

3 February 2023

Baby I

+ Prof Owen Arthurs on Babies E, F, G, H & I

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Friday, 3 February 2023

(10.30 am)

(Delay in proceedings)

(10.35 am)

(In the absence of the jury)

MR JUSTICE GOSS: Mr Johnson, I gather there is a difficulty with the link to Australia, but we're going to proceed anyway.

MR JOHNSON: Right, thank you.

(In the presence of the jury)

MR JUSTICE GOSS: Mr Johnson.

PROFESSOR OWEN ARTHURS (recalled)

Examination-in-chief by MR JOHNSON

MR JOHNSON: Welcome back, Professor Arthurs. For the sake of the record, would you just identify yourself, please?

ARTHURS: I'm Owen Arthurs, I'm a consultant radiologist at Great Ormond Street Hospital in London.

JOHNSON: Thank you. Professor Arthurs, you have assisted the court before with evidence about several of the children that are involved in this case. Two of the children in respect of whom you have given evidence are [Baby E] and [Baby D].

In the context of the evidence that you previously gave to the jury, you were asked a question or asked questions about the prevalence of air in the great vessels post-mortem and explanations for that.

ARTHURS: That's correct, yes.

JOHNSON: And you previously referred to a medical paper, I think; is that right?

ARTHURS: That's right, yes.

JOHNSON: If you could just remind the jury of the gist of the evidence you gave earlier so that we can put into context what you're about to add to that.

ARTHURS: Yes. So I was asked about how common it was to see post-mortem gas in some of the great vessels of the body, the aorta and the IVC, and I made reference to a paper that I had been the senior author on, on writing back in 2015, which we published. That was a paper that looked at post-mortem CT in a large range of children, several of whom were older children, and so I was asked the question whether any of those were particularly relevant to the babies in this case.

JOHNSON: Yes. Just to help us all, because we are not as familiar with this material as you are, or the basis for it, you have mentioned CT there, and in this case we haven't got CT scans or --

ARTHURS: That's correct.

JOHNSON: What's the difference between a CT scan and a radiograph or X-ray?

ARTHURS: In very simple terms, an X-ray takes one image through the body and so you get a picture of a three-dimensional structure in two dimensions, if you like, a black and white photograph. A CT scanner does that repeatedly around the body and so can create a 3D reconstruction of the body. Many of you will have had a CT scan of the chest or the abdomen, so what we are able to do then with those pictures is look at them in many

different ways to find very small aspects of things that you might miss on a simple two-dimensional photograph, if you like.

JOHNSON: So does it follow that a CT scan is much more discriminatory, much more detailed than a radiograph?

ARTHURS: Yes, often that's true. It involves a higher dose of radiation, you are using lots of different X-rays at the same time, but it tends to give a more detailed picture and a more precise picture in terms of localising things, which why we use it in clinical practice.

JOHNSON: So things that may not show up on a traditional X-ray do show up on a CT scan?

ARTHURS: Yes, that's usually the case.

JOHNSON: And this was a study that you authored, with others, that related or had as its database CT imagery rather than X-ray imagery?

ARTHURS: That's right because we wanted to know how common -- or where you saw gas at post-mortem -- the purpose of the study wasn't to address this specific question, but we wanted to use the best technique that we had and we have a large collection of CT scans in children who have died. So we wanted to try and categorise, if you like, where those things occurred.

JOHNSON: Yes. So it was that when you gave evidence on 21 October last year, his Lordship asked you a direct question:

"How many were babies who were 1 to 2 days old and were premature?"

ARTHURS: Yes.

JOHNSON: Do you remember that?

ARTHURS: That's right.

JOHNSON: The point being, was the material in the paper directly relevant to the issues or the control sample, the babies, in this case?

ARTHURS: Yes.

JOHNSON: And I think your response on that occasion was that you couldn't say off the top of your head, but very few, probably none, was the answer you gave previously.

ARTHURS: That's right.

JOHNSON: Since then you have gone back to the paper; is that right?

ARTHURS: In fact, to the raw data. So because we wrote the paper we have all the raw data stored, we have all the scans still there on our database. We have an obligation to keep the information for 10 to 15 years for data governance reasons. So I was able to go back and actually look at the specific cases in that and actually try and address that question if it would help the court to explain how many of these children were in that period and if none, then so be it.

JOHNSON: Yes. And what was the result of your further research?

ARTHURS: I found that six of the cases that we had presented on, 48, six out of the 48, were of what I would say is a relevant age, they were less than 6 weeks old and they were probably directly relevant to this case -- or the most relevant.

JOHNSON: In those cases -- because of course one of the points you have made is that air in the great vessels without an explanation is very rare.

ARTHURS: Yes.

JOHNSON: That's the gist of the evidence you have given.

ARTHURS: Yes.

JOHNSON: In those cases were there objectively reasons for air being in the great vessels (overspeaking) --

ARTHURS: In the six cases that I found -- most importantly I think I only found gas in the great vessels and in two of those cases and in both of those cases there was an explanation.

JOHNSON: And what was the explanation?

ARTHURS: One was a baby who died with a twist in the small bowel, so a clear explanation as to why there would be gas in the great vessels near the bowel, and in another baby who was premature they had died of necrotising enterocolitis and infection. So -- and that baby had a very, very small locule of gas in the IVC, so the significance of it being very small is that's the sort of thing that you wouldn't see on an X-ray.

JOHNSON: Yes.

ARTHURS: In only two of those cases of the six where they would be relevant, out of the 50 or so in the paper, there were no unexplained cases of post-mortem gas in the great vessels.

JOHNSON: Yes. And even in the explained cases, was the amount of gas that was found comparable to the amounts of gas that were found in the cases of [Baby A] and [Baby D]?

ARTHURS: No, not directly comparable. So the one where they died of NEC had a very small locule of gas and a bubble, effectively. The other one, who died of bowel twisting, had quite a lot of gas throughout the system, as you might expect with that sort of abnormality.

JOHNSON: Just to bring back to mind the images that you were referring to when you gave this evidence originally, were they both pictures taken from the side of the child?

ARTHURS: The CT scan is a picture taken all the way round --

JOHNSON: Sorry, I'm talking about the radiographs that we were looking at --

ARTHURS: Yes.

JOHNSON: -- on the occasion that you gave this evidence.

ARTHURS: Yes, that's right.

JOHNSON: So these were the images from the side with the line of bubbles, in effect, lying above the spine?

ARTHURS: That's right.

JOHNSON: I'm sure we can all bring that back to mind.

ARTHURS: Yes.

MR JUSTICE GOSS: I'm sure you'll remember the X-ray in question, but if necessary it can be put up again if anyone wants.

MR JOHNSON: It can be if anybody wants to see it. They were fairly similar pictures?

ARTHURS: Yes.

JOHNSON: Just to bring it back to mind, I think you told us that when we dealt with [Baby E], there was a case about to come where there was more --

ARTHURS: Yes.

JOHNSON: -- and that was [Baby D]?

ARTHURS: That's right.

JOHNSON: Sorry, not [Baby E], [Baby A].

MR JUSTICE GOSS: Yes.

MR JOHNSON: My fault, sorry. I made the mistake because I was about to go to [Baby E].

So can we turn then, please, Professor Arthurs, to the case of [Baby E].

ARTHURS: Yes.

JOHNSON: Just to remind the jury, this is count 5. If I can just put this into -- bring him back to mind specifically.

I'm looking at your statement dated 19 May 2020. There you record [Baby E]'s details in summary, that he was born on 29 July 2015, his gestation at birth was 29 weeks and 5 days, his birth weight, 1,327 grams --

ARTHURS: Yes.

JOHNSON: -- and that he died on 4 August 2015 at 01.40. Just to remind the jury, my Lord, this is the case where [Mother of Babies E & F], his mother, gave evidence. She told the jury that she'd seen blood on his mouth at 9 pm, 21.00 hours, on 3 August. And Lucy Letby was looking after him and she -- the phone calls between [Mother of Babies E & F] and her husband or a phone call calling him in, that evidence.

MR JUSTICE GOSS: Do you remember that case with the phone calls, and from the telephone data she was able to say when the call was made? It just brings it back to mind because you've heard a lot of evidence since then. But thank you, that's the context.

MR JOHNSON: That's the context.

Professor Arthurs, going to your report, and the other detail that I would like to remind the jury of, my Lord, is there wasn't a post-mortem examination in this case.

ARTHURS: Yes.

JOHNSON: You were given a deal of material, weren't you, professor, so far as [Baby E]' case was concerned?

ARTHURS: Yes, that's right.

JOHNSON: That included statements from Dr Evans dated 31 May 2018 and 24 March 2019, and a report from Dr Marnerides, the pathologist, dated 23 January 2019; is that right?

ARTHURS: Yes, that's correct.

JOHNSON: You also received two X-rays or radiographs of [Baby E]?

ARTHURS: Yes.

JOHNSON: I'd like to deal with one of those if we may, reminding ourselves, if we can, that [Baby E] was born at 17.53 on Wednesday, 29 July 2015. The first radiograph you received was dated 30 July 2015 at 10.41; is that right?

ARTHURS: That's correct, yes.

JOHNSON: The second, which I invite Mr Murphy to put up from the [Baby E] sequence -- and it is tile 161 in the [Baby E] sequence -- is a radiograph dated 4 August 2015 at 00.27.

ARTHURS: That's correct.

JOHNSON: So this image, just to put it into the chronology, is taken in life, taken about 9 minutes before CPR was started on [Baby E] and taken about an hour and 15 minutes or so before he died.

Can you help us, please, Dr Arthurs, with this -- and just for the sake of your Lordship and anyone else's notes, I'm going to section 5 of Professor Arthurs' report and, in particular, paragraph 4 of section 5.

Can you talk us through --

ARTHURS: Yes, absolutely. So this is clearly a small baby as their entire chest and abdomen fits, if you like, on one image. So this is the top (indicating) and you can see an endotracheal tube -- I don't know if you can see my arrow on there. There's an endotracheal tube, so that is in place to help ventilate the baby.

The black aspects both sides of here are the lungs and you can see the ribs either side. So the lungs are clear, there's nothing abnormal in the lungs at that stage.

The big white blob in the middle is the heart. Then going further down, there is this white patch, the liver, and then bowel gas in the rest of the abdomen.

In fact, they still have the umbilical clip on, which you can see just crossing there in the abdomen (indicating).

So this is effectively a normal image of a normal baby on the unit. So the lungs are clear, none of the bowel gas is dilated, there's the normal heart and liver. You can't see the stomach on this, but there's no significance to that. So this is effectively a normal picture.

JOHNSON: Yes. Does the fact that you can't see the stomach inform the issue of whether or not there was air in the stomach?

ARTHURS: No, a small amount of air, you would see it. You can see there's a nasogastric tube in, and I actually make the comment that this isn't a particularly good radiograph, you can't really discriminate the grey and white things as easily as we will in subsequent radiographs.

If we can zoom in. Can you see there's a faint line that crosses down the chest and goes to the right of the image, the left of the baby, here? So that would be a nasogastric tube and the stomach bubble would be here (indicating) if there was air in it.

JOHNSON: Yes, if. No one is saying there is --

ARTHURS: There isn't on here, but there's not a great deal of significance to that.

JOHNSON: No. So -- and I'm really looking now to your report written much more recently, dated 14 July 2022, which deals with all the children.

ARTHURS: Yes.

JOHNSON: Did you conclude that there were in reality no significant abnormalities in this radiograph?

ARTHURS: Yes, that's correct.

JOHNSON: If it were to be suggested that if it was an air embolus, air in the circulation, that killed [Baby E], that we'd be able to see that in the radiograph, what would you say?

ARTHURS: First of all, we don't see that on the radiograph. But there would have to be quite a lot of air for you to see it on the radiograph and that would have to have been done quite close

in time, so the radiograph would have to have been taken almost immediately were that to have happened.

JOHNSON: Yes.

ARTHURS: I can't exclude the fact that that may have happened, but it's just not demonstrated on the X-ray.

JOHNSON: So does it follow that the fact that one can't see air in the great vessels or other parts of the circulation on this, that fact doesn't help either way in determining whether that was the cause of death?

ARTHURS: Yes, and that's my conclusion: I don't think this contributes either way.

JOHNSON: No, thank you.

What about the issue of NEC? Does the radiograph help with determining whether or not [Baby E] had NEC?

ARTHURS: Only insofar as there are no features of necrotising enterocolitis on the X-ray. If the baby were to die of NEC within hours of the X-ray, you might expect to see some of those features.

JOHNSON: Yes. So insofar as this image assists with that question, it does not support any suggestion that this is a case of NEC?

ARTHURS: That's correct.

JOHNSON: Thank you. I'm going to turn to [Baby F] next, please, my Lord.

His case is count 6. [Baby F], of course, was born at the same time or a minute later than his twin, [Baby E], on 29 July. The allegation concerning [Baby F] is one of attempted murder. The issue, the factual issue, for the jury revolves around the TPN bag that was connected to [Baby F] at 00.25 on 5 August. In other words, the day after, almost exactly 24 hours after, his twin [Baby E] died. The allegation centres around the issue of who it was that put insulin into the TPN bag.

Professor Arthurs, you wrote a report in [Baby F]'s case, dated 21 January 2020; is that right?

ARTHURS: That's correct, yes.

JOHNSON: You were given, as in other cases, Dr Evans' reports that existed as at that time?

ARTHURS: Yes.

JOHNSON: You also received Dr Bohin's report, dated 4 April 2019?

ARTHURS: Yes.

JOHNSON: And you were given four separate radiographs, two from 29 July, one from the 30th and the final one timed at 11.41 hours on 5 August?

ARTHURS: That's correct.

JOHNSON: So putting that into the factual matrix, about 11.5 hours after the -- 11 hours and 20 minutes or so after the TPN bag was connected to [Baby F], give or take.

Now, is there any assistance that you can provide from the radiographs that you have seen that helps at all with the issue of, first, whether there was insulin in the bag and, two, who it was that put it there?

ARTHURS: In short, no. They are not things that can be seen on X-ray images, but none of [Baby F]'s X-rays were done because they were worried about his heart or lungs or anything. And in fact, the last radiograph was done to look at where his long line was.

JOHNSON: Yes.

ARTHURS: So as far as I can see, I can make no comment on those.

JOHNSON: Thank you. Can we turn next, please, to the case of [Baby G].

ARTHURS: Yes.

JOHNSON: My Lord, the count concerning [Baby G] is count 7. Just to remind us all, [Baby G]'s birth was 31 May 2015. She was born at Arrowe Park. She was transferred to Chester on 13 August 2015. There are two incidents relating to [Baby G]. They are two allegations of attempted murder, the first on 7 September and the second on 21 September.

This is evidence that the jury has heard more recently.

They will recall, I'm sure, the first incident concerned a projectile vomit, for which we have a picture which has been annotated by Ailsa Simpson. The issue was the withdrawal or the aspiration of 45ml of milk from [Baby G]'s stomach after the

vomit, set against the record that established that she had been fed 45ml.

So let's deal with that event first, Professor Arthurs. Is your initial report on [Baby G]'s case dated 19 May 2020?

ARTHURS: That's correct.

JOHNSON: As before, were you sent two statements of Dr Evans, dated 31 May 2018 and 24 March 2019?

ARTHURS: That's correct, yes.

JOHNSON: A report from Dr Bohin dated 28 March 2019?

ARTHURS: Yes.

JOHNSON: And also in [Baby G]'s case, quite a lot of radiographs?

ARTHURS: Yes.

JOHNSON: Dealing with the relevant radiographs first of all, and dealing with the first collapse first, so the collapse of 7 September, did you receive the following radiographs taken on that day? One at 4.49 hours?

ARTHURS: Yes, that's correct.

JOHNSON: For anyone's note, that's at T96. The second at 6.36 hours?

ARTHURS: Yes.

JOHNSON: And again, for anyone's note, that's T127. These are both in the [Baby G] sequence, I should have said.

And the third, also in the [Baby G] 1 sequence, tile 205.

You have annotated these radiographs, haven't you, professor?

ARTHURS: I have, yes.

JOHNSON: And what I'd like to do now is to produce, show to the jury and exhibit those annotated radiographs. If Mr Murphy can help us with this, please.

Let's take this slowly. This is a radiograph from Arrowe Park, actually, isn't it?

ARTHURS: Yes, it doesn't pertain to the dates you just mentioned.

JOHNSON: No. But just for reference, it features in your report and it may be a good introduction to the issues we're going to be looking at. What does it show us? Can we deal with the -- the date and time in the top left corner is superimposed on the picture itself, isn't it?

ARTHURS: Yes, that's my annotation but it's based on the image that I was provided with. You should disregard these white lines that go across the radiographs. They are ECG dots on the outside of the baby.

JOHNSON: Yes.

ARTHURS: So they are not on the inside, so they are clear to see on the outside, so that's not the reason the X-ray is being taken.

JOHNSON: Yes.

ARTHURS: They show a nasogastric tube in here, going into the stomach. The stomach, like the other babies, is not dilated. There is oxygen tubing, again outside of the patient, going across the top, which again is largely irrelevant to the image. And then they show lots of dilated loops of bowel. This particular loop is dilated more than the others (indicating).

JOHNSON: What about the two arrows that we see that you've put on?

ARTHURS: The arrows here denote the nasogastric tube, just to make it clear to people what the normal passage down the oesophagus and into the left-hand side of the baby into the stomach is.

JOHNSON: So that's a reference for us?

ARTHURS: Yes.

JOHNSON: Can we move on to the next radiograph in your report, please. This is still pre either of the incidents that we are concerned with. Does this also originate from Arrowe Park?

ARTHURS: That's correct, yes.

JOHNSON: What does it show, please?

ARTHURS: Again, much the same. There is a nasogastric tube in.

It has gone a little bit further. These are the overlapping -- the white lines are the overlapping ECG probes outside of the patient. But it just shows again normal sort of bowel gas, a few bowel loops of which are dilated.

JOHNSON: Thank you. The next radiograph, please? This is now one from Chester, isn't it?

ARTHURS: That's correct, that's 7 September, yes.

JOHNSON: Just to put this into the chronology, my Lord, this is some time between 2 and 2.5 hours after the incident, after the projectile vomiting.

So what do we see here?

ARTHURS: Similarly, I've labelled the nasogastric tube that can be seen. Lots of loops of bowel. Most of this is small bowel. There might be a loop of large bowel which I've written "LB" over there. The stomach is not dilated.

Presumably if there's been a large vomit then that would account for the stomach being decompressed. And she's beginning now to develop complications of lung disease of prematurity. So the lungs are not as black as they would be otherwise.

JOHNSON: Just to cross-reference this image to the sequence of events, the unannotated version of this appears in the [Baby G] 1 sequence of events at T96. Can we move to the next radiograph, please, which is taken almost 2 hours later at 06.36. Sorry, no, that's the wrong one.

ARTHURS: I don't think I have that in the --

JOHNSON: Right, okay. That doesn't matter. The one we saw is the first radiograph taken after the incident, isn't it?

ARTHURS: Yes, that's right.

JOHNSON: So if we could just go back to it, please, sorry. This is 7 September?

ARTHURS: So 04.49?

JOHNSON: Yes. What, if anything, do we see of the stomach at that stage?

ARTHURS: We don't see the stomach. The stomach would be expected to be in the top right of your image, in the abdomen, if you like, the top left of the baby. So the stomach is decompressed.

JOHNSON: Is that decompression of the stomach consistent with a history of vomiting?

ARTHURS: Yes.

JOHNSON: Before we get to your opinions, if we can move to the second incident. This, of course, is count 8 on the indictment.

MR JUSTICE GOSS: Sorry, just before you do, you referred leading up to this to there being three X-rays taken on 7 September.

MR JOHNSON: Yes.

MR JUSTICE GOSS: We're only looking at the first one?

MR JOHNSON: We are.

MR JUSTICE GOSS: So we can forget about the other two --

MR JOHNSON: Yes.

MR JUSTICE GOSS: -- and the references there?

MR JOHNSON: Yes.

MR JUSTICE GOSS: The first one, the unedited version or the version on to which Professor Arthurs has imposed these things is tile 96?

MR JOHNSON: It is, my Lord, yes.

MR JUSTICE GOSS: Just so we can focus on that.

MR JOHNSON: Yes. Tiles 127 and 205 are further radiographs taken later in the day, but they don't impact on your opinion, do they?

ARTHURS: That's right.

JOHNSON: They're included so that people can look at them if they want to and understand what it was you have taken into account in reaching your opinion.

So that's the first collapse. That's count 7.

Count 8 is a further projectile vomiting collapse on 21 September. The collapse itself is in the [Baby G] sequence, the second sequence, at tile 90. The radiograph you received, Professor Arthurs, is also dated 21 September, isn't it?

ARTHURS: Yes, that's correct. That's the one.

JOHNSON: We see from the image on the screen now, which again you have annotated, so this is your annotated version of tile 60 in [Baby G] 2, we see that this image was taken at 12.21 --

ARTHURS: Yes.

JOHNSON: -- is that right?

ARTHURS: That's correct.

JOHNSON: Again, this is, in general terms, about 2 hours after the incident that forms the basis for the allegation in count 8. So that incident, my Lord, occurred at about 10.15 on 21 September. So we're 2 hours and 6 minutes on if we're going to be absolutely precise.

So again, professor, can you help us with, first of all, what this is and then what you can help us to see?

ARTHURS: Yes. This is an image of the baby's abdomen. It's slightly at an angle. You can see at the very top the heart, the nasogastric tube coming into where the stomach would be, and then again, like before, several dilated loops of what's likely to be small bowel and maybe large bowel. The stomach is empty and decompressed on this image.

JOHNSON: Thank you. Going back to your report then, please, professor. Can we start with your section 5, which is, I think, on your page 4. And in the papers it's page 2043.

Do you record the fact that during her clinical care at Arrowe Park, there were 46 radiographs which you looked at?

ARTHURS: Yes, that's right.

JOHNSON: 42 of those between her birth and transfer to Chester on 13 August?

ARTHURS: Yes.

JOHNSON: And four subsequently in September when she was returned to Arrowe Park?

ARTHURS: Yes, that's right.

JOHNSON: And of those radiographs, 18 showed the abdomen?

ARTHURS: Yes.

JOHNSON: Do you also refer to the fact that there had been abdominal radiographs taken on 6 June 2015?

ARTHURS: Yes, that's correct.

JOHNSON: And that the cause of that request was that there had been a distended/discoloured abdomen with NG aspirates?

ARTHURS: That's right.

JOHNSON: Is there any bowel dilation on those radiographs?

ARTHURS: No, not on those, which is why I didn't reproduce them.

JOHNSON: So far as any abdominal radiographs taken of [Baby G] in May or June 2015, so at the beginning of her life, was there any evidence of any unusual bowel dilation?

ARTHURS: No, not that I saw from the radiographs.

JOHNSON: In July, so looking at your paragraph 7 now, did you look at a radiograph taken on the 11th of that month?

ARTHURS: Yes.

JOHNSON: What did that show?

ARTHURS: That was the first radiograph that we looked at in this sequence.

JOHNSON: Yes. Let's just get Mr Murphy to scroll back and give us the picture with the explanation. It may be helpful.

Thank you.

ARTHURS: Yes. So we've talked about where the lines and tubes are. And there's a small amount of small bowel dilatation. So this is effectively normal care of this baby.

JOHNSON: Yes. That is not associated with any distension of the stomach, is it?

ARTHURS: That's correct.

JOHNSON: Was there a further episode of bowel dilation on 4 August?

ARTHURS: That's right.

JOHNSON: Is that the second photograph that we've -- radiograph that we've got?

ARTHURS: It is, yes. I've described the features on this image in the same way, yes.

JOHNSON: Moving on to the radiographs from Chester and on 7 September, do you reproduce in your report contents or partial contents or a summary of the contents of Dr Bohin's report of 28 March 2019 --

ARTHURS: That's right.

JOHNSON: -- in which Dr Bohin records that [Baby G] was feeding normally on the 5th and 6 September?

ARTHURS: That's right. That's the information I had.

JOHNSON: Just for the jury's information, my Lord, if we go to jury bundle 2, divider 7, page 7012, which is at the back of that divider, there we have the feeding charts referred to by Dr Bohin for the 5th and 6 September.

Over the page at 02.00 hours, we have the feed given by [Nurse E], who we will recall then left the neonatal unit or went on a break. That's timed at 2 am.

Do we then see -- then have a picture here, professor, on the screen now of your annotated version of the radiograph taken at 04.49 that same morning?

ARTHURS: That's right, yes.

JOHNSON: What do we see here, please?

ARTHURS: I think we've explained already where the ET tube and the nasogastric tube is. The stomach is decompressed and there are several dilated loops of small bowel and potentially large bowel here. They are dilated with air.

JOHNSON: Yes. Do you then record the fact, moving on to your paragraph 8 on what is your page 8 --

ARTHURS: Yes.

JOHNSON: -- the fact that Dr Bohin has recorded the fact that a large volume of air was aspirated from the nasogastric tube?

ARTHURS: Yes.

JOHNSON: And that later chest radiographs that day showed some abnormalities in or associated with the lungs?

ARTHURS: Yes, that's all.

JOHNSON: So far as those abnormalities are concerned, are they surprising or not in the context of [Baby G]'s treatment?

ARTHURS: No. [Baby G] was a very small, very premature baby, so she would be expected to have some lung changes associated with prematurity.

JOHNSON: Going on to, I think it's the next radiograph in this sequence, please, Mr Murphy.

ARTHURS: Yes.

JOHNSON: This is following [Baby G]'s transfer to Arrowe Park, taken at 5 in the morning on 8 September. What does that show us?

ARTHURS: This shows us again that there's a nasogastric tube, the stomach is decompressed, and there are some loops of small bowel that are dilated. I think the important thing here was -- I think [Baby G] was being transferred on the basis that she might have necrotising enterocolitis.

JOHNSON: Yes.

ARTHURS: The X-rays don't support that diagnosis, so there aren't any features of NEC on any of the images that we've seen.

JOHNSON: Are you saying as a matter of fact you can absolutely exclude it or just --

ARTHURS: No.

JOHNSON: -- there is no evidence to suggest it was there?

ARTHURS: It's an entirely reasonable thing to do, to transfer a small baby on the basis that they have something that potentially needs further management elsewhere, only that the X-rays don't support that diagnosis, that's all.

JOHNSON: Whilst she was there, if we look at the next radiograph -- and by there I mean Arrowe Park --

ARTHURS: Yes.

JOHNSON: -- on the 12th there is a --

ARTHURS: Yes.

JOHNSON: -- further picture that we have there. Can you talk us through that, please?

ARTHURS: This is very similar to several of the other X-rays, again just of the central abdomen, and there are lots and lots of loops, as you can see, of gas-filled small bowel. I can't see the stomach on here, but it doesn't look particularly distended. So these are all non-specific features.

JOHNSON: [Baby G] then returned to Chester on 16 September; is that right?

ARTHURS: That's correct.

JOHNSON: On the 21st, we have the first of two incidents in respect of which allegations are being made, the second of course has nothing to do with the radiography, so concentrating on count 8, for the jury's information can you tell us about -- if Mr Murphy would kindly scroll on to 21 September. This is an image that we have referred to before, isn't it?

ARTHURS: Yes, that's right. So this is about 2 hours after the episode that you described at 10.30.

JOHNSON: Yes. Just for the jury's information, it corresponds to the image in the [Baby G] 2 sequence at tile 60, so the unannotated version, [Baby G] 2 sequence, tile 60. But working with your slightly altered image, would you talk us through it?

ARTHURS: Again, nasogastric tube at the top coming in. The stomach is decompressed and there are here less dilated but loops of small bowel and large bowel. Again, no features of NEC, no other significant abnormalities.

JOHNSON: So progressing to your interpretation of that series of imaging, please, professor, can we go to section 8 of your report.

ARTHURS: Yes.

JOHNSON: Take us through your -- slowly through your interpretation.

ARTHURS: Yes. So putting her lung changes aside, because she was very premature and she had some chronic lung diseases associated with that, she essentially had several episodes of bowel distension that seemed to resolve given the medical treatment you've described. Each of those should be interpreted in the context of how unwell she was at the time.

JOHNSON: All right. Let's just concentrate on that for a second.

So the jury's heard quite a lot of evidence from treating medical practitioners and nursing staff surrounding this.

ARTHURS: Yes.

JOHNSON: In your opinion, does that need to be taken into account in drawing conclusions from what we see in the pictures?

ARTHURS: Yes. There were obviously several episodes where she was acutely unwell. So if in their opinion she had sepsis or infection or they recognised features of NEC, then it's not unreasonable to associate the images, what we see on the images, with how she was clinically. All I can say from the images is there isn't anything specific to suggest any of those abnormalities.

JOHNSON: Would you defer to the paediatricians/neonatologists -- would you defer to their opinions as to how unwell or otherwise [Baby G] was at the times of these events?

ARTHURS: Yes, absolutely.

JOHNSON: Just to be clear, so far as the radiograph of 7 September is concerned, taken a couple of hours after the projectile vomiting, is there anything on the face of the radiograph, taken in isolation, that distinguishes it from the balance of the imaging that we have considered?

ARTHURS: No.

JOHNSON: You know, because you have seen the reports, that Drs Evans and Bohin attribute these events to overfeeding, deliberate overfeeding. Does the radiology assist us either way in interpreting their opinions?

ARTHURS: No, not really. If the baby had been overfed with milk, we wouldn't necessarily see that on an X-ray. The X-rays all show lots of gas in the abdomen, so overfeeding with milk, a combination of milk and/or air, could cause these findings.

JOHNSON: Did you look at the totality of these images that you have isolated and draw comparisons between what can actually be seen in the imaging as compared with these pictures -- as compared with each other?

ARTHURS: I'm not sure I understand the question.

JOHNSON: Sorry, that wasn't a very good question.

Did you look at all these pictures that we've just gone through on the screen --

ARTHURS: Yes.

JOHNSON: -- first of all? And did you consider whether there was anything to differentiate between them so far as your opinion was concerned?

ARTHURS: I understand. No, I didn't. She was a very premature, very small baby. She clearly had lots of episodes of where her abdomen got distended. And in my opinion, there's nothing on the X-rays that would really provide a diagnosis as to why that had happened.

JOHNSON: So there's nothing in the X-rays that bears on the issue of deliberate force-feeding or overfeeding --

ARTHURS: No.

JOHNSON: -- or injection of air into the stomach?

ARTHURS: Not in my opinion, no.

JOHNSON: Thank you. We're going to move on to [Baby H], her case, now, please. Just to remind the jury, this is very much more recent evidence, of course, but counts 10 and 11 name [Baby H]. They are incidents which took place -- the first was on 26 September 2015, which is count 10, and that's at 03.20. Count 11 is 27 September 2015 at about 00.55.

In [Baby H]'s case, did you sign a report initially on 19 May 2020?

ARTHURS: That's correct, yes.

JOHNSON: Did you record there the fact that [Baby H] had been born on 22 September 2015?

ARTHURS: That's correct.

JOHNSON: And thus the first incident you were being asked to consider was 4 days after she'd been born?

ARTHURS: Yes, that's correct.

JOHNSON: I'm sure the jury don't need a prompt from me, but the issue here is chest drains, putting it into a single word; is that right?

ARTHURS: Yes, that's right. [Baby H] had a pneumothorax.

JOHNSON: Yes. So far as the material that you received, were you given a report from Dr Evans dated 31 May 2018? It's your section 3, paragraph 2.

ARTHURS: Yes, that's right.

JOHNSON: From Dr Bohin, dated 27 March 2019?

ARTHURS: Yes.

JOHNSON: A report from Dr Marnerides of 28 January 2019?

ARTHURS: Yes.

JOHNSON: That's what you say, but I think it's a typo.

ARTHURS: Apologies.

JOHNSON: And a supplementary report from Dr Evans dated April 2019?

ARTHURS: Yes.

JOHNSON: Were you given about 14 or so radiographs taken of [Baby H], starting on 22 September 2015 at 19.49 and ending on 27 September at 01.34?

ARTHURS: That's right. So that's about 15 or so radiographs taken within a two or three-day period, so they are all taken in very close succession if you like, yes.

JOHNSON: All right. Well, if anyone wants to take a note of where they appear in the sequence of events for [Baby H], I'll give the tile numbers. Not all of these are reproduced in the sequence: tile 48, tile 66, tile 75, tile 137, tile 158, tile 200, tile 229, 381, 402 and 451.

As I've gone through, I've missed out one, which is tile 55. So that comes between 48 and 66.

Before we get to the images themselves, in general terms did the series of images show a recurring pneumothorax?

ARTHURS: Yes, that's right.

JOHNSON: And did you -- I am looking at your review section, so section 5, paragraph 5. Did your review also identify the fact that needle aspiration had been required?

ARTHURS: Yes, that's correct.

JOHNSON: That several chest drains had been inserted?

ARTHURS: Yes.

JOHNSON: That the ET tube had been adjusted?

ARTHURS: Yes.

JOHNSON: And that the bowel gas pattern was normal throughout --

ARTHURS: Yes, that's right.

JOHNSON: -- these processes?

Was your initial opinion that you hadn't -- or did you say as part of your initial opinion that you were not reproducing the images because all they showed was that the appropriate clinical care and the expected course for this complication and treatment had been followed in effect?

ARTHURS: Yes, that's right. That was my initial opinion.

JOHNSON: Subsequently, were you asked to consider the issue of whether any of the three chest drains that the jury have heard were used were inappropriately placed or had moved?

ARTHURS: Yes, that's correct.

JOHNSON: Was this an issue that you developed in your report of 26 September 2022?

ARTHURS: That's right.

JOHNSON: Just to remind the jury, my Lord, several witnesses were cross-examined about whether or not one or one of the drains was touching the heart and/or the vagal nerve.

MR JUSTICE GOSS: Yes. I'm sure the jury will remember that.

MR JOHNSON: I'm sure they will, but just to remind everybody.

Now, I'd like to go to these images one by one, please, Mr Murphy. So can we start with [Baby H]'s sequence of events at tile 48? Thank you.

You talk us through what we can see there, please, professor.

ARTHURS: Yes. This is on 25 September. There's an X-ray before this one on 24 September that shows that she has a big pneumothorax. Pneumothorax is air outside of the lung in what is

a space called the pleural space, so between where the lung and the chest wall is. So normally, there's nothing in that space, so the lung is closely adherent to the chest wall. [Baby H] is ventilated so it may be that the ventilation has caused a small hole in the lung somewhere and that's led to air leaking out and forming this rim of blackness around the grey lung. So you can see what the normal lung looks like on the other side, this sort of hazy greyness, and there is hazy greyness here, but in addition there is some blackness around and particularly at the bottom area, so that is air outside of the lung rather than within the lung.

What you can see on this radiograph is that a needle has been placed into the lung and then -- into the pleural space and then a pigtail catheter with a coil that's gone in through the chest wall into this space.

JOHNSON: So that's tile 48. If we can move on to tile 75, next, please, which is an image taken at 04.37 the same morning, so 3 minutes shy of 3 hours later.

ARTHURS: Yes.

JOHNSON: Again, can you --

ARTHURS: The same baby, similar projection, an image of the chest. There's an endotracheal tube in. There's another nasogastric tube in here into the stomach. Here you can't see the pneumothorax because there are two drains in. This is the same drain that we've seen already and that looks as though it's in the same position. And there's now another drain coming in lower down on the chest wall that appears to go to the midline. So this is a newer, non-coiled chest drain.

MR JUSTICE GOSS: The first one is what's called a pigtail?

ARTHURS: Because it coils at the end, so like the tail of a pig, and the idea of that is that once --

MR JUSTICE GOSS: We've heard all about that. We're very familiar with these drains now, the two different types, and a pneumothorax, so you may take it we have the knowledge and the evidence in relation to that.

ARTHURS: Thank you, my Lord.

MR JOHNSON: Now, one of the issues that's been explored with the witnesses, I'm not going to ask you to deal with it immediately, is whether that lower drain is touching the heart or the vagal nerve, all right? We'll park that as a concept for now, as a suggestion, and carry on with the images first of all if we may.

Can we go to 137 next. So this is an image taken the same day at 14.53, so just slightly more than 10 hours later.

ARTHURS: Yes.

JOHNSON: Is this the same aspect as we saw in the previous image?

ARTHURS: Firstly, this image hasn't been performed in order to look at the chest. This image has been performed to look at the position of a line. There is a line coming in on the right arm. You can see this tiny faint tubing that goes in and then it positioned somewhere around the heart. So this image wasn't done because they were concerned about the drains.

It does show that there is the same pigtail drain and then the lower drain has moved slightly or been repositioned and now lies in a slightly different position in the chest, but there's still no re-accumulation of a pneumothorax at that stage, which is the important point.

JOHNSON: Do these images enable one to say that the line is moving of its own accord -- that the drain is moving of its own accord?

ARTHURS: No, chest drains are sutured into the chest wall so they don't move. That's my understanding.

JOHNSON: Can one read necessarily anything into the fact that the position appears to be different in different pictures?

ARTHURS: Radiologists don't really comment on the position of where chest drains are because if they're succeeding in the treatment which they are trying to create, in this case draining a pneumothorax, then their position is largely irrelevant.

JOHNSON: Why is it irrelevant?

ARTHURS: So with a chest drain, unlike an ET tube or a nasogastric tube, there is no desired or ideal position. So an endotracheal tube needs to be in a particular position in the trachea to ventilate the child. The nasogastric tube needs to be in the stomach to provide the right care there. So a chest drain needs to be somewhere around the lung, somewhere in the pleural space. So its precise location, if you like, up and down or left and right isn't really critical if it's having the desired effect, which is to drain the pneumothorax.

JOHNSON: All right. Let's just, while we're developing this, move on, please, to tile 158, if we may. This is an image taken at 17.25, so about 2.5 hours after the previous image at 137.

ARTHURS: Yes.

JOHNSON: What do we see here, professor?

ARTHURS: The child here is slightly rotated. The image is taken at a slightly oblique angle. But essentially, the same thing: the ET tubes are there, the drain is there (indicating). This drain looks as though it's been withdrawn slightly. That might have been by accident or deliberation, but again there's no pneumothorax and that's the key part.

JOHNSON: The final image for that day is at tile 200. Timed at 22.56, so about 5.5 hours after 158. Again, what do we see here?

ARTHURS: This looks very similar to the X-ray at 4 o'clock that morning, with the drains in position. You see the black line around the heart here? That's suggesting maybe the pneumothorax is re-accumulating, so the drains may not be working in that sense.

JOHNSON: Then an image from the following day, the 26th.

ARTHURS: Was the 26th at 02.30 the next X-ray?

JOHNSON: Yes. That's 229, thank you. What does that show us?

ARTHURS: In response to the pneumothorax potentially re-accumulating, they have placed a third pigtail drain.

JOHNSON: Yes.

MR JUSTICE GOSS: A second pigtail drain, a third drain.

ARTHURS: Yes, a third drain, a second pigtail drain.

MR JOHNSON: Is there anything concerning about the position of that drain?

ARTHURS: No. So long as it's draining the pneumothorax, then it's achieved the clinical purpose of placing it in.

JOHNSON: Concerning the issue of the possibility that one of these drains in some way touched the heart or the vagal nerve and precipitated a decline in the child, what do you have to say about that?

ARTHURS: Well, chest drains aren't known necessarily to cause bradycardia/desaturations. They are not a common cause on a neonatal unit otherwise we'd be seeing it in almost every baby who had a chest drain in. We don't comment on the position of chest drains as radiologists because, as I've said, they're largely not relevant to the care but you have to remember that this is a two-dimensional image of a three-dimensional structure. The heart is at the front of the chest so although on some of these images -- so for example, on this one the drain looks as though it's touching the heart, it may actually be several centimetres away from the heart because it's going round the chest wall at the back, for example.

But we don't try and examine where chest drain positions are in detail, largely because they tend not to cause any problems. And so long as they are resolving the complication, their precise position isn't really that relevant to a radiologist.

JOHNSON: So are you saying that if there was a known association between chest drains touching the heart and serious collapses in children, this would be an important issue for your part of the medical profession to consider on looking at these sorts of images?

ARTHURS: Yes. If that was to occur then a neonatologist, when they put in a chest drain, would be very wary of where its position would be because of a known association of putting one in. I'm sure there are complications to chest drains and children respond differently to them, but from the imaging point of view it's not of critical importance.

MR JOHNSON: Thank you. My Lord, we are going to move on to [Baby I]'s case and that will take a while.

MR JUSTICE GOSS: Yes. Good time to have a break, a ten-minute break.

I can't remember whether you've had a ten-minute break before, but we do have ten-minute breaks. We'll have a ten-minute break and then continue with your evidence, professor.

(11.47 am)

(A short break)

(11.57 am)

(In the absence of the jury)

MR JOHNSON: My Lord, just before the jury comes in, you will remember from yesterday that Dr Gibbs and Dr Chang are waiting

in the wings. Our priority, for the reasons I explained yesterday, is Dr Chang. Given the balance of Professor Arthurs' evidence-in-chief and cross-examination, we think that it's almost an impossibility to fit both Drs Chang and Gibbs in this afternoon, so with your leave, we'll just turn Dr Gibbs round now rather than inconvenience him any further.

MR JUSTICE GOSS: Certainly. That thought was crossing my mind as we were progressing with the professor's evidence. Yes, don't keep him here.

MR JOHNSON: Thank you.

(In the presence of the jury)

MR JOHNSON: Professor Arthurs, can we turn your attention, please, to [Baby I]?

ARTHURS: Yes.

JOHNSON: Just to remind the jury, albeit they probably don't need a reminder, [Baby I] was born on 7 August 2015 and she died on 23 October 2015.

First, the material that you reviewed initially at least contained in section 3 of your report --

ARTHURS: Yes.

JOHNSON: -- did that include two reports from Dr Evans, dated 31 May 2018 and 25 March 2019?

ARTHURS: That's correct.

JOHNSON: A report from Dr Marnerides, dated 28 January 2019?

ARTHURS: Yes.

JOHNSON: And further material from Dr Evans?

ARTHURS: Yes.

JOHNSON: Is this another case where you have received a lot of radiographic material?

ARTHURS: Yes, that's right.

JOHNSON: But so far as your report was concerned, was the primary focus on material from 30 September, the 13th, 14th and 15 October, and 23 October?

ARTHURS: Yes, that's right.

JOHNSON: Just dealing with the parameters first of all, just for people's notes rather than for your information, professor, the first and indeed only radiograph taken on 30 September 2015 was taken at 17.39?

ARTHURS: Yes.

JOHNSON: That's just over an hour after the first event concerning [Baby I]. It's in the [Baby I] 1 sequence of events at tile 78.

ARTHURS: In my report, I also have a radiograph from before that, from late in August.

JOHNSON: Yes.

ARTHURS: I don't know if you wanted to refer to that as well in chronological order.

JOHNSON: At the moment I'm simply restricting the references to the material that the jury actually has at the moment.

ARTHURS: Fine, thank you.

JOHNSON: If you don't mind, thank you.

So far as event 2 is concerned, it's your small (h), it's a radiograph taken on 13 October at 04.25?

ARTHURS: Yes.

JOHNSON: Just to remind the jury, the event to which that relates happened 1 hour and 5 minutes earlier at 03.20, and it's in the second [Baby I] sequence at tile 80.

The third radiograph is from the afternoon of that same day at 16.21. That's in [Baby I] sequence 2 at tile 181.

We then have three radiographs you considered from the 14th into 15 October.

ARTHURS: That's correct.

JOHNSON: They are each in the third [Baby I] sequence respectively at tiles 85, 129 and 305.

Then the final one that the jury has is in the fourth [Baby I] sequence. It's tile 116 and it relates to an image taken at 00.23. [Baby I], of course, died about an hour and a half later.

Just to put all this into context, professor, and looking at section 5 of your report, did you review all the in-life material from [Baby I]?

ARTHURS: I did, that's right.

JOHNSON: Beginning, I think, as you did, with material from 19 August?

ARTHURS: Yes.

JOHNSON: Did you regard that as, to use your word, unremarkable?

ARTHURS: Yes, that's right.

JOHNSON: 23 August, did you detect bowel gas dilation with dilation of the stomach?

ARTHURS: Yes, that's right.

JOHNSON: And did you observe that there were no features on the image of 23 August of NEC --

ARTHURS: Yes.

JOHNSON: -- although the suspicion was raised appropriately at the time by the Countess' in-house consultant radiologist?

ARTHURS: That's right.

JOHNSON: Did you observe, by reference to that image -- and it may be that Mr Murphy can help us with your annotated version. The jury haven't got this in the sequences.

23 August at 22.03, please.

Just so that the jury understands, this is an image, as it says on its face, 23 August, 22.03. What do you see there, please?

ARTHURS: That's right. This is an image of [Baby I]'s abdomen. You can see the pelvic bones and the legs at the bottom.

The arrow points to the nasogastric tube here (indicating) and then there's gaseous dilatation of the stomach labelled with an "S". There is also mild dilatation of the small bowel and this is likely to be the large bowel over here (indicating).

JOHNSON: Are they specific or non-specific findings as far as your expertise is concerned?

ARTHURS: These are non-specific.

JOHNSON: Moving on to the 5th and 6 September, did you look at material from those days?

ARTHURS: Yes, that's right.

JOHNSON: What did you see?

ARTHURS: [Baby I] was now developing lung changes of chronic lung disease of prematurity and she had some residual distended bowel loops, not dissimilar to that image, but again no other features of NEC.

JOHNSON: Thank you. You record the fact of [Baby I]'s transfer to Liverpool Women's Hospital on 6 September; is that right?

ARTHURS: That's right, yes.

JOHNSON: I think you actually said it was Alder Hey in your report, but it may have been -- it may be my mistake, actually, it makes no difference, both are in Liverpool -- and that [Baby I] was transferred back to Chester on 30 September?

ARTHURS: That's correct.

JOHNSON: Did you come next in your review to an image from 30 September 2015; is that right?

ARTHURS: Yes, that's right.

JOHNSON: It's on the screen. Just putting this into the sequence, the first -- there are two events, 3 hours apart, on the 30th. One was at 16.30 and one was at the handover at 19.30. So can you help us with what one can see on this image, which is the same image as is in the [Baby I] number 1 sequence at tile 78?

ARTHURS: Yes. So the first thing you can see is she has lung disease of prematurity, but her abdomen is very distended because they are pushing her -- her diaphragm's quite high up. So if the look at the ratio of the lung volume to the volume of the abdomen, you can see her abdomen is very distended and that would have been obvious clinically.

The arrow again points to the nasogastric tube that goes down into the stomach. The stomach is distended here, marked with an "S". Then there's lot of areas of small bowel and large bowel that are also distended, so almost all of her gut is distended here.

The reason for the circle is because one of the features of NEC is air within the bowel wall, known as pneumatosis, and it was flagged at the time and, I agree, this could be a little bit of pneumatosis just in that one corner.

JOHNSON: For those of us that aren't as familiar with medical terminology as you, what's pneumatosis in normal language?

ARTHURS: Normally, the bowel is like a tube. As the bowel gets infected or becomes affected by NEC, you can actually get little bits of gas from the inside of the bowel into the wall. So that's what we might see there.

JOHNSON: So gas within the tissues, in effect?

ARTHURS: Within the bowel wall itself rather than simply in the tube, yes.

JOHNSON: Moving on to the images of 13 October, please. This is an image, as we can see, taken at 04.25. In the sequence it corresponds to [Baby I] sequence number 2, tile 80. It was taken at 04.25, which is just after the second event concerning [Baby I]. Can you help us with what one can see here?

ARTHURS: Yes. Again, chronic lung disease of prematurity.

There's an endotracheal tube. The arrow points to the nasogastric tube which here is coiled within the oesophagus. So it hasn't made it through to the stomach. So that's a not uncommon finding in placing a tube. If it's coiled you simply withdraw it and place another one. But again, the large bowel is quite distended here. I don't think this is stomach distension, I think this is large bowel distension here on this radiograph.

JOHNSON: It's in a similar place to where we would normally see the stomach?

ARTHURS: Yes, that's right. The configuration is slightly different.

JOHNSON: But your experience and expertise enables you to differentiate between the stomach and the bowel?

ARTHURS: Yes.

JOHNSON: Incidentally, just so that the jury understands, when you look at this material in your own time, so to speak, are you looking at it on a monitor like this?

ARTHURS: No, we have dedicated radiology workstations and I have been given the raw images from which these were obtained, so

we're able to magnify in and change the black and white, the greyness, if you like, of the image in quite a lot of detail.

JOHNSON: The contrast?

ARTHURS: Yes.

JOHNSON: So your opinions, as you are expressing them, are as a result of looking at very much better images than what we see in court?

ARTHURS: Yes, they're very much based on the images that we see from a radiology point of view. These are effectively poor reproductions of that.

JOHNSON: Thank you. So that's an image taken at 4.25 that morning. Did you look at the image taken about an hour and 40 minutes later at 06.05 hours?

ARTHURS: Yes, that's right.

JOHNSON: If we can just put that up, please, Mr Murphy.

ARTHURS: That isn't in this series, but...

JOHNSON: I thought it was, I beg your pardon. Well, this is in [Baby I] number 3, tile 85, if we can look at it from there, please.

What do we see here?

ARTHURS: This is dated the following day at 06.05.

JOHNSON: Sorry, yes, I've lost a day. I beg your pardon, that's my fault.

ARTHURS: This shows quite similar features again. This is the nasogastric tube down into the stomach. Here the stomach is markedly dilated and there's lots and lots of dilatation of both the small bowel and the large bowel here. No features of NEC.

JOHNSON: At tile 129, which is the next one in time, taken at about 2 hours later at 08.03, what do we see there?

ARTHURS: This has almost identical appearances but the stomach has been decompressed at this stage. So you can see the nasogastric tube going down the stomach would be here (indicating) and because it's collapsed what you actually see behind there now is dilated bowel instead.

MR JUSTICE GOSS: Can you just give me the reference again of this, please?

MR JOHNSON: Yes, my Lord. [Baby I] sequence 3, tile 129.

MR JUSTICE GOSS: And the time?

MR JOHNSON: 08.03.

ARTHURS: Yes.

MR JUSTICE GOSS: Thank you.

MR JOHNSON: So that's breakfast time on the 14th.

The following morning at 03.17, is there a further image?

ARTHURS: That's right, yes.

JOHNSON: This is tile 305, please, Mr Murphy. What do we see here, please, professor?

ARTHURS: Two things critical here. One is that actually her left lung has completely collapsed. I think that's incidental to the discussion we're having about her bowel. Can you see all of her bowel has now decompressed, so it has all gone down, there is no more dilatation, the diaphragm has come down, so clinically she wouldn't have had such a distended abdomen. So that episode has resolved within, what is that, 24 hours or so.

JOHNSON: Yes. Just so that the jury remember the sequence, on the 15th [Baby I] was transferred out to Arrowe Park, where she remained until the 17th.

Just so that we know, is it a matter of record from the radiographic material that the collapsed lung had re-inflated by later that morning at 11.18?

ARTHURS: Yes, that's right.

JOHNSON: Now moving on to the fourth and final series of events for [Baby I], did you consider a body of radiographic material from Chester, which started on 18 October?

ARTHURS: Yes, that's right.

JOHNSON: Can we summarise this by saying the bowel on the 18th was normal?

ARTHURS: Yes.

JOHNSON: As it was or there was mild dilation of the right-sided loops on the 20th?

ARTHURS: That's correct, yes.

JOHNSON: Then moving to the 23rd, and shortly before [Baby I]'s death, can we go to tile 116 in the fourth sequence of events for [Baby I].

ARTHURS: Yes.

JOHNSON: Sequence 4, tile 116, please, Mr Murphy.

Is that it?

ARTHURS: Yes.

JOHNSON: Can you talk us through this, please?

ARTHURS: The lungs are now back to normal, but normal for her being premature. There's a nasogastric tube in and this is massive dilatation of the stomach.

JOHNSON: So it goes all the way across the midline, apparently; is that right?

ARTHURS: In the sense that the middle of the image is here (indicating) then yes, it crosses over to the other side, yes.

JOHNSON: Is there any clue from the image as to what's caused the dilatation of the stomach?

ARTHURS: No, the image doesn't give you a cause, but it's quite unusual to see babies with this degree of dilatation of the stomach.

JOHNSON: What effect does that sort of dilatation have on the well-being of a child?

ARTHURS: That dilatation -- and you have seen previously all the bowel dilatation -- causes what we would term splinting of the diaphragm, so it compresses up against the diaphragm so they can't move, so you could get respiratory complications as a result of that.

(Pause)

MR JUSTICE GOSS: You were just saying the dilatation of this nature causes splinting of the diaphragm, about which we have heard, pushing everything up essentially?

ARTHURS: That's right. It prevents you from bringing your diaphragm down in order to breathe.

MR JUSTICE GOSS: It compromises breathing?

ARTHURS: Yes.

MR JOHNSON: I think subsequent to this, to the report that we are actually looking at, you were given rather better quality imaging from Alder Hey, which is the hospital to which [Baby I]'s body was taken for post-mortem examination; is that right?

ARTHURS: That's correct, yes.

JOHNSON: You deal with that imaging in your second report, which is our page 4525, my Lord. You were sent that good quality images in June 2021; is that right?

ARTHURS: Yes.

JOHNSON: What could you see on the post-mortem imaging?

ARTHURS: So the post-mortem imaging shows that she also has a large amount of dilatation of the bowel, but we know that she had that ante-mortem. It also shows then that some gas has disseminated through the body, particularly up to the head.

JOHNSON: Can one safely read into the fact that there was gas in the head any conclusion?

ARTHURS: No, I don't think so. I think some of the air dissipates out of the bloodstream post-mortem and her radiographs, I think, were 3 days after she died. So I don't think you can read any significance into the fact that there was gas in different places at her post-mortem imaging.

JOHNSON: I want to go, if we may, Professor Arthurs, to the report that you signed on 14 July 2022 --

ARTHURS: Yes.

JOHNSON: -- where you were taking an overview of all the cases; is that right?

ARTHURS: Yes.

JOHNSON: It's your paragraph 5, what you call case 8, [Baby I].

ARTHURS: Yes.

JOHNSON: You were here, I believe, taking an overview of what you describe as:

"Multiple episodes of gross stomach, small and large bowel dilatation, as well as lung disease of prematurity"?

ARTHURS: Yes.

JOHNSON: What conclusion did you reach from that overall consideration?

ARTHURS: Well, on balance there aren't very many conditions that cause intermittent dilatation of all of the bowel and occasionally of the stomach as well. That's not a feature of NEC. In fact, there weren't very many other features of NEC in her case either. So one of the explanations for this would be giving air down the NG tube.

JOHNSON: Let's deal with NEC as a theory.

ARTHURS: Yes.

JOHNSON: Is there any way of establishing whether or not as a matter of fact a baby had NEC?

ARTHURS: Well, independent of the radiographs, [Baby I] had an autopsy, as I understand, so it would be apparent at the autopsy whether the bowel had been recently or even previously affected by NEC.

JOHNSON: Yes. So would you defer to the pathologist --

ARTHURS: Yes.

JOHNSON: -- in determining the issue, if it is an issue, of whether or not [Baby I] had NEC?

ARTHURS: Yes. I've commented on whether or not that's likely to be present from the radiographs we have, but yes, I would defer to a pathologist.

JOHNSON: So putting it in more common language, they're better placed to give an opinion on that issue?

ARTHURS: Yes.

MR JUSTICE GOSS: So it's both whether [Baby I] had NEC at the time of death --

ARTHURS: Yes.

MR JUSTICE GOSS: -- or had had NEC previously?

ARTHURS: Yes.

MR JUSTICE GOSS: That could be ascertained at a post-mortem?

ARTHURS: That's my understanding. So whether [Baby I] died of NEC there and then or whether her bowel had previously been affected by NEC.

MR JUSTICE GOSS: Right, thank you.

ARTHURS: Again, that's my understanding. Your pathologist will be able to give you more detail.

MR JUSTICE GOSS: Thank you.

MR JOHNSON: What are the other possibilities of this amount of gross stomach small and large bowel dilatation?

ARTHURS: We've talked about NEC. I think that is a possibility.

I don't think there are many other causes that would cause that. Had [Baby I] had several episodes of sepsis, where she's generally unwell with an infection, it's possible that the bowel stops working and gets dilated from those, typically not the stomach, and again that's because most babies like this have a nasogastric tube in the stomach and they are either regularly being aspirated and the nurses are looking after them in that sense or the tubes are on free drainage, which allows the gas to freely emit from the body. So it's quite unusual, given that context, to see this degree of stomach dilatation in particular.

JOHNSON: What about CPAP belly?

ARTHURS: Yes, babies who are on CPAP, sometimes the gases can go down into the stomach and distend the stomach. I don't know the exact clinical conditions in which [Baby I] was at each of the times that this was taken, but were CPAP belly to be such a common phenomenon, I don't think we'd be looking at these radiographs and thinking, gosh, that's quite striking given the baby's on CPAP.

JOHNSON: Yes. And this is quite striking?

ARTHURS: Yes. The X-rays show that she's intubated in quite a lot of these, so I don't think she's on CPAP, I think she's intubated and ventilated by conventional means.

So I don't think that's a cause for several of these findings.

JOHNSON: No. And just so that the jury understands, is that because if an ET tube is correctly placed, the air can't be going into the stomach and the bowel because it's going directly into the lungs?

ARTHURS: That's right.

JOHNSON: Simple as that.

MR JUSTICE GOSS: Whereas CPAP with a face mask --

ARTHURS: That's right, it's a face mask or cannulae into the nose -- again, this is outside of my expertise, but we see that and therefore we don't see ET tubes on the radiographs. And I think every one of [Baby I]'s chest radiographs has shown that she has been ventilated.

MR JOHNSON: Yes. So no CPAP belly if there's no CPAP, is one way of putting it?

ARTHURS: Yes, that stands to reason.

JOHNSON: Now, were you to be asked the question, how much air does it take to generate the sort of appearances that we see on these images, what would your response be?

ARTHURS: I think the truthful answer is we don't know. And I don't think anybody really knows because those experiments can't really be carried out.

JOHNSON: Whilst the answer may be utterly obvious, why can't the experiments be carried out?

ARTHURS: We can't experiment on babies, giving them 50ml or 100ml of air and then taking images of their body. If I were to guess, I think that some neonatal nurses are able to withdraw 20ml or 50ml of air from a stomach and they wouldn't have these appearances. So if I'm guessing, it would be more than that.

JOHNSON: So if those possibilities that we've just run through are excluded, does it follow that one is left with the inference that someone has deliberately injected air?

ARTHURS: I think that stands to reason, yes.

MR JOHNSON: Thank you. Would you wait there, please?

Cross-examination by MR MYERS

MR MYERS: Professor Arthurs, I'm going to try to go through topics roughly in the order that we've dealt with them in chief to keep everything in place.

ARTHURS: Thank you.

MYERS: If there's any diversions along the way, my apologies.

We started by going back to the question of research and what that can tell us about air embolus. As a general point, would you agree, when applying research we do need to be careful, or you do, that it isn't taken beyond the purposes for which it was designed, first of all?

ARTHURS: Yes.

MYERS: Or beyond what it can safely tell us unless we keep in mind the limits of that research?

ARTHURS: Yes.

MYERS: You began by telling us about a paper that you co-authored in 2015, didn't you?

ARTHURS: Yes.

MYERS: Is that together with Barber, Kiho and Sebire?

ARTHURS: Yes.

MYERS: I may have pronounced the names incorrectly.

ARTHURS: That's all right.

MYERS: It's from the Journal of Forensic Radiology and Imaging, isn't it?

ARTHURS: Yes.

MYERS: Now, you have been asked questions about that to help with the issue of whether air in a vessel is from an air embolus or from some other cause, haven't you?

ARTHURS: Not about air embolus. I was asked how commonly it occurs.

MYERS: Yes, how commonly. The paper that you've taken us to today, or you were taken to, let's be clear, was not designed to answer that question, was it?

ARTHURS: That's correct.

MYERS: That's the first thing. I'm not criticising you, Professor Arthurs, for working with what you have.

ARTHURS: Yes.

MYERS: I've got the introduction to it here. The purpose of the paper you've told us about was to look at post-mortem computer tomography?

ARTHURS: CT, yes.

MYERS: CT. You say -- the writer said:

"The significance of some findings, such as intravascular gas, remains uncertain. In order to correctly interpret the findings we provide data on a series of cases in whom intravascular gas was noted on PMCT imaging to assess whether it correlates with clinical features including type of death (traumatic), resuscitation and post-mortem interval."

ARTHURS: Yes.

MYERS: And the conclusion -- I'm just drawing it from the summary of the conclusion -- was that:

"Intravenous gas is commonly identified the PMCT in children and may be related to resuscitation rather than putrefaction or decomposition."

ARTHURS: Yes.

MYERS: And:

"A better understanding of intravenous gas on PMCT will help interpret these findings on future studies."

ARTHURS: Yes.

MYERS: Now, if one was to enter the search term "air embolus" into that, that's not going to turn up in that article, is it?

ARTHURS: No.

MYERS: You went back to look at the circumstances of the cases in the case study, didn't you --

ARTHURS: Yes.

MYERS: -- to help us as far as it could with this?

ARTHURS: Yes.

MYERS: And you found two out of six cases where there was post-mortem gas in the great vessels, didn't you?

ARTHURS: In babies, yes.

MYERS: In babies?

ARTHURS: That's correct.

MYERS: You identified that they occurred where there had been a gut abnormality?

ARTHURS: Yes.

MYERS: To some extent, do you agree, the question of what correlates or what causes can be a moot question with this?

ARTHURS: Yes.

MYERS: And so it's quite clear what I mean by that, sometimes in medicine we can say one thing must have caused another thing?

ARTHURS: Yes.

MYERS: Sometimes in medicine we have to say, well, one thing has been found to happen alongside another thing?

ARTHURS: Yes, they co-exist.

MYERS: In any event, you found two cases out of the six within this age group where they co-existed?

ARTHURS: Yes, that's right.

MYERS: All right. It remains the case, doesn't it, so that we can keep focused on this, that where we've seen images of gas in the great vessels it's possible that arises because of post-mortem changes? That's a possibility, isn't it?

ARTHURS: Yes.

MYERS: It's possible it arises because of resuscitation that takes place prior to death?

ARTHURS: Yes, if those cases had received resuscitation.

MYERS: Yes, if they did, obviously.

ARTHURS: Yes.

MYERS: It's possible that it could be as a result of air introduced from outside into the body for some reason?

ARTHURS: Yes.

MYERS: And in fact, in the paper which you were taken to this morning, and that you considered, one of the strongest features to come out of that was the presence between resuscitation and air afterwards in the vessels or in the body?

ARTHURS: Yes.

MYERS: All right, thank you.

I'm going to ask you next about [Baby E] a little bit. We've been reminded, I'm grateful for this, of the bare facts and dates that relate to [Baby E]. Your principal concern where [Baby E] was concerned, Professor Arthurs, is that the radiographs don't show any significant abnormality which would contribute to the cause of death?

ARTHURS: That's right.

MYERS: That's at page 1 of your report, dated 19 May 2020.

ARTHURS: Yes.

MYERS: To remind everybody, we heard about the blood observed at 9 o'clock in the evening with [Baby E]. Just to remind everybody again, in [Baby E]'s case, sadly, there was very large loss of blood that seemed to have commenced an hour or two before midnight and ran through into the period after midnight.

But from your view of the radiographs, nothing can assist us with any abnormality that relates to that or any part of the case?

ARTHURS: That's my opinion, yes.

MYERS: Thank you. When you dealt with [Baby E], you were also asked questions about what the absence of air from the post-mortem photograph could tell us, if anything, about whether there had been an air embolus.

ARTHURS: Yes, that's correct.

MYERS: Do you recall being asked about that? And you told us that the fact we don't see air in any of the great vessels in

effect doesn't make a difference either way in determining whether air had been introduced from outside at some point?

ARTHURS: That's correct. What I mean by that is that if you gave somebody an air embolus and they had a massive embolus and died and their X-ray 2 hours later didn't show any abnormality, you can't infer anything either way as to whether or not that event occurred.

MYERS: You say 2 hours, does it follow therefore that it may be a neutral finding but it depends to some extent on the precise circumstances relating to the period we are looking at clinically?

ARTHURS: What I mean from the imaging point of view is that we rarely see air embolus or the consequences of it on an image because the image isn't taken in the acute period where the baby is being resuscitated, for example.

MYERS: That's what I'm getting at. If, for example, the point of introduction of an air embolus had been very shortly before the point of resuscitation, then the likelihood of seeing it would increase?

ARTHURS: No, it would have to be very shortly before the point of the X-ray image being taken.

MYERS: Very well. If it was shortly before that point, if air was introduced shortly before the point of the X-ray being taken, the likelihood of identifying it would therefore increase?

ARTHURS: Would increase, yes.

MYERS: Yes. Now, I'll ask you a little more about images and air embolus, if I might, Professor Arthurs. Just to help us, when we consider the aorta, the large vessel carrying blood around the body --

ARTHURS: Yes.

MYERS: -- that's a layman's description of it -- or the vena cava, which is the large vessel taking blood back to the heart, those vessels aren't just built of one highway, they have lots of junctions and tributaries running through and from them, don't they?

ARTHURS: Yes, they do.

MYERS: So if I or a qualified doctor were to put some dye in somebody's blood and the heart was to be beating it round the

body, you'd expect it to go down the channel it was put in, but also to spread?

ARTHURS: Yes. And we do that exactly as you've described.

MYERS: Yes. You've assisted with the material that you have in explaining to us what may be the cause of air in the great vessels where we have seen them and you have seen them on post-mortem radiographs, haven't you?

ARTHURS: Yes, that's correct.

MYERS: What we haven't got, and I don't say this critically, but I want to draw this out if I may, is an image of what a known air embolus actually looks like. See what I mean?

ARTHURS: There are images in the literature of what severe fatal air embolus looks like.

MYERS: Right.

ARTHURS: But as you can imagine, it will look like the whole vascular tree has air within it.

MYERS: Right. When you looked at the images in this case, were they images that you were able to perform a comparison against to better inform your assessment of air embolus?

ARTHURS: No, I think that's challenging. I think very few babies die of air embolus and so we don't really have the imaging of those children to be able to compare against.

MYERS: If air is introduced into the bloodstream in life, however it gets to be there, and so the heart is beating --

ARTHURS: Yes.

MYERS: -- it's more likely it will spread through the different tributaries and junctions branching off the vessels it travels through, isn't it?

ARTHURS: Yes.

MYERS: And similarly, if air emerges post-mortem, and therefore the heart isn't beating and the body is static, it's likely to remain in the place where it emerges, isn't it?

ARTHURS: Yes.

MYERS: Or gradually spread if more air comes out?

ARTHURS: Yes, and it makes sense that where the largest area of blood is, because air bubbles out of the blood, that's where you typically would see that, so that's the heart.

MYERS: Right. There is one image we've seen in this case which I'm going to look at with you and it comes from the authors Lee and Tanswell. You may have encountered that.

ARTHURS: Yes.

MYERS: Are you familiar with that, Professor Arthurs?

ARTHURS: Yes.

MYERS: Just to remind all of us, although we've seen it a few times, I'm going to ask Mr Murphy, please, to put up page 24946, the following page. We'll come to a better quality image, but if we can enlarge the photo in the top right and the text under it, please.

We'll come to a better image shortly. But we're familiar with the article, which includes a description a discolouration.

ARTHURS: Yes.

MYERS: But it says here:

"Anteroposterior chest and abdominal radiograph of a case of pulmonary vascular air embolism showing pulmonary interstitial emphysema with a left thoracotomy tube, intracardiac air, and air in the major vessels of the neck, chest and abdomen."

ARTHURS: Yes.

MYERS: We're looking at a pulmonary vascular air embolism here?

ARTHURS: That's true.

MYERS: Right. So we do have this image?

ARTHURS: Yes.

MYERS: And if we could put up D16, which is taken from this, but a better image than what we see here. This is the image from the Lee and Tanswell paper, but taken in a way that doesn't involve copying it?

ARTHURS: Yes.

MYERS: And we have heard that where we see dark patches on radiographs, that's air, isn't it?

ARTHURS: Black.

MYERS: Black?

ARTHURS: Air is black, that's correct.

MYERS: Air is black. So in the central -- what I'm calling the central part of the body there, I don't know if you've got the cursor with you --

ARTHURS: That's the liver (indicating) that you can see air overlying. So there is air within the heart here (indicating), the black patches within what would ordinarily be grey in the centre. There is air within -- this is probably the liver (indicating) and there is air in some other tributaries, as you have mentioned, in the abdomen.

MYERS: Yes. So that's been identified as -- is it pulmonary vascular air embolism?

ARTHURS: This is a specific type of air embolism that comes from the lungs. So this child has lung disease to the point where the lungs have burst or some of that air has entered into the blood supply around the lungs. They also have a big chest tube in -- you can see the size of this chest tube relative to the size of the child.

MYERS: Yes.

ARTHURS: So they have two points of entry, if you like, of air into their system. As a result of that, the air is then circulated and we have seen that this child -- I don't remember whether they died, but they have a pulmonary air embolus.

MYERS: So this would be an example of air entry in what we have heard is iatrogenic, in the course of medical procedures?

ARTHURS: Yes, that's right, yes. It could have been either the chest tube or it could have been a complication of the ventilation given the lung disease that the child has.

MYERS: Right. But what we do see is once air gets into the vascular system, it then spreads, doesn't it?

ARTHURS: With the heart beating, yes.

MYERS: With the heart beating, yes. And that's when I asked you a little earlier about if air enters one of the vessels in life and the heart is beating then the likelihood is if it continues

for some time -- well, rapidly spread around the vessels won't it?

ARTHURS: Yes. But this is a nice example of where air embolus has occurred for which there's quite a good explanation.

MYERS: Yes. There may be an explanation. But what we see there is undoubtedly an air embolus, isn't it?

ARTHURS: Yes.

MYERS: And the image which we've been looking at, with what looks like air in the great vessel or the great vessels, is not of this character, is it?

ARTHURS: No.

MYERS: It's not got air spreading, has it?

ARTHURS: That's right.

MYERS: And if one thinks -- I'm not being rude when I say that, but if one considers that, Professor Arthurs, if the air is just sitting in the great vessel, as it happens that is going to be more likely to be with a static system than a system with a heart beating and pushing that round the body, isn't it?

ARTHURS: I don't think you can infer that from the image. Given that they're post-mortem radiographs, you know that the heart isn't beating but I'm not sure you correlate those two things together.

MYERS: If you want to see what is undoubtedly an air embolus in life, this is one example, isn't it?

ARTHURS: One example, yes.

MYERS: Take that down, thank you, Mr Murphy.

[Baby F] we dealt with briefly because radiographically -- radiologically there is nothing to add to the overall picture?

ARTHURS: That's my opinion, yes.

MYERS: I'm going to ask you next then about [Baby G] if I may, Professor Arthurs.

ARTHURS: Yes.

MYERS: [Baby G], born on 31 May 2015, at Arrowe Park Hospital --

ARTHURS: Yes.

MYERS: -- at 23.57 hours. Now, you reviewed the radiographs for [Baby G], didn't you?

ARTHURS: Yes.

MYERS: Including those from birth up to the transfer to the Countess of Chester Hospital?

ARTHURS: That's right.

MYERS: There is one image which I'd be grateful if we have a look at or a couple of them. They come from the Arrowe Park images on 1 June in the very early hours of the morning. So [Baby G] would be only a couple of hours old when that happened. I'm going to ask if we could put up, please, exhibit number or J8139. These aren't on the carousel, ladies and gentlemen, because obviously it falls just outside -- it's just after [Baby G] had been born.

ARTHURS: Yes.

MYERS: In fact, that's the label, but it says:

"Arrowe Park Hospital, 01/06. Chest X-ray and abdomen reference."

Could we go to the following page, which is page 8140? Just enlarge that if we could, thank you.

The reason I go to this -- it may pre-empt why I'm going to it, it's not something we've looked at before -- this is an image of [Baby G] very soon after she'd been born, isn't it?

ARTHURS: That's right.

MYERS: Her liver would be on her right side or, as we are looking at the radiograph --

ARTHURS: I have an arrow, I can point it out. Her liver is below the diaphragm here (indicating). It's essentially this white or grey area with this white line in the centre of it.

MYERS: Is that one of the -- likely to be an umbilical catheter?

ARTHURS: That's an umbilical venous catheter, which is misplaced, its tip should not be in that position. It should be closer to the heart.

MYERS: Yes.

ARTHURS: So what has happened is this is misplaced, but has probably lodged or is going into one of the big veins in the liver, and as a result, some air has gone and causes this almost tree like pattern within the liver. So this is the inappropriate positioning of a UVC and then in delivery of medicines, or a tiny bit of air, a little bit has gone into that, into the liver, rather than where it would have gone otherwise into the heart.

MYERS: All right. Thank you for that. That's cut through some of the questions, really, but that's the point that we can see air. That would be an iatrogenic air embolus, in fact, wouldn't it?

ARTHURS: Technically, yes, that is. I mean, this is a well-recognised complication of UVC placement. The air is explained and it's very well explained by somebody's accidentally put the catheter in the wrong place. So when they reposition the catheter, that shouldn't happen.

MYERS: All right. But as it appears, this can happen during a medical procedure, can't it?

ARTHURS: Yes, as is demonstrated.

MYERS: Do we have the timing on that image?

ARTHURS: 01.55 in the smaller image. I don't see the date.

MYERS: We've got the date on the labelling, which is 1 June.

It's on the cover sheet beforehand.

MR JUSTICE GOSS: It was, it was 1 June.

ARTHURS: Yes.

MR JUSTICE GOSS: 01.55 on the morning of 1 June.

MR MYERS: Could we go to 8141, please? We'll see this is about 45 minutes later, it's 02.40. So before we enlarge it, may I just draw attention to the date beneath the diamond image? 02.40 hours, so 45 minutes later.

ARTHURS: Yes.

MYERS: Thank you, Mr Murphy, if we enlarge that. It would appear we have still got some residual air in the liver at that point.

ARTHURS: Yes, because the line is still not in the right place.

MYERS: Right.

ARTHURS: The tip of the UVC here (indicating) should be several centimetres further into the heart and were that to be the case, you wouldn't see that abnormality, so yes.

MYERS: Right. If we go to the next image then, the final one, 8142. This is some hours later at 08.10.

ARTHURS: Yes.

MYERS: Whatever's happened, it would appear from that image that the air has cleared or moved away, do you agree, from what we see?

ARTHURS: Yes, I wouldn't like to comment for sure on an image on a PowerPoint projection, but it looks like the air has gone, I agree.

MYERS: All right, thank you. I'm grateful, Mr Murphy.

MR JUSTICE GOSS: The tube seems to be still in the same place.

ARTHURS: The tube is still in the wrong place so they may not be using it at that point.

MR MYERS: I'm grateful for that, Mr Murphy, we can take that down, thank you.

I'm going to move then to the images which we looked at with [Baby G] and what you can tell us about those, Professor Arthurs.

ARTHURS: Yes.

MYERS: I've also got your report, dated 19 May in front of me.

My Lord, that starts at page 2040.

MR JUSTICE GOSS: Thank you.

MR MYERS: Just a general opinion first, which is at your point 5 on the first page of your report, Professor Arthurs. That was this:

"The abdominal radiographs demonstrate multiple episodes of small and large bowel dilatation which were treated as presumed sepsis and settled with supportive management."

ARTHURS: Yes, that's right.

MYERS: Of course, when you say that, we've heard now you had the benefit of a significant number of photographs, both from -- is it Arrowe Park Hospital and the Countess of Chester Hospital?

ARTHURS: Yes.

MYERS: One observation that was drawn to our attention was when we saw the radiograph for 21 September -- in fact, no, 7 September, which is the first [Baby G] incident, at time 04.49. I wonder if we could put that up, it'll help with where it is.

(12.52 pm)

(Pause due to technical issue)

(12.54 pm)

MR MYERS: I'll continue and they'll tell us if they hear nothing, thank you. I'm grateful.

I was asking about the images and I'd started with a general opinion, Professor Arthurs:

"Given the large number of images, the abdominal radiographs demonstrate multiple episodes of small and large bowel dilatation, treated as presumed sepsis and settled with supportive management."

I went to this: one of the images you told us about was this one, which is 04.49 on the morning of 7 September.

ARTHURS: Yes.

MYERS: Tile 96 if anybody wants to cross-refer it to what we have on the sequence of events, but we're just looking from your image here.

You pointed out that the stomach doesn't appear to be distended, it appears to be decompressed.

ARTHURS: Yes.

MYERS: Which would certainly be consistent with a history of vomiting; is that right?

ARTHURS: Yes.

MYERS: In fact, is that something that you saw at least on some of the Arrowe Park images, that there might be dilatation of the small or the large bowel but not necessarily the stomach?

ARTHURS: Yes, that's right, some of the previous images from Arrowe Park also had the same features, that's correct.

MYERS: And if we in fact look at the first one in the bundle that you gave us, this is an image from Arrowe Park, and it's 11 July. If we go to the first one, please. There we are. 11 July, at Arrowe Park, 00.30. Again, there's dilatation there of the small bowel, isn't there?

ARTHURS: Yes, but the stomach is empty.

MYERS: The stomach is empty, for whatever the reason --

ARTHURS: Yes.

MYERS: -- but that could be vomiting?

ARTHURS: Yes.

MYERS: If we move to what conclusions you can draw from the [Baby G] images, and of course we are particularly interested in 7 September at 04.49 and 21 September at 12.21, tiles 96 -- I have it down as tile 90, the other one. One of the items you were asked to consider was whether milk or milk and air introduced in any excessive quantity could cause dilatation of the bowel like that.

ARTHURS: Yes.

MYERS: In fact, you pointed out milk alone wouldn't do that because there's gaseous dilatation in the bowel, isn't there?

ARTHURS: Yes, the reason we can see it is because of the gas, so there would need to be air or gas administered for us to be able to identify that on the radiographs, that's correct.

MYERS: So as it happens, just following from the images, excessive milk on its own would not account for what we see on its own?

ARTHURS: That's right, that's my opinion.

MYERS: Air on its own could?

ARTHURS: Yes.

MYERS: And milk and air could?

ARTHURS: Yes.

MYERS: But you have explained to us, and I'd just like to clarify this, you can identify for us where there is dilatation on these radiographs?

ARTHURS: Yes.

MYERS: What isn't always possible to do from a radiographic point of view, or radiological, is to identify what the cause of that is?

ARTHURS: Yes.

MYERS: When you came to consider the overall picture with [Baby G] -- and I'm looking at paragraph 9 of your report, section 9 at page 12 my Lord, page 2051 -- and you were asked to consider the question of excess air via the NG tube.

ARTHURS: Yes.

MYERS: Putting to one side for the moment the question of whether it would be milk and air, you say this:

"There are several episodes of acute abdominal distension with bowel dilatation on abdominal radiographs including at Arrowe Park Hospital."

ARTHURS: Yes.

MYERS: You go on to say:

"In my opinion, it is highly unlikely that this mechanism [that's the air and milk mechanism] accounts for all of the episodes of bowel distension in two different hospitals."

ARTHURS: Yes.

MYERS: The point you are drawing is that whatever the cause, from a radiological point of view, looking across the images, you see similar things at both hospitals, don't you?

ARTHURS: Yes, that's correct.

MR MYERS: Thank you, Professor Arthurs.

My Lord, I was going to move to [Baby H] next, but it's just about 1 o'clock, so maybe it's a good time to stop.

MR JUSTICE GOSS: Yes, it's a good time for a break. Could I just enquire about how much longer your cross-examination is likely to be? I'm not putting any pressure on you, but I'm thinking

of -- we have another witness and it's important that that witness can give evidence today.

MR MYERS: I imagine about 20 minutes, give or take 5 minutes, something like that.

MR JUSTICE GOSS: Right. You both know who this witness is.

MR MYERS: Yes.

MR JUSTICE GOSS: Are we going to complete that witness's evidence this afternoon?

MR MYERS: If I can assist first, I'm standing. She's a witness who in the first instance we don't have any or much cross-examination for. It's for the prosecution to produce her, just to assist in explaining what happened.

There may be questions that arise, but not extensive cross-examination.

MR JUSTICE GOSS: That's fine, thanks. I just wanted to ensure that we won't have any difficulty in that regard.

You couldn't see Mr Astbury, I could see him, he is obviously going to be calling that witness and you will be cross-examining the witness, I assume, therefore we're all right. It's just so that we don't have to take a truncated lunch break. That was the reason I was asking.

MR MYERS: I understand, my Lord.

MR JUSTICE GOSS: All right. 2 o'clock then, please, to continue, members of the jury.

(1.00 pm)

(The short adjournment)

(2.00 pm)

(In the presence of the jury)

MR MYERS: Professor Arthurs, I'm going to move to [Baby H] next, counts 10 to 11 on our indictment.

The questions you were asked about [Baby H] included some questions about the potential effect of a chest drain within the chest cavity, didn't they.

ARTHURS: Yes, that's right.

MYERS: Can I start with this: as the consultant radiologist, your principal concern, when looking at radiographs of a chest drain, unless told otherwise, is that the chest drain is in the right place to have the desired effect as a chest drain?

ARTHURS: Yes, that's right.

MYERS: In terms of what's going on on a ward or in a clinical setting with a chest drain, and how it's being handled and how that goes, that's not something that you're concerned with, are you?

ARTHURS: No, but usually when there's a request for an X-ray in a baby with a chest drain, the request will usually say something like, "The drain has stopped bubbling, so can we have another X-ray?" So we are aware of the clinical situation.

MYERS: Particularly if there's a problem that's been identified and you are being asked to look at that?

ARTHURS: Yes.

MYERS: You may not be of your own volition looking for things which might have an effect clinically that goes beyond the functioning of a chest drain as a chest drain?

ARTHURS: The most important thing is that it's been placed for a reason and has that reason been resolved by virtue of placing the drain, yes.

MYERS: I make it clear the questions I'm asking about the clinical effect of it in no way are to be disrespectful to your status as a consultant radiologist. I'm talking about the clinical situation on a ward treating a child.

ARTHURS: Yes.

MYERS: When you were giving evidence, you were asked this, I've got the note here:

"Question: Are you saying if there was a known association between chest drains touching the heart and serious collapses in children, this would be an important issue for your part of the medical profession to consider on looking at those sort of images?"

And your answer, Professor Arthurs, was:

"Answer: Yes. If that was to occur, then a neonatologist when they put in a chest drain would be very wary of where its

position would be because of a known association of putting one in. I'm sure there are complications to chest drains and children respond differently to them, but from the imaging point of view it's not of critical importance."

ARTHURS: That's right.

MYERS: A couple of things from that. First of all, that emphasises that, unless told otherwise, your concern as a radiologist is in the location of a chest drain so it can operate as a chest drain?

ARTHURS: Yes.

MYERS: Secondly, so far as the potential effect of a chest drain within the thoracic cavity on structures there, so far as that's concerned, that may be an area where a neonatologist dealing with that regularly may be better placed to describe the potential effect?

ARTHURS: Yes. But we don't regularly get asked to X-ray children with chest drains because a neonatologist has observed desaturations and bradycardias, for example. So that's not a common pattern of referral for another X-ray.

MYERS: And certainly if a chest drain has been correctly placed, one would not expect there to be the sort of problems that would get referred to very often?

ARTHURS: That stands to reason, yes.

MYERS: It's a circular situation.

When you provided your report that dealt with this aspect of the chest drains, it's the report of 26 September 2022.

ARTHURS: Yes.

MYERS: It's the final page. Our statements page 5525, my Lord.

It's paragraph 7. You say this, Professor Arthurs:

"Whether a drain can cause clinical complications, such as episodes of desaturation or bradycardia, is outside of my area of expertise and I defer to the neonatology experts regarding whether [Baby H] suffered more or fewer than expected of these episodes than any other baby."

ARTHURS: Yes, that's right.

MYERS: And that reflects the division in professional expertise between the neonatologist and the radiologist?

ARTHURS: Yes.

MYERS: You were asked some questions about what would be the proper position for a chest drain or how it would be placed and you said that there was no desired or ideal position for a chest drain, somewhere in the pleural space, the precise location isn't critical if it's having the desired effect.

ARTHURS: Yes, that's right.

MYERS: Again, that's very much from a perspective of a radiologist looking at it. When you say that the desired -- there's no desired or ideal position for a chest drain, are you quite sure about that in terms of the clinical use of chest drains?

ARTHURS: I meant in the anatomical sense. We are used to looking at endotracheal tubes and there is a desired position for an endotracheal tube so that you can ventilate the baby and we comment on those on radiographs. There's a desired position for a nasogastric tube, for example, or a UVC. So I'm making a distinction between those tubes, which we commonly report on and talk about abnormal or inappropriate positions, in distinction between those tubes and a chest drain tube where there is no desired position in the sense of it doesn't have to be in a particular area of the chest. So that's what I was trying to refer to in layman's terms.

MYERS: Are you aware of guidelines as to where a chest drain should be inserted --

ARTHURS: Yes.

MYERS: -- in terms of intercostal spaces?

ARTHURS: That refers to where they go into the chest, in terms of the chest wall, not in terms of where they are then subsequently positioned within the chest.

MYERS: All right. But as to the consequence of a chest drain in the chest coming into structures there, that's something that you regard as more the province of a neonatologist than your daily work?

ARTHURS: Um, I'm not sure what structures that a chest drain is likely to come into in terms of in the chest. The chest drain will lie in the pleural space and I'm not sure where exactly in

the chest it is in a neonatologist's domain any more than a radiologist's. We comment on its placement where it's important.

MYERS: All right. But as to the complications that may arise for whatever reason in terms of desaturation or bradycardia, that's an area for a neonatologist?

ARTHURS: Yes, I accept that.

MYERS: When dealing with this issue, Professor Arthurs, and you were taken to the images that we have of the chest drain, the apparent different positions --

ARTHURS: Yes, that's right.

MYERS: You said:

"I can't say whether it's moving of its own accord. It was sutured into the chest wall."

ARTHURS: It is normal practice to suture a chest drain into the chest wall to prevent it from moving, yes.

MYERS: And that's your understanding as to how this would have been dealt with on this occasion?

ARTHURS: I see no reason why that shouldn't have occurred.

MYERS: Right. Just to assist us with recalling the evidence and to assist you in looking at the images, I'm just going to ask if we can put up from the [Baby H] part of the case tile 149, which is a nursing note from a nurse called [Nurse D].

If we could enlarge what we have on the top left side, Mr Murphy.

Just to assist you, Professor Arthurs, this is a note by a nurse, [Nurse D], who was looking after [Baby H] on the afternoon of 25 September 2014, dealing with events a little after 16.21 in the afternoon.

ARTHURS: Yes.

MYERS: We can see -- we've seen this before so I'm just going straight to the part at 16.21. Then, if we just move down now, please, to the larger paragraph, can you see it says -- what I'm going to is in this body but let me take you to it:

"Re-intubated by Dr Austin at second attempt."

It's got the details of that:

"On moving [Baby H] back in position noted bedding to be wet and stained, probably with secretions from chest drain. Air entry good on right but none on left. Improved if tube held back slightly. Doctors contacted and Dr Gibbs then pulled ET tube back as possibly slipped when tying in."

A reference to the chest X-ray and then the ET tube then it says:

"Second chest drain noted to be in a different position and holes close to chest wall. Further Tegaderm applied and chest drain tubing position altered. Chest drains bubbling."

That's what we have in the note there. Then following through from that, just so you have the picture, could we put up tile 160 from the same section of the case, which is a note by Dr Gibbs. Just scroll down to the bottom of this, please. This is a note on 25 September 2015, the same day, 17.45, but made retrospectively.

If you look at the foot of the note, you can see there, Professor Arthurs, reference to:

"Chest drain fixed more securely to chest wall."

Do you see that?

ARTHURS: Yes.

MYERS: Just so you know, we've had evidence as to the position of that chest drain at that time, so it had to be re-secured at that stage.

Again, can I just through you, before I ask about the radiographs, remind us of this piece of evidence.

The same night at 23.50 -- tile 210, please, Mr Murphy.

This relates to an incidence where the clinical notes record the chest drain being moved. It's a note by Dr Alison Ventress. 23.50.

If we scroll down, please. Can you see at the end of that section it says:

"Second chest drain advanced back to 4 centimetres as was almost out."

ARTHURS: Yes.

MYERS: "Done prior to chest X-ray."

So we can see certainly, at least, a couple of occasions where, notwithstanding your understanding about it being sutured to the chest wall, there has been movement of the chest drain?

ARTHURS: Yes.

MYERS: And certainly one where one of the doctors had to put it back into a position and an earlier one where it had to be secured?

ARTHURS: Yes.

MYERS: Having looked at that, I want to go to several of the tiles that we saw with the radiograph on it. Just starting with tile 158, please. This is at 17.25 --

ARTHURS: Yes.

MYERS: -- on 25 September. We've all seen that when the chest drain was first inserted in the early hours of this morning, it ran in a line, a basal position, above the diaphragm towards the centre of the chest as it appears on the radiograph.

ARTHURS: Yes.

MYERS: This is some time forwards now, 17.25, and the chest drain we're interested in is the one that doesn't have the pigtail and this is shortly before Dr Gibbs has re-secured it.

We can see, after Dr Gibbs has re-secured it, by the next radiograph at T200, please, Mr Murphy, this is the image at 22.56 -- perhaps if we pull out for a moment so we can see the timing if possible. There we are, 22.56.

We know that it had been secured by Dr Gibbs at about 17.45, Professor Arthurs. And we know at about 23.50, Alison Ventress repositioned it because it appeared to have moved.

ARTHURS: Yes.

MYERS: What we can't tell from the radiographs is the extent to which it has moved in the interim period; do you agree?

ARTHURS: Yes.

MYERS: That's the position at 22.56. Can we move forwards to the next image at 2.30 in the morning on 26 September -- sorry, that's tile 229. My fault. Tile 229, 02.30 on the 26th.

We know shortly before midnight Dr Ventress had repositioned it.

ARTHURS: Yes.

MYERS: This is about 2.5 hours after she'd repositioned it and about 45 minutes before event 1, which was at 03.20.

When you were asked about this image, Professor Arthurs, what you said about it was:

"It looks like it's touching the heart [that's the second chest drain]."

ARTHURS: Yes.

MYERS: "It may be several centimetres away."

It follows from that that it may be several centimetres away, it may not be several centimetres away; do you agree?

ARTHURS: Yes.

MYERS: This can't tell us precisely how close it is to the surface of the heart or whether it's actually touching it?

ARTHURS: Yes.

MYERS: That's all I wanted to ask you about [Baby H].

I'm going to move to [Baby I] next, Professor Arthurs.

You have had the opportunity to see a number of ante-mortem, in-life, radiograph images of [Baby I], haven't you?

ARTHURS: Yes, that's correct.

MYERS: Looking across all of them, have you been able to identify multiple episodes of stomach, small and large bowel dilatation?

ARTHURS: Yes, that's correct.

MYERS: You've also said that you identified lung disease of prematurity, although that's something you might well expect to see on a baby like this in this situation?

ARTHURS: Yes, that's right.

MYERS: There's a couple of the images I want to clarify some points with and then I can move to the points that I wish to make in addition to the evidence you have already given.

One image that we don't have on our sequence of events, but you looked at and you've been asked about, was an image for 23 August 2015. That was, I think, the first image in the bundle that's been provided to us.

ARTHURS: That's right.

MYERS: So we'll put that on the screen with Mr Murphy's assistance, please. 23 August 2015. This is at 22.03.

Just to confirm on this image, you were able to identify small bowel dilatation. Would it assist you if it was the image that you've marked?

ARTHURS: No, it's okay.

MYERS: Also dilatation of the stomach?

ARTHURS: Yes. The nasogastric tube comes in at the top. This is the stomach (indicating) that's dilated, the large black area at the image's top right. So the bowel in the middle is small bowel, this is small bowel dilatation (indicating) and the bowel down at the bottom is likely to be large bowel, which is also dilated.

MYERS: Thank you. The other image I would like to go to specifically is the one from 23 October, which is our event 4 at 00.23, which...

MR JUSTICE GOSS: Tile 116.

MR MYERS: Thank you, my Lord. Tile 116 on the tiles. The final one in the bundle that we have from Professor Arthurs.

ARTHURS: Yes, that's right.

MYERS: This is the image that you've marked for us.

ARTHURS: That's right.

MYERS: When describing this, you said that -- the word you used was "massive dilatation of the stomach"?

ARTHURS: Yes.

MYERS: We can see that with the S in it?

ARTHURS: Yes.

MYERS: There's also, from what you can see, dilatation of the bowel as well; is that correct?

ARTHURS: That's correct.

MYERS: When you dealt with this, Professor Arthurs, you went on to talk about the respiratory complications that could follow from a dilatation like the one we see here.

ARTHURS: Yes.

MYERS: And in your opinion, if there's dilatation like this, it would have been or would have the potential to splint the diaphragm?

ARTHURS: That's correct.

MYERS: Once that happens, that may interfere with respiration, with breathing?

ARTHURS: Yes.

MYERS: If that does happen how immediately will that happen?

Do you see what I mean? Once the air is in there and it's in this position, so 00.23, I'm not asking you to be precise to the minute, but could you help us, if you can, with how soon that would interfere with it if that's splinting the diaphragm?

ARTHURS: I don't think I can answer that question. They are not things that radiologists will be able to comment on, how quickly splinting occurs after an X-ray has been taken.

MYERS: Right. But certainly that would look like splinting has happened there?

ARTHURS: Again, an X-ray is a static image --

MYERS: Yes.

ARTHURS: -- without any movement. So I can't talk about the movement of the diaphragm. But we know that massive dilatation of the stomach and the bowel can cause splinting.

MYERS: As to how soon it could happen after what we see here, that's not something that you'd be comfortable to give a time to?

ARTHURS: I think I would defer to the neonatologists on that.

MYERS: Thank you. Thank you very much. That's what I wanted to ask you about those images.

Some general questions with [Baby I] in mind and dealing with distension or dilatation of the stomach and the bowel.

There are several possible causes for dilatation of the stomach and the bowel, the sort that we've seen when looking at [Baby I]'s case; is that right?

ARTHURS: That's correct.

MYERS: And one of them is the exogenous administration of air?

ARTHURS: Yes.

MYERS: Depending on the clinical history, that could be a cause; do you agree?

ARTHURS: Yes.

MYERS: Do you agree it's not the only possible cause?

ARTHURS: Yes.

MYERS: I'll look at the other causes with you, but is it the case that from the radiograph alone it's not possible to establish the precise cause?

ARTHURS: That's correct.

MYERS: So you look at the radiograph together with all the clinical picture?

ARTHURS: Yes.

MYERS: Thank you. You were asked about NEC, necrotising enterocolitis. In principle, put it that way, that can be a caution of dilatation --

ARTHURS: Yes, of the small and large (overspeaking) --

MYERS: -- in principle?

Where [Baby I] was concerned, so far as you understand, there's no features of NEC identified at post-mortem?

ARTHURS: Yes.

MYERS: There are a couple of occasions during the images that we've seen during her life when there are indications of possible NEC, aren't there?

ARTHURS: Yes, that's right.

MYERS: Just to help us, I won't go to the images but could you confirm this, that they are on the images we've seen on 30 September, the image for 30 September?

ARTHURS: Yes, that's right.

MYERS: And is it the image for 13 October? I know it's in the period of the 13th to the 14th, but perhaps you could help us with the precise date.

ARTHURS: My notes are the radiograph of the 13th at 04.25 don't identify features of NEC. The radiograph of 13 October at 16.21 shows that there is no features of NEC.

MYERS: Can I take you to 14 October?

ARTHURS: And the 14th at 06.05 shows marked gaseous distension but without features of NEC.

MYERS: Is that 8.03 in fact, finally?

ARTHURS: There is some additional lucency in the left iliac fossa which could be, that's right, pneumatosis. That's a second occurrence which was raised as possible NEC.

MYERS: Raised as possible?

ARTHURS: Yes, that's right.

MYERS: So we've got 30 September and the 08.03 image in the morning of 14 October?

ARTHURS: That's correct, yes.

MYERS: But to be quite clear, that does not apply to the 23 August or 23 October images?

ARTHURS: That's correct.

MYERS: An alternative diagnosis or explanation for the type of distension that may happen is air from breathing support? I'm going to come to the type in a moment.

ARTHURS: Yes.

MYERS: You were asked about CPAP belly.

ARTHURS: That's right.

MYERS: Breathing support like CPAP has the potential to introduce air directly into the stomach and from the stomach into the bowel, doesn't it?

ARTHURS: Yes.

MYERS: Now, again, we have the situation where you're aware of what comes across your desk as a radiologist and how frequently.

ARTHURS: Yes, that's right.

MYERS: On the other hand, I am not disputing your expertise with that, Professor Arthurs, in terms of the nursing of babies and giving them air, day to day you don't have experience of quite how CPAP belly plays out with babies on a ward, do you?

ARTHURS: No, that's correct.

MYERS: Are you aware of a device called a Neopuff device or have you encountered a Neopuff device in your work causing abdominal distension?

ARTHURS: As far as I know, a Neopuff is just another way of ventilating a baby with a face mask. It's before the step of requiring CPAP, which is before the step of requiring intubation and ventilation. So we typically wouldn't be X-raying children who have been given a few breaths of Neopuff.

MYERS: Right. So in that sense, if we go beyond a few breaths, if a baby is given a lot of Neopuff, generally speaking babies that have been given Neopuff won't come to you because they're not at that high stage of intervention?

ARTHURS: Those where they are worried about abdominal distension will, because if someone is concerned that they've resuscitated a baby with a face mask to the point where they may have distended the abdomen and therefore, by inference, there might be gas in the stomach, then they will come to us for a radiograph. So we have quite a low threshold for doing X-rays on babies on a neonatal unit and so if the clinicians have a suspicion that something may have occurred, just as you've described, they are likely to have an abdominal radiograph.

MYERS: With CPAP and with Neopuff, the distinction you've drawn is that they involve putting air in through the mouth or the nose directly into the baby?

ARTHURS: Yes, because in order to get air into the stomach you have to get air through the oesophagus and if you have a tube that bypasses the oesophagus and already goes into the trachea, it's difficult to explain why air would then track down into the oesophagus and the stomach. So you are comparing chalk and cheese --

MYERS: (Overspeaking).

ARTHURS: -- a little bit in terms of ventilatory support with an endotracheal tube versus CPAP and other ways of supporting babies.

MYERS: That, of course, presumes the endotracheal tube is correctly placed?

ARTHURS: Yes.

MYERS: I suppose if an endotracheal tube is not correctly placed, if it's too high in the trachea, then air could go down through the oesophagus into the stomach?

ARTHURS: Again, this is going go a neonatologist's field but bearing in mind the pressures that are used during ventilating a baby, if the tube slips and goes into the oesophagus or starts to ventilate, I think they would get massive abdominal distension very quickly and, more significantly, you would not be ventilating the baby properly.

MYERS: And therefore the baby may desaturate or have bradycardia if that's what the ventilation was designed to do?

ARTHURS: Potentially, yes.

MYERS: In terms of your position as a radiologist, can I confirm this: the amount of air it would take to cause the distensions we are looking at and the length of time it would take, whatever the means, are not things that you could readily put figures on?

ARTHURS: Not in terms of air, no. I think we've described why those experiments to find that out wouldn't be ethical or feasible.

MYERS: They certainly wouldn't. But in real terms, therefore, if it comes to working out how much or how long, that's not something that radiology can do for us?

ARTHURS: We regularly put contrast into babies' stomachs for other reasons, to look at gastric emptying and those sort of things, and we know how big babies' stomachs are in terms of fluid content. But I think what you're seeing with air is

abnormal distension above and beyond normal fluid contents, for example.

MYERS: So it's not something we can quantify?

ARTHURS: I don't think it's something anybody can quantify.

MR MYERS: Well, thank you for dealing with that, Professor Arthurs.

Re-examination by MR JOHNSON

MR JOHNSON: Just one question, please, professor. You were asked just after lunch about the relative fields of expertise of a neonatologist/paediatrician and a radiologist.

ARTHURS: Yes.

JOHNSON: So far as determining where in the pleural space a drain is from a radiograph, who has primacy between the neonatologist and the radiologist?

ARTHURS: The neonatologist is involved in the act of putting the drain in, so from the outside of the patient they are involved in putting it in, how far they put it in, suturing, making sure that it starts to work. The purpose of the X-ray is to see that the drain is correctly in place and that it's being resolved, so I think we work in tandem in that respect.

JOHNSON: But who is best placed to determine from a picture where the drain is?

ARTHURS: In that case, the radiologist.

JOHNSON: Yes. Do you have any concerns about the location from the pictures of the drains in [Baby H]?

ARTHURS: No, I don't.

MR JOHNSON: Thank you. Does your Lordship have any questions?

MR JUSTICE GOSS: No, I don't, thank you very much.

Thank you for coming back today to give evidence, Professor Arthurs.

ARTHURS: No problem, thank you.

MR JOHNSON: Date to be confirmed.

MR JUSTICE GOSS: You may be required again, but you'll get plenty of notice and obviously your convenience will be accommodated.

ARTHURS: Thank you very much.

MR JUSTICE GOSS: Not at all. Thank you very much. In the meantime, please don't talk to anyone about anything to do with this case or any of the babies concerned.

Thank you very much.

(The witness withdrew)

MR ASTBURY: My Lord, I call Dr Rachel Chang, please.

(Pause)

MR ASTBURY: We had arranged for Dr Chang to be outside, but I think something may have come up, which my Lord is probably aware of. She's on her way now.

MR JUSTICE GOSS: Okay. We'll just wait.

(Pause)

DR RACHEL CHANG (sworn)

Examination-in-chief by MR ASTBURY

MR ASTBURY: Although you're sitting, could I ask, please, that you keep your voice up? Sometimes there's a temptation to drop your voice if you're sitting so if you can project your voice towards the back of the room, that would be really helpful.

CHANG: Yes.

ASTBURY: All right, thank you.

Could we start with your full name, please?

CHANG: Rachel Elizabeth Ng Chang.

ASTBURY: And your occupation, please?

CHANG: I'm a doctor.

ASTBURY: Is it right that in October 2015, you were a registrar within the neonatal unit at the Countess of Chester Hospital?

CHANG: I was, yes.

ASTBURY: Although I think your responsibilities extended a little bit just beyond the neonatal unit as a paediatrician?

CHANG: Yes.

ASTBURY: When you were asked to assist in this particular investigation, I think you recalled two particular dates when you had contact with a baby called [Baby I]?

CHANG: Yes.

ASTBURY: The first date being 15 October?

CHANG: Yes.

ASTBURY: And the second date being the early hours of 23 October?

CHANG: Yes.

ASTBURY: Dealing if we may, briefly, with the first of those dates, 15 October. Is it right that you treated [Baby I] during the course of the day on the 15th?

CHANG: Yes.

ASTBURY: Had you received a handover early that morning from Dr Neame?

CHANG: I had.

ASTBURY: And would it be fair to say that [Baby I] was poorly through the course of the 15 October?

CHANG: Yes.

ASTBURY: And were you aware that later in the day she was transferred over to Arrowe Park Hospital, which is a tertiary centre nearby?

CHANG: Yes.

ASTBURY: The transport team attending to complete that?

CHANG: Yes. I wasn't there at that time.

ASTBURY: Right. I'd like to move forward, then, please, to the evening of 22 October into the early hours of the 23rd October.

MR JUSTICE GOSS: Dr Chang, could you keep your voice up, please? Instinctively you're looking at Mr Astbury who's asking you questions --

CHANG: Sorry.

MR JUSTICE GOSS: No, no, don't apologise, that's all right.

MR ASTBURY: It's my fault.

So you were on, were you, a night shift, beginning 22 October?

CHANG: Yes.

ASTBURY: Do you have any recollection of that particular night shift?

CHANG: Only from my notes.

ASTBURY: Okay. You've had the opportunity to read your notes from the shift?

CHANG: Yes.

ASTBURY: And that's refreshed your memory with regards to what went on?

CHANG: Sorry, I'll correct you: I do have a personal recollection of obviously when [Baby I] died, but the details have come from the notes.

ASTBURY: Okay. We have the benefit, if you look to your right on the screen, of a sequence of events chart which will also contain the notes that you made.

CHANG: Okay.

ASTBURY: So I'm going to take you to your notes. If you could take us through them, please, and if you could assist with any recollections that that brings about during the course of reading those notes.

CHANG: Okay.

ASTBURY: If we go, please, first to tile 97. We don't need to go behind it, we can see your name there, doctor, on 22 October 2015 at 23.56. We have the benefit of swipe data. Is it right that as one of the staff on the unit, you would have a card which you would, for security purposes, have to use to enter certain doorways which are secure?

CHANG: That's right.

ASTBURY: If we go behind that, we can see that shows you entering the maternity neonatal entrance at 23.56?

CHANG: Yes.

ASTBURY: I'm not going to go to them, but there were other instances on our sequence of events of you using your swipe data moving round the hospital in the evening before that, would that be the usual course --

CHANG: Yes.

ASTBURY: -- from department to department?

CHANG: Yes, very much so.

ASTBURY: We have heard evidence from somebody else about a long line with [Baby I] --

CHANG: Mm-hm.

ASTBURY: -- during the course of the evening before this particular time.

CHANG: Yes.

ASTBURY: Do you have any recollection of assisting with [Baby I]'s long line --

CHANG: I have no recollection, but I've seen it in the notes.

ASTBURY: Okay. Let's concentrate please on what you do recall.

CHANG: Okay.

ASTBURY: Can you tell us, please, around about midnight, looking at that time, what would have caused you to be going into the neonatal unit at that particular moment?

CHANG: Likely a phone call.

ASTBURY: Okay. What were you notified about?

CHANG: That [Baby I] was unwell.

ASTBURY: Okay. Can you recall receiving that information?

CHANG: No.

ASTBURY: You can't remember the phone call or indeed the way in which you were notified?

CHANG: No.

ASTBURY: Do you remember who told you?

CHANG: No.

ASTBURY: All right. When you went in to the neonatal unit, what did you do?

CHANG: I don't remember.

ASTBURY: Okay. We'll have a look at your notes. If I can ask Mr Murphy to assist me and turn to tile 102, please.

What I'd like you to do is have a quick read of those notes now, refresh your memory, and we'll go through them.

(Pause)

CHANG: Yes, that's fine.

ASTBURY: We can see from the very first entry that you've written the notes in retrospect.

CHANG: Mm-hm.

ASTBURY: Forgive me for asking, if I may, an obvious question: why are notes written after the event, what's the priority when you arrive?

CHANG: [Baby I].

ASTBURY: Right. That suggests that you were crash called to the NNU.

CHANG: Yes.

ASTBURY: Just very briefly tell us what that means.

CHANG: So the nurses put out a crash call, which is a code, a specific code on the phone in the department, that will bleep my bleep to make a certain ring so that there's no questions asked, you just go.

ASTBURY: Right. Would you have perceived that in those circumstances as an emergency?

CHANG: Yes, it's a medical emergency.

ASTBURY: Your next note is that:

"[You] arrived as the patient was having two-person ventilation on pressures of 25/5."

Explain that to us, please.

CHANG: So two-person ventilation is where a mask is applied to the baby and that is often quite a difficult thing to make sure it's accurate on your own, so you ask a second person to put a seal around the baby's mask while you press the top of the mask to deliver the pressure and the air to the baby, which is the 25/5, which is the pressure that is delivered to the baby via the mask.

ASTBURY: Do you remember who was doing that?

CHANG: I don't.

ASTBURY: You have noted that [Baby I] had desaturated to 40%. We know that's the percentage of oxygen in her blood at that particular time, which is, would you agree, low?

CHANG: Yes.

ASTBURY: And that suggests that her heart rate was 60 to 30?

CHANG: Yes.

ASTBURY: Is that 60 falling to 30 or between 60 and 30?

CHANG: From the way that I document, that would be 60 falling to 30.

ASTBURY: Okay. Do you recall what you were told when you arrived in the unit?

CHANG: I... I don't recall now, but from my statement I recalled.

ASTBURY: Okay. You have refreshed your memory from the statement?

CHANG: Yes.

ASTBURY: So what do you understand you were told when you arrived?

CHANG: The baby was crying.

ASTBURY: Do you remember being told anything else at that stage?

CHANG: No.

ASTBURY: Would you expect to be crash called in the event that a baby was simply crying?

CHANG: No, but I'd been crash called because she'd had a significant deterioration associated with that crying.

ASTBURY: Right. So you described the scene that you came upon?

CHANG: Mm-hm.

ASTBURY: You told us what you were told?

CHANG: Mm-hm.

ASTBURY: Do you recall what you did next?

CHANG: I will have taken over the airway of the baby.

ASTBURY: What does that entail?

CHANG: So as we can see here, initially there was two-person ventilation from the nurses, but as I've documented, the heart rate was dropped, you would start then CPR and part of that is for me to take over the ventilation of the baby.

ASTBURY: CPR is chest compressions?

CHANG: Mm-hm, and resuscitation.

ASTBURY: Is there a level at which that becomes a necessity when it comes to the heart rate?

CHANG: Yes.

ASTBURY: At what point does that become necessary?

CHANG: At this point, once the heart rate reaches about 60.

ASTBURY: And indeed, it was falling below 60 on your arrival?

CHANG: Yes.

ASTBURY: Do you remember where you'd been immediately before you got the crash call?

CHANG: Yes.

ASTBURY: Where had you been?

CHANG: I'd been on the maternity unit, attending another delivery.

ASTBURY: So there was a delivery going on in the maternity suite?

CHANG: Yes.

ASTBURY: You got the crash call, you go to the NNU?

CHANG: Yes.

ASTBURY: How far, can you say?

CHANG: I couldn't say now. Not far is my answer.

ASTBURY: I think we'll hear a little more about perhaps the distance in a moment. But not very far away?

CHANG: No.

ASTBURY: All right. So:

"Started chest compressions."

Do you remember who started the chest compressions?

CHANG: No.

ASTBURY: If you were concentrating on the airway --

CHANG: Yes.

ASTBURY: -- what does it involve then, concentrating on the airway?

CHANG: Ensuring that I'm happy, if we're using the mask, you know we said about the two persons, that I'm happy that that's all being delivered adequately and then making the decision to intubate if therefore you are not feeling that the airway is adequate.

ASTBURY: So we can see that Dr Gibbs was called. Is that an indication of the seriousness of the situation?

CHANG: Yes, and it was policy between the doctors there.

ASTBURY: What were you thinking at this stage with [Baby I]'s heart rate dropping that quickly, the requirement for CPR?

CHANG: That she was in cardiac arrest.

ASTBURY: Right. You mentioned intubation. We can see the next line indicates that she was intubated with a size 3 tube to 8 centimetres at the lips.

CHANG: Mm-hm.

ASTBURY: And that was successful at the first attempt?

CHANG: Yes.

ASTBURY: Would that have been your job?

CHANG: Yes.

ASTBURY: Intubation being the?

CHANG: The placement of a tube into the airway to help the baby breathe.

ASTBURY: And once intubated, what would that tube have been connected to?

CHANG: The same monitor as the mask had been and eventually on to a ventilator.

ASTBURY: "Good CO2 colour change."

We've heard about capnographs. Is that how you check the change in the CO2 colour?

CHANG: Yes.

ASTBURY: What does that tell you?

CHANG: That if there's a colour change, that you're getting adequate output of CO2, which means that there's been change from the oxygen and back, therefore you're getting good ventilation through.

ASTBURY: So air is going into the lungs with a certain proportion of oxygen and carbon dioxide?

CHANG: Yes.

ASTBURY: It's coming out with the carbon dioxide being detected?

CHANG: Yes.

ASTBURY: Because that's -- is that a by-product of the breathing process, the respiration process?

CHANG: Yes.

ASTBURY: All right. You continued chest compressions for about a minute post-intubation; is that right?

CHANG: Yes.

ASTBURY: Then you prepared adrenaline. What's adrenaline?

CHANG: Adrenaline is a drug to help stimulate the heart.

ASTBURY: Is that a part of the resuscitation procedure?

CHANG: It is.

ASTBURY: So because, is this right, [Baby I] is in cardiac arrest, adrenaline is prepared to give her heart presumably some sort of jolt to get it going?

CHANG: Yes, if required.

ASTBURY: In fact, in this case, not required?

CHANG: Mm-hm.

ASTBURY: Please tell us what happened next.

CHANG: Her heart rate improved and her sats picked up to to over 100% over a five-minute period.

ASTBURY: So are you able to help us, from the time that you arrived, so about 23.56, through the doors and then presumably -- we've seen a map -- very quickly into the nursery. Which nursery was she in, can you recall?

CHANG: 1.

ASTBURY: Okay. Are you able to tell us how long she was in arrest for before those signs started to recover?

CHANG: When I was there or before?

ASTBURY: We can see there that chest compressions began.

CHANG: Yes.

ASTBURY: You prepared the adrenaline.

CHANG: Yes.

ASTBURY: And then the heart rate began to increase, I think you put "over 130"?

CHANG: Yes.

ASTBURY: So how long did that take, do you think?

CHANG: It would just be speculation, but it'd be no longer than probably 10 minutes in absolute total.

ASTBURY: Ten minutes of arrest, is that a serious --

CHANG: No, no, sorry, I misunderstood the question. I thought you meant from the time -- from the start -- for the 5 minutes for her to be better. Sorry.

ASTBURY: I am perhaps not fair. If we go to your note we can see there a five-minute period.

CHANG: Yes.

ASTBURY: So not immediate?

CHANG: No.

ASTBURY: Is that a serious concern for a doctor in your position if there's been an arrest for 5 minutes?

CHANG: Yes, but she'd shown signs of improvement through that 5 minutes.

ASTBURY: You have noted though that she's still very pale.

CHANG: Yes.

ASTBURY: And that her capillary refill time is more than 5 seconds, is that?

CHANG: Yes.

ASTBURY: Then you made a note:

"Sats picked up with 100%..."

Is that "over"?

CHANG: "Over a five-minute period."

ASTBURY: So that follows on?

CHANG: Yes.

ASTBURY: And then you have said:

"Difficult to open up again."

Can you explain that to us, please?

CHANG: Yes. So what I mean by that is there's sometimes a feeling of resistance to opening the chest once it's collapsed down. That's all -- it's very subjective this, this is just my feel when I'm ventilating a baby.

So someone might -- like I said, it's very subjective, but by that documentation what I've meant is there felt to be a little resistance to opening up once the baby had collapsed. That's not always unusual.

ASTBURY: Okay. So we have this picture, this collapse, cardiac arrest, it taking about 5 minutes, the heart rate picking up but not the lungs straightaway. Is that right?

CHANG: Yes. Well, maybe -- yes, all I can assume is it's felt more resistant to opening up, which would fit with the fact that it took around about 5 minutes for her to be back to completely 100%.

ASTBURY: All right. You've given, it says there, 10ml per kilogram of sodium chloride bolus?

CHANG: Yes, because of the CRT.

ASTBURY: So that's to increase fluids to increase the flow of fluids round the body?

CHANG: Yes.

ASTBURY: Okay. Then Dr Gibbs arrived?

CHANG: Yes.

ASTBURY: At the stage after [Baby I] had recovered initially?

CHANG: Yes.

ASTBURY: You have told us you intubated her. She was then connected to a ventilator?

CHANG: Yes.

ASTBURY: Okay. Was there then a conversation with Dr Gibbs about continuing to ventilate [Baby I]?

CHANG: Yes.

ASTBURY: Could you tell us about that, please?

CHANG: That -- we discussed her situation as I arrived and obviously the situation that we were now faced with and whether or not ventilation should continue.

ASTBURY: What was [Baby I] doing in respect of the ventilator?

CHANG: From my notes, she was rigorous.

ASTBURY: Okay. And what was -- was there any significance in her reaction to the ventilation?

CHANG: In what respect?

ASTBURY: Physically, was she accepting it, was she resisting it?

CHANG: No, so by rigorous I meant it was resisting, she was uncomfortable and unsettled.

ASTBURY: Right. What are the alternatives when you have a ventilated baby who is rigorous in those circumstances?

CHANG: So the alternatives to stopping ventilation would be to heavily sedate the baby or even paralyse her so that she can tolerate it given that, as we can all imagine, it's a painful procedure to go through.

ASTBURY: Or?

CHANG: Or take the tube out and let the baby ventilate herself.

ASTBURY: Okay. So was that the type of thing that you were discussing with Dr Gibbs?

CHANG: Yes.

ASTBURY: The pros and cons of both, I would imagine?

CHANG: Yes.

ASTBURY: And what was the decision in the end?

CHANG: The decision was to extubate and let the baby ventilate herself.

ASTBURY: Okay. Would that have been done if you'd had any concerns about [Baby I]'s ability to do that?

CHANG: No.

ASTBURY: Perhaps if we can just scroll down the rest of your note, please. You've described it as "fighting ventilation" on your note.

CHANG: Yes.

ASTBURY: Dr Gibbs suggested asking to wait (sic) for an X-ray; is that right?

CHANG: Yes.

ASTBURY: Was that before or after you had this conversation about extubating?

CHANG: It was probably all during. I can't recall.

ASTBURY: I think a chest X-ray was obtained?

CHANG: Mm-hm.

ASTBURY: The purpose of that chest X-ray?

CHANG: Multiple. So any baby who has an invasive tube to help them breathe needs an X-ray to make sure it's in the lungs, in the right area. So that is completely routine. So it's possibly just for that, but by doing the X-ray you can see whether there's any changes to the lung fields, which would then add to your picture of whether this child still needs to be ventilated.

ASTBURY: Do you recall looking at the X-ray?

CHANG: No.

ASTBURY: You've noted there that there were no acute changes?

CHANG: Mm-hm.

ASTBURY: That you saw a -- is that "a large stomach bubble"?

CHANG: Yes.

ASTBURY: And the tube was presumably in a satisfactory position?

CHANG: Yes.

ASTBURY: Any concerns arising out of what you've written there about the X-ray?

CHANG: No.

ASTBURY: You have then written a plan, again presumably in company with Dr Gibbs?

CHANG: Yes.

ASTBURY: "Continue to monitor."

This sounds like it had been an acute incident --

CHANG: Mm-hm.

ASTBURY: -- over albeit a relatively short period of time?

CHANG: Yes.

ASTBURY: And very soon after, [Baby I] was fighting the ventilator and able to breathe on her own again?

CHANG: She was.

ASTBURY: What were your thoughts at that point?

CHANG: I didn't have any worrying thoughts. She's had an event, she'd had lots of events, but I had to work with what was in front of us, that she recovered very quickly and so we then went to the next stage. I don't recall any thoughts as such.

ASTBURY: All right:

"Ambient O2 whilst recovering."

Is that "oxygen being blown" --

CHANG: "Into the incubator", yes.

ASTBURY: "Keep measures to keep settled."

CHANG: Mm-hm.

ASTBURY: During the course of the shift before midnight and when you were alerted, were you aware of any concerns about [Baby I]?

CHANG: No.

ASTBURY: Anything brought to your attention?

CHANG: No. The notes say about this long line, but I don't recall that.

ASTBURY: You have seen the notes. Is there anything in the notes that you think informs what may have happened at midnight?

CHANG: I'm obviously now aware of Ashleigh's notes about the baby being unsettled and crying, but at the time I hadn't been given that information.

ASTBURY: Okay. So you formulated the plan with Dr Gibbs?

CHANG: Yes.

ASTBURY: Baby, on the face of it, recovering --

CHANG: Yes.

ASTBURY: -- well?

CHANG: Yes.

ASTBURY: What did Dr Gibbs do next?

CHANG: I'm not sure.

ASTBURY: What did he say he was doing?

CHANG: Going home probably.

ASTBURY: Okay. Do you know whether he did go home?

CHANG: No.

ASTBURY: You say that with a smile.

CHANG: Because he was always there when you needed him so sometimes he would say he would go home but he would actually be round the corner in his office in case you needed him again.

ASTBURY: We've heard about, perhaps in circumstances like these, sometimes a septic screen. Was any septic screen ordered?

CHANG: We didn't.

ASTBURY: Why not?

CHANG: Because there didn't seem to be an indication for it.

ASTBURY: Dr Gibbs said he was going home. Do you recall where you went after [Baby I] had recovered?

CHANG: I don't recall, but from -- I assume I went back to the case I'd been called from.

ASTBURY: And that's the delivery in the maternity suite?

CHANG: Yes.

ASTBURY: But you were called again fairly soon after to come back to [Baby I]?

CHANG: Yes.

ASTBURY: Do you remember how you were notified this time?

CHANG: Ashleigh came and got me.

ASTBURY: Right. Do you know if there's a reason why she physically came to get you rather than crash bleep again?

CHANG: I think she knew where I was, so she knew I was close by.

ASTBURY: Is that an indication of how close you were to the unit?

CHANG: Yes.

ASTBURY: All right. Now, if we go to tile 127, please, Mr Murphy. We can see that you went back into the neonatal unit at a minute to midnight.

CHANG: Yes.

ASTBURY: Is that consistent with your recollection?

CHANG: Yes.

ASTBURY: And that's when Ashleigh's come to get you and take you back?

CHANG: Yes.

ASTBURY: What were you told this time?

CHANG: I can't recall.

ASTBURY: When you left the maternity suite, did you leave in a hurry?

CHANG: Yes.

ASTBURY: Whatever you were told, were you anticipating it was an emergency again?

CHANG: Yes.

ASTBURY: But you can't remember exactly what you --

CHANG: Not exactly, no.

ASTBURY: Do you remember what you saw when you went back in -- was it nursery 1 still?

CHANG: Yes.

ASTBURY: Do you remember what you saw when you went in the second time?

CHANG: No. Sorry, could I have a look at my notes?

ASTBURY: Of course. If we can go to tile 132. Again, and perhaps because of what then followed, it's written in retrospect at 03.50.

CHANG: Mm-hm.

ASTBURY: And you've reminded yourself that she was extubated earlier whilst the consultant was present.

CHANG: Yes.

ASTBURY: That she'd coped well post-extubation.

CHANG: Yes.

ASTBURY: She'd been relatively settled, sucking dummy, et cetera.

CHANG: Yes.

ASTBURY: What would the "et cetera" be there?

CHANG: I couldn't say.

ASTBURY: Okay. Sucking a dummy, a significant sign in any way?

CHANG: Yes. It's a natural and good, content thing that babies do.

ASTBURY: You repeat there you had:

"... been called to emergency theatre for premature delivery. Whilst preparing for that delivery, NICU nurse came to theatre."

That was Ashleigh you told us?

CHANG: Yes.

ASTBURY: To tell you that [Baby I] was unwell and your recollection was at that point it was about 01.12?

CHANG: Yes.

ASTBURY: We can see was a little bit earlier than that (overspeaking) --

CHANG: Earlier than that, yes.

ASTBURY: And you arrived on the intensive care unit, nursery 1, to find, did you, [Baby I] being bagged with Neopuff?

CHANG: Yes, so similar to the previous.

ASTBURY: Okay. Again, just pausing for a moment, do you recall who was doing what at that stage?

CHANG: No, sorry.

ASTBURY: Can you recall any of the people who were there other than you and Ashleigh?

CHANG: Yes, Mel, Lucy, they're the two people I remember.

ASTBURY: You can't remember who was doing precisely what?

CHANG: No, sorry.

ASTBURY: If we just scroll down please, a little bit. You have written there -- I think, is that what you saw rather than what you were told?

CHANG: Yes.

ASTBURY: Your first note, "Poor colour"?

CHANG: Yes.

ASTBURY: Could you expand on that for us, please?

CHANG: By poor colour -- good colour on a baby is pink, and that equals good perfusion. Poor colour is pallor, so paleness or blueness, which means there's not oxygen being delivered.

ASTBURY: Do you have any independent recollection of the colour of [Baby I] at this point?

CHANG: No.

ASTBURY: You're just going off your note?

CHANG: Yes.

ASTBURY: Sats now were below 60 in 100% oxygen?

CHANG: Yes.

ASTBURY: That's via the Neopuff that you've mentioned?

CHANG: Yes.

ASTBURY: And heart rate dropping below 60 again to high 30s?

CHANG: Yes.

ASTBURY: As you told us before, that's below the threshold for cardiac arrest --

CHANG: Yes.

ASTBURY: -- and you've commenced compressions, 3:1. I think that's what was in the earlier note. Explain that to us.

CHANG: It's three compressions with your fingers to one puff of the ventilation.

ASTBURY: Would you have taken a particular role at this point?

CHANG: Again, as the doctor, senior doctor, I would have been ventilating the baby.

ASTBURY: Do you remember -- let's just go a little bit further and I'll ask if you remember something in a moment.

You tried to pre-oxygenate for 30 seconds. What does that mean, please?

CHANG: So before you are intubating a baby, there is time for that, so anyone skilled -- there is a minute -- you know, not even a minute, but you have to get the tube, get the baby, open the airway with a special instrument to look down and place the tube.

ASTBURY: So this is the process of actually intubating?

CHANG: Intubation.

ASTBURY: And we've heard that doctors look for the vocal cords and visualise the vocal cords in order to pass the tube in the right place down the right --

CHANG: Yes, avenue, yes. So you will lose seconds doing that, so you aim to pre-oxygenate the baby with the Neopuff to get the oxygen to as much as you can to minimise the reduction in oxygen that that few seconds to intubate entails.

ASTBURY: Okay. How do you do that?

CHANG: So with a good seal around the Neopuff and actually just ventilating the baby with a Neopuff for up to, like this says, 30 seconds.

ASTBURY: So would it just be a rush of oxygen before you --

CHANG: Yes.

ASTBURY: -- disconnect and try and intubate?

CHANG: But unfortunately, she didn't pre-oxygenate well.

ASTBURY: Is that "Sats remained poor"?

CHANG: Yes.

ASTBURY: All right. You intubated again with, you put there, a 3.5-centimetre tube to a length of 9 centimetres at lips?

CHANG: Yes.

ASTBURY: "Good air entry on auscultation..."

CHANG: Yes.

ASTBURY: "... and good CO2 colour change."

I think we've dealt with this a few minutes ago.

That tells you, does it, that the lungs are working?

CHANG: Yes.

ASTBURY: Air is going in and out?

CHANG: Yes.

ASTBURY: What reaction are you actually getting?

CHANG: None, or not like before.

ASTBURY: So this time the heart rate remained low?

CHANG: Yes.

ASTBURY: You haven't -- I am just looking if you have recorded any saturations on there. Do you remember whether, despite the air going in and out of the lungs, whether the saturations improved?

CHANG: I don't remember.

ASTBURY: And unlike last time, you've resorted to adrenaline?

CHANG: Yes.

ASTBURY: And you've noted the first time at 16 minutes past -- I think it says midnight --

CHANG: It is an error. That is an error.

ASTBURY: It's 1 o'clock?

CHANG: Yes, it is.

ASTBURY: You have corrected that in your statement?

CHANG: I have, yes.

ASTBURY: "Compressions and ventilation continued."

Again, do you have any recollection at all of the resuscitation process?

CHANG: I do in my mind's eye.

ASTBURY: Tell us what that is, please.

CHANG: I have a very unwell-looking baby in front of me and then Ashleigh's face. That's what I remember.

ASTBURY: Okay. What's Ashleigh doing?

CHANG: Ashleigh was delivering the compressions to my, obviously, ventilation and obviously that's the most important thing, so I have just feel very focused on the baby in front of me and Ashleigh's face.

ASTBURY: Okay. Despite your efforts and Ashleigh's efforts, was there any improvement in the heart rate?

CHANG: Sorry.

ASTBURY: It's okay. There are some tissues there. Please take a glass of water if you need one.

(Pause)

CHANG: Sorry.

ASTBURY: Okay. Your next note, doctor, is that there was adequate chest expansion.

CHANG: Yes.

ASTBURY: So just going back to, again I think this is the third time we've revisited this, are you looking for the chest to be moving?

CHANG: Yes, obviously, ultimately, my responsibility is to direct the resuscitation and ventilate the child, so successful ventilation, not just looking at numbers, needs to be that you're hearing adequate air entry into the lungs and you're seeing the chest expand as you deliver the oxygen. And I could see both of those physically, the auscultation, which is hearing, and I could see the expansion.

ASTBURY: Any reaction at all to that?

CHANG: For [Baby I]? No.

ASTBURY: You've noted the pressure that was being applied to the ventilation. It was via the Neopuff and the ETT that you'd placed?

CHANG: Yes.

ASTBURY: And the oxygen was 100%?

CHANG: It was, and it was 30, so a high pressure.

ASTBURY: But still nothing?

CHANG: No.

ASTBURY: If we could go to the next page, please, Mr Murphy.

Sorry, my Lord, just checking the second page. We thought it had been added. Just bear with me a moment, doctor.

(Pause)

206, certainly, both pages are on. Your note continues:

"Second dose of adrenaline given."

Is that bicarbonate of soda 2 minutes later?

CHANG: Yes.

ASTBURY: We have heard, correct me if I'm wrong, that's to try and balance the acidosis of the blood?

CHANG: Yes.

ASTBURY: Still no improvement in the heart rate?

CHANG: No.

ASTBURY: Sats were between 60 and 80 despite the 100% oxygen and the chest movement that you could see?

CHANG: Yes.

ASTBURY: Pale with poor perfusion throughout?

CHANG: Yes.

ASTBURY: Another saline bolus and we can see that Dr Gibbs arrived about 12.25?

CHANG: Yes.

ASTBURY: When the consultant arrives, is there a change in personnel and jobs?

CHANG: Sometimes the significant change is that he then leads the arrest, so until now I'd been doing a job and leading the arrest as the most senior physician. He's now the most senior, so although the actual role of me holding a tube and ventilating a baby may not change, the responsibility of the resuscitation process then falls to Dr Gibbs, if he wants to, and that would usually be the case.

ASTBURY: Okay. What role did Dr Gibbs take, do you recall?

CHANG: From the notes, there's details, and in my statement I think I could recall then. From my statement he observed, he examined intermittently. He also took over the tube at intermittent periods, in the same way that I had ventilated and

wanted to know everything was going -- everything was perfect in the right position, he was doing the same. But I don't have a clear recollection of every single movement of us both during the arrest.

ASTBURY: Just before we leave the page, they should of course be 120, 125 --

CHANG: Sorry, yes.

ASTBURY: -- and (overspeaking).

CHANG: That was all corrected, yes.

ASTBURY: You told us who was present and did one of nurses leave when Dr Gibbs arrived?

CHANG: I can't be sure. From my statement, I believe one of the nurses left to take over the delivery of the premature baby that I'd been attending.

ASTBURY: Would that be usual for that to happen?

CHANG: Not usual.

ASTBURY: Do you remember which nurse you asked?

CHANG: From my statement, Mel.

ASTBURY: Okay. Any reason why Mel? Is that Mel Taylor?

CHANG: Yes. She's very senior. I trusted her and I knew she could help.

ASTBURY: Okay. Did anyone else attend during the course of the resuscitation?

CHANG: Not that I can recall.

ASTBURY: Do you remember whether [Baby I]'s parents were present at any stage?

CHANG: Sorry, yes.

ASTBURY: Are you able to help us with what stage they arrived?

CHANG: No, I've never been able to truly remember. It's only ever come from the nursing notes and things like that.

ASTBURY: Did you speak to them at all?

CHANG: I must have because I directed them to call them --

ASTBURY: Right.

CHANG: -- and I recall, in my mind, [Baby I]'s mum touching [Baby I] as we were trying to revive her.

ASTBURY: Okay. We know that there came a point where the resuscitation came to an end.

CHANG: Yes.

ASTBURY: Whose decision was that?

CHANG: Dr Gibbs'.

ASTBURY: Why was that?

CHANG: Because we'd worked for a period of time and there'd been no sign of improvement at all.

ASTBURY: Once that decision was made, do you recall what happened?

CHANG: To who?

ASTBURY: Well, to [Baby I].

CHANG: At that point, I left.

ASTBURY: Okay. So you were there for the attempts at resuscitation?

CHANG: Yes.

ASTBURY: Once they sadly had failed --

CHANG: Yes.

ASTBURY: -- you left?

CHANG: Yes.

ASTBURY: And presumably other patients required --

CHANG: Yes. I stayed on the unit for a while, as long as I could, until -- I will have been called away again.

ASTBURY: Did you attend a debrief after the (overspeaking) --

CHANG: I didn't attend one, no.

ASTBURY: Have you reflected on the death of [Baby I] --

CHANG: Yes.

ASTBURY: -- and the causes?

CHANG: Yes.

ASTBURY: And the shift generally?

CHANG: Yes.

ASTBURY: And what has that caused you, if anything, to think?

CHANG: Just that I've never been able to truly explain it, that it was awful. But I was never worried, I knew we'd done everything, and I'd done everything the way I did it the first time I attended and I trusted everyone around me implicitly.

MR ASTBURY: Okay. Thank you, doctor, I have no more questions for you. If you could wait there, please.

Cross-examination by MR MYERS

MR MYERS: Just one thing, Dr Chang. It sounds quite small after the enormity of what you've been describing to us, but I did want to ask about this. You told us there was a discussion between you and Dr Gibbs about whether to extubate or not --

CHANG: Yes.

MYERS: -- in between the two incidents. When you were asked questions, you said there were pros and cons with both.

CHANG: Yes.

MYERS: And one of the pros was that if you take her off the ventilator then you wouldn't have to sedate or paralyse her because of how she'd been fighting the ventilator?

CHANG: Yes.

MYERS: What were the cons in taking her off the ventilator?

CHANG: Can I have a minute just to think?

MYERS: Yes.

(Pause)

CHANG: In the clinical scenario that we faced, there were minimal cons. On reflection, the cons are that if she had been on a ventilator, she would have been breathing, someone would have been assisting with her breathing, but that's it. The benefits outweighed them so much, because we made that decision.

MYERS: For those of us who don't have to make these decisions and don't deal with this, we know from what you have put in the notes on the first part of the incident that there had been a cardiac arrest and she required resuscitation --

CHANG: Yes.

MYERS: -- and -- were you aware of her clinical history at the time you were dealing with this?

CHANG: I was.

MYERS: From what you can recall, was that all taken into account when weighing up the pros and cons?

CHANG: Yes.

MR MYERS: All right. That's what I wanted to check, thank you.

Re-examination by MR ASTBURY

MR ASTBURY: When later ventilated, did that assist with [Baby I]'s saturations? When you were forced to ventilate her at 1 o'clock in the morning, did that assist?

CHANG: No, no, no.

MR ASTBURY: Does my Lord have any questions?

MR JUSTICE GOSS: I don't, thank you.

Dr Chang won't be required again?

MR ASTBURY: No, we don't expect Dr Chang back again.

MR JUSTICE GOSS: Thank you very much for being available today and giving evidence. I know that you were yesterday as well.

CHANG: Yes, thank you so much.

MR JUSTICE GOSS: I'm sorry you've been inconvenienced to that extra extent. Thank you very much. It's not expected that you're going to be required to give evidence about anything else to do

with this case, but just in case, would you please not talk to anyone about anything to do with this case --

CHANG: Of course.

MR JUSTICE GOSS: -- any of the patients? I'm saying this to everyone in your situation, just in case someone decides that you are for some reason, unforeseen at the moment, asked to come back --

CHANG: Of course. Thank you so much.

MR JUSTICE GOSS: Until it's all over. Thank you very much.

(The witness withdrew)

MR JUSTICE GOSS: I think we don't have any more witnesses to give oral evidence, but there are some statements that can be read?

MR ASTBURY: There are, yes.

MR JUSTICE GOSS: So we'll have a break. Can you give us an estimate as to how long the statements are likely to take?

MR ASTBURY: About 15 minutes, I think.

MR JUSTICE GOSS: I still think we'll have a break. I think we should have a short break. No more than 10 minutes, thank you very much.

(3.16 pm)

(A short break)

(3.26 pm)

Witness statement of MS CAROLINE OAKLEY (read)

MR ASTBURY: My Lord, I'm going to return to the statement, first, please, of Caroline Oakley, part of it. It is page 68 of my Lord's bundle. We've heard part of it in an earlier part, dated 6 April 2018.

Following on, ladies and gentlemen, in her statement, Caroline Oakley says this:

"The second date that I have been asked about is the 22nd into 23 October 2015, the day when [Baby I] died.

"I was on a day shift on 22 October, starting at 07.30 hours, so was not there when she passed away, but I was her designated nurse during that day.

"I have been able to review my notes and it looks like she had a good day on the day shift. I basically put that she had a long line in, fluids going through, and she was nil by mouth, waiting to go to Alder Hey for a barium enema.

"She was unsettled at time, obviously very hungry, but usually settled with a dummy. We were getting minimal clear aspirates from her NG tube and her abdomen was fine, soft and not distended. She'd also weed and poed and her cares were attended to by mum.

"I do sort of remember that time with her because I remember her mum getting frustrated about this appointment at Alder Hey and me trying to chase the doctors and nagging them to try to get the appointment sorted. Because she'd had so many episodes of her tummy blowing up, I think they must have decided to keep her nil by mouth until she had this test done. Mum and dad were really angry with Alder Hey because it hadn't been sorted. If I recall, I was told that the post-mortem didn't show anything, so that would indicate that the barium wouldn't have helped, but you don't know that at the time.

"I just remember her being a lovely, beautiful but problematic baby. She was a bit older, so she was more responsive, like eye contact and things.

"I remember her because of the investigations that weren't done, ie the barium enema, because that was upsetting, seeing her lying there stuck in a cot, awake and hungry.

"I had come to a day shift again on 23 October and I remember the bereavement part a little because the cold mattress that we nursed babies on when they died kept heating up and alarming. At times like that you want everything to run smoothly, not being made to look incompetent by a piece of equipment.

"I don't remember anything else about that day other than [Baby I] being with her family in bedroom 2. I basically would have left her with her parents and then be doing the bereavement paperwork. The night staff had already done the memory box.

"Dr Gibbs spoke to mum and dad and told them the coroner wanted a post-mortem. They weren't happy but understood it was a legal requirement. Because they weren't happy with Alder Hey, they didn't want [Baby I] staying there after the post-mortem.

"The bereavement coordinator, whose name I can't recall, was involved and spoke with Alder Hey who said they would facilitate getting [Baby I] back to the Countess after the post-mortem. The medical photographer came and took some lovely photos for mum and dad. I can't remember her name.

"From my notes, [Baby I] then went to the mortuary at approximately 2 pm. I then escorted mum and dad to the mortuary at 3 pm for their appointment to see her. They must have come back to the unit to collect all the mementos as my notes reflect this.

"They also reflect that the parents had another appointment at the mortuary the next day to go back and see [Baby I]."

Witness statement of DR BHUVANESHWARI LADDE (read)

MR ASTBURY: The next statement, please, my Lord, is in the fourth bundle, back to the fourth bundle, at page 93.

In a statement dated 8 June 2020, Bhuvaneshwari Ladde states:

"My name is Bhuvaneshwari Ladde, I am currently a general practitioner. I was working as a general practice specialist trainee year 1 in paediatrics at the Countess of Chester Hospital NHS Trust between 5 August 2015 to 2 February 2016. I have been asked by Cheshire Police to provide a witness statement in relation to my involvement with one patient, [Baby I].

"My statement is solely based on reviewing the medical records. According to the clinical records, I had documented notes on three occasions.

"(1) I documented notes following a consultant-led head grand round by Dr Brearey on 2 September 2015.

"(2) I reviewed bloods on 4 September 2015 and discussed the results with the neonatal registrar, Dr Matt, and actioned the results as per his advice.

"And (3) in the early hours of 23 October 2015, I was on duty as GPS ST1 paediatrics SHO rota at the Countess of Chester Hospital when an emergency resus call was put out for [Baby I], requiring emergency medical assistance.

"I can't recall that event at all. I cannot recall who was present and the statement is purely based on the medical notes that I have reviewed. My role in this resuscitation was limited to documenting the drugs that were given during the resuscitation. I was not involved in decision-making about the

drugs or the doses of the medications. I was not involved in decision-making about [he repeats the same line] the drugs or the doses of the medications. I was also not the person who administered the drugs. I have noted that medications had been retrospectively documented on the electronic system after resuscitation.

"From the medical notes and identifying my own handwriting, I have recorded the list of drugs given to [Baby I] during her resuscitation."

If I can just ask, rather than read it, my Lord, to put tile 142 up. In his statement, Dr Ladde simply lists what's shown on his original document. Then he states -- just to complete -- thank you. Everyone's seen it.

Dr Ladde goes on:

"'Flush' in the notes indicates sodium chloride, 0.9%, which is used to flush the line after the medication administration. In addition, the asterisk that I put at 01.43 and 02.00 against two doses is because of the different strength of adrenaline used here (1 in 1,000) which was as per consultant paediatrician Dr Gibbs' decision, who was the resuscitation lead.

"The list of medication is included in [Baby I]'s medical notes and was subsequently signed by myself. Reading from the medical notes, this was my only contribution to the event."

Witness statement of CHRISTOPHER BOOTH (read)

MR ASTBURY: Moving on, please, my Lord, to Christopher Booth, page 97. He states in a statement dated 16 May 2018:

"I have been asked by DC Birch of the Cheshire Police about my recollections and knowledge of a baby called [Baby I] and the night she died on 23 October 2015. I have had the opportunity to review the notes of that night, but I also have my own recollections.

"[Baby I], from what I recall, was about 10 weeks old at the time. She was a prem baby who'd had numerous investigations into a distended abdomen. She was waiting for a barium enema, I think to be done at Alder Hey, but that was a forthcoming investigation. She was nil by mouth at the time and she had a long line in situ into a large vessel, so we could give long-term intravenous fluid, but that had to be removed that evening because it was occluding. She was in nursery 1 that evening.

"She did have periods of being really quite unsettled at the time because she was not being fed and on that evening she was

really unsettled particularly around 11 or 12-ish. Normally, she could be placated with like a dummy or what we call containment holding where you place a hand over them to calm them down. But she was really quite fractious up to about midnight when she became apnoeic (stopped breathing).

"Her oxygen levels started to drop. Her heart rate started to drop, so resuscitation manoeuvres were undertaken by Ashleigh Hudson and the doctors were crash bleeped. I think it was Dr Chang who attended and Dr Gibbs was called in and I think [Baby I] did need full resuscitation.

"I did cardiac compressions and she was intubated and ventilated. Dr Gibbs attended and I'm pretty sure she needed resuscitation drugs but the exact drugs I'm not sure of. She became very fractious and was fighting against the ventilator and sometimes when babies do that, it becomes counterproductive, so the decision was made to extubate her and so the breathing tube was taken out.

"She then seemed okay for a while, she was breathing independently, looking round and rooting. I'm pretty sure Dr Gibbs left then as he was satisfied she was okay and I think as a team we felt she'd recovered from this episode.

"About an hour later, she dropped again. She lost her colour, dropped her oxygen levels and her heart rate dropped. I'm pretty sure Dr Chang was in theatre at that time at a delivery, so Lucy Letby and I managed her airway and undertook normal ABC resuscitation manoeuvres and Ashleigh ran to theatre to get Rachel Chang. Theatre is just beyond nursery 1, about 50 yards away, so it was quicker than crash bleeping her. She came through and it was full resus again.

"Dr Gibbs was called and he came in as he wasn't very far away. He acted as team leader. The senior doctors took charge of the resus. Ashleigh took charge of cardiac compressions, I think, and I think myself and Mel Taylor were drawing up drugs; it needs two registered nurses to do that. Lots of adrenaline was given and there were episodes where her heart rate rose and we thought we had her back, then it would drop again.

"The parents had been called in and it goes without saying it was very, very distressing for them to watch their daughter being resuscitated.

"It was very dire indeed and it became apparent there was pulseless activity. She maintained her heart rate on the monitor, but it wasn't strong enough to produce a pulse. It was fruitless, really, and we were getting nowhere. So the decision was made, with the parents' consent, at about 2 am to withdraw

resuscitation attempts. So she was wrapped in a blanket and Ashleigh handed her to mum and dad and she was pronounced dead at about 2.30 am.

"It was particularly upsetting because in that 10 weeks we'd got to know the family really well and got to know [Baby I] really well because she was quite a character herself and we were all very fond of her and had high hopes for her. So I think everyone was extremely upset. We'd all looked after her a lot and got to know the family. It was gut-wrenching for the team as a group. I wrote an email to the ward manager, Eirian Powell, that morning as we were all heartbroken. I wanted to convey to her how hard the team had worked and how upset they were.

"I wanted her to know that as a team everyone had tried their hardest and did their bit. The team I work with are an amazing team, particularly at that time. If we weren't such a good team we would have crumbled as there were so many horrible things going on, but we just supported each other.

"I have been asked if on that night I was designated nurse for any baby but I honestly can't remember.

"The drugs given to [Baby I] that night were from the resus trolley and I'm pretty sure we exhausted those supplies and had to break into the two separate resus boxes from pharmacy because we were going through a lot of adrenaline.

"I believe there was a debrief a couple of weeks after [Baby I]'s death, which was led by Dr Gibbs. At this time I can't think of anything else that may assist the investigation."

Witness statement of MS MELANIE TAYLOR (read)

MR ASTBURY: My Lord, next, please, page 100, which is Melanie Taylor and a statement dated 1 October 2018.

She says:

"I have been asked by DC Birch from Cheshire Police about my involvement in the care of a baby called [Baby I] in 2015 at the Countess of Chester Hospital.

"The first date I was asked about was 30 September 2015. I had the opportunity prior to seeing DC Birch of reviewing the nursing notes for that date. I was on a long day that day. I remember [Baby I] very well because she was on the unit for a long time and she had quite a few problems that meant she was transferred off the unit a few times.

"it's the type of environment where you get to know the patients and parents very well and I know she had had episodes where she'd needed resuscitation. But my honest recollections are that I don't really remember the date of 30 September much at all.

"The notes say I rang the parents and I do vaguely remember calling them, thinking this may be a very serious situation, but that's all I genuinely recall. I wasn't looking after her personally and wasn't directly involved in what was going on.

"I think [Baby I] was the second baby whose death I was directly involved with on the unit and before that I was there a few years and wasn't involved in another death. I was never concerned about any of the care or treatment that the babies had on the unit.

"I have also been asked about the 22nd into 23 October 2015 by DC Birch. This was the night that [Baby I], sadly, died. Again, I have had the opportunity to review the notes for that night. I was on a night shift and, having looked at the notes, I can say Ashleigh Hudson was on and was looking after [Baby I]. Chris Booth has said he was on that night, but I can only vaguely recall him. I think Val Thomas was on too. I don't really remember the doctors who were on, but I know from the notes Dr Gibbs and Dr Rachel Chang were there.

"I don't remember a great deal about the actual shift that night. I can't remember where I was or anything about when the call for assistance came. I can't remember which baby I was looking after or in which nursery.

"I think with regard to [Baby I]'s resuscitation, I was involved in drawing up drugs, ie adrenaline, and wasn't doing CPR; that was Ashleigh and someone else. What I remember more from the shift is more the emotional side, seeing her parents come in, trying to talk to them and seeing their reaction. And after [Baby I] died I just remember how upset her parents were.

"I have memories of leaving them behind screens with her. For me, my memories of that night are more about the parents, but also my own emotions because obviously we were all devastated, even more so because we knew the family and [Baby I] so well and they'd been through so much. It was just pure shock.

"She was stable before that. She had had episodes before that and was in and out of the hospital, when she'd dip and get transferred to one of the bigger hospitals, then she'd get well and come back.

"I think her parents came in during the resuscitation but I don't know who called them. I don't even know if it was me.

"I remember them walking into nursery 1 and standing there, not really knowing what to do, and myself personally not really knowing what to say. Generally, someone in the peripheral area will take the lead and be responsible to speak to them, maybe someone drawing up drugs or making notes.

"The actual resuscitation is a bit of a blur, to be honest. I can remember right at the end when the doctor decided to call it and said we should stop. I feel like I was either administering or drawing up drugs and was just shocked when he said stop. Everyone has their role to play and there's usually lots of people in the room. I had been looking at [Baby I] and then the monitor thinking she was going to come out of it and then when she didn't, my heart just dropped. When he said stop I was just devastated, especially when I looked at her parents.

"As far as the bereavement paperwork went, I think that may have been down to the person responsible for [Baby I] form the next shift as it was nearer the end of the shift. We let the parents spend a lot of time with their baby and it would be down to the designated nurse to help with the memory box. I want to say that Lucy Letby helped a lot with that, but the paperwork side of it was probably down to the next shift.

"I think Lucy was on a couple of other shifts I was on where babies had died and she was quite involved with doing memory boxes on those occasions so she was used to doing them. The memory boxes are from a charity set up by someone who lost a baby called 4Louis. We do handprints and footprint and take a lock of hair. It's about what the parents want to do.

"We offer parents the use of our unit camera and each box has a memory card in so that they can keep the photos. We keep a stock of these boxes and Jo Williams and myself are responsible for ordering these from the charity. We get them directly from the 4Louis website. Jo and I cascade a bit of training to other staff about how to use them through the bereavement packs we put together for them. The packs also contain the paperwork and how to complete it.

"In conclusion, I can't think of any other information that I can offer at this stage that may assist the investigation into [Baby I]'s death."

Witness statement of MS VALERIE THOMAS (read)

MR ASTBURY: My Lord, finally this afternoon, the statement of Valerie Thomas, a statement dated 18 September 2018.

At 105 in my Lord's bundle. Valerie Thomas says:

"I started training in January 1975 and qualified as a nurse in December 1977. I started work on the maternity wing at the Countess of Chester Hospital in June 1978 and have worked there ever since.

"As regards to qualifications, I am a band 4 nurse. I have been asked by DC Birch of Cheshire Police about a baby called [Baby I] and my involvement with her and my recollections of her from 2015. I have had the opportunity to review the nursing notes for [Baby I] prior to making this statement.

"My first recollections of [Baby I] were from 5 September 2015. I had come on nights that night and was allocated [Baby I] to care for. I had received a handover and at that point I think she had started to not be quite right. She was starting to desaturate.

"Within an hour of me being on, she had desatted up and down and it was decided to pass her over to more qualified staff. I passed her over to [Nurse C] and she passed her on to Yvonne Griffiths later than night. Both of them are band 6s.

"She had obviously been well to be allocated to me. At my level we don't take any really poorly babies and she'd been well enough to work through the nurseries. I can't remember exactly where she was but she wasn't in nursery 1 that night.

"I was a nurse the night before on 4 September. I have had the chance to go through the notes I wrote for that night and it did jog my memory. I was her designated nurse and [Baby I] was breathing for herself and her temperature was stable. My notes show she was having expressed breast milk every 3 hours via her nasogastric tube and we were looking for mum to offer her the first bottle.

"She wouldn't have been in nursery 4 as she was still in an incubator, so she would have been in 2 or 3. Nothing in the notes says it was anything other than an uneventful night. I finished at 8 am on 5 September and then back on duty 7.30 that night.

"I'd have received a full handover that night, but I can't recall anything other than that she was starting to desaturate. Nothing stands out. [Nurse C]'s notes state that [Baby I] continued to desaturate and needed ventilator support. I can't remember what support she had as she was moved into nursery 1 and my involvement ceased.

"I have also been asked by DC Birch about 30 September 2015. I have been able to review the nursing notes for that night prior

to making the statement. I can't remember anything about [Baby I]'s handover and have no knowledge of her care that night. I now know from the notes it was Lucy Letby handing over to Bernie Butterworth but I have no recollection or personal knowledge at all about that.

"Finally, I have been asked about the night of 22 October into the 23 October 2015, which was the night that [Baby I] died. Again, I have had the opportunity to review the nursing notes made that night prior to making this statement.

"Again, I was on a night shift, I had a baby on transition care that night, and I think it was my first night back after annual leave.

"I only had one baby up on the ward and would have been allocated babies on the unit downstairs. I wouldn't have spent too much time on transitional care but I can recollect that I had been up on the transitional care ward at one point and came down to the unit. The phone was ringing but no one was at the desk. I answered it and it was [Baby I]'s mum.

"At that stage I didn't realise what was going on in nursery 1 as I had been upstairs. I subsequently found out it was [Baby I] who was very poorly. When I answered the phone, [Baby I]'s mum knew that [Baby I] wasn't well, so she must have been spoken to earlier and was ringing back to see how she was.

"I went into nursery 1 and said that [Baby I]'s mum was on the phone, not realising that [Baby I] was being resuscitated in there. Lucy Letby said that [Baby I]'s parents should come in.

"I then waited for her mum and dad to come in by the door to let them in. I didn't get involved in any of the resuscitation at all. By that time there was Ashleigh Hudson, Lucy Letby, Chris Booth and two doctors. I might have taken a call from Dr Gibbs, who was asking what the problem was. I think I just said, 'It's [Baby I], you need to come in', but other than that, my involvement was minimal.

"I was not aware that [Baby I] had suffered an earlier collapse that night around midnight. When I went into nursery 1, having taken the call from [Baby I]'s mum, I think it was Lucy and Ashleigh doing the CPR, but I can't recall who else was doing what. There's nothing else that sticks in my memory from that night other than I think I stayed down on the unit to help look after all the other babies while the rest of the staff were busy with [Baby I].

"I don't remember there being any conversation amongst the staff after [Baby I] had died. It goes very quiet after something like

that. There is usually a debrief process after a baby dies, but I have never been on one. It wasn't a compulsory attendance thing, but I think that may now have changed.

"In conclusion, I would like to say it was a busy time on the unit, but shifts were covered and I had no concerns about anything or anyone on the unit. A lot of the babies were very poorly and had very complex needs, but everyone did their best."

That concludes those statements, my Lord.

MR JUSTICE GOSS: Thank you very much. Well, the next witness will be Dr Gibbs --

MR ASTBURY: Yes.

MR JUSTICE GOSS: -- but obviously, he will be a little time. That's why he is not going to give evidence this afternoon. Then, just so that the jury know, after that Dr Evans and Dr Bohin?

MR ASTBURY: Yes.

MR JUSTICE GOSS: Then we will have finished the evidence in relation to [Baby I]?

MR ASTBURY: For now, yes.

MR JUSTICE GOSS: Good. There will be some pathologist evidence because there was a post-mortem.

Right. So that's it for the weekend, members of the jury. Please remember your responsibilities as jurors and adhere to them. Don't talk to anyone unless you're all together in a room together where no one can hear what you're saying about the case apart from the other 11 of you. So when you're in public places, don't talk about it, even amongst yourselves; you have to be a group. No research, no communication with anyone about anything about to do with this case. 10.30 on Monday morning, please. Thank you.

(In the absence of the jury)

MR ASTBURY: I omitted to mention, and I apologise, we've done a little more editing on the Melanie Taylor statement, which I'm sure my Lord saw when we got there.

MR JUSTICE GOSS: Thank you very much, yes. There we are.

I've got a note of what's relevant.

MR ASTBURY: Thank you.

MR MYERS: My Lord, we'd be grateful if we could speak to Ms Letby briefly, just at the conclusion of the proceedings.

MR JUSTICE GOSS: Straightaway after court rises?

MR MYERS: Yes, thank you.

MR JUSTICE GOSS: Yes.

MR JOHNSON: Just one other thing in terms of next week, my Lord. We think it's unlikely that we'd make substantial progress beyond Drs Evans and Bohin on Monday, and Dr Gibbs obviously. So subject to your Lordship's better view, we'd prefer to start the case of [Baby J] on Tuesday.

MR JUSTICE GOSS: Yes. I don't anticipate we'd be completing the evidence before the afternoon in any event.

MR JOHNSON: No.

MR JUSTICE GOSS: Right. You may take it that that's the situation.

Mr Maher, I understand you're committed elsewhere?

MR MAHER: Yes.

MR JUSTICE GOSS: Mr Myers, will you be going down to see Ms Letby?

MR MYERS: Yes, I will.

MR JUSTICE GOSS: Thank you.

(3.55 pm)

(The court adjourned until 10.30 am on Monday, 6 February 2023)