very recent NCIN paper published by one of my colleagues, Andy Brodbelt, and he has shown, looking at 10,000 patients over the last 10 years or so, that if you do diagnose them, treat them with surgery, radiotherapy, chemotherapy to the standards that we use at the moment, virtually all the patients through all age groups get benefit from it. That means that there is probably an element of lead bias in that, but not that much, and it is worthwhile doing this. The other aspect of it of course is how dreadful to have to say to a patient, "You have been going back to your GP for six weeks and now you have come to me, hemiparetic and aphasic, and there is nothing I can do for you now". This is a real problem to deal with and we are trying to seek the answers here.

Q65 Ben Howlett: I am trying to think of some questions because I was probably going to ask exactly the same thing as Oliver. That is very useful. One thing I do want to ask relates to the equipment and the scanning technology that is available. I know from my own hospital and some of the evidence that has been provided to this Committee already that scanning equipment can be made available in many instances, because it is so expensive, only by private donations and so on. From your own perspectives, what is lacking out there at the moment in terms of equipment that would be able to do exactly what you just said there, which is to increase the rate of scans?

Professor Cruickshank: Just quickly on the clinical side, I think access to diagnostics. That is a critical issue and it is right across the whole sphere of cancer and it is going to get worse before it gets better. We need to alter some of the thresholds, as I have said, for

access to imaging, but we also need to deal with the fact that pressure on imaging is fantastic at the moment, with interventional treatments for stroke and all these sorts of things coming along now, we need a real drive to get more imaging available. Most x-ray departments that deal with MRI scans are completely overstressed with surveillance scanning, diagnostic scanning and so on. We have to negotiate any increases in that, so that is number one.

In terms of technology for what we do, there are some very obvious things, for example, in Europe you have access to a drug called PharmaMar linolenic acid. It is easily available right across for helping us do better surgery for these patients. The more tumour you can remove when you do surgery safely, the better these patients do through the whole process. It is approved through the EC for all this; it is available. It is not a therapeutic drug, it is a drug that enables us to operate and it is not available in the NHS. It has been turned down by specialised commissioners and NICE were not prepared to consider it because it is not a therapeutic drug. We are left in a limbo where the commissioners will not make an opinion about it and NICE will not make an opinion about it and yet everywhere in Europe is using it, the States are going to be taking it up very soon and we are left sitting there.

Of course there is a sting in the tail: this is expensive, about £900 per patient, but that is subtly different from £30,000 for a therapeutic drug. But the difference for patients will be that about 25% more patients will be able to gain from the treatments that we offer. Then there are some other technologies to do with access to radiation treatment, access to some of the more specialised forms, the robotic stuff. There is very little evidence for robotic surgery in this kind of area. There is evidence for good surgery. It is about having each of the departments that we have properly equipped to be able to deliver that service timeously and quickly. Those are the major issues.

Q66 Ben Howlett: Following on from that point, what sort of investment would you say is needed in those particular areas from other departments around the UK?

Professor Pilkington: What Garth is talking about here is a technique that should be there, which empowers neurosurgeons to help patients. There are a few things like that around at the moment, but of course what we are missing and it depends—it is tumour-type specific because there are a whole realm of different types of tumour that have different outcomes—but if we are dealing with the more malignant primary brain tumours and even secondary brain tumours that come from the lung or the breast or skin, what we need is better biomarkers, better ways to identify the nature and the severity of the disease and we need new therapeutic targets. We are steadily moving towards the era of personalised medicine, whereby we have very powerful molecular tools to subgroup patients, rather than just looking down the microscope and eyeballing and getting a pattern recognition and saying, "That is a glioblastoma, that is an oligodendroglioma" or whatever it may be.

We can now pinpoint specific subtypes of tumour that may be able to be differentially treated, not just so that we can cure more patients or have more patients who would benefit longer, but also reducing the problems with quality of life as a consequence of the toxicity of the therapy, so lowering the toxicity. In one group of paediatric brain tumours—the so-called medulloblastomas that occur in the cerebellum in the back of the brain—the

survival rate is quite good, it is around 75%. But a lot of those patients suffer from very dreadful downstream quality of life, due to the toxicity because a generic treatment was employed. Nowadays we have these four groups and that can be modulated according to the precise diagnosis. We are trying to do that with the adult brain tumours and we are using a whole series of DNA mutations and molecular signatures. That is where we need to be pushing this and that of course requires infrastructure, it requires equipment, it requires investment in people to be able to pursue that route so we can help patients more rapidly.

Professor Warr: Yes, I think Geoff is right. The technology has developed at a phenomenal rate over the last 20 years. The complexity of brain tumours, particularly the malignant brain tumours, is also a huge opportunity for developing personalised medicine where you can stratify patients and almost have an off the shelf cocktail of drugs. We have moved from a position where we think of a personalised medicine as in, "You will have a tumour that is particularly developed, one medicine to your particular cancer", to a point where we can say, "Okay, this patient has a tumour and it has aberrations in A, C, D and F and we have a drug that we can target those specific aberrations" and so we can give them a cocktail of these drugs. That may well be different from the next patient, who has aberrations in B, C and Z. We are at a point where, with the proper investment, we can start to make a huge difference in stratification.

Q67 Ben Howlett: If I may, just one last question: at the crux of getting to personalised treatments, we obviously need to increase the rate of clinical trials, but it is quite clear that clinical trials in this country are reducing in number and taking far too long to get introduced. What steps would you like to see introduced—it is quite topical at the moment, debates are going on about it in this place at the moment—that would end up improving access to clinical trials and increasing the rate of those clinical trials too?

Professor Pilkington: We can all take that one, I guess. I think you are alluding to the repurposed drugs Bill, which is very important. In my mind, we have been perpetuating for high-grade malignant brain tumours a very similar approach over four decades now. We have these drugs called DNA alkylating agents that are being used in combination with radiotherapy. The survival curve is modulated by a very tiny amount by adding the chemotherapy on to the radiation therapy in many cases. We owe it to patients to look a little bit wider. There are a number of things that we find in the laboratory that are cheap drugs, which can be repurposed and utilised for other purposes. Some of these may need to be delivered by different means, so by using perhaps insertion in a nanoparticulate system that will deliver them more effectively to the brain or by reformulating the drugs to make them more bioavailable.

For example, there are some drugs like metformin, which have been shown to have some effect in killing brain tumours in mice in laboratories, but the amount of drug you would need to give a patient to get the clinical quantity required in the brain would prove toxic to the patient. You need to either incorporate that into some nanodelivery system or use another drug along with an inhibitor system, which is more efficient in its treatment modality. There are a lot of things out there and I think we ought at least to assess some of the patients for small cohort trials or cohort studies, particularly when you have a disease where the mean survival time is 14.5 months, and that is with gold standard treatment.

There is a real cause to go out there and look not just for new medications—and I think most of us are looking, working with drug companies, working with biotech companies to bring new medications in—but to look at some of those repurposed drugs in those cases where there is no other hope for them other than to go down the traditional route.

Q68 Paul Flynn: The World Health Organisation's reputation has taken a few dents recently. They were criticised for the egregious failure of the six-month delay in recognising Ebola as a world emergency. In 2009, they wrongly identified H1N1 as a world pandemic when it was nothing of the sort. The example was that countries like ours spent £1 billion and we had twice the number of cases per million of the population as Poland. They had spent about 7 zlotys and they did not spend anything on the under-trialled virus and on the useless antivirals. The World Health Organisation is a body that we look to to lead international research and to decide that there was not duplication and to lead the way. Are they performing this function, or is anyone, or is there a danger of efforts being duplicated in other countries wastefully?

Professor Pilkington: I can take that from the pathology standpoint and perhaps Garth can take it from the clinical standpoint. In terms of pathology, the World Health Organisation has a panel of experts that meet about every seven years to classify brain tumours based on the knowledge that has been accrued over that period. The next one of those is due out next May. Having spoken to some of the members of the panel, we know that the number of types of tumour will change and the implications for treating them will change, based on some of the molecular information that is there. As far as the clinical picture is concerned—

Professor Cruickshank: That is an interesting point you raise. Bizarrely, I have never thought of the WHO in the context of cancer, so I find that one a bit difficult to deal with, the reason being that most cancers are dealt with by some very well-established organisations already, so Cancer Research UK and all that kind of thing, perhaps world federations who deal with different types of oncology in different areas. For us, for example, we have just been to the big American meeting, which was pretty intense, I can tell you, but that represents a body of knowledge about what is available worldwide in terms of trials. That itself provides tremendous leadership and understanding about what is going on at the research level, what is happening at the translational level, that is getting stuff into patients, and what is happening at the clinical level. That provides for us a good window into what is available internationally right across the world.

The question I guess would be do you think it is a WHO type of role to drive this process and provide some more leadership, other than that which is going on at the moment? That is what we are here to decide, in a way: does this particular area warrant a much more detailed process to make sure that we get results in this area over the next five years? I think it does, and I think there is a world element to it, if I can just digress a tiny bit. We know, for example, in the work that I do day-to-day that the number of patients who are surviving with breast cancer has massively increased. They are living much longer—long enough to get metastatic disease in the brain. That is a brain tumour as much as anything else is. So if you add up the figures for benign and malignant intrinsic brain tumours, you are talking 12,000 or 13,000 a year, double that figure for metastatic disease to the brain. We are talking about in the UK maybe 30,000 people who will survive long enough to

have metastatic disease to the brain. If that is not an epidemic of world proportions, I do not know what is. At the moment we are struggling to cope with this. In my everyday workload, 50% of the referrals I now receive are patients with renal, melanoma, breast, lung, referred to me, "Can you do anything to control this disease? Can you do anything to help?"

The game is changing now. It used to be palliative care, "Can you keep these people alive for a little bit longer?" With breast cancer and drugs such as herceptin, which now keeps systemic disease under control, if I can control the disease in the brain where herceptin does not reach—which underlies another problem with the drugs we have—not only do they live longer, but they live longer with a better quality of life. This is a really big problem that is creeping up on us.

Chair: Can I just interrupt there? We are up against the clock so I want to get as many colleagues in as possible. Paul, do you have another brief question?

Q69 Paul Flynn: Just a brief one. The main criticism of the WHO is the influence of the pharmaceutical industry and the committee that decided to declare, quite unreasonably, because the epidemiology did not justify the recommendation of an epidemic, was a secret committee, the names were not announced and the majority of them were of course employed by big pharma. We have the same problem here when we have Bills on trying to get rid of patents for medicine. Everyone in the House was in favour of it, and on the sugar, the controversy about the sugar now, whether you should tax sugar. We know that big pharma, like big sugar, have the Government in a throathold and the only people who opposed those two very sensible reforms are the pharmaceutical industry, who influence the Government.

You have made a point about the difference in the way that NICE is going and it is an eternal battle just between NICE and the costs and so on. Is there anything that one can do to expose this and say that this drug, £900 you said—others cost a great deal more—is overpriced? Is there any pressure that should be put on the pharmaceutical companies?

Professor Cruickshank: I think it is very simple. What often happens with brain tumour drugs is that they have been tested in other cancers, other areas and so on, and if it has not worked in breast and it has not worked in colon or melanoma, "We have a little bit of money left in the pot. Let us just try it on brain and see what happens". They would not go to brain straight away with a new drug, because if it fails, as it often does because it is not formulated for that, they may lose a big commercial drive to get it.

The drug temozolomide that we use, for example, only started making any money for the drug companies in the last nine months almost of its patent time as far as brain tumours were concerned. So no self-respecting pharma would look at brain tumours as a prime area to put money into, because the return is virtually zero.

Chair: Thank you very much. If I can take some brief questions from colleagues and perhaps if just one of you could take the answers at the moment so that we can finish on time.

Q70 Steve Double: We have heard a lot of stories about people being referred by their opticians. Why is it easier for opticians to identify brain tumours?

Professor Cruickshank: Why? Well, it depends where the tumour is. For example, if it is in the occipital region at the back of the head where the visual cortex is, they may have aberrant vision and they may say, "Can you see this?" and they cannot, and they will say, "There is a problem". They can do some objective testing and they might pick it up. Conversely, if the tumour is well-advanced and they get pressure inside their heads they may develop a phenomenon called papilloedema, which is a swelling of the optic nerve in the back of the eye and when they look into the back of the eye they will pick that up. So those headaches that they have been going to the GP about for some time, you would look in the back of the eye and you would say, "Right, this is quite clearly relating to cranial pressure. They need a scan". So it may take an experienced person to look in the back of the eye to find it.

Q71 Steve Double: Could regular eye tests generally help with early diagnosis?

Professor Cruickshank: Yes, in about 4% of patients. It would help, but the gain would not be high.

Q72 Paul Scully: You talked about secondary tumours in passing. We understand that deaths by secondary tumours are not recorded as such, so if you had breast cancer and then it spreads to the brain it would be according to breast cancer. Is that correct?

Professor Cruickshank: It is changing now. The NCIN is now in a position to recognise that a brain tumour can be secondary or primary, but up until fairly recently, getting at that figure, the denominator for how many people need a brain tumour pathway, has been very difficult. If it is a secondary from the lung, for example, it has been counted as a lung tumour, you are absolutely right. Increasingly, I think the sophistication of the NCIN now is such that we can demarcate that.

Q73 Paul Scully: What sort of benefits do you think that will bring?

Professor Cruickshank: That will put weight to what I have been saying about the sheer numbers that are coming along now that we are going to have to deal with. The impact on us for surgery, for stereotactic radiotherapy, for managing these patients, is going to be phenomenal.

Q74 Jim Dowd: Just briefly, Professor Cruickshank, in answer to my colleague over there you said that eye tests would benefit only 4% of cases. Is that 4% of people who would have tumours or 4% of all the eye tests that were taken?

Professor Cruickshank: No, 4% of patients who would have tumours. In other words, you are looking at the group that have a brain tumour and you say, "If they had had an eye test,

how many of them would have benefited from that eye test?" and the answer is only about 4% or 5%, something like that. It is a little bit different between specific eye testing, that is loss of visual field, which may come because a tumour is pressing on the optic pathway, and they might pick that up. The second group are the ones who have raised intracranial pressure and would have actual abnormalities at the back of the eye on ophthalmoscopy. A visual field test you can get from any ophthalmologist or ophthalmic optician, as it were. Being able to look at the back of the eye very well indeed demands quite a bit of experience as well. Bizarrely, ophthalmic opticians are usually better at it than GPs and probably a lot better than I am.

Q75 Jim Dowd: Can I just pursue that a bit further? Surely as a general proposition, testing, whether it is optical or dental, whatever it might be, or scans of any kind, is always better than not testing people. Is the difficulty not deciding the cost benefit of that: how many scans you take compared with the number of problems you identify? Does this not play into the hands of the worried well, who always want to be scanned and tested for everything?

Professor Cruickshank: That is really difficult, it is a loaded question, in a way. On Suspected Cancer, we are now saying that we are happy to spend £200 on a CT scan for a 5% pickup rate. That is what has been decided at an economic level for the health service. Under that argument, we are on the borderline of saying, "Well, anybody who has anything that sounds vaguely CNS or somewhere above the shoulder blades should go and have an ophthalmology test straight away" and we would have to find a way of funding that.

Q76 Jim Dowd: On the broader question of the increased incidence or the apparent increased incidence of detection and diagnosis of brain tumour and cancers, surely that is true across the whole field of cancers of all kinds, for the simple reason that it is almost counterintuitive that cancer is far more prevalent now than it was a generation ago?

Professor Cruickshank: Lung cancer is going down, because we have stopped smoking.

Q77 Jim Dowd: Yes, but the point I was coming to—I think you alluded to this in an earlier response—is cancer is essentially an illness of older people, except in certain exceptional circumstances, childhood leukaemia and so on. People are not dying of things that used to kill them off before they became more susceptible to cancer—

Professor Cruickshank: I see where you are going, yes.

Jim Dowd: —so is the increased incidence in the reporting and the diagnosis of cancer a reflection of that or is there a separate issue?

Professor Cruickshank: No, it is across all age groups, so you are still talking about working-age people, young people, having 20% of their life years lost in this process.

Q78 Chair: Does that apply to paediatric cancers, can anyone tell us? Are they increasing too?

Professor Pilkington: Paediatrics account for only about 450 cases in the UK. They are the second most prevalent form of paediatric cancer after the leukaemias, and indeed they are the most frequent of solid cancers, but the numbers game is different there. The information that I have seen would suggest that, if there is an increase, it is an incredibly slight increase compared with the adult population, but we are dealing with small numbers.

Chair: Thank you. That is very helpful.

Q79 David Mackintosh: You said earlier that GPs would very rarely see many cases around this, and I just wonder if that is a reason why there is a lack of funding and awareness around the issue.

Chair: Professor Warr, do you want to tell us about that?

Professor Warr: It comes back down to numbers, and I think you have to take the numbers out of the argument to some extent and look at years lost and the socioeconomic effects of having a brain tumour. We have talked about the smaller number of paediatric tumours in comparison with tumours in older people; we have talked about the cancer brain tumours as an ageing disease, it is present in an ageing population. But then we also have this period, and I think again this is very specific to brain tumours, from the early adult all the way through those younger years of life. That has a huge impact and I think that is very specific to brain tumours and we cannot ignore that.

Q80 Chair: Are you suggesting that in looking at funding for this we should be looking at the number of life years lost, rather than the number of incidents?

Professor Warr: Absolutely, yes.

Q81 Chair: That has been put to us by a number of people. I am asking you, as scientists, do you think that would be the correct measure for this?

Professor Warr: I think it is, absolutely, but then if you wanted to play the numbers game, you have the explosion that we predict is going to happen in metastases, and although we are talking about different molecular target drugs, there are still all of the issues with drug delivery to the brain, that any lessons that are learned from pure brain tumour research can be translated easily into that.

Q82 Chair: Thank you. We are hitting the time barrier. There are lots of questions that we still might want to put to you, but there is one particular one I want to put. If this area was funded and researched better than it is, do you believe we could make progress in it, because

the thing that Governments always want to look at is whether they will get a return for the input? In other words, could research in this area pay off, in your view, in the way that we have made progress in dealing with other cancers, leukaemia being an obvious one—people survive it now and more survive breast cancer—or are we only at the start of a very long road? I wondered if each of you could respond on that.

Professor Cruickshank: I think that is a really good question, because that is the basis on which funding occurs. If you put that in a general way, say to Cancer Research UK, they might give you an answer that, "Right, we are involved in organising trials and research to improve the lot of patients with cancer, so we would set you a target, so we will move the number of patients going into trials from 10% to 17% over the next five years" and that would be a target that they would go for, arguing that more patients in trials means better care anyway for patients. They do better on trials anyway, so you would have some improved outcomes almost automatically as a result of that, plus the fact that we are not wasting clinical material, if you want to put it like that, going through it. We will learn from that and we will be able to test any of our own novel ideas coming from the UK as well as be part of an international effort to test drugs worldwide, so we are helping the whole thing. That is the kind of argument that they would use.

In brain tumours, we have 5% or less of patients going into trials. Increasing that figure would be a fantastic thing to do and we would learn from that. There is a problem to do with the critical mass in terms of basic research for us to be able to be real innovators on the international stage, but we should think very carefully about that, that some of the major developments that have come through in brain tumours have come from British scientists working in different laboratories, so it is possible for us to contribute in this area.

Professor Pilkington: I think the ultimate goal for us all is to deal with all these different types of brain tumour more effectively, whether that is better quality of life for patients or ultimately a cure for patients, but that is the direction we are all pushing in.

You could answer the question in two ways. One of them is, will the net gain that comes out of this be relative to what is happening in other parts of the world? I think we are underperforming in comparison with our colleagues on the other side of the pond. All three of us have just returned yesterday from the American Society for Neuro-Oncology meeting, where we have regular meetings. We have now the World Federation of Neuro-Oncology Societies. We know what each other is doing, but we are under-resourced in the UK so we lose people to American labs, to Canadian labs, where they have far better facilities. In a way, we are missing a game then. Yes, Britain does need to catch up on that gap. We have some very good scientists over here, we have some very good laboratories here, but we are playing catch-up in some respects.

The other thing that we are talking about here is that a lot of the funding streams come through on the back of very solid research, no-risk research, if you like. So where all these changes might occur might be in the blue skies thinking, looking for higher-risk experimentation and so on and so forth, which might just bring the breakthroughs that we require in this field. I think funding streams could perhaps be deployed better than they are in just funding the secure research. It has almost got to the stage where you need to have done so much pilot work that you have done part of the project before you submit your grant application to get funding, which to me is the wrong way around. There are some

very good ideas out there, which speculating a little bit, might end up being of great value clinically.

Professor Warr: I would reiterate very much what Geoff has said. As a nation of scientists, we are very innovative. The way a lot of our academic and educational institutions are set up, universities, for example, there is a great degree of intra-disciplinary collaboration. We are quite good as a nation at thinking outside the box and joining up the dots and collaborating, and I think exactly that, being able to fund some very innovative ideas and move away from this very risk-averse idea of funding streams, we could benefit a huge amount.

Chair: Thank you very much indeed. Can I once again thank all of you for coming? If there is anything we have not touched on in this brief session that you would like to say to us, please feel free to submit it as written evidence to the Committee. We will produce a report at the end of this short inquiry and hopefully hold a debate on it as well. We hope you see it as the start of some progress in this area, although we do not have the resources of some of the other Committees in this House to spend as much time on it as we would like. We are very grateful to you all for coming, particularly as we know that you have an awful lot of very serious work to do. We are grateful to you for giving your time to us this afternoon. Thank you very much, and we look forward to hearing from you further in the future.

Examination of Witness

Witness: **Dr Karen Kennedy**, Director, National Cancer Research Institute, gave evidence.

Q83 Chair: Thank you, Dr Kennedy, and welcome to the Committee this afternoon. If I might start by looking at some of the figures that have been quoted in the Government's answer, they quoted percentage funding for brain tumours as 1.5% of the total cancer spend. They say that includes both fundamental research and funding relevant to all cancer sites. Given the complexities of brain tumours, can research in this area benefit from the fundamental research and research said to be relevant to all cancer sites?

Dr Kennedy: I should start by saying I am not an expert myself in brain cancer research. I work in the research funding area and NCRI is a partnership of the major cancer research funders in the UK. Normally for most cancer types, yes, there will be some commonality in terms of the biology of the underlying disease and the cell biology, so I would imagine that at least some of that research would be relevant to brain tumours, but I understand that there are specific issues as well in that each type of cancer will have its own etiology, its own biology as well, but I would imagine that at least some of that would be useful.

Just to clarify, we do classify the research that is relevant to all cancers, as there are two components to that. There is the fundamental biology, biological research, but then there is also the part of that research funding that is looking at the support and care of patients. So there are two components: there is the earlier research and then also research looking at the support and care of patients, which would also have relevance.

Q84 Chair: What do you think is the actual figure for research funding spent on brain tumours? What is the percentage of all funding?

Dr Kennedy: In terms of the data that we collect from our partners, the only figure that we can be absolutely sure about that is absolutely dedicated to brain tumour research is the 3.3% figure, because that is work that has been carried out specifically on brain cancer. It is very hard to make an estimate of what the other research would be.

Q85 Chair: That is 3.3% of what total, just so we are clear?

Dr Kennedy: That is 3.3% of the site-specific research.

Q86 David Mackintosh: Do you think there is one type of research where it is more difficult to get funding or applications for?

Dr Kennedy: One type of research?

David Mackintosh: Yes, so when you are looking into things, is some of it easier, for example, young adults or children, or is there any specific way of being able to narrow it down?

Dr Kennedy: There are lots of reasons, as the Government itself has alluded to, for research funding in different areas. As I said, there is a range. It is the science itself. Obviously some fields of science are further ahead than others, so they attract more people into the field, they attract more funding through that, the quality of the proposals are often higher. There are issues around fundraising as well. Where there is an area that has a large number of charities, there is naturally a larger pool of research funding available. As well, disease burden is often an issue that will attract both funders and individual scientists into the area.

Q87 Jim Dowd: Brain cancers are comparatively rare compared with the generality of other cancers. There is a general problem with getting research funding, for obvious reasons, for unusual or less common conditions. It is obvious from what the Chair said earlier that the Government wants to see the maximum benefit for any research or other funds it spends. How can you square that circle, given the fact that brain cancers are among the most pernicious and life-changing cancers of all?

Dr Kennedy: As NCRI, we work with our partners to try to identify areas where we can, as a collective, make most impact. Those tend to be areas that cross-cut, rather than disease cap, so cross-cut cancer areas rather than in a specific cancer type. Some examples of that would be radiotherapy research. We work with our partners to build capacity in radiotherapy research. We are working with our partners with the surgical research community to build capacity. Both of those areas will benefit individuals who have brain tumours, but we do not usually have activities where we look at one specific disease type. That is because we have to look for where we will get most the impact working collectively with our partners.

Obviously, some of our partners are looking at this individually. I think you have heard from Cancer Research UK, which is looking at this as an area. Children with Cancer,

which is one of our partners, are looking at this area for paediatric cancers, but as NCRI we work together, we look and we develop initiatives in areas where collectively we can have most impact, and that does tend to be areas that cross-cut different types of cancers rather than a site-specific cancer.

Q88 Jim Dowd: For obvious reasons, it will be dependent upon the optimum benefit to the numbers of people affected, ultimately?

Dr Kennedy: Our partners would have to agree that that would be an area where they feel they would get most impact from that investment, yes.

Q89 Jim Dowd: Do you look at what is going on and reward the most noteworthy, the ones who seem to be making best progress, or do you promote particular types of research?

Dr Kennedy: I should probably just clarify that as NCRI itself, the National Cancer Research Institute, we are a partnership with research funders, but as NCRI we are not reviewing and awarding grant funding ourselves. Our partners carry out that role. Our role is looking across the research spectrum in cancer and identifying where there might be gaps and opportunities, and opportunities for collective working, as I have already alluded to, in terms of areas where we can achieve some impact by working together. We would not be directly awarding grant proposals as NCRI.

Q90 Steve Double: What do you think about the current level of spending on brain tumour research? Do you think it is adequate or do you think more should be put into it?

Dr Kennedy: It is obviously quite low, but there are other areas that are low as well in the research portfolio. It is hard for me to comment on that, because I think that is for our partners, who have to decide what the priorities are within their individual areas and decide if they want to target a specific area. As I have said, two of our partners are already actively looking at this area.

Q91 Chair: How do your partners assess which areas to concentrate on? Are they doing it on the basis of where they think they will make most progress? Are they doing it, as we heard earlier, on the basis of the number of life years lost? What is the deciding factor?

Dr Kennedy: I think it would be a mix of all those, and again I cannot speak on behalf of the individual partners.

Chair: But in your experience?

Dr Kennedy: In my experience, as I said, it would be a mix, depending on their research strategy, the community that they work with. Obviously some are site-specific charities, some cover the breadth of cancer, some work at different parts of the patient path, so it would be dependent on their research strategy, what they are trying to achieve for the area

that they are working in, but it is often a mix of all those. They will definitely want to have most impact.

Q92 Chair: But the question I am trying to get at is how people measure the impact. Is it on quality of life years lost, or is it on where they think they might make the most progress most quickly?

Dr Kennedy: Again, impact in research is a very hard thing to measure, because it is a very long process. If you are talking from the basic end of research right to a change in an individual's outcome, to the development of a drug, that is 15 years sometimes, so it can be a very long process. Again, it depends what part of the process. Some of the research will be blue skies research at the more fundamental end, where people fund a wide portfolio of research without any real idea of where that might go, but some of that will lead into translational. There is a whole portfolio of research, but I think the site-specific charities would be looking at where they can achieve the most impact.

Q93 Chair: But the site-specific charities are quite small, on the whole, are they not? I am looking at the bigger cancer charities. I think the Committee would be helped by some clarification on why brain cancer, which affects quite a large number of younger people, somehow does not have the priority that other forms of cancer have. Can you explain that to us?

Dr Kennedy: Again, I cannot answer on behalf of our partners. As a partnership, we flag data to our partners. We carry out an analysis on an annual basis of the data that our partners provide to us in terms of what funding is happening in their portfolios and we reflect that back to the partners. Then we have discussions around our priority areas, where again as a partnership we can achieve most impact. The areas that I have mentioned already where we are working together are areas that cross-cut throughout cancer, so surgery, radiotherapy, survivorship is another area, so quality of life for individuals living with and beyond. We have rarely, as I have said already, carried out an activity where we have looked at a site-specific. Our individual partners use that data to decide whether they wish to focus on a specific cancer type, but we do not tend to do that as NCRI.

Q94 Steve Double: Do you think there is a role for Government in setting the importance and what would be helpful to your partners from Government in assessing that?

Dr Kennedy: We have Government as a partner. We have the four relevant Health Departments, the research funding arms of those, and we have three research councils as our partners, so they are engaged in that dialogue as well. We have the Government as partners, so we do not lobby obviously for a specific area of research. It is very much a partnership working ethos where we identify collectively the areas that will have the most impact if we are to work together towards them.

Q95 Steve Double: Do you think there is a role for Government overall then in terms of measuring the importance of where research is focused?

Dr Kennedy: I think it would be helpful for anybody funding research to look at where you could have the most impact. But as I said, it is very hard to determine where your impact is going to be if you are going right from blue skies research. Maybe in the clinical research arena it is a bit clearer where you might have some impact, but it is very hard to measure impact from research.

Q96 Paul Scully: Part of the NCRI's role is to look at barriers in research and at areas where maybe a bit more could be done. I am just wondering how you go about identifying barriers in funding research.

Dr Kennedy: Yes, we have done this in several areas, so where there is a mandate from our partners, where they want us to look at a specific area, where we have become aware that there is a challenge in research, we would then talk to the relevant communities, look at what is happening out there already, look at what activity there is in the area, talk to the experts, look elsewhere—are there models that work better elsewhere?—to really understand what the issues and the barriers to the research are. Then we would propose bespoke solutions dependent on what those barriers are. Then obviously it is for our partners to decide whether they then want to resource those.

Q97 Paul Scully: Specifically in terms of barriers is brain tumour research something that you have looked at?

Dr Kennedy: No, we have not specifically. We have not had a mandate to look at that.

Q98 Chair: Is that because your partners have not asked you to look at that?

Dr Kennedy: Yes.

Q99 Chair: Do you have any idea why that might be?

Dr Kennedy: Priorities have been elsewhere. As I said, where we work together they have been to really look at underpinning issues, and those have been the focus of the collective working.

Q100 Chair: In terms of barriers to research, some of the evidence we have indicates there is a kind of vicious circle here, where projects are not given approval because they are not deemed worthy enough, and we are not building up the quality of researchers in order to submit the kind of projects that would then get approval. Has that not been looked at at all?

Dr Kennedy: I understand that some of our partners individually are looking at that, but we have not looked at it collectively as NCRI.

Q101 Paul Flynn: One of the bits of information we had was that in cases of, for example, breast cancer that went into remission and then later a secondary cancer appeared as a brain cancer and the patient would subsequently die, that that death is put down as a breast cancer death rather than a brain cancer death. Is there enough of these cases to suggest that the figures badly distort and understate the level of the incidence of brain cancer?

Dr Kennedy: Again, I cannot speak on behalf of the cancer registries. They would be the people collecting this data and how they record that, but that would be something to look at, whether there is a distortion in the figures because of the way these deaths are being recorded.

Q102 Paul Flynn: Does your organisation or any of your partners form up and support Nick Thomas-Symonds's recent Bill about repurposing the use of drugs in order that off-patent drugs that perhaps cost 6 pence a day could be used for effects, where they have been successful for other diseases, rather than wait for what the pharmaceutical companies wanted, a new patent on a new drug that would cost £60 per day? Are you involved in support of that Bill?

Dr Kennedy: As NCRI we are not, but I believe that some of our partners have been involved in that.

Q103 Paul Flynn: Have you any view yourselves on the desirability of that advance as a useful way of possibly acquiring a new drug for brain cancers?

Dr Kennedy: I cannot speak again specifically about brain cancers, but we would support any way that we can bring benefit to patients.

Q104 Chair: We have had it suggested to us that investment in research into brain cancer, because it is so complicated, might in fact have benefit in other areas of cancer. Is that something that you and your partners have looked at?

Dr Kennedy: As I said earlier, there will be some of our common activities, for example, our radiotherapy activities, where we are building research activity in radiotherapy. That is something that will have wider applications to other types of cancer. I was not sure if you were referring to some of the comments that were made earlier about some of the genomic complexity of the disorder.

Chair: In both areas, yes.

Dr Kennedy: Okay, so I guess anything that is learned about cancer at a fundamental level is potentially, as I said before, applicable to other cancer types, so that would then have

benefits in the other areas. The activities that we are carrying out in terms of developing capacity in radiotherapy, some of the work that we have done in imaging capacity as well will also have applications to other cancer types.

Q105 Chair: You obviously have a lot of discussions with your various partners. We have heard about some of the log-jams in research into this. From your experience, what would break this log-jam on brain tumour research? What should be done? Does it need action by Government? Is it more awareness from some of the major cancer charities? What would lead us forward?

Dr Kennedy: Again, I would imagine it is a whole mix of things, and without going in and looking at the very specific details of what the exact barriers are in this area I would not like to make a judgment on that.

Q106 Chair: But that work is obviously not being done?

Dr Kennedy: Not by ourselves, but as I understand it, Cancer Research UK are looking into this and taking some actions, and also Children with Cancer, which are two of our partners. We would not duplicate effort that is already happening. We are all about co-ordination and collaboration and trying to avoid duplication.

Q107 Chair: Yes, I understand that. I am trying to draw on your experience from working with a number of charities and funders to see exactly what the barriers are. I find it difficult, I must say, to understand what the barriers are, given that we have made progress in lots of other cancers, where many years ago you might have said we were not going to make any progress at all. I am wondering what is so different about brain cancer that we are not for some reason willing to invest and to make that progress. Do you know?

Dr Kennedy: I think there are some inherent challenges, as we have heard, particularly about the blood-brain barrier and the treatment options. But again, I think in terms of research capacity, other barriers, we would have to talk to the people, look at what is happening in the UK already, look elsewhere where they might be having more success in this area and really understand from there what might work and how we could target that appropriately.

Q108 Chair: Is there any chance of that being done?

Dr Kennedy: In the UK?

Chair: Yes.

Dr Kennedy: Cancer Research UK are looking at that at the moment, and so are Children with Cancer.

Q109 Chair: But have they identified any of the blocks?

Dr Kennedy: I understand that they have. It is difficult for me to speak on their behalf, but I understand that they have, yes, and they are trying to address them.

Chair: Okay, that is fine. Thank you very much for that. Again, we are grateful for the evidence that you have given us. If there is anything that we have not touched on that you wish to say, please feel free to give us that evidence in writing.

Once again, can I thank all of our witnesses this afternoon and also the members of the public who have come along to listen and who have been very supportive of the inquiry? The Committee has drawn quite a lot of inspiration from the many members of the public who have both written in and come along to give evidence or to the round tables that we have held in this inquiry. Their stories have been very inspiring. We are also very enthused by the commitment of those who are working in this area, often against the odds, to make progress and we hope that we will see from this inquiry at least some nudges towards some progress in the future. Thank you very much indeed, Dr Kennedy.

Dr Kennedy: Thank you.