



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

Inquest: Inquest into the death of Jasmine Chiang

Hearing dates: 16 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, persistent pulmonary hypertension of the newborn, perinatal and paediatric postmortem examination, NSW Health Pathology

File number: 2014/118950

Representation: Mr A Casselden SC, Counsel Assisting, instructed by Ms E Wells, Crown Solicitor's Office

Mr P Rooney for South Western Sydney Local Health District and NSW Health Pathology

Findings: I find that Jasmine Chiang died on 18 April 2014 at Bankstown-Lidcombe Hospital, Bankstown NSW 2200. Jasmine died from hypoxia resulting from primary idiopathic pulmonary hypertension of the newborn which was probably secondarily complicated by pulmonary haemorrhage. Jasmine 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 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.

Table of Contents

Introduction.....	1
Why was an inquest held?	1
Jasmine’s life.....	2
Background.....	2
The events of 17 and 18 April 2014	2
The postmortem examination.....	5
Issues relating to the conduct of perinatal and paediatric postmortem examinations in coronial cases in NSW generally	8
Background	8
Other similar inquests.....	9
The current landscape	10
Findings.....	16
Identity	16
Date of death.....	16
Place of death.....	16
Cause of death	16
Manner of death.....	16
Epilogue.....	16

Introduction

1. Jasmine Chiang died shortly after 4:00am on 18 April 2014. She was the beautiful baby daughter of first-time parents, Nathalie and Simon Chiang. Jasmine had been born only 7 hours earlier following an uncomplicated pregnancy and delivery. However, within about 30 minutes of birth the nursing staff at the hospital where Jasmine was born noticed that something was not right. Jasmine's condition gradually worsened in the following hours and despite the best efforts of the doctors and nurses treating her she later died. An autopsy was later performed but it was, initially, unable to reveal the cause of Jasmine's tragic and extremely sad death.

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 Jasmine's case the coronial investigation gathered sufficient evidence to answer the questions about Jasmine's identity, and where and when she died. However, in the initial period following Jasmine'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. Even after a postmortem examination had been performed, the cause and manner of Jasmine's death remained, at that stage, unanswered. The inquest was therefore focused on answering these questions.
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 recommendations made by Coroners are made with the hope that they will lead to some positive outcome by improving general public health and safety.

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

Jasmine'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 Jasmine's tragically all too brief, but important, life.
7. As the first child of Mr and Mrs Chiang there is no doubt that Jasmine's birth would have been greatly anticipated. The moments following her birth, before any signs of distress were apparent, would, like the birth of any newborn infant, have been a wonderfully special time for Jasmine's parents. It is painfully distressing to know that the precious time that Jasmine's parents had with her was so brief. Although Jasmine lived for about 7 hours in total, much of that time was spent with hospital staff who were doing their best to preserve her life. Near the final 30 minutes of Jasmine's life she was able to be held one final time by her mother, with her father close by. It is hoped that that memory of Jasmine is the one that will remain with Jasmine's parents.

Background

8. In September 2013 Mrs Chiang discovered that she was pregnant. She had her husband had been trying for a baby since about July 2013. During the pregnancy, Mrs Chiang regularly saw her obstetrician, Dr Ng, and Mrs Chiang's expected due date was 23 April 2014.
9. At around 10:30pm on 16 April 2014 Mrs Chiang began having contractions. By this time Mrs Chiang was 39 weeks pregnant. The next morning Mrs Chiang went to see Dr Ng who performed an ultrasound. At the time it was discovered that Mrs Chiang had had some fluid leaks. Dr Ng asked Mrs Chiang to pack a bag to go to the hospital to be induced. This was because of the fluid leak which carried with it a risk of infection to the baby.

The events of 17 and 18 April 2014

10. Mr Chiang drove Mrs Chiang to Bankstown-Lidcombe Hospital where they arrived at about 3:30pm. Mrs Chiang was admitted to the birthing unit and later transferred to a delivery suite. Dr Ng arrived at the hospital at about 5:00pm and began induction of labour via intravenous oxytocin and artificial rupture of the membranes.² Mrs Chiang was given a dose of intravenous antibiotics (ampicillin) at about 5:05pm as she had a prolonged rupture of membrane in excess of 18 hours. It appears that the rupture (which Dr Ng noticed on 16 April 2014) had occurred at around 2:00pm on 13 April 2014. After the antibiotics Dr Ng examined Mrs Chiang and ruptured some membranes in front of Jasmine's head. Registered Midwife (**RM**) Pamela Keith started a syntocinon infusion within about 15 to 20 minutes.

² 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.

11. Mr Chiang's mother, Jennifer (Jenny) Chang, who was a registered nurse and midwife and worked at Bankstown Hospital at the time as a casual nurse, arrived at about 7:00pm and saw Mr Chiang and Mrs Chiang. Labour was progressing quickly at this time and it appears that Mrs Chiang was becoming distressed by her contractions. According she was given 100mg of pethidine for pain relief. 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.
12. At about 8:00pm RM Keith called Dr Ng (who by this time had left the hospital) and told him that Mrs Chiang was 10cm fully dilated and ready to start pushing. Dr Ng returned to the birthing suite and delivered Jasmine at 9:00pm.
13. Jasmine had APGAR³ scores of 9 at both 1 minute and 5 minutes. The placenta was delivered by Dr Ng at 9:16pm. As Mrs Chiang was feeling tired she asked Mr Chiang to cuddle Jasmine while she rested. RM Keith gave Jasmine to Mr Chiang and noted that Jasmine appeared to be pink and breathing normally. RM Keith left the room at about 9:20pm and examined the placenta. She saw that it appeared normal, with no unusual odour, and found no clinical indication that it should be kept so she disposed of it.
14. RM Keith went back to the room between about 9:25pm and 9:30pm. She saw that Mr Chiang was still holding Jasmine and that Mr Chiang's mother was also in the room at this time. RM Keith noticed that Jasmine was "*dusky, a bluish colour*".⁴ RM Keith took Jasmine from Mr Chiang and placed her on the resuscitare trolley. RM Keith performed tactile stimulation to encourage increased breathing and noted that Jasmine became pink but had a harlequin mark – a distinct line down her chest where the left side was blue and the right side was pink.⁵
15. Dr Ng re-entered the room at some point and RM Keith pointed out the harlequin mark to him. Dr Ng felt for Jasmine's femoral pulse and expressed the view that Jasmine would be fine once she warmed up.
16. RM Keith decided to perform an oxygen saturation test, which she did three times. On each occasion she was unable to get a saturation level higher than 76-80%. Realising that Jasmine's saturation should have been above 96%, and noting that Jasmine had developed a "*respiratory grunt*", RM Keith told Mrs Chiang and Mr Chiang that she was going to take Jasmine to the special care nursery (SCN) for observation.
17. RM Keith, accompanied by Jenny, took Jasmine to the SCN at 9:40pm. RM Yasmin Oztas was working in the SCN at the time. RM Oztas placed Jasmine on a resuscitare and saw that she appeared to have no signs of respiratory distress. Whilst examining Jasmine, RM Oztas noticed that Jasmine's preductal (right hand) oxygen saturation was registering 97-98%. She saw that Jasmine had a harlequin appearance on the left side of the body but that there were no signs of grunting and that Jasmine appeared alert and active, and had a good tone. Whilst continuing to examine Jasmine, RM Oztas noticed that Jasmine's preductal oxygen saturation had a sharp drop to 80% before quickly recovering to 97-98%. Due to Jasmine's harlequin appearance, RM Oztas was interested in obtaining a postductal (foot) oxygen saturation reading. When she performed

³ 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.

⁴ Exhibit 1, tab 20 at [20].

⁵ Exhibit 1, tab 20 at [20].

this test she saw that the postductal reading was 70-75%, whereas the preductal reading was 97-98%.

18. At about 10:40pm RM Oztas paged the paediatric registrar, Dr Pragya Malla, to examine Jasmine. Dr Malla arrived at about 10:50pm and assessed Jasmine. Dr Oliver, the night paediatric registrar, also arrived within a few minutes. Dr Malla saw that Jasmine appeared dusky and had cyanosed lips and tongue. Dr Malla also noted that whilst Jasmine was able to maintain her own airway she was working hard to breathe with occasional grunts. Dr Malla recognised that Jasmine was in respiratory distress and began support with the Neopuff (a ventilator for neonatal patients) whilst Dr Oliver went to call Dr Philip Emden, the paediatric consultant on call. Dr Malla began Jasmine on 21% FiO₂⁶ but saw that there was no response by Jasmine and so increased the FiO₂ to 100%. With this increase Dr Malla saw that Jasmine's colour and saturations improved and her work of breathing reduced. As the amount of oxygen increased, Jasmine's preductal and postductal saturations eventually both increased to 100%.
19. Saline and ampicillin were given to Jasmine. Dr Oliver returned to insert an intravenous line whilst Dr Malla left to call the Newborn and Paediatric Emergency Transfer Service (**NETS**)⁷ at about 11:16pm and spoke to Dr Neeta Rampersand, the on call NETS consultant. During the conference call Jasmine's condition deteriorated and at 11:23pm a NETS team was dispatched to Bankstown Hospital. As the clinical staff at Bankstown continued to treat Jasmine, Dr Rampersand sought advice from other specialists, including a number of neonatologists at different hospitals. Dr Rampersand later made arrangements for Jasmine to be transferred to Sydney Children's Hospital (**SCH**). During another conference call at around 1:51am it was suggested by the Intensive Care Paediatric Fellow at SCH that the next step in Jasmine's treatment should be to add inhaled nitric oxide (**iNO**) to treat possible persistent pulmonary hypertension of the newborn. Dr Rampersand made arrangements to have inhaled nitric oxide equipment sent urgently to Bankstown Hospital. iNO therapy is used when it is clear that the therapy of oxygen, adequate ventilation and inotropic support⁸ have not been successful in stabilising a newborn infant.
20. Dr Pradip Patel, a NETS advanced trainee, and Clinical Nurse Specialist (**CNS**) Wendy Bladwell, left the NETS at 11:31pm and arrived at Bankstown at 11:49pm. Dr Patel saw that Jasmine appeared pink and well perfused. Dr Patel tested Jasmine's oxygen dependency by reducing the FiO₂ from 70% to 50% noting that Jasmine's post-ductal saturations remained at 100%. However, when the FiO₂ was reduced from 50% to 21% (natural air) Jasmine's post-ductal saturations dropped to 63% with the pre-ductal saturations remaining above 97%. The Neopuff mask was reapplied with 100% FiO₂ which resulted in post-ductal saturations climbing to 82%. Dr Patel decided to intubate Jasmine and commence a prostin infusion.⁹ From about 12:30am until about 1:42am Jasmine was ventilated and stabilised. Her pre-ductal and post-ductal saturations remained at 100% even when FiO₂ was weaned from 100% to 80% and then 60%.
21. At 1:42am Jasmine's post-ductal saturations dropped to 67% whilst her pre-ductal saturation remained at 100%. Dr Patel increased the prostin infusion and noted that Jasmine's post-ductal

⁶ Fraction of inspired oxygen: the fraction or percentage of oxygen in the volume being measured. Natural air includes 21% oxygen, which is equivalent to 21% FiO₂.

⁷ The state-wide emergency service for medical retrieval of critically ill newborns, infants and children in NSW.

⁸ Medication that affects the contraction of the heart muscle.

⁹ Medication used to relax the ductus arteriosus (a blood vessel connecting the main body artery to the main lung artery) in early post-natal life and support its patency (remain open and unobstructed).

saturations continued to drop to 63%. The prostin infusion was increased again and the FiO₂ was increased from 60% to 100%.

22. At around 1:46am Dr Patel noted that Jasmine did not have adequate chest expansion. He attempted to manually ventilate Jasmine and identified much reduced lung compliance and much reduced chest expansion. By 2:00pm Jasmine continued to be manually ventilated with no significant improvement. As a result a call was placed to the Medical Emergency Team (**MET**).
23. An ultrasound and, later, a chest x-ray were performed. At 2:15am the x-ray showed no pneumothoraces¹⁰ and confirmed that the endotracheal tube was in the correct position. Dr Patel formed the view that they had to begin treating Jasmine for Persistent Pulmonary Hypertension of the Newborn (**PPHN**). Jasmine was given magnesium sulphate and sodium bicarbonate and boluses of adrenaline to maintain blood pressure. A nitric oxide system (for the delivery of iNO therapy) was requested from NETS by CNS Bladwell.
24. By 2:40am Dr Patel had still been unable to adequately ventilate Jasmine and her pre-ductal oxygen saturations were decreasing. Jasmine's heart rate was 120bpm. The nitric oxide system arrived a short time later and at 3:04am nitric oxide ventilation was commenced. By this time Jasmine's pre-ductal saturations were unrecordable and her post-ductal saturation was at 19% despite 100% FiO₂.
25. At 3:15am, after 10 minutes of iNO ventilation, Jasmine's heart rate had dropped to 99 beats per minute (**bpm**) her pre-ductal saturations were still unrecordable and her post-ductal saturations had increased to 45%.
26. At 3:33pm Jasmine's heart rate dropped to 80bpm and a cardiac echo¹¹ showed severe global hypokinesia¹², which required cardiopulmonary resuscitation (**CPR**). At 3:46pm there was a brief return of spontaneous circulation and Jasmine was given to Mrs Chiang to hold. However, CPR was recommenced at 3:48am, and by 3:53am Jasmine's heart rate and post-ductal saturations had both dropped.
27. By 4:00am Jasmine's heart rate was continuing to drop and CPR was recommenced. At 4:04am, after almost 30 minutes of CPR, there had still been no return to spontaneous circulation. Following a discussion between the NETS Consultant, the SCH Intensive Care Unit doctor, the local paediatrician and the family, the clinical staff believed that Jasmine's prognosis was extremely poor and a decision was made to stop CPR at 4:11am and Jasmine was pronounced life extinct.

The postmortem examination

28. Jasmine was later taken to the Department of Forensic Medicine in Glebe. On 19 April 2014 Dr Szentmariay, forensic pathologist, performed an autopsy. In a report dated 29 January 2015, Dr Szentmariay described the autopsy findings as "*largely negative*"¹³ meaning that the clinical findings did not suggest any anatomical or toxicological cause of death.

¹⁰ Abnormal accumulation of air in the pleural space between the lung and chest wall.

¹¹ A test that uses high frequency sound waves to create pictures of the heart's chambers, walls, valves and blood vessels attached to the heart.

¹² The decreased amplitude of muscle movement.

¹³ Exhibit 1, tab 4, page 4.

29. The most significant finding was severe congestive changes in the vessels in the lung, with widespread presence of blood in the alveoli and extensive recent haemorrhage along the connective tissue septae (a thin wall dividing two cavities of softer tissue).¹⁴ The toxicology results showed a blood concentration of 0.49 mg/L of pethidine. Dr Szentmariay ultimately recommended that the cause of death be recorded as unascertained. However in his report Dr Szentmariay referred to the possibility that consideration could be given to the adherence of guidelines associated with pethidine use.¹⁵

What was the cause of Jasmine's death?

30. Given the inconclusive autopsy findings, further expert opinion was sought regarding the possible cause of Jasmine's death. Associate Professor Nick Evans, senior staff specialist neonatologist from Royal Prince Alfred Hospital, was briefed to review Jasmine's case. In a report dated 13 December 2016, Associate Professor Evans concluded that Jasmine died from hypoxia resulting from primary idiopathic¹⁶ pulmonary hypertension of the newborn which was probably secondarily complicated by pulmonary haemorrhage. Associate Professor Evans explained that Jasmine's initial presentation was clinically typical of PPHN. Associate Professor Evans also explained that this condition was complicated by pulmonary haemorrhage which caused Jasmine's sudden deterioration at 1:42am.
31. In both his report and in evidence during the inquest, Associate Professor Evans explained that when a foetus is in the womb, the blood vessels in the lungs are constricted, or clamped down. This is because in the foetus most of the blood bypasses the lungs due to the placenta, and not the lungs, being the organ of respiration. However, at birth one of the changes that occurs is that the blood vessels open so that blood can flow to the lungs to allow gas exchange¹⁷ to occur. The blood vessels relax at birth as the lungs expand and as oxygen levels in the bloodstream increase.
32. However, in some babies this process occurs temporarily before reverting back to foetal circulation, or does not happen at all. In either case this means that blood bypasses the lungs which in turn means that oxygen is not collected from the air. Associate Professor Evans explained that Jasmine's harlequin appearance and differential post-ductal and pre-ductal saturations was a typical clinical presentation for PPHN. This is because the deoxygenated blood bypasses the lungs, through the ductus arteriosus¹⁸, to the left side, and lower, body.
33. Associate Professor Evans explained that the clinical staff did everything expected in managing PPHN. By giving supplemental oxygen and positive pressure ventilation, the treating team were doing their best to augment the dilatation of the pulmonary blood vessels. This resulted in a temporary improvement in Jasmine's condition between about 12:50am and 1:42am.
34. However, Jasmine's deterioration at 1:42am was both sudden and very unusual. Associate Professor Evans explained that the clinical pointers indicate that at this time the primary problem was not with the pulmonary blood vessels, but instead with the pulmonary

¹⁴ Exhibit 1, tab 4, page 16.

¹⁵ Exhibit 1, tab 4, page 5.

¹⁶ A condition with an unknown cause or mechanism of apparently spontaneous origin.

¹⁷ 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.

¹⁸ In the developing foetus, a blood vessel connecting the main body artery to the main lung artery.

parenchyma (lung tissue). The treating team noticed that ventilation was no longer effective in inflating Jasmine's lungs.

35. Associate Professor Evans explained that the suddenness of this deterioration and the autopsy findings would be consistent with it being due to pulmonary haemorrhage consisting of blood stained fluid in the tissues of the lungs. Associate Professor Evans explained that while the cause of this condition is unclear, it is most often seen in preterm babies or growth-restricted babies. Associate Professor Evans said that in preterm babies, the condition is associated with patent ductus arteriosus with a left to right shunt (as opposed to a right to left shunt of PPHN) which causes excess pulmonary blood flow, which in turn probably leads to rupture of the overloaded pulmonary capillaries (the smallest of the body's blood vessels). However, Jasmine was neither a preterm nor growth-restricted baby and so the cause of this condition in her case is not known.
36. Associate Professor Evans explained that once Jasmine deteriorated due to the pulmonary haemorrhage it was unsurprising that she did not respond to the iNO therapy and other vasodilators¹⁹ (such as magnesium sulphate) which were being tried. By the time the iNO therapy was introduced, Associate Professor Evans explained that the pathology was no longer PPHN.
37. In evidence Associate Professor Evans was asked whether the pulmonary haemorrhage would have occurred absent the PPHN. He explained that whilst logic may suggest that one led to the other, this was not biologically logical. This is because in treating PPHN attempts were being made to increase blood flow to the lungs, whereas pulmonary haemorrhage results in bleeding into the lung.
38. Associate Professor Evans specifically excluded the rupture of membranes as being related to the PPHN and pulmonary haemorrhage. He explained that the main risk of rupture is infection which can result in breathing difficulties. However, in Jasmine's case the primary problem was an oxygenation one.
39. Associate Professor Evans ultimately described Jasmine's case as rare and unusual, which meant that it was not predictable and could not have been prevented. Indeed, Associate Professor Evans said that, in his years of experience, he had never seen a clinical presentation such as Jasmine's before. Associate Professor Evans described the care and treatment given to Jasmine as entirely appropriate and said that every attempt was made to give Jasmine the best chance for life.

40. **Conclusion:** Jasmine died from hypoxia resulting from primary idiopathic pulmonary hypertension of the newborn which was probably secondarily complicated by pulmonary haemorrhage. Neither the development of Jasmine's PPHN nor her sudden deterioration at 1:42am on 18 April 2014 due to pulmonary haemorrhage could have been predicted. The expert opinion provided by Associate Professor Evans establishes that the clinical response to Jasmine's condition was appropriate and that, tragically, there is no evidence-based strategy that could have prevented the eventual outcome.

¹⁹ Medication that open blood vessels to allow blood to flow more easily.

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

41. Jasmine's death, and the circumstances surrounding it, raises some broader systemic issues beyond the events of 17 and 18 April 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

42. It has now taken more than four years to answer the question of what caused Jasmine'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.
43. Perhaps even more importantly, this expenditure does not take into account the considerable emotional toll and mental strain likely placed on Jasmine's parents and family. The overall coronial investigation was led to a situation where:
- (a) Jasmine's parents were left in an immediate state of uncertainty as to the cause of their daughter's death in April 2014 and the months that followed;
 - (b) The reporting of Jasmine's death to the Coroner brought with it the unfortunate, but necessary, intrusion that a coronial investigation brings at a time that families, like Jasmine's, are experiencing immeasurable grief and loss;
 - (c) When the autopsy report became available in January 2015, some 9 months later, it raised for consideration whether the pethidine administered to Mrs Chiang had played a causative role in Jasmine's death;
 - (d) In December 2016, a further 23 months later, Associate Professor Evans' report discounted the indicated the possibility that pethidine had played such a role and indicated that Jasmine had died from natural causes due an idiopathic condition which could not have been predicted;
 - (e) By the time of the findings being delivered, in which I have concluded that the opinion expressed by Associate Professors Evans is persuasive, a further 18 months have elapsed.
44. 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 Jasmine's family by the lack of clarity, for several years, surrounding the cause of Jasmine's sudden and unexpected death. However, even a rudimentary understanding of the likely experience of Jasmine's family in this regard leads to the reasonable conclusion that it should be mitigated and avoided if possible.

Other similar inquests

45. Jasmine's death was not the only neonatal death in 2014 where the possibility of pethidine playing a possible causative role was raised. At about 10:00pm pm 24 November 2014 Manusiu Amone was born at Fairfield Hospital. During the course of labour Manusiu's mother had also been given pethidine for pain relief. About 25 minutes after Manusiu's birth it was observed that she was gasping for air and in respiratory distress. Attempts were made to resuscitate and ventilate Manusiu but this was, tragically, unsuccessful. Manusiu was later pronounced deceased at 12:25am on 25 November 2014.
46. A postmortem examination was later performed and in an autopsy report dated April 2015 it was indicated by the forensic pathologist who performed the autopsy that Manusiu's death was most likely due to the toxic effects of pethidine. In Manusiu's matter expert opinion was again sought from two experts as to the cause of her death: Associate Professor Evans, and Associate Professor Susan Arbuckle, senior staff specialist perinatal and paediatric pathologist from The Children's Hospital at Westmead. Both Associate Professors Evans and Arbuckle opined that Manusiu's clinical presentation of gasping was inconsistent with her suffering the effects of pethidine toxicity or narcosis which might have been occasioned via placental transmission. Instead both Associate Professors Evans and Arbuckle concluded that Manusiu's presentation was consistent with PPHN and that due to some intrinsic lung pathology and an in utero hypoxic event. Associate Professor Arbuckle ultimately opined that 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.
47. In summary, Manusiu'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 Manusiu's death also occurred in a hospital within the South Western Sydney Local Health District (**SWSLHD**), an inquest into Manusiu's death between 12 to 15 March 2018, in the same week and immediately preceding the inquest into Jasmine's death.
48. The deaths of both Jasmine and Manusiu 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?
49. 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 Elsie'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.”²⁰

50. 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”.²¹

The current landscape

51. 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. The deaths of both Manusiu and Jasmine raised common issues and questions. As such, it was considered appropriate for evidence gathered during the investigation of Manusiu’s death, and the evidence given during her inquest, which related generally to the broader issue concerning the performance of regarding perinatal and paediatric postmortem examinations in coronial cases to be tendered into evidence during Jasmine’s inquest. Accordingly, I have reproduced below the part of the findings that I have made in the Manusiu’s inquest. In all respects, they are equally applicable and relevant to Jasmine’s death.
52. 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 2018²² 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.
53. Further details about the new model of service was sought from Professor Wilson. In a further letter dated 13 March 2018²³ Professor Wilson explained²⁴ that the new service model aimed, most relevantly, to provide that investigation, including post mortem examination of the baby

²⁰ Findings in the Inquest into the death of Elsie Coghill at [98].

²¹ Findings in the Inquest into the death of Elsie Coghill at [107].

²² Exhibit 1, tab 44. This reference, and the subsequent references to exhibits and portions of transcript of evidence, relates to evidence tendered and given in the Inquest into the death of Manusiu Amone.

²³ Exhibit 5.

²⁴ Noting that other pathologists, credentialed to perform this work on the recommendation of peer experts, might also be utilised.

and pathological examination of the placenta, only be performed by specialist perinatal and paediatric anatomical pathologists²⁵. Professor Wilson went on to explain that:

- (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”*.²⁶

54. 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.

55. 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;²⁷
- (b) There are approximately 500 non-coronial perinatal autopsies performed in NSW annually, with about 20% relating to deaths following live birth;²⁸
- (c) Approximately 90% of all non-coronial perinatal autopsies are performed by specialist perinatal pathologists;²⁹
- (d) There is currently a NSW (and national) workforce shortage of suitably credentialed and trained perinatal pathologists and forensic pathologists;³⁰
- (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;³¹
- (f) The DOFM is seeking to attract a suitably credentialed perinatal pathologist;³²
- (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

²⁵ For convenience, I will refer to specialist perinatal and paediatric anatomical pathologists simply as perinatal pathologists for the remainder of the findings.

²⁶ Exhibit 5.

²⁷ 14/3/18, T5.30.

²⁸ 14/3/18, T3.7.

²⁹ 14/3/18, T3.43.

³⁰ Exhibit 1, tab 44; 14/3/18, T6.6.

³¹ 14/3/18, T6.15.

³² Exhibit 1, tab 44.

maintain chain of custody on specimens, which cannot be accommodated in a hospital setting;³³

- (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;³⁴
- (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);³⁵
- (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;³⁶
- (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;³⁷
- (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;³⁸
- (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;³⁹
- (n) It would not be sustainable for a perinatal pathologist to only do postmortem work as most have a broader clinical practice;⁴⁰
- (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;⁴¹
- (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

³³ Exhibit 1, tab 44.

³⁴ 14/3/18, T10.14.

³⁵ 14/3/18, T6.46-T7.9.

³⁶ 14/3/18, T7.18.

³⁷ 14/3/18, T7.19-T7.27.

³⁸ 14/3/18, T7.45.

³⁹ 14/3/18, T8.5.

⁴⁰ 14/3/18, T8.47.

⁴¹ 14/3/18, T29.31.

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.⁴² Whilst there is no position currently being advertised, some informal inquiries are being made amongst the profession to locate a suitable candidate.⁴³

56. 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.⁴⁴ Further, Associate Professor Arbuckle explained that a similar view was also held in much of the United States and in most European countries.⁴⁵
57. 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.⁴⁶ 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.⁴⁷ 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.
58. 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".⁴⁸

59. **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.

⁴² 14/3/18, T9.3.

⁴³ 14/3/18, T9.18.

⁴⁴ 14/3/18, T36.30.

⁴⁵ 14/3/18, T36.35.

⁴⁶ 14/3/18, T39.16.

⁴⁷ 14/3/18, T40.39.

⁴⁸ 14/3/18, T12.36.

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

61. 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.

62. 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.

63. **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.

64. 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.⁴⁹ 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.

65. **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

⁴⁹ Exhibit 5.

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.

66. 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.⁵⁰

67. 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".⁵¹

68. **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.

69. 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.

70. **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 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.

⁵⁰ 14/3/18, T38.44; T39.1.

⁵¹ 14/3/18, T10.15.

Findings

71. 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.
72. The findings I make under section 81(1) of the Act are:

Identity

The person who died was Jasmine Chiang.

Date of death

Jasmine died on 18 April 2014.

Place of death

Jasmine died at Bankstown-Lidcombe Hospital, Bankstown NSW 2200.

Cause of death

Jasmine died from hypoxia resulting from primary idiopathic pulmonary hypertension of the newborn which was probably secondarily complicated by pulmonary haemorrhage.

Manner of death

Jasmine's death was due to natural causes.

Epilogue

73. Jasmine's life was measured in a matter of hours or minutes. However, the brevity of her life in no way accurately reflects the enormity of her loss. It is hoped that lasting changes may follow from the lessons learned following Jasmine's death so that other bereaved families who come within the coronial system may experience some measure of comfort.
74. On behalf of the Coroner's Court, and the counsel assisting team, I extend my deepest sympathy and offer my respectful condolences to Jasmine's parents, Nathalie and Simon, and Jasmine's entire family for their truly heartbreaking loss.
75. I close this inquest.

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