Wednesday, 29 March 2023

(10.30 am)

(In the absence of the jury)

Housekeeping

MR JUSTICE GOSS: As far as today is concerned, there are going to be some statements read, are there, first of all?

MR DRIVER: My Lord, we are going to begin by reading some agreed facts on the topic of pathology, which in effect prove the -- by agreement, obviously -- the essential parts of the statements made by the pathologist that conducted the post-mortem examinations. Thereafter, we'll move to Dr Marnerides.

MR JUSTICE GOSS: Right. So there won't be any statements read, it'll just be agreed facts, of which the jury will have copies?

MR DRIVER: They will. They will have copies and your Lordship has had a copy provided to you. You will also see that we have, by way of accompaniment to those agreed facts, a further glossary because effectively some of the terms are a little obscure to laymen. Unfortunately, we've just noticed now, a moment or two ago, the version of the glossary that we had printed is incomplete. We're trying to resolve a formatting issue whilst I'm on my feet, so with your Lordship's leave

we will distribute and read the agreed facts and then at a convenient moment during the course of the morning provide a glossary.

MR JUSTICE GOSS: And you can always, at the time of reading any agreed fact, refer orally to the completed document and say that they will get a copy of it in due course. That's all right.

As far as Dr Marnerides' evidence is concerned, it will involve the showing of a presentation or presentations, will it not?

MR DRIVER: Yes.

MR JUSTICE GOSS: I've looked at the relevant documents, I believe, all of them. They are understandably, by their nature, quite graphic because there are body parts.

MR DRIVER: Quite.

MR JUSTICE GOSS: I would propose just to warn the jury that that is what this presentation is going to contain or you could -- Mr Johnson is going to lead the evidence. Mr Johnson could warn the jury so they are not taken by surprise and they're not computer-generated images, they are actual images in certain respects, but not to dwell on the matter too much. Mr Johnson, I'll leave it to your good judgement.

If Mr Myers wants anything particular to be said, no

doubt he will tell you.

MR MYERS: We've discussed the matter in advance, my Lord.

MR JUSTICE GOSS: Thank you.

MR DRIVER: As your Lordship would imagine, (inaudible) all family members who may be viewing this evidence, either here or remotely, have been forewarned.

MR JUSTICE GOSS: Thank you.

Jury, please.

(In the presence of the jury)

MR JUSTICE GOSS: Good morning, members of the jury. I'm sorry we're a few minutes late starting. I hope you weren't unduly inconvenienced by our not sitting on Monday and you all got the message in good time that you were not required on Monday. And yesterday, for good reason, we couldn't sit, as you were informed.

Thank you very much.

Mr Driver.

MR DRIVER: May I ask Mr Stansfield to hand out to the jury 12 copies of further written agreed facts.

(Handed)

All agreed facts that we've considered to date are stored, should be stored, behind divider 3 of the first jury bundle. You'll see from the document that Mr Stansfield has just handed to you that this section of agreed facts is entitled "Pathology".

If I may, my Lord, inform the jury as to the proposed course of events this morning. I shall read to you these agreed facts, which summarise the essential facts that pertain to the post-mortem examinations of some of the babies about whom you've received evidence already. After I've completed that exercise, my learned friend Mr Johnson will call Dr Marnerides, a pathologist, to give evidence about the pathology that derives from these post-mortem examinations.

Some of the language within these agreed facts, members of the jury, is a little obscure to us laypeople and you will be provided during the course of the morning with some additional definitions. You've already received a glossary of medical terms and we'll provide some additional ones relating to some of the words used in this document and it may very well be that after Dr Marnerides has given his evidence, we'll give you a further glossary of some of the terms that may arise during the course of his evidence.

So turning to the document if I may --

MR JUSTICE GOSS: Can I just emphasise what Mr Driver has said: don't be concerned, because I've just seen this document now, and some of the passages to me are difficult to understand because I don't have the detailed medical knowledge and I don't suppose many of

you do. But don't be concerned. It will be, I assume, Mr Driver, explained by Dr Marnerides where necessary --

MR DRIVER: Quite so.

MR JUSTICE GOSS: -- what is referred to in these agreed facts? You have this, it's a working document and you can -- as with any document that you have, you can write on it and add to it, any notes that you wish to.

Sorry, Mr Driver.

Statement of agreed pathology facts (read)

MR DRIVER: Not at all, my Lord.

Returning to the document, members of the jury, section 4, "Pathology", and agreed fact number 20, which refers to [Baby A], date of birth 7 June 2015:

"(i) Dr Rajeev Shukla, consultant paediatric pathologist, conducted a post-mortem examination of [Baby A] at the Royal Liverpool Children's Hospital (Alder Hey) at 12.30 hours on 10 June 2015.

"(ii) Dr Shukla made a written report of the examination dated 14 September 2015, which included the following findings of fact.

"Cardiovascular system: The pulmonary trunk arises normally. However, the pulmonary arteries are crossed with the left pulmonary artery originating to the right and above the origin of the right pulmonary artery. Foramen ovale is patent.

"Respiratory system: The lungs are severely congested and haemorrhagic.

"Microscopy: Multiple sections from the lungs show marked capillary congestion and congestive collapse of the alveoli."

The glossary you'll receive, members of the jury, may inform you, as you may very well know, that the alveoli are tiny air sacs within the lungs that allow gas exchange.

Continuing with this paragraph:

"Foci of intra-alveolar haemorrhage is noted."

As to foci, members of the jury, focus is a pathological term describing -- surrounding tissues based on their appearance. I can see the version of the glossary I'm using is --

MR JUSTICE GOSS: It needs amendment.

MR DRIVER: Yes. I'm just using the wrong version. You'll receive the definitions in due course:

"The alveolar ducts appear dilated and contain squames indicating amniotic fluid aspiration. There is no obvious meconium or inflammation. There are no viral conclusions.

"Toxicology: The toxicological investigation showed caffeine in concentrations consistent with therapeutic use. There was no other toxicological abnormality to

explain sudden unexpected death of this infant."

Conclusions. Dr Shukla noted that:

"The only positive finding was that of crossed pulmonary arteries. Dr Shukla observed that crossed pulmonary arteries are a quite rare form of pulmonary arterial malposition. It has been described in association with congenital cardiac and extra-cardiac diseases. No other anomalies were noted in this case. In absence of any other abnormality, it is unlikely to be significant as a cause of death."

"Dr Shukla observed that:

"There is a strong temporal relationship between the long line insertion and the patient's apnoeic spell and collapse. The long line's position could not be confirmed at autopsy as it was removed during life."

The next agreed fact, that is to say agreed fact number 21, relates to the baby [Baby C], date of birth, 10 June 2015:

"(i) Dr George Kokai, consultant paediatric pathologist, conducted a post-mortem examination of [Baby C] at Royal Liverpool Children's Hospital (Alder Hey) at 10.00 hours on 16 June 2015."

Dr Kokai made a written report of the examination dated 25 September 2015, which included the following findings of fact:

"Abdominal cavity: All abdominal organs show normal anatomical position. The gallbladder, extrahepatic biliary ducts and pancreas are normal. The stomach and all loops of bowel and mesentery show normal rotation pattern apart from descending colon, which crosses the midline into the right lower abdominal cavity and connects to the sigmoid colon, which is in normal position. The serosal cover is thin, shiny and translucent. The stomach contains a large amount of air and some bile-stained secretions. The remaining bowel is empty. The colon contains meconium.

"Lungs: Saccular stage of development with partial atelectasis areas of fresh bleeding into interstitium and distal airways. Also, multiple areas of partly resolving hyaline membrane in many foci without inflammation. Foetal type of wall of pulmonary arterial bed with patent lumina. Congested pulmonary venous bed."

MR JUSTICE GOSS: That's classically a paragraph that's going to have to be explained to us by Dr Marnerides, what all that means.

MR DRIVER: Understood.

Agreed fact number 22 relates to the baby [Baby D]. Date of birth 20 June 2015:

"(i) Dr Jo McPartland, consultant paediatric

pathologist, conducted a post-mortem examination of [Baby D] at the Royal Liverpool Children's Hospital (Alder Hey) at 11.15 hours on 23 June 2015.

"(ii) Dr McPartland made written reports of the examination dated 3 August 2017 and 13 May 2019, which included the following findings of fact.

"(a) In her report of 3 August 2017 Dr McPartland observed that:

"Lungs: There is patchy acute pneumonia, most prominent within one of the right lung samples with some hyaline membranes present, indicating diffuse alveolar damage. Although pneumonia can develop secondary to ventilation, the period of intubation and ventilation was short in this case, taking into account the clinical scenario with spontaneous rupture of membranes 36 hours before birth."

As to that 36 hours before birth you'll read in due course Dr McPartland qualifies that later, but just reading as per her first report:

"... with spontaneous rupture of membranes 36 hours before birth, and then collapse of the baby soon after birth followed by continuing respiratory problems and the histological pneumonia, which is quite convincing, I think it is likely that pneumonia was already present at birth.

"It is most unfortunate that the placenta was disposed of after delivery as examination may have revealed an ascending genital tract infection as the cause of congenital pneumonia and would have allowed me to be more definitive about the timing of onset of the pneumonia.

"Although [Baby D]'s CRP was low, in early onset sepsis the sensitivity of CRP in detecting infection may be as low as 22% and therefore does not rule out infection. Microbiology tests were negative in this case, but this is often the case after antibiotic treatment and does not rule out infection, which is histologically proven in this case.

"Virology tests were negative for viral infections. Toxicology revealed a very low concentration of morphine consistent with that routinely used in neonatal care during intubation and ventilation."

Dr McPartland also recorded the following summary findings:

"(i) Early neonatal death after 36 hours of age.

"(ii) A normally growth (sic) and developed baby girl with weight on the 91st percentile. Length on 25th percentile and head circumference on the 98th percentile.

"(iii) Acute pneumonia with hyaline membranes

indicating alveolar damage.

"(iv) Placenta not submitted for examination."

So paragraph (b). In her report of 13 May 2019, Dr McPartland observed that:

"After issuing my post-mortem examination report, I was informed by Dr J Davies, consultant obstetrician at the Countess of Chester Hospital, that the duration of premature rupture of membranes was 60 hours, not 36 hours, as I had stated in my report."

MR JUSTICE GOSS: That's obviously a reference back to the top line of that page where it says 60 hours, which I've scrubbed through and written 36.

MR DRIVER: Vice versa, my Lord. The top of the page reads 36 hours --

MR JUSTICE GOSS: Sorry, yes.

MR DRIVER: Members of the jury, the next agreed fact, agreed fact number 23, relates to the baby [Baby I], date of birth 7 August 2015:

"(i) Dr George Kokai, consultant paediatric pathologist, conducted a post-mortem examination of [Baby I] at the Royal Liverpool Children's Hospital (Alder Hey) at 14.30 hours on 26 October 2015.

(ii) Dr Kokai made a written report of the examination dated 25 September 2017."

The next agreed fact, agreed fact number 24, relates

to the baby [Baby O], date of birth 21 June 2016:

"(i) Dr George Kokai, consultant paediatric pathologist, conducted a post-mortem examination of [Baby O] at the Royal Liverpool Children's Hospital (Alder Hey) at 14.00 hours on 28 June 2016. Dr Kokai made a written report of the examination dated 25 September 2017."

Agreed fact number 24 relates to the baby [Baby P], date of birth 21 June 2016:

"(i) Dr George Kokai, consultant paediatric pathologist, conducted a post-mortem examination of [Baby P] at the Royal Liverpool Children's Hospital (Alder Hey) at 15.00 hours on 28 June 2016.

"(ii) Dr Kokai made a written report of the examination dated 25 September 2017."

Agreed fact number 25:

"[Redacted]"

My Lord, may I hand over to Mr Johnson?

MR JOHNSON: Dr Andreas Marnerides, please.

DR ANDREAS MARNERIDES (affirmed)

Examination-in-chief by MR JOHNSON

MR JOHNSON: Thank you very much. I wonder whether you'd like to take a seat.

We have a live transcript being kept of the proceedings, so if you wouldn't mind just pulling the

microphone towards you to make sure that what you say can be heard.

Could we start by you telling the jury who you are, please?

A. Yes. I'm Dr Andreas Kyriacou Marnerides and I'm a consultant perinatal and paediatric pathologist based at St Thomas' Hospital in London.

Q. Thank you. That's a bit of a mouthful. Could you just explain -- I'll come to your qualifications in a moment, doctor, but could you explain to the jury what your day-to-day work involves, please?

A. So a pathologist is a medical doctor that has trained in a specialty called pathology. That's a specialty that means basically two things of expertise: one is interpreting specimens from the living, biopsies that you may have heard, so if somebody had an operation, they're being investigated for a tumour or any other disease, the pathologist will look at that specimen under the microscope and help the clinicians make the diagnosis. The other part of their expertise is when they perform post-mortem examinations, so people that have died.

A perinatal and paediatric pathologist has the sub-specialty of dealing with the paediatric population. The term perinatal refers to the time around a woman's

pregnancy and the early time after the baby's delivered. So the perinatal pathologist has the expertise in examining the placentas in case there is a need for examination, foetuses that have died in utero, so before they were born, babies that are born alive and die very early in the neonatal period. And of course the paediatric, you can understand, is every age of a child.

Q. Thank you. In terms of your workload, doctor, how many cases of perinatal and paediatric people do you deal with a year?

A. So in terms of post-mortem examinations, at my department we do roughly 750 post-mortem perinatal/paediatric examinations. This includes both cases that are -- those that are called hospital cases, so there is -- the doctors and the parents want to investigate further what has happened in the pregnancy or why there was a stillborn baby or the baby died early in their life. There is no coronial, so no judge involved, and no police involvement.

But we also do, which is a big number -- around half of these cases, the 750, are medico-legal cases, so there is a coronial request or a police request. I'm dealing with 99% of those requests that have come through the police, so the forensic cases where there's a suspected crime being investigated.

It's three pathologists that do the 750, three consultant pathologists, so I would be roughly doing one third. And on Fridays we go through the cases that we have seen and discuss all the cases, so even if one has not done the post-mortem examination, one has the experience of what the other colleagues have seen in that post-mortem examination, what were the findings, and then there is a discussion around that.

Q. So your figure of 750, is that a year?

A. Yes, that's a year.

Q. Okay. In very round terms, about two a day in very round terms?

A. Yes. I can't do the maths as quickly as you.

Q. You're more likely to get to the right answer than I am!

MR JUSTICE GOSS: It depends what you call a day. Days of the calendar, yes, but the working days, unless you're working 7 days a week carrying out post-mortems, it's... We can all understand the mathematics.

MR JOHNSON: Yes, thank you.

All right. So that's your day-to-day working life. Could we deal with your qualifications, please? Can we take these reasonably slowly, please?

A. Yes. So I have a medical degree from the Medical School of the University of Athens in Greece.

Q. In what year did you get your medical degree?

A. 2002.
Q. So 21 years ago?
A. Yes. Then I proceeded with training -- in Greece it's called forensic medicine, it's the equivalent of forensic pathology in the United Kingdom. I did a PhD as well in pathology: I studied the function of Hodgkin's lymphoma, which is a haematological malignancy, so a tumour of the blood in very simple terms. Then I proceeded and I went to the Karolinska Institute in Stockholm and did my training in paediatric and perinatal pathology.

I joined St Thomas' Hospital as a consultant perinatal and paediatric pathologist in January 2013, having worked for approximately a year as a consultant before that in Sweden. And since then I'm based at the St Thomas' -- since 2013 I'm based at St Thomas'. The everyday work is what I have described before that.

I became a fellow of the Royal College of Pathologists, I think it was 2021, and I also hold the diploma of medical jurisprudence, which is -- from the Royal Society of Apothecaries in London, which is specialising in forensic pathology.
Q. For anyone that doesn't know St Thomas' Hospital in London, is that one of the main teaching hospitals in the capital?

A. Yes.
Q. Thank you. What I'd like to do, doctor, is to go through the cases that you can help us with one by one, if we may. There are two lever arch files in front of you and the one to the left has a number 1 on it. Behind divider 3 are some agreed facts. If you go to agreed fact 20 onwards, please. These have just been read to the jury, just before you came in. What I'd like you to do, please, is to help us as to what these mean.

Agreed fact 20 mentions a baby by the name of [Baby A]. [Baby A]'s case is one of the ones that you have reviewed; is that correct?
A. That's correct, yes.
Q. We see that a Dr Rajeev Shukla, who is a consultant paediatric pathologist in Liverpool, conducted a post-mortem examination of [Baby A] at Alder Hey Hospital at 12.30 hours on 10 June 2015 and that he issued a written report dated 14 September.

He made the following findings of fact on his examination -- just before we get to the details of this, when a post-mortem examination is conducted by a pathologist, does it start with a description of what's on the outside of the body?
A. So a post-mortem examination in babies starts even

before the description of what one sees on the outside of the baby. It typically starts with a post-mortem radiology examination. That's either X-rays that are taken at the mortuary with a machine called a Faxitron, to which the pathologist has direct access. This is typically the case in so-called hospital cases when there is no involvement of coroners or the police. And in that case, the pathologist has the training to assess the growth of the skeleton, that's the reason of doing the examination, and whether there is anything that would suggest that there is an underlying metabolic bone disease for that baby.

If it is a medico-legal post-mortem examination then the radiology examination is much more detailed, it's called a skeletal survey, and that is being reported according to the guidelines by a paediatric radiologist, so a radiologist that has sub-specialty or is working in a paediatric hospital.

So even before examining externally, this is what's happening. When the pathologist goes in the post-mortem examination room, the pathologist will make an examination of how the baby or the child looks externally. They will typically take some measurements and weigh the baby to assist them in forming an opinion on what's the baby's growth, whether they're growing

normally or not, using those parameters. And on the external examination, they will look for dysmorphic features of the case.

Q. What does dysmorphic means?

A. It means that something has not formed in the way we expect it to form. So for example, we expect the ears of the baby to be set at the level we are used to seeing them in everyone. If they are low set, so set below where we typically expect them, that's called low set ears and that's a dysmorphic feature. So that's one thing all pathologists will look for. They will look at everything else, so the trunk, the front and the back of the body, the limbs, the fingers, the genitalia, the anus, everything that is visible from the outside, and see whether everything has formed the way it should have formed.

They will also typically, in cases where there is a coronial or police involvement, note down whether there are any injuries visible from the outside, note down whether they see marks of medical intervention, so needles, needle puncture marks, cannulas, tubes, they will write those down.

In many -- not all, many -- we will make a detailed or less detailed assessment of how the post-mortem phenomena have developed. The post-mortem phenomena is

what -- in layman's terms we say decomposition. This goes -- we decompose in stages. So some pathologists will be more detailed in that, some will be less detailed in that, and some will just not say anything at all.

Q. So once the pathologist has assessed the outside of the body following the radiological investigation, does the examination then proceed to what is inside the body?

A. Yes. Sometimes before that, the pathologist may take some samples for testing before even opening the body, so may take some swabs from the nose or from the mouth or take a small piece of skin for some tests that we need to do. Then we will proceed with opening the body cavities.

A typical way of doing this -- and I apologise, I understand this is distressing, but this is how it's done -- there is an incision typically starting from the upper part of the chest going down to the lower abdomen and then they will expose the organs of the baby.

The first check done there is: is every organ where it's supposed to be, does it look the way it should? And then they will make a dissection of each organ to assess the anatomy of the organs, weigh them, if there is a need, take photographs, either in situ, so inside the body, or when they take them outside of the body,

and take small pieces of tissue from the organs to look. Those will be processed in the lab so we get slides that we can look under the microscope and make an assessment on the microscopic level, so on the cellular level.

Then after finishing with the organs of the chest and the abdomen and the structures of the neck, the brain is being removed from the head. So the scalp is reflected and checked, the anatomy of the skull bones is checked, the brain is removed. Typically the brain will have to be fixed in a liquid, which is called formalin, because if you try to examine a baby's brain in particular, in a fresh state, the information you will get is not very useful because they go into autolysis very quickly and the brains of babies, once you put an incision through them, typically will start melting and you can't really examine them. So we fix them and we examine them at a later stage and take the samples then.

Q. By fixing in this context is it literally put the brain into a liquid, formalin, that you have said?

A. Yes.

Q. Does it harden the brain?

A. That's what it does: it makes it harder so we can make incisions and assess the anatomy.

Q. Yes. We will come to some details relating to that perhaps in the case of [Baby A]. But just

continuing with the process for now, just taking up what you have said about the organs, when we get to the cases of [Babies O & P], will we be hearing from you that they had unusual findings in their livers?

A. Yes.

Q. In order for you to explain to us those particular findings, are there some photographs of their livers?

A. Yes.

Q. In order for you properly to explain to the jury what the findings are and your conclusions, will it be necessary to show the jury those photographs?

A. In my opinion, yes.

Q. This is never pleasant, everybody understands that. But is the position that the photography focuses solely on the liver?

A. Yes.

Q. And so there's no picture of either child as one would normally see a child?

A. No, it's only the liver.

Q. All right. That's a warning. In the case of [Baby O], in order to demonstrate your explanation as to what you found, the pathologist at the time has cut into the liver; is that right?

A. That's correct, yes.

Q. So one sees the liver, in effect, partially split?

A. Yes, that's correct.
Q. All right. We will come to that in due course.
Now can we take up the case first of [Baby A], please, Dr Marnerides. You can see there on the page in front of you are some agreed facts that have been read to the jury this morning.
I'd like you just to give us a few words of explanation, if you would. So we see the first underlined heading in paragraph 20 is "Cardiovascular system". What is that a reference to in terms of the anatomy, please?
A. So that's a reference to the heart and the vessels.
Q. And the vessels are what?
A. The major vessels that one can access and examine in a baby are the vessels that originate from the heart and the vessels that end to the heart. The vessels that originate from the heart are called arteries. The major artery that originates from the heart and gives blood supply to everything in our body, basically, is called -- it has a specific name and it's called the aorta. So that's the one major vessel that leaves the heart and it's called the aorta. The other major vessel that leaves -- takes away blood from the heart is called the pulmonary artery and it takes blood to the lungs; that's why it's called pulmonary. Where that blood --

there will be an oxygenation of the blood and the blood will return to the heart via the pulmonary veins.

So the vessels bringing, back from the body, blood to the heart are called veins. So the blood coming back to the heart from the lungs are the pulmonary veins. From the rest of the body it's the superior vena cava, so the big vessel that brings back blood from the upper part of the body, to put it as simply as possible, and the inferior vena cava brings blood back from the lower part of the body.

These are the vessels that are always examined. In some occasions, when the anatomy allows it and the size of the vessels and the instruments we have access to allow it, a pathologist may be more meticulous or interested in examining smaller vessels in the periphery of the body. Those I referred to have always been examined.

Q. All right. We see, just going back to the written word on the page for a moment:

"The pulmonary trunk arises normally."

What does that mean, please?

A. So that's the main of the proximal -- so the heart has four chambers, two atria and two ventricles; two are on the right side and two are on the left side. The blood circulation, so you can understand it, comes from the

rest of the body into the right atrium, goes into the right ventricle. From the right ventricle arises the pulmonary trunk, which is the small proximal part of the vessel I referred to, the pulmonary artery. Remember?

That vessel has two branches, the left and right pulmonary artery, and those take blood to the lungs.

Q. "The pulmonary trunk arises normally", what does that mean?

A. That means it was arising from the pulmonary valve, which is at the right place in the right ventricle.

Q. Thank you:

"However [recorded Dr Shukla], the pulmonary arteries are crossed with the left pulmonary artery originating to the right and above the origin of the right pulmonary artery."

So what does that mean in practical terms?

A. So imagine that you have a tube and you get a branch from the tube that goes to the left, a branch from the tube that goes to the right. That's the normal branching of the pulmonary trunk. In this occasion, the branch that was originating from the left was turning and going to the right and the branch originating from the right was turning and going to the left.

So this is a finding that can be seen in isolation or can be seen in association with other malformations

of the heart. In this instance it was seen in isolation. When it's seen in isolation, it's not known to have any clinical consequences to the individual. The best example for that is that we see it as an incidental finding even in adults that have survived many years, no issues whatsoever, because they didn't have anything else with that.

If there is a malformation then we are discussing a different thing, but in this case there was no associated malformation to make anyone worried that this could not be regarded within the variation of normality.

Q. Next:

"Foramen ovale is patent."

The jury have heard a bit about this, but if you could give us the forensic pathologist's point of view, please.

A. So if you remember, we said there are four chambers in the heart, the two upper are called the atria, the two lower are called the ventricles. In between them there is a septum, a wall, if I put it simply. The wall, the septum, between the left and the right atrium has a round structure called the fossa ovale. That's a Latin term for saying that it's a round area, that's how it's translated.

This fossa ovale in the intrauterine life has

a membranous covering which is called a septum, which functions like a flap. You need to have communication in the intrauterine life between the two atria.

When babies are being born, this will not close anatomically within the first period of life. It will typically close later on in their life, but some individuals will have a small opening there in the fossa ovale, anatomically open, and this may become a problem later on in their life.

In a newborn baby or a few months' old baby, an anatomically open foramen ovale, patent foramen ovale, is what we expect to see.

Q. Next in the written word, please:

"Respiratory system: the lungs are severely congested and haemorrhagic."

What does that mean, please?

A. It literally means that the pathologist that looked at the lungs and felt that they were more -- apologies for the word I will be using -- contain more blood on their cut surfaces than what he would expect to see. Okay? That's what it literally means.

If you're asking me what it means as a finding, what's the pertinence of the finding in relation to the cause of death, the answer is it basically means nothing because it's a very common finding, a very non-specific

finding. That's the reason people take histology to look under the microscope to see whether that impression they had on a naked-eye examination has any pertinence or not.

Q. So histology, we're back to taking samples --

A. Yes.

Q. -- tissue samples which are preserved, stained, put on a slide and looked at under a microscope?

A. That's correct.

Q. So that description, "The lungs are severely congested and haemorrhagic", is that what you would call a macroscopic observation?

A. That's correct, a naked-eye observation.

Q. Thank you. That's probably why we go to microscopy next. So macroscopy, lungs severely congested and haemorrhagic, in other words the naked-eye view. Viewed through the microscope, it says:

"Multiple sections from the lungs..."

In this context, are sections the samples that are put on to slides and looked at under the microscope?

A. Yes.

Q. "... show marked capillary congestion and congestive collapse of the alveoli."

Could you put that into language I can understand?

A. To put things into context, a baby's lung would be about

this size each, the whole lung (indicating).

Q. About the size of, what, a plum?

A. A plum, yes, maybe slightly bigger. The right lung has three lobes, so imagine this size (indicating) divided in three. The left lung has two lobes, so divided into two.

On microscopy, you cut through those lobes and you take a small piece of tissue, which is not thicker than maybe half a centimetre in thickness, and not bigger than this (indicating), so maybe a couple of centimetres. This is put in a plastic container, which is slightly bigger than 2 centimetres, and the sections we get after the processing you described are of the thickness of 4 microns. So divide the millimetres -- the thickness of our hair, okay? That thickness, of a hair. So that's what we look at in the microscope. It's that level of examination.

Capillaries are the very, very, very small vessels, the most distal part of our circulation. Those were seen by the pathology as markedly congested. So typically, you expect to see some of those capillaries full of blood, some empty. His assessment was that he saw more of the capillaries being full of blood rather than the proportion of empty and full of blood typically seen. That's the congestion of the capillaries.

"Congestive collapse of the alveoli." So the structure of the lung is -- if you imagine minute balloons within very, very small structures, that's where the air that we breathe goes from the larynx, the trachea and the bronchi into those small air spaces, small balloons that you can only see under the microscope; they're very, very small. Those are typically filled with air. When he says "congestive collapse of the alveoli", he says that instead of seeing them open like this (indicating), next to areas where the small capillaries were full of blood, he saw them collapsed. That's the description of what he saw.

The next line says:

"Foci of intra-alveolar haemorrhage is noted."

So he says that in those small spaces where one knows air should be, he saw blood, haemorrhage.

Q. Thank you. We go on then to:

"The alveolar ducts appeared dilated and contain squames, indicating amniotic fluid aspiration."

A. So the alveolar ducts is a descriptive term used as synonymous to the alveoli. Okay? So these air spaces have a cellular lining. They're called pneumocytes. When we look at lungs from dead babies we know that some of those pneumocytes will start disintegrating and collapsing into that empty space and they form squames,

that's what we call them, so flakes of tissue that doesn't really have a cellular component or a nuclear component that we can say, "Yes, this is a dead pneumocyte".

But also in babies we know that, in utero, the way the lung is growing is by the fluid within which the baby lives in the womb of his or her mother -- swallows/aspirates that fluid because that's the normal thing to do, that's how the lungs grow in utero. You need that. So some remnants of that is what Dr Shukla describes that he saw. And it's a normal thing to see in this setting. It's nothing.

Q. Then finally so far as this paragraph is concerned:

"There is no obvious meconium or inflammation."

Are we still talking about the lungs here?

A. We're still talking about the lungs. So he's making this comment to say -- so it's a normal process for the lung, for that fluid ending into the lungs, okay, in utero. But sometimes when babies get stressed in utero they discharge meconium. Meconium is the baby's stool. If the baby then aspirates that meconium because it's in the fluid, this could be used as a sign, not make the diagnosis, but it's a sign that the pathologist would need to assess if they see it, to say was this baby stressed in utero or not.

Inflammation is the body's response to external stressors, the most common in this setting being infection, so an infection either inside the womb or outside the womb. The pathologist tells us that he did not see any reaction to such a thing, so he has nothing to tell him that there had been any source of infection.

Q. Yes.

A. The other term is, "There are no viral inclusions". The last sentence. Viral infections in babies is a topic of interest in all perinatal and paediatric pathologists because we know that such infections can result to intrauterine death, so stillbirth, or early neonatal death. So we're trained and we meticulously always look for signs of such an infection, a viral infection.

There are two major categories of signs. One is whether you see viral inclusions, so the virus bodies themselves inside the cells, and he couldn't see those. The other way of testing for that, for looking for that on histology, is whether you see inflammatory response, the type of the response expected in viral infections. That type of response is different to what one sees in bacterial infections. One is characterised, the bacteria, by neutrophils, the other is characterised typically by lymphocytes, but he says he didn't see any inflammation, so that includes both bacterial and viral.

Q. Does that translate in simple terms then to no evidence of infection?
A. Yes.
Q. Could we move then, please, to your reports on [Baby A]? If you would confirm, please, I think they're in your binders. So far as [Baby A]'s case was concerned, were you initially approached by Cheshire Police late in 2017?
A. That's correct.
Q. Was the first report that you wrote dated 21 January 2019?
A. That's correct, yes.
Q. Were you provided further material in 2021, which I will list in a moment, and did you write a statement confirming what it was you had received?
A. That's correct.
Q. That's 20 October 2021. Then finally, did you write a very short statement dated 5 September 2022, dealing with some further information that you had received from the police?
A. That's correct.
Q. I'd like, if you would, please, for us to use your first report as the basis for your evidence to the jury, so the report dated 21 January 2019.
Were you told and did you reproduce in your report

the fact that [Baby A] was born on 7 June 2015 at 20.31 hours?

A. Yes. That was the information received, yes.

Q. And that he died the following day at 20.58 hours?

A. Yes.

Q. His gestational age at birth was 31 plus 2?

A. That's correct.

Q. His weight, 1,660 grams?

A. That's correct.

Q. So far as the material that you received from the police was concerned, did you list that in your report?

A. I did.

Q. The initial material you received, did it include a witness statement made by Dr Evans, dated 31 May 2018?

A. That's correct.

Q. A 331-page PDF document, which was in effect medical records from the Countess of Chester Hospital?

A. That's correct.

Q. And then quite a lot of photographs that were taken by the pathologist Dr Shukla, at the post-mortem examination?

A. That's correct.

Q. A list of the photographs can be provided, but in essence were you given or shown the photographs that Dr Shukla took at that examination?

A. Yes.
Q. Did you also receive 78 pages of paperwork relating to Dr Shukla's examination?
A. Yes.
Q. The coroner's records, which ran to 100 pages?
A. Yes.
Q. And also the 25 histology slides that had been compiled consequent on the initial post-mortem examination?
A. Yes.
Q. Together with 23 paraffin blocks?
A. Yes.
Q. What is a paraffin block in this context?
A. You'll remember when I said a piece of tissue is put in a cassette and it's transferred to the lab, where they take the small, the very thin sections and stain them. The tissue that is left from the thin section is retained in the lab in the form of a paraffin block. And people can go back if they see something and if they need to go deeper into the tissue or they need to do further tests, further stains, specific stains, they can always use those blocks. So that's standard practice.
Q. Later on, and I'm just looking at your report of 20 October 2021, did you receive another complete set of medical records for [Baby A]?
A. I did, yes.

Q. Did you receive the report of Professor Arthurs, dated 19 May 2020?
A. Yes.
Q. The report of Dr Bohin, dated 12 December 2020?
A. Yes.
Q. Four further statements made by Dr Evans, dated 7 November 2017, 24 March 2019, 24 June 2021 and 31 May 2018?
A. That's correct.
Q. A statement made by Professor Sally Kinsey, dated 4 March 2020?
A. Yes.
Q. Two further statements made by Professor Arthurs, dated 19 May 2020 and 25 January 2021?
A. Correct.
Q. Then a series of eight further statements made by Dr Bohin, all dated in 2021, various dates in April, June, July and indeed January 2021?
A. Yes, that's correct.
Q. Thank you. I want to go to the relevant findings or the findings that are relevant to your instructions and your response.

My Lord, I won't take long doing this, but I would like to go through some of this material just to remind the jury of the context of [Baby A]'s case.

MR JUSTICE GOSS: I was going to suggest that we did that in any event because it's a long time ago when we heard this evidence. We've heard an awful lot of other evidence since then, so let's just cast our minds back to [Baby A]'s case.

MR JOHNSON: Thank you. If Mr Murphy would help, please, by putting up the sequence for [Baby A], please.

Starting with tile 3, do we see that [Baby A] was born on 7 June at 20.31? If we click on the tile, please, we see the Apgar scores there for [Baby A]. Did you record, Dr Marnerides, the fact that [Baby A]'s mum had a known history of antiphospholipid syndrome and had been on long-term warfarin treatment because of the risk of blood clots, which was subsequently changed to a combination of different drugs including aspirin?

A. Yes, I recorded that.

Q. [Baby A] was born by C-section, as we can see recorded on that slide. His birth weight was as you have already told us, again recorded on that slide, and he was in poor condition initially but became stable following resuscitation. It says:

"Minimal spontaneous respiratory effort, albeit he has good tone, blue/pink."

I think you refer to CPAP in your report but you have revisited the records in this respect, is that

right, Dr Marnerides?

A. That's correct, yes.

Q. If we look at tile 84, for example, we can see that by the following morning, [Baby A] was on CPAP.

A. Yes.

Q. And that that continued, as we could see from tile 172, if anybody wanted to check that, at 8 pm that night.

If we can go to tile 134 next, please. If we click on that. Do we see here that the position of a UVC was being reported on by Dr MacCarrick from an X-ray at 14.28 on the afternoon of 8 June and we know, as a matter of fact, that that UVC was removed because it ended up in the portal vein. I think you refer to that in your report, don't you?

A. Yes.

Q. The portal vein, just to remind us, is where?

A. It's in the liver.

Q. Thank you. Was a second UVC inserted into [Baby A]'s belly button at 16.30, into the umbilicus, and that also ended up in the portal vein?

A. Yes.

Q. If we go to tile 154, please, do you refer next to the fact that Dr Harkness inserted a long line via the left antecubital fossa? And that's at 19.00 hours.

A. Yes.

Q. Do you refer next to what is our tile 185, which is [Baby A]'s sudden deterioration at 20.26 hours on 8 June? And do you refer in your report to the attendance of Dr Jayaram, who noted the absence of respiratory effort or heart sounds or pulse, that resuscitation was futile and that was discontinued at 20.58, which we can see on tile 221? Just click on that, please.

I think you record the fact that Dr Harkness had removed the long line following [Baby A]'s collapse, albeit the UVC was still in place; is that right?

A. That's correct, yes.

Q. Did you refer next to Dr Jayaram's description of discolouration, which had been observed on [Baby A]?

A. Yes.

Q. To remind us, we heard that evidence on Monday, 24 October last year.

Did you turn then, Dr Marnerides, to Dr Shukla's findings at the post-mortem examination?

A. I did.

Q. We've seen those summarised in the agreed facts that we've already run through. Did you also summarise Dr Evans' witness statement --

A. I did.

Q. -- which in effect reviewed the medical records?

A. That's correct.

Q. Thank you. I'd like to go to your paragraph 15, please. Having reviewed all that material, having reviewed the physical findings of Dr Shukla, and having looked at the slides, the histology slides of tissue taken from [Baby A], did you find anything unusual?

A. Yes.

Q. Let's take this slowly, if we can, please. From what part of the body, first of all, was the first unusual thing that you found?

A. The first unusual finding was from the lungs and I observed that on histology, so by looking at the sections under the microscope.

Q. So this is meat and drink and daily language to you, but the sections are the very thin slices, is that right --

A. Yes.

Q. -- taken from the samples of tissue from the lungs?

A. Yes.

Q. So they're in the paraffin block, they're then sliced very thinly -- 1 micron did you say?

A. Four. It's the width of our hair, one hair.

Q. Four microns thick on a slide?

A. Yes.

Q. And then put under a microscope?

A. Stained and then put under a microscope so we can see the structure.

Q. What is the purpose of staining in this context?
A. Because there's no other way, using light, that you can see the structures differently. That's the physics of how light and...
Q. Do various things react differently to a stain?
A. Yes.
Q. And so by staining the tissue, you in effect produce a contrast between different structures?
A. Yes, that's how you can observe them.
Q. This is so thin that if you put a light under it, you can see through it?
A. Yes.
Q. What did you see?
A. So in two of those sections -- and I refer to what sub-numbering they had on the sections I received -- I could see occasional, very occasional, relatively large spherical empty spaces or globules.
Q. I'm sorry to break this down, but "spherical empty spaces or globules", what does that mean, what are you seeing?
A. So structures that resemble a grape that has been cut through and you only see one surface of that cut, so round or roughly round structures. But I see them on two dimensions, so a section, not in three dimensions. Imagine a grape, cutting through it, and that surface

you get, looking on it from the top, that's a spherical structure.

Q. Where did you see those spherical empty spaces or globules?

A. Within the lumens of small -- of medium-sized veins. So the lungs, remember this big (indicating), cut on very thin layers. They have veins and arteries. And the veins -- you can tell the difference most of the times within an artery and a vein on the microscopic level. And those veins, imagine tubes, cut through them, you have a ring. So the inside of the ring is called the lumen. In those lumens, in the inside of the ring, the ring being the vein, on the inside of the ring I saw that cut surface that resembled the cut surface of a grape.

Q. If we think of a vein as being a tunnel, you're looking down the tunnel from end to end?

A. Yes.

Q. That view. And as you look down the tunnel, you see a round object in the tunnel?

A. Yes. But that's three-dimensional, I'm looking two dimensions. So I'm looking at a section like this (indicating) of the tunnel.

Q. Yes. And what was the significance of what you could see to your trained eye?

A. Those empty spaces, which meant that they stained for neither haematoxylin, which is the substance we use, or eosin, which is the other substance we use, had no colour, they were white.

Q. What does blood show up as in a vein if you stain it with haematoxylin or the other substance?

A. We stained the slide with both, haematoxylin and eosin. The blood will look red and you see red blood cells and you see the other cellular components of the blood, for example neutrophils, which have a different -- they have a bluish multi-lobulated nucleus and a red surrounding. You see lymphocytes, which have basically no surrounding but a very dark, round nucleus. You see the different structures. This was an empty structure, a white structure. And in practice, this can be two things: it can either be air or it can be fat. Okay?

Q. Yes.

A. Fat has a slightly different appearance from -- so the empty space we typically see when it's fat, it's different to the grape structure that I have described. It's much smaller, so it's not a grape, it's a small berry, if you compare the sizes, that has been cut. It's typically round rather than oval or spherical or multi-lobulated, that could be air. Plus when we see fat, we always look -- when we think it's fat and we see

something, a small globule and we think it's fat, we look for further evidence of fat embolism because that's when you expect to see fat.

When do we get fat embolus? We get it when we have a fractured bone. And when we have that, it's because small fragments of the bone will get into the circulation and go into the vessels.

When we see fat emboli, we will, with very careful observation, find next to those globules in other vessels or in capillaries, elements of bone marrow. In this case I didn't see the globules that I would expect to see if this was fat.

Q. So they were not typical of fat globules?

A. Yes, and I did not see the other elements of bone marrow embolism -- plus we had no fractures that would explain why we had these (inaudible).

Q. So what conclusion did you draw as to --

A. I need to say something else.

Q. Sorry, I beg your pardon.

A. So if these blocks were sent to me a decade ago, I would have requested from the lab to undertake a special stain, the single special stain we can on paraffin-embedded tissue called osmium stain, that specifically stains fat, and I would have excluded that possibility. However, it's a very toxic substance, labs

don't do it anymore, so we can't do that. What we do nowadays, not having the -- not being allowed to use that stain anymore, basically, because there are health risks for the lab staff, we take smaller pieces from the tissues of interest, routinely, we freeze them, and those can be stained with -- but it needs to be frozen tissue, which we didn't have here. It needs to be stained with a stain called Oil Red O and that will give us the answer whether indeed it's fat or not.

So from what I had, my conclusion was that this would more likely than not -- these spaces represent air.

Q. Yes.

A. I saw a similar thing in a section from the brain, in that I could see that the lumen was surrounded by blood, which tells me, but I cannot be 100% sure, I cannot be categoric, it tells me that most likely this bubble of air went there while this baby was alive because there is a response to that. And the response is the haemorrhage.

Q. So in the brain, air in the brain or gas in the brain?

A. That's how it looked.

Q. And there was a response to the air, which suggested that that air went to the brain in life?

A. Yes. However, I need to make it clear to this court and

to the jurors that those findings cannot be taken as an absolute proof.

Q. Yes.

A. They are in my eyes and my opinion suggestive, highly suggestive, but if I had no other history, no clinical information, no assessment by a clinician, and I only had those two findings, I would have said, "I cannot really tell you if it's air there and it's not an artefact explicable on the decomposition changes and all the artefacts we made".

Q. Does it come to this, that you cannot say, and you do not say, that your findings necessarily mean that there was an air embolism in this case?

A. That's correct.

Q. Would it be fair to say that one has to look at other evidence to make that determination, if there is any other evidence?

A. If there is any evidence, the pathologist needs to take that into account. We need to accept that a post-mortem examination is a snapshot, taken after the death of an individual, of the process of somebody dying. So to interpret the snapshot, sometimes we are able to say without any clinical information, "Yes, this is what I see, this is what happened", but in many cases, and that's the bread and butter of paediatric pathology, we

need the assessment of the course before that snapshot. If that assessment tells me that the findings indicate towards air embolus being the case, my findings would be consistent with that. But my findings on their own would not say yes it is.

Q. We've heard from Professor Arthurs, the radiologist, about gas getting into the circulation after death. Was there any evidence from what was seen at the post-mortem examination, the pathologist's examination, to suggest that decomposition likely played a part in any gas in the bloodstream?

A. No, there wasn't. It's highly unlikely.

Q. Highly unlikely. Why do you say that?

A. Because for decomposition to result in air into vessels, you need to have evidence of decomposition. This evidence of decomposition is typically visible to the naked eye, so you see decomposing bowels, you see a greenish discolouration of the abdomen. Most importantly, on histology, so looking under the microscope, the structures look autolysed and you can say, yes, there has been significant decomposition here or not; this was not the case here.

The other reason is that the brain -- there was a response to that finding that wouldn't -- the haemorrhage around that vessel. That wouldn't be

expected if that was due to decomposition. So although one cannot categorically say it wasn't, I think I would confidently say it's highly unlikely.

Q. There's one thing I have overlooked as we've gone through and that's the issue of a tamponade, which is to do with the long line perforating or agitating against the heart. You deal with this in your report, Dr Marnerides. Was there any evidence from the findings of the post-mortem examination that that played any part in [Baby A]'s death?

A. Can you direct me to where I deal with this?

Q. It's back from where we were, I'm afraid, it's your paragraph 13.

A. That's what Dr Evans assessed.

Q. Forget that then.

A. If there was evidence of tamponade at post-mortem, one would have seen haemorrhage into the sac that surrounds the heart; that's called the pericardium. One would have seen blood there. Dr Shukla did not see blood there and there was no such blood in the photographs.

Q. Yes. So what Dr Shukla recorded as the physical findings and what you have seen from the photographs do not support any suggestion that there was tamponade?

A. Yes.

Q. Thank you.

Can we go to the opinion section, please, of your report, Dr Marnerides. Was there any evidence of any natural disease in [Baby A] that could have contributed to his premature death?

A. My understanding from the clinical review is that there wasn't. From the pathology review, there is no evidence indicating to a natural disease. So overall, there is, in my opinion, no evidence that a natural disease would explain his death.

Q. So looking at the cause of [Baby A]'s death, what conclusion did you draw, please?

A. On the basis of the clinical information, the findings that I have explained and the caveats I have explained to this court in relation to how these findings can be interpreted, I took the view that the death would be explicable on the basis of air embolism.

Q. Thank you. And the means by which that air embolism came about, did you draw any conclusions from all the information?

A. From the information, it would appear this is injection, so insertion of air into a vascular access line.

MR JOHNSON: My Lord, that may be a good moment for a break.

MR JUSTICE GOSS: Yes. I'll just explain to the doctor.

Dr Marnerides, we have a break in the morning session, a ten-minute break by way of a comfort break,

just so that people can detach from the evidence for a few moments. We'll resume again, please, in 10 minutes' time. So you may leave the court, as long as you're back in 10 minutes and ready to continue. Thank you very much indeed.

(In the absence of the jury)

MR JUSTICE GOSS: Mr Murphy, there's an issue with an iPad. Number 1.

The defendant has left court but there's no prejudice here. Is it proposed that the cross-examination will be individual to each -- it'll be done as a piece at the end? Right, thank you.

(12.05 pm)

(A short break)

(12.15 pm)

(In the presence of the jury)

MR JOHNSON: Dr Marnerides, if we can go to agreed fact 21, we're moving to the case of [Baby C], please.

I just want to deal with the abdominal cavity, what's written here:

"All abdominal organs show normal anatomical position."

That speaks for itself. And then it says:

"The gallbladder, extra-hepatic biliary ducts and pancreas are normal. The stomach and all loops of bowel

and mesentery show a normal rotation pattern, apart from the descending colon, which crosses the mid-line into the right lower abdominal cavity. It connects to the sigmoid colon, which is in the normal position."

I just want to show you a picture that has been produced earlier in the case. It's D8, I believe. Thank you.

If we can try and translate what's on the page to what we can see in the picture, please, Dr Marnerides, with the benefit of your assistance.

A. Shall I try and explain?

Q. I'd be very grateful if you would.

A. Where my cursor is, that's where the stomach is (indicating). The next part is called the duodenum; that's the first segment of our small bowel. This continues into the abdomen. In the central part of our abdomen, roughly, is the small bowel, the loops of the small bowel; they are called jejunum, it's the part of the duodenum. The ileum is the distal part of the small bowel; this connects typically to the large bowel on the lower right-hand side part of our abdomen to the caecum, which is the first part of the large bowel or the colon, that's the other name. That's where many people may be familiar -- that's where the appendix is, so people may be familiar with that.

Q. Yes.

A. Then the colon has an upwards direction to turn. That turning point is called hepatic flexure because it turns at the level of the liver, which, to give you an understanding, if you put your right hand on the end of your ribs, that's where approximately your belly starts, that's where approximately this turn happens. That's where your liver is.

Then it goes on a transverse way in front of the stomach, so not entirely how it's shown in the photograph. It goes in front of the stomach. That's called the transverse colon. On the left-hand side of the abdomen, so this side on your body where the spleen is, it's called the splenic flexure, it turns downwards. The downwards-going part of the colon is called the descending colon. And around the level of where your umbilicus is, where your belly button is, on the left-hand side, slightly below that, the pattern that we see of the colon resembles the S letter -- that's why it's called the sigmoid because it resembles the S -- to come and meet the part of the colon which is the most distal part called the rectum, and that's where it connects with the anus and that's the opening of our colon.

Q. Right. So that's a description. What we see here

in the written word is that:

"[The abnormality] [the descending colon] crosses the midline into the right lower abdominal cavity and connects to the sigmoid colon, which is in the normal position."

So what is it -- what's the abnormal feature so far as [Baby C]'s case is concerned?

A. Abnormal in Dr Kokai's description. He doesn't really call it abnormal because it says everything is in normal anatomical position. He describes a deviation, probably, of the anatomy.

Q. Yes.

A. So I wouldn't use the term abnormal because he says everything is normal and I would agree that everything is normal. So what he describes is, if you look at my cursor, in some babies we can see this part of the colon (indicating) and the sigmoid, instead of going down and then forming an S or something that resembles an S, it comes like this (indicating) to the midline. So the midline is here (indicating). So the midline is the line from our head downwards through the umbilical -- through the umbilicus, so belly button. That's the midline.

So instead of being all the way on the left-hand side, you have the bowel forming something like this

(indicating) and then it continues downwards in a normal way.

Q. Yes.

A. You mentioned the term "abnormal".

Q. Yes.

A. I wouldn't agree that this is an abnormal finding, even if that was confirmed to be a true finding --

Q. Yes.

A. -- because we see it very often in babies. We see it in adults. The only complication this may have is a complication called volvulus. So because it has this course, the membrane that connects that to the walls of the abdomen, we all have that membrane, called the mesocolon, that's the name of the membrane, that membrane is larger because it has a larger distance from the wall to cover. This allows for the colon to twist around itself when we are digesting, for example. This twisting around itself is called volvulus. Complications of volvulus could be the baby or the adult starts to vomit or not producing any stool, they are in severe pain, they have a fever, and on naked eye examination you will see that bowel. I tend to say to my registrars, "If you miss a volvulus on naked eye, you should not be passing your exams". It's something you don't miss. It's obvious. Instead of having the normal

colour, it has the black colour. It's the colour of the screen. That black.

Q. Yes.

A. So you don't miss it.

Q. So anyone who -- a pathologist who misses a volvulus at a post-mortem examination is a failed pathologist?

A. They shouldn't have -- in my view, it's nothing, you shouldn't miss that. And in all fairness, it looks that nobody has missed that because the pathologist says it's normal -- and I didn't see any photographs that would suggest a volvulus. So if we are to accept that this description that Dr Kokai produced is correct then I don't see any problems with that. In the absence of a volvulus, I wouldn't call it abnormal.

Q. Thank you. Just reading on in the written word:

"The serosal cover is thin, shiny and translucent."

Is that a normal finding?

A. That's the normal description of a bowel.

Q. Serosal, what does that mean?

A. That's the outer surface.

Q. Of the bowel?

A. Of the bowel.

Q. The next two lines we can read for ourselves and understand, I'm sure, but then:

"The colon contains meconium."

Is there any significance in that finding in the context of someone suggesting that there was or might have been a volvulus?

A. Let me just refresh myself. How old was this baby when the baby died?

Q. I'll give you the exact dates: he died at almost 6 am on 14 June and he was born on the 10th, so he was 5 days old.

A. Okay. Meconium, as I mentioned earlier, is what we call the stool in utero. So at this stage you can see meconium but you can also see stool or you can see mixed, both meconium and stool, inside the colon. Should there have been a volvulus there, it wouldn't look like a meconium. To give you context, meconium has a slightly lighter green colour. I see a green bottle there with one of the jurors. Do you mind showing that?

It's slightly more open green, light green, than that, towards yellow. So that's the colour you see in a meconium. Thank you. A baby's stool typically is yellowish, brownish. Stool in the context of a volvulus is that black colour (indicating). So if he calls it meconium, it cannot be black, it cannot be volvulus.

Q. So inconsistent with volvulus?

A. Yes.

Q. All right. Can we go to your reports, please,

Dr Marnerides. Your first is dated 23 January 2019; is that correct?

A. Yes, that's correct.

Q. The second, of 20 October 2021, which follows a similar pattern to your reports in [Baby A] in that that was when you received a lot more material from other witnesses; is that right?

A. Yes.

Q. Then your third, 4 September 2022?

A. That's correct.

Q. Thank you. As before, I'd like to deal -- starting at the beginning, just deal with your instructions. So going back to your original report of 23 January 2019, please. You were instructed by or approached by Cheshire Police in November 2017; is that right?

A. That's correct.

Q. You were asked to examine the evidence relating to the death of [Baby C] and provide a statement addressing his cause of death; is that right?

A. That's correct.

Q. Initially, you were sent Dr Evans' report of 31 May 2018?

A. That's correct.

Q. Also the medical records; is that right?

A. Yes.

Q. Your item 4, digital photographs that had been taken at the post-mortem examination?
A. That's correct.
Q. A skeletal survey radiology report, which you have previously described to us, I believe; is that right?
A. Yes.
Q. The pathology paperwork, which in this case extended to 160 pages?
A. That's correct.
Q. Coroner's records consisting of 37 pages?
A. That's correct.
Q. And in this case, 27 histology slides from the post-mortem examination of [Baby C]?
A. That's correct.
Q. So far as those slides are concerned, are they broadly speaking the same type of material that you had received in the case of [Baby A]?
A. Yes, it's histology slides.
Q. Thank you. Just dealing with other material that you have received before coming to your final view, Dr Marnerides, and turning to your statement of 20 October 2021, did that further material consist of an updated version of [Baby C]'s medical record?
A. Yes.
Q. Professor Arthurs' report of 19 May 2020?

A. Yes.
Q. Dr Bohin's report of 12 December 2020?
A. That's correct.
Q. And four reports from Dr Evans: November 2017, May 2018, March 2019 and October 2020?
A. Yes.
Q. Together with a witness statement provided by Dr Katherine Davis, who was one of the treating physicians at Chester, and indeed Dr Kokai's witness statement concerning his examination of [Baby C]?
A. I can't see.
Q. Over the page, I think.
A. I don't have the other page.
Q. You haven't got the second page?
A. If it's been submitted to court, then that's --
Q. Yes. Well, it bears your signature.
A. Yes.
Q. Okay. Your initial examination or your initial view, I should say, was expressed in your report of 23 January 2019?
A. That's correct.
Q. It may be that you will be asked about this, but did you conclude at that stage that [Baby C] had died of natural causes in effect?
A. Yes, that was my initial conclusion back then. The

reasons were there was no clinical indication in the materials I had received. That was my understanding, that there may have been natural causes. There was evidence of a reasonably plausible cause of death from the post-mortem examination. And on that basis, my assessment was that it was natural causes.

Q. However, on receipt of the further information that we have just outlined, did your view change?

A. Not at that stage.

Q. No, but in your report of, I think, 4 September 2022?

A. Yes. So the materials you referred to earlier were -- the statement was 28 October 2021.

Q. You are correct.

A. So at that stage I still was of the same view.

Q. You are quite right. You set out in your report of 4 September a full list of material that by that stage you were taking into account; is that right?

A. Yes.

Q. Much of that information is what you had had earlier, but what had changed?

A. So what had changed then is that I had the benefit of the experts' meeting which took place, so experts from the prosecution and experts from the defence that were present in that meeting. I had the benefit of more written statements of the clinical assessment. I was

invited to revisit my view in light of these new statements, re-review the histology, and see whether I still had the same view or not.

Q. Yes.

A. As I explained earlier, that's what pathologists do. We interpret a snapshot on the basis of the information that we have. This is part of the process.

Q. Looking at page 8 of 16 of your report of 20 October, please, Dr Marnerides, did you mention specifically Dr Bohin's statement of 12 December, which you hadn't had when you produced a statement in January 2021, and Dr Bohin's statement of 15 October 2021, together with a further statement made by Dr Evans?

A. That's correct.

Q. When you were reviewing the case, or re-reviewing the case might be a more accurate way of putting it, did you take into account the following features? I'm looking at your paragraphs 2(a) through to (d). Can you tell the jury, please, what were the factors that you were taking into account?

A. So as I said earlier, on the histology examination there was evidence of acute pneumonia with acute lung injury on the histology from [Baby C]. So one can die from pneumonia but one can also die with pneumonia, so meaning not from pneumonia, but pneumonia was

a bystander there, that's not the cause of death.

The information I had led me to the conclusion that it's reasonably plausible that the baby died from pneumonia. Having received further clinical information indicating to me that, yes, the clinical assessment is that [Baby C] had pneumonia but clinically he was stable, he was responding to treatment and was giving no indication that collapse was imminent. So that's the clinical assessment.

A baby with pneumonia responding to treatment, this is the expertise of the neonatologist, the descriptions we pathologists receive from neonatologists, babies dying from pneumonia is a deterioration of a baby which is progressive and not responding to the treatment. This is not the presentation that I was informed at this stage that was the case in the case of [Baby C].

So the clinical assessment was: stable, responding to treatment, suddenly collapsed, not consistent from the clinical point of view that the baby could have died from his pneumonia, which changes completely what I needed to take into account in terms of what that histologically evident pneumonia and acute lung injury meant.

And there was an assessment of what the massive gastric dilatation that was observed -- so ballooning,

basically, of the stomach -- meant. So all these were taken into account, and having considered the reports by the radiologists, both from the defence and the prosecution, who agreed that there is the infection, the pneumonia, yes, we know that, but there is also massive gaseous dilatation of the stomach and the small bowel, so this part that I'm showing on the screen (indicating) -- do you see the screen?

This part was dilated like a balloon and all these loops were dilated. That's what the radiologists concluded. So lots of air in that.

Having heard the discussions at the meeting, having considered the potential explanations about how such a dilatation could have been caused, I reached my -- I revisited the cause of death I proposed and reached the conclusion I reached and it's noted in my report.

Q. Yes. So taking that information into account, did you go back -- I'm looking at your paragraph 6 -- to the digital photographs taken at the post-mortem examination?

A. Yes.

Q. What did the photographs or a photograph show?

A. The photographs showed a distended stomach -- so this part (indicating) dilated, distended -- and distended bowel loops. These loops were in this region

(indicating), in the left part in that photograph. And to a little extent were crossing the midline. So mostly distributed here (indicating) on the left-hand side of the abdomen.

Q. Was the colour that you could see of the bowel in the photographs of significance in this context?

A. Well, there was no dark red/black discolouration to suggest necrotising enterocolitis.

Q. Yes.

A. So on that basis, and from what I could see on the histology -- necrotising enterocolitis on histology is the bread and butter of a paediatric pathologist.

Q. Did you exclude NEC in this case?

A. Yes, I did exclude NEC. So one of the potential causes for this dilatation, I think, had been certainly excluded.

Q. Yes.

A. My understanding is that none of the experts regarded NEC as a possibility here. They also -- they agreed. So if we go back to the photograph and the description by Dr Kokai that we read earlier about what was actually crossing and what was distended or not, on the photographs you can't really say whether it's a small bowel or large bowel, so I need to take a different approach on understanding -- on whether I could confirm

the description was accurate or the view of the radiologists that were saying it's the small bowel that is dilated, not the large bowel crossing and so on, was correct. So that was the exercise I had to undertake.

Q. So you were looking at it as working out whether it was the small bowel dilated or whether it's the large bowel dilated?

A. Yes.

Q. And did you work through both possibilities --

A. Yes.

Q. -- and see where either possibility or both possibilities led you?

A. Yes.

Q. All right. So let's deal with the possibilities one by one as they might lead to different interpretations. What was the first possibility that you considered?

A. The first possibility that I considered was: are these dilated bowel loops small bowel loops? That would be in keeping because of the anatomy that I explained with the stomach being dilated.

Q. Okay. I'm sorry to stop you, but just so I can keep up with you. The small bowel is directly connected to the stomach?

A. Yes.

Q. And so that eventuality fits with the stomach being dilated on the basis that the air passes from the stomach immediately into the small bowel? Am I with you so far?
A. That's correct.
Q. So that's what you were looking to either confirm or refute; is that right?
A. Yes.
Q. You understood, and the jury has heard from Professor Arthurs, that his view was that it was the small bowel that we could see dilated in the radiographs?
A. Yes.
Q. So bearing that in mind as well, what did you then move on to --
A. I said, okay, let's examine this possibility being the truth. What are the potential explanations for that? So one is deliberate exogenous administration of air via the tube. That's one explanation.
Q. Yes.
A. The other explanation is necrotising enterocolitis. There was no evidence from the photographs, from the clinical history, from the histology.
Q. And you have excluded it?
A. And I have excluded it. The other explanation is what

had been proposed during the meeting as the CPAP belly.

Q. Yes.

A. So because the baby was on CPAP, that's why the bowels were dilated. I will revisit this possibility in a while. And there were other anatomical explanations like stenosis or atresia of the bowel that are congenital abnormalities that would have explained that. And there is no evidence either from the post-mortem from the photographs or from the radiology that there was such a stenosis or atresia. Atresia means a complete block of the lumen.

Q. So the tube is blocked?

A. The tube is blocked. And it continues like a tube but there's no connection between them. Stenosis means that it's narrower compared to what it should have been.

Q. So like an hourglass?

A. Sorry?

Q. Like an hourglass?

A. Yes, but that has a typical presentation on radiology and, again, paediatric pathologists are trained to look for them. From what I can see on the photographs I couldn't see anything suggesting. Dr Kokai said there was nothing of that form when he physically looked at the bowel.

Q. Okay. So that's --

A. That's possibility 1. And we parked the CPAP --
Q. Yes.
A. -- in possibility 1.
Q. So leave the CPAP to one side?
A. Yes. Possibility 2, the distended bowel segments represent sigmoid, so large bowel, and descending colon. So this part of the colon (indicating). Why did I say -- examine it in that form? Because of the description that we discussed earlier from Dr Kokai, that that part looked to him as if it was crossing the midline.
Q. Yes, all right.
A. Okay?
Q. So this is -- is this in -- sorry to stop you again, but is this -- and to be contrasted to the -- possibility number 1 was small bowel distended, this is possibility number 2, large bowel distended?
A. Yes.
Q. So the distended colon; yes?
A. Yes. And it's on the left side that I see it on the photographs. That's where I see the distended bowel loops. So I was thinking, could this distension correlate to that description?
Q. Yes.
A. And again, I had to make a logical approach of what that

meant. So you need to understand a mechanism, how air would be in the proximal aspect of a canal, so in the entry of a tunnel; that's the stomach. There is no dispute there's air in there. It's seen on photographs, it's seen at post-mortem examination, it's seen on radiology. And the proximal part of the small bowel, the duodenum, again there is no dispute on that.

Then there is no air in between and there is air on the distal part. That's what I had to explain, should this have been the case.

Q. Yes.

A. So I had to break that down, bearing in mind that would have been a very unusual distribution of air in a bowel to make logical sense. So what would explain this biphasic, if I call it this way, distribution of air in a bowel? It could be an infection that had a localised effect in the two areas, or disseminated infection, sepsis, that, for a weird and wonderful reason that I cannot explain, presented itself this way. There is no evidence of infection on histology, there's no evidence of infection, of sepsis on histology, and the clinical presentation was what I explained.

So I had to consider: what about that pneumonia? Would that pneumonia direct your thought that there is a systematic infection going on that could present like

that? So should that have been the case, one would expect some other findings. A body's response to a systematic infection rather than a localised infection would be either a systemic inflammatory response or a response with molecules that are in the blood called chemokines. Okay? So the part with chemokines and interleukins and all those molecules I cannot assess on post-mortem but the clinical indication that the baby was stable and responding to treatment makes this unlikely. So that's one mechanism part.

The other mechanism, the morphologically evident systemic inflammatory response to an infection I know is there in the body. What would pathologists look for? They would look for histological evidence of such a response in the liver. I'm more than happy to go into the details of those findings if you want me.

Q. Were they there?

A. They were not there.

Q. That may do.

A. So considering those possibilities, liver histology, bone marrow histology, spleen histology, capillaries of the other organs, was there any systemic inflammatory -- there was nothing there to suggest that this baby had a systemic response to the localised infection. So that possibility to explain the air presence in the bowel --

again, I had no findings to suggest it. I think I can reasonably exclude it.

Then we go to other finding, other conditions, like volvulus, twisting of the small bowel or twisting of the large bowel. I have explained previously why this cannot be a volvulus because the colour is normal, there is no twisting, there is nothing on histology.

The other possibility is a condition called Hirschsprung's disease, which is a condition where the nerves, small cells in the wall of the bowel, are absent, and it's typically the large bowel, so the distal part, the part of potential interest here. I looked under the microscope. The cells were there, so we cannot suggest Hirschsprung's disease in this.

So having considered all this, I came to the conclusion that most likely the description about the descending and sigmoid was imprecise and what we were looking at were dilated stomach and bowel.

Q. Which would be in keeping with the radiology?

A. Which would be in keeping with the radiology. And having excluded, as far as I could, all the proposed conditions, we have not discussed CPAP yet, barely.

Q. No, we haven't discussed post-mortem gas either.

A. Yes. Having not yet discussed CPAP and post-mortem decomposition, the distribution of air would be in

keeping with injection of air through the tube.

Q. Okay.

A. So CPAP --

Q. Can we deal with decomposition first? I'm sorry to divert you, but it may be more straightforward. I'm looking at your paragraph 8(b)(vi).

A. Yes.

Q. Can you exclude post-mortem decomposition as the source of the gas that was found?

A. Um... Highly, highly unlikely. The description of the bowel is that of a normal bowel. That's how it looks in post-mortem. There were no microscopic findings to suggest that decomposition was of any significance there. But most importantly, on the sampled segments of the bowel that I looked at, on histology, the mucosa, the inner surface of the bowel, not the outer surface, that's the first thing that will go into decomposition, looked normal. So yes, I think I can confidently exclude it instead of just saying highly unlikely, yes.

Q. All right. Having excluded all other possibilities, what about CPAP?

A. So CPAP -- and I need to express myself with caution here because I'm not the expert on how CPAP actually works in babies. My understanding is it's used in millions of babies and it's a safe procedure in neonatal

care units.

My understanding is that the clinicians felt that it is unlikely that CPAP would explain this dilatation. My experience as a pathologist dealing with neonates and dealing with neonatal care unit doctors discussing cases -- in my experience, from reading the literature and textbooks, and going back to the cases to see, I've never come across a description or a suggestion of CPAP belly accounting for arrest of a baby, nor have I been asked by any of my colleagues at St Thomas', "Could this be a possibility?" So I think it's fairly, highly unlikely that CPAP belly would explain this distribution of air.

Q. So as opposed to the possibility that somebody put air down the nasogastric tube and caused what was found -- I'm looking now at your (xi) -- were you left with what you regarded as a theoretical possible alternative?

A. Yes.

Q. What was that theoretical possible alternative to somebody putting air down the NGT?

A. That we had either a volvulus on two -- on the small bowel and the large bowel, that result -- that's why we didn't get the necrosis to see it, but the air remained trapped there.

Q. So something trapping the air, which resolved and left

the trapped air there, despite the fact it wasn't there to trap it?

A. Yes. That's a very theoretical possibility. I have never come across such a description. I have never seen it. I cannot think of a reasonably plausible mechanism, but I consider it as a theoretical possibility.

Q. All right. Theoretical possibilities apart, what was your opinion as to why it was that [Baby C] died when he did?

A. On the basis of what I have explained and the information, I think that the explanation for the sudden collapse in a background of his pneumonia was the excessive injection or infusion of air into the tube.

Q. Into the nasogastric tube?

A. Yes.

MR JOHNSON: My Lord, that may be a convenient point.

MR JUSTICE GOSS: Yes. That completes [Baby C]?

MR JOHNSON: Yes.

MR JUSTICE GOSS: Right. That's a good point to break off then, members of the jury. We will resume at 2 o'clock, please. Do, of course, remember your responsibilities as jurors: no discussion with anyone outside your number when you're all together and no research about anything to do with this case or anyone to do with it.

Thank you.

(1.00 pm)

(The short adjournment)

(2.00 pm)

MR JOHNSON: Dr Marnerides, can we turn to the case of [Baby D], please?

A. Yes.

Q. Starting with the agreed facts, as we have done before, we see that [Baby D] was born on 20 June. We have heard evidence that she died at 04.25 on 22 June.

So far as the factual summary is concerned, which the jury have of Dr McPartland's evidence, it is all in fairly straightforward language. If we go to where the heading "Lungs" appears at the bottom of the page. It says:

"There is a patchy acute pneumonia most prominent within one of the right lung samples with some hyaline membranes present, indicating diffuse alveolar danger."

Could you put that into more straightforward language for us, please?

A. Yes. So patchy means that the inflammation one observes, so the neutrophils that one sees are not in all the alveoli, so the air spaces of the lungs or all the air tubes, the airways that you can see on histology. But they have patchy distribution. So some have it, some do not have it. That's what patchy

inflammation means. Patchy (inaudible).

Q. Yes.

A. "Most prominent within the right lung samples."

Typically one would take one sample from each lobe of the right lung, so three samples in total from the right lung, two samples from the left lung. She says she could see these being more prominent. So patchy, but more alveoli and airways being involved in the samples from the right lung.

Hyaline membranes. So I need to explain a little bit how infection and the response to that infection, which is the inflammation, causes damage to the lung and reduces the exchange of oxygen, because that's ultimately where the pathology lies: we cannot exchange oxygen because of the inflammation.

One is the physical presence of the neutrophils there, they block the exchange. Two is, if you remember I discussed those cells that form the lining of the alveoli, the air spaces --

Q. I think we have got a picture, actually, which might just help. It was produced by Dr Kinsey. Do any of those help?

A. Yes, it may help. So as we look at this sketch, right side, left side, right lung has three lobes, left lung has two lobes. The distal aspect that we see on

histology -- imagine a section like this, flat surface, a section through those spaces that you see there, these are called the alveoli.

In these alveoli you see the neutrophils, which is the acute patchy pneumonia. Acute means not all the alveoli that one sees on the section are packed with those neutrophils, some are, some are not.

The inner lining of the -- the inside of the spaces, the alveoli, is lined by cells. Two types of cells, pneumocytes, type 1 and type 2, and some other cells there, not going to the details.

When there is injury to those cells and these cells die, plus some blood that is there, we see inside these something that is very pink and it forms -- it's like covering the inside of those spaces. Okay? It's like covering that. So the inside of these alveoli. That pink material, when it's well formed, and we see that here on those surfaces, on the inner surface of the alveolus, it's called a hyaline membrane.

So when you see those, this is evidence that not only there has been response to something, the infection in this instance, for example, but there has been some damage to the alveoli.

Q. Thank you. I think otherwise, unless anyone particularly wants me to deal with any of the remainder

of that section of the agreed facts, I will turn to your reports. I believe that everything else is straightforward.

So turning to your reports on [Baby D], please, Dr Marnerides, was your first report dated 22 January 2019?

A. Correct.

Q. Your second, 20 October 2021?

A. Correct.

Q. Your third, 22 October 2021?

A. Yes.

Q. And your third, 3 September 2022?

A. Yes.

Q. Thank you. I'll deal first, as before, with the material that you received, so going back to the first report, please, 22 January 2019.

Did that material include a witness statement from Dr Evans, dated 31 May 2018?

A. Correct.

Q. A binder of medical records running to 446 pages?

A. Correct.

Q. Lots of photographs from [Baby D]'s post-mortem, 32 in one bundle and three in another?

A. Correct.

Q. A further PDF document, which included 111 pages of

paperwork from the pathologist?

A. Correct.

Q. The coroner's record consisting of 157 pages?

A. Correct.

Q. And then some additional medical photographs from the Countess of Chester and 42 histology slides from the post-mortem undertaken by Dr McPartland?

A. Correct.

Q. Thank you. Just to give us the chronology for [Baby D], please, if Mr Murphy would help by putting the sequence on the screen. As I said earlier, [Baby D] was born on 20 June 2015.

Go to tile 7 and just click on it, please. We see she was born as an emergency C-section following premature rupture of the membranes and a failed induction of labour. She weighed 3.13 kilograms. She had satisfactory Apgar scores. She required rescue breaths at 12 minutes of age. She was taken to the neonatal unit.

Tile 8, please. At 19.30 her oxygen saturations were 48% and her respiratory effort was poor, so she was put in an incubator and given Neopuff assistance.

Tile 14. She received antibiotics at 20.00 hours. She was intubated slightly later, tile 35, please, by Dr Brunton, who we may remember is the Scottish

registrar at the time, who now works in Glasgow. That's at 21.45.

The following morning, on the 21st at 01.50 hours, she was stable on CPAP and seen by Dr Brunton, which is tile 69. The ET tube was removed, at tiles 105 and 107, at 09.00 hours the following morning, 21 June, and she was put on to CPAP at 10.30 that morning.

I think so far as your paragraph 12 is concerned, you have reviewed the medical records, which we have at tile 158, please.

A. May I...? I have not reviewed the medical records.

Q. Sorry.

A. I have extracted the information from the medical records and I state it in my reports because that's the job of the clinicians, to assess the medical records.

Q. Yes.

A. So I strictly followed my instructions, did a pathology review. So this, I extracted it from the report by Dr Evans that I received --

Q. Yes, thank you.

A. -- so I didn't go through the medical records.

Q. No, of course not.

At 21.10, you record the fact that [Baby D] had saturations, this is tile 174, of 100% on CPAP, without increased work of breathing or any signs of respiratory

distress.

At your paragraph 14 you note that -- and it's our tile 214 -- at 01.40 hours on the 22nd, Dr Brunton was called urgently to review [Baby D] and the nurses noted she had become extremely mottled and that there were tracking lesions, which were dark brown or black, going across her trunk, albeit there was no increased work of breathing or signs of respiratory distress.

Following on from that, other medical practitioners at the scene, so tile 218, for example Dr Newby, noted that whilst [Baby D] was saturating well on CPAP in air, there was a prolonged capillary refill time of 4 seconds in her feet, 3 seconds in her fingers, with two "bruised areas on her abdomen like evolving purpura", which at that stage it was thought was secondary to sepsis.

At 02.35 on the 22nd, tile 222, Dr Brunton recorded that [Baby D] was clinically much improved and that the areas of discolouration had completely disappeared.

At your paragraph 17, 03.15, Dr Brunton was again called to review [Baby D] -- this is tile 236 -- as she was very upset and crying and desaturated to 80% in 100% oxygen and the skin discolouration became more prominent but was not as obvious as it had been previously.

Tile 253. At 03.55 hours, on the 22nd, Dr Brunton noted that [Baby D] was struggling to saturate. By

tile 273, at 04.21 hours that morning, resuscitation was deemed futile, CPR was stopped, and at tile 276 [Baby D] was pronounced dead.

So that is the factual sequence as set out in your report; is that correct?

A. That's correct.

Q. Thank you. Before we get to your conclusions I'd just like to deal with further material that you have received along the way. This is set out in your report of 20 October 2021.

Did you receive a full copy of [Baby D]'s medical records, RM/8, and statements made by Professor Arthurs on 19 May 2020?

A. Yes.

Q. Dr Bohin, 3 December 2020. A couple of statements from Dr Evans, albeit one was one you'd seen before, but the other was 7/11/17. And a witness statement made by Nurse Caroline Oakley. Is that right?

A. Yes.

Q. I'm going back to paragraph 20 now, please, of your initial report of 22 January. Were you sent the post-mortem skeletal survey, so the full body X-rays that had been carried out at post-mortem?

A. I'm referring to the report?

Q. Yes.

A. Yes.
Q. And did you set out what had been found in that report?
A. Yes.
Q. Thank you. We have dealt with Dr McPartland's report insofar as it's relevant in the context of the written material that the jury have under paragraph 22 of the agreed facts. You set out in summary form Dr Evans' report that you had been sent at that stage; is that correct?
A. Yes.
Q. Do you then, at your paragraph 24, deal with the post-mortem radiology?
A. Findings.
Q. Yes.
A. Yes.
Q. In this context what did you believe was significant of the post-mortem radiology?
A. I felt that it could be significant, the presence of air in the aorta. That's what I felt was the significant part here.
Q. I think you now know that the evidence that was given by Professor Arthurs was that he couldn't differentiate between air in the aorta and air in the inferior vena cava.
A. Yes.

Q. Does that make a difference at all so far as you are concerned?
A. As far as I am concerned, there is evidence that there is air in an intra-abdominal vessel, a large intra-abdominal vessel.
Q. All right. I think one of the other features that was picked out on the radiograph was a small amount of intravascular air around the tip of the catheter; is that right?
A. Yes, that's correct.
Q. This is a question I asked you in the context of a different case, but one of the explanations for air being in the great vessels potentially is decomposition --
A. Yes.
Q. -- is that right? And so far as [Baby D]'s case was concerned, from what you saw in terms of the photographs taken at the time, was there any overt evidence of decomposition?
A. No. Let me expand a little bit on this.
Q. Could you keep your voice up a little?
A. No, there was no evidence of decomposition being of pertinence here. I note that [Baby D] died on the 22nd, early hours in the morning. The post-mortem was done the following day. It's not enough time for

such -- for gaseous production to start.

Q. Let's deal with the timings then because I don't think we actually have this -- we don't have the second time in evidence. The first time is the time of death, which we have established was 04.25 on 22 June.

A. Yes.

Q. The time at which Dr McPartland's examination began was at 11.15 on 23 June; is that right?

A. Yes.

Q. Okay.

A. That's in the folder you --

Q. Yes.

A. So next day is not enough time for post-mortem decomposition to evolve yet so you get gaseous production. From the examination of the photographs, there is no evidence of decomposition being there, and from the histology, there is no such evidence. So I think, again, attributing to decomposition the presence of intravascular air is highly unlikely. I think it's -- I would confidently exclude this as a possibility in this case.

Q. Understanding as you now do that the radiology can't distinguish between the aorta and the inferior vena cava, is there any further assistance you can give us as to the presentation of the gas in whichever of

those vessels it was?

A. I'm not a radiology expert, I will defer to the opinion of the experts in radiology in regards of how easy it is to identify which vessels it was. From the pathology point of view, the important thing is that there was air visible radiologically in the vessel.

Q. Now, in the context of the suggestion that [Baby D] died as a result of an air embolism, was there any evidence you could identify from the perspective of your specialty which either supported or refuted that suggestion?

A. No. I couldn't see findings like the air bubbles that I discussed in a previous case. I couldn't see this.

Q. Moving to your opinion, please, Dr Marnerides. This is the paragraph that follows your numbered paragraph 25. What opinion or what conclusion did you draw as to whether or not there was any natural disease in [Baby D] which caused her death?

A. So the natural disease that was present was the pneumonia with the acute lung injury. As I explained in the previous case, one can die from pneumonia, one can die with pneumonia. To make the assessment whether one died from pneumonia, you need the course of events being assessed by the clinicians and see whether this was a baby that was unwell, dying from their pneumonia or whether the pneumonia was something that they die with

instead of dying from.

Q. Yes.

A. From the clinical assessment I had, my understanding was that this baby did not die from the pneumonia, the clinical assessment was that the baby died with pneumonia.

Q. What about the fact that you were unable to find overt evidence of air embolism?

A. I cannot, on the basis of not identifying air bubbles on histology, from the pathology point of view, say that I can refute the clinical suggestion of this being the likely explanation for the cause of death. I cannot prove it and we know that this is the nature of this beast. We know that post-mortem identifying air either using methods that cannot be used in mortuaries with respirometers is not reliable. If you see air bubbles on histology, that is something in keeping. If you don't see them, you can't say that's not the case. So you need the clinical information and the clinical assessment.

Q. Yes. So what conclusions did you draw so far as the cause of --

A. The conclusion is that the infection that was there, which appears to be a congenital infection, so explicable on the basis of the premature rupture of the

membranes, would not sufficiently explain the death. And in my opinion, it does not explain the death because I have taken into account the clinical assessment. There is no other natural disease that has been brought to the attention of this case by the clinical review that could explain death. There is no other morphologically evident natural disease from the post-mortem examination. So my view is that this baby died with the pneumonia in terms of natural diseases rather than dying from the pneumonia.

So in terms of unnatural causes, my findings -- the findings of the post-mortem examination, my findings from the review of the histology cannot positively confirm it, but cannot refute it either. The findings that can confirm it are the findings of the radiology and the findings -- and the assessment by the clinicians and that's how I came to the conclusion in relation to the cause of death here.

Q. Yes. What was that conclusion?

A. I think the likely explanation of this baby dying is air embolism.

Q. And is that by the same means?

A. By the same means, yes: injection of air into a vascular access line.

Q. But that is based on your assessment of the clinical and

radiological evidence rather than --

A. It's based on the co-assessment of the clinical radiological views with the findings of the post-mortem and my findings.

Q. In other words, no other evidence of disease which could account for this premature death?

A. I couldn't identify it.

Q. Thank you. Can we move to the case of [Baby E], next, please. To find him mentioned in the agreed facts we have to go right to the end to paragraph 25. We see --

A. I have up to 24. I don't have 25.

Q. Do you not? Right. I don't know how that's happened. I'll just remind us all of paragraph 25. It says:

"[Redacted]."

I think you were asked to review the evidence in [Baby E]'s case, is that right, Dr Marnerides?

A. I was, yes.

Q. And you did complete several reports, one dated 23 January 2019, a further one 20 October 2021, and then 11 September 2022.

A. That's correct.

Q. It may be that we can cut a long story short so far as your contribution is concerned. On reviewing the evidence, in the absence of there being a post-mortem

examination by a pathologist, were you essentially unable to assist in the determination of the precise cause of [Baby E]'s death?

A. What I would say is that I cannot bring into this court any further knowledge other than what has been said by the clinical experts --

Q. Yes.

A. -- so I will defer to their view.

Q. Thank you very much.

MR JUSTICE GOSS: You have no pathology, there was no post-mortem?

A. No, there wasn't.

MR JUSTICE GOSS: And as you've been very clear, you have simply reached conclusions on the pathological evidence and where you take into account clinical evidence, you say so? And here you didn't have any pathological evidence.

A. Yes, I cannot make an assessment without pathological evidence. I can make an assessment of the clinical assessment if I have pathological evidence.

MR JUSTICE GOSS: Yes.

A. Correct.

MR JOHNSON: Thank you, doctor.

Can we move to [Baby I] then, please. Just starting with the agreed facts that were read this

morning, they establish that Dr Kokai conducted a post-mortem examination of [Baby I]'s body at 14.30 on 26 October. We will remember that [Baby I] died on 23 October, so 3 days earlier. There was a report by Dr Kokai, so there's nothing that I will ask you to explain from that.

Can we move to your reports then, please?

A. Yes.

Q. Was the first dated 28 January 2019?

A. That's correct.

Q. Was the second dated 20 October 2021?

A. Yes, that's correct.

Q. Was the third dated 22 October 2021?

A. Yes.

Q. Was there a very short supplementary report, which probably isn't relevant to your opinion, dated 5 September 2022?

A. That's correct.

Q. Thank you.

Can we start, as we have in other cases, with the material that you received, please. I'm going to that section of your original report of 28 January.

With your letter of instruction, did you receive Dr Evans' statement of 31 May 2018?

A. Not with the letter of instruction.

Q. Well, separate to.
A. Yes.
Q. I beg your pardon. Also, 1,926 pages of medical records relating to [Baby I]?
A. Yes.
Q. A radiology report containing the post-mortem skeletal survey on [Baby I], dated 26 October 2015?
A. That's correct.
Q. Some 52 pages' worth of laboratory results containing laboratory investigation results related to [Baby I]?
A. Correct.
Q. 22 pages of pathology paperwork concerning [Baby I]?
A. Correct.
Q. Two bundles of photographs in JPEG format, one a bundle of 11, taken at the post-mortem at Alder Hey?
A. Correct.
Q. And another 16 X-rays from the Countess of Chester?
A. That's correct.
Q. Were you also sent 89 pages of medical records from Arrowe Park Hospital, together with 80 pages of coroner's records?
A. Correct.
Q. Thank you. The additional material that you were sent is set out in your report of 20 October 2021. Did that consist, so far as medical records were concerned, of

a new bundle of medical records relating to [Baby I]?

A. Sorry, where?

Q. It's your report of 20 October 2021, page 4 of that report. There's a table with the material in, 20/10/21.

A. Yes.

Q. So far as expert reports were concerned, did you receive two from Professor Arthurs, the first dated 19 May and the second, 21 July, both 2020? And Dr Bohin's report of 12 December 2020 and Dr Evans' reports in addition to the one you'd already had, dated 8 November 2017 and 25 March 2019? Were you also sent witness statements made by Dr Rachel Chang and two nurses by the name of Yvonne Griffiths and Ashleigh Hudson, together with a single page from [Baby I]'s medical records?

A. That's correct.

Q. Thank you very much. If we go back to your original report then, please, Dr Marnerides. Did you summarise [Baby I]'s short life in the response to your instructions section of your report?

A. Yes.

Q. We'll just deal with this if we may, just to remind us, so if we look at the [Baby I] sequence of events, please. I think it's the first sequence. We may have the wrong sequence up. There are, of course, four sequences of events.

At tile 2, [Baby I]'s birth at 27 weeks' gestation on 7 August 2015 and her birth weight of 960 grams. Did you then record her movement between the Liverpool Women's Hospital and the Countess of Chester Hospital between 18 August from Liverpool to Chester; on 6 September from Chester to Liverpool; on 13 September from Liverpool to Chester; on 15 October from Chester to Arrowe Park; then on 17 October from Arrowe Park to Chester where, as I have already said, she died at 02.30 hours on 23 October?

Did you reproduce material that was contained in the report that we have referred to from Dr Evans concerning the collapses that [Baby I] had suffered on various dates?

A. I did.

Q. The dates were 23 August, 5 September, 30 September, which is the event that the jury have in the first sequence of events, 13 October, which the jury may recall was the collapse in nursery 2 when Ashleigh Hudson was present. That's in the sequence of events number 2. There is one on the morning of 14 October, which is in sequence of events 3. Then in sequence of events 4, the final and fatal collapse on 23 October.

Did you also receive the post-mortem skeletal survey relating to [Baby I], which you've set out in that section

of your report as well?

A. Yes, I received the report.

Q. The report. Did you there -- or did you reproduce in your report from that report the fact that were foci of air projected within the skull vault that had been assumed to be a post-mortem finding?

A. Yes.

Q. Do you also reproduce other findings from that report?

A. Oh yes.

Q. So far as histology was concerned -- I'm now looking further down what's the same page in my version of your report, it has a 7 in front of it and it's under the material from the post-mortem examination, Dr Kokai's examination. Do you have that there? It's in your report. You may have gone too far. The trouble I have in directing you to the specific part, doctor, is that the print of mine is different. The content is the same but the way it's formatted is different.

A. So number 7, you said?

Q. Yes. It's in your -- so far as your report is concerned, you set out [Baby I]'s movements. You set out the findings in the skeletal survey. You then go to Dr Kokai's findings --

A. Yes.

Q. -- from the post-mortem. Under section 7 of that part

of your report you summarise the histology as reported by Dr Kokai.

A. That's correct.

Q. What did the histology show, so these slides that you have told us about?

A. So we need to make it clear to the court that I had not received the histology slides --

Q. Right.

A. -- and I have not reviewed the histology slides --

Q. Yes.

A. -- so I'm relying on the observations of the pathologist.

Q. Yes.

A. The explanation for not receiving the slides is given by the Coroner for the County of Cheshire, it's point 11 of my report, and it says that they have been disposed of after the end of the inquest, basically.

Q. You're just dropping your voice a little.

MR JUSTICE GOSS: I was going to say. You've been speaking a lot today. You've got plenty of water there to keep going.

So in short, by the time you became involved, they had been disposed of?

A. Exactly.

MR JUSTICE GOSS: So you weren't able to look at them.

A. Yes.

MR JUSTICE GOSS: So you're entirely relying on what Dr Kokai has reported?

A. Exactly, that's correct.

MR JOHNSON: So could you summarise for us the report of the histology?

A. The histology said that there was:

"Early stage of chronic lung disease (due to immaturity and prolonged ventilation) without inflammation or recent bleeding. Foci of earlier ischaemic damage of the myocardium. Multi-focal resolving ischaemic hypoxic damage to the white matter of brain (early periventricular encephalomalacia) without associated acute recent ischaemic neural damage. Abdominal organs showed non-specific changes only without signs of necrotising enterocolitis."

Q. This is a case where there were no signs at the post-mortem of NEC?

A. Yes.

Q. So far as the other histological findings were concerned, what, if anything, do they tell us?

A. They tell us that this baby had nothing occurring acutely shortly before the baby died.

Q. Okay. So "acutely" in a medical sense means what?

A. I am not going to answer generally in a medical sense.

I'm going to answer what pathologists mean when they say "acutely".

Q. Yes.

A. So when pathologists use the word "acutely", they mean that they have features that they can see on morphology.

Q. What's morphology?

A. So on looking at the organs or looking at the slides, that tells them that this change that is now visible developed within a short period of time. Typically, acute when used by pathologists means the 24 hours before death.

Q. Okay.

MR JUSTICE GOSS: So is acute used in that sense as opposed to chronic, which means ongoing?

A. Yes. Chronic means it could be 2 days, 3 days, 10 days, weeks.

MR JOHNSON: So early stages or stage of chronic lung disease in the context you've described. And "foci of earlier ischaemic damage of the myocardium"?

A. Shall I explain?

Q. Yes, please.

A. Chronic lung disease is something perinatal pathologists are very familiar with because they see often babies that die after being some time in the ventilator or for whatever other reasons they might have developed chronic

lung disease. On this occasion, what is very important is that there is no inflammation, which would have said there is an infection going on in the background of that chronic lung disease that may be the explanation for why the baby died.

And there is no recent bleeding, which would have been something very acute, as we all can understand, a bleeding.

Q. Yes.

A. The other finding, foci, so small areas, that's what foci means, of earlier ischaemic damage of the myocardium. So when a baby, for whatever reason, or an adult for whatever reason, drops either the blood supply to the heart or the oxygen supply to the heart, there is a chance that you will have small foci, small areas, of the myocardium there dying. Like the way we get an infarction in the heart and people die in adults.

So what he says is that he saw areas of such foci that were not acute and he knows that they were not acute because they were fibrotic. For fibrosis to develop, that takes time.

Q. Is it a healing process?

A. It's a healing process, yes.

Q. You said infarction of the heart. Again, could you put that in language that people like me can understand?

A. Yes. So infarction of the heart is a segment, a large segment rather than a focus of the heart, a good 2, 3, 4 centimetres of the heart dying. That's the infarction.

Q. In a child of this age's heart, is it that big an area or...?

A. Acute infarctions in babies of this age, I have never seen a description. I've seen foci of recent ischaemia.

Q. Anyway, it doesn't apply?

A. It doesn't really apply. An infarction of the heart doesn't really apply in the paediatric -- in the neonatal --

Q. So I think I've sent us off on a wild goose chase there. "Foci of early ischaemic damage of the myocardium", what does that actually mean then?

A. It means that for some reason there was reduced either blood flow or oxygen to that small area of the heart, causing a small area of the myocytes, so the cells of the heart, there dying, and in response to that one developed fibrosis, which is the healing. The same way when we -- let's say somebody has a superficial scratch on their hand, most of us are familiar with this, it makes a crust and then there is a very fine line that one can see. That very fine line is the result of fibrosis being visible to the naked eye. Imagine

something like that on the heart of a small baby but much smaller because you can't see it with naked eye, you can only see it under the microscope.

Q. Okay. Then:

"Multi-focal resolving ischaemic hypoxic damage to the white matter of the brain."

What is that, please?

A. It'll take some time to explain that. We have the brain. The brain has two hemispheres and the part that is at the back is called the cerebellum. Inside the brain we've got empty spaces that are called ventricles and those spaces are responsible for the fluid that is being produced and circulates and protects the brain.

In premature babies, especially when they have been born in the context of hypoxia related to the delivery or in utero hypoxia or infection around the time of delivery, you have reduced either blood flow or oxygen supply, in most cases in babies it's a reduced oxygen supply to the brain, which results in areas of the brain dying.

So the very acute changes one can see are the so-called hypoxic neurons that we see in specific areas of the brain and for those to be visible you need -- depending on the textbook one chooses to rely on, some

textbooks will say 2 to 6 hours, some will say 4 to 6 hours from the onset of hypoxia. So you have hypoxia, you need 2 to 4 -- sorry, 4 to 6 or 2 to 6 hours for that very early change to become visible. If the baby dies that the point, you see it. If the baby dies before, you don't see it.

If the baby survives from the onset of hypoxia, the changes because of the reduced oxygen supply evolve. And in the evolvement of that hypoxia you have changes around these ventricles that are inside the brain and it's basically areas, small areas, which may become bigger later on if the baby survives, and that's what we see in babies that have cerebral palsy, for example, and live.

You have areas where the baby's brains, small areas where the parenchyma is dead and that, when the time goes on, will become something like a cyst and that cyst may be filled with water -- sorry, with fluid, cerebrospinal fluid, and remain like this. So that's the natural development of the hypoxic ischaemic brain injury.

What this doctor described is changes around the ventricles that tells us that there has been a hypoxic ischaemic event to this brain weeks ago.

Q. By weeks, inevitably from the lawyer comes a question,

how many weeks?

A. That can only be judged on the clinical information. From the pathology point of view it could be anywhere from 1 week, because that's the earliest you can see that, up to many weeks.

Q. Okay. So fairly non-specific but more than a week?

A. More specific -- non-specific in isolation in terms of timing it. In the context of clinical information, one can make an assessment.

Q. Yes, and in general terms what would be the clinical consequences of that type of an injury? So how would that injury or that event, which then causes the injury to become visible, how does that injury impact on the behaviour of the child?

A. That's a very unpredictable -- it depends on how the injury evolves. Let's say we have a baby that is born prematurely, they have corioamnionitis, the baby is born with congenital problems, pneumonia, they have developed hypoxia, they baby has a hypoxic ischaemic brain injury, the baby survives, leaves the hospital. The baby can leave the hospital with only the small cysts and live a normal life. The baby can, if the damage is greater, develop cerebral palsy.

Q. Sorry, it's probably my question. What I meant was, if an event happens that causes that injury, what happens

to the child at the point of the event happening? How does that injury manifest itself in terms of how the baby at that time behaves?

A. That's a question for the clinicians, not for a pathologist.

Q. Okay.

MR JUSTICE GOSS: Sorry, can you just confirm, hypoxia itself, hypoxia is a result of what?

A. Reduction of oxygen supply. Ischaemia is reduction of blood supply and because when you have reduction of blood supply, you will have reduction of oxygen supply. That's why we typically group them together. So we cannot necessarily say that the reduction of oxygen was because not enough blood was going there, it could be that the blood was going there but it wasn't carrying enough oxygen. That's why we put the two terms together.

MR JUSTICE GOSS: The blood carries the oxygen?

A. Yes.

MR JUSTICE GOSS: Therefore it's either because the blood is not getting there or oxygenated blood is not getting there; is that right?

A. Not enough oxygenated blood, yes.

MR JOHNSON: From your review of the photographs that you were sent from Dr Kokai's post-mortem examination, what

conclusions did you reach, please? Section 7, I think.

A. I could not see any traumatic injuries.

Q. What is a traumatic injury?

A. So a stab wound, a wound from a bullet, bruises. I couldn't see things like that. I couldn't see facial dysmorphic features or abnormalities of the external -- visible externally. So the ears were where they were supposed to be, the eyes were where they were supposed to be and so on, as I explained in a previous case.

The organs that I could see from the photographs showed normal structure. The segments of bowel that I could see in the photographs were very dilated, apparently because of the presence of air. And other than that, I couldn't see any abnormality.

Q. So the one unusual finding is a markedly dilated bowel?

A. Yes.

Q. Which, to you, appeared to be due to air within the bowel; is that right?

A. Yes.

Q. But no other identifiable abnormality of the bowel. In that context what are you hinting at?

A. I was looking at naked eye visible features that the bowel had evidence of necrotising enterocolitis. So I was looking, is the colour of the bowel black or is it the normal colour that we usually see? Is there any

evidence of volvulus, twisting? I couldn't see anything like that. Any evidence of stenosis? It looked dilated, so that's not -- at least from what I could see in the photographs.

Atresia, it's definitely not the case because if there had been an atresia of the bowel that would have been picked up in so many hospitals and so many doctors that have looked at the baby. If a baby's atresic, simply there is no stool coming out. They would have picked that up.

Q. Yes. [Baby I] lived for quite a long time in the context of this case anyway.

So moving on to your opinion then, please, Dr Marnerides, in the case of [Baby I]. What conclusion did you draw, first of all, so far as the possibility that [Baby I] had died a natural death?

A. I was very sceptical. I think these were brought into question on the basis of my observation and interpreting what the pathologists have reported in their reports.

So to attribute a death to the morphological findings, you need to be able to understand a mechanism or have something that tells you that, yes, something happened that I can identify on histology within the period before death that is linked to the chronic changes that I see that can be explained due to the

natural causes, due to the reason, day 1, the baby was at the hospital.

So this chain I could not follow in this case. The important factor was that the hypoxic ischaemic brain injury that Dr Kokai was describing could not be, on the basis of the clinical review, corresponding to her birth. So something at a different point occurred that resulted to that hypoxia. The CT scans around that collapse, the first collapse she had, if this was a brain injury that occurred around the time of her delivery they would have picked much more advanced changes rather than the small haemorrhages that they have picked. So the starting point of this hypoxic ischaemic brain injury that we see cannot be tracked down to the point of delivery. That's one.

Q. So at some stage after birth she had sustained this brain injury?

A. Yes.

Q. Then looking at the collapses of 30 September and 13 October, what conclusions, in the light of all the evidence that you had, did you draw so far as they were concerned?

A. Sorry, I...

Q. It's in your opinion section. You then have a section A and you then have numbered paragraphs, 1, which is long,

2 and 3, which are quite short. Then towards the end of 3, just before 4, what conclusions did you draw relating to -- well, it is paragraph 3, in fact -- to [Baby I]'s collapses on 30 September and 13 October?

A. I would consider it entirely reasonable on the basis of the clinical review, and for the reasons I explained previously in relation to the brain injury, that those collapses would be more likely due to infusion of air into her stomach and bowel.

Q. Was there any evidence that you could see at the post-mortem that revealed morphological evidence of some sort of natural disease which would account for excessive air being identified in [Baby I]'s GI tract?

A. No, I couldn't identify.

Q. From your perspective, from the pathological perspective, how does excessive air in the stomach cause a collapse?

A. We cannot morphologically prove it, but the two proposed mechanisms in the literature that are entirely reasonable, and they make sense on the physiology and pathophysiology of the human body we observe in the living, is that you have either a splinting of the diaphragm -- so the diaphragm should normally work when we breathe like this (indicating). If an over-distension causes a splinting because of the air

pushing it up, the lungs cannot work. That's one mechanism.

The other mechanism is because of where the stomach is located and how the nerves go down, there is a nerve called the vagus nerve. So you can have stimulation, because of the pressure against it, of that nerve resulting in cardiac arrest.

Q. So the vagal nerve runs from where to where?

A. It runs from the brain down to the organs of the abdomen.

Q. Okay. How does stimulation of the vagal nerve -- does it run in a straight line or something approximating a straight line?

A. I think we will need at least a day to go through the vagal nerve stimuli.

Q. Forget that. How does inflation of the stomach --

A. To put it as simply as possible, the vagal nerve is one of the nerves that helps us eat and digest food. We are all familiar with our -- when we have eaten and we are digesting, especially when we have eaten a lot, we have this feeling of being tired and trying to digest, the feeling of heavy. That's because the vagal nerve tells the brain: make your bowels work so they can digest. That system works so they can digest.

So if you have lots of air infused into the bowel,

the meaning is: no, stop now, we need to digest this. And if it's an over-stimulation, you can have a cardiac arrest. It's a very simplistic way of explaining it, but this is more or less how it happens.

Q. Yes. All right. So, so far as [Baby I]'s fatal collapse was concerned, so at the cusp of midnight of the 22nd into 23 October, and culminating in her death shortly afterwards, first of all was there any evidence identifiable at the post-mortem examination which would support a suggestion that she had any disease or other issue that would have caused that, other innocent issue that would have caused that?

A. So the findings at the snapshot we have, the post-mortem examination, from what Dr Kokai says, is the findings of previous brain injury, so the question we need to ask is: would that account for a sudden deterioration? We have no morphological evidence from the histology according to Dr Kokai to tell us, oh yes, there is an acute event some hours before her death that we can see. There is no haemorrhage, there is no inflammation there. So from the morphology of the brain we cannot explain it. Whether the function of the brain can explain it, I will defer to my clinical colleagues, which will comment on how neurologically the baby was. My understanding is they had no concerns in regards to

that.

The other finding is the finding from the lung, the chronic lung disease. Again, my understanding from the clinical investigation, the clinical opinion, is that there was no natural disease reason for that function to have deteriorated, so there was no clinically suspected infection, and on the histology Dr Kokai could not identify something like that.

So the co-assessment tells me that I cannot explain the sudden deterioration and collapse on the findings from the brain, I cannot explain on the findings from the lung. What about the findings from the heart, those small patches of fibrosis? So this could have been what we call in medicine arrhythmogenic. So they could have caused called arrhythmias, a very good cause for somebody to collapse suddenly. However, this would have caused arrhythmia -- if they were distributed, more likely to have caused arrhythmia that becomes fatal if they were distributed in the conduction system of the heart, so close to the sinuses that control the heart rhythm or close to the bundle of His in the septum between the ventricles, for example, that would allow one to say, yes, this morphology would fit with erythema.

So the description I have doesn't say something like

this. It doesn't tell me where the samples were taken from in the heart. So one has to -- and I have nothing that tells me the heart acutely died, so recent ischaemia, which would be a new superimposed cause for erythema. But the most important evidence from that comes from the monitoring of the baby in the neonatal care units. If those were arrhythmogenic they would have -- they have been there for some time because they are fibrotic and they would have shown their teeth during the baby's life.

It would be exceptionally unlikely, in my view, that a fibrotic lesion which is detectable only on histology and does not sit in the areas where the conduction system is would have produced a fatal arrhythmia in a baby after so many months being in a hospital only at that point in time. So I cannot be convinced that those can sufficiently explain the death.

Q. So it's an old injury because of the healing, the fibrosis?

A. Yes.

Q. And if it was an old injury and it was causing arrhythmias, those arrhythmias would have manifested themselves before this stage?

A. Yes, that's what one would have expected.

MR JUSTICE GOSS: In other words, you would have found some

clinical evidence of arrhythmias?

A. Yes.

MR JOHNSON: What about other explanations for [Baby I]'s premature death?

A. Um... I have discussed this. So the other finding from the review is the presence of gas reported radiologically.

Q. So this is the stomach bubble?

A. Yes.

Q. What about that?

A. So in the absence of sufficient clinical or post-mortem findings to explain -- and I'm talking about the fatal deterioration -- and given the presence of air detected radiologically, in the absence of findings that would allow one to take the view that this air could be the result of post-mortem decomposition, for example, or be there for -- because of an underlying disease like NEC, obstruction, volvulus and all this, this would indicate infusion of air, injection of air, into her stomach and bowels.

Q. So far as [Baby I]'s cause of death was concerned, what conclusion did you draw as to what caused it?

A. In my opinion, on the basis of what I have explained, it's excessive injection/infusion of air into the gastrointestinal tract.

Q. So air down the NGT?
A. Yes.
MR JOHNSON: That may be a good time for a break, my Lord.
MR JUSTICE GOSS: It would be, yes. We have another ten-minute break, Dr Marnerides. The jury know the drill. Ten minutes, please.
(3.15 pm)
(A short break)
(3.25 pm)
MR JOHNSON: Dr Marnerides, can we move on, please, to the cases of [Baby O] and [Baby P], who are named in the records as [Baby O] and [Baby P].
A. Yes.
Q. Dealing with the case of [Baby O] first, you have written, I believe, a report on 24 January 2019?
A. That's correct.
Q. 20 October 2021?
A. Yes.
Q. 22 October 2021?
A. Yes.
Q. 5 September 2022?
A. Correct.
Q. And very recently, 21 March 2023, which is your statement covering the production of a PowerPoint presentation?

A. That's correct.
Q. These are the images about which the jury were told this morning of [Baby O] and [Baby P]'s liver injuries?
A. That's correct.
Q. All right. So far as [Baby O] was concerned, and indeed [Baby P], the jury have heard the evidence relating to them very recently. Can we deal with [Baby O] first. Can I ask you a question, really, that may demonstrate your approach to these two cases, but it also is relevant to your approach generally to all these cases.

When you drew conclusions about the cases of [Baby O] and [Baby P], did you put them together and come to a conclusion which you then used in both cases or were you looking at each case individually without reference to what was going on in other cases?
A. No, I was looking -- in every case I was looking in each case individually.
Q. Okay. Just to make this clear then, when you draw conclusions about what you say happened in an individual case, you are not taking into account the evidence relating to other children?
A. No.
Q. Right. Well, we may come back to that in a while, but can we start with [Baby O] then and start with your report of 24 January 2019. So far as the material that you

received and used for the report, in addition to your letter of instruction or terms of reference, did you receive the following? The statement of Dr Evans of 2 June 2018?

A. Correct.

Q. A binder containing 521 pages of medical records relating to [Baby O]?

A. Correct.

Q. A radiology report containing the post-mortem skeletal survey radiology report?

A. Correct.

Q. Twenty digital photos of the post-mortem examination, some of which we're going to see parts of?

A. Correct.

Q. Three digital photos showing the radiological images of [Baby O]?

A. Correct.

Q. Forty-eight pages of pathology paperwork?

A. Correct.

Q. 220 pages of coroner's records relating to both [Baby P] and [Baby O]?

A. That's correct.

Q. And 20 histology slides from the post-mortem examination of [Baby O]?

A. Correct.

Q. Just dealing with the additional material that you set out in your report of 20 October, was that the finalised bundle of medical records, first of all, JR/8A?
A. Yes.
Q. Professor Arthurs' report of 19 May 2020?
A. Correct.
Q. Dr Bohin's report of 12 December 2020?
A. Correct.
Q. Additional reports from Dr Evans, dated 17 April 2019 and 21 November 2017 and 25 March 2019?
A. Correct.
Q. Did you also receive a statement made by Dr Kokai?
A. Correct.
Q. Thank you.
So far as the facts that you set out in your report -- if I can deal with these quickly given the recentness of the evidence we've heard -- did you record the fact, this is tile 2 of the [Baby O] presentation, that [Baby O] was born on 21 June at 14.24 hours?
A. Yes.
Q. His Apgar scores were good and he was reported to be in good condition?
A. Correct.
Q. You reproduce [Dr D]'s observations at 14.45, albeit they're mis-transcribed from Dr Evans' report as being

at 15.55, but I think it's put at 14.45, at tile 6, about [Baby O] crying immediately and his progress on to CPAP from that point.

A. Yes.

Q. On the 23rd in the morning, tile 109, did you reproduce Dr Evans' reproduction from the records that there were no nursing concerns for [Baby O], he was breathing without additional oxygen? At tile 165, a report of a cranial ultrasound scan showing normal appearances as recorded by [Dr A] at the behest of [Dr B]? At tile 169, at 13.35, Lucy Letby's record relating to vomiting at 13.15, also recorded by [Dr A] at tile 168?

Then moving on, at tile 199, to [Dr A]'s record of [Baby O] collapsing at about 14.40 and his then downhill progress to his death later that day.

A. Correct.

Q. Thank you. So far as the post-mortem was concerned, did you focus on an injury to [Baby O]'s liver?

A. Yes.

Q. So with the warning in mind, I would like now to show the PowerPoint presentation. The first page says, "Haematomas on liver". A haematoma is?

A. A bruise.

Q. Thank you. That's slide 1.

Go to slide 2, please. Is the text in this

presentation your text?

A. Yes.

Q. Okay. So this shows the -- it's in effect a mannequin of a baby with the position of the liver in the child's body; is that right?

A. That's correct.

Q. Could you just talk us through it, please?

A. Yes. So we're looking at a baby from the front. Where my cursor is, that's the heart (indicating). These projections here are the airways, the bronchi (indicating), and on the right-hand side you've got the right lung, left-hand side you've got the left lung. These two vessels here (indicating) or the two big vessels that we discussed earlier, the pulmonary trunk and aorta.

This structure here (indicating) that separates the chest from the abdomen is called the diaphragm. Typically, the ribcage, that is not illustrated here, in a baby will be at this height (indicating), so partly covering on this side the liver. But note that this part is abdomen because that's where the diaphragm is.

On this side you've got the spleen, the diaphragm, the stomach, the bowels and at the back of the body you've got the two structures there, kidneys and, on top of them, the adrenals. You've got this pipe here

(indicating) that goes down. That's the ureter. They connect to this structure, which is the urinary bladder, and through this area you've got the urethra from where the urine comes out. This is the basic anatomy of the chest and the abdomen.

Q. Thank you. The next photograph, please, or slide. Here we have the same image of the child albeit this time the liver is not highlighted in green; is that right?

A. Yes. The two red dots here give you an understanding of where Dr Kokai in his report mentions the presence of two subcapsular haematoma. What a subcapsular haematoma means, it means that you have a bruise underneath the thin membrane, the capsule of the liver, that's what it means. In real life in a photograph taken from the baby, these haematomas that Dr Kokai refers to have this appearance.

Dr Kokai also described in his report that there was an area of blood clot and this is the area where he identified the blood clot and you see remnants of the blood clot there (indicating). It's this red area there. The blood clot is visible in a different photograph later on.

Q. Yes, all right. Just for our information, the whitish appearance there --

A. So this is the stomach (indicating). This is the distal

part of the stomach called the pylorus. And this turning point here (indicating) is the proximal part of the small bowel, the duodenum, that continues downwards and posteriorly and then continues as bowel. This greenish structure here is the gallbladder. This whitish membrane of stuff, which in real life he had to cut through to open the abdomen, continues with this whitish part here (indicating). So you should imagine a structure that continues like this (indicating) on this side of this haematoma. That's the falciform ligament, which is a membrane whose ligament that helps connects the liver with the diaphragm superiorly and the heart -- sorry, the inner surface of the abdomen in the region of the umbilicus.

Q. Does it hold the liver in place in effect?

A. The liver moves inside the belly when we breathe. So it stabilises but it doesn't make it --

Q. It's not rigid?

A. Immobile, yes.

Q. So the next picture, please. Is this the same image?

A. It's the same. It's a close-up of the two haematomas described by Dr Kokai and the area of noting the blood clot he described. You will see the blood clot that he refers to later on.

Q. Then the next image, please.

A. That's the liver itself taken out of the body by Dr Kokai. So this is the blood clot that he describes and this is the liver (indicating). This is the right-hand side. This is the left-hand side. This is where the falciform ligament I talked to you about is (indicating). This is the gallbladder projecting (indicating), so we're looking from the front and above. This is the one subcapsular haematoma Dr Kokai identified (indicating) and refers to and this is the other one (indicating).

Q. It's probably obvious from what we've already seen so far, but just to give us a perspective of what we're looking at, if the baby was lying on its back, head above the screen, feet below the screen, is that the image in general terms that we'd have of the liver?

A. No. The image that we would have of the liver is -- imagine the front part being projected upwards.

Q. Right.

A. This is lying flat like this (indicating). This is lying flat like this on a surface (indicating), the photograph we see. If it's lying on its back, it's going to be like this (indicating). So if looking from above, we would be observing this area that I'm showing here (indicating).

Q. Yes. So if we're trying to orientate ourselves, and we

imagine we're looking through the head of the child down on to the liver, this is the view that we would get?

A. Yes.

Q. With the front pointing towards the bottom of the screen and the child's back pointing towards the top of the screen?

A. Yes, front, back, right, left (indicating).

Q. Right. The next image, please.

A. That's looking at the liver from the undersurface. So the photograph you had in the previous was the liver sitting like this (indicating). Now -- so the photograph you have in the previous illustration was the liver sitting like this (indicating). Now the liver has been lifted to look at the undersurface.

I know that this part that we are focusing to is the right side of the liver, the right lobe of the liver, because this is the gallbladder and the gallbladder of the liver is on the right lobe of the liver. And I know that this is the falciform ligament, which is the anatomical structure that divides the left lobe from the right lobe. You can see that this haematoma is much larger when seen from the undersurface. It occupies this area (indicating) as well, continues to this area (indicating).

So what a pathologist would think, looking at this,

is that this is not a small bruise, this is a rather large haematoma, a rather large bruise, and it involves also the substance of the liver. It's not like only a superficial part of the liver under the capsule, it involves a large part of the substance, of the parenchyma of the liver.

Q. Parenchyma means what, sorry?

A. The organ itself, the body of the organ, the substance of the organ.

Q. Okay. If we look at the next one, please.

A. That's looking -- again, lifting the liver from the undersurface. This liver is still inside -- it's a photograph from -- the liver is still pink, inside the abdomen of the baby. So you can see here the falciform ligament (indicating), which makes me think that I'm on the left lobe, and you can see that there is another significant area of bruising here (indicating), which involves also the undersurface. So it's not only the two small areas that -- well, not small -- the two areas that we saw that were recorded -- much more haemorrhage into this liver is seen when you actually look at the undersurface.

Q. So this is -- in life this would be pointing downwards?

A. In life, if you imagine me lying on my back, it would have been like this (indicating) and this liver has been

lifted like this (indicating) so you see the left side and the undersurface and the anterior aspect which, if I'm standing, is this aspect here (indicating).

Q. Thank you. So that's 34924. Moving on to the next page, please.

A. These are zoomed-in photographs that Dr Kokai took. I cannot say which bruise this is, but I can say it is a bruise, and you can see that at the margin of this bruise there are superficial lacerations, so discontinuities superficially of the substance of the liver.

These are significant in terms of telling us about the mechanism by which these liver injuries could have been produced. These lacerations in the margins of bruises tell us that this is most likely due to an impact type of injury. Okay? It doesn't tell us if the impact is accidental or not accidental, it tells us it's impact.

Q. 34925. The next photograph, please.

A. That's another zoomed photograph. We see the haematoma and you see that the same superficial lacerations, irregular in shape, that (inaudible) took for impact type of injury.

Q. Thank you. Next one, please.

A. So this is a photograph that was in the photographs that

I was sent and it illustrates sections through the areas of haemorrhage. You can see the normal colour of a cut surface of a liver would have been this (indicating).

Q. The light bit?

A. The light yes, where my cursor is. Light or something like this (indicating). This dark red through the areas of bruising that we could see on the surface tells us that there is significant bruising involving the substance of the parenchyma.

Q. It looks like two cuts have been made in --

A. It shows two areas, yes.

Q. So has the pathologist used a scalpel or some surgical tool to cut into the organ?

A. Either a scalpel or a PM40, which is a type of bigger blade that we use in post-mortems. A scalpel is a small blade.

Q. The point of cutting in is what, please, the purpose?

A. I would suspect that he cut in this direction starting from here (indicating) going this way (indicating).

Q. Sorry, I think I -- it's my question. Why would the pathologist have cut into this liver? What was the purpose?

A. We always cut into the liver. That's routine. We cut to see if there is any focal lesion, if there is a cyst, if there is a haemangioma, for example, which is

a vascular abnormality. We always cut. That's how we examine all organs. We always cut through the organs in -- I mean, the heart, parallel sections, the lungs the same. We have a routine we follow to examine the organs. We don't just look at them, we cut through them, we dissect them, and that's how one takes the samples.

Q. If we go back to the first image, please. The one after that, please, page 3.

Was there a record made of the size of the haemorrhage, first of all, that we saw in one of the photographs?

A. The record was...

Q. It's photograph 5. I'm looking in your opinion -- sorry.

A. Dr Kokai recorded that there were 25ml of free blood in the abdomen and there was a haematoma, which is what I showed you in the photographs, which measured 2.5 times 1 centimetre. From what I can understand, based on the description, that would equate to 20ml of blood, that blood clot.

Q. So 20 millilitres of blood in the -- let's look at photograph 5 assuming that that's the whole of what was recovered.

A. So my understanding from the description is that this

clot here was 20 millilitres and that there were 25 millilitres of free blood, not clotted, in the abdomen.

Q. Yes. So what is, as a matter of fact, the total circulating blood of a child of this age and weight, approximately?

A. I discussed this. Apologies, I can't remember this out of the top of my head. The average blood volume in premature neonates is approximately 95 millilitres per kilogram. So for [Baby O]'s weight of 2,020 grams, times 95, that would be 192ml.

Q. So this is -- I think it's set out in your opinion at A(b), isn't it, the calculation?

A. Yes.

Q. So that's a fair proportion of [Baby O]'s total estimated blood volume; is that right?

A. Yes, it's an estimated blood volume based on averages. Whether this is the genuine circulating blood volume in [Baby O]'s case, I can't answer that.

Q. No. How does that type of injury come to be in a child of [Baby O]'s age in hospital?

A. So the distribution of the bruising and the pattern of the bruising and the appearances of the bruising indicate towards an impact type of injury. So one needs to consider: is there anything in this baby's clinical

history that could mimic an impact type of history? Does this baby, for example, have multiple vascular abnormalities in the liver that can present themselves this way and make us think that this is an impact type of injury? The answer is there is no evidence for that.

Is this a pattern of bleeding to the liver that we can see in the context of infection? The answer is no. Is there any other malformation to the liver that would mimic that? The answer is no, there is no evidence. So I'm fairly confident this is an impact type of injury.

The next question that needs to be asked is: is this impact the impact type of injury one may see because of application of pressure to the chest to revive the baby or is it not consistent with that type of pressure?

The answer is, in the neonatal care unit setting, where people are trained how to give CPR, one may see bruising to the liver, but it would be very small areas of bruising and they will be distributed on the surface of the liver, typically on the anterior edge or the superior surface of the liver. They would be small and there wouldn't be extensive haemorrhage into the liver.

Q. Just pausing there, the last picture, photograph 10 or slide 10, where the incisions had been made into the liver, which show the haemorrhage extending right into

the body of the organ, that is not something one would see?

A. So I have only seen this extensive haemorrhage in two babies' livers -- livers of children, not babies. In road traffic collisions, in accidents with bicycles, you know, the wheel against the abdomen that can cause this. And I have seen it in babies in the context of cases -- not in the neonatal care unit, babies that have suffered non-accidental type of injury, typically with other injuries to the abdomen and injuries to the brain.

Q. Yes, so just decoding that, non-accidental types of injuries, that's child assaults by parents or carers at home, where children are brought into hospital with this sort of an injury?

A. That's the legal term used.

Q. NAI is the legal term. What it means is somebody's beaten a child to death?

A. I'm not --

Q. Well, all right.

A. -- a representative of the legal profession. I cannot use that term. What I can say is non-accidental injuries.

Q. Deliberate, I should say.

A. Yes.

Q. All right. Just looking at this sequence of

photographs, would you rule out the possibility that these injuries were caused by CPR?

A. I cannot convince myself that in the setting of a neonatal care unit this would be a reasonable proposition to explain this. I don't think CPR can produce this extensive injury to the liver. If this is the first case ever, I don't know, but in my experience, in my understanding of the literature, no, this cannot be explained by CPR.

Q. So in reaching that opinion, are you bringing to bear your personal experience as you set it out at the beginning of your evidence and are you also bringing to bear what you know of reading over your years of practice as a paediatric pathologist?

A. That's correct.

Q. Have you ever heard of this sort of injury resulting from CPR?

A. No.

Q. So far as --

A. Let me clarify that. When I say no, I have heard people discussing whether it could be from CPR, but I have never heard it being accepted that it can be.

Q. In considering how it was that [Baby C] died, did you conclude that this was his sole cause of death or were there other features of his death that struck you?

A. So from the radiology review and the clinical experience review, the information and the assessment was that there was also profound gastric and intestinal distension following excessive injection/infusion of air via a nasogastric tube. So I took the conclusion that the death -- the cause of death would best be described if one was to combine those two in the cause of death.

I believe that subsequently I was presented with further evidence from the radiology and clinical review that there was also embolism of air into the vessels.

Q. Let's deal with that issue as well. The jury has heard from various sources, not least [Baby C]'s father, about moving discolouration on [Baby C] at about the time of his collapse and death. Another witness, Dr Brearey, described it as a purpuric rash, which appeared and then disappeared. Was there any evidence from the post-mortem findings that could either confirm or undermine the likelihood of there having been an injection of air into the vasculature?

A. I understand you're talking from the histology and naked eye examination?

Q. Yes.

A. I have not commented, so... Not that I can see. Can I have a couple of minutes to go through this?

Q. I don't believe there is anything in there, but by all

means.

A. Yes, I don't remember there being, to be honest.

Q. No, no. I think you deal with this, at least in passing, in section B, paragraph 3 of your report, your first report.

A. Yes.

Q. Were you in a position to comment either way on --

A. No, no, I'm not in a position to comment either way from the histology or the naked eye examination findings.

Q. But insofar as you have spoken of there being an impact-type scenario for causing that internal injury, would you necessarily expect to see any outward sign, in other words on the skin itself, overlying the site of the impact?

A. It's very common that you see nothing, especially in babies, from the outside. You can have the most devastating injury internally and nothing at all visible externally and that's very common.

Q. A further issue that was raised, and you deal with this in your report of 20 October 2021, has been whether or not a decompression with a cannula at McBurney's point, which the jury will remember was carried out by Dr Brearey, whether that type of intervention could have caused the injuries that we've seen in those photographs.

A. I don't think so. And I'll explain why. So a drain is a tube that is entered into the abdomen.

Can I go back to the photographs, please?

Q. Yes.

A. I think it's easier to explain using the photographs.

Q. Which one would you like?

A. Can I change the photographs?

So for the tube entering the body of the baby to cause a bruise, it needs to contact the liver. There's no other way it can produce it. If a tube was to cause an injury to the liver, one would expect that there would have been a perforation type of injury, it's like stabbing the liver with the tube. This is not what we see here. What we see here is something that has pressed against it.

So a perforation type of injury would look like this (indicating) for example, what I'm showing here on the right-hand side of the liver. Okay? It wouldn't look like this (indicating). Is this a perforation-type injury that occurred due to this drain being inserted? My answer is: highly unlikely. The reason being there is no significant injury -- haemorrhage associated with that. One would expect haemorrhage around that should this have been while the baby was still alive and there was circulating blood.

Q. So just so we can clarify, if somebody -- is there a perforation injury noted in the notes from the post-mortem, first of all?

A. No.

Q. So you're going off the photograph and that thing that you can see where you have the cursor looks like it might be?

A. Yes. This looks like it could be a perforation-type injury and there are two explanations for that -- three, actually. We will discuss them. The first explanation, this being a perforation-type injury from the drain. I think this is unlikely because there is no surrounding bruising, which one would expect to see while the baby was alive. One would expect to see the colour that you see here (indicating) around this area.

Explanation number two, they inserted the drain when the baby had no circulation. This is not my understanding from clinical notes.

Explanation number three, this is a post-mortem artefact, probably when the liver was being removed from the baby's body, maybe a scalpel, maybe something else that was there on the PM table caused this. The appearances of these are of a post-mortem injury rather than an injury that occurred in life.

But if that drain indeed caused injury to the liver,

I would expect to see haemorrhage of this colour (indicating) around that and it would have been a perforation. The other thing that cannot be accounted for with this pattern of injuries is if one was to accept that the drain was inserted, touched the liver, did not perforate but caused a bruise, to generate bruises on the right side, the left side, the underside, the top side, you need to have repeated such episodes, which is not the description and it's highly unlikely that if you had repeated efforts of somebody trying to resuscitate a child they would have on all occasions caused bruises but not perforated the liver. So I don't think it is a plausible, reasonably plausible explanation.

Q. Thank you. So Dr Marnerides, what in your view was the cause of death of [Baby O] -- I am in your report of 20 October now -- (inaudible: coughing) taken all the features?

A. Now that I have considered all the materials that were made available to me, I am of the view that the cause of death would best be given as inflicted traumatic injury to the liver, profound gastric and intestinal distension following acute excessive infection/injection of air via nasogastric tube and air embolus into to administration of air into a venous line.

Q. So impact injury to the liver, air into the NGT, air into the circulation together?
A. Yes.
Q. We have one more to do --
MR JUSTICE GOSS: We won't complete that because we've got more images to look at, haven't we?
MR JOHNSON: Yes.
MR JUSTICE GOSS: I'm just wondering if I could ask one question now while we have the images up. If we could go back, please, Mr Murphy. Sorry, that one, that's fine, thank you very much.

We can see there the two red dots and then we can see an image of the liver itself.

A. Yes.
MR JUSTICE GOSS: Given the weight of this baby and the size of this baby, how big would the liver be? Because it strikes me these are very enlarged images, this liver. Just how much are they enlarged? I think we need to know.
A. I will answer this question as accurately as I can.
MR JOHNSON: We do have the weight, don't we?
A. We have the weight of the liver. If my recollection is correct --
Q. 79, I remember it.
A. It's roughly 80 grams.

Q. 78.7.
A. Yes, 78.7.
Q. Sorry, 86.
A. So a liver in a baby of this age, of this weight, would be from one end to the other probably this size (indicating) and the whole thing would be -- the largest area would be something of this size, the thinnest part would be something like this (indicating). So the left lobe would look this thin (indicating), the right lobe would look like this (indicating). It's approximately this size.
MR JUSTICE GOSS: For the benefit of the recording --
MR JOHNSON: I've got a measure so perhaps I can hand it.
MR JUSTICE GOSS: What you are using are two plastic beakers crushed.
A. So from right to left, we're talking about approximately 10 to 12 centimetres. Anterior to posterior, we're talking about 9 to 10 centimetres. Inferior to superior, the thickest part, we are talking about 7 to 8 centimetres. Inferior to superior, the thinnest part, we are talking about 1 to 3 centimetres.
MR JUSTICE GOSS: Seeing it physically is better than -- well --
MR JOHNSON: There's no record on the transcript.
MR JUSTICE GOSS: Yes, we have it for the record on the

transcript. You can see what the size of the liver will have been.

Right. We're going to break off there.

MR JOHNSON: Can I make a request on behalf of Dr Marnerides? If at all possible, he needs to be away by the end of business tomorrow, so if it's not too much of an imposition on the jury, if we could have a slightly earlier start, that would be much appreciated.

MR JUSTICE GOSS: Yes. I don't know how long you are likely to be, but do you think -- would it be helpful to have an earlier start just in case?

MR MYERS: Yes, it would, if that's not inconvenient for everybody.

MR JUSTICE GOSS: No. Do you mean 10 o'clock, Mr Johnson?

MR JOHNSON: Yes.

MR JUSTICE GOSS: Would it be possible to start at 10 o'clock tomorrow? It won't cause any undue inconvenience? Thank you. So we'll start at 10 o'clock tomorrow then. Thank you very much.

It also seems to have got quite warm in here this afternoon. You're very used to it now. So 10 o'clock tomorrow morning, please, members of the jury. And remember, don't conduct any research.

(In the absence of the jury)

MR JUSTICE GOSS: Mr Myers, will someone want to see the defendant?

MR MYERS: Yes, my Lord, someone will.

MR JUSTICE GOSS: Thank you. I recognise the members of staff, they've been here before. Thank you very much.

(4.16 pm)

(The court adjourned until 10.00 am on Thursday, 30 March 2023)

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