Thursday, 3 May 2012

(9.45 am)

(Delay in proceedings)

(9.53 am)

PROFESSOR RUPERT RISDON (called)

Questions from MS ANYADIKE-DANES

THE CHAIRMAN: Good morning, professor. Thank you for joining us. On the screen which we have, we have a frozen picture of you, but your voice is coming over fine. Can we move straight into the questioning, if you are ready for that?

A. Yes, of course.

THE CHAIRMAN: Thank you very much.

You'll be questioned by Ms Anyadike-Danes.

MS ANYADIKE-DANES: Morning, professor.

A. Good morning.

Q. Professor, I wonder if you could first take us through your qualifications and your experience.

A. I'm a consultant forensic paediatric pathologist. My qualifications are, I'm a doctor of medicine, a fellow of the Royal College of Pathologists and I hold the diploma of medical jurisprudence.

How far back do you want me to go? I retired from the NHS in 2004. Prior to that, I was professor and head of department in histopathology at Great Ormond

Street Children's Hospital. I have a long experience of both paediatric and adult pathology. I was consultant at Addenbrooke's Hospital in Cambridge before I went to Great Ormond Street, and also at the London Hospital, the Royal London, as it is now.

I have been a consultant since 1972.

Q. Thank you very much indeed. You were asked by the PSNI to produce a report for them, which I think you produced. I'm not sure whether you can get the same references as we do, but we have your report reference 093-031-081, and it's dated 2 June 2006. Do you have that with you?

A. I looked at it last night. I can give you any details from it.

Q. No, do you have a copy of it with you?

A. I don't have -- I've got a copy of a number of things here. I don't think I actually have that one.

I certainly have -- okay, I've got within the documents that were given to me, there is a ... The substance of that report is written out for me.

Q. Right. The inquiry also asked you to deal with some discrete issues, which you did, and you provided that statement dealing with those issues, at least explaining why you weren't able to deal with them, and that is dated 22 February 2011. We have its reference for the

record as 098/1. Do you have that with you?

A. I do have that with me, yes. I do have a transcript of my first report, so I have that in front of me and I have the answers to those questions.

Q. Thank you very much. When the inquiry sought a statement from you, can we just confirm the documentation that you saw and also confirm the documentation that was sent to you for the purpose of you providing your report for the PSNI.

Just give me one moment. For the record, we have a letter being sent to you on 16 May 2006 from DS William Cross. The reference is 094-203-871. What he says is he's providing the following for the purposes of you giving them a report: four boxes of tissue samples mounted in paraffin wax consisting of eight samples from the lung, three from the liver, two from the kidney, one from the spleen, one from the gland, one the trachea, 15 from the brain and three from the spinal cord and that they were all marked up in blocks. There was also a letter sent to you from the renal transplantation in Greater Glasgow -- and I will come to that in a moment -- and another letter to you also from UK Transplant. The post-mortem report of Dr Armour and the report of Professor Berry and a statement from Adam's mother consenting to the police assisting --

well, you assisting them.

Now, that was the information provided to you before you produced your report from the PSNI; is that right?

A. I have no memory of that. And certainly, that documentation, I wouldn't have kept this long after the event. I have just the brief note that I have given in my current statement. I can't remember exactly what I was given at the time. The tissue samples and so on were all returned. And you have to understand, I have a very small office. I'm retired from practice now. I never expected to hear any more of this, so they've been shredded long since.

Q. I understand that. But in any event, that's what the letter seeking your advice says you received. But more closer to today's date is the request that you received from the inquiry.

Can I just confirm that the inquiry sent you certain documents, which are attached as part of your witness statement that came back. They start at 098/1, page 12, the first of which is a letter that UK Transplant sent to the solicitor to the inquiry, addressing the issue of the fate, if I can put it that way, of the other donor kidney. The donor donated two kidneys, one which came to Belfast and another which remained in Scotland. And this letter deals with what happened to that kidney.

It's just to assist you in case you don't have it with you.

It says:

"We follow up all our transplants at three months past transplant and at that time we were notified that the transplant of the second kidney, which took place on 26 November 1995, had failed on the day of transplant due to infection of the graft. At the time of reporting this information to us, the hospital at which the transplant was performed reported that the recipient was alive."

Now, we went back again and this letter was also in your papers, it's a letter from NHS Transplant, again to the solicitor to the inquiry dated 3 June. That's 098/1, page 13. That letter deals with a number of queries in relation both to what happened to the kidney that went to Adam, before it was sent to Belfast but, for present purposes, gave more information about the fate of the kidney that remained in Scotland, and one finds that on page 14.

It says:

"The other kidney was transplanted on 26 November but failed due to poor recipient arteries, which were very thin and attenuated and infection of graft was recorded as the cause of death but there was no

evidence ..."

(Alarm sounds)

(Pause).

"There was no evidence of infection within the graft although he did have post-operative pyrexia. Subsequent scans show that the kidney was not adequately perfused and the kidney was removed after about a week. The donor was still alive at the three-month follow-up. There was no record of infection recorded for either kidney when they were removed from the donor at Glasgow Southern General Hospital."

Then, of course, you were supplied with the kidney donor information form.

So I don't know if you remember seeing that -- sorry?

A. I have got copies of those here.

Q. Thank you. So you provided your report and it's to those two reports that I want to focus on.

If I can tell you the scheme of what I have in mind. I would like, first, if you could explain your methodology, how you went about compiling your report, help us with how you interpreted the results that you received, and then your view, if you can give it, on the cause of infarction, and certainly your confirmation as to why you think the time, albeit a judgment, is as

you have given it.

Once we have that, then I would like you to consider the views of those who were actually present in the operating theatre and have described variously the colour of the donor kidney, its perfusion, pulsatile flow and production of urine. Not all of them agree with each other, but those are the issues that they deal with, if I can put it that way.

Then I would like you to help us with how your view is -- well, your observations, if I can put it that way, on the report on autopsy, and then your observations on the findings of Professor Berry, who was asked to perform a similar exercise as you were, but that time instructed by the coroner. I will take you to his reports and ask you for your observations and comments on them.

I would like, then, to move on to the comments of other experts who have considered the kidney and what they feel or their view as to its condition when it was transplanted and what some of the reasons might be for what happened to it. That is principally Professor Koffman, who is a consultant transplant surgeon, and Messrs Forsythe and Rigg, who are the expert transplant surgeons for the inquiry. And then finally the view of Dr Coulthard, who is the expert

nephrologist for the inquiry. And then once we have gone through that, I will ask you for, in the light of all of that, your concluded view.

Obviously, if at any stage you feel that I've asked you something that you really can't comment on, it's outside your area, then obviously you say that. But these are the issues that are of concern, not just to the inquiry but also the interested parties. And if you could help us with them, we would be grateful.

THE CHAIRMAN: Sorry, can we just pause for a moment? There's an interference with sound, which I think ... Professor, could you allow us two minutes? There's some interference on our end with sound, which is causing some problems. Do you want to break the link and call back? We'll call you back in a moment or two.

A. I shan't move. I shall be here.

MS ANYADIKE-DANES: Thank you very much indeed.

(Pause).

THE CHAIRMAN: Professor, can you hear us again? (Pause). I can't hear you, I'm afraid.

Can you hear us now, professor? I'm sorry, if you wait for one moment because we can't hear you.

(Pause).

Professor, can you hear us now? It doesn't sound like it. (Pause).

We'll take five minutes.

(10.09 am)

(A short break)

(10.19 am)

THE CHAIRMAN: Are we back?

A. Yes.

THE CHAIRMAN: Professor, thank you for your patience.

A. That's okay.

MS ANYADIKE-DANES: Thank you. Professor, despite the interference, I hope you were able to hear the rough plan of the questioning I had?

A. Yes, yes, I did hear that.

Q. Thank you very much indeed. I wonder if we could just start with what I've called your methodology, how you actually went about the exercise of examining these samples.

A. I looked at them down a microscope. I'm not quite sure what you mean by methodology. I am a histopathologist. I examine histological slides down a microscope, I form an opinion about them and I write a report. I mean, there isn't any other methodology than that.

Q. Can you explain what you're looking for?

A. No, that would be to describe the whole profession of histopathology. One looks at a slide and looks for various forms of pathology. Now, in this particular

slide, this particular set, the pathology was -- significant pathology was confined to the sections of the child's own kidney, which confirmed the clinical diagnosis of cystic dysplasia with quite severe kidney damage in the original kidney. In the sections from the transplant, the transplant was completely infarcted, it was just dead.

Q. I understand.

A. Okay? Now --

Q. Sorry, what I was going to ask you is, were you able to know whether the samples that you were looking at from the transplanted kidney came from a particular section of the kidney or whether they came from a number of different places in that kidney? One's trying to see how representative what you were looking at might be.

A. The person doing the post-mortem would form an opinion as to whether the change was diffuse, involving the whole organ, or there were different areas. Had that been so, they would have taken different areas. As I remember, I think there were two areas but they showed completely the same changes. So the implication of that is that the whole kidney is affected in the same way.

Q. Thank you very much. If you'd had any cause to be concerned about whether you were looking at something

that was localised or generalised, would it be your practice to communicate back and say, "Can I see some other samples?"

A. I was satisfied that these were representative of the kidney as a whole.

Q. Thank you.

A. There are two things that I would like to ask you before we go any further. In all the papers, one of the things is that there is some discrepancy between my understanding of how long the child survived after the transplantation and what I read from Professor Berry's reports. Now, my understanding was that the child died within 24 hours of the transplant. His suggestion that it may be a longer period. That's important in terms of my interpretation of the changes.

So it would be useful if you could tell me two things. One, how long after the operation the child survived. And, two, I know it's the practice in Ireland to perform post-mortems very soon after death, I would like to know whether the child's body -- whether there was a significant period of time between the child dying and having a post-mortem examination, because both of those things would have some bearing on the changes that I see down the microscope.

Q. I understand. Ventilatory support was withdrawn from

Adam at 11.30 on 28 November 1995.

A. And it was the -- the operation occurred on the 27th; is that correct?

Q. Yes. The operation was concluded somewhere in and about noon on 27 November.

A. It's about 24 hours later?

Q. It's about 24 hours later. I can tell you the times when the brainstem --

A. It doesn't matter absolutely precisely. That was my understanding, that it was about 24 hours. And can I confirm that there was not a long delay between the child dying and the post-mortem examination?

Q. No, there wasn't. The post-mortem itself was conducted at 2.40 on 29 November. So ventilatory support is withdrawn at 11.30-odd on the 28th; the post-mortem takes place at 2.40 on the 29th.

A. Thank you very much for that. Okay. You should be asking me the questions.

Q. No, I want to give you whatever information is necessary that you can assist us with your view. What we are trying to understand is how you reached the view you do about the timing.

A. Okay. Well, it's really a matter of experience. In the tissue in which the blood supply has been completely removed, the tissue will die and changes will be

recognisable that it has died over a period of time after that. If I can give you a more familiar example.

Q. Yes.

A. If somebody suffers a heart attack -- okay? -- they clutch their chest with pain because a coronary artery has been blocked by a thrombus. Okay? Now, they might die almost immediately, and if their heart was examined at that stage, it would look completely normal, even though the blood supply had been completely withdrawn. It takes about 12 hours for anything to be recognisable histologically and about 24 hours before there is clear evidence that the heart tissue has suffered a loss of blood supply.

So the point I'm making is that we're talking about a 24-hour period between the transplant being put in and the tissue being examined, albeit a day later, at post-mortem. And the complete degree of infarction with virtually no sign of the individual structure of the tissue, other than in ghost form, after 24 hours would be quite remarkable, in my view. I would expect that to take at least two days.

Q. If I may ask you something about timing. I wonder if you could help us with two scenarios. Let's take the one when either just before or for some reason at the time of literal transplant the kidney suffers a loss of

blood supply and oxygen and so forth. Let's say that is, therefore, happening, I don't know, noon or whatever -- I don't know how precise these things have to be -- on the 27th. So that has happened. The kidney is not having an adequate blood supply and that continues on, and then the ventilatory support is withdrawn at roughly 24 hours in the morning of the next day, and then you do your autopsy the day after that.

So if there's that situation where that kidney could have been effectively without a blood supply for not just the period from when the ventilatory support was withdrawn but almost from the moment of the surgery, and then if we can contrast that with a situation where there was absolutely nothing wrong with the kidney when it was transplanted but the ventilatory support is withdrawn and then you are asked to, amongst a range of other slides, look at the slides of the transplant kidney. So in that case, you're dealing with a loss of supply from whenever the ventilatory support is withdrawn until the autopsy is carried out, you see those results when you're looking at it. Do you see what I mean by those two scenarios? Can you help us with the difference of what you would expect to see?

A. I'm not quite sure I get it completely. You're saying that --

Q. It's a longer period. If the kidney --
A. Okay, the transplant is performed. The child is on respiratory support almost immediately after that for another 24 hours, then the support is withdrawn.
Q. Yes.
A. And is the child certified dead at that point?
Q. Yes. If you've got that scenario --
A. So there is 24 hours between the kidney being implanted and the child's death.
Q. Healthy kidney being implanted and then the child dying. Yes, that was the second scenario I put to you. The first --
A. The first scenario --
Q. It's a difficulty for the stenographer if we talk over each other. That was a second scenario that I put to you, which is a perfectly healthy kidney at transplant goes in and the child suffers the cerebral oedema and dies and ventilatory support is withdrawn. So it's going in at about noon, or thereabouts, on 27 November. Ventilatory support is withdrawn the follow day. There's that scenario. Okay?

The first scenario I had to put to you is when the supply to the kidney is compromised, either there's a problem with the kidney just before it goes in or as part of the process of it going in, it's compromised, so

it has an inadequate blood supply right from the outset.

A. Yes.

Q. So there is a longer period, if I can put it that way, where it is not receiving a blood supply, and I was putting that to you. So what I'm trying to see is your view about those two different timings, if I can put it that way.

A. I think you raised another very important point, and that is to seek to get that degree of precision out of a subjective interpretation of a kidney [loss of sound] microscope is just impossible. You cannot time events with that degree of precision. I know it would be nice from a lawyer's point of view if you could, but you cannot. The scenario you just described adds on two or three hours or something like that to the other time frame.

Q. I think it may add more than that. Let's just be clear about the timings that I'm putting to you so that we're clear on it.

The transplant is finished at noon, let us say, on 27 November. That's one important time.

Ventilatory support is withdrawn at, I think it's, 11.30, the following day, the 28th. That's another scenario.

And, then, thereon it's a matter of when the slides

then are taken at, I think it was, 2.40, on the 29th. So that's what you're looking at.

A. Yes. Between the child's death and the tissue being removed post-mortem is less important. I only asked that because if it's a considerable period of time that in itself might cause deterioration in the appearances --

Q. I understand?

A. The time interval that you're talking that won't add another dimension to the equation. And neither would a couple of hours either way because, as I say, this isn't a precise science.

However, if one was talking, you know, not in a transplant situation, maybe -- what shall we say? -- in the course of an operation, a surgeon had inadvertently tied the blood vessel to a perfectly normal kidney, you wouldn't expect the sort of changes that I saw down the microscope here to occur in that sort of period of time. It would be really pushing it for that to happen.

Now, I think there's another point that is important here, and that is the transplant kidney doesn't go straight from the donor into the recipient. There is a period of time when it is perfused, kept on ice, et cetera. And I understand from the other documents

that a degree of renal tubular necrosis, particularly if it's a very long period, as I believe it was about 30 plus hours in this child's case. That in itself might produce changes in the renal tubules that I would recognise at post-mortem. So it isn't quite the same as a perfectly normal kidney going into a child and then 24 hours later -- so I think you'd have to factor that in to what one is seeing.

But I think at one point Professor Berry suggests that the event that caused the non-perfusion of this kidney must have occurred either at the time of transplantation or thereabouts. Now, I would agree with that. That would be the shortest period of time that you could envisage, even taking into account that the kidney was not a normal kidney, in the normal sense of the term, it was a kidney that had already been stored for 30 hours and perfused.

I think that you would certainly -- I don't think there would be any period of time after transplant surgery had been completed when that kidney would have functioned. That would be my view from the histology. And that is taking account, as I say, that this is not an exact science, but the degree of change, in my view, would have taken at least that period of time to occur. So I don't -- one scenario that I would like to get rid

of, and that's the only contribution I think I can make here, is that that kidney wasn't perfectly normal for some hours after transplant and then something happened at that time. Whatever happened, it happened during the procedure that that child received the kidney.

Now, the other thing I would say about timing with regard to histological changes here is that because it's so imprecise, one is very open when one is asked by a lawyer how long does this take, how long does that take. You take very careful cognisance of what other people who might have been there when whatever it was happened, what they think. Now, it seems to me that when the kidney was first put in, many people thought that at that time it was being perfused, although there's some difference of opinion as to whether it was still doing so at the end of the operation.

Now, my only contribution would be that I think something did happen at that time or immediately after the procedure was finished, and there would be no way that the changes that I and Professor Berry saw in the kidneys from the autopsy could have developed in a shorter time than that. Do you see what I mean?

Q. Yes.

A. So something must have happened at the time, roughly at the time of the procedure occurred. Because they

were so advanced, my first thought was that it actually wasn't viable before it was put in, but I've taken note of what other contributors, particularly the clinicians, have said. And also another reason why I said that was the fact that I had been told that the other donor kidney of the pair that went to Glasgow had also failed.

Now, it's quite clear that that failed for a completely different reason, so I don't think one can use that as evidence that both kidneys in some way were irretrievably compromised before they went in. I think they're two different scenarios. And I take the point that -- the observations that were made at the time of the surgery, but I would still stick to the point that something happened to that kidney at least at that time or immediately afterwards, and there has been no period after the operation where that kidney worked normally and then something else happened.

Is that too complicated?

Q. No, it's not. You have just brought me to the very point. Just for people who are following it, if I can benchmark a few things for them from what you were saying in terms of Professor Berry. His point was at 011-007-022.

What he said was very straightforwardly:

"The transplant kidney was infarcted, dead. The

extent of change suggested that this occurred at or before the time of transplantation."

I think that's a point you were making. And then he went on in his -- he had a sort of letter back to the Coroner when he said -- this is the letter of 25 March, 011-053-187:

"My only contribution is that I doubt this kidney would ever have functioned."

Then to bring him up to the statement he made for the PSNI, and this introduced, I think, some of the sorts of qualifications that you've referred to. That's at 093-030-079.

He said:

"The microscopic changes were sufficiently well-established that I estimated that the damage had occurred about two days previously before or around the time of transplantation."

He says, as you do, that the estimate of timing is not exact. Then he says:

"Could be overridden by strong clinical evidence that the kidney was functioning normally after that time."

"After that time", presumably meaning after transplantation.

Then he says:

"This view would be strengthened if the other donor kidney failed to function was found to be infarcted."

And finally:

"A single sample of a whole kidney does not necessarily prove that the whole kidney was infarcted."

Finally:

"I do not know what the kidney looked like to the naked eye inspection."

I think those are the points that you were bringing out in your explanation to us.

You have looked at the views -- or the descriptions, I should say, of the kidney from the other clinicians and you know they're not all entirely consistent, but you say that you factored them in, and even having done that, you are still of the view that this is a kidney which the process that you have described may have started slightly beforehand because of the long ischaemic period, but certainly was starting at or around the time of transplantation. Would that be a fair way of summarising it?

A. That would be exactly it. I think that very much agrees with what you quoted from Professor Berry. I think his point, you know, at or very close to the time the kidney was inserted would be entirely my own view as well, accepting that it is difficult.

I think one has to take some cognisance of the fact that more than one of the people at the operation felt that the kidney at least initially perfused. So I think one would have to that take. But there is some difference of opinion as to whether the kidney appeared normal throughout the procedure.

And my point would be, I don't think -- in the same way as Professor Berry is saying, I don't think this kidney would have ever have functioned normally after the transplant. I would entirely agree with that based on the extent or the advanced state of infarction in the kidney. As Professor Berry said, this kidney was dead.

Q. I wonder if you can help us with this, and I may be showing my ignorance of your science. Is there any way of being able to distinguish between the damage that's done through the long ischaemic time period and the damage that's done, if that's what it is, through depriving the kidney of an adequate blood supply?

A. Yes.

Q. Either the type of damage or the place where you would see that damage.

A. Yes. I think the point is that the most sensitive cells in the kidney to a loss of perfusion are those that line the kidney tubules. The urine -- there are little structures called glomeruli, which are perfused by

blood, and it's clearly from the blood that forms the urine, which then passes down the tubule. Okay?

Now, if there is significant loss of perfusion, the first change you would see under the microscope would be in the tubules. So you could have a stage where the tubular cells are clearly in the process of being destroyed, whereas the glomerulus might look relatively normal. That's why the term "renal tubular necrosis" is used, because the tubules are affected first.

Now, it could well be, and I picked this up from some of the other experts' comments, that sometimes when a kidney has a fairly long ischaemic time before it's inserted that the patient may fail to produce urine because their renal tubules are necrotic, and it may take several days or even longer before those cells regenerate and the kidney works again. So it implies that there has been significant damage to the tubules at least during the time that the kidney is ischaemic, even in those kidneys that worked perfectly normally afterwards.

What I'm saying here is that one would have to take cognisance of the fact that some of the changes or maybe all of the changes that you see in the tubule may be due to a prolonged ischaemic time and they've never recovered because the perfusion has never been effective

after the kidney's been put in, and during that time changes also occur in the glomeruli. I mean, that would be a perfectly feasible scenario that the tubules are already badly damaged and following or during or following the operation, poor perfusion has the same effect on the glomeruli as it does on the tubules.

Q. If I might interject there and help you, I think the person who discusses that in a report is Professor Koffman, and he discusses that in a report that he provided to the PSNI. The reference for that is 094-007-039. It's at paragraph 4.8.

He says:

"The fact that the kidney appeared to change colour and become less well perfused during the operation again is a phenomenon which occurs not infrequently and usually denotes acute tubular necrosis, which is a recoverable process usually caused by a prolonged storage time."

So that seems to equate with what you're saying, that unfortunately, though, it didn't get to the stage where it could recover --

A. Precisely.

Q. -- if I understand what you're saying?

A. It was from that opinion that I made the suggestion that I've just done now. I think that's perfectly plausible.

But I don't think that you would have got the changes in the glomeruli, and something happened very --

Q. I'm going to ask you about that. If we can then go on in his report, and you may help us with this, he then says at 094-007-040 at paragraph 4.10:

"It is likely that the kidney infarcted soon after the operation was complete and there would probably have been either thrombosis in the renal artery or vein."

He goes on to express the view that he thought the kidney was viable when it was transplanted. But that's not the bit that I'm asking you to comment on.

I wonder if you saw any evidence of this, that there would probably have been either thrombosis in the renal artery or vein. Is that something you could see any evidence of?

A. It would be something that you would be -- more usefully look for at post-mortem, because we just have a section of the kidney. You would need to follow the artery or the vein up to see whether there's any thrombus in it.

Q. I understand that. A post-mortem, it's a very, very cryptic description of matters, but what we do have is -- it's 011-010-038. It says under "Transplanted kidney":

"Was in situ in the right pelvis. The ureter drained freely and the vascular attachments were

intact."

And then the other comment that she has to say is at 011-010-040 under "Transplanted kidney":

"There was complete infarction."

Now, does that help you as to whether the pathologist was attempting to describe whether there was thrombosis in the renal artery and vein or not?

A. I think what she would be looking for would be -- she would be looking at the anastomosis, where the surgeon had sutured the vessels together to make sure that they were intact and there hadn't been any technical problem at that stage. I don't think she would -- I think if she would be specifically looking for thrombi it would have said so in the report.

Q. I understand that. I wonder if you can help us with this. So you have identified the tubular necrosis that Professor Koffman has talked about, and you have said that that could be attributed to its long ischaemic time. But you say that's not all that you saw and it's not for that that you've come to the conclusion that the kidney was infarcted at or round about the time of transplant. You went on to say other damage that you had seen which wasn't compatible with simply a kidney that had been overlong in storage, if I can put it that way. So can you help to describe what else you saw that

has led you to this conclusion?

A. I don't think there is -- I think what I have described is why I've come to the conclusion that I have. I mean, I hadn't actually considered the possibility that under normal circumstances with a transplant that has had a long ischaemic time, some damage to the tubules is actually quite common. I didn't know that. But clearly, from the experts' letter, this is so. So at least some of the changes that I see could be related to that rather than just to lack of blood supply.

I mean, I was looking at it from the point of view of how long would it take a perfectly normal tissue to go from perfectly normal to the degree of ischaemic necrosis that I saw in the sections. I think you would have to modify that a bit to say that the fact that the tubules might have been damaged earlier than that would have some effect on the appearances and, therefore, I think the observations that the kidney appeared to perfuse when it was first put in are probably relevant. But at the same time, I would take the point, which Professor Berry also makes, that I don't think this kidney would ever -- after the operation was complete, would ever have had any meaningful function.

Q. Yes. I understand that. But there are issues that depend upon or at least relate to whether you're saying

that notwithstanding the fact that some of the damage that you detected could have been there prior to transplant and therefore, I suppose in layman's terms, shouldn't be used to extend the time that you think the kidney was infarcted for, if I can put it that way. But it is nonetheless important if you help us with, even if you leave that aside, the other damage that you detected to the glomeruli was such that you are pretty firm in your view as to what the implications of that extent of damage is or are, rather.

A. Yes. I would agree with that.

Q. So because of that damage, are you, therefore, of the view that this kidney really must have been compromised at roughly the time that you and Professor Berry put it, which is round about the time of the transplant? Irrespective of whatever other damage it may have sustained as a result of the ischaemic time?

A. Yes.

Q. In a way, we've sort of entered into the territory, and you were doing it, I think, when you gave us the example of the person who sustained a heart attack. But I wonder if you could help us a little more with how that damage is actually caused. What is the cause of the damage that you saw, so far as you can help us with that?

A. If you withdraw blood supply to an organ or even part of an organ, the tissue -- if you obstruct or cut the blood supply, then the area of tissue that is supplied by that vessel will die. This is what we mean by an infarct. An infarct means death of a tissue as a result of withdrawing its blood supply.

Now, what happens, in terms of what you see under the microscope, is that over a period of 12 to 24 to 36 hours the cells in that tissue will lose their normal characteristics, their nuclei will become small and condensed, the [loss of sound] cells will change. All those things are things that we recognise down the microscope.

But going back to my analogy with the [loss of sound] you can completely compromise the blood supply to an area of tissue, but it will be at least 12 hours or more before you would actually be able to recognise changes down the microscope. So the fact that I can see changes in the glomeruli and in the blood vessels here means that it's longer than that. Do you see what I mean?

Q. I do.

A. So we're talking about up to 24 hours even in that scenario, and this is the sort of length of time we're talking about. That's why I bring is back to something

happening at or very, very soon after the surgery.

Q. And it may be that this is outside your area, but are you able to express a view of the kind of thing that would happen to produce that result?

A. No. That's a clinical question. You have loads of clinicians here who are much better qualified.

Q. I was going to go through with you the views of the clinicians in the sense of -- although we know that they're not all consistent, but one way or another they all speak about the colour at various times of the kidney, its perfusion, whether or not it produced urine, although I think it's only the surgeon who considers it does. None of these things are very clear, as you probably have detected from their witness statements and their notes. But, nonetheless, they all raise them, if I can put it that way.

I was going to go through those with you, and I was also going to go through Professor Berry's views with you and Professor Koffman. But it seems one way or another you have actually covered those by having accepted that you have read those and taken them into consideration in your view. So unless somebody else specifically wants me to take you to something, I don't particularly feel it's necessary to take you to all of those.

But I would just ask you now, in the round, having read all of that and reflected on it, can you give us your final view of the timing of infarction of this kidney?

A. Yes. Could I just say that, as far as the observations of kidney colour made by the clinicians, that's right outside my area of expertise so I wouldn't want to go down that -- but as far as Professor Berry's comments are concerned, I would really go along with him. I mean, I think we're in more or less complete agreement that this is an infarcted kidney that suffered a loss of perfusion at or very close to the time that the transplant was inserted. And I think there is good reason for suggesting that.

I think my first suggestion that something might have occurred before the kidney was transplanted, I think that's really sorted out by Mr Koffman's letter, where he's saying that some degree of tubular damage is quite common in kidneys that have a long ischaemic time before they're inserted.

I wasn't aware of that. Had I been aware of that, I would have tailored my opinion to that to say that particularly with all the clinical evidence, that I think something happened to that kidney at round about the time that it was inserted, maybe at the end of the

procedure rather than the beginning, but I don't think that kidney could ever have had any meaningful function after that.

Q. Just to be clear --

THE CHAIRMAN: Professor, can I interrupt for one moment just so I understand it clearly. You agreed a few minutes ago with Professor Berry's report in which he said that his view was that the damage occurred about two days previously at round about the time of transplant, and he would hold that view unless there was strong clinical evidence that the kidney was functioning normally at that time. Right?

A. Yes.

THE CHAIRMAN: I have to take a view about how strong that clinical evidence is, but if that clinical evidence was strong that the kidney was functioning at the time of the transplant, what is the alternative explanation of when the damage occurred? Or is there an alternative explanation?

A. That's actually quite a complicated question, and some of the reasons that I've been going through -- I mean, I think the danger is taking the kidney when it first goes in as being a perfectly normal organ. Okay? And what the clinicians are talking about is whether it is being perfused with blood, which would be things

like: can you see the vessel pulsating? Has the kidney become pink? This sort of thing. As far as I can tell, that did happen when the kidney was immediately put in.

But in terms of what we see 24 hours later, we have to take cognisance of the fact that there may have been some damage to the kidney tubules before all that happened. That damage might have been something that under normal circumstances could have regenerated and been got over. In this particular case it didn't.

Again, the issue over how long this happened -- I mean, Professor Berry was obviously under the impression that there was two days between the operation and death, which is why I queried it in the first place. But at the same time, I think the clinical evidence and the fact that people actually saw the [loss of sound] pulsate, the kidney appeared to become pink, I think some blood must have perfused through the kidney at that point.

What I'm unclear about is what stage after that the perfusion became sub-optimal or even stopped, and whether it was during -- I mean, after all, the operation isn't a single moment in time, it's a four-hour procedure. Whether during that period something happened or immediately after the procedure was finished. My view is that in terms of an operation

being complete and now you go away with a kidney that is functioning, I don't think so. I don't think that kidney ever had any meaningful function by the time the whole transplantation procedure was complete.

THE CHAIRMAN: Thank you.

A. After it was complete.

MS ANYADIKE-DANES: Thank you. Just to clarify one point. When you produced your first report, you said you had not taken into consideration the damage that you were seeing could include damage that the kidney had already sustained through its long ischaemic time. So you took all the damage together and took a view in your professional judgment as to what that meant in terms of when that kidney ceased to have an adequate blood supply. And the question that I wanted to raise with you is, now that you know that some of that damage might actually have happened before transplant and so the damage that could have resulted from the -- let's call -- it the inadequate blood supply, it's a slightly different damage than you had originally thought. Does that affect at all your view of when you thought the kidney or think the kidney infarcted?

A. I think when I talk about damage occurring at the time of transplantation or maybe before, I think some of the damage did occur before and it was the result of the

long ischaemic time. Now, I wasn't aware of that when I wrote the report. But in actual fact my report is probably still correct. There was some damage before the kidney was actually transplanted and more damaged subsequently. But it would have an effect on what that kidney looked like under the microscope 24 hours after the transplantation.

I mean, I'm quite happy to accept that some of the changes that I saw in the tubules might well have been due to the long ischaemic time, which under normal circumstances wouldn't have mattered. The kidney would eventually -- what happens is that those necrotic cells in the tubules regrow as normal cells and then the kidney functions. That is what apparently normally happens but didn't have the opportunity to do so in this case.

Q. So now that you recognise about the long ischaemic time and how you can attribute some of the damage you saw to that cause, I think what you're saying, it's what I want confirmation on, is that doesn't affect when you think that kidney was likely to have infarcted?

A. Yes, that's correct.

Q. Thank you. That's the point I wanted clarifying.

Mr Chairman, I don't think I have any further questions.

THE CHAIRMAN: Professor, could you wait one moment while I just check if there are any questions?

MR MILLAR: If we could just ask the professor to wait for a couple of moments if that would be convenient.

THE CHAIRMAN: Yes. Professor, just allow us a few moments, please. (Pause).

MS ANYADIKE-DANES: Thank you, professor, for waiting. There is one further issue to raise. As you have been talking about the kidney being deprived -- or the donor kidney being deprived of its blood supply and, therefore, oxygen and the effects of that which you have described, an issue arises as to what the general effect of the patient, the recipient, being deprived of adequate oxygen is. As you will know from the post-mortem report, the results of the autopsy were, and indeed the verdict on inquest, that Adam died as a result of acute cerebral oedema. The result of that oedema was that he coned, herniated and therefore died.

The issue is this. If that was happening and there is a live issue as to when it happened, it is believed by some of the experts that it could have happened anywhere between 8.30, 9, 9.30, maybe just before noon, but there is a range of hours in which that could have happened.

The question for you is, if that happened in that

way, is that likely to have had any effect on what you would see as the damage to the kidney? And, therefore, I suppose, the question is, could the damage to the kidney have started, leaving aside the tubular necrosis point, in advance of what you have described as something happening in and around the transplant?

A. That's almost how long is a piece of string? I'm quite happy to accept that other particularly extreme processes going on in Adam's body might well have affected the perfusion of the kidney, but it would mean that -- it would be something that would be happening almost immediately after the transplant occurred, and it could well be that whatever caused the cerebral oedema could have also caused compromise of the perfusion of the kidney.

The actual cerebral oedema is a very dangerous thing, as we've seen here, it can cause death, but it has a myriad of causes. There could be a number of reasons why that happened. And I don't think it is for me as a pathologist to really go into that. These are clinical issues from the people who were looking after him in intensive care, but I'm quite happy to accept the possibility that whatever those processes were, they might also have affected the perfusion of the kidney.

Q. Yes, I think the point is that if it could have that

effect -- and we're not asking you to address the question of whether he did or did not develop cerebral oedema, and if he did, how he did. But assuming that that is what was happening and that he was coning at some point prior to the completion of his surgery, assume that, and if you accept that that process could have had an effect on the oxygen to the transplanted kidney, along with everywhere else in his body, I presume, does that change your view as to when the kidney might have infarcted? Does it have any effect on the conclusion that you've given us today?

A. Not in terms of timing because what is going on in the kidney in terms of what I see down the microscope is independent of what might be happening elsewhere. What I'm saying is that the process that caused the poor perfusion or even absent perfusion of blood through the kidney might well have something to do with the other processes that were going on in this child at the same time. Is that ... I don't know whether I've really answered your question or not.

Q. Well, I think you have answered it partially. I suppose the question really is -- I think you've described it as a combination of effects. You're looking at the end stage, you can see how the kidney looks at the end stage, and you're working back from that to say: if I'm

seeing this level of damage, how long do I think it's likely to have taken for that level of damage to be produced? Is that not effectively what you're saying?

A. That's exactly so. But this child was very ill with a number of processes going on, and it's very, very difficult to dissect one from the other. But in terms of the kidney alone, which is what I'm focused on, for the appearances that I saw from the post-mortem kidney, I'm talking about a sort of minimum time that the clinical observations would suggest was appropriate; in other words, the kidney did function, albeit briefly perhaps, but certainly after the procedure was finished I don't think there was any significant renal function from that kidney, for whatever reason, whether it is related to the other things that were going on in the child's body at the same time. But I'm looking at it just from the point of view of the kidney.

MS ANYADIKE-DANES: Thank you very much indeed, professor.

THE CHAIRMAN: Thank you very much. Professor, we're going to cut the link now. Thank you very much for your time.

A. Thank you very much indeed.

THE CHAIRMAN: Ladies and gentlemen, we'll take a break now for 15 minutes and we'll resume with Dr Haynes. Thank you.

(11.08 am)

(A short break)

(11.30 am)

DR SIMON ROBERT HAYNES (continued)

Questions from MS ANYADIKE-DANES (continued)

MS ANYADIKE-DANES: Good morning, Dr Haynes. I had indicated that we would be going on to look at the issue of atracurium and the matters that follow on in terms of brainstem death and so on. But I've been asked before I deal with that if there are two things that I would address, which really go to the question of blood loss.

The first, if I may take you to the blood swab or the blood loss count and ask for your views on this. Let me pull it up. It's 058-007-021.

You have seen that before, haven't you?

A. Yes.

Q. So that's the count. It's registered by the nurses. One of the nurses, Staff Nurse Mathewson, gave evidence on 30 April, this month, about that count in order to try and assist in what the actual extent of blood loss was likely to have been. Nobody knows that precisely, and you know that, and a number of experts, and indeed some of the clinicians, have tried to formulate their view as to what they think it was. This was part of that process.

Now, I am looking at the transcript of the 30th,

starting at page 126. If I help to locate you in that it's a series of questions that start from my learned friend Ms Comerton at line 10. She's talking about recording the weight of the swabs and whether you timed them, and Staff Nurse Mathewson says, no, you don't time them.

If we go down to line 18 question is:

"Do swabs hold fluids other than blood?"

And the answer is:

"There are six or seven figures there on the left-hand column and they were saline soaks."

And she's asked to specify which ones they might have been. And the answer comes:

"39.8 down to 27.9."

And then she corrects herself and she says:

"They are lines through them."

She refers to those assay line soaks. And when she's asked over the page what that means, at 127, she says:

"Whenever the kidney is put in place a theatre lamp was overhead, so they were used to keep the kidney moist while they were working in that area. So there was saline on the soak or the swab already. So we have the total weight."

Then if one goes down a little further to line 9:

"We used saline soaks, saline swabs that were soaked.

"Question: So they would be chilled or cooled saline water?

"Answer: Cool."

So that's the issue that some of those swabs that have gone into the count, if I can put it that way, were not blood soaked but were saline soaked. What she did is she used roughly 50 per cent.

In fact, if you look at that series that she's talking about, 39.8 down to 27.9, all of which are struck through, you can see just alongside them that she's got half of that figure there. It's that 50 per cent that is attributable to blood loss and that is how she gets her figure.

Do you have any observations to make on that at all in terms of trying to account for or monitor blood loss during the surgery so that you as a paediatric anaesthetist can be monitoring or managing, if I can put it that way, Adam's fluids?

A. Yes, in a general sense of view. Monitoring blood loss is, first of all, very necessary to an anaesthetist involved in any major operation where there may be some bleeding. Having said that, it is actually very difficult to get an accurate measure of the volume of

blood lost. Sometimes in major surgery there can be a significant bleed from a severed blood vessel and when that is the case, it can be more readily measured because one knows that that is blood.

Q. Mm-hm.

A. Broadly speaking, although the sheet looks untidy, they have gone to some length, the nursing staff, to try and allow for confounding factors such as other fluids being mixed with what undoubtedly would have been a steady trickle of bleeding as opposed to a torrential blood loss. So my general comment is that as records of intraoperative blood loss go, this is actually quite carefully kept in that they have made a real effort to try and allow, as best they can, a factor into their arithmetic for fluids measured which aren't blood.

Q. Would this have assisted you?

A. Yes.

Q. Thank you. I don't know if you have seen or read, probably a better way of putting it, the transcript of the evidence of Mr Keane, the surgeon?

A. Yes, I've read it.

Q. And he has addressed the issue of blood loss. There was an exchange as to whether it was significant and how much blood loss you would have to have to constitute significant. One of the things he said was, well --

I think he couches it in terms that it wasn't particularly significant to the task in hand, in the sense that he did expect that there would be blood loss and then perhaps there wasn't -- I think what he's indicating is there wasn't much more than he would have expected for that kind of surgery on Adam with his history, if I can put it that way.

Can I ask your view, as the anaesthetist, did you consider the blood loss to be significant, insofar as you can tell from the papers that you've read?

A. It was significant in terms that it would have to be recognised as occurring and would have to be replaced by the anaesthetist. It is not significant in that it is not out of what one might expect for an operation such as this, given Adam's previous history.

Q. But it would have to be addressed?

A. It would have to be addressed, but it appears to me that the blood loss during the operation was of the magnitude that one would expect from such an operation in a child such as Adam, who had had multiple previous surgical interventions.

Q. Yes. Have you been able to detect from the papers that you have seen any consequences or implications for the level of blood loss that you think he did sustain?

A. Well, I've looked at several papers from several

different angles during the course of this exercise and I think the simplest way of doing it is to look at his haemoglobin before he started.

Q. Yes.

A. And his haemoglobin at the end of the operation, bearing in mind that he received during the operation, I think it was, 500 ml of red cell concentrate approximately. I don't have the paper in front of me, and I can't give the page reference, but --

Q. Well, I think we can help with the haemoglobin. At least where it was at 9.30, which is at 058-003-003.

A. No. No --

Q. That's where it is at 9.30.

A. That's where it is at 9.30, but if we go back --

THE CHAIRMAN: Were you going to make a general point about the haemoglobin?

A. I was going to make a general point in relation to the blood lost in totality during the course of the operation.

MS ANYADIKE-DANES: Sorry.

A. So the haemoglobin was 10 point something or other approximately when it was measured on the eve of surgery. Then again when it was measured subsequently --

Q. Sorry, we can help with that. 307-006-071. If one

looks at the bottom chart, those are the blood results there, and you can see that the haemoglobin level at 7 o'clock is 10.5. At 9.30 it's 6.1. And at 11.30, it's 10.6. Does that help?

A. Yes.

Q. Thank you.

A. So we know that the haemoglobin at the start of surgery before there'd been any blood loss was 10.5. At 11.30 when he returned to the intensive care unit it was 10.6. So the concentration of haemoglobin in Adam's blood was pretty much the same before surgery and after surgery, which suggests to me that the volume of red cells given back by Dr Taylor pretty much approximated to that lost.

Now, blood is transfused or -- it was transfused as red cell concentrate, as opposed to whole blood, and the haemoglobin concentration of red cell concentrate, it varies from unit to unit, but it's of the order of 20 to 24 grams per decilitre. So if one says that he got 500 ml of blood, that would be -- sorry, 500 ml of red cell concentrate in terms of haemoglobin returned or red blood cells returned to Adam, that would equate to approximately 1,000 ml or 1,000 -- or 1 litre of blood which had been lost and the red cell components in it had been replaced. So using that argument, I would suggest that a reasonable estimate for blood loss by

Adam -- or from Adam during the course of his surgery was of the order of 1,000 ml.

Q. And given his size, is that -- and, therefore, I think we were told 1,500 was his circulating blood; is that a lot?

A. His circulating blood volume would be 20 times 80, which is 1,600. So 1,500/1,600 ml would be his normal circulating blood volume. So you can see that 1,000 ml is a significant proportion of his total blood volume and it would have been required to have been replaced and it was replaced by Dr Taylor.

Q. Yes. Then just finally, can you assist with the effects of that on Adam? It may be that we can look at the blood pressure and the pulse and the anaesthetic chart and see, it's 058-003-005. There's the anaesthetic record showing that, and I think we have a chart which reduces it into a slightly simpler ...

In any event, are you able, looking at the actual anaesthetic record itself, to see what effect that blood loss was having?

A. If we could perhaps scroll up to see the graphical part of the chart. Thank you. If you look at the graph at the bottom, the Vs is, if you like, they represent the systolic blood pressure, which is the blood pressure within the arterial tree as the heart ejects, as it

contracts. We can see that it is pretty much around about 100 and then latterly it begins to creep up, perhaps for other reasons. But from this --

Q. Sorry, what does that mean, "perhaps for other reasons"?

A. Well, we have discussed the possibility of raised intracranial pressure developing during the course of events. We have discussed the variability of depth of anaesthesia for various reasons.

Q. We're going to come to that.

A. There's a lot of things that can influence blood pressure during the course of an anaesthetic. The only comment I think that can be usefully drawn in relation to the question you've asked, which is the effect of blood transfusion on Adam in terms of blood pressure, is that there is no doubt that Adam was not allowed to become hypovolemic during the course of the operation, and I think to draw any further or deeper conclusion from that would be inappropriate, given the information we have in front of us just now.

Q. We can pull up a chart showing all his vital signs in case that discloses anything further. 307-006-063. It's the top chart, chart 1, which shows his heart rate, blood pressure and so forth.

A. So this is a chart that has been prepared by the inquiry with a tabulation form of an anaesthetic.

Q. Yes. Of those numbers, yes, but just so you can see them all together along side the times. Does that show anything that can be attributed to the fact that he had lost that amount of blood and had that amount of blood infused?
A. No. I think I would hold by what I've just said, that his systolic blood pressure has never significantly -- has never decreased to a point which could be attributable to hypovolemia, and the only cause of hypovolemia would be failure of the anaesthetist to keep up with fluid or blood administration into Adam's circulation.
Q. That didn't happen, as far as you can see from the evidence?
A. No, there's nothing to suggest that happened. One thing I might add is that had an accurate central venous pressure been available, it might have shown something different, but we don't have that information.
Q. Yes. What could an accurate central venous pressure be showing that one wouldn't be gleaning from this?
A. If I could take an example perhaps there from a different setting.
Q. Yes.
A. If you have, for the sake of argument, a child of Adam's age and weight who was having a major operation of

a different kind and there was bleeding, it may well be the case that the blood pressure would be sustained because of the body's reflexes to maintain perfusion pressure to vital organs. But the actual volume of blood within the child's circulation would have diminished significantly and that would be reflected by a decrease in central venous pressure.

Q. Okay. If we go back to the anaesthetic record, I'm going to move on now to deal with the issue of atracurium. If we go to the anaesthetic record, one can see at 058-003-005 -- well, it's in Dr Taylor's handwriting. It's just the first three typed administrations of drugs on the far left side. Then immediately below that is what we understand to be atracurium, and you will see -- and we'll pull up a chart where it's easier to see the exact times, but in any event, that's it being administered over the course of the surgery.

Then if we go to 058-003-008, here's the chart which shows a number of things. You see the anaesthetic agents. Then if you look to the right-hand side, halfway down, you see relaxants, and then one sees atracurium there and the box is ticked. So that's the form of muscle relaxant that was being used with Adam.

Then if I pull another piece of information so that

we just all have it conveniently, maybe we can see if we can get these alongside. 307-006-063. There we are. It's really the bottom one. If you look, these are the drugs that were administered to Adam along the left-hand side is the time, and you can see atracurium at 10, at 7, 10 at 7.30, 10 at 8, 5 at 8.30, 10 at 9.30 and nothing further.

If we look at it in a slightly different way, along with other things that were going on, by looking at a graph at 307-006-064, there we are. You can see along the bottom the drugs and including there the atracurium. And you can see in relation to everything else that's being administered when the atracurium is recorded as having been administered.

You see there at 9.30, that's the last administration of it, and the operation continues on.

I should say that that chart and this graph, these are documents that were compiled by the inquiry's legal team just to try and find perhaps a more accessible way of presenting the information.

Now, the first thing I would like to ask you is, we know it's a relaxant because the box is ticked, but what is the purpose of the atracurium?

A. The purpose of atracurium is twofold. Would you like me to elaborate a bit about the nature of the drug?

Q. Yes.

A. It's a neuromuscular blocking agent, which is synthetically made. The original prototype, if you like, is a naturally occurring curare. It acts at the neuromuscular junction and it blocks the transmission of a signal from a motor nerve to a muscle to contract. So if the appropriate receptor sites on the muscular side of the junction are occupied by an atracurium molecule, the muscle is no longer able to respond to a neural stimulus to contract.

The purpose of giving a neuromuscular blocking agent is very broadly speaking twofold during an anaesthetic. If it is a major procedure such as Adam underwent, then he would have required to have been artificially ventilated, and that necessitates the placing of a tube in his windpipe. To do that, the anaesthetist has to visualise the larynx and pass a plastic tube through his mouth through his larynx. Even with a significant depth of anaesthesia, the muscle tone and contraction and reflexes make that quite difficult to do unless muscular activity is abolished. First of all, it allows the anaesthetist to complete that part of the anaesthetic, which is very near the beginning of the whole procedure.

Part of that allows the patient to be ventilated without any reflex, coughing, bucking, moving. So the

first requirement for a muscle relaxant is to allow the anaesthetist to secure the airway and safely ventilate the patient for the duration of the procedure.

The second reason to give a neuromuscular blocking agent is to allow relaxation of the muscles when, if it's an abdominal operation, in the abdominal wall. If a surgeon is operating on a structure deep inside the body cavity, any tension in the muscles of the abdominal wall which have been incised will render access to the operative area difficult.

So a neuromuscular blocking agent is continued, certainly for an operation where a body cavity is opened for the duration of the operation, to improve the ease of access of the surgeon to the operative area. And those, broadly speaking, are the two reasons why a neuromuscular blocking agent is given at the beginning and during an operation where a body cavity is opened.

Q. You were asked to provide a report dealing with the administration of atracurium. That's correct, isn't it?

A. That is correct.

Q. Yes. And the issue of atracurium was actually -- we're trying to find the precise reference for it -- raised during the experts' meeting of 9 March. The issue of the drugs that were administered to Adam was raised during the experts' meeting on 9 March.

A. Yes.
Q. You've seen that transcript?
A. Yes.
Q. There was a discussion about all the drugs that he was given and atracurium in particular, and I'm trying to find -- I think my learned friend probably has that reference -- it now, where that's discussed. It's right towards the end.
MR UBEROI: I'm afraid I don't have the inquiry pagination. It's page 132 of my transcript, but I don't know how it's made its way into the inquiry's bundles.
MS ANYADIKE-DANES: We're trying to see if we can find it for you.
I think it has come up.
MR UBEROI: It starts at page 132, which is obscured there, and then there's a passage which goes on, broadly speaking, up until page 135.
MS ANYADIKE-DANES: If we start, I think it's at 18, you've been asked the question about -- well, I have asked you the question as to one is called Atrac, what is that for? And so then you start and you're going from left to right on the drug sheet to actually explain what all the drugs are.
If we carry on from that, I think there's -- the next page. Yes. It starts with the query -- pick it up

at line 14, and then you start with your answer at line 15. You say what it's an abbreviation for, that it's a muscle relaxant, a sensible choice and why it is a sensible choice.

Then I say that I'm going to ask what the effect you think any of these things contributed to his presentation or his condition, but the Atrac, though, was given, it would appear, five times periodically and it doesn't appear to have been given again after 9.30. And the question is posed: why would that be?

And you pick up your answer:

"If you give a dose of atracurium sufficient to cause neuromatic blockade adequate to allow intubation and surgical incision to take place, the duration of action is about 20 minutes to 30 minutes."

And I ask:

"Does that mean they are topping him up?"

As you see the administration of it, and you say "Yes".

And then I ask:

"Well, why wouldn't they be topping him up after 9.30?

And then you say:

"Well, it verges on speculation."

Can we go to the next page, please?:

"The perceived need to top him up. One would imagine that the surgeon was reaching the end of the operation. I can't remember the exact time but it would be 10 o'clock onwards. But one would speculate."

I tell you that roughly the time of anastomosis is 10.30. You say:

"Well, they would be closing up at around 11."

Then I ask you so effectively what about 9.30?

And you say it's speculation, and I invite you not to speculate if you don't want to.

Then you go on to say:

"Because there wouldn't have been any perceived need. There is usually a surgical plea for: can I have some muscle relaxation when closing an abdomen, particularly if a large organ has been -- an adult size organ would have been transplanted."

So I ask you:

"Does that mean surgeons usually want it?

"Answer: Yes.

"Question: If the closing up happened some time round about 11, when would you be given it to permit --"

And then you say:

"You would be trying as an anaesthetist not to give it because the patient won't breathe at the operation because you have given it, but the surgeon wants at that

point in time to assist with muscle closer."

A. Closure, it should be.

Q. "However, fortunately there was none given since the 9.30. So when it comes to saying Adam didn't breathe at the end of the operation I think you can discount the effect of atracurium."

And unless my learned friend tells me to the contrary, I think that's pretty much the end of the discussion on atracurium.

MR UBEROI: It goes on to the next page, 135, please. Your final remark in the middle of the page:

"Now, I think you can sum this up by saying that you cannot read any significance from the drugs used during the course of anaesthesia, including his epidural anaesthetic."

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: Then I ask whether anybody else agrees or disagrees, and people say either they do agree or it's not in their area, but effectively nobody raises anything about atracurium and its mode of -- well, not its mode but its pattern of administration.

That is an issue which was partially raised with Dr Taylor and, as a result of that, we asked you to provide a report, and we asked Dr Taylor to provide a statement. You provided your report without the

benefit of Dr Taylor's statement. He provided his statement without the benefit of your report. So they're independent entirely.

I wonder if we could go to Dr Taylor's statement now. I don't have a paginated version.

THE CHAIRMAN: It's witness statement 008/7.

MS ANYADIKE-DANES: Thank you. If we go there and we see at the next page, which would be page 2 of that, it's recited for him what the anaesthetic record shows and where that comes from. Then he's asked to explain the purpose for which atracurium was administered to Adam and why that particular drug was used.

He goes through essentially, I think, what you have said, which is that it's a neuromuscular blocking drug. It's short acting, around 20 to 30 minutes, and so on.

You would agree with all of that?

A. Yes.

Q. Then we've asked what determined the dose at which it was administered to Adam, including why it was administered at 10 milligrams at 10 o'clock, 7.30, 8 o'clock, and 9.30, but 5 milligrams at 8.30. And you see the answer there. You say:

"The recommended dose is 0.3 to 0.6 milligrams per kilo. Adam was around 21 so the dose given was within the recommended range."

He said:

"It was administered at the beginning of anaesthesia to assist with intubation of the trachea."

Which I think is pretty much what you were explaining in your evidence:

"And it was given throughout the surgery to prevent unwanted muscle movement especially in the diaphragm or abdominal muscles."

I gather you would agree with that, that would be a reason to do it?

A. Yes.

Q. And then --

THE CHAIRMAN: Sorry, rather than read through the statement, is there any point in this section about the dose or the next section about the times with which you don't agree?

MS ANYADIKE-DANES: Well, just for the benefit of those who would be trying to follow the evidence who wouldn't necessarily be able to pick that up in that way, if they were reading the transcript on the website, if I may just give a little bit of the salient points.

THE CHAIRMAN: Is the witness statement available on the website?

MS ANYADIKE-DANES: I'm not sure it is at the moment.

THE CHAIRMAN: It is.

MS ANYADIKE-DANES: Well, perhaps you can read it through and ... If I may take you to page 3 because I'd particularly like to take you to that:

"I don't remember why the subsequent doses were given."

That's the one after 7:

"But the reasons would be to prevent unwanted muscle activity."

And in the knowledge of the activity of the duration of 20 to 30 minutes.

Can you help with why you would give 10 milligrams at the intervals that he did and then give 5 milligrams at the time that he did? What is your understanding of such a pattern of administration of dose?

MR UBEROI: If I might interrupt, if someone were to be following it on the website they would have missed his explanation there, which is very clear, which is as a matter of clinical judgment based on, I think, at least two clear reasons he's given there. Either his judgment as to muscle movement.

MS ANYADIKE-DANES: Yes, you're quite right.

MR UBEROI: So the reason has been given and it is perhaps for the witness to comment whether he agrees with it or not.

MS ANYADIKE-DANES: Yes, you're quite right. I was trying

to be shorter, but anyway perhaps it's fairer to put it out like that:

"To prevent unwanted muscle activity or to assist the surgeon once the surgeon has commenced with the knowledge of its duration of activity of 20 to 30 minutes."

Is why he would have done it. And then he says:

"I cannot remember the reason for its administration as 9.30, but I would have been exercising my clinical judgment or for any of the reasons I have stated before."

And he reasons that he's stated above is to do with not wanting any unwanted muscle activity. So it's a combination of not wanting muscle activity and exercising his judgment as to whether he's likely to have unwanted muscle activity or a surgical request.

So those are the reasons he says. And there's been no evidence of the surgeon requesting it. So if one's with exercising his judgment so as to achieve a situation where there is no unwanted muscle activity, if that's what Dr Taylor was trying to achieve, can you help with why you might have a pattern of 10 milligrams administered at 7, 7.30, 8 o'clock, then 5 milligrams at 8.30 and then an hour and 10 milligrams at 9.30?

A. Could I ask you to put up the report that I prepared

in relation to this? It may help.

Q. Yes. Perhaps the best place to start is page 204-014-002.

MR UBEROI: Well, while that's being brought up, may I add for completeness the remark about no evidence of a surgical request I accept there hasn't been not been any evidence about surgical requests, but it's because it's not been asked because of the way this issue has arisen. So I think that's putting it slightly more clearly for the witness, if I may say.

MS ANYADIKE-DANES: Yes. We may have to address that.

This is your report then. Using that or anything else that you want to say, can you help with the pattern of the administration of the dose initially?

A. Okay. Can I preface this by just quoting from the summary report that I prepared on 18 March? When I said -- I was asked to comment on the anaesthetic given by Dr Taylor, and in that, I said:

"Appropriate anaesthetic agents were used."

And at that point there's no discussion over the dosage pattern, other than to exclude the presence of a neuromuscular blocking agent at the time of the end of the operation. This issue has arisen subsequent to that.

Q. Just before we leave that, the issue -- this issue --

may have arisen subsequent to that, but what he was actually administered is something that happened on 27 November and is recorded, and it was there for consideration. The point itself was raised during the experts' meeting on 9 March. So I don't think, Dr Haynes, it's entirely right to say there's been no issue raised about it?

A. That is true, but the emphasis was a little different during that discussion and, forgive me if there's been a slight misunderstanding, but I believe I've fully addressed it in this report now, which we have in front us.

Q. Yes. Well, except to say that I think that there may be an issue as to why, if you expressed the view that you had no comment to make or the anaesthesia was entirely satisfactory, including the epidural, why you could express a view like that without having considered the actual dose and pattern of the various anaesthetic agents and relaxants. That presumably is part of what you would have been looking at to have formed the view that you had no adverse or other comment to make about the anaesthesia.

A. No. Would it help perhaps if we just discussed this --

Q. Yes.

A. I have tabulated in the middle of this page, as you have

done, the doses given and noted that none -- that the last does was given at 9.30.

Q. Yes.

A. And looking at the other documents available, it appears that the closure of the surgical incision is unlikely to commence prior to 10.30 at the earliest.

Q. Yes.

A. Forgive me, but it was possibly an omission during the original discussion, but this has now been fully addressed as to an examination of the dosage pattern.

MR UBEROI: In fairness to the witness, I think there might be some confusion emerging, and I appreciate the way it's being put and I appreciate the way the witness is trying to answer it. But on my reading of his report, it may well be there is still an issue with the decisions taken as to the administration, for example, this muscle relaxant during the surgery, and rather this new report is more aimed at engaging with a separate issue as to the precise timing of brainstem death. So I would not want the witness to feel it was necessarily being put to him that it was agreed that there is now an issue, from his point of view, with the administration of this drug, when, in all fairness, there may well not be.

MS ANYADIKE-DANES: Why don't we hear his evidence? What

I'm putting to him first, before we get into the issue of brainstem death, before we get into the issue of why nothing was administered after before 9.30 in terms of atracurium, the first question I'm asking is why in those intervals is it 10 milligrams and then you've got a dosage of 5, and why do you have half hourly intervals and then you have an hour space? That's the first point I want to deal with before we deal with what happens after 9.30.

A. Okay. First of all, when an anaesthetist records dosage of a drug such as atracurium, it is so commonly used that the individual may not actually note the time it was given. Secondly, I can't understand why Dr Taylor or whoever was working with him chose to give an increment of 5 milligrams rather than 10 milligrams.

Q. What might be an anaesthetic reason, if I can put it that way, for doing that?

A. A very simple, a really simple reason is there may have only been 5 milligrams left in the syringe that contained the drug, and to give more would have meant opening another vial, which sounds very trivial, but if there is a problem with muscular tone, a dose of 5 milligrams could easily resolve it while another syringe-full is drawn up and made really. As simple as that, is the answer.

If you were to look at a wide range of anaesthetic charts for children ventilated, of a size like Adam, during an operation, you might find that some anaesthetists give 10-milligram increments, some might give 5, some might give more. The actual dosage is -- the dose given at any one time is in all honesty somewhat idiosyncratic.

What I think is important is we note that an adequate dose was given at the start of the procedure and in relation to, was there any effect of atracurium at the end of the operation? Was too much given such that the effect persisted beyond the desired time? And as you'll see I say no --

Q. Well, now that's coming on to, why was nothing administered after 9.30?

A. Yes.

Q. But just so we have your thoughts, the explanation -- or in your view, an explanation for the pattern of amount and interval of the administration prior to 9.30 is simply you start off with a dose that will achieve the desired effect right from the outset and then it's really a matter, as I think Dr Taylor said, of judgment for how much topping up you do and when you do it, recognising the size of the child and the effect, how long it takes the effects to wear off.

A. Yes, that's correct.
Q. Right.
A. And it can be achieved with greater precision if the anaesthetist chooses to give it by continuous infusion, but that is another layer of complexity which is necessary.
Q. Can I ask how it actually is administered? Sorry, can you tell from the evidence here how it was administered?
A. It was administered by Dr Taylor or his assistant taking a syringe containing the drug, connecting it to Adam's drip, his intravenous line, and injecting a known volume into the fluid which was being administered to him.
Q. Thank you. Sorry, then, now I think you're going to help us with why, in your view, no further atracurium was administered after 9.30.
A. Yes. I've put forward several possibilities, and if I may go through them?
Q. Yes.
A. First of all --
MR UBEROI: Sorry. So this question is perhaps put in a clearer sphere, is the question -- is the witness being asked to give his view as to why there was no clinical need or clinical indication for the further administration of atracurium after 9.30? Which I think

might be a more sensible way of putting the question to the expert, if I may say.

MS ANYADIKE-DANES: I think it might amount to the same thing. What I want him to express is why, in his view, from an anaesthetic point of view, you might not require any further administration of atracurium after 9.30. And he's going to go through, as I understand him, the various reasons why you might or you might not.

MR UBEROI: I just repeat, if I may, with the witness having agreed it's a matter of clinical judgment, in his view -- the question is surely, in his view, why would clinical judgment --

THE CHAIRMAN: Were we not referred to the second Newcastle meeting at which he said the choice of drug was entirely sensible and you would be trying not to top him up after 10 o'clock and trying not to give it after 9.30?

MS ANYADIKE-DANES: I think perhaps it would be better if the witness answered that because I'm not entirely sure that that is what he was saying at the meeting.

But in any event, you have the point, you're being asked for your view as an expert anaesthetist as to the reasons why you might not prescribe any atracurium after 9.30 in this surgery. It's his view, Mr Uberoi. I think he can give his view.

MR UBEROI: Well, again, it would be my opinion that the

question should be phrased along the lines of: what factors affect the anaesthetist's clinical judgment as to why atracurium wasn't in fact given after 9.30, the 9.30 dose having worn off at 10?

MS ANYADIKE-DANES: I'd first like his view as an expert.

A. Which question am I to answer?

THE CHAIRMAN: Your question, Ms Anyadike-Danes is?

MS ANYADIKE-DANES: Why, in his view, might you not administer atracurium after 9.30 in this surgery?

THE CHAIRMAN: We have your view --

MS ANYADIKE-DANES: He hasn't answered that.

THE CHAIRMAN: I'm sorry. He has said that -- well, there's no evidence if there was a surgical request, but that leads back to a point about this issue not having been raised previously.

MS ANYADIKE-DANES: Yes.

THE CHAIRMAN: If you're expressing a view on why it might not be administered after 9.30, how speculative is your answer to that question to be?

A. It's going to be more -- with more certainly than speculation but it is not going to be with certainty, if that makes sense.

THE CHAIRMAN: What would be ... So you're being asked to give a clinical -- well ...

A. Can I give my answer and then you can perhaps take it

1 further if you wish?
2 THE CHAIRMAN: Okay. Answer as clearly as you can what
3 would affect your judgment as to why this drug would not
4 be given after 9.30.
5 MR UBEROI: [Inaudible: no microphone] then you avoid the
6 query, the speculation. And if it's put like that, then
7 I think it's a far more appropriate way for it to be put
8 to an expert.
9 THE CHAIRMAN: Okay.
10 A. You want me to answer my view as to why it was not given
11 after 9.30?
12 MS ANYADIKE-DANES: What would affect your judgment?
13 MR UBEROI: Your clinical judgment after 9.30.
14 A. The first thing is to assume that what is written on the
15 anaesthetic chart is absolutely correct and that nothing
16 has been omitted.
17 Q. Mm-hm.
18 A. Given the detail on this chart, I think it unlikely that
19 anything has been omitted to have been recorded. It's
20 a detailed record of what was given and what happened,
21 so I think it would be safe to put that to one side.
22 THE CHAIRMAN: Because it's not obviously lacking in --
23 A. It's not lacking in other areas so it's unlikely to be
24 lacking in this area. The next part of my answer
25 is that I am surprised that no further muscle relaxant

was given beyond 9.30, given the fact that wound closure would have been taking place starting at around 10.30.

Also given that it might have been a little difficult to close the wound, given the fact that an adult or certainly adolescent-sized kidney was being implanted. So there would need to have been some muscle relaxation present at the time of wound closure.

The reasons why further -- or the prompt that would have resulted in Dr Taylor or whoever was with him giving further doses of muscle relaxation would have been comments from the surgical team about the lack of muscle relaxation, the patient may have begun to cough and gag on the endotracheal tube, which would be another prompt, or many anaesthetists will simply give a bolus, that's an incremental dose of a neuromuscular blocking drug, at regular intervals throughout a long operation without waiting for those prompts.

What I cannot dissect out from information given is whether the atracurium was given by rote, pre-empting any requests or clinical signs, or in response to any particular sign or stimulus evident in Adam.

The next thing that I think one can with a degree of certainty conclude from this pattern of drug administration is to say that beyond 9.30, there would have been no prompt either in terms of signs visible to

Dr Taylor from Adam or verbally from the surgical team that the effect of the previous doses of atracurium were no longer evident.

MS ANYADIKE-DANES: You say that because if that had been the case, he would have administered it?

A. Yes, and given the otherwise completeness of this record, I think it very unlikely that it would have merely been forgotten to have been put down in the document.

Q. And why might there be no prompt?

A. Because there was no muscle tone, because there was no coughing on the endotracheal tube, and muscle tone was such that there was no visible need to give a further dose. And I anticipate that your next question is going to be, why is that the case?

Q. Yes, it is going to be: why that is the case?

A. Well, there are two possible explanations that I can offer you. One is if one takes the assumption that the neuromuscular blockade was given pre-emptively by rote, that in fact the epidural anaesthetic and the Halothane anaesthesia provided adequate muscle relaxation for surgeons to work in the surgical field, regardless of the fact that he was or wasn't given atracurium.

The second alternative view is that Adam was no longer able to provide or to give signs such as reflex,

gagging, coughing on an endotracheal tube, or increase in muscle tone in response to surgical stimulus in the operative wound.

THE CHAIRMAN: And he would no longer be able to give those signs if the catastrophe had already occurred?

A. That is correct.

MS ANYADIKE-DANES: Now, that's actually very helpful, the way you framed it, because I think you put it slightly differently in your report, and I think that people wanted some clarification about that. If you go to 204-014-003, in fact it starts really on the page -- it's before that. What you're doing is you're listing out the possibilities, and you've given the one that actually everything had been done in a certain way, just not recorded, which you discount.

Then you have that an excessive dose had been given and, therefore, he didn't need any more after 9.30, and you don't seem to think that is relevant or occurred.

Then the Halothane anaesthesia combined with the epidural nerve blockade produced adequate muscle relaxation for the surgical field, which is one of these last two options that you have just given evidence on.

You said:

"This is a possibility but the question is then asked whether the previous repeated doses were given

pre-emptively by rote, as is often the case, or because of increased muscle tone in the operative field or coughing in response to the tracheal tube stimulus."

And before we go to the fourth one, let's just stick with that for the moment.

If it was given by rote, why would you stop at 9.30?

A. Well, you wouldn't.

Q. Right. Then if we go with your fourth one, that Adam had suffered brainstem death by the time the abdominal incision was being closed:

"It has to be noted that following brainstem death reflex muscle contraction can still take place in response to noxious stimulus. The reflex is purely at a spinal level. However, the usual situation at this point is complete loss of muscle tone."

Now, just so that we understand you, leaving aside whether he was sort of gagging and coughing on this tracheal tube and stick with the muscle tone, what is it that an anaesthetist would be able to detect when you say a loss of muscle tone? What happens?

A. In response to surgical operation, it would become visibly difficult for the surgeon to sustain exposure of the operative field within the body cavity.

Q. I mean, just what happens?

A. When --

Q. When you say it became visibly difficult, what is it you're seeing?
A. Tense muscles in the abdominal wall or the chest wall.
Q. Contractions?
A. Yes.
Q. Okay. In terms of his other muscle tone, since Dr Taylor -- not in the abdominal cavity, he may not actually have been seeing that, so what is it that an anaesthetist did actually detect when one's talking about a loss of muscle tone?
A. Lack of movement, no resistance to movement.
Q. Right.
A. Soft muscles that aren't contracting.
Q. Okay. So leaving aside the gagging, that is something that you think that an anaesthetist would be able to detect if that was happening?
A. Easily.
Q. Easily. Is that part of the stimuli that the anaesthetist is looking for to guide him as to whether he should be topping up or administering any further dose?
A. Yes.
Q. And if he doesn't see it, then he --
A. There's no prompt, there's no visual prompt to do so.
Q. That's fairly clear. Then you go on to give a bit in

italics as to your opinion as to what is the most likely reason.

But I think we need to be very clear here. All of these scenarios or possibilities as to what might have happened and the reason why that might be, that is your view looking at the information? You're not trying to say, are you, that that's something that Dr Taylor thought? This is your view?

A. That is my view given the information available to me after giving it a great deal of consideration.

Q. And you have there expressed what you think is the most likely reason?

A. I have.

Q. And your most likely reason is what?

A. That Adam beyond 9.30, or certainly beyond 10 o'clock, when the last dose of atracurium's effect would have gone, was no longer in a position to be able to cough on the endotracheal tube and had lost abdominal wall muscle tone, because at this point perhaps brain dysfunction might be a better term than brain death, but certainly he was not, in my opinion, neurologically capable of demonstrating these signs which are invariably present during the course of an anaesthetic for an abdominal operation.

Q. I understand that. When you were explaining about the

loss of muscle tone, you say that is something that would be -- I think you said readily apparent, or something close to that description, to the anaesthetist. Is that something that anybody who was handling Adam or close to him would be able to detect?

A. Yes.

Q. A medical person, I mean.

A. It needn't be medical. The surgeon, the surgeon's assistant, the scrub nurse, the anaesthetic nurse would all be capable of providing cues, prompts, if they noticed these things.

Q. What you mean by that, so we're absolutely clear, is they would all be capable of appreciating that if that had happened, that that is what had happened, that there had been a loss of muscle tone?

A. No. If there was normal muscle tone at a point where further muscle relaxation would be required, they would easily turn round and say, "Dr So-and-so, this is a bit tight, he's coughing", you know. The cues for further administration of muscle relaxant would easily be picked up by any member of the operating team.

Q. Thank you.

THE CHAIRMAN: Just to get that clear, what would be detectable to all the doctors and the nursing staff is the need for a further dose of atracurium?

A. Yes.
THE CHAIRMAN: Not the fact that there seems to be a level of neurological inactivity?
A. Yes, that's correct.
THE CHAIRMAN: Well, if this is right and there wasn't neurological activity, to whom would that be apparent?
A. The fact that there's no neurological activity I think didn't become apparent until the end of the operation when Dr Taylor found that Adam was unable to breathe, cough and that brainstem reflexes, in terms of response to light by his pupils, were absent.
MS ANYADIKE-DANES: Sorry, I wonder if I could put it this way, because it was a question I wanted to follow up on and I hadn't put it well the first time you answered it. You have described the fact that if the patient requires further muscle relaxant, you can see the muscles start to constrict a little bit, maybe there's some coughing. You can see those and you described those as prompts for muscle relaxant. I think your view was that any of those nurses there, the scrub nurse, the anaesthetic nurse, any of the assistants or the surgeons, that is something they would all be able to see?
A. Correct.
Q. When I was asking you prior to that about something that I called the loss of muscle tone, and maybe that's the

wrong expression to use --

A. No, that's correct.

Q. I was asking you how that would manifest itself and you said, well, he'd be floppy and you described -- maybe you should describe in a little more detail, because I think what I would like to know is whether -- leaving aside whether you would notice the prompts and the cues for the requirement of further muscle relaxant, who, if anyone there, would be in a position to notice that he had got a loss of muscle tone?

A. I think it would be very unusual for anyone to actually comment or note on the loss or the fact that muscle tone wasn't present.

Q. No, who would be in a position to notice that that had happened, not whether they would comment on it or not, but whether they'd be in a position to appreciate that that had happened?

A. I think for someone to appreciate it, that it had happened, they would have to be actually asked the question at the time. But the people who would be able to ascertain that, had the question been for discussion at the time, would be the surgeon, the anaesthetist and possibly the scrub nurse if he or she was suitably experienced.

Q. If he's floppy, how does that floppiness manifest

itself?

A. If I can perhaps answer it with the converse. If you have an injury to the abdominal wall or abdomen, you will walk around with your muscles tense. If you're floppy with no muscle tone there, there is no reflex muscle contraction when retractors are placed in the wound, there is no spontaneous movement, the limbs adopt a neutral position, and the head, as defined by the effects of gravity.

Q. So what is the effect of the appearance of a loss of muscle tone on the one hand and a muscle that is relaxed through the use of muscle relaxant?

A. No difference.

Q. They would appear the same?

A. Yes.

Q. Thank you. In your view, if you had noticed something that allowed you to form the view that no further muscle relaxant was required for the reason that you have given, which is your fourth scenario, as an anaesthetist in the operation what do you do at that stage?

A. The first thing you would do is try and ascertain what is actually happening. If I was in what would be a hypothetical situation, I hope, where I'm worried that a patient has no muscle tone in the abdominal wall, despite it being a significant period of time since any

neuromuscular blocking drug had been given, I would satisfy myself that any other agent hadn't been administered excessively such that it would cause a depth of anaesthesia, which again may produce the same effect. I would look as the first point of examination at the patient's pupils. That would include retracting the eyelid, shining a bright light into the eye and observing to see if there's any reflex contraction of the pupils.

Q. Adam's eyelids were actually taped, we know that from the anaesthetic record, so you'd just remove the tape and do that?

A. Absolutely.

Q. What would you do then?

A. Then I would start to begin to wonder what had happened, what was causing this. It would be a terrifying finding because the implication is that something dreadful has happened to that patient, and at that point in time it would be very hard to know exactly what has happened.

In the situation -- I know that the only thing that one could do would be to ensure that the operation proceeded to as timely a conclusion as possible, if I was ... If I felt concerned that a major neurological event might have happened, I would consider withdrawing the general anaesthetic, effect of the Halothane. If

once the general anaesthetic effect of the Halothane had been removed and I was happy that no other drugs with a serious or major sedative effect remained in the circulation, that would give information that something was far amiss.

Q. How long would it take to reverse that or withdraw the effects of that?

A. The Halothane?

Q. Yes.

A. If I can put it into context. If a patient is ventilated for an operation and Halothane is a drug used and, let us say, it is a three or four-hour long operation, it may take 15 or 20 minutes for the effect of the Halothane to disappear. Halothane is mostly removed by being exhaled from the patient's lungs, some of it is removed by the liver, but the -- it's a relatively long duration so 15 to 20 minutes before you could consider that the effects of Halothane had been removed. And there is a clue -- more than a clue, there is a guide as to how much Halothane is present in that there's a gas monitor and the gas monitor was used in Adam's case. Once the exhaled concentration of Halothane or any other volatile anaesthetic was at or near zero, then the effects of that could be -- the presence or absence of it could be monitored and the

presence or absence of any anaesthetic effects could be assessed.

Q. Before we got to the issue of why atracurium hadn't been administered by Dr Taylor after 9.30, in his evidence Dr Taylor did give evidence about the lightening of anaesthesia and just what his general pattern would be coming towards the end of surgery. You can find that in the transcript of 20 April. It starts at page 123.

To give the context of it, he talks about -- he starts right at the top really at 2. I'm asking him about when you heighten up the anaesthesia and try to bring him round, where does that happen? And he says it happens in the operating theatre, and then in advance of the wound closure.

Then he goes on down that page and he talks -- there's a bit of an issue as to whether Adam did or did not have sterile towels over his face. The fact of the matter is that Dr Taylor just can't remember. He says it would have been his practice not to put sterile towels over his face but that doesn't appear to be how it's recorded. In any event, he doesn't remember so that's that.

What he does say is:

"But I would be looking at his vital signs ..."

If we go over the page:

"... to look at his face and his pupils and to see signs of recovery from his anaesthetic."

So that's what he's doing, he's starting to lighten him, and he puts that process as before the wound closure he's starting to lighten him.

Now, in the course of lightening a patient in that way, I presume you understand the process as he's talking about it? In the course of doing that and examining Adam as he described he did, if Adam had suffered a loss of muscle tone, could that be detected in an examination of Adam in the way that Dr Taylor is describing?

A. It is something that would have gradually dawned on him, crept up on him.

Q. No, sorry, I would like to put it a slightly different way because that has you sort of standing in the shoes of Dr Taylor. The sort of examination that Dr Taylor is here describing, he said: I would look at his vital signs, look at his face, look at his pupils looking for signs of recovery. If that is the sort of examination that you are conducting, would you be able to detect whether Adam had indeed had some sort of loss of his muscle tone at that stage?

A. At that stage?

Q. Yes.

A. Can I elaborate on this? Closure of an abdominal wound isn't an instant process, it takes the surgeon for a wound like Adam's, I would estimate, 15 to 20 minutes because there's various layers that have to be closed, one of which is the muscle. The surgeon would first of all satisfy himself that the operation itself was satisfactory, that there was no ongoing bleeding from anywhere, and then he would close the various layers of tissue, beginning with muscle.

Once the abdominal muscle is brought together securely by the surgeon, there still remains a layer of fat and a layer of skin to be sutured, which takes some time. They can be sutured without the same rigour for muscle relaxation as when the muscle layer is closed. So it would be appropriate for the patient to begin -- or the anaesthetist to seek the return of spontaneous ventilation as the skin layer is being closed, typically, to try and time the withdrawal of muscle relaxant, try and time the withdrawal of anaesthetic agent such that the respiratory drive is present as the final layer is being closed as the wound is being cleaned by the nurses and a dressing placed over the wound.

Q. Yes.

A. So there's a period of 5 or 10 minutes when the

anaesthetist would actively seek for the patient to begin to breathe normally.

Q. Yes.

A. And it would be during that period of time if there was no return of spontaneous movement, no return of coughing, no evidence of normal increased abdominal muscle tone that concerns would -- very serious concerns would become very evident.

Q. Right. And then perhaps one final question in this area. We've got no muscle relaxant administered after 9.30. Muscle relaxant, as you said, has an effective duration of somewhere between 20 and 30 minutes. Somewhere thereabouts. The wound closure is starting somewhere about, I think, quarter to 11, something of that sort?

A. I think I worked out at the very earliest 10.30.

Q. At the very earliest 10.30, so somewhere in or around then. Nobody entirely knows. We know that Mr Keane has himself leaving just before it happened or when it was about to happen, and we know people have expressed a view as to how long it would take. And so working back, you try and work out when that must mean that he was leaving and the muscle closure was -- and the wound closure was happening, but probably somewhere between 10.30 and 10.45 perhaps on the evidence.

So if that's the case, and you realise that you've administered no muscle relaxant, there's been no prompts, no cues from everybody, or anybody who would be in a position to assist you with that, at what stage do you start to get concerned about the patient?

A. I would begin to get concerned from thereon.

Q. Where is thereon?

A. From the point that it had dawned on -- thought about things and said, "Why is that patient not beginning to cough? It's an hour plus since I've given him any neuromuscular block. There's no muscle tone." Usually I'm being asked by the surgeon or there's consternation about the difficulty in bringing the wound together at this point in time. Why am I not -- what's happening?

If one looks at this more generally, the commonest reason for that happening at that point in time is there's still a residual effect of neuromuscular blockade which can be examined for and tested in the operating theatre.

Q. And how do you do that?

A. By a readily available device where an electrical impulse is applied to the skin overlying a peripheral motor nerve, commonly the ulnar nerve at the wrist, which will make the muscles of the hand contract. It should be available in every operating theatre up and

down the country.

Q. In 1995?

A. Yes.

Q. Okay.

A. And it provides a very quick assessment of the presence or absence of a neuromuscular blockade.

Q. Is that something, if you were that situation, you feel you would have done?

A. That would be the first thing I would do, check for residual drug effect. It always remains the possibility that one might have inadvertently given more than one thought, made a simple mistake in the dose given. There's always a possibility that if you had a trainee anaesthetist with you, they've given some -- they've not recorded in the chart and then walked out to do something else or been distracted. And there's a natural variation among the population as to the duration of effect for the administration of any drug, including neuromuscular blockade such as atracurium.

Q. Although this was apparently given, leaving aside the one-hour interval, at fairly regular intervals. But in any event, you say that's the first thing you would have done and you would have -- I think your evidence was you'd have been prompted to do that round about the time of wound closure?

A. Yes.
Q. Before?
A. At or around. I don't think I'd be looking -- I don't think that the issue would have been prominent in my thoughts until round about that point.
Q. And --
MS WOODS: I wonder if we could just clarify at what point in wound closure? Because Dr Haynes has described it being a staged process.
MS ANYADIKE-DANES: Yes, thank you very much.
You've described that as a process that might take 10 to 15 minute, I think you said.
THE CHAIRMAN: I think the wound closure would take 15 to 20 minutes. It was the final skin layer. The closure of the final skin layer would take 5 to 10 minutes of that 15 to 20 minutes; is that right? Approximately?
A. It depends on the kind of sutures used by the surgeon, particularly of the skin. If one says that closure of a wound of the size that Adam had would take 20 minutes overall, then no more than 10 minutes would be taken up with the skin there.
THE CHAIRMAN: Okay.
MS ANYADIKE-DANES: And --
MR MILLAR: Sir, I think the evidence has been that the anastomoses are complete at about 10.30. I appreciate

there's uncertainty, but that seems to be the working estimate at present. I think then the evidence has been that after you complete the anastomoses, you don't move direct to wound closure. There's the re-implantation of the ureters after that, which takes a period of time. The anastomosis is 10.30, this further surgical procedure, which takes a period of time, and I think it's after that one moved to wound closure. I'm not sure the assumption one moves to wound closure at, say, 10.45 quite fits with the evidence we've had so far, for what it's worth.

MS ANYADIKE-DANES: Thank you very much. That is helpful. In all of this we're trying to time by benchmarking things to other events exactly what happened where we don't have accurate times. But if that's correct, that you have the anastomoses, which is recorded at or about 10.30, then there's the ureter implant that has to happen and that takes a period of time, and then you've got a --

THE CHAIRMAN: Do you have any idea what period of time that might take? Again --

A. It would depend on the surgeon and depend whether it was a straightforward procedure. But I'd imagine, no -- I'll rephrase that. It is my understanding that a straightforward implantation of the ureter into

the bladder would take about 15 minutes. No more than that.

MS ANYADIKE-DANES: That puts us to, assuming that it was straightforward, quarter to 11. Then if you're saying that the total wound closure might be 20 minutes, I think you said?

MS WOODS: Mr Brown's evidence is that it would take about 15 minutes. That was his best guess.

THE CHAIRMAN: And this witness has said 15 to 20, maximum 20. So we're in the same area.

MR MILLAR: Sir, just since we're teasing this out, there's the suprapubic catheter to go in as well.

MS ANYADIKE-DANES: Quite right. So you have re-implanted the ureters, you have to insert the suprapubic catheter, we'll hear from the surgeon, I'm sure, how long they think it would have taken them to do that, but do you have any idea yourself as to how long that's likely to take.

A. A suprapubic catheter?

Q. Yes.

A. A minute, two minutes. A brief procedure, very brief.

Q. Slightly after 11 o'clock. Then we've got anywhere between 15 and 20 minutes for wound closure. Quarter past, 20 past 11. Atracurium, last administered at 9.30. And then if you've got 9.30 on that side,

somewhere -- the start of the wound closure maybe 11 o'clock, taking up to quarter past, 20 past. Those parameters.

When do you think you would have started to be a little concerned about the lack of any prompts in terms of muscle relaxant requirements in that space of time?

A. Let me think through times again. Say the clamps came off --

Q. 9.30 was the last administration of it?

A. The kidney was perfused at 10.30. Say the --

THE CHAIRMAN: The implantation of the ureters are about 15 minutes after anastomosis.

A. That would take us to quarter to 11, maybe a little bit earlier.

THE CHAIRMAN: Suprapubic catheter, 1 on 2 minutes.

A. Say that takes us to ten to 11.

THE CHAIRMAN: Then wound closure.

A. The requirement for muscle relaxation would be at the beginning of wound closure, which takes us to just before 11 o'clock. As far as we can ascertain by --

MS ANYADIKE-DANES: So normally speaking, you'd be wanting to make sure that the muscles were sufficiently relaxed at 11 o'clock for wound closure?

A. Yes. And it has to be borne in mind that there is

a conflicting demand that you are near the end of the operation and you will want that patient to breathe in the near future.

Q. Yes.

A. Yet you still need to get this part of the procedure over.

Q. It's a slightly different question I have asked. So you've got one and a half hours there; is that right?

A. Yes.

Q. What I am trying to find out from you is, you have a drug which has a life, if I can put it that way, of 20 to 30 minutes or so. It has, for reasons which you don't know, been administered roughly every half hour. Nothing after 9.30. And you've got an hour and a half gap with no prompts or cues, assuming --

MR UBEROI: It obviously lasts until 10 o'clock.

MS ANYADIKE-DANES: Yes. So after 10 o'clock, from between 10 o'clock to 11, no prompts or cues in relation to the need for muscle relaxant. At what stage do you become concerned and want to see what may or may not be happening? That's the point I'm making.

A. My appraisal of this is that concerns would first begin to pass through my head as the wound layers were beginning to be brought together, which we've just agreed is shortly before 11 o'clock --

Q. Yes.
A. -- as best we can guess. Unlikely to be before quarter to 11, unlikely to be much after 11.
Q. You, I think, have said that with that concern would be a need to determine what was happening, and that you've indicated what your first examination would involve to see what was happening, which was the stimulus of the nerve, the ulnar?
A. Yes.
Q. Thank you. If you remained concerned, what do you do about that? Is there any discussion you have or do you just sort of beaver away by yourself, worried about what's going on?
A. The first thing to do, as you say, is make sure there's no residual neuromuscular block. Second is to withdraw the anaesthetic agent, by which time one would have had a chance to assimilate some thoughts.
Q. Sorry, before you assimilate your thoughts, can I just ask you, if you're going to take the step of withdrawing any anaesthetic agent, do you advise the surgeon that you're going to do that?
A. I wouldn't do it --
Q. Sorry?
A. If the concern was within my mind at that point, I would want to clarify those concerns to some degree before

I discussed it.
Q. Right.
A. As the responsible person. Because otherwise, you end up with conjecture and comment that just may confuse the issue further. So I'd want to crystallise my thoughts as rapidly as possible.
Q. Okay. So --
A. And at the point of concern when I would have realised that there actually was something that wasn't just a simple mistake in drug administration or something that had a readily identifiable cause, you'd have to discuss it with the senior surgeon.
Q. Assuming they were still there?
A. You took the words out of my mouth.
Q. So is it possible that the tests that you would apply to satisfy yourself before -- so as not to embark upon conjecture with the surgeons, may take sufficient time that the surgeon would have completed the closure of the wound and left?
A. If you're talking about Mr Keane or Mr Brown?
Q. Whoever was closing the wound.
A. I think Mr Brown was left to close the wound.
Q. Yes.
A. I think that looking at the timing of the various events that we're discussing here, I think it quite likely that

Mr Keane may no longer have been present at the time. I'm saying I, you could say Dr Taylor was beginning to be concerned.

Q. And for Mr Brown?

A. It depends on what relationship, what discussion was being held between Dr Taylor and Dr Brown, because the responsibility for the case, for the operation, certainly began with Dr Taylor and Mr Keane and, normally, responsibility for the patient afterwards would remain with the surgeon. So the surgeon should know if there's a major problem.

Q. Yes.

THE CHAIRMAN: Sorry, doctor, you said before you would raise any concerns with the surgeon you would withdraw the anaesthetic agent to avoid unhelpful or unnecessary conjecture.

A. Correct.

THE CHAIRMAN: And you've also said that for a three or four-hour operation, withdrawing the general anaesthetic or the wearing off of the general anaesthetic effect, that takes about 15 to 20 minutes. So if you start to -- and this is difficult and hypothetical, but if you had started to do that at about 11 o'clock when your concerns began to appear, then you wouldn't have spoken to the surgeon for, am I right, 15 to 20 minutes until

the anaesthetic had worn off and you would then have known if your concerns were justified or not?

A. That's a logical conclusion.

THE CHAIRMAN: Is there a but coming?

A. Yes, there is a but. The but is the discussions you would have would depend on your relationship, interaction under normal circumstances between yourself and the surgeon. If it is someone with whom you have worked for many years, with whom you have much in common, who you are comfortable about sharing any discomfiture with, then it's likely, I think, you'd broach the subject a little bit sooner. If it's someone with whom you don't work regularly, with whom you're uncertain of the verbal dynamic, if you like, between them, then you would hesitate a little bit perhaps before raising the subject.

THE CHAIRMAN: Since Mr Keane and Dr Taylor didn't work in the same hospital, there does not appear to have been any relationship between them and, in any event, it appears at least possible that Mr Keane had left by then, because Mr Brown appears to have closed the wound, though he doesn't recall it. Mr Brown and Dr Taylor did work in the same hospital. I don't think we have a clear picture of how frequently they worked together or how much they knew each other, but even to the extent

that they had worked together and did know each other, which they must surely have done if one was a paediatric surgeon and the other one was a paediatric anaesthetist, then you would have expected a conversation, a discussion, to develop as the anaesthesia was lightened or was removed.

A. Yes. I think that is -- put like that, I agree with everything you say.

THE CHAIRMAN: There's a degree of speculation in what I'm saying --

A. Yes.

THE CHAIRMAN: -- but this does put us some time after 11 o'clock.

A. Yes.

THE CHAIRMAN: Right. Thank you.

MS WOODS: Sir, the words you've used are "you would have expected a conversation a discussion to develop". I wonder whether -- I'm just postulating this -- it's better to express it in the information must come from Dr Taylor, a discussion can't develop unless Dr Taylor actually raises it with whoever is present at the time.

THE CHAIRMAN: Sorry, yes. I take your point. I think the witness is saying that this would be something which would be started by Dr Taylor. Your initial point was that you wouldn't immediately raise your concerns until

you began to see whether your concerns were warranted, but I think, as you coloured that a few minutes later, the extent to which you would do that or whether you would do that would depend on what your relationship was with the surgeon, how well you knew him and --

A. How comfortable you felt broaching a potentially difficult subject.

THE CHAIRMAN: But I think the intervention is to the effect that the starting point for this would come from the anaesthetist.

A. Yes.

THE CHAIRMAN: Right. Would that be even if the lack of response from Adam was also -- would it not also have been apparent from what you've said to the surgeon? I mean, the prompts you were talking about aren't necessarily only for the anaesthetist to pick up.

A. No, but the surgeon would be concentrating typically on the task in hand and it would -- in terms of hierarchy of things that he was concentrating on, it would not be at the top.

THE CHAIRMAN: Right.

MS ANYADIKE-DANES: Sorry, if I just pick up --

MR MILLAR: Mr Chairman, the other thing the witness could consider at this point is obviously the surgeon has no way of knowing when or whether the muscle relaxants have

been discontinued.

THE CHAIRMAN: Let's just confirm that. Would the surgeon know that? He would assume it had been administered?

A. He would assume that it had been given appropriately and the operation had been done and that he wouldn't want to know any details of it.

MS ANYADIKE-DANES: I think when you were giving your evidence, though, you said there is quite often a tension between the surgeons who want muscle relaxant at the time when they're closing and the anaesthetist who actually wants to administer less or keep it as low as possible because they want the patient to breathe spontaneously once there is closure in the wound. In that case then is not the surgeon concerned about the fact that they are embarking on closing the wound or are coming to the end of closing the wound and there's been nothing at all?

A. I think it would not cross the majority of surgeons' minds. Surgeons really -- as a group really do at this point tend to concentrate on the task in hand and make the assumption -- and very infrequently raise any or initiate any discussion about --

Q. So they're only concerned if actually they're detecting some sort of movement, that's what they're concerned about?

A. They would be concerned if their job was being made difficult because of inadequate anaesthesia or muscle relaxation, and they would expect to know if there was a significant problem, maybe not instantly, but shortly afterwards.

Q. There were two other things I wanted to ask you. Firstly, maybe I can address something that the chairman raised, which is how often that Dr Taylor and Mr Brown might have worked together. Well, in relation to Adam himself, the schedule of Adam's surgical procedures at 300-060-107 discloses that they worked on two occasions simply in relation to Adam, it's the third procedure if you see the line there, which is on 20 December 1991. That was a transuretero urostomy. And then on item 8, which is 25 February 1992, and the fourth one, sorry, also, the laparotomy on 24 December 1991.

So in relation to Adam, they had worked on three previous occasions. And then because we had called for the theatre log in relation to November 1995 -- and you can see that at 301-124-686. This is just obviously a snapshot of time in November. One can see on the right-hand side, which is the date, as it happens, 14 November 1995, we have them working there together in that theatre for four procedures. You can see their names across, Brown and Taylor.

THE CHAIRMAN: I think the point generally is that a paediatric surgeon and a paediatric anaesthetist who are working in the same hospital and have been there for a number of years will have some relationship with each other.

A. They will have undoubtedly worked together regularly. I don't know the actual size of the hospital in terms of numbers of consultants, but it would be relatively small. It would be a relatively small number of surgeons, a relatively small number of anaesthetists.

MS ANYADIKE-DANES: Can I ask you this question. I think what you had said is depending on your relationship with the surgeon, you may or may not have wanted to entirely exclude the possibility of the remnant of anaesthesia affecting matters. If you're more comfortable with the surgeon, then you don't mind raising your concerns earlier. If you're less comfortable, perhaps, you indicated you wanted to be more certain. But what I wanted to ask --

MS WOODS: I just want to be absolutely clear that what we're talking about here is Dr Haynes' practice. We absolutely cannot begin to think what may or may not be going through Dr Taylor's head.

MS ANYADIKE-DANES: No, I hoped that I had prefaced all these questions with: this is your view of what you

would have done in that situation. Whether or not Dr Taylor and Mr Brown had worked together is another issue that the chairman has expressed a view on. But all these questions that I'm posing to you is what you would have done in those circumstances.

And the particular question that I was going to ask you then is: as you are lightening or at least trying to reverse the residual anaesthesia to see whether that is providing enough anaesthetic to depress any movement, if I can put it that way, as you are doing that, are you over that period of 15 minutes, or however long it takes to you completely redress that, are you looking to see whether there are prompts and signs or do you simply start the process and see what happens at the end of 15 minutes?

A. No, you look as you go along.

Q. So as you're getting closer to the complete withdrawal, are you getting more concerned that this is something quite serious or can you not start to form a view --

A. The longer it takes, the more concerned I would get and I imagine my colleagues wherever would get.

Q. You may not have to wait for the entire 15 minutes to be concerned about it?

A. No. If I can put it into context, this kind of situation does arise from time to time and this is the

first time I've been involved in a case where there's not been a satisfactory resolution in terms of patient outcome.

Q. Thank you. Mr Chairman, I was going to move on to the last area, which is the diagnosis of brainstem death and the time of brainstem death. I wonder if, given that, it might be a moment to --

THE CHAIRMAN: Okay.

MS ANYADIKE-DANES: I'm happy to continue.

THE CHAIRMAN: Can we start again at 2.05. It seems, Dr Haynes, that it might not take very much longer for your evidence to finish. If there are any questions they can be fed in over lunch. I'm keen to get started with Mr Rigg and Mr Forsythe.

(1.15 pm)

(The Short Adjournment)

(2.05 pm)

THE CHAIRMAN: I now understand the apprehensive look on your face before lunch when I said you'd be finished this afternoon. I think you're being collected at 3; is that correct?

MS ANYADIKE-DANES: Two very quick questions, but I will put them after we've dealt with the brainstem death because that issue really needs to be addressed. The diagnosis of brainstem death first arose when matters were being

discussed amongst the experts on 9 March. The meeting in Newcastle. Do you recall that?

A. Yes.

Q. In fact, there's a transcript of it, which starts at 307-008-267. I think it's you who raised it, is it not, Dr Haynes, that you might raise an issue and say that he was still hyponatraemic at the point he was declared brainstem dead? Is that correct?

A. That's correct.

Q. Then over the page, in fact given the time constraints, this is an issue that is discussed from that first reference I gave you up until the reference of 307-008-277. So I'm not going to take you all the way through it, you were there, there's a transcript of it for those who want to see it, but that was the first place where it arose.

I wonder if you can help us with the concern that you had.

A. Yes. Could I ask you to put up -- there's a flowchart from one of the references I gave you. I think it's page 17.

Q. Page 17 of it, yes. It would be 306-035-0021.

A. Thank you. This is -- would it help if I very briefly outlined how brainstem death is diagnosed in the UK?

Q. Yes. Can I just be clear that we are talking about

1 1995, which is the relevant time.
2 A. Yes. There's no difference in 1995 and in current times
3 between the legislation.
4 Q. Yes. This code is in fact dated March 1998, but I think
5 you're saying that it would have been applicable in
6 1995?
7 A. Completely, yes.
8 Q. Thank you.
9 A. It also has to be remembered that how brainstem death
10 diagnosis is made varies between countries, and in the
11 United States it can vary from state to state. I will
12 try and be as concise as I can in summing it up.
13 The brainstem is the area at the back of the brain
14 just above the hole in the skull through which the
15 spinal cord passes. The brainstem is essential -- or
16 ongoing function of the brainstem is essential to life
17 as we know it. It contains sensors which govern the
18 respiratory drive, which govern the neural output, which
19 maintains blood pressure and the tone of smooth muscle
20 in the vessel walls. It also contains the nerve bodies
21 of several nerves which supply areas both of the head
22 and of a nerve called the vagus nerve, which supplies
23 the autonomic nervous system and the airway.
24 So if there is no function of the brainstem and this
25 was -- references to this are quoted within this code of

conduct. If a patient or an individual can be certified as brainstem dead, that individual will go on to die as other people die by cessation of heartbeat fairly shortly afterwards, over a period of days.

So the brain -- and also the brainstem contains nerve fibres containing all signalling information which goes from the brain to the body and vice versa, sensor information from the body to the brain. So if the brainstem isn't functioning on a permanent basis, if it is dead, then life as one knows it will not be able to continue.

And the brainstem is an area which can be damaged by other pathology within the head. Typically a head injury involving a bleed, or leading to tumour, or any one of a wide variety of insults, and it's damaged usually by a process called -- which is abbreviated to coning, by which the pressure within the skull increases and brain tissue is squeezed out through the foramen magnum, this hole through which the brain and spinal cord pass.

Q. But what was your concern in relation to Adam's case?

A. Right. If you look at this flowchart, please, this is a very concise summary of what is required in this country to diagnose brainstem death. First of all, the patient has to be comatose. In Adam's case, yes,

he was. And there has to be clinical evidence of the cause of coma, possibly supported by imaging such as a CT scan, which Adam had.

And we know that Adam had cerebral oedema. And it is my belief, and many others' belief, that the cerebral oedema was caused by hyponatraemia, a low concentration of sodium in the blood.

So I feel happy to move on to the third line of this, where we look at exclusion of hypothermia, exclusion of intoxication, sedative drugs, neuromuscular blocking drugs, all those I'm happy were excluded.

And then the next sentence says:

"Severe electrolyte, acid base or endocrine abnormalities as causative."

And it's the fact that -- well, perhaps it would help if I went through the rest of this chart before coming back to it.

The text goes that the clinicians have to be convinced that all these causes of coma are excluded and they can then go on to perform the bedside examination, which allows brainstem death to be diagnosed, details of which I don't think need to be elaborated on at this point in time.

Then the diagnosis of brainstem death is reached if all these criteria are fulfilled. And then ventilation

can be withdrawn, the patient is declared dead. But the patient is not declared dead until two doctor on two separate occasions are convinced that everything meets these requirements.

Now, I have to preface this by saying that having seen what happened to Adam and looking at the time course of events, and having looked in depth at all the events which have been discussed and will be subsequently discussed at this inquiry, I have no doubt in my own mind that Adam was brainstem dead. Absolutely none whatsoever.

But if we return to the code of conduct or the requirements, the third line down, I have anxieties raised if we could outline where it says "severe electrolyte, et cetera, abnormalities".

Adam died because of a severe electrolyte abnormality. Now, in my view, and I am confident to say in the view of everybody else, that doesn't mean to say that brainstem death couldn't have and shouldn't have been diagnosed.

If we are now able -- if we could perhaps show a chart that we showed yesterday where it gives the flowchart of laboratory investigations performed on Adam in the intensive care unit.

Whilst that's being outlined, we could -- I can

perhaps come back to it. Adam, as we know, returned from the operating theatre to the intensive care unit with a serum sodium level at, if I remember correctly, 119.

Q. Yes.

A. There were several more assays of that made. I think there was a total of four. And the -- I don't have this in front of me. I'm sure it'll be found for us shortly. Shortly before the second set of brainstem death testing was done, his serum sodium was 125.

Q. Sorry, I beg your pardon. Would you like to see that flowchart up now as you're speaking through it?

A. I'm sure it'd help everyone else.

Q. 057-007-008. That's the one you mean, I think.

A. Yes. We can see on the left that there's the date and time of the sample taken and in the middle it says, "Blood chemistry". And the third one along is sodium, NA.

So we see 134 preoperatively, 119 when he came back to the intensive care unit. And the last two are 121 and 125. So he was still hyponatraemic either at or shortly before the time the second set of brain death tests were done.

Q. With a normal range being 135 to 145?

A. That's correct, yes. And I feel I am obliged to point

out that I have some discomfort that although I cannot for one second believe that he wasn't actually brainstem dead at the point both sets of tests were done, that more strenuous efforts to return his serum sodium over the intervening hours to a more normal value hadn't been made. I'm also a little bit concerned because the general principle of care of a patient in a coma is that until he or she is declared brainstem dead, there is -- that patient should be treated as if they have a recoverable condition.

Q. What would that have meant?

A. That would have included taking active steps to attempt to normalise over a period of hours the concentration of sodium in his blood.

Q. Yes. Now, I think you said that you were all agreed. Did you mean by that you being all the experts in Newcastle?

A. Yes.

Q. Although I'm not going to go through it all, I wonder if I might give some references that might help. I don't have the inquiry references, but if you have the first reference for the first page, if you go to the next page, which is 106 in mine, if you start at line 6 you've got Professor Kirkham saying she'd have wanted the saline to be normal, and she goes on to talk about

that.

Then if you go to line 19 of that page, you deal with blown pupils at that stage. Then if you go to the following page after that at line 18, there's a reference to Professor Kirkham saying you would want to have a normal metabolic situation.

Over the page again at line 9 you have got Professor Gross' views on what they would do in Germany about that, including an EEG, and there is some discussion with the experts as to whether an EEG should in fact have been performed to ensure that there is no electrical activity in the brain. And I think all of you join in on that.

Then if you go to page 110 on my pages, and I can subsequently give you the inquiry reference, line 16, you have Dr Coulthard, who also expresses a doubt about the situation and that:

"I would have questioned the decision to formally carry out brainstem death tests where there is still a very low sodium concentration."

I think probably there's one more reference at page 111 at line 14 on carrying out an EEG of 12 and then perhaps another the following day.

So in terms of what the other experts agreeing with you, is that the sort of thing you're talking about?

A. Yes.
Q. Thank you. Can you just very briefly, because I'm conscious of the time, explain why it is in the protocol or, so far as you're concerned, important to exclude these electrolyte imbalances, if I can put it that way, or to rectify them?
A. Brainstem death is a diagnosis made when a patient is comatose, who's on a ventilator, and it is important to exclude any reversible causes of that coma. The first premise is to be that there has to be an underlying demonstrated diagnosis, which in Adam's case there most certainly was. There has to be the knowledge, and the wording is no stronger than that, there has to be a certainty that there is no residual effect of any neuromuscular or sedative drugs or other intoxicating agents, which in Adam's case, none were present. Then there has to be the exclusion of metabolic and biochemical causes of coma. And that exclusion has to be made before doctors making the test can go on and do the test.
Q. Okay. Can I just pull up, while you're speaking there, the results on the brainstem death form for Adam. 058-004-009. Is that a form with which you would have been familiar?
A. I would have been familiar with the form that was used

in the hospital where I worked.

Q. Yes.

A. This is a form that is clearly designed by the hospital itself and it serves very much as a prompt as well as a formal record of the date and timing and identity of people doing the test.

Q. It's the prompting point that I want to take you to. These things that you are saying it's imperative are excluded, although you don't actually think it made any difference in this case, but in terms of the procedure, that are excluded.

If we look at F:

"Could the patient's condition be due to a metabolic endocrine disorder?"

Is that what you're talking about or not?

A. Yes, that's what I'm talking about. It's an issue which I have thought long and hard about, and even the fact that raising it will be distressing in some circles to talk about. But I feel that we cannot get away from the fact that more strenuous efforts were not made to normalise the concentration of sodium in Adam's blood following his admission to the intensive care unit up to the point in time when brainstem death testing occurred.

I think it has to be put into context that when a tragedy like this occurs to anyone, under any

circumstances, it's not always easy and straightforward to follow the rules exactly as they're written, which is why the guidelines are written with the wording that has been chosen. But I would have felt much happier had -- at least between the first tests and the second tests, had there at least been a visible effort to try and increase the serum sodium concentration in Adam's blood.

THE CHAIRMAN: Doctor, can I ask you, just to make sure I understand the significance of what you're saying. This is in the context that you've emphasised that neither you nor any of the other experts actually doubt for a moment that Adam was brainstem dead?

A. That's correct.

THE CHAIRMAN: So is this being raised as an issue which is of general importance before anybody is stated to be brainstem dead that these procedures are followed, or is there a particular significance in Adam's case?

A. Both, in fact. It's a general --

THE CHAIRMAN: Okay, I understand the general point. What is the particular significance of it in Adam --

A. The particular significance of it in Adam's case, I feel, is that if one goes right the way back to what the insult to Adam's brain was, it was a low sodium concentration.

THE CHAIRMAN: Right.

A. And if one follows it through, then there's -- I'm possibly from a practical point of view more concerned that there weren't more vigorous attempts to normalise it from the time he was admitted to the intensive care unit before formal testing of brainstem function was carried out. Because during that time he was still a patient who wasn't dead.

THE CHAIRMAN: But I understand you to be saying that you don't think that these efforts would have had any successful outcome, or can you not say that?

A. No, I can say with -- I hesitate to use the word "certainty", but as close as one can be that the outcome was inevitable.

THE CHAIRMAN: Okay.

MS ANYADIKE-DANES: That was just where I was going to try and bring you to, which is precisely when you thought that moment was. There's been a number of different periods for it.

I think you suggest, in your report of 204-009-364, 9.30. And then you say or that brainstem dead occurred at some stage during the transplant operation, and that's at 204-012-380.

Dr Coulthard expresses a view in his report of 200-022-271 that Adam was probably brainstem dead by between 7 and 10.

Professor Gross in his report of 201-015-236, he puts it as 9.32 or maybe before.

And Dr Squier at 206-002-008 has it as before 11.55.

You have obviously seen all the experts' reports and seen their views as to the times they put it and the reasons for it. Bearing all that in mind and the evidence you've heard, what is your view now of when you think Adam's condition was irretrievable, if I can put it that way?

A. My view is that his condition was irretrievable at some point during the operation.

Q. I understand.

A. I don't think we can be any more precise than that. Could I ask you to bring up another page though?

Q. Yes, of course.

A. Which is 058-035-and I think it's 141.

Q. Yes?

A. Now, I mentioned in my introductory preamble, if you like, that one of the features of brainstem death was the loss of ability to regulate the blood pressure and muscle tone [indistinct] blood vessel walls.

When one observes a patient who has sustained an irretrievable brain injury, for whatever reason, over a period of hours, there are inevitably a sequence of events which the observer sees. The first of those,

Adam was not able to demonstrate because he had no functioning kidneys. That is the production of a large volume of dilute urine, because the endocrine stimulus to retain fluid originates from a hormone called antidiuretic hormone, which is governed by the hypothalamus, which is within the brain. When that function is gone, the ability to produce that hormone is gone and water is shed in an uncontrolled manner from the kidneys. But for that to work, you have to have a functioning kidney and Adam didn't. So that sign wouldn't have been evident.

The next sign that one sometimes -- well, almost invariably sees when observing a patient who has sustained an irretrievable head injury or brain injury is this loss of control of blood pressure. And I believe that this page in the clinical notes is describing when this happened.

If we recall the anaesthetic chart at the end of the operation, Adam had a systolic blood pressure of about 100. If we read this, this is dated 28 November 1995, 1 o'clock in the morning.

And it says:

"Blood pressure dropping over past hour."

I think it's mean arterial pressure down to 70. Very pale, et cetera. But still fairly well perfused,

et cetera. And they go on to increase the amount of dopamine being given and to give Adam some more fluid to try and bring his blood pressure up.

I think this paragraph perhaps brings down slightly the window when the actual final terminal event occurred. And I think, although there was visibly no brainstem function observed at the end of the operation in terms that Adam wasn't able to breathe, that he had no brainstem reflexes or the brainstem reflexes of pupilary response to light weren't present. I think one could say that beyond the 1 o'clock in the morning, the morning after, he was definitely beyond doubt brainstem dead beyond that point, and I don't think one can be -- say with precision and clarity that it definitely occurred before that point, though the irretrievable insult may have happened during the operation. Complete loss of brainstem function, I think perhaps might not have happened until a little bit later, but that doesn't mean to say that the situation was still reversible during the operation.

THE CHAIRMAN: Okay.

MS ANYADIKE-DANES: Thank you. There are two questions that I've been asked to ask you and I'm conscious of your time, so I will interpose them now to make sure I get those in.

One is, how often would you, if you had been the anaesthetist, have checked Adam's eyes during the course of the operation, if you would have done so at all?

A. If it had been an uneventful operation and I had no cause for concern during the course of a four-hour period, I would certainly have looked at the end of the operation.

Q. Mm-hm.

A. But unless there was cause for concern, usually relating to depth of anaesthesia, because one of the signs of inadequate analgesia, anaesthesia, are dilated pupils and lacrimation, the production of tears. But unless there was a reason to do it during the operation or concern about something else, I wouldn't do it. But I would automatically, without evening think, have a look at the end of the operation.

Q. Thank you. One other question on that -- well, not on that, but to put to you and that relates to CVP, really. Dr Coulthard expressed a view that the initial -- appeared to express a view that the initial CVP measurement of 17 is likely to have been reliable. If we can pull it up quickly so you know what you're being referred to. 204-012-381. He says:

"I've seen numerous children with a CVP measuring 17 to 20. They never appear normal. There is invariably

swelling of the head and neck, even when sitting up. The liver is enlarged and there is leg oedema. There is nothing to suggest that Adam was in this condition at the start of the anaesthetic."

That's your --

MR UBEROI: That is Dr Haynes' paragraph.

MS ANYADIKE-DANES: Yes. I'm putting to you what you have previously responded to Dr Coulthard about. He says he thought that that initial reading of 17 was likely to have been, could have been reliable. I'm putting to you what you have said if you had a child with that CVP value of 17-odd, this is how you have described that child presenting, and I think that's part of your argument for why you didn't think that the 17 figure at the start was reliable. That's what I'm asking you to comment on.

A. That's absolutely correct. My view is that if a central venous pressure as measured in the neck is genuinely of that order, the patient will have physical signs showing venous engorgement, some oedema. They will not have a normal appearance. You should be able to detect that without measuring the CVP.

Q. Yes. Just so that we are clear about it, are you saying that the physical signs of it are such that Dr Taylor just would have seen that and that would be -- or others

would have seen it and that would be recorded somewhere?
A. Yes.
Q. Can I just ask, how many times you have seen a child with a central venous pressure at that level?
A. Because of the specialist aspect of my practice, I see it fairly frequently. But it's not under normal circumstances -- not under circumstances such as a patient like Adam, who, whatever the variability in his fluid balance was not massively fluid overloaded at the start of his operation. As we talked yesterday, he may have been a little bit overloaded or a little bit dry but certainly not of that magnitude.

The two circumstances, very broadly speaking, where I've seen numerous children with a central venous pressure like this are, one, when a child with severe advanced heart failure presents, such as a child presenting for heart transplantation when the heart is so distended and tense that that pressure is transmitted to the veins in the body. And the other is following a specific kind of palliation in heart surgery when the venous drainage of the head and neck, instead of going back to the heart, is diverted to flow passively through the lungs. And any difficulty in resistance to blood flow passing through the lungs will cause a child after -- usually in the first couple of days or so after

this operation to visibly have a head which is very puffy, eyelids swollen, the child can't see out, neck veins are engorged, and the pressure measured in the veins of the neck will be in that order of.

Q. To conclude that then, if that was so, that is something that would have been present at the very outset. Well, in any event, at 8 o'clock when the CVP was being erected. I think what you're saying is that that would have been an extremely striking appearance in that was the case?

A. Yes, and all the information I've been given is that Adam looked normal in appearance up to then.

Q. One final question for you, and it arises out of what you were saying yesterday about your experience as a clinical director. If you can't answer this, so be it. But I was asked if you might try and assist with it. That is, I think yesterday you were saying about what your role was and if you had had experienced anything like this difficulty, you would have tried to see if you could get to the bottom of it yourself. If you couldn't understand exactly what had happened, then you had no option but, I think you said, you'd have to go to the director who ultimately would be responsible to the board and to see exactly what steps would have to be taken.

The issue that arises is this, until all that is resolved and anybody has a very clear picture of what happened and so on, nonetheless you would have with you clinicians who have been involved in an event of this sort, and in particular you would have an anaesthetist who at that stage you would have identified certain errors or omissions in the calculations of the fluid balance.

What is it as a clinical director that -- what is the role of the clinical director when he or she is at that stage?

A. Well, I think you have to -- as frequently is the case, one has to compare 1995 with 2012.

Q. Sorry, that was my next point, just to make sure that we're talking about 1995 because we've heard an awful lot of how things are different now. But in 1995, when it was all a little nascent, I think you said.

A. Yes. Now it's much clearer, much more formalised, what would be expected --

Q. Yes, but can we stay with 1995.

A. -- so let's put that to one side. In 1995 the clinical director had broad responsibility for clinical governance, whatever that meant in 1995. And certainly, when I began as clinical director, what the -- the interpretation among all my colleagues was that when

something wasn't going right, they came to the clinical director to see if we could have a look at it, be that a fault in the systemic approach to the way the department was run or if somebody thought there was a genuine problem with one of the doctors or surgeons, "Could I have a look at it, please?"

The first thing -- and this happened to me on several occasions. The first thing that I would arrange to do would be to ask to have a private off-the-record discussion with the individual who either had or was perceived as having the problem.

Q. Mm-hm.

A. Usually, the person was fully cognizant of the fact that they weren't performing to the best of their ability either on that occasion or in general, and in those days if someone knew they weren't performing to the best of their ability and if it was because they were having a bit of a problem with life outside the hospital, you could say, "Go away for a couple of days, and come back. We'll cancel your clinics. We'll take care of that. Come back when you can come back to work in a calm manner and approach things and there's nothing wrong with the patient's knowledge or practice".

Q. Can we deal with a slightly different situation?

A. The situation you're talking about is a situation like

Adam, where something terrible happened.

Q. It's not so much that. Something terrible did happen, but it's not so much that that I think the question is directed towards. It's when the person who is perceived to be involved in it does not accept that the calculations they made or whatever it was they did are -- not that they weren't part and parcel of what happened but the result was that which their colleagues might think or what the coroner might have identified was the cause of death. What are you as a clinical director to do in those circumstances?

A. Right. Let me take you back perhaps to what I envisage I would have done --

Q. In 1995 --

A. Well, at the beginning of my time as a clinical director, which would have been 2000/2001. The first thing would be to ask to have a discussion within a very short time frame with the individual where the perceived problem is. If the individual said, "Look, I did something wrong that day. I know I did something wrong. I don't normally do that. I know I made a mistake. I will never do it again. It's terrible", then the situation would appear to be resolved.

If the individual comes into your office and sits down and clearly has no perception that they've done

something which has caused misadventure, then that conversation at that point can't go any further.

The next thing I would do is say, "Can you come back, perhaps tomorrow, or maybe this afternoon, but within a very short time space and I will ask one of our senior colleagues to come in and join in this discussion". At that point I would minute it and take notes and records.

If at the end of that, there was still -- I was still unhappy that the person whose practice was being challenged -- and that there was a real problem, and that that person's perception of their own practice was unchanged, they felt they'd done nothing wrong, they were going to continue doing exactly the same again, at that point in time you have to take the matter further with a degree of urgency.

If I say -- if I call myself a junior clinical director for the first six months or year of my time doing it, that would perhaps equate to whoever was in charge in 1995 in Belfast Children's, then you have no option but to go and seek senior support in what you are doing. If something of this magnitude had happened and there hadn't been a satisfactory local resolution of that problem within a fairly short space of time, we're talking days, the medical director of the trust would be

hearing from me and in many ways it would be passed up to the medical director to take further, which would make the whole thing an awful lot more formal and may involve bringing in of outside agencies to look at events.

THE CHAIRMAN: There's no mystery about that.

A. It's common sense.

THE CHAIRMAN: [Inaudible: no microphone]. You can't allow that person to continue until you're reassured that this will not happen again.

A. Absolutely.

THE CHAIRMAN: And to do that, you don't have to wait for the inquest finding?

A. No.

THE CHAIRMAN: Which comes the following spring. You have to act immediately?

A. It should be done in-house or within the home-base organisation within a short period of time.

THE CHAIRMAN: You're talking about a few days, aren't you? Because within that time the same doctor will be operating on more patients?

A. Yes.

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: Thank you very much, sir. I don't have any further questions unless my colleagues do.

THE CHAIRMAN: Mr Hunter on behalf of Adam's family.

Questions from MR HUNTER

MR HUNTER: Dr Haynes, you have said in one of your reports, and I can give the reference, it's 204-004-170, that:

"It is customary to keep his head [that is the patient] visible during an anaesthetic whenever possible and to examine it including looking at the pupils at intervals during a long operation."

Can I ask you when you say it's customary, does that mean it is accepted practice or standard practice?

A. It is standard practice that whenever possible you keep an area of the patient available for examination and inspection. It's something that was instilled, is instilled from day 1 of your anaesthetic training that, if you can, you want to be able to have a -- see as much of the patient as possible.

Q. And when you say that that includes looking at the pupils at intervals, how often would you check the pupils, at what intervals?

A. I think I've answered that question earlier, but I'm more than happy to answer it again.

THE CHAIRMAN: Unless there was a cause for concern, you would not normally look at the pupils until the end of the operation?

A. In the normal course of events, in a long operation,

there are inevitably times when you might wonder if the depth of anaesthesia is adequate or not, and you may wish to look. So it's hard to answer with absolute precision, other than to say we'd certainly look at the pupils at the end and may well have reason to look at intervals, but how often those intervals are depends on the pattern of events as they unfold. But it's certainly normal practice if you can to keep an area available for visualisation around the patient's head and neck if they have an operation in the lower half of the body.

MR HUNTER: Thank you very much.

Questions from THE CHAIRMAN

THE CHAIRMAN: Thank you.

No more questions? Can I just raise one other issue with you. We fell behind a little in our progress and we haven't heard evidence yet from Dr Montague, who you will recall was the registrar who at the start of the operation was assisting Dr Taylor.

A. Mm-hm.

THE CHAIRMAN: And Dr Taylor's initial position in his written statement was that Dr Montague had agreed the fluid input and this was a team effort, in essence, he was saying. Right? Now, Dr Taylor has now accepted that these were his mistakes and his responsibility.

What is the extent of a registrar's input and responsibility when working with a consultant? I'm sure you can speak for days on that, but is there a short summary version you can give?

A. The short summary is that, by and large, the consultant is responsible for the registrar's actions. If that consultant thinks that that particular registrar is capable of doing that particular case on his or her own without any input from the consultant, then that's his decision, and providing he remains available, that's fine.

At the other end of the spectrum you have a complex operation, a relatively inexperienced registrar who certainly is not familiar with the particular surroundings at that time and the way the hospital works, has been out of clinical practice for a while. I would expect Dr Taylor to have taken pretty much complete responsibility for everything regarding Adam and would have wanted to know, even if the registrar was doing something -- he would want to check it was being done to his satisfaction.

THE CHAIRMAN: How aware would a registrar be in a normal situation of what the consultant is doing? You have described it to me in terms of the consultant being responsible for the registrar's actions, but in this

case we have a consultant who, on your view was, to put it bluntly, he had made some terrible mistakes, and he himself has accepted that he made some terrible mistakes. To what extent is it reasonable to say surely Dr Montague should have or might have picked up on some of that?

A. I think it's a very valid point to which it's quite hard to give a concise answer. If Dr Montague had realised that something was being done which was to his mind incorrect for whatever reason, then I would expect him to have alerted Dr Taylor.

THE CHAIRMAN: That's why I asked you to what extent he would know what Dr Taylor was doing.

A. I think that it is unlikely, given his sphere of clinical practice, leading up to this time, that he would have fully realised, appreciated the significance of everything that was happening.

MS ANYADIKE-DANES: Sir, I wonder if I might ask a question.

THE CHAIRMAN: Just one second.

What then is the value of Dr Montague's presence?

A. That's a question which was asked in the preparation of one of my reports. The value of Dr Montague's presence is he has -- one has to ask is the trainee present for the trainee's benefit, the consultant's benefit, the patient's benefit or all three? And depending on the

circumstances and depending on the experience of the trainee, that might be completely variable.

Trying to be as precise as possible, the answer to that question is Dr Montague was a skilled pair of hands able to carry out specific tasks to assist Dr Taylor. There would also have been periods of time when, if everything was stable, it would have been entirely appropriate for Dr Montague to remain in the operating theatre, assuming everything was proceeding in a satisfactory manner while Dr Taylor could take a brief break and vice versa.

Given that Dr Montague was inexperienced in this sphere at that time, one reaches the conclusion that Dr Montague's presence was very much for the benefit of training Dr Montague.

THE CHAIRMAN: Right.

MS ANYADIKE-DANES: The evidence in relation to this, certainly from Dr Taylor, not necessarily always accepted by Dr Montague, is that prior to Adam's surgery, or at least being anaesthetised, the fluid management plan was discussed between Dr Taylor and Dr Montague. In fact, had Dr Montague given his evidence before you'd given yours, we would have had that evidence of exactly what was discussed on what basis.

Leaving that aside and answering almost hypothetically in the way it's been put to you, if the plan had been discussed in such a way that Dr Montague, who although not an experienced paediatric anaesthetist was certainly a senior registrar, and in fact I think within a year or so became a consultant himself, if the discussion had been such as to convey to Dr Montague that the plan was based on 200 ml an hour urine output of Adam, is that something, given all that you said yesterday, that a senior registrar should have appreciated the implications of?

A. It depends to what extent he had sat down independently and thought through the whole process, I think.

Q. Well, are you saying that you could be told that a four-year-old, 20-kilogram boy, has an output of 200 ml an hour and you need to sit down and work out whether that is likely of, urine?

A. If it's presented as bluntly as that, the answer is you would question that.

Q. Thank you, but it may not be presented --

A. But if it's not presented like that, then it may or may not have been picked up in the appraisal of the case.

THE CHAIRMAN: Dr Haynes, thank you very much indeed. You're free to leave and thank you for your time.

(The witness withdrew)

THE CHAIRMAN: Let's take a break for 10 minutes and at 3.05 we'll come in and do Mr Forsythe and Mr Rigg, and we won't go past 4.30.

(2.57 pm)

(A short break)

(3.10 pm)

PROFESSOR JOHN FORSYTHE and MR KEITH RIGG (called)

Questions from MS ANYADIKE-DANES

MS ANYADIKE-DANES: Thank you.

Mr Forsythe, you, I believe -- we are going to look through your CV in a minute, but just in order to explain how we think the evidence will run. You were doing paediatric renal transplants up to 1995 and a little bit thereafter, and your input into your joint report has been largely addressing this position as it would have been at the time of Adam's surgery.

PROFESSOR FORSYTHE: That's correct.

Q. Mr Rigg, you are still carrying out paediatric renal transplants, and so to the extent that there becomes an issue as to what are the different procedures about things, you're in a position to assist with that?

MR RIGG: Yes.

Q. Were you also carrying out paediatric renal transplants in 1995 or thereabouts?

MR RIGG: I was.

Q. So you can make a comparison?
MR RIGG: I can.
Q. Firstly, gentlemen, we have your CVs. One for you, Mr Forsythe, is to be found at 306-034-001. And the one for you, Mr Rigg, is to be found at 306-038-001.
Do you have them there with you?
PROFESSOR FORSYTHE: We do, thank you.
Q. I wonder, without going through it all, because I note that you have a considerable number of publications, Mr Forsythe, I wonder if you can help and say something about your surgical background.
PROFESSOR FORSYTHE: I trained mainly in Newcastle-upon-Tyne. I was appointed as a consultant surgeon in the general surgery department but with a particular interest in transplant surgery to Newcastle-upon-Tyne, and there I was involved in paediatric renal transplantation.
I then moved to become consultant transplant surgeon and general surgeon in Edinburgh and headed the unit in Edinburgh in 1995. I continued to be involved in paediatric transplantation for the next couple of years, but then the service moved from Edinburgh to Glasgow.
Q. Sorry, just so I am clear, when you say the service moved, you mean the paediatric renal transplant service moved from Edinburgh to Glasgow?

PROFESSOR FORSYTHE: Correct.
Q. Do you know why that happened?
PROFESSOR FORSYTHE: It happened largely because of the numbers involved, the fact that it was felt to be sensible that the numbers were focused in one particular unit, and I supported that, in fact went across to Glasgow and helped with some of the first paediatric transplants in Glasgow to help with that process.
Q. Does that mean that the centre, when you joined it in Edinburgh, simply didn't have an appropriate level of numbers of paediatric renal transplants?
PROFESSOR FORSYTHE: It was true that the numbers that were going to go through Edinburgh if it continued were of such a size that actually it needed to be coalesced for the whole of Scotland in one centre, and that's what happened in Glasgow.
Q. Thank you. Was there any -- because you have expressed views in your reports as to the appropriate level of -- if I call them the numbers -- the numbers of transplants that really need to be done so that people can maintain their skills and experience with them, and you have commented on that in your report. Was there that sort of discussion or, if there was, were you aware of it in Edinburgh when the service was moved to Glasgow?
PROFESSOR FORSYTHE: Yes, there was discussion about numbers

and about trying to provide the best possible service for an extremely skilled procedure that happened relatively infrequently.

Q. Thank you. Mr Rigg, I wonder if you could assist us with your surgical background and qualifications.

MR RIGG: I too trained in general surgery in Newcastle and towards the end of my training spent a total of 3.5 years in renal transplantation, including both adult and paediatric. Two of those years were spent while I was doing research and the other year and a half was as a senior registrar.

By the time I left Newcastle I'd done 150 kidney transplants and I was appointed as a consultant general surgeon with a special interest in renal transplantation in Nottingham in October 1992. And I would say that looking at my job plan then, about 60 per cent of my time was spent in transplant-related activity, and the other 40 per cent in general surgery. And within the renal transplant that included both adult and paediatric in Nottingham, and that has continued to the present day.

Q. Thank you very much indeed.

Now, you've produced a number of joint reports, and just so we go through them so that people can locate them. I think your first one was 23 June 2011. That's

203-002-019.

Then there's a report of 12 October 2011, which is 203-004-058.

A report of 19 November 2011, 203-008-105.

And then a report regarding comments that you made in relation to document 301-121-656, that report is dated 5 April 2012 and its reference is 203-009-111.

To the extent -- well, subject to anything that you may wish to say in your oral evidence, are you adopting those reports as your view on the matters that you've been asked to express an expert view on in this case?

MR RIGG: Yes.

Q. Thank you. You've given your experience and -- well, it's certainly set out in your CVs and you've explained some of your background and your experience paediatric renal transplants. What I propose to do is to take you through certain aspects of the transcript of Mr Keane's evidence.

You've seen his witness statements, you've seen the witness statements of the other clinicians, you've looked at all the reports and you've written your reports in that context. I'm not wishing to take you through all that. You've said what you said and you've now adopted it.

But what you haven't had an opportunity to do is to

comment on anything that the principal surgeon, Mr Keane, and to some extent also Mr Brown, who was assisting him, what they have said in their evidence. That's what I propose to do, and to take you through that and deal with certain sorts of issues.

So if we could start really with Mr Keane's experience. In the transcript of his evidence of 23 April, page 6, and then from about lines 3 to 16 he sets out his own experience.

I don't know if you've had an opportunity to see his CV, but we can certainly furnish that to you over the evening or in one of the breaks. Mr Keane was a urologist with an interest in transplantation, and you both have described yourselves as starting off as general surgeons with an interest in transplantation.

He said he wasn't a full-time transplanter, if I can put it that way, and that there was no full-time transplanter in Belfast until the end of 1999, although obviously they were carrying out paediatric renal transplants. The question that arises is, from your point of view, should the Belfast service, paediatric renal transplant service, have had a full-time transplanter?

MR RIGG: I think from what we said before, I'm not sure they needed a full-time transplanter. At that time very

few surgeons were full-time transplanters. The majority shared -- experienced both in general surgery and transplantation. There were some urologists who also did some transplantation. I think what was important is that there were consultants who took a particular interest in transplantation, even though they also had another speciality, such as urology or general surgery.

MR FORTUNE: Can I rise at this stage because it seems that we're getting into areas that might more properly be described as governance.

MS ANYADIKE-DANES: I think that's fair comment.

MR FORTUNE: Also into a fairly political area, with a small p.

THE CHAIRMAN: I don't see it as part of my remit, just to reassure you, Mr Fortune, to recommend to the Minister for Health about how the transplant service continues in Northern Ireland or whether it continues in Northern Ireland. I'm assuming that that was a rather unintentionally broad introduction to a specific topic.

MS ANYADIKE-DANES: Yes.

MR FORTUNE: I'm grateful for that indication.

MS ANYADIKE-DANES: Yes, thank you, Mr Chairman. It was. Everybody will have read their reports and the observations they make on those reports, and where this cascades down, if I can put it that way, is into some of

the difficulties it may or may not have presented for that service at that time in relation to the arrangements that were being made for Adam's own surgery. So that's really the context in which it's being raised. But I am happy, Mr Chairman, if you think it's more of a governance matter, not to really pursue it.

THE CHAIRMAN: Well, I'm not even sure it is a governance matter, because we know in fact from the objection that DLS on behalf of the Belfast Trust raised to Mr Forsythe giving evidence. We know there has already been a report commissioned, which at least touches on the future provision of paediatric renal transplants in Northern Ireland or in the island of Ireland. And if that report is already available, I don't see it as being within the list of issues that we have set out, which follow on from the terms of reference for me to do a report on how I see paediatric renal transplant services continuing in Ireland or beyond in the future.

MS ANYADIKE-DANES: No, I certainly hope -- I wasn't intending to go down that particular road.

THE CHAIRMAN: There's more than enough to write about without that.

MS ANYADIKE-DANES: Yes. I'm sure.

The issue really is the impact of the arrangements

on how Adam's own surgery was carried forward and -- well, right back from when he was first put on the transplant list up until the conduct of his own surgery. That's really the point of it. Maybe now that we've got over the fact that the surgeons are not the surgeons in the Children's Hospital, but they are general surgeons, urologists, with an interest in transplant surgery and that they're based in another hospital, which is the Belfast City Hospital --

THE CHAIRMAN: Sorry, let me go back to the original question which Mr Rigg took in a slightly different way. You're not saying that in Northern Ireland or in the Royal we needed a full-time paediatric transplanter but, as I understand your evidence, it would be helpful to Professor Savage, who was trying to develop a service, that he had somebody such as Mr Keane who was offering his services, who regularly did transplants and who was expressing a degree of support or interest in the building up of a paediatric renal transplant service; is that right?

MR RIGG: I think that's exactly right. I think it is important that there is particularly one surgeon who takes the lead in that. It might be helpful just --

THE CHAIRMAN: Let's be careful. It wasn't Mr Keane who was taking a lead in this. He has expressed himself in

general terms as being supportive of what Professor Savage was doing and, therefore, being willing to be someone who would contribute to the development of the service. Okay?

MR RIGG: Okay.

MS ANYADIKE-DANES: I think, Mr Chairman, if I'm going to do it, I will come back to this point and see how it can be refined in such a way that it's of most immediate use to the issues that you have to deal with in relation to Adam; or help, rather.

Maybe I will move to the question of the protocol. You have seen the protocol that was in force, it's dated 1990, and that's the one that was in force when Adam had his surgery.

You'll have appreciated, I think if you've read the transcripts, that although it has been referred to as a protocol, in fact it says in the admission protocol that it has also been variously referred to as guidance, an aide-memoire, really. But whatever its nomenclature, what has been clear is that the steps and issues that are recited there are things that Dr Savage really thought ought to happen.

There may be reasons why in any given instance a particular thing can't happen quite like that, but that was his way of trying to record the various things

that he thinks in a typical surgery or preparation for surgery ought to happen. Is that kind of document -- maybe not exactly that, but is that is kind of document something that you are familiar with from your own practice? As at that time?

MR RIGG: At that time, and currently there is a protocol. I think you're right, whether it's called protocol or guidance, but I think it's there so that there is a consistent approach. We know that junior staff move around very frequently and, therefore, it's important that there's something written that people can follow who come onto that unit who may not be familiar with the process. That's even more important with paediatric transplantation when there are never a large volume. So I think it is important that there is a record there to act as a guidance for those involved.

Q. Yes. Can I ask, if one looks at this protocol and you see the history on admission, and one can see how it applies to the junior doctors and the nurses, even, who would be involved in preparing the child prior to the surgery. And then if one looks down at the bottom, there is an intraoperative fluid, so it does go on to address matters that happen during the course of the surgery.

Dr Savage has given -- Dr Haynes has given his

evidence as to how relevant he felt this guidance might have been to the anaesthetist. From the surgeon's point of view, how relevant is guidance of this nature? If we go over the page -- perhaps we can put the two pages side by side. 53 as well.

There we are.

MR RIGG: I think it's fair to say that this protocol in common with the protocol that I've worked with over the years doesn't actually cover what we as surgeons would do during the operation. It gives a guidance as to what information is required in the clerking of the patient and their families, so we know what needs to be recorded in terms of the history and examination. It says very clearly what investigations need to be done.

Often it will be different anaesthetists who are involved with the renal transplant procedure. Sometimes it may be an anaesthetist who is very familiar and knows this by heart and, therefore, doesn't need reference to it. Other times it may be somebody who's doing the procedure for the first or second time who needs a reminder. And the immunosuppression, again, there was a standard prescription written up for the child after the operation.

So this is familiar. I mean, it's a short protocol, but I think at that time that was entirely appropriate

for what was required.

Q. Yes.

MR FORTUNE: Can we be very clear with both Mr Forsythe and Mr Rigg. We are talking about 1995. Mr Rigg said over the years --

MS ANYADIKE-DANES: I was just coming to that point, I promise you, Mr Fortune. I was just coming to that point. In fact, I was going to go directly to Mr Forsythe, who is the person who is essentially -- his practice was up to that point and a little bit over. The focus of his assistance to the inquiry has been his experience round about that this time. And what I was first going to as Mr Forsythe is, Mr Forsythe, when you were in 1995 carrying out paediatric renal transplants, were you aware of any protocol that affected what you did as the surgeon?

PROFESSOR FORSYTHE: There were protocols that affected the care of the patient, but very little that actually, as Keith Rigg said, affected directly what happened in theatre. So there was guidance for the management of the patient, but really nothing that impacted greatly on what I did technically within the operating theatre.

Q. Understood. Would you actually have even been aware, read, considered the protocol that addressed the care of the patient?

PROFESSOR FORSYTHE: Yes, I would. I would have been keen to look at that and be, if necessary, involved in discussing some aspects of it.

Q. If we look at this protocol now, it is short, we've conceded that, or you have acknowledged that. But nonetheless, what are the elements of this protocol that give rise to things that you may have wished to discuss, either because they're there or because they're not there, if I can put it that way?

PROFESSOR FORSYTHE: I think I would want to check that the initial assessment of the patient on admission was correct and comprehensive, and I would also -- as transplant surgeon, I would also be very interested in the immunosuppression on the second page. I would want to be involved in the decisions that were made regarding immunosuppression. It would be done as a joint thing between myself and an experienced nephrologist, but I would be keen to be involved in the decisions that were made to set down that protocol.

Q. So given that the protocol covers those areas, however briefly, that would be a reason for wanting to know what's in the protocol?

PROFESSOR FORSYTHE: Yes.

Q. Thank you. I wonder if we could move now to the question of the phase which is sort of the prior to the

offer of the kidney, and taking it from Adam being placed on the transplant list. There has been some evidence from both Professor Savage and also Mr Keane about how that process worked, what meetings there were and between whom, and the extent to which the surgeons were or were not or could or could not have been involved in them.

You, I think, had in your reports referred to multidisciplinary teams and the benefits of that, and I believe that Dr Coulthard had similarly and also Dr Haynes. From your point of view, when do you think the role of a surgeon in terms of putting a child on the transplant list with a view to the child having transplant surgery, when do you think the surgeon's role really starts?

PROFESSOR FORSYTHE: When it is considered that the patient may be suitable for the transplant list. So very early on in the process would be when we feel that a -- particularly a complex young child like Adam --

Q. Can I just pause there. Because that is an expression that's very often used with Adam, and can I have your view as to why you think he was a complex case? Let's benchmark it. At the time when he was being put on the transplant register?

PROFESSOR FORSYTHE: The main thing that strikes me as

a surgeon is the fact that this young lad had many previous operations and so that alone actually places him into a category for me which is more complex, and I would want to know as many details as possible before he goes on to that list.

Q. Sorry, just so that we understand, why is that? Why is just the sheer number of his operations making it a complex case?

PROFESSOR FORSYTHE: I was going on to say that the assessment would be about the diagnosis of any surgical problems that there may be now, the problems that may arise at the time of transplantation or immediately following transplantation, looking for the most successful outcome that there can be. Clearly, if someone, anyone, has had multiple previous operations and particularly multiple previous abdominal operations, then there is the capacity for each one of those operations to affect, if you like, each of the different categories that I have laid out to you. Hence, if someone has had previous surgery I would want to know exactly what that surgery is, whether that affects my assessment of him now and around the time of possible transplantation.

Q. Would it make a difference how many operations, how far from the point in time when you're thinking of placing

the child on the transplant list those operations had occurred? Would any of that be significant?

PROFESSOR FORSYTHE: It's more the type of operation. I mean, somebody could have had multiple relatively minor operations, which it would be easily dismissible. But if they had had two major procedures, perhaps one on the bladder, one on the area where you're going to plumb in the new kidney, then those two operations alone would be worrisome in terms of planning for the future.

Q. I think you will have seen a schedule of Adam's surgical procedures. I think you saw that when you were dealing with the issue of the Broviac line. You will have seen that initially his plumbing, as you put it, was the subject of operations. I think he had ended up with a T shape, one ureter draining into another and then that ureter into the bladder, and that happened when he was quite young. We can pull up the surgical procedure schedule should anybody want to see that. We're probably looking for it now.

MR FORTUNE: It's 300-060-107.

MS ANYADIKE-DANES: Thank you very much. There we are. If we just increase that a little bit, if we can. The sort of procedures that you were discussing that would be of interest to you and which might add complexity or at least you would want to know more details about,

can you identify that kind of procedure from this schedule?

PROFESSOR FORSYTHE: I can try to. It is quite small print.

Q. Maybe if we take the first four and enlarge those?

PROFESSOR FORSYTHE: I think actually it may well be the first four are the key ones.

Q. There we are.

PROFESSOR FORSYTHE: Yes, I think as you say, from the list down, ureteric re-implantation, laparotomy, cystoscopy, laparotomy, trans uretero-ureterostomy and laparotomy all of those are intra-abdominal procedures which affect -- and I said 'plumb in the kidney' not -- I didn't say about the plumbing of a patient. All those would affect the area in which you would be planning to operate. So all of those would be pertinent for you to know about in terms of just planning. It may not affect what you do, but it's nice to know about it ahead of time.

Q. And when you say it would affect you in terms of planning, forgive me, how does it affect you in terms of planning, what is the impact on your planning of knowing, for example, that he had undergone in 1991 those four procedures?

PROFESSOR FORSYTHE: It's about the site of the surgical incision, it's about whether or not there is likely to

be more scarring in the area and, therefore, making the operation more difficult. And that's not just about me knowing that it's going to be more difficult, it's also telling relatives what the anticipated difficulties might be.

It's also about: is there something within the set-up which is going to make infection more likely, either during the transplant, when you're doing a second operation? Or, alternatively, when the patient is immunosuppressed, their immune system taken down slightly, is there a chance that there will be infection, an increased chance there will be more infection? And all of these are going through your mind as you look at this list.

Q. If that's relevant for a surgeon to know and consider as part of his planning, and I think your evidence a little while ago was that you thought that a surgeon ought really to be involved almost as soon as you've made the decision that the child is going to go on to the transplant list, the situation that existed in Belfast at that time was that there was, as the chairman has said, no dedicated surgeon who's going to carry that out. So there will be no surgeon who's going to be Adam's surgeon. There will be surgeons who have the expertise and skills to do it, but there's no guarantee

at any given time which one it will be. So if you're in that situation and you also feel that Adam's surgical history means it's quite important that this information is conveyed, how does that get done to make sure that the surgeon on the day has the appropriate information to assist them in their planning?

PROFESSOR FORSYTHE: I think I remember that at the outset you said "a surgeon" rather than "the surgeon", and I think that is important, because I work in a team of surgeons and I may well see -- on a night for transplantation, I may well see a patient who has seen one of my colleagues for an assessment. I will trust that colleague to have made an appropriate surgical assessment and do all the things that I have just alluded to. And on the night, I will then hope that all of the planning that I have mentioned has gone forward and that will aid significantly in making sure that there is a successful outcome. So if you work in a team of surgeons, then as long as a surgeon who is experienced in transplantation has seen the patient, has carried out the full assessment, then I am content.

THE CHAIRMAN: Okay. Let me just pick you up on that. Going back to 1995. Back to 1994. 1994, Adam goes on the list for transplant, okay? At that time, I understand your evidence is that it would have been

better if there had been some input from a surgeon at that point.

PROFESSOR FORSYTHE: A surgeon who was experienced in transplantation, if I may.

THE CHAIRMAN: Okay, yes. And that means then that when as it turns out it's Mr Keane who's called in and does the operation starting on the 27th, what tangibly will he have before him or on a file or anywhere, which gives him the benefit of the input of the surgeon at the time that Adam went on to the register?

PROFESSOR FORSYTHE: So, normally, the assessment procedure would have been chronicled either by the surgeon involved writing in the notes or, more likely, or maybe in addition, a letter back to the referring nephrologist, saying, "Thank you for asking me to see this patient, here are the problems, here are the things I think we need to do about it now. I think they can go on the list". All of those things with the assessment will have been carried out fully and will then be available to Mr Keane or any transplanting surgeon on the night.

THE CHAIRMAN: So instead of him coming in and trawling through the notes or having to trawl through the notes at comparatively short notice, he has the advantage that somebody has already done this, has already examined

Adam and has given him this preparation for the transplant he's about to do?

PROFESSOR FORSYTHE: As you say. I mean, it still would be ideal that the surgeon would come in and still carry out an assessment. But as you say, that assessment will be short circuited and improved because of prior planning.

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: When you say that an assessment will be carried out, will that assessment involve considerations as to how the surgery might actually be carried out? I presume there are a number of ways in which you can carry out paediatric renal transplants. Will some thought have already been given to that, bearing in mind the child's specific anatomical circumstances, if I can put it that way?

PROFESSOR FORSYTHE: Yes.

Q. Is that part of the judgment that you receive and the benefit of that that you are using if you're the person who comes in at the last moment?

PROFESSOR FORSYTHE: Yes.

Q. So effectively you don't have to think through all those options, you may be able to form a view of them, but somebody has already done some of that thinking based on the examination and the assessment?

PROFESSOR FORSYTHE: Correct. A simple example would be

that if somebody has had a previous transplant and the right lower side of the abdomen has already been used, then that's clearly going to be fully assessed and you can say the left side would be better to be used on this occasion. There are more complex examples of that same process, but you are correct that it does help short circuit the thought on the night.

Q. And when you said short circuit, I take it it doesn't exclude it entirely. I presume it is still the surgeon's responsibility to assess then to see if there are any changes or differences since those assessments or views were communicated or drawn up?

PROFESSOR FORSYTHE: As I answered the chairman, yes. That's absolutely correct.

Q. Now, that's what the surgeon is doing and why the surgeon's doing it. But a number of our experts, and indeed for that matter, not that it happened in 1995 in Belfast, but Professor Savage and Mr Keane have acknowledged the benefit of multidisciplinary teams. But going back to 1995, when I think you, gentlemen, were saying there were multidisciplinary teams in 1995, how does that work in terms of how the other disciplines help for the planning of what in due course one hopes will be the offer of a kidney?

MR RIGG: Certainly in Nottingham at that time we used to

have a regular meeting where the nephrologists, the transplant surgeons, specialist nurses, used to meet, and we used to discuss all patients who were ready to go on to the list so that we could discuss those specific points. We used to discuss every patient who was already on the list, so we could see whether things were changing. We discussed everyone who had recently had a transplant so we could see what had gone well, what hadn't gone well, and this was repeated on a regular basis.

Q. You may not know, in fact I'm sure we have the information, we can find out, but just in case you do know, in 1995 roughly how many paediatric transplants was Nottingham doing a year?

MR RIGG: At that stage we were doing around 8 to 10.

Q. 8 to 10 a year?

MR RIGG: At that stage, yes. I think it's also fair to say from the evidence we've seen, in 1992 there were only 102 paediatric transplants performed in the UK in ten centres. When I last looked at the data, there were about 150 paediatric transplants done a year now. So it's not a high volume, although obviously a higher volume in some centres than others.

MR FORTUNE: Sir, can we establish from Mr Rigg that in Nottingham at that time all the members of the

multidisciplinary team were in fact based on one site? Because what Mr Rigg needs to remember is that the urologists who would carry out the paediatric surgery would come from the City Hospital on a different site.

MR RIGG: In 1995, we were on one site. Over the last four years we've been on two sites. So we are now doing it by one team coming over to join the other team.

MS ANYADIKE-DANES: The data that I just referred you to, I think if we can pull up 300-021-033. Yes. There's Nottingham, almost halfway. We can see, if you look down, it's grouped up to 14 and then 14 to 17. There we are.

If we look and see the pattern of what you were doing, for the younger ones, which is the category that Adam would have fallen into, you don't -- well, you had quite a high year in 1992 and a high year in 1994. But apart from that, there were years actually when you doesn't do any at all, then 3, 2, a 5, that's right of thing. So would it be fair to categorise Nottingham as not a very large paediatric renal transplant centre?

MR RIGG: I think probably we were medium sized. Can I just clarify for the columns? Because I think the first column is the age under 14. So that's actually got the larger number in. And the second column is the 14 to 17.

Q. Yes, that's exactly right, obviously somebody's got their symbols round the wrong way. That's under 14 and the other one is 14 to 17.

MR RIGG: But obviously, in the under 14 group that's a fairly wide range, so that would include the two-year-olds to five-year-olds, which are obviously the smaller children. But it would also include those between five and 14, so it's quite a wide range within that.

MS ANYADIKE-DANES: It is. The point was, where we were is you discussing these multidisciplinary teams, and what you were discussing was a series of meetings even though there may not actually be that many transplants being carried out, was actually where I was taking you to on that. But nonetheless, you had instituted this system, am I right in thinking -- was it in 1995 or did it exist prior to 1995?

MR RIGG: It existed when I arrived in Nottingham.

Q. Which was?

MR RIGG: In 1992. The paediatric nephrologist who had started that single-handed had set these up, and by the time I arrived there were two paediatric nephrologists and two transplant surgeons and we continued.

THE CHAIRMAN: Sorry, there were more children on the transplant list than there are transplants?

MR RIGG: Yes.
THE CHAIRMAN: So this actually gives the number of transplants, not the number of children on the list.
MR RIGG: That's right.
THE CHAIRMAN: But the multidisciplinary team meetings that you are talking about are for the children who go onto the list.
MR RIGG: We include those who go onto the list, those who are coming up to going onto the list and those who have been transplanted as well. So it will be larger numbers than these that we discussed.
MS ANYADIKE-DANES: And that would be true for any centre instituting that sort of system if they adhered to that?
MR RIGG: That's correct.
Q. Have you any idea of the sort of numbers that you'd be dealing with of children who were on your list in 1995?
MR RIGG: Um ... It would be between 10 to 20 at any one stage.
Q. Yes. Then what I was going to ask, if you could help us with, is the disciplines that you have described, participating in those meetings, we can see what the surgeons are doing. In fact, it's of some value the surgeons meeting together collaboratively and taking the benefit of their pooled experience. But what exactly was the plan that was -- if we stick with the meetings

that we're discussing, the children who were going to have transplants, as opposed to those who had already had them and you were monitoring them, for example, what exactly was the plan and the purpose of those meetings for those children who were going to have transplants?

MR RIGG: There were a number of factors. For some children there may have been specific surgical or urological factors, so it may have been they needed further investigations on their bladder, for example, to make sure they were suitable to take a transplant, or whether they would need to have a catheter put in afterwards. There were factors to do with if a child was just about to go on to the list, what sort of match would we want for that particular transplant.

Q. You mean how urgent or acute might be the need for a transplant?

MR RIGG: That's correct, and whether they -- whether dialysis was going very straightforwardly, or whether the options for dialysis were becoming fewer, in which case we would need to look at ways in which we could optimise that. It was also the opportunity to discuss with the wider team whether living donation was an option for those children because obviously for some it was, but for others it was not. So there was a whole range of medical and other factors that were considered,

each child was different and we would consider different issues.

Q. Where is that information, the product of that discussion, where is that distilled so it is of use to those who, on the particular time when the kidney is offered, have the care and management of that child's surgery?

MR RIGG: We kept it on a database or a spreadsheet which had the relevant information, and that was available to our transplant coordinators, who took the call. It was available to both the nephrologist and to the surgeons who were on the rota.

Q. Can I ask you a question. You have said that one of the things you would be reviewing at a meeting like that is how well the dialysis was going. And you'd also said another thing that you would be forming a view of is how urgent this child's need for a transplant was.

What actually determines urgency of need, so far as your experience was in 1995? This is a question addressed to both of you in your practice in 1995. What determined the urgency of a child's need for a transplant?

MR RIGG: I think that was very much the view of the nephrologist and the wider paediatric nephrology multidisciplinary team. So it would also take a view of

the specialist nurses, who would know about how dialysis was going. It would take the view of the psychologists of the social workers, of the play therapists, how families were coping with their child who had renal failure. So it wasn't just physical factors, it was also social and emotional factors as well.

Q. Yes. Broadly speaking, although you might not be able to answer it in that way, if a child was being maintained very well on dialysis and was healthy, then what effect, if any, does that have on all other things being equal, on the urgency of their need for a transplant?

MR RIGG: I think that allows us to be a little more selective in the organ that we accept for that particular child. I think it's important to recognise that the child has potentially many, many years ahead of them, and many children end up with one, two, three, or even four transplants as the years go by and, therefore, it's important that each transplant lasts for as long as possible. So we would think about getting the best match, for example, that we could because we know that that goes with outcome.

Q. And in Adam's case, if multidisciplinary meetings were happening in relation to his particular case, knowing what you do of his medical notes and records and his

surgical history coming up to when he was placed on the transplant list -- you may not be able to answer this -- what are the things that, in your view, would be being discussed or are likely to have been discussed in relation to him?

MR RIGG: Again, I'm not sure I'm able to comment on the specifics, but in general principles it was how well he was managing on dialysis, whether he'd had any episodes of peritonitis, whether the dialysis was working well. It'd be those sorts of factors.

THE CHAIRMAN: Can I just interpose because, to be fair to Professor Savage, and the other witnesses from the Royal, they've accepted that it would have been a better system if they'd had the multidisciplinary team meetings you're talking about if they'd had them in 1995. But he suspect you may make two points about it. One is that he was getting a fledgling service up and running so he seems to have a bit less far down the road than either of you were in Scotland, England or Nottingham.

The second point is that they were having multidisciplinary team meetings of a different sort, which involved nephrologists, renal nurses and psychologists. Isn't that right?

MR FORTUNE: And sociologists.

THE CHAIRMAN: And sociologists. So I presume you'd agree

there would be a value to the then Northern Irish multidisciplinary team meetings, even if they didn't involve the surgeon, but your point would be they would have been more valuable had they included the surgeon; would that be it?

MR RIGG: I think transplant is but one aspect of caring for a child with renal failure. So even in Nottingham there were separate multidisciplinary teams that discussed all of the aspects of that child's care. These are multidisciplinary team meetings that were specifically concentrated and focused on transplantation. So there were other ones going on at the same time, which sounds as though they were similar to those happening here in Belfast.

MS ANYADIKE-DANES: And I think, Mr Rigg, you said that you are actually now in the situation where your surgeons are coming from a different site. Is that what you said?

MR RIGG: That's what happens -- well, in fact, what happens now is that actually the nephrologists come to us rather than us go to them for the meetings.

Q. And what are the arrangements for how that works in terms of your multidisciplinary meetings?

MR RIGG: We plan a specified meeting every three months where we discuss those things. As well as including the

surgeons, the nephrologists, the specialist nurses, we also include our colleagues from tissue typing, the histo-compatibility and genetic laboratories as well. So we combine that meeting every three months formally, but if there are other issues to discuss with specific patients in between time, then we will have a phone conversation or an individual meeting.

Q. But I take it that even though they might not be on the same site they're all within the same trust?

MR RIGG: That's correct.

Q. I wonder if I could take you to the issue of live donation. I think you've said that that is one of the sorts of things that would be being discussed in one or other of those multidisciplinary meetings.

Now, I think it's Mr Keane who gave evidence -- this is 23 April transcript at page 138. I think we can pick it up at 1. He said -- maybe go to the page before to see the context of that answer.

If we start at line 17, although it's a conversation -- it's obviously a discussion that gets raised slightly ahead of that. Line 17:

"The issue of the live donation, you could have it as part of the discussion but I think with Mr Keane, I wouldn't dream of a live donor procedure on Adam Strain."

And the question is:

"Why?

"Answer: You have to be a close relative, maybe his mother. I would discuss this obviously with her, but you the reasons would be if something happened to Adams' mother ..."

And then he's asked about the risks of that, if one goes over the page:

"Well, it's very low, but this is a consideration, that she might die. Living donors have died or that she would have a major complication of a major operation and be seriously impaired in her ability to bring him up. Furthermore, the size of her kidney as distinct from the size of the adolescent kidney ..."

Pausing there, the kidney that was offered for Adam was from a 16-year-old that he was to receive, and then I say:

"Can we just understand that, are you saying there would have been a material difference in size between the 16 year-old donor kidney that Adam was ultimately offered and his mother's kidney?

"Answer: Absolutely, yes, as an urologists conceptualise on this debate, yes, huge difference."

And then I asked if that was such a thing as to affect risk and he said:

"No, it wouldn't affect risk, it would affect the type of procedure."

And then going on down to the issue of the live donation:

"But the issue for Adam in a live donation is his weight and the potential size of his mother's kidney, which you can assess, but if you're looking at it, you're talking about a small child taking a larger kidney he has to work harder to drive it. There would be a significant disparity in Adam's own capability to, if you like, drive the kidney when coming from a 16-year-old as coming from an older adult."

And then he goes on that you would also have a placement issue:

"In my opinion, which would be that you would have to consider an aortic placement of this particular graft, which was, in my opinion, an aortic graft to me in Belfast would -- no, you were going over to Mr Koffman in Guy's if I thought that was the issue."

A number of matters raised there.

If one tries to tease some of them out so that we can have your views on them. Can we first start with whether, in Adam's circumstances, you would have been

discussing or it would have been discussed at a multidisciplinary meeting the question of live donation if the mother had asked about it?

PROFESSOR FORSYTHE: I think it would. We have discussed this and I think even in 1995 when live donation was perhaps not considered so strongly, as it is today, but even in 1995 we would have considered the possibility of live donation. We would have discussed that. That is another advantage, as we've hinted, of the assessment process, as the possibility of Adam going on to the transplant list gives the opportunity to open out discussions about living donation. It is very hard, obviously, to raise that without producing some element of coercion on the potential donor but, of course, we want to make people aware of that possibility and discuss with them very openly the positives and negatives that are associated with a live donor procedure for a child like Adam.

Q. Can I ask, in 1995, how much discussion would there have been in 1995 of a live donation and what were its relative benefits?

PROFESSOR FORSYTHE: In 1995, I think the possibility of live donation would at least have been raised. If any family member showed an interest in live donation, we would then want to give more information. I take

absolutely what Mr Keane says that there are risks of complications, and there is even, as he has noted, a risk of death following a live donation. But what we would try to do in that circumstance is simply provide as much information as possible and in a supportive way help to make a decision as to whether this is the opportunity that Adam and his potential donor want to take on further.

Q. And the benefits of it over and above, as in 1995, over and above a cadaveric transplant?

PROFESSOR FORSYTHE: Live donation is probably the best, the most successful form of transplantation, of kidney transplantation. That's for a number of different reasons, probably because of the -- in general the better match of the kidney, even in 1995, and also the fact that, if you like, you can check the quality of the kidney that is about to be transplanted. So it is a very successful form of donation for a child.

In addition, when there is any complexity to any patient who is to receive a transplant, performing a live donor transplant is sometimes preferable because, of course, you can say it is going to happen almost in an elective way during daylight hours and the recipient can be brought into the best possible shape for the transplant to go ahead, and so a live donor transplant

is perhaps a good option to at least look at.

I'm not saying for one moment that that is the thing that would have gone through, but it is at least a reasonable thing to have looked at.

THE CHAIRMAN: In fact Mr Keane said two things, there were live donations in Northern Ireland by 1995 but not paediatric and, secondly, if this had been the route that Adam's mother went down, it would have been in London, not in Belfast. It would not have been carried out here.

MR FORTUNE: Sir, bearing in mind the topic presently under discussion involves the multidisciplinary team, can I invite my learned friend to put in front of Mr Rigg and Mr Forsythe what Professor Savage had to say on this topic because it's particularly apposite, so far as Adam is concerned. It is 17 April, page 69.

MS ANYADIKE-DANES: It starts at line 9, I believe.

MR FORTUNE: They might like to look at the bottom of page 68 and read that large paragraph on page 69 and even go down to page 70.

THE CHAIRMAN: Can you give us 68 and 69 together, please, to start? Thank you.

MS ANYADIKE-DANES: I think it starts right down at line 25:

"So I am aware that Debra Strain offered to become a live donor for Adam, and of course Adam was her entire

life and I accept that. As her nephrologist and his nephrologist, I don't recollect exactly what I said to her, but my feeling would have been that Adam was totally dependent Debbie Strain. He was very close to her. He was very dependent on her. She looked after all his dialysis, all his tube feeds, all his medicines, she lived and breathed for that little boy. He was a lovely little boy. So my feeling probably was that to do one of our first live donor transplants in that situation, where there's a risk to the mother and a risk of failure -- because he's so small, putting an adult kidney into a small child -- and also the idea that she would be little in a different hospital and not be there for him during the transplant and because she was a single parent, although I accept of course that his grandparents were enormously involved in his care as well, I thought on balance that that was something we should not pursue and I believe I advised her: let's put him on call and see if we can get a cadaver transplant and then you will be there to look after and support Adam through that transplant. And I think that was probably the discussion that we had."

Then he was asked what the actual risks to her were, and he asked: in percentage terms? If we go over the page to 70:

"I don't know. They'd be fairly slight, but she could be unwell for six months afterwards."

And then there is an acknowledgment at line 8 that it probably would have been better in terms of the actual outcome, improved chances for Adam:

"But you'd still be putting an adult kidney into a small child. If you remember, the kidney was selected from a 16-year-old, which is not quite an adult."

If we pause there, because those are two points that I wanted to raise with you out of what Mr Keane had said. The chairman had quite properly taken you to what Mr Savage was saying, but the two points that I wanted to draw out of what Mr Keane said -- can we go back to where we had his evidence, please, which I think was 138? Thank you very much. 24 April.

THE CHAIRMAN: The 23rd. 23 April.

MS ANYADIKE-DANES: I beg your pardon. 23 April, sorry.

The two points I wanted to draw out was this first issue as to how significant it was for the chances of success of a live donation that his mother's kidney would be an adult kidney as opposed to what he actually was offered was a 16-year-old kidney. Of course, he didn't ever have that option directly staring him in the face, you could have a 16-year-old one or you could have an adult one, but I think what was being signalled was

that there was a material difference to him in having an adult kidney as opposed to having a 16-year-old kidney. Can I have your views on that?

PROFESSOR FORSYTHE: Sorry, Mr Chairman, it was just the testimony of Professor Savage. It seems to me that was just read out to me -- that seems to me that the professor's having to have thought very carefully about the whole issue of live donation and had tried to think through the whole thing and had tried to make a decision, obviously with a great deal of thought that was the right thing. So I'm not sure how much that had been shared with Adam's mother. But that seems to be an entirely appropriate thought process that he was going through. I just wanted to say that.

THE CHAIRMAN: I think if there was to be any point made on that, it would be that, as I understand it, and I am subject to correction, that was his thought process, but it hadn't been shared with Adam's mother. And I get the feel from you that your point is that you would not necessarily be critical of that thought process, but that is something which should be discussed with her?

PROFESSOR FORSYTHE: Spot on.

MR FORTUNE: To put Mr Forsythe's mind at rest. Because on 18 April, Day 2 of Professor Savage's evidence at page 36, starting at line 8, and this will help

Mr Forsythe:

"Debbie Strain and I have a very close working relationship. I was very close to her son, Adam. So I think when you're talking to parents in these situations, some of them will demand or expect to know every minute detail."

Moving on to line 19:

"I don't know the exact situation with Debbie then, but I do know this I trusted her care of Adam and she trusted mine. Therefore, the information that I gave her would have been in that mutuality trusting situation."

THE CHAIRMAN: Thank you.

MS ANYADIKE-DANES: Just for completeness, can we have Debbie Strain's own evidence? It's 001/2 at page 5.

MR FORTUNE: I accept what's about to be given. I'm merely helping Mr Forsythe as far as his state of knowledge is concerned.

MS ANYADIKE-DANES: Absolutely. The only reason for pulling this up is that the chairman was expressing his recollection of the evidence had as to whether indeed that thought process was shared with the mother. So far as the mother's evidence is, it wasn't.

She had raised the issue of a live donor and there we are:

"Did anyone ever discuss with you the possibility of using a living donor?

"Answer: I asked if I could donate, but as a single parent this was not allowed, apart from that there was no other discussion on a living donor."

So you have his thought process and I think the point that the chairman was putting is the issue as to the extent to which that thought process, in whatever style he chose to do it, bearing in mind his knowledge of the mother, to what extent that should have been shared with the mother. I think that was the point that the chairman was putting to you.

And before I move on, just so we don't leave that hanging, do you have an observation or a comment on that? Obviously he knew the mother, so he has that knowledge and you don't have it. But do you have an observation?

PROFESSOR FORSYTHE: I agreed with what the chairman said, that I felt that Professor Savage has obviously thought that through very carefully and I would have hoped that would have been discussed fully with Adam's mother.

Q. Thank you. Then can we go to the more medical issues that I was asking you about, which is this issue of the significance or not of Adam's mother's kidney, if that was to be the kidney to be transplanted into him, being

an adult kidney. How relevant is that?

PROFESSOR FORSYTHE: I'm not sure of the relevance of that. I think before we looked into some of the detail that has been provided, I think we felt that the 16-year-old kidney that was ultimately transplanted into Adam was near adult size. That's how I would have catchphrased it, if you like. And I still am of that feeling, even with references that have been provided regarding the size of kidneys.

Q. If we pause there, maybe I will ask the point in this way. To you as surgeons, as the transplant surgeon, is there -- and you've explained how you would look at all these issues and formulate your plan and so forth. Is there much difference to you as surgeons that you're told that you're going to be dealing with a donor kidney from a 16-year-old as opposed to a donor kidney from the child's mother?

PROFESSOR FORSYTHE: There isn't a great deal of difference in that, no.

Q. Does it add to the risks in any way?

PROFESSOR FORSYTHE: It adds to the risk only in that trying to think through what Mr Keane was talking about in the sections that you read out to me before in that when the kidney is moved from a live donor, the vessels have to be removed obviously in a safe way for the donor. So

the vessels are relatively short. So that makes the technical aspect of the surgery even more difficult. So there is a part of the process which becomes more difficult.

However, the approach to the recipient and how that kidney is, if I may use the term again, plumbed in, is largely the same. So for me, I do not feel that the actual recipient procedure is changed remarkably.

Q. Thank you. Can I go back to that page and pull up just one point, because I think you've mentioned it, but just to get your view on it. I think it's 23 April, page 138. Maybe if we go over the page. It's where he talks about the aorta. There we are.

It starts at line 7:

"There would be a placement issue in my opinion, which would be that you would have to consider an aortic placement of this particular graft and that an aortic graft to me in Belfast ..."

And I presume he means then in 1995:

"... no, you were going over to Mr Koffman in Guy's if I thought that was the issue."

First, if you can explain why it is that putting in an adult kidney requires an aortic graft, and what's the significance of that?

MR RIGG: I think it's probably more to do with Adam's size

rather than the size of the kidney. Adam was a small child, he was around 20 kilograms, between four and five years of age. And in children of that size and age, we would go for a larger blood vessel because the relative flow in a child is lower than it is in an adult. Therefore, if you're going to put in a larger kidney, then you want to ensure that the flow into that kidney is as good as you can make it and, therefore, it makes far more sense to use one of the larger vessels than one of the smaller vessels.

Q. If I have understood you correctly from what Mr Forsythe was saying and you have just said now, does that mean that if the 16-year-old donor kidney going in, an adult kidney going in would actually not have made any difference to the fact that you would have wanted to plumb him in, I think Mr Forsythe's expression, to those larger vessels in any event?

MR RIGG: That's correct.

Q. Can you then express a view on the fact that Mr Keane is saying if you were going to go an aortic graft, so plumb it into that larger vessel, then that is not something that he would be comfortable doing in Belfast and that is something that Adam would be taken to -- well, elsewhere to a centre which perhaps has more experience, expertise or support. You mentioned specifically

Mr Koffman in Guy's. What is it about doing an aortic graft that might lead to that conclusion?

MR RIGG: I think there were two aspects. One is to make sure you're able to expose the aorta and the inferior vena cava, which are the major blood vessels in the abdomen. That does mean often a larger incision to get to that place.

It's also a part of the -- I suppose those vessels are not vessels that many surgeons deal with in their normal daily practice. Vascular surgeons may do, but for the majority of other surgeon, urologists, general surgeons, that's not an area that many would feel comfortable with, and because children of this age, there are not that many, therefore many surgeons do not gain that experience.

Perhaps I can just use an illustration from my own unit, if I may. There are five of us. Four of us are comfortable in approaching the aorta and doing small children. One of my other colleagues is more of a full-time urologist, but he helps us out on the rota, but he has said that he does not do children because he does not feel comfortable in dealing with those larger vessels.

Q. And, as far as you're concerned, that is because, as I understand you, in your view, an adolescent or an adult

kidney, to give it its best chance of success, needs to be plumbed up to those larger vessels, given Adam's size, so that it has the best flow of blood; is that what you're saying?

MR RIGG: It is, yes.

PROFESSOR FORSYTHE: Just to confirm, it is one of the larger vessels, so it is either -- as I think has been presented in other evidence, either the common iliac vessel or the aorta, which you'll be able to, if you like, use either one of those if necessary. So if you are attempting to put a more large kidney into a small child, then we both feel that it would be suitable that you should be prepared to use any of those vessels and particularly the larger vessels.

Q. Now, just so that we're clear about it, Mr Rigg, the colleague of yours who wouldn't be prepared to do an aortic graft, is that shorthand for saying he wouldn't be prepared to in a small child using any of those larger vessels, not just confining himself to the aorta?

MR RIGG: He wouldn't be prepared to transplant a small child. He's happy with teenagers where he's able to use the conventional blood vessels, but he said he does not want to do small children.

Q. So the issue is the plumbing into the larger vessels and the approach required for that, as opposed to whether

it's plumbing into the aorta or one of the larger iliacs? That's the issue, it's the fact that you're going for these larger vessels?

MR RIGG: That's correct.

Q. So if Adam -- in your view then, if that's what's required, that would mean that unless Adam was being offered a kidney that didn't require that sort of blood supply because it was smaller and more in keeping with his own size, that was always going to pose a problem?

MR RIGG: I think it's probably always going to pose a problem whatever the size of kidney. I mean, there was certainly evidence that using kidneys from similar aged children actually resulted in a higher risk of those vessels thrombosing or blocking off, and I think that's what helped people to understand that actually it was the flow into these kidneys that was more of an issue and why it was more important to use a larger blood vessel to plumb them on to rather than a smaller one.

Q. I see. And so the other way around, when you're dealing with a small kidney, is it because you've got tiny vessels and it's the difficulty of connecting those up, and when you're dealing with a large kidney it's because the small vessels of the recipient can't provide a sufficiently inadequate blood supply to the larger

kidney?

MR RIGG: There's various laws in physics, but one tells us about the flow in a blood vessel, and it's to do with the radius of the blood vessel. But actually, the smaller the blood vessel is the lower the flow. And that's not proportional, it's much more than that. So if you halve the diameter of a blood vessel, then the flow probably goes down by about eight times.

Q. Just that we are clear, what are the implications of that for the success of the surgery or the transplant, I should say?

MR RIGG: The implications are to use --

Q. No, no, the implications of not having used the larger vessels for the success of the transplant?

MR RIGG: If you use the smaller vessels, then the implication is that that kidney -- or the vessels of that kidney are far more likely to thrombose and block off in the period immediately after the transplant.

Q. And if they block off?

MR RIGG: The kidney is lost.

Q. Thank you. Mr Chairman, I'm just --

MR FORTUNE: Sir, can I suggest that actually we adjourn for the afternoon? It's getting very warm in here and it's not the first afternoon where it's got very warm. I'm not referring to my learned friend's questioning!

THE CHAIRMAN: I'm fine with that, Mr Fortune. These two witnesses will continue tomorrow. In very crude terms, there's about three and a bit pages of questions. I think we've reached the bottom of page 1. We have to finish them tomorrow and if we stop now, what time can we start out tomorrow to make sure we do finish?

MR FORTUNE: Sir, at the risk of upsetting my learned friend Mr Millar, 9.45?

THE CHAIRMAN: Is that okay? If we get a good morning done, we'll be on schedule comfortably for tomorrow afternoon. Thank you very much.

MR UBEROI: Sir, have you formed a view yet as to the potential witnesses for next week?

THE CHAIRMAN: Yes. If you wait for five minutes after I finish --

MR MILLAR: Sir, have you formed a view as to when you're going to start not sitting on the Fridays?

THE CHAIRMAN: I think for the next two weeks we'll sit on Fridays and we'll do everything we can not to sit on Fridays when we resume in June.

(4.25 pm)

(The hearing adjourned until 9.45 am the following day)

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