



**STATE CORONER'S COURT
OF NEW SOUTH WALES**

Inquest: Inquest into the death of Manusiu Amone

Hearing dates: 12 to 15 March 2018

Date of findings: 22 June 2018

Place of findings: NSW State Coroner's Court, Glebe

Findings of: Magistrate Derek Lee, Deputy State Coroner

Catchwords: CORONIAL LAW – neonatal death, pethidine, squames, persistent pulmonary hypertension of the newborn, gasping respirations, postnatal observations, perinatal and paediatric postmortem examination, NSW Health Pathology

File number: 2014/348387

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Findings:

I find that Manusiu Amone died on 25 November 2014 at Fairfield Hospital, Prairiewood NSW 2176. The cause of Manusiu's death was ischaemic hypoxic encephalopathy secondary to factors associated with the sudden onset of gasping respirations with difficulty in ventilating. Manusiu died from natural causes.

Recommendations:***To the NSW Minister for Health:***

1. I recommend that consideration be given to the introduction of a policy applicable to NSW Health Pathology requiring that the postmortem examination of all reportable neonatal deaths be performed jointly by a forensic pathologist and a perinatal and paediatric anatomical pathologist in a forensic facility.
2. In the event that Recommendation 1 is unable to be implemented due to reasonable workforce, and other, limitations, I recommend that consideration be given to the introduction of a policy applicable to NSW Health Pathology requiring that the postmortem examination of all reportable, non-suspicious, non-traumatic neonatal deaths occurring in NSW hospitals be performed by a perinatal and paediatric pathologist. I further recommend that, depending on the geographic location where the death occurred, that the postmortem examination be performed at The Children's Hospital at Westmead, Sydney Children's Hospital at Randwick, or John Hunter Children's Hospital.
3. In the event that Recommendation 1 is unable to be implemented due to reasonable workforce limitations, I recommend that consideration be given to the introduction of an annual training program, applicable to NSW Health Pathology, for Department of Forensic Medicine forensic pathologists in relation to the identification and potential significance of squames when performing neonatal postmortem examinations.
4. In the event that Recommendation 1 is unable to be implemented due to reasonable workforce limitations, I recommend that consideration be given to the development and implementation of structured guidelines, applicable to NSW Health Pathology, to facilitate consultation between forensic pathologists from the Department of Forensic Medicine and perinatal and paediatric pathologists from paediatric pathology units at The Children's Hospital at Westmead, Sydney Children's Hospital at Randwick, or John Hunter Children's Hospital regarding postmortem examination of all reportable neonatal deaths. I further recommend that such guidelines should provide for any such consultation to be appropriately documented, and for any resulting autopsy report to be jointly authored by the case forensic pathologist and consulting perinatal and paediatric pathologist.

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Introduction

1. Manusiu Amone was born at about 10:30pm on 24 November 2014. She died suddenly and unexpectedly at 12:25am on 25 November 2014. Given these tragic circumstances, and because it was initially unclear what caused Manusiu's death, her death was reported to the Coroner and an investigation commenced in order to answer this and other questions. That investigation initially raised one possibility as to the cause of Manusiu's death. However, subsequent investigation raised another possibility. The challenges associated with determining the cause of Manusiu's death, and the resulting distress that has been caused to Manusiu's family by being left in a state of uncertainty, has in turn raised its own questions about how deaths like Manusiu's are investigated.

Why was an inquest held?

2. Under the *Coroners Act 2009* (**the Act**) a Coroner has the responsibility to investigate all reportable deaths. This investigation is conducted primarily so that a Coroner can answer questions that they are required to be answered pursuant to the Act, namely: the identity of the person who died, when and where they died, and what was the cause and the manner of that person's death. All reportable deaths must be reported to a Coroner or to a police officer. One type of reportable death is what the Act describes as a sudden death where the cause is unknown.¹
3. In Manusiu's case the coronial investigation gathered sufficient evidence to answer the questions about Manusiu's identity, and where and when she died. However, in the initial period following Manusiu's death there were unanswered questions about what caused her sudden and unexpected death, and whether any circumstances surrounding her death may have contributed to it. The inquest was therefore focused on answering these questions relating to the cause and manner of Manusiu's death.
4. Inquests have a forward-thinking, preventative focus. At the end of many inquests Coroners often exercise a power, provided for by section 82 of the Act, to make recommendations. These recommendations are made, usually, to government and non-government organisations, in order to seek to address systemic issues that are highlighted and examined during the course of an inquest. Recommendations in relation to any matter connected with a person's death may be made if a Coroner considers them to be necessary or desirable.
5. The coronial investigation into the death of a person is one that, by its very nature, occasions grief and trauma to that person's family. The emotional toll that such an investigation, and any resulting inquest, places on the family of a deceased person is enormous. A coronial investigation seeks to identify whether there have been any shortcomings, whether by an individual or an organisation, with respect to any matter connected with a person's death. It seeks to identify shortcomings not for the purpose of assigning blame or fault but, rather, so that lessons can be learnt from such shortcomings and so that, hopefully, these shortcomings are not repeated in the future. If families must re-live painful and distressing memories that an inquest brings with it then, where possible, there should be hope for some positive outcome. The

¹ *Coroners Act 2009*, section 6(1)(a).

recommendations made by Coroners are made with the hope that they will lead to some positive outcome by improving general public health and safety.

Recognition of Manusiu's life

6. Inquests and the coronial process are as much about life as they are about death. A coronial system exists because we, as a community, recognise the fragility of human life and value enormously the preciousness of it. Recognising the impact that a death of a person has, and continues to have, on the family and loved ones of that person can only serve to strengthen the resolve we share as a community to strive to reduce the risk of preventable deaths in the future. Understanding the impact that the death of a person has had on their family only comes from knowing something of that person's life and how the loss of that life has affected those who loved that person the most. Therefore it is extremely important to recognise and acknowledge Manusiu's tragically all too brief, but important, life.
7. Manusiu was the fourth child of Sharon and Samuele Amone. Manusiu only lived for approximately 145 minutes. Much of that time was spent under the care of nurses and doctors who were fighting to give her every chance of life. However, it is some small comfort to know that for about the first 25 minutes of her life, Manusiu was able to feel the love, the warmth, and the embrace of her parents.
8. That Manusiu's life was so fleeting is unbearably painful to even consider. She never had the opportunity to meet her siblings or the other members of her loving family. There is no doubt that the memories that Manusiu's parents have, in those very special and treasured first moments after childbirth, are ones that will last a lifetime: seeing their newborn daughter for the first time, holding her, and feeling just how much love they had for her.

What happened between 23 and 25 November 2014?

9. Manusiu was the fourth child of Mr and Mrs Amone. Apart from one miscarriage, Mrs Amone's three previous pregnancies and deliveries had all proceeded without complications. Like those earlier pregnancies, Mrs Amone's pregnancy with Manusiu had similarly proceeded without complication. Mrs Amone had a due date of 15 November 2014.
10. When this date passed, a decision was made to induce labour. Mrs Amone was admitted to Fairfield Hospital on 23 November 2014 for this to occur. During the evening prostin² was inserted to bring on labour, which resulted in some contractions occurring.
11. At about 9:45am the following morning, 24 November 2014, Dr Nurhani Mohamad Ansor, an obstetrics and gynaecology senior resident medical officer, reviewed Mrs Amone. Dr Ansor performed a vaginal examination and found that the cervix was unfavourable (meaning that it was not ready to respond to labour contractions). Therefore a second dose of prostin was inserted, again with intention of inducing labour.

Labour

12. During the afternoon true labour developed and Mrs Amone was transferred to the birthing unit at around 3:30pm. At that time Registered Nurse (**RN**) and Certified Midwife Kathleen Walker

² A vaginal gel and synthetic version of prostaglandin, a hormone that prepares the body for labour.

was in charge of the birthing unit. RN Walker allocated Registered Midwife (RM) Young Mei Lau to care for Mrs Amone.

13. At this time Manusiu's heartrate and Mrs Amone's contractions were being monitored with electronic foetal monitoring via continuous cardiotocography (CTG). RM Lau observed on the CTG that Mrs Amone was contracting mildly every 5 minutes. Dr Ansor reviewed Mrs Amone again at 3:55pm and performed a further vaginal examination. This revealed that the cervix was favourable (3cm dilated) and so artificial rupture of the membranes³ was performed.
14. Between 4:10pm and 6:30pm, RM Lau commenced two 1-litre bags of Hartman's solution⁴, as charted by Dr Ansor, whilst both maternal and foetal observations were charted, and foetal monitoring conducted. Dr Ansor reviewed Mrs Amone again at 6:40pm and noted that the CTG was reassuring, meaning that no heart rate abnormality was observed. At this time Mrs Amone was 5cm dilated. Further maternal and foetal observations were charted at 7:30pm.
15. Dr Harry Ngo, the on-call obstetrician, reviewed the CTG at 7:45pm and instructed RM Lau to commence induction of labour⁵ with syntocinon⁶. By 9:15pm Mrs Amone was involuntarily pushing. RM Lau performed a vaginal examination and noted that Mrs Amone was still 5cm dilated.⁷ RM Lau offered to provide Mrs Amone with pain relief in the form of pethidine but Mrs Amone declined. Pethidine belongs to a group of medication known as opioid analgesics and can provide short-term relief for acute moderate to severe pain. It can be delivered in tablet or syrup form, and also by intravenous or intramuscular injection.
16. After initially declining the offer to be given pethidine, Mrs Amone later agreed to it being given about 10 minutes later. RM Lau suggested to Dr Ansor that a 150mg dose of pethidine be prescribed to Mrs Amone and this was charted. The pethidine was subsequently given to Mrs Amone intramuscularly by RM Lau, after being checked by RN Walker.
17. Various nursing and medical staff have described the birthing unit as particularly busy on this particular night. There were two patients in the assessment room and all six birthing rooms were occupied by patients who were either in labour, or had just given birth. RM Lau was attending to Mrs Amone, as well as another patient who was in labour in a different room.⁸ RM Lau had also been told by RN Walker that one of the nursing night shift staff members, who was expected to start at 9:30pm, was unable to start until 10:45pm.⁹ As a result, RM Lau left Mrs Amone's room at about 9:45pm to conduct a newborn baby check in another room. At this time Dr Ansor completed her shift and handed over Mrs Amone's care to Dr Chee Tan, the night obstetrics and gynaecology registrar.

Delivery and birth

18. At around 10:00pm¹⁰ Dr Tan was at the delivery desk when he heard a call alarm sound for Mrs Amone's room. At the same time Mr Amone, who had been in the room with his wife,

³ A procedure by which the membranes containing amniotic fluid are deliberately punctured allowing the amniotic fluid to escape from the uterus, removing the fluid buffer between the foetus and uterus thereby stimulating uterine contractions.

⁴ Also known as sodium lactate solution, used for replacing fluids and electrolytes.

⁵ Exhibit 1, tab 24 at [17].

⁶ Medication administered by intravenous infusion to induce labour.

⁷ The active stage of labour in the first stage of labour usually occurs when the cervix is between 3cm to 7cm dilated.

⁸ Exhibit 1, tab 24 at [24].

⁹ Exhibit 1, tab 24 at [25].

¹⁰ Exhibit 1, tab 19 at [12].

approached Dr Tan and told him that Mrs Amone was about to give birth. Dr Tan immediately went to Mrs Amone's room and saw that Mrs Amone was in the process of delivery: Manusiu's head had come out and that the umbilical cord was around her neck.

19. At about 10:03pm RN Walker heard the call alarm from Mrs Amone's room. RN Walker went into the room and saw that Manusiu was on the bed between Mrs Amone's legs and that Dr Tan was untangling the umbilical cord from around Manusiu's neck and body. RN Walker wrapped Manusiu up and placed her on Mrs Amone's chest. RN Walker told Mr Amone words to the effect of, "*Stand next to them because your wife has had pethidine*".¹¹
20. At around this time, RM Lau had finished conducting her newborn check in another room and saw that the call light was on outside Mrs Amone's room. When RM Lau entered the room she saw that Mrs Amone had Manusiu on her chest and that Dr Tan was attending to Mrs Amone. Whilst RM Lau helped Mrs Amone to tidy up, RN Walker assessed Manusiu and gave her an APGAR score¹² of 8 at one minute (following delivery) and another score of 9 at five minutes.
21. After checking that RM Lau was able to attend to Manusiu and Mrs Amone on her own, RN Walker left the room and formed the view that both Manusiu and Mrs Amone were in a stable condition.¹³ A short time later, after making sure that Mrs Amone was stable, RM Lau also left the room and told Mr Amone to use the call alarm if help was required.
22. At 10:30pm RM Lau heard a call alarm from Mrs Amone's room and immediately went to investigate. When she entered the room she saw Mr Amone holding Manusiu, who was pale in complexion and gasping for air. RM Lau took Manusiu to the Special Care Nursery (SCN), accompanied by Mr Amone.

Attempts at resuscitation and ventilation

23. RM Sophea Ly was working in the SCN and saw that Manusiu appeared "*pale, limp and non-responsive*".¹⁴ Manusiu was placed on a resuscitator whilst RM Lau and another midwife, RN Siu-Fun Poon, began cardiopulmonary resuscitation (CPR) in an attempt to revive Manusiu. RM Ly measured that Manusiu's heart rate at this time was 60 beats per minute and activated the Medical Emergency Team (MET) call button. RM Ly also paged the paediatric registrar, Dr Rosaleen Jacob.
24. RN Walker responded to the MET call. She went to the SCN and CM Lau told her that the call related to Manusiu. RN Walker immediately thought that Manusiu might be affected by the pethidine which had been given to Mrs Amone at 9:25pm.¹⁵ RN Walker injected Manusiu with Narcan¹⁶ intramuscularly at 10:35pm. Despite, this RN Walker noticed that the Narcan appeared to have nil effect.¹⁷

¹¹ Exhibit 1, tab 13 at [15].

¹² A scale used to evaluate the health of a newborn infant using five criteria (Appearance, Pulse, Grimace, Activity, Respiration) on a scale from zero to two, with overall scores ranging from zero to 10.

¹³ Exhibit 1, tab 13 at [17].

¹⁴ Exhibit 1, tab 25 at [7].

¹⁵ Exhibit 1, tab 13 at [22].

¹⁶ The brand name for naloxone, a medication used to block the effects of opioids, such as pethidine, especially in overdose.

¹⁷ Exhibit 1, tab 25 at [12].

25. RM Lau, RM Poon, and RM Ly continued performing CPR. Dr Jacob responded to the page and arrived in the SCN at around this time. She found that Manusiu was pale and unresponsive with no spontaneous respiration and that her pupils were dilated and sluggishly reactive to light.¹⁸
26. The clinical staff continued CPR until the MET arrived a short time later and took over Manusiu's care. Dr Refaat Ibrahim was the Team Leader of the MET. He saw that Manusiu was pale and not breathing and that her pulse was weak. He intubated Manusiu at around 10:35pm and ventilated 100% oxygen but found that Manusiu's oxygen saturation¹⁹ did not improve. At 10:37pm Dr Ibrahim checked that the intubation was correct and found that it was. He again ventilated 100% oxygen and again Manusiu's condition did not respond with improvement.
27. Manusiu was given adrenalin at 10:55pm in an attempt to quicken her heart rate and increase blood pressure. As Manusiu's condition continued to not improve Dr Ibrahim asked one of the nurses to contact the paediatric consultant, Dr Rosemary Ambler. Meanwhile Dr Ibrahim and Dr Jacob continued to ventilate Manusiu, both manually and mechanically, but she still remained unresponsive to ventilation and her oxygen saturation did not improve.
28. Enrolled nurse Gisella Fodor contacted Dr Ambler at 10:57pm. Dr Ambler arrived in the SCN sometime between 11:15pm (according to Manusiu's progress notes) and 11:25pm (according to Dr Ambler's own notes). She found that Manusiu appeared cyanosed and poorly perfused with no spontaneous movement and no spontaneous respiration, and that her pupils were dilated.
29. Over the next hour Manusiu had repeated episodes of bradycardia²⁰ which were treated with intermittent CPR and a number of boluses²¹ of adrenalin. Manusiu's blood pressure was measured as 67/27 on one occasion but was unable to be recorded on all other attempts. The clinical staff noted that on Manusiu's admission to the SCN her oxygen saturation had only been 29% and the highest it achieved was 46%. Manusiu had not had any spontaneous breaths or movement since the time of the MET call.²² A chest x-ray was performed at 11:42pm to confirm that there was no pneumothorax²³ and an arterial blood gas sample²⁴ was taken. This supported the clinical appearance²⁵ of profound asphyxia²⁶ with acidosis²⁷.
30. Dr Ambler formed the view that Manusiu's prognosis was poor and at around 12:00am on 25 November 2014 she discussed Manusiu's treatment with Dr Tom Grattan-Smith, the duty consultant for the Newborn and Paediatric Emergency Transfer Service (**NETS**)²⁸. Dr Grattan-Smith agreed with Dr Ambler that all appropriate measures had been taken and that there was no other useful treatment that could be provided to Manusiu.²⁹

¹⁸ Exhibit 1, tab 14.

¹⁹ A measure of the amount of oxygen in the blood with normal levels considered to be at 95-100%.

²⁰ Abnormally slow heart rate.

²¹ Administration of discrete amounts of medication in order to raise its blood concentration to an effective level.

²² Exhibit 1, tab 20 at [6].

²³ An abnormal collection of air in the space between the lung and the chest wall.

²⁴ A test to measure the amount of arterial gases, such as oxygen and carbon dioxide, in the blood, requiring a small amount of blood to be drawn from the main artery of the forearm.

²⁵ Exhibit 1, tab 15, page 1.

²⁶ A condition of severely deficient oxygen supply to the body that arises from abnormal breathing.

²⁷ Increased acidity in the blood and other body fluids which is caused, in the case of respiratory acidosis, by the inability of the lungs to remove carbon dioxide, leading to its excessive build-up.

²⁸ The state-wide emergency service for medical retrieval of critically ill newborns, infants and children in NSW.

²⁹ Exhibit 1, tab 20 at [8].

31. Dr Ambler and Dr Grattan-Smith made a conference call to Dr Rodney Tobiansky, a staff specialist neonatologist at Liverpool Hospital, to discuss Manusiu's prognosis and treatment. Dr Tobiansky agreed with the assessment that Manusiu had suffered a severe hypoxic/ischaemic event which had not responded to resuscitation. By the time of the conference call there had been no return of spontaneous circulation despite more than 90 minutes of CPR, Manusiu's pupils were dilated and unreactive, and she was severely acidotic. On that basis it was decided amongst the clinicians that resuscitation should cease and that Manusiu should be provided with palliative care.³⁰
32. The conference call ended at about 12:17am. Active attempts to resuscitate Manusiu ceased a short time later and at 12:25am Manusiu was pronounced deceased.

What issues did the inquest examine?

33. Prior to the inquest a list was circulated to the parties given leave to appear at the inquest setting out a number of issues which it was expected that the inquest would examine. During the course of the investigation leading up to the inquest, and during inquest itself, some of these issues were resolved, whilst there was greater focus on other issues.
34. The issues which the inquest examined may be conveniently summarised as follows:
 - (a) What was the cause and manner of Manusiu's death?
 - (b) Was the administration of pethidine to Mrs Amone appropriate?
 - (c) Was Manusiu provided with appropriate care, treatment and management, and in particular was there an appropriate level of observation during and after her delivery?
 - (d) Did midwife staffing issues impact upon the care provided to Manusiu and have there been any changes made to staffing levels since November 2014?
 - (e) Do the circumstances of Manusiu's death and the postmortem examination performed in her case have any bearing on the procedures and protocols that govern the performance of perinatal and paediatric postmortem examinations in NSW generally for deaths reported to the Coroner?
35. I shall deal with each issue separately below.

Expert evidence gathered and considered by the inquest

36. As part of the coronial investigation a number of medical experts were asked to provide opinions in relation to several of the above issues including, primarily, the cause of Manusiu's death. Firstly, a postmortem examination was performed by Dr Isabella Brouwer, senior staff specialist forensic pathologist from the Department of Forensic Medicine (**DOFM**). Secondly, the Crown Solicitor's office briefed three independent experts to consider the available evidence and provide reports. All three experts also gave evidence during the inquest. The experts were:
 - (a) Dr Andrew Child AM, a consultant obstetrician;

³⁰ Exhibit 1, pages 580-581.

- (b) Associate Professor Nick Evans, senior staff specialist neonatologist, Royal Prince Alfred Hospital; and
- (c) Associate Professor Susan Arbuckle, senior staff specialist perinatal paediatric pathologist, The Children's Hospital at Westmead.

37. In order to answer the question as to what caused Manusiu's death, it is necessary to consider the findings and opinions of each of these experts. I will do so below.

Background to Manusiu's death being reported

38. Following Manusiu's death Dr Ambler issued a Medical Certificate of Cause of Perinatal Death³¹ which recorded respiratory failure as the main condition causing Manusiu's death. Recurrent cardiac arrest was recorded as contributing to the respiratory failure and it was noted that Manusiu's death had occurred in circumstances of severe acidosis and hypoxia.
39. Manusiu's death was later deemed to be a reportable death under the Act, and a form which reported the death of a patient to the Coroner was completed at Fairfield Hospital. Within the form, under the heading "*Opinions as to cause of death*", the following was written: "*?Hypoxic ischaemia, ?sepsis, ?metabolic*".³²

What were the findings from the postmortem examination?

40. Manusiu was later taken to the Department of Forensic Medicine at Glebe. On 27 November 2014, Dr Brouwer performed a postmortem examination and subsequently prepared an autopsy report dated 20 April 2015.³³
41. When Manusiu's preserved postmortem blood sample was analysed it was found to contain 0.58 mg/L of pethidine. Dr Brouwer noted that this was at the lower range of toxic for adults. However, Dr Brouwer explained that the level was difficult to interpret in Manusiu's case because no reference ranges exist for potentially toxic levels of pethidine for newborn infants. Dr Brouwer also noted that due to there being limited suitable samples for analysis, central blood (mixed pulmonary artery and aorta blood) samples, instead of peripheral blood samples (such as from the femoral vein), were used for toxicological testing. This may have resulted in post mortem redistribution³⁴.
42. In the autopsy report, Dr Brouwer explained that "*significant placental transmission of pethidine occurs in utero, leading to transmission of the drug to the foetus causing significant central nervous system/respiratory depression after birth*" and that "*this may be fatal if the baby is left unobserved or without the administration of Naloxone (a Pethidine antagonist)*".³⁵ Dr Brouwer noted that the time between the administration of pethidine to Mrs Amone and Manusiu's birth "*allowed enough time for significant placental transmission of pethidine to have occurred*".³⁶

³¹ Exhibit 1, page 147.

³² Exhibit 1, page 9.

³³ Exhibit, tab 4.

³⁴ Post mortem redistribution is the phenomenon where drugs may shift from their original tissue compartment to a different tissue compartment. This can have the effect of increasing drug concentrations in the blood leading to a result that does not accurately indicate the true blood concentration at the time of death

³⁵ Exhibit 1, page 14.

³⁶ Exhibit 1, page 14.

43. Dr Brouwer also noted that the toxicology results revealed the presence of codeine and morphine, and their respective metabolites, as well as the benzodiazepine, Temazepam. Dr Brouwer explained that there are also no reference range values for these drugs available for newborn infants. However, Dr Brouwer said that all three drugs have potent central nervous system/respiratory depressant effects and that when used in combination with a central nervous system/respiratory depressant drug such as pethidine, *“the minimum fatal dose of these drugs may be significantly lowered”*.³⁷
44. Ultimately, after taking into account all of the above findings, Dr Brouwer opined that Manusiu’s death was most likely due to the toxic effects of pethidine.
45. The postmortem examination also revealed other significant findings, for reasons that are discussed in more detail below. As part of the autopsy, sections of all five lobes of the lungs were examined. The sections showed marked pulmonary congestion and interstitial haemorrhage. Dr Brouwer noted that *“prominent foetal squames were seen in the alveoli – an essentially insignificant finding in an infant soon after birth”*.³⁸ Dr Brouwer described the lungs as being *“solid with a liver-like consistency”* and having *“a non-aerated appearance reminiscent of the appearance of lungs of a stillborn”*.³⁹ Dr Brouwer further noted that microscopic examination showed *“diffusely non-aerated spaces (lung collapse) and pulmonary congestion with acute pulmonary haemorrhage”*.⁴⁰

Was Manusiu’s death due to the toxic effects of pethidine?

46. Dr Brouwer’s autopsy report raised the possibility that Manusiu’s death had most likely been caused by the toxic effects of the pethidine that had been administered to Manusiu approximately 35 minutes before she was born. Dr Child, Associate Professor Evans and Associate Professor Arbuckle were all asked to consider this as being the possible cause of Manusiu’s death. At the outset, it should be explained that Dr Child was invited to give his opinion primarily in relation to the obstetric care provided to Mrs Amone. In this context it is, firstly, important to note that Dr Child opined that the antenatal care appeared *“appropriate and comprehensive”*.⁴¹ Secondly, it should also be noted that part of the material that Dr Child was briefed with included Dr Brouwer’s autopsy report. On this basis, when preparing his report Dr Child made the assumption that the autopsy report was correct and that the cause of Manusiu’s death was the toxic effects of pethidine.⁴² This assumption was acknowledged by Dr Child in his evidence during the inquest.⁴³
47. With that said, Dr Child explained that the timing of Manusiu’s collapse about 15 minutes after birth would correlate well with the timing of the administration of a large dose of pethidine to Mrs Amone at 9:25pm. In such circumstances Dr Child explained that, due to the time needed for the pethidine to be absorbed and then transferred across the placenta to Manusiu, it would probably not have a major effect on Manusiu until some minutes after the birth when it was having specific effects on various organs.⁴⁴

³⁷ Exhibit 1, page 14.

³⁸ Exhibit 1, page 21.

³⁹ Exhibit 1, page 13.

⁴⁰ Exhibit 1, page 13.

⁴¹ Exhibit 1, page 583.

⁴² Exhibit 1, page 584.

⁴³ 14/3/18, T15.29.

⁴⁴ Exhibit 1, page 588.

48. The combined opinions of Dr Brouwer and Dr Child would, at first, suggest that there is a reasonable basis to conclude that the most likely cause of Manusiu's death was due to the toxic effects of pethidine. However, an important observation made of Manusiu in the immediate period after she was born is critically relevant to this issue. It was noted in the statement of the investing police officer in charge, Constable Kelly Anscombe, that whilst Mr Amone was holding Manusiu, he saw that her breaths became "*short and sharp and she was only inhaling, as if gasping for breath*".⁴⁵ This observation was reflected in the P79A, a standard form completed by police when reporting a death to the Coroner. There it was noted that Manusiu was seen "*to be having short, sharp inhaling breathes [sic], though she was not breathing out*".⁴⁶ Indeed, this observation was also noted by Dr Brouwer in her autopsy report where she said that Mr Amone saw that Manusiu "*was giving short, sharp inhalations, but did not appear to breathe out*".⁴⁷
49. During the inquest and in written submissions counsel for Mr and Mrs Amone queried whether the description of Manusiu gasping was correct. Upon any review of the evidence it is clear that that the description of Manusiu gasping is clear and correct for the following reasons:
- (a) Mr Amone gave evidence that about 15 or 20 minutes from the time that Manusiu had pinked up he noticed that Manusiu's "*breathing seemed short as if she was gasping for air*".⁴⁸ This prompted Mr Amone to press the call alarm.
 - (b) In her evidence RM Lau said that when she returned to Mrs Amone's room after hearing the call alarm she saw Manusiu gasping whilst being held Mr Amone.⁴⁹
 - (c) The observations by Mr Amone and RM Lau that Manusiu was, indeed, gasping were recounted contemporaneously by Dr Ambler during her initial call to Dr Grattan-Smith⁵⁰, and again during the subsequent conference call with Dr Tobiansky.⁵¹
50. There is therefore contemporaneous and corroborated evidence that Manusiu began gasping for air about 30 minutes after her birth and whilst she was being held by Mr Amone.
51. The observation that Manusiu was seen to be gasping for air is one that was of critical importance to both Associate Professor Evans and Associate Professor Arbuckle. Associate Professor Evans did not consider that the toxic effects of pethidine was a primary cause of Manusiu's death for a number of reasons:
- (a) Firstly, Associate Professor Evans described pethidine as an opiate analgesic and explained that it is well recognised that it can cause respiratory depression in a newborn as it rapidly crosses the placenta into the foetal blood stream. However, he explained that when any opiate, like pethidine, causes collapse it does so by depressing the respiratory centre in the brain which results in the cessation of breathing. In other words, the reaction of a foetus affected by pethidine toxicity is not that they are working harder with their breathing (by, for example, gasping for air) but that they simply don't breath at all.⁵² In

⁴⁵ Exhibit 1, tab 6 at [27].

⁴⁶ Exhibit 1, tab 1.

⁴⁷ Exhibit 1, page 13.

⁴⁸ 12/3/18, T20.19.

⁴⁹ 12/3/18, T51.45; T52.34.

⁵⁰ Exhibit 1, page 575.

⁵¹ Exhibit 1, page 581.

⁵² 14/3/18, T24.24.

Manusiu's case Associate Professor Evans said that the observation that Manusiu was gasping is more in keeping with respiratory distress rather than respiratory depression.⁵³ Put another way, if pethidine had been the only factor which contributed to Manusiu's collapse then she would have been expected to slowly stop breathing, and not be gasping for air.

- (b) Secondly, Manusiu unexpectedly did not respond to resuscitation. Associate Professor Evans explained that when a baby who is narcosed (made unconscious) by a drug like pethidine is ventilated appropriately, their heart rate and oxygen will usually improve rapidly. However this did not occur in Manusiu's case even though, according to Associate Professor Evans, she was being ventilated appropriately with reasonably high pressure in 100% oxygen. Despite this, Manusiu's heart rate could not be maintained and her oxygen saturations, which should have been greater than 95%, did not rise about 66%.
- (c) Thirdly, Associate Professor Evans gave evidence that pethidine narcosis in the newborn is very rare and has "*historically been incredibly over diagnosed*".⁵⁴ Indeed, Associate Professor Evans said that in his career he could only recall two cases where he was convinced that pethidine narcosis existed.⁵⁵
- (d) Finally, the observations made of Manusiu in the period after her birth were all put to Associate Professor Evans: namely that Manusiu gave out an audible cry following physical stimulation shortly after delivery; that her tone and appearance improved and she "pinked up"; that she had APGAR scores of 8 and 9 at one minute and five minutes, respectively; and that she was observed to be breathing normally initially, but later seen to be gasping at around 15 or 20 minutes after delivery. Associate Professor Evans said that all these clinical features were inconsistent with Manusiu suffering from the adverse effects of pethidine.⁵⁶

52. Associate Professor Arbuckle shared an almost identical view to that of Associate Professor Evans regarding the issue of pethidine and its possible causal connection with Manusiu's death. At the outset Associate Professor Arbuckle indicated that she did not agree with Dr Brouwer's opinion that the cause of Manusiu's death was most likely due to the toxic effects of pethidine.⁵⁷ In forming this view, Associate Professor Arbuckle relied principally on two factors:

- (a) Firstly, Associate Professor Arbuckle noted that observations of Manusiu gasping were inconsistent with pethidine toxicity and "*not the normal response*" to an opiate, such as pethidine.⁵⁸ Associate Professor Arbuckle explained that this is because pethidine depresses the respiratory functions in the brain resulting in an affected person having short, shallow, longer separated respirations before going to sleep and not, as in Manusiu's case, gasping respirations.⁵⁹
- (b) Secondly, Associate Professor Arbuckle noted that Manusiu was difficult to ventilate, a feature inconsistent with pethidine overdose. This is because, Associate Professor

⁵³ Exhibit 1, page 593.

⁵⁴ 14/3/18, T24.32.

⁵⁵ 14/3/18, T24.33.

⁵⁶ 14/3/18, T25.35.

⁵⁷ 14/3/18, T29.47.

⁵⁸ Exhibit 1, page 606.

⁵⁹ 14/3/18, T30.4.

Arbuckle explained, pethidine has no impact on the compliance of a person's lungs, only on the respiratory centres in the brain.⁶⁰

- (c) Thirdly, Associate Professor Arbuckle noted that Manusiu should have responded to the administration of Narcan. That fact that she did not suggested to Associate Professor Arbuckle that Manusiu may have transiently switched from in utero to ex utero circulation, but then reverted back to foetal circulation with pulmonary hypertension. This was supported by evidence of thick walled small arteries and arterioles⁶¹ with small lumens⁶² seen in the lungs. According to Associate Professor Arbuckle this would have made for gasping respirations and difficulty with ventilation.

53. After considering the reports prepared by Associate Professors Evans and Arbuckle, Dr Chid revisited the question of pethidine in a subsequent report. Having regard to the opinions expressed above, Dr Child subsequently noted that the recorded observations of Manusiu were "*clearly different*" to the logical effects of pethidine, namely, "*respiratory depression, shallow widely separated respirations and sleepiness, not gasping*".⁶³

54. **Conclusion:** There is consistent and contemporaneous evidence to establish that about 25 minutes after being born, and whilst being held by her father, Manusiu's displayed short and sharp inhalations, whilst not appearing to breathe out. This has been variously described as Manusiu gasping for air. Such observations are consistent with respiratory distress, and inconsistent with respiratory depression which is usually associated with the effects of an opiate such as pethidine.

55. Counsel for Mr and Mrs Amone submitted that the terming gasping is a highly subjective description of Manusiu's condition and that no reliance can be placed on it as a clinical description. With respect, this submission does not accurately reflect the available evidence and cannot be supported. To the contrary, the description of Manusiu gasping was of critical importance to both Associate Professors Evans and Arbuckle.

56. Counsel for Mr and Mrs Amone was also critical of the opinion expressed by Associate Professor Arbuckle and submitted that she had entirely discounted the effects of pethidine for which she did not make clear. Again, with respect, this is not an accurate description of the evidence given by Associate Professor Arbuckle both during the inquest and of the opinions expressed in her reports. As noted above, Associate Professor clearly and convincingly expressed the clinical reasons upon which her opinion was founded as to why she did not share Dr Brouwer's opinion regarding the possible effects of pethidine. For avoidance of doubt, it should again be noted that the opinion of Associate Professor Evans was consistent with that of Associate Professor Arbuckle. The submission made by Counsel for Mr and Mrs Amone also ignores the importance of other clinical findings, which were properly considered by Associate Professor Arbuckle, which are discussed in detail below. Further, it should be noted that Counsel for Mr and Mrs Amone did not put the criticisms raised in submissions to Associate Professor Arbuckle during her evidence in the inquest; indeed, the evidence given by Associate Professor Arbuckle was not challenged at all.

⁶⁰ 14/3/18, T30.11.

⁶¹ A small diameter blood vessel that extends and branches out from an artery and leads to capillaries.

⁶² The cavity or channel within a tubular organ such as an artery.

⁶³ Exhibit 1, page 588.

57. The combined weight of the medical opinions expressed by Associate Professors Evans and Arbuckle, and Dr Child, confirm that if Manusiu had been adversely affected by the pethidine administered to Mrs Amone, she would have gradually developed shallower and more widely separated respirations, as she slowly stopped breathing. Manusiu's failure to respond to appropriate life-saving measures such as resuscitation, ventilation, and the administration of Narcan confirm that the cause of Manusiu's death was not due to the toxic effects of pethidine.

Other significant clinical findings from the autopsy

58. Having reached the above conclusion, the obvious question is that if Manusiu's death was not due to the toxic effects of pethidine, what was the cause of her death? On this issue, there were a number of significant clinical findings noted by both Associate Professors Arbuckle and Evans.
59. In his report of 13 December 2016, Associate Professor Evans considered that the reference in the autopsy report to findings of foetal squames in the lungs may be a significant finding. Squames are flakes of dead skin cells that have been shedded or sloughed off a person's skin; the process of shedding is a constant one that occurs as part of everyday life. When this occurs in utero, the foetal squames remain in the amniotic fluid⁶⁴. Associate Professor Evans explained that the presence of squames in a foetal lung is evidence that the foetus has been inhaling amniotic fluid deep into the lung, which is abnormal and pathological. This is because the foetal lung is a fluid-producing organ where fluid passes out into the amniotic fluid, rather than vice versa.⁶⁵ Whilst the foetus normally makes breathing movements, the type of deeper breathing that would result in amniotic fluid being inhaled deep into the lung is associated with a response to hypoxia.⁶⁶
60. Associate Professor Evans explained that the pattern of large numbers of inhaled squames in the alveoli⁶⁷ is a consistent finding in stillborn babies. In live born babies who die it is seen mostly after more prolonged borderline hypoxia due to placental insufficiency⁶⁸, rather than acute hypoxia due to, for example, a tight umbilical cord around the neck of the foetus. Associate Professor Evans noted that large numbers of squames in the alveoli has been a consistent feature of cases of failure to respond to neonatal resuscitation that he has been requested to report on, usually to the Coroner's Court.⁶⁹ Associate Professor Evans ultimately recommended in his report that the findings regarding the squames found in Manusiu's case should be reviewed by a specialist perinatal pathologist.
61. Associate Professor Arbuckle later addressed this issue, both in her reports and in evidence during the inquest, and agreed with Associate Professor Evans' conclusions. Associate Professor Arbuckle described the squames as marked, in areas, with layering which meant that the squames were inhaled quite rapidly and packed down on each other.⁷⁰ This excessive number of squames indicated that Manusiu had experienced some hypoxic event in utero that had caused her to gasp and breathe in more amniotic fluid than usual.⁷¹ Associate Professor Arbuckle

⁶⁴ Fluid contained in the amniotic sac which surrounds the foetus during pregnancy.

⁶⁵ Exhibit 1, page 594.

⁶⁶ Exhibit 1, page 594.

⁶⁷ Tiny sacs in the lungs which allow for gas exchange.

⁶⁸ When the placenta is unable to deliver an adequate supply of oxygen and nutrients to the foetus.

⁶⁹ Exhibit 1, page 594.

⁷⁰ 14/3/18, T31.10.

⁷¹ 14/3/18, T30.46; T31.1.

described the presence and number of squames as being “*most significant as a marker of significant in utero hypoxia*”.⁷²

62. Both Associate Professors Evans and Arbuckle also pointed to three other clinical findings which provided evidence that Manusiu had experienced a hypoxic event:
- (a) Firstly, it was noted that Manusiu had a raised nucleated red cell count. Red cells carry oxygen in the blood stream and are produced in bone marrow. Production of red cells increases as a compensatory response to hypoxia. Only immature red cells, immediately after their release from bone marrow, have a nucleus, which they quickly lose. In Manusiu’s case, her nucleated red blood cell count was more than 3 times an expected normal range.⁷³ Associate Professor Evans explained in evidence that a very high nucleated red blood cell count, such as in Manusiu’s case, demonstrated that the bone marrow had been very actively producing red blood cells to try to cope with the relative lack of oxygen.⁷⁴
 - (b) Secondly, Associate Professor Arbuckle noted that Manusiu’s organs were congested and haemorrhagic, which was consistent with a hypoxic event both in utero and ex utero.⁷⁵
 - (c) Thirdly, Associate Professor Arbuckle opined that there was probably also early tubular necrosis⁷⁶, which suggested an insult⁷⁷ prior to birth.⁷⁸
63. Associate Professor Arbuckle was unable to determine when the hypoxic event had occurred but hypothesised that it may have occurred up to two priors to delivery, or at the time of delivery.⁷⁹ Associate Professor Arbuckle went on to explain that it was impossible to be certain of the timing of the hypoxic event and that it could have resulted from an umbilical cord accident such as entanglement, which then resolved as the cord untangled from around a body part.⁸⁰ Importantly, Associate Professor Arbuckle discounted the possibility that the hypoxic event was in any way related to the administration of pethidine because Mrs Amone had demonstrated no ill effect or reaction to it.⁸¹

What was the cause of Manusiu’s death?

64. Manusiu’s gasping, her lack of response to appropriate resuscitation, the evidence of an in utero hypoxic event, and the excessive number squames, all taken together led Associate Professor Evans to opine that Manusiu’s lungs may not have been normal and that she might have been suffering from some primary respiratory pathology. By way of explanation Associate Professor Evans said that in the foetus the blood vessels in the lungs are clamped down because the foetus does not require blood to flow into the lungs for gas exchange⁸² to occur. However, at birth these blood vessels open up in order to allow blood to flow into the lungs to allow for gas exchange. In

⁷² Exhibit 1, page 606.

⁷³ Exhibit 1, page 594.

⁷⁴ 14/3/18, T23.36.

⁷⁵ Exhibit 1, page 606.

⁷⁶ Damage to the kidneys caused by lack of oxygen reaching the cells of the kidney.

⁷⁷ In medical terms, an insult is the cause of some kind of trauma or injury to the body.

⁷⁸ Exhibit 1, page 606.

⁷⁹ 14/3/18, T31.26.

⁸⁰ Exhibit 1, page 612.

⁸¹ 14/3/18, T31.32.

⁸² The physical process which occurs in the lungs where oxygen from inhaled air is delivered from the lungs to the bloodstream, and carbon dioxide is eliminated from the bloodstream to the lungs.

Manusiu's case, Associate Professor Evans opined that, for reasons not understood, the blood vessels in her lungs clamped down again which stopped blood flowing through the lungs.⁸³ This meant that even though ventilation was allowing air to enter Manusiu's lungs, there was no gas exchange resulting in her inability to respond to resuscitation.

65. Associate Professor Arbuckle also similarly referred to the fact that Manusiu's pulmonary arteries in the lungs "*were very thick and closed down – which is the way they are in utero*".⁸⁴ Associate Professor Arbuckle explained that at birth, when a baby starts to breathe and adapt to the outside world, the arteries open up and the resistance decreases so that blood can flow through them to allow gas exchange to occur in the lungs.
66. The observations made of Manusiu after her birth (see at paragraph 51(d), above) were all put to Associate Professor Arbuckle. She indicated that this clinical picture was consistent with a syndrome known as persistent pulmonary hypertension of the newborn (**PPHN**), or maladaptation to outside life, where a newborn infant fails to make the transition from foetal circulation to normal newborn circulation.⁸⁵ In essence, Associate Professor Arbuckle explained that, following birth, Manusiu had switched from in utero circulation to ex utero circulation transiently. However, after about 15 or 20 minutes Manusiu then reverted back to in utero circulation.⁸⁶ This explained why Manusiu did not respond to ventilation and the resuscitation attempts.
67. Associate Professor Arbuckle also noted that maladaptation to normal circulation is seen more commonly in babies that who have been induced, given opiates and have suffered an acute hypoxic event, all of which applied in Manusiu's case and which made her at risk. Associate Professor Arbuckle concluded by noting that she did not think that the pethidine "*was the only factor in this case and that the maladaptation to ex utero life had a possibly bigger role to play with the opiates being one factor that may have played a role*".⁸⁷
68. Ultimately Associate Professor Arbuckle concluded that Manusiu died due to ischaemic hypoxic encephalopathy⁸⁸, secondary to factors associated with the sudden onset of gasping respirations with difficulty in ventilating. Associate Professor Arbuckle opined that Manusiu's circulation switched back to foetal circulation and the precipitating factors were acute intrauterine hypoxia as shown by the lung squames, opiates delivered just prior to birth, rapid and precipitous birth, and pulmonary hypertension which would have made ventilation difficult.⁸⁹

69. **Conclusion:** The finding of excessive numbers of squames in Manusiu's lungs was a significant finding. It, together with evidence of a raised nucleated red cell count, established that Manusiu had experienced an in utero hypoxic event that was unrelated to the effects of pethidine that had been administered to Mrs Amone. It is not possible to determine the cause of the hypoxic event although the available evidence indicates that it occurred at some stage between two hours prior to, and at the time of, delivery.

⁸³ 14/3/18, T23.5.

⁸⁴ 14/3/18, T32.16.

⁸⁵ 14/3/18, T32.42.

⁸⁶ 14/3/18, T33.8-19.

⁸⁷ Exhibit 1, page 606.

⁸⁸ Lack of oxygen and restriction of blood flow causing damage or malfunction to the brain.

⁸⁹ Exhibit 1, page 607.

70. The hypoxic event indicated that Manusiu had some intrinsic lung pathology. This was confirmed by the finding that Manusiu's lungs were high resistance, characterised by thick and closed down pulmonary arteries. This resulted in a lack of blood flow into the lungs which in turn prevented gas exchange from occurring, depriving Manusiu of necessary oxygen. This clinical picture, and Manusiu's consequent failure to respond to appropriate resuscitation and ventilation, was consistent with persistent pulmonary hypertension of the newborn. The cause of Manusiu's death was therefore ischaemic hypoxic encephalopathy secondary to factors associated with the sudden onset of gasping respirations with difficulty in ventilating.

Was the administration of pethidine to Mrs Amone appropriate?

71. It should be reinforced at the outset that consideration of this question is prefaced on the above conclusions. That is, that the administration of pethidine, and its toxic effects, were not the primary cause of Manusiu's death. Associate Professor Evans explained it in this way:

"So in this case it is possible that the pethidine interplayed with the other pathology by having some effect on respiration. So it's possible that [Manusiu] deteriorated more quickly because the pethidine was on board as well but it was not the primary cause of her demise".⁹⁰

72. With that in mind, resolving the question of whether the administration of pethidine was appropriate requires further consideration of two issues: was the timing of its administration appropriate, and was the amount appropriate?

Timing of the administration of pethidine

73. RM Lau raised the issue of possible use of pethidine with Mrs Amone on two occasions during the night of 24 November 2014. It appears that on at least the second occasion RM Lau informed Mrs Amone that the pethidine would assist with pain relief and help Mrs Amone to relax, and that if this occurred it might in turn help with dilation of the cervix and speed up labour.⁹¹ At the time the pethidine was administered Mrs Amone had been in true labour for approximately six hours. She had received two doses of prostin and had been on a syntocinon infusion for almost two hours; all of these measures were implemented to induce labour.
74. The appropriateness of when the pethidine was administered is dependent upon whether Manusiu's birth was considered imminent. This is because it is well-recognised, as noted above, that administration of pethidine proximate to the time of delivery and sudden progression of labour can result in placental transmission of pethidine from a mother to a foetus.⁹²
75. RM Lau was asked about this issue during the inquest. She gave evidence that whilst she felt that Mrs Amone's labour was not progressing, she agreed that it was likely that Mrs Amone would give birth within a two-hour window.⁹³ Despite this, RM Lau later said in evidence that if she had been concerned about delivery within two hours she would not have suggested a dose of 150mg of pethidine.⁹⁴

⁹⁰ 14/3/18, T25.3.

⁹¹ 12/3/18, T39.4.

⁹² 14/3/18, T16.2.

⁹³ 12/3/18, T40.48.

⁹⁴ 12/3/18, T44.39.

76. It appears that Dr Ansor had a different view to that of RM Lau. Dr Ansor did not accept that there was a strong likelihood that delivery would occur within two hours of 9:25pm.⁹⁵ Instead she said that she thought that it would take another four hours for Mrs Amone to be fully dilated.⁹⁶
77. In considering this issue, Dr Child opined that it was “*not surprising*” that Mrs Amone’s labour progressed from 5cm dilated (at around 9:30am) to delivery (at around 10:00pm) in 30 minutes.⁹⁷ Dr Child explained that it is well recognised that the rate of progress of labour increases on average with each birth. Dr Child noted that Manusiu was Mrs Amone’s fourth child and that each of her previous labours had progressively gotten faster: from 26 hours for her first child, to eight hours for her second child, and then to six hours for her third child. Dr Child also noted that 15 minutes before the pethidine was administered Mrs Amone’s cervix was 5cm dilated and that she had been given syntocinon intravenously.
78. In such circumstances Dr Child considered that Mrs Amone was “*very likely to deliver within the next 2 hours and it would therefore be considered unwise to give pethidine*”.⁹⁸ In evidence Dr Child described the progress of labour at the time the pethidine was administered to be “*fairly well progressed at that stage*” and that it would be “*normal obstetric practice*” to think that Manusiu would be delivered within the next hour.⁹⁹
79. Further, Dr Child noted that other agents for pain relief, other than pethidine, could have been considered for Mrs Amone:¹⁰⁰
- (a) Firstly, Dr Child noted that the use epidural anaesthesia was a possibility however, it was conceded that the need for an anaesthetist to administer it and the length of time the procedure would take, meant that it may not have been a suitable option at the time.¹⁰¹
 - (b) Secondly, continued use of nitrous oxide¹⁰², which was already being given to Mrs Amone for pain relief, could have been considered.
 - (c) Thirdly, reducing the syntocinon infusion in order decrease the strength and frequency of contractions, thereby reducing the amount of pain that Mrs Amone was experiencing, could also have been considered. Indeed Dr Child noted that in the 30 minutes prior to delivery, the CTG tracing indicted that Mrs Amone was experiencing 3 to 5 contractions at 10 minute intervals which was indicative of strong labour. Dr Child explained that it is usual practice to consider stopping a syntocinon infusion if there are more than 3 contractions per 10 minutes.¹⁰³

80. **Conclusion:** Having regard to the evidence of RM Lau and the opinion expressed by Dr Child, the decision to administer pethidine to Mrs Amone at 9:25pm was not optimal practice. This is because the CTG indicated that Mrs Amone was experiencing strong labour at the time and her medical history in relation to past pregnancies indicated that her periods of labour became

⁹⁵ 13/3/18, T39.32.

⁹⁶ 13/3/18, T33.38.

⁹⁷ Exhibit 1, page 586.

⁹⁸ Exhibit 1, page 584.

⁹⁹ 14/3/18, T16.32.

¹⁰⁰ Exhibit 1, page 584.

¹⁰¹ 14/3/18, T17.23.

¹⁰² Commonly known as “laughing gas”.

¹⁰³ Exhibit 1, page 587.

progressively faster. This meant that it was likely that Mrs Amone would give birth within a one to two hour window from 9:25pm. In such circumstances the decision to administer pethidine to Mrs Amone at this time was, as Dr Child described it, unwise. Further, it appears that insufficient consideration was given to other possible methods to provide with pain relief, without creating a risk of possible placental transmission of pethidine.

The dose of pethidine

81. At as November 2014, Fairfield Hospital's standing order (in accordance with a policy manual issued by South Western Sydney Local Health District (SWSLHD)¹⁰⁴) recommended a dosage range for pethidine to be between 75mg to 100mg. Any prescription in excess of 100mg required authorisation from a medical practitioner.¹⁰⁵
82. RM Lau gave evidence that she suggested to Dr Ansor that 150mg was an appropriate dose of pethidine to chart for Mrs Amone.¹⁰⁶ However, on several occasions during her evidence, RM Lau sought to emphasise that this was a suggestion only and that the ultimate decision regarding the dose rested with Dr Ansor.¹⁰⁷
83. It appears that RM Lau determined that 150mg was an appropriate dose based on two considerations:
 - (a) Firstly, she appeared to suggest that that this was a common or established practice at Fairfield Hospital. She said that *"in the past all along working in Fairfield we all have worked with overweight patients and we have been giving 150 milligram [sic] of pethidine"*.¹⁰⁸ It should be noted that Dr Tan also gave evidence that in his experience doses of 100mg were commonly used and that *"occasionally we do use a bigger dose"*¹⁰⁹, with the dosage dependent to some extent on a patient's weight.¹¹⁰
 - (b) Secondly, the dose of 150mg was determined, also in accordance with the above, by Mrs Amone's weight.
84. Despite the above, there was a distinct lack of evidence regarding, firstly, whether any accurate measurement of Mrs Amone's weight was known to any nursing or medical staff; and secondly, precisely how any such measurement of weight was used to calculate a therapeutic dose of pethidine.
85. There was no evidence that any measurement of Mrs Amone's weight was performed either at the time she was admitted to hospital on 23 November 2014, or the following day when Manusiu was born. Certainly, RM Lau said that she did not ask Mrs Amone how much she weighed on the day.¹¹¹ Indeed, the only evidence in the hospital records as to Mrs Amone's weight is to be found from her antenatal booking history which records her weight to be 84 kilograms (with a BMI of 28.3) at 20 weeks gestation on 4 July 2014.¹¹² Despite this, RM Lau simply said *"at that time I*

¹⁰⁴ Exhibit 1, tab 31B.

¹⁰⁵ 12/3/18, T42.24.

¹⁰⁶ 12/3/18, T44.24.

¹⁰⁷ 12/3/18, T44.21; T44.34.

¹⁰⁸ 12/3/18, T44.3.

¹⁰⁹ 12/3/18, T32.4.

¹¹⁰ 12/3/18, T32.8.

¹¹¹ 12/3/18, T42.34.

¹¹² Exhibit 1, page 164.

*didn't use the calculation of body mass index. I just go by [Mrs Amone's] weight, she is overweight".*¹¹³ As to exactly what weight RM Lau went by is unclear on the available evidence.

86. As at November 2014, Dr Ansor had only been training in obstetrics for seven months (from April 2014)¹¹⁴ and had administered pethidine to a patient on more than 10 occasions.¹¹⁵ She similarly said that she could not recall ever asking Mrs Amone how much she weighed.¹¹⁶ Nevertheless, Dr Ansor gave evidence that the 150mg of pethidine was suggested by RM Lau because RM Lau was concerned that a dose of 100mg would not be enough given Mrs Amone's high BMI.¹¹⁷ Dr Ansor said that from her "*own learning previously*" she had read that the correct dosage of pethidine could be calculated as being one milligram per kilogram of body weight.¹¹⁸
87. Dr Ansor went on to explain that it was her understanding that Mrs Amone's weight had been measured at about 90 kilograms "*in the early pregnancy*" and on this basis Dr Ansor came to the conclusion that Mrs Amone weighed more than 100 kilograms at the time of delivery.¹¹⁹ Counsel Assisting suggested to Dr Ansor that if this was her method of calculation then it meant that, by prescribing 150mg of pethidine, this meant that Dr Ansor believed Mrs Amone weighed 150 kilograms¹²⁰, which was highly unlikely to be the case. Dr Ansor sought to explain her suggested method of calculation by claiming that it was not possible to administer a dose to Mrs Amone that accurately accorded with her weight because pethidine came in "*pre-packed dosage*"¹²¹ of 100mg.¹²² On this basis Dr Ansor thought that it would be difficult to accurately measure any dose that was not in increments of 100mg.¹²³
88. Dr Ansor rejected the proposition put by Counsel Assisting that if Mrs Amone weighed 84 kilograms at 20 weeks gestation, it was equally unlikely that she would have weighed more than 100 kilograms at 41 weeks.¹²⁴ Eventually, confronted with the absence of logic in her answers in evidence, Dr Ansor agreed that she was simply guessing as to what Mrs Amone's weight was, and that when she calculated how much pethidine to prescribe to Mrs Amone it was merely an estimation.¹²⁵ Despite this concession, which was validly made, Dr Ansor refused to accept the suggestion that her estimation may have been, as Counsel Assisting put it, "*horribly wrong*".¹²⁶
89. When asked to consider the amount of pethidine given to Mrs Amone, Dr Child described it as "*excessive dose to use in advanced labour*".¹²⁷ In evidence Dr Child said that in 50 years of obstetrics practice he himself had never prescribed more than 100mg of pethidine to a patient.¹²⁸
90. Dr Child was asked in evidence whether he was aware of any methodology which might assist a medical practitioner to calculate a therapeutic prescription of pethidine in excess of 100mg. Dr

¹¹³ 12/3/18, T44.12.

¹¹⁴ 13/3/18, T35.42.

¹¹⁵ 13/3/18, T36.1.

¹¹⁶ 13/3/18, T40.9.

¹¹⁷ 13/3/18, T35.5.

¹¹⁸ 13/3/18, T36.11.

¹¹⁹ 13/3/18, T36.21.

¹²⁰ 13/3/18, T36.37.

¹²¹ 13/3/18, T36.37.

¹²² 13/3/18, T45.18.

¹²³ 13/3/18, T45.12.

¹²⁴ 13/3/18, T37.23.

¹²⁵ 13/3/18, T37.36.

¹²⁶ 13/3/18, T37.39.

¹²⁷ Exhibit 1, page 584.

¹²⁸ 14/3/18, T15.47.

Child said that he was not aware of any methodology to perform such a calculation.¹²⁹ Instead, Dr Child explained that clinical practice for administration of doses of less than 100mg are usually dictated by a patient's response. For example, if there was nil effect after prescribing a dose of 50mg, a subsequent dose might be increased to 75mg.

91. **Conclusion:** The 150mg dose of pethidine administered to Mrs Amone was excessive. Despite Dr Ansor's claims to the contrary, there is no evidence that any clinically accepted and reliable method of calculation was applied to determine an appropriate and therapeutic dose to prescribe. Indeed, the evidence established that no such methodology was available in clinical practice. This means that the decision to prescribe 150mg was based simply on, as eventually conceded by Dr Ansor, estimation and guesswork. Dr Ansor's refusal to accept that the estimation was horribly wrong is both illogical and unreasonable, and against the compelling expert evidence given by Dr Child.

92. Even if it were possible (and the evidence does not establish that this is the case) to conclude that the dose of 150mg was appropriate simply because Mrs Amone was overweight, that reasoning was based on information that was available as at 4 July 2014, almost five months before the pethidine was actually prescribed. According to an experienced obstetrician such as Dr Child, competent clinical practice suggested that if it was determined that administration of pethidine was appropriate, the correct dosage should have been determined based on a careful assessment of a patient's response to a dose of less than 100mg, with incremental dosages prescribed as necessary depending on that response.

93. Counsel for Mr and Mrs Amone submitted that a recommendation ought to be made that the weight of patient about the give birth should be recorded upon that patient's admission. However, given the evidence of Dr Child as to the absence of any correlation between a patient's weight and calculation of the administration of pethidine, in my view it is neither necessary nor desirable to make such a recommendation. In this regard it is also noted that the evidence established that pethidine is no longer stocked or prescribed in birthing units within the South Western Sydney Local Health District.

Was Manusiu provided with appropriate care and treatment, and in particular was she appropriately observed?

94. It has already been noted above that the antenatal care provided to Mrs Amone, and the response to Manusiu's decline and attempts to resuscitate and ventilate her, were appropriate and consistent with competent medical practice. The obstetric care provided to Mrs Amone during labour, particularly in relation the administration of pethidine, has also already been considered above. The remaining issue to consider surrounds the circumstances of Manusiu's delivery and observations of her that followed.

Observations at the time of delivery

95. It is evident that Mrs Amone was unattended by any nursing or medical staff at the time that delivery commenced. The only other person in the room with her at the time was her husband. There is some difference in account as to whether Manusiu was fully expelled by the time Dr Tan

¹²⁹ 14/3/18, T16.18.

arrived in the room. According to both Mrs Amone¹³⁰ and Mr Amone¹³¹ Manusiu had been fully expelled. However, Dr Tan said that when he entered the room only Manusiu's head and part of her body (but not her whole body) was out.¹³² It is not possible to resolve this difference and ultimately it is unnecessary to do so. As noted, what is clear is that Mrs Amone was unattended by any hospital staff at the time that delivery commenced.

96. According to RM Lau, she left Mrs Amone's room at about 9:45pm to check on a newborn in another room. This means that Mrs Amone was unattended for about 15 minutes before delivery commenced. When this occurred Mr Amone attempted to call for assistance but there was some delay before eventually he left the room and called Dr Tan. Mrs Amone said that "*as the baby came out [Mr Amone] just ran straight to the buzzer, he kept pressing the buzzer, and then no one still came and so he ran out, he ran out calling for someone to come*".¹³³ Mr Amone estimates that it took between 60 and 90 seconds from the time that delivery commenced to the time that Dr Tan entered the room.¹³⁴

Observations following delivery

97. Dr Tan was the first to attend Mrs Amone at the time of delivery, followed closely by RN Walker. RN Walker recorded both the one minute and five minute APGAR scores, and left the room less than 10 minutes after Manusiu had been born.¹³⁵ RM Lau was the last to enter the room. By that time the five minute APGAR assessment had been performed and she was told the score shortly after entering. On this basis, RM Lau agreed that she might have entered the room about 5 minutes after Manusiu was born, but also said that it could have been up to 10 or even 15 minutes after birth.¹³⁶ Dr Tan said that he was unsure whether RM Lau was present in the room at the same time he was¹³⁷, explaining that he was busy delivering the placenta and attending to Mrs Amone.¹³⁸ In any event, Dr Tan would not have performed any observation of Manusiu; that task was the responsibility of the nursing staff, whilst he attended to Mrs Amone.
98. RM Lau later indicated that she left the room about 15 minutes after Manusiu had been born.¹³⁹ Mr Amone said that it was about 15 to 20 minutes after Manusiu was born that he noticed that Manusiu was gasping for air and he became concerned for her welfare.¹⁴⁰ On this basis he sounded the emergency alarm and estimated that it took less than a minute for someone to arrive in the room.¹⁴¹ It has already been established that RM Lau was the first person to respond to the second call alarm.
99. The evidence indicates that RN Walker left the room shortly before the 10-minute mark after Manusiu had been born. At that point it appears that Dr Tan had already left the room and RM Lau was the only hospital staff member still in the room with Mr and Mrs Amone, and Manusiu. RM Lau left the room about 5 minutes later, that is about 15 minutes after Manusiu had been born. If it is accepted that Manusiu was born at 10:03pm then it appears that there was at least

¹³⁰ 12/3/18, T11.42.

¹³¹ 12/3/18, T18.12.

¹³² 12/3/18, T12.47.

¹³³ 12/3/18, T11.34.

¹³⁴ 12/3/18, T18.29.

¹³⁵ 13/3/18, T10.47; T11.44.

¹³⁶ 12/3/18, T49.34.

¹³⁷ 12/3/18, T30.37.

¹³⁸ 12/3/18, T30.15.

¹³⁹ 12/3/18, T51.37.

¹⁴⁰ 12/3/18, T20.16.

¹⁴¹ 12/3/18, T20.26.

one midwife in the room until about 10:18pm. Accepting that Mr Amone observed Manusiu to be gasping and raised an alarm at around 10:30pm, this means that there was a period of about 12 minutes where Manusiu was not attended or observed by a midwife. This fact of its own is not unusual. RM Lau explained in evidence that it is usual practice to allow parents some time alone to spend with their newborn child in the immediate period following birth.¹⁴²

100. A NSW Health Policy Directive (since rescinded) relating to observation and management of newborn infants with respiratory maladaptation at birth (including infants exposed to opioids administered to the mother during labour) provides that where such medication is given within 4 hours of the birth then the baby should be monitored for respiratory rate, colour, chest recession or retraction every 15 minutes in the first hour and for at least 4 hours after birth.¹⁴³ As such monitoring was not ordered in Manusiu's case, Dr Child concluded that "*there was a definite oversight by the attending staff to not arrange such monitoring*".¹⁴⁴
101. It appears that the delay in response to the first call alarm, and to a lesser extent the second call alarm, was due to two factors: the birthing unit being short of one midwifery staff member between 10:00pm to 10:30pm, and a difficulty in the call alarm from Mrs Amone's room being heard. The first issue concerning staffing is discussed further below. As to the second issue, the evidence established that in November 2014 if a call alarm was placed it would only be heard in the nurses' station in the birthing unit. If the station was unattended the call would not be heard.¹⁴⁵ It appears that because RM Lau was attending to another newborn in another room between 9:45pm and 10:00pm she did not initially hear the first call alarm. However, the evidence also established that since 2014 a new call alarm system has been introduced in the birthing unit where the alarm sound is louder and remains continuous until the call is answered.¹⁴⁶
102. The question that arises from the above is whether, if Manusiu had been continuously observed between 10:00pm and 10:30pm, there might have been a different outcome. Associate Professor Evans suspected that Manusiu would have been showing signs of respiratory distress from shortly after birth, and that if this had been recognised and acted on earlier then "*it might have been possible to interrupt the hypoxic spiral that led to her death*".¹⁴⁷ However, Associate Professor Evans reasoned that Manusiu's failure to respond to resuscitation suggested that even if that had been implemented earlier it would not have changed the outcome.¹⁴⁸ Associate Professor Evans explained that he had seen other cases, similar to Manusiu's, where early detection of an adverse event had been present where the patient could not be resuscitated. Ultimately Associate Professor Evans said that he did not know whether earlier detection, leading to earlier resuscitation attempts, would have made a difference, but if this had occurred it would have optimised the chance to reverse Manusiu's decline.¹⁴⁹

103. **Conclusion:** Mrs Amone was unattended by any nursing or medical staff at the time that delivery commenced. Despite a call for assistance being made by Mr Amone it appears that there was a brief delay of some 60 to 90 seconds before a hospital staff member, Dr Tan, entered the room. By this time, Manusiu was in the process of being delivered, or had just been delivered. It

¹⁴² 12/3/18, T50.43.

¹⁴³ Exhibit 1, tab 31A.

¹⁴⁴ Exhibit 1, page 585.

¹⁴⁵ 12/3/18, T47.39.

¹⁴⁶ 12/3/18, T48.2.

¹⁴⁷ Exhibit 1, page 595.

¹⁴⁸ Exhibit 1, page 595.

¹⁴⁹ 14/3/18, T26.38.

appears that the lack of attendance was due to a combination of three factors: the birthing unit being short of one midwifery staff member, the birthing unit being particularly busy on the night of 24 November 2014 with all the birthing rooms occupied, and an inability for the call alarm from Mrs Amone's room being heard in other parts of the unit.

104. There is evidence that appropriate changes have been implemented (some discussed further below) to address the first and third issues so as to mitigate the possibility that another patient will encounter the situation experienced by Mrs Amone of giving birth whilst unattended by a hospital staff member. Notwithstanding, there is no evidence to establish that the lack of attendance at the time of Manusiu's delivery was causally connected to her death.

105. Whilst monitoring was not ordered in Manusiu's case, in accordance with the applicable NSW Health Policy Directive applicable at the time, the evidence establishes that at least one hospital staff member remained in Mrs Amone's room with Manusiu at least until about 10:18pm. The fact that Mr and Mrs Amone were left alone to spend time in private with their newborn daughter for a brief period of time is not unusual practice. In such circumstances it was not unreasonable for Manusiu not to have been observed by a nursing staff member between about 10:19pm and 10:30pm. The evidence establishes that when the emergency call alarm was sounded by Mr Amone, there was a prompt response to it by RM Lau.

106. Counsel for Mr and Mrs Amone submitted that a recommendation ought to be made providing for a documented observation plan in circumstances where a newborn infant is thought to be affected by maternal narcotic administration during labour. However, in Manusiu's case there is no evidence that she was so affected during labour or during the period that she was observed following birth up to about 10:19pm. To the contrary, Manusiu's APGAR scores were within normal ranges and she was initially observed to be breathing normally. On this basis it does not appear that a recommendation of the kind that it is submitted should be made is either necessary or desirable. In this regard, it should be noted that the current Standard Neonatal Observation Chart in use within SWSLHD, and other Local Health Districts, provides that where mothers who have received narcotics less than four hours prior to birth their newborn infants are to be observed at 15 minute intervals in the first hour following birth.

107. In any event, whilst it is impossible to know if any earlier observation of Manusiu might have altered the outcome, it appears that this was unlikely. The expert evidence from Associate Professor Evans establishes that earlier observation resulting in earlier resuscitation attempts would have optimised Manusiu's chances of recovery. However, Manusiu's inability to respond to resuscitation for the reasons already described above, and Associate Professor's experience of cases similar to Manusiu's, both suggest that this would not have altered the outcome.

What was the impact, if any, of midwife staffing levels on the care and treatment provided to Manusiu?

108. On 24 November 2014, there were three maternity staff assigned to the birthing unit. RN Walker and RM Lau were both on the afternoon shift from 2:30pm to 11:00pm. There was also a third midwife working a shift from 1:00pm to 9:30pm who was to be replaced by another midwife from 9:30pm.¹⁵⁰

¹⁵⁰ 13/3/18, T2.47.

109. However, on this particular evening the midwife due to start at 9:30pm called (at around 4:00pm to 4:30pm) to request that she be allowed to start her shift at around 11:00pm, and that if she was not permitted to do so she could have to call in sick. As the nurse in charge of the unit, RN Walker agreed to the delayed shift start time but advised the midwife that if the birthing unit became busy she would have to call the midwife to attend work.¹⁵¹ This meant that the birthing unit was one midwife short from 9:30pm onwards.¹⁵² Although work in the unit did indeed become busy, RN Walker did not call the third midwife to come in, explaining that thinking to do so was not in the forefront of her mind.¹⁵³
110. Since Manusiu's death, Fairfield Hospital (along with other hospitals in South Western Sydney Local Health District) has adopted a midwifery workplace planning methodology known as *Birthrate Plus*. This is a tool used to calculate the required midwifery workforce to ensure that patients in the birthing unit are provided with a minimum standard of one-to-one midwifery care throughout labour and birth. The use of *Birthrate Plus* has led to a the following changes: ¹⁵⁴
- (a) In November 2014 there were three maternity staff and an obstetrics and gynaecology registered medical officer or registrar rostered on for the afternoon shift in the birthing unit. The current staffing principles now provide for the same number of staff as in November 2014, with the addition of an onsite paediatrics medical officer available 24 hours per day, and clinical midwife specialist after hours support.
 - (b) In November 2014, there were two maternity staff rostered on for the night shift in the birthing unit. The current staffing principles now provide for three maternity staff and an obstetrics and gynaecology registrar onsite.
111. In addition to the above, credentialed obstetrics registrars are available onsite after hours to deal with clinical issues, replacing less experienced junior medical officers with variable experience.¹⁵⁵
112. **Conclusion:** Due to a midwife delaying the start of her shift from 9:30pm until 11:00pm, the birthing unit was one short of its full complement of three rostered midwives. This occurred during the period that Manusiu was delivered, and when she was seen to be gasping whilst in respiratory distress. Given the number of patients and workload on the night, and the difficulties described above in hearing a room call alarm, there is no clear basis to conclude that the presence of an additional midwife might have meant that Mrs Amone and Manusiu were attended to more promptly on either occasion. However, based purely on the division of workload responsibilities, it would be reasonable to conclude that a full complement of midwife staff members would have made this more likely. For the reasons described already above it is not possible to conclude that any earlier attendance by a midwife, in particular in response to the call alarm made when Manusiu was seen to be gasping, would have altered the outcome for Manusiu.
113. Since Manusiu's death the SWSLHD has made changes to midwifery staffing levels within the birthing unit. These changes have improved midwife-to-patient ratios and increased the

¹⁵¹ 13/3/18, T3.13.

¹⁵² 13/3/18, T3.4.

¹⁵³ 13/3/18, T3.27.

¹⁵⁴ Exhibit 1, tab 35 at [13].

¹⁵⁵ Exhibit 1, tab 35 at [15].

availability of advice and assistance from suitably credentialed medical officers. Accordingly there is no basis to conclude that it is necessary or desirable to make any recommendation in this regard.

Issues relating to the conduct of perinatal and paediatric postmortem examinations in coronial cases in NSW generally

114. Manusiu's death, and the circumstances surrounding it, raises some broader systemic issues beyond the events of 24 November 2014. In order to understand how these issues arise, it is necessary to set out the background to this inquest, and others like it.

Background

115. It has now taken approximately three and a half years to answer the question of what caused Manusiu's death. In that time, considerable public and private resources have been expended to gather evidence, seek expert opinion, instruct legal representatives, and conduct the inquest itself. This expenditure does not take into account the impact that the conduct of the coronial investigation and the inquest has had on individuals such as witnesses and persons with an interest in the outcome of the coronial proceedings.
116. Perhaps even more importantly, this expenditure does not take into account the considerable emotional toll and mental strain likely placed on Manusiu's parents and family. When the autopsy report was completed in April 2015 the available evidence at the time raised one possibility as to the cause of Manusiu's death. However, when Associate Professor Evans' first report was prepared in December 2016, another possibility as to the cause of death was raised, which was later supported by the time of Associate Professor Arbuckle's first report in February 2017.
117. The final result, at the conclusion of the inquest, has been that:
- (a) Manusiu's parents were left in an immediate state of uncertainty as to the cause of their daughter's death in November 2014 and the months that followed;
 - (b) The reporting of Manusiu's death to the Coroner brought with it the unfortunate, but necessary, intrusion that a coronial investigation brings at a time that families, like Manusiu's, are experiencing immeasurable grief and loss;
 - (c) When the autopsy report became available some 5 months later, it indicated that it was likely that Manusiu had died from the effects of a medication that Mrs Amone had consented to being given to her;
 - (d) A further 20 months later, Associate Professor Evans' first report indicated that it was likely that Manusiu's death was unrelated to the effects of such medication;
 - (e) The opinions expressed in Associate Professor Evans' report were supported by Associate Professor Arbuckle's report; and

- (f) By the time of the findings being delivered, in which I have concluded that the opinions expressed by Associate Professors Evans and Arbuckle are persuasive and should be accepted, a further 17 months have elapsed.

118. Having outlined the above chronology it is difficult, for anyone not experiencing it first-hand, to fully understand and appreciate the expected emotional burden placed on Manusiu's family by the lack of clarity, for several years, surrounding the cause of Manusiu's sudden and unexpected death. However, even a rudimentary understanding of the likely experience of Manusiu's family in this regard leads to the reasonable conclusion that it should be mitigated and avoided if possible.

Other similar inquests

119. Manusiu's death was not the only neonatal death in 2014 where the possibility of pethidine toxicity as the cause of death was raised. At 9:00pm on 17 April 2014 Jasmine Chiang was born at Bankstown-Lidcombe Hospital. About 40 minutes after the birth it was observed that Jasmine's oxygen saturation levels were in decline and she was later found to be in respiratory distress and in need of ventilation and resuscitation. Despite these measures, Jasmine later tragically died at 4.11am on 18 April 2014, only 7 hours after being born.
120. A postmortem examination was later performed and in an autopsy report dated January 2015 it was indicated by the forensic pathologist who performed the autopsy that the cause of Jasmine's death could not be determined. However, the autopsy report referred to the fact that Jasmine's mother had been administered pethidine during labour and suggested that consideration could be given to whether guidelines associated with pethidine use had been adhered to.
121. In Jasmine's matter expert opinion was again sought from Associate Professor Evans as to the cause of her death. Associate Professor Evans explained that Jasmine's presentation was clinically typical of PPHN, leading him to eventually conclude that Jasmine died from hypoxia related to pulmonary maladaptation to extra-uterine life.
122. In summary, Jasmine's death was the second time in which the possibility that pethidine had played a causal role in the death of a newborn in 2014 had been raised by an autopsy report. It also eventually represented the second time where expert evidence subsequently gathered suggested a different cause of death. Given these similarities, and because Jasmine's death also occurred in a hospital within the SWSLHD, an inquest into Jasmine's death was held on 16 March 2018, in the same week and immediately following the inquest into Manusiu's death.
123. The deaths of both Manusiu and Jasmine raise questions about current systems surrounding the conduct of postmortem investigations in neonatal deaths that have been reported to the Coroner. The obvious questions to be asked are:
- (a) If specialist expert opinion had been sought at an earlier stage, would this have likely assisted in determining the cause of death?
 - (b) If such specialist expert opinion had been sought, would the need for an inquest have been obviated?

124. This is not the first time that these issues have been considered. On 11 March 2016 his Honour, former Deputy State Coroner Hugh Dillon delivered findings in the *Inquest into the death of Elsie Coghill*. Elsie died on 27 May 2013 in a public hospital in Coffs harbour less than a day after being born. Like Manusiu's case, both Associate Professor Arbuckle and Associate Professor Evans were briefed to review Elise's death and both gave evidence during the course of the inquest. In his findings Deputy State Coroner Dillon said:

*"...during the course of this inquest it became obvious that Dr Susan Arbuckle's expertise as a perinatal and paediatric pathologist added significantly to the analysis of the case. I propose to recommend that in cases such as this, that autopsies be conducted either by specialist perinatal/paediatric pathologists or that such specialists work with forensic pathologists to establish (if possible) the cause and manner of death."*¹⁵⁶

125. Ultimately Deputy State Coroner Dillon made the following recommendation to the Minister for Health and to the Mid-North Coast Local Health District:

*"That consideration be given, in cases of unusual and unexpected deaths of newborn children in regional hospitals in New South Wales, to having autopsies conducted by specialist perinatal/paediatric pathologists or that deaths of such deceased newborn children be investigated medically by forensic pathologists and a specialist perinatal/paediatric pathologist together in whatever way is appropriate in all the circumstances to establish (if possible) the cause and manner of death".*¹⁵⁷

The current landscape

126. It is against this background, that the issues relating to the conduct of perinatal and paediatric postmortem examinations in coronial cases in NSW generally come to be considered. Before the commencement of the inquest into Manusiu's death a response was sought from NSW Health Pathology in relation to Deputy State Coroner Dillon's recommendation, given that it had been made some two years earlier. That response was provided by Professor Roger Wilson, Chief Pathologist for NSW Health Pathology. In a letter dated 6 March 2018¹⁵⁸ Professor Wilson explained that the NSW Ministry of Health supported Deputy State Coroner Dillon's recommendation and had referred it to the NSW Health Pathology Perinatal Post Mortem and Related Services Committee (**the Committee**). Professor Wilson went on to explain that the Committee is currently proposing a new model of service for perinatal and post mortems in NSW, that this new model had been endorsed by NSW Health Pathology, and it will be further developed in consultation with Local Health Districts before it is finalised and implemented.
127. Further details about the new model of service was sought from Professor Wilson. In a further letter dated 13 March 2018¹⁵⁹ Professor Wilson explained¹⁶⁰ that the new service model aimed, most relevantly, to provide that investigation, including post mortem examination of the baby and pathological examination of the placenta, only be performed by specialist perinatal and paediatric anatomical pathologists¹⁶¹. Professor Wilson went on to explain that:

¹⁵⁶ Findings in the Inquest into the death of Elsie Coghill at [98].

¹⁵⁷ Findings in the Inquest into the death of Elsie Coghill at [107].

¹⁵⁸ Exhibit 1, tab 44.

¹⁵⁹ Exhibit 5.

¹⁶⁰ Noting that other pathologists, credentialed to perform this work on the recommendation of peer experts, might also be utilised.

¹⁶¹ For convenience, I will refer to specialist perinatal and paediatric anatomical pathologists simply as perinatal pathologists for the remainder of the findings.

- (a) NSW Health Pathology has never considered limiting the recommendation made by Deputy State Coroner Dillon to only NSW regional hospitals; and
- (b) (b) the Committee *“has recommended that paediatric anatomical pathologists should perform all unusual and unexpected non-suspicious non-traumatic neonatal deaths occurring in hospitals, where the baby has remained in hospital from the time of delivery to death, irrespective of the facility in which the death occurred, except where toxicology analysis is required or where the death has been unattended”*.¹⁶²

128. However, Professor Wilson explained in evidence during the inquest that the Committee’s recommendation relates only to non-coronial neonatal deaths. It was established during the inquest that even if the recommendation did not only relate to such deaths, Manusiu’s death would not have fallen within the scope of the recommendation. This is because her death was one where toxicological analysis was required. Therefore, the ultimate issue which the inquest focused on is whether an equivalent level of postmortem examination by specialist perinatal pathologists can be provided in relation to both non-coronial *and* coronial deaths in NSW.

129. In order to answer this question it is necessary to understand the current system relating to the conduct of perinatal postmortem examinations and the limitations within the system. The evidence at inquest established the following:

- (a) Perinatal and paediatric pathology is a specialist area of training;¹⁶³
- (b) There are approximately 500 non-coronial perinatal autopsies performed in NSW annually, with about 20% relating to deaths following live birth;¹⁶⁴
- (c) Approximately 90% of all non-coronial perinatal autopsies are performed by specialist perinatal pathologists;¹⁶⁵
- (d) There is currently a NSW (and national) workforce shortage of suitably credentialed and trained perinatal pathologists and forensic pathologists;¹⁶⁶
- (e) The possible ways to address the workforce shortage are by recruiting specialists either from interstate or from overseas, or by anatomical pathologists undertake necessary training to specialise as perinatal pathologists;¹⁶⁷
- (f) The DOFM is seeking to attract a suitably credentialed perinatal pathologist;¹⁶⁸
- (g) Apart from workforce limitations, there is a difficulty in perinatal pathologists performing autopsies in coronial cases where toxicology is required due to the requirement to maintain chain of custody on specimens, which cannot be accommodated in a hospital setting;¹⁶⁹

¹⁶² Exhibit 5.

¹⁶³ 14/3/18, T5.30.

¹⁶⁴ 14/3/18, T3.7.

¹⁶⁵ 14/3/18, T3.43.

¹⁶⁶ Exhibit 1, tab 44; 14/3/18, T6.6.

¹⁶⁷ 14/3/18, T6.15.

¹⁶⁸ Exhibit 1, tab 44.

¹⁶⁹ Exhibit 1, tab 44.

- (h) In the absence of a suitably credentialed perinatal pathologist (who would also have necessary forensic pathology training and experience) the current system for the conduct of coronial autopsies for perinatal deaths involves forensic pathologists consulting with, and seeking input from, paediatric pathologists on an ad hoc basis;¹⁷⁰
- (i) This arrangement poses challenges because of geography (the distance that forensic pathologists are required to travel, usually between the DOFM at Glebe and The Children's Hospital at Westmead), and because of the competing workload commitments faced by paediatric pathologists (who are also required to perform non-postmortem work such as diagnostic pathology for surgical cases);¹⁷¹
- (j) There is a recognition by NSW Health Pathology for the need for the consultation process between forensic and perinatal pathologists to be pre-emptive rather than reactive;¹⁷²
- (k) The goal of pre-emptive consultation is sought to be achieved via the recruitment of a care coordinator (such as a clinical midwife specialist) to centrally coordinate non-coronial postmortem work, and link that person to a similar care coordinator position within the DOFM;¹⁷³
- (l) Professor Wilson's understanding is that the paediatric anatomy pathology units at The Children's Hospital at Westmead and John Hunter Children's Hospital in Newcastle "*would be able to...would be willing and see that as part of the, the role that they should be performing*" to perform postmortem examinations on reportable, non-suspicious, non-violent deaths occurring in NSW where the infant has not been discharged from hospital, where the death has not been unattended, and where toxicology is not required;¹⁷⁴
- (m) However, there are significant workforce limitations in the sense that there are currently only eight perinatal pathologists (with a further one to come on board) in NSW, all of whom are working part-time, and even increasing their work load marginally would have significant impact;¹⁷⁵
- (n) It would not be sustainable for a perinatal pathologist to only do postmortem work as most have a broader clinical practice;¹⁷⁶
- (o) Recommendations from equivalent pathology colleges in the United Kingdom and United States indicates that perinatal pathologists should perform a minimum of 50 autopsies annually to maintain existing skill sets;¹⁷⁷
- (p) One possible solution may be to attract more than one perinatal pathologist with a joint appointment in both forensic medicine and hospital practice (including both postmortem and diagnostic pathology), which would address workforce challenges on the diagnostic side, allow for collegiality to discuss cases, and provide cover in the case of absences.¹⁷⁸

¹⁷⁰ 14/3/18, T10.14.

¹⁷¹ 14/3/18, T6.46-T7.9.

¹⁷² 14/3/18, T7.18.

¹⁷³ 14/3/18, T7.19-T7.27.

¹⁷⁴ 14/3/18, T7.45.

¹⁷⁵ 14/3/18, T8.5.

¹⁷⁶ 14/3/18, T8.47.

¹⁷⁷ 14/3/18, T29.31.

¹⁷⁸ 14/3/18, T9.3.

Whilst there is no position currently being advertised, some informal inquiries are being made amongst the profession to locate a suitable candidate.¹⁷⁹

130. In evidence Associate Professor Arbuckle referred to the fact that guidelines established by the Perinatal Society of Australia and New Zealand, which have been adopted by the Ministry of Health, are that all perinatal autopsies should be performed by an expert perinatal and paediatric pathologist, and not undertaken by other pathologists.¹⁸⁰ Further, Associate Professor Arbuckle explained that a similar view was also held in much of the United States and in most European countries.¹⁸¹
131. Associate Professor Arbuckle also expressed the view that, given the relatively small number of coronial perinatal cases annually, they should all be performed in conjunction by both a forensic and perinatal pathologist.¹⁸² Associate Professor Arbuckle referred to this system being used in the United Kingdom where an autopsy is performed in tandem by a perinatal and forensic pathologist.¹⁸³ Associate Professor Arbuckle explained that if the autopsy was deemed a trauma case then the forensic pathologist would take the clinical lead but if it was a hospital death then the perinatal pathologist would take the lead.
132. It would appear that the evidence given Associate Professor Arbuckle is supported by Professor Wilson. He said in evidence:

"...there are some cases that, that paediatric anatomical pathologists believe are going to the coronial system that perhaps could be appropriately managed and, and perhaps better managed in terms of the, the expertise that they have which is different to forensic pathologists if those cases were done by them. So I think that the forensic pathologists acknowledge that the paediatric anatomical pathologists have expertise that they don't have. But vice versa the paediatric anatomical pathologists recognise and make it very clear that they are not forensic pathologists. And that forensic pathologists have expertise and experience that they don't hold. So hence the model of working together perhaps rather than, rather than trying to do each other's jobs".¹⁸⁴

133. **Conclusion:** It is clear from the above that the conduct of perinatal autopsies is a specialist area. Optimal clinical practice, and guidelines established both in Australia and overseas, indicates that such autopsies should be performed by specialist perinatal pathologists. Using such expertise to assist in determining the cause of death in coronial cases would assist to both reduce both delay and uncertainty in making such determinations. This is likely to have the resultant effect of reducing the emotional burden placed on bereaved families when experiencing such delay and uncertainty. Timelier and more conclusive resolution of the cause of death is also likely to mitigate the significant resources expended in the conduct of coronial investigations, including inquests.

134. It is recognised that consideration of cause of death in some coronial cases (for example those cases involving suspected trauma) will require the expertise of a forensic pathologist. Further, postmortem examinations in such cases cannot be performed in non-forensic facilities such as

¹⁷⁹ 14/3/18, T9.18.

¹⁸⁰ 14/3/18, T36.30.

¹⁸¹ 14/3/18, T36.35.

¹⁸² 14/3/18, T39.16.

¹⁸³ 14/3/18, T40.39.

¹⁸⁴ 14/3/18, T12.36.

hospitals which lack the necessary infrastructure to provide for maintenance of chain of custody of specimens.

135. The totality of the available evidence indicates that an ideal clinical model for the performance of postmortem examinations relating to all reportable deaths is that such examinations be performed jointly by a forensic pathologist and a perinatal pathologist. For such examinations the circumstances of death ought to indicate which discipline of pathology should take the clinical lead. It was submitted by Counsel for the SWSLHD and NSW Health Pathology that a recommendation for such a model to be implemented in practice should not be made due to the workforce and system limitations referred to above. However, the evidence during the inquest established that while consideration has appropriately been given to such limitations, some of the steps taken to address them remain in the contemplative or informal stage at present (for example, the formal recruitment of additional suitably credentialed perinatal pathologists). Further, it was acknowledged by Professor Wilson that opportunities may exist to restructure current systems to allow for improvement (such as by creating a system of dual pathology appointment). Finally, given the recommendation made by former Deputy State Coroner Dillon in the *Inquest into the death of Elsie Coghill*, and the period of time that has elapsed since without the issue having been materially advanced, it seems timely to again focus attention on the issues raised in that inquest, and the inquests into Manusiu's and Jasmine's deaths.

136. Having regard to all of the available evidence and in considering what system for the conduct of coronial postmortem examinations is most likely to comply with clinical best practice and provide information to bereaved families in a timely and consistent manner, I am of the view that it is both necessary and desirable to make the following recommendation.

137. **Recommendation 1:** I recommend to the Minister for Health that consideration be given to the introduction of a policy applicable to NSW Health Pathology requiring that the postmortem examination of all reportable neonatal deaths be performed jointly by a forensic pathologist and a perinatal and paediatric anatomical pathologist in a forensic facility.

138. As has already been acknowledged Recommendation 1 may not be feasible given the limitations referred to already. However, it would seem that some of the limitations may be eliminated if the performance of neonatal coronial postmortem examinations was confined to only those cases which currently fall within the scope of the non-coronial system. Professor Wilson indicated that annually there are less than 10 unusual and unexpected non-suspicious non-traumatic neonatal hospital deaths referred to the coroner.¹⁸⁵ These circumstances suggest that, even making allowance for the limitations identified, the resultant impact changes to the current system would not prove to be prohibitive. I am therefore of the view it is both necessary and desirable to make the following further recommendation.

139. **Recommendation 2:** In the event that Recommendation 1 is unable to be implemented due to reasonable workforce, and other, limitations, I recommend to the Minister for Health that consideration be given to the introduction of a policy applicable to NSW Health Pathology requiring that the postmortem examination of all reportable, non-suspicious, non-traumatic neonatal deaths occurring in NSW hospitals be performed by a perinatal and paediatric pathologist. I further recommend that, depending on the geographic location where the death

¹⁸⁵ Exhibit 5.

occurred, that the postmortem examination be performed at The Children's Hospital at Westmead, Sydney Children's Hospital at Randwick, or John Hunter Children's Hospital.

140. As already explained above the finding of squames in Manusiu's case was a significant one. It is also not the first occasion that such a finding has been relevant to determination of cause of death in other coronial cases. In evidence Associate Professor Evans said this:

"I quite often sit in this Court of [sic] cases very similar to this...And they end up in the Court because people come [sic] unclear as to why the babies have died. And they almost universally have this finding of squames throughout their lungs and they, they have the same background pathologies as [Manusiu] had".¹⁸⁶

141. From my own experience, and knowledge of the experience of other Coroners, I am aware that Associate Professor Evans is often briefed by those assisting the Coroner's Court to provide an opinion in relation to the cause of a neonatal death. The fact that Associate Professor Evans was briefed to do so in relation to the death of Elsie Coghill, now some five years ago, reinforces this.
142. Given the significance of the squames finding Associate Professor Arbuckle was asked during the inquest whether she thought there was any efficacy in a training module being designed to assist forensic pathologists when undertaking a perinatal autopsy.¹⁸⁷ Associate Professor Arbuckle responded in this way:

"For the identification of squames, yes. I think, that's, I, I think the thing about perinatal pathology which we struggle with, with our registrars, is that it's not like identifying a breast cancer. You identify a breast cancer and you've got certain criteria you have to put it under and it all fits nicely into a synoptic report. But I keep telling them that putting together a perinatal case is really picking up every single clue along the way, every single finding that you make which is the evidence of the lungs and the various others things and putting them altogether and then seeing how they all fit together in association with the clinical history; in the association with the findings in the baby - it's size and all these other factors. And then coming to a final conclusion on how they best fit together with the, with the totality of what you think the events may have occurred".¹⁸⁸

143. **Conclusion:** The findings of squames in the lungs in Manusiu's case was a significant finding. Its significance provided much of the foundation for the opinions expressed by Associate Professors Evans and Arbuckle which I have found to be persuasive in determining the cause of Manusiu's death. It is evident that such findings have been equally significant in other coronial neonatal deaths. It is equally evident that annual training of forensic pathologists regarding the significance of such findings would be beneficial to clinical practice.

144. Counsel for the SWSLHD and NSW Health Pathology submitted that any perceived knowledge gap on the part of forensic pathologists might better be managed internally with a positive initiative through Medical Management Review or otherwise incorporated elsewhere as part of a Continuing Professional Development Program. As noted above, and discussed further below, the current practice is for there to be only ad hoc consultation between forensic pathologists and perinatal pathologists which appear to be dictated by the circumstances of particular cases. The

¹⁸⁶ 14/3/18, T26.31.

¹⁸⁷ 14/3/18, T35.46.

¹⁸⁸ 14/3/18, T35.46-T36.9.

nature of this current system and the evidence of Associate Professor Evans suggests that a more structured periodic training regime is required to ensure clinical best practice and consistency of information provided to bereaved families who come within the coronial system. I therefore consider that is both necessary and desirable to make the following recommendation.

145. **Recommendation 3:** In the event that Recommendation 1 is unable to be implemented due to reasonable workforce limitations, I recommend to the Minister for Health that consideration be given to the introduction of an annual training program, applicable to NSW Health Pathology, for Department of Forensic Medicine forensic pathologists in relation to the identification and potential significance of squames when performing neonatal postmortem examinations.

146. In evidence Associate Professor Arbuckle was asked about the current ad hoc consultation system that exists between forensic and perinatal pathologists. Associate Professor Arbuckle indicated that, in her opinion, one of the ways that the current system could be improved is for the opinion of the paediatric pathologist to be recorded in the autopsy report, rather than just an indication given that one had been consulted.¹⁸⁹

147. Professor Wilson was of a similar view. He said:

"The paediatric anatomical pathologists tell me when they are asked for help, they provide that help to the extent that they can. But we discussed that we think there'd be some benefits in putting some structure around that happens [sic], so it happens in a consistent way, that it's documented, that the nature and the consultation and the advice that's received is, is clearly documented".¹⁹⁰

148. **Conclusion:** The current ad hoc consultation process that occurs between forensic pathologists and perinatal pathologists could be improved with the introduction of a more structured process supported by guidelines for referral, consultation and advice. This would allow for the consultation process to be pre-emptive, rather than reactive, and give perinatal pathologists greater ownership of the advice given, and opinions expressed, by them.

149. Counsel for the SWSLHD and NSW Health Pathology submitted that the reasonable limitations referred to above would be an obstacle to the creation of a more structured consultative process. Further, it was submitted that it was understood that the creation of such a process would be met with some reluctance by perinatal pathologists due to differences in training and expertise. With respect, this submission is not supported by the evidence of both Associate Professor Arbuckle and Professor Wilson. Further, Professor Wilson's evidence, as extracted above, was supportive of the replacement of the current ad hoc process with a more structured one, reinforced by appropriate documentation. I therefore consider it be to both necessary and desirable to make the following recommendation.

¹⁸⁹ 14/3/18, T38.44; T39.1.

¹⁹⁰ 14/3/18, T10.15.

150. **Recommendation 4:** In the event that Recommendation 1 is unable to be implemented due to reasonable workforce limitations, I recommend to the Minister for Health that consideration be given to the development and implementation of structured guidelines, applicable to NSW Health Pathology, to facilitate consultation between forensic pathologists from the Department of Forensic Medicine and perinatal and paediatric pathologists from paediatric pathology units at The Children's Hospital at Westmead, Sydney Children's Hospital at Randwick, or John Hunter Children's Hospital regarding postmortem examination of all reportable neonatal deaths. I further recommend that such guidelines should provide for any such consultation to be appropriately documented, and for any resulting autopsy report to be jointly authored by the case forensic pathologist and consulting perinatal and paediatric pathologist.

Findings

151. Before turning to the findings that I am required to make, I would like to acknowledge, and express my gratitude to, Mr Adam Casselden SC, Counsel Assisting, and his instructing solicitor, Ms Elizabeth Wells of the Crown Solicitor's Office. Their assistance during both the preparation for inquest, and during the inquest itself, has been invaluable. I would also like to thank them both for the sensitivity and empathy that they have shown in what has been a particularly distressing matter. I also thank Constable Kelly Anscombe for her efforts during the investigation into Manusiu's death and for compiling the initial brief of evidence.

152. The findings I make under section 81(1) of the Act are:

Identity

The person who died was Manusiu Amone.

Date of death

Manusiu died on 25 November 2014.

Place of death

Manusiu died at Fairfield Hospital, Prairiewood NSW 2176.

Cause of death

The cause of Manusiu's death was ischaemic hypoxic encephalopathy secondary to factors associated with the sudden onset of gasping respirations with difficulty in ventilating.

Manner of death

Manusiu's death was due to natural causes.

Epilogue

153. The brevity of Manusiu's life cannot equate to the enormity of the loss felt by her family, in particular her parents, nor their immense love for her.
154. On behalf of the Coroner's Court, and the counsel assisting team, I offer my deepest and most respectful condolences to Manusiu's parents, Samuele and Sharon; Manusiu's siblings; and Manusiu's family for their tragic and devastating loss.

155. I close this inquest.

Magistrate Derek Lee
Deputy State Coroner
22 June 2018
NSW State Coroner's Court, Glebe