



**CORONERS COURT
OF NEW SOUTH WALES**

Inquest:	Inquest into the death of AN
Hearing dates:	22 August 2023
Date of findings:	22 August 2023
Place of findings:	Lidcombe
Findings of:	Magistrate Kennedy Deputy State Coroner
Catchwords:	CORONIAL LAW – Unascertained cause of death in newborn, toxicology findings of methylamphetamine, likely effects of drug consumption by drinking methylamphetamine, likely effects on unborn baby as a result of methylamphetamine exposure, lethal ranges of methylamphetamine in newborn babies
File number:	2019/00273074
Representation:	Coronial Advocate Mr Durand Welsh

Findings:	<p><i>The identity of the deceased</i></p> <p>The deceased person was AN</p> <p><i>Date of death</i></p> <p>1 September 2019</p> <p><i>Place of death</i></p> <p>Canterbury Hospital, 575 Canterbury Road, Campsie, New South Wales</p> <p><i>Cause of death</i></p> <p><i>Methylamphetamine toxicity</i></p> <p><i>Manner of death</i></p> <p><i>Misadventure (Complications of methylamphetamine exposure)</i></p>
Recommendations	Nil

Non-Publication Orders	Non-publication orders prohibiting publication of certain evidence pursuant to the <i>Coroners Act 2009</i> have been made in this Inquest. A copy of these orders, and corresponding orders pursuant to section 65 of the Act, can be found on the Registry file.
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Background

1. Baby AN was born at 12:57 a.m. on the 1 September 2019 at Canterbury Hospital but survived 8 hours and 27 minutes before being pronounced deceased.
2. AN was born in the Ambulance Bay at Canterbury Hospital, 575 Canterbury Road, Campsie, following AN's mother, father and AN's brother transporting AN's mother to Canterbury Hospital using private vehicle in labour. There was no time to enter the hospital itself, and AN's mother gave birth to AN before entering the hospital. AN was then taken into hospital for treatment but did not survive.

Purpose of the Coronial Jurisdiction

3. The purpose of the coronial jurisdiction, according to law, is to make formal findings as to the following five aspects of a death:
 4. the identity of the person
 5. the date of their death
 6. the place of their death
 7. the manner of their death
 8. the cause of their death.
9. Guided by these five aspects, an inquest investigates the facts and circumstances of a death, places them on the public record, and in certain

cases will examine changes that could be made to prevent similar deaths in the future.

10. Section 27(1)(d) of the Coroner's Act 2009 legislates that an inquest "is required to be held...if it appears to the coroner concerned that the manner and cause of the person's death have not been sufficiently disclosed".
11. It is the lack of certainty regarding the cause and manner of AN's death that has necessitated the holding of this inquest. It is not the purpose of the coronial jurisdiction to lay blame or censure any individual or organisation. Such assessments are outside the scope of the jurisdiction, and the focus of this inquest is to address the factual question of the cause and manner of AN's tragic death.

Antenatal History

12. The medical professionals involved in this case did not note anything remarkable in AN's antenatal history. The history indicated a low risk on prenatal testing and a normal morphology scan.
13. The officer in charge obtained three ultrasounds and associated reports from Medical Imaging Bankstown. These reports are dated 31 January 2019, 13 May 2019 and 23 August 2019. The reports indicated had no obvious abnormalities and indicated that there was at those times a finding of being within the normal growth percentile.
14. Her mother was documented as being "G4P2", meaning that she had had 4 pregnancies in total, two of which were completed full term, including AN. She experienced high blood pressure during AN's pregnancy and the previous pregnancy, and had been prescribed labetalol. She was also prescribed thyroxine for a low thyroid function. Maternal serology and infectious screens were negative.
15. On 1 September 2019, shortly before 1:00 a.m, the mother arrived via private vehicle in the ambulance bay of the Emergency Department (ED) at Canterbury Hospital. She was in labour and giving birth upon arrival. Hospital staff immediately attended the ambulance bay and AN was birthed as a vaginal delivery with no complications.
16. The paediatric registrar on site on this night shift was Dr Natasha Diller. She was contacted by emergency staff to attend the ambulance bay, the

attendance of a specialist from paediatrics being the usual practice when the birth occurs outside the hospital's birthing unit.

17. Dr Diller arrived shortly after AN had been delivered. She states that delivery was *precipitous*, meaning a rapid labour and delivery. Dr Diller took AN to *resuscitaire*, a mobile unit with a mattress, heating device and resuscitation mask. The unit also has heart rate and oxygen saturation monitoring equipment.
18. Dr Diller notes that AN was crying, had plethoric (purple) appearance, which can be an indicator of a high haemoglobin level and haematocrit, which reflects the amount of red blood cells in the body. There was no control over blood flow from the placenta, as the cord was not immediately clamped. Dr Diller states that a high haemoglobin level or haematocrit is not unusual just after delivery, but it rarely affects breathing.
19. Dr Diller notes that AN had good muscle tone but was breathing quite rapidly and having subcostal recessions (indrawing of the chest), which is a sign of respiratory distress. Dr Diller placed a mask on AN's mouth and nose for continuous positive airway pressure (CPAP). Whilst AN was receiving additional oxygen, her heart rate was always in the normal range and her oxygen saturation improved after around 10 to 12 minutes with help from CPAP.
20. Dr Diller transferred AN to the Special Care Nursery (SCN) on CPAP and moved AN onto bubble CPAP, which is a specialised CPAP for newborn babies and infants. Within her statement, Dr Diller says that the nurse on duty within the SCN was a "very experienced neonatal registered nurse (RN) Ulrike Brooks."
21. After arrival, Dr Diller assessed AN's vital signs, which were all normal. RN Brooks and Dr Diller made the decision to take AN off the CPAP, as it appeared it was no longer required.
22. RN Brooks was the Nurse in Charge and was working with one midwife within the SCN. She recalls that Dr Diller told her that AN's vital observations were within the acceptable parameters.
23. RN Brooks states that she was informed that AN's mother was still in the ED and that it was common for babies to be taken to the SCN if they received CPAP after birth. This was not necessarily because of them requiring acute

care, but it did allow for further observations as the ED was not equipped to provide this type of care for an extended time.

24. During the beside handover, RN Brooks connected AN to continuous cardiac monitoring. She noted and documented the vital observations and completed a baby check on AN.
25. Some time after, a midwife from the Birthing Unit attended the SCN with AN's mother in a wheelchair, accompanied by AN's father. RN Brooks told the parents that AN's vital observations were within acceptable parameters and that AN was "stable." RN Brooks handed AN to AN's mother.
26. RN Brooks observed the parents' interactions with AN and assessed them as appropriately emotional and happy. While the mother was holding AN, her oxygen saturation dropped briefly below 90% and AN became irritable at that time.
27. The drop in oxygen saturation caused RN Brooks to return AN to the bed and to request the midwife administer blow-over oxygen using neopuff. RN Brooks went to the nurses' desk to call the paediatric registrar. RN Brooks was able to observe AN, the midwife and the monitoring devices while making the call.
28. RN Brooks observed the oxygen saturation to recover immediately following the neopuff and to remain within acceptable parameters without assistance. The paediatric registrar, Dr Diller, ordered a capillary gas test. This is a blood test obtained by heel prick. Dr Diller also ordered AN to be fed.
29. RN Brooks asked the mother if she wished to feed AN. Her mother declined and RN Brooks obtained consent for AN to be fed formula and, if necessary, to insert a nasogastric tube (NGT).
30. When RN Brooks attempted to feed AN using a bottle she was unable to suck or swallow properly and regurgitated a lot of mucous. In RN Brooks's experience this is quite normal for newborns. RN Brooks inserted a NGT into AN's nostril. She administered the requested amount of formula, which was tolerated. Both AN's mother and father were present during this.
31. Dr Diller states that she reviewed the capillary gas results and that at that point in time AN's heart rate was slightly elevated, but her observations were otherwise in the normal range. The blood gas results showed high haemoglobin at 270 g/l, which Dr Diller states was a sign that during delivery AN was likely receiving blood through the placenta, which could be avoided

by having the cord clamped. Dr Diller also said that high haemoglobin can cause problems for end organs as the blood is thicker, but it is no longer treated with removing blood from the vascular system unless patients are symptomatic.

32. AN's blood lactate was slightly high but it was not in Dr Diller's opinion unusual for babies to have higher lactate, depending on the level of stress after birth. This was the first blood gas for AN and Dr Diller did not have previous results to compare it to, but she found the lactate level reassuring.
33. She did note that the results indicated that AN's gas exchange was not ideal, indicating a level of respiratory acidosis, but in the context of AN not feeding well and a clinical suspicion she may have aspirated some milk, Dr Diller did not feel that this required actioning through restarting respiratory support as there was no underlying respiratory distress observed.
34. Given that all the observations were within the normal range, Dr Diller documented a plan to repeat another capillary gas test in another couple of hours. At that point in time there was nothing clinically that caused Dr Diller to feel concerned.
35. After the feeding, AN's mother held AN for a bit longer. She then asked to be taken to her room as she was tired. RN Brooks was always within the nursery while the parents were present with AN.
36. Her father took her mother back to her room and returned to hold AN. He held AN for some time. RN Brooks observed the vital observations to be within acceptable parameters and observed AN's behaviour and colour to be normal.
37. RN Brooks recorded vital observations every 15 minutes for the first hour after admission to SCN and then once every hour after that. She did not remain with AN's father at the bedside all the time as her father appeared comfortable holding AN.
38. RN Brooks was always within hearing distance and could observe them from within the nursery as it is a small space.
39. AN's father left approximately just before 5:00 a.m. At the time, the midwife was on a break and RN Brooks was alone within the nursery. Around this time, RN Brooks heard AN making gurgling sounds. RN Brooks immediately

went to AN and saw she was gasping for air. AN had turned mottled all over and her oxygen saturation dropped drastically and rapidly below 70-80%.

40. RN Brooks immediately pressed the emergency alarm for a Medical Emergency Team (MET) call and the team arrived moments later.
41. The MET team, postnatal ward staff, Birth Unit staff and ED staff all arrived at approximately 5:05 a.m. Dr Diller and the MET team commenced the resuscitation on AN.
42. Dr Diller noted AN as being in acute respiratory distress. Dr Diller recalls thinking that an acute event must have prompted these changes. AN looked poorly perfused and had weak femoral pulses.
43. AN's heart rate started to drop and Dr Diller attempted to intubate her. AN deteriorated so quickly that intubation became difficult and was complicated by a pulmonary haemorrhage. Dr Diller states that pulmonary haemorrhages are very rare events that tend to occur in patients with severe acidosis or cardiac problems. In babies they can occur with clotting or bleeding disorders.
44. AN's heart rate dropped very shortly after the pulmonary haemorrhage. When it dropped below 60 beats per minute the resuscitation team administered IV adrenalin and commenced cardiopulmonary resuscitation.
45. The paediatric consultant, Dr Mansour, and the Newborn and Paediatric Emergency Transport Service (NETS team) were also called. When Dr Mansour and the NETS team arrived they led the resuscitation effort on AN.
46. Dr Diller was able to intubate AN with assistance from the NETS consultant, who recommended use of a smaller tube. AN's heart rate rose after intubation, but even on the ventilator that NETS brought, AN required very high pressures to achieve gas exchange.
47. After the airway was established, NETS commenced AN on adrenalin and prostaglandin infusion at 7:30 a.m. to stabilise the cardiac function and keep the patent ductus arteriosus open, in case there was an unrecognised duct-dependant cardiac lesion.
48. A chest x-ray showed that the endotracheal tube was too far in, and a new tube was subsequently re-sited by Dr Greenhalgh. Throughout, ventilation remained very difficult. Further blood gas results revealed severe acidosis. Discussions in regard to direction of care were held between paediatrician Dr

Mansour, NETS consultant Dr Greenhalgh and RPA consultant Dr Adrienne Gordon.

49. In light of the high likelihood of severe neurological damage from the severe acidosis, the team agreed the expected damage would have been too great for AN to recover, and a decision was made to withdraw care.
50. AN was extubated and subsequently passed away in her mother's arms at 9:24 a.m. on 1 September 2019.

Post-mortem

51. The cause of death was undetermined. Amongst the autopsy findings, it was noted that the atrial chambers of the heart were enlarged, with the left ventricle relatively enlarged compared to the right. The inferior vena cava was noted as dilated. The liver was also noted to be enlarged and portal tract inflammation present.
52. Dr Pokorny gave evidence at inquest, she was the supervising senior forensic pathologist during autopsy. She noted that the above findings were found during the CT scan, however at autopsy noted that the heart appeared to be in what was considered the normal range. There was nothing of significance found at autopsy to assist in identifying the cause of death except for the finding of acute and chronic portal tract inflammation. This identified mixed inflammatory infiltrate of the portal tracts with prominent macrophages and eosinophils. This is a finding that is consistent as a recognised complication of methylamphetamine use during pregnancy.
53. A significant toxicological finding was the presence of methylamphetamine (1.1 mg/L) and its active metabolite, amphetamine (0.09 mg/L), within the post-mortem blood sample. Ante-mortem blood samples collected at an unspecified time after birth also detected methylamphetamine (1.0 mg/L) and amphetamine (0.07 mg/L). Pathologist Dr Thompson, working under supervision of Dr Pokorny, states in the autopsy report that such concentrations are within the reported fatal range.
54. The autopsy report states that methylamphetamine is transferable in utero across the placenta and through breastmilk. Use during pregnancy it can lead to cardiac enlargement, infarction, myocardial fibrosis or other evidence of left ventricular remodelling. Liver toxicity is also a recognised complication of

methylamphetamine use during pregnancy. The autopsy report indicates that features similar to those that were identified within the post-mortem, including acute and chronic portal tract inflammation, have been reported in cases of methylamphetamine use during pregnancy.

55. The autopsy report indicates that although post-mortem blood methylamphetamine has been detected in similar concentrations in stillborn infants whose deaths were reported as due to methylamphetamine toxicity, it is also noted that many infants exposed to methylamphetamine in utero will not suffer significant toxic effects.
56. The autopsy report states that it is likely that AN's exposure to methylamphetamine occurred in utero.
57. Dr Pokorny was able to comment on Dr Diller's view that AN's deterioration might be related to acute closure of the ductus arteriosus, a foetal artery connecting the aorta to the pulmonary artery, which may have resulted in a pulmonary hypertensive crisis. Dr Pokorny stated that findings at autopsy in her view did not support that finding. However, Dr Pokorny stated that pulmonary hypertension would not be detectable at autopsy, and that the methylamphetamine exposure was a known cause of pulmonary hypertension.
- Dr Pokorny had the benefit of Dr Fu's toxicological report. After considering this and additional material she was able to say that on balance AN's death was a result of methylamphetamine toxicity.

Dr Diller and Dr Selvarajah

58. Paediatricians Dr Diller and Dr Vansanthakumar Selvarajah disclose their opinions about the cause of death within statements in the brief of evidence. Both doctors were provided with the autopsy findings prior to making their statements.
59. Dr Selvarajah's view is that AN's deterioration was most likely cardiac related or due to pulmonary hypertension. Dr Selvarajah said that it was unlikely the cause of the pulmonary hypertension would ever be known. Dr Selvarajah states that he cannot say whether the methylamphetamines would have been a contributing factor to AN's deterioration.

60. Dr Selvarajah indicates that if they had been aware of methylamphetamine exposure prior to AN's birth, it would not have changed her management within the first 48 hours. He states that babies born to mothers who are methylamphetamine users are usually admitted to the Special Care Nursery for monitoring of signs and symptoms of withdrawals, including breathing difficulties, which can sometimes be an immediate cause of death for the baby.
61. While Dr Diller states that maternal amphetamine use is associated with neonatal death and the presence of amphetamines may have contributed to AN's deterioration, she was uncertain that it fully explains the deterioration as a whole.

Enquiries with AN's mother

62. When police initially spoke with AN's mother at the hospital, as described in Constable Ferris's statement, AN's mother denied consuming drugs or alcohol during the pregnancy. After the results of the autopsy report became known, Detective Batten attempted to reach AN's mother to discuss the findings.
63. Detective Batten had considerable difficulty in reaching AN's mother to discuss the autopsy report findings. However, on the 22 June 2022, Detective Batten attended AN's mother's home address and spoke to her.
64. She provided a version of events on body worn camera that is consistent with the versions of hospital staff. She said that she did not breast feed as she had not developed breast milk.
65. At the conclusion of her version, Detective Batten states he informed AN's mother about the presence of methylamphetamine and amphetamine in the toxicology results. Detective Batten states AN's mother put her head in her hands and requested the recording be stopped. She requested the interview be concluded on another day. Detective Batten suggested the interview continue but with the recording switched off.
66. AN's mother began crying and told Detective Batten that a day or two before the labour she had been with acquaintances who had been taking illicit drugs. She stated she was not taking drugs or drinking alcohol. She stated to Detective Batten that she picked up a bottle of water from the table that she thought was hers and that she believed contained water. She stated she

drank one sip from it and it tasted like medicine and was very bitter. She believed it might be a prohibited drug and immediately drank a lot of water and put her fingers down her throat to try and vomit but without success. She stated that she felt no effects from drinking the substance.

67. She stated that she was due to go into labour in two weeks, but a day or two after sipping from the bottle she went into labour. She told Detective Batten she believed that the substance made her go into labour early.

68. There is no information stored within police holdings associating AN's mother or father with illicit drugs.

Opinion of Forensic Pharmacologist/Toxicologist Dr Fu

69. To assess the possible contribution of methylamphetamine to AN's death, Detective Batten sought the opinion of Dr Fu, a forensic pharmacologist/toxicologist employed by the New South Wales Police Force.

70. Dr Fu provided a statement that noted various studies that have examined the link between methylamphetamine exposure and paediatric patients and paediatric deaths. Dr Fu then offered an opinion specific to AN's case.

71. Dr Fu states that the signs that AN displayed, such as "breathing difficulties", "actively crying/strong cry," and the indications that AN was very irritable, crying, couldn't be settled, was not feeding well and was uncoordinated, were consistent with methylamphetamine effects on a newborn baby.

72. Dr Fu states that the possible causes of AN's death as opined by Dr Diller and Dr Selvarajah, namely underlying pulmonary hypertension or an undiagnosed cardiac problem, are consistent with the toxic effects of methylamphetamine. Dr Fu notes that AN's antemortem and post-mortem central blood methylamphetamine concentrations (1.0 mg/L and 1.1 mg/L, respectively) are within the reported normal, toxic and lethal ranges. Dr Fu states that when considering that AN would have no methylamphetamine administration experience, she is of the opinion that the detected level of methylamphetamine would have contributed to AN's death. Dr F states that the detected methylamphetamine possibly would have been due to AN's mother administering methylamphetamine in the hours prior to delivery and

the methylamphetamine transferred through the placenta, especially as it was not clamped during the delivery.

73. It is also possible, in Dr Fu's opinion, that possible methylamphetamine levels could also be the result of the drug accumulating during gestation due to regular methylamphetamine use, but as AN's body weight and head circumference are within the reported normal ranges, Dr Fu believes it is unlikely regular use was the source of the methylamphetamine.

74. Dr Fu also expresses the opinion that it is possible, albeit unlikely, that the formula provided to AN in the Special Care Nursery was contaminated. However, she stated that this is not consistent with the signs displayed by AN between when she was born and 5 a.m. on 1 September 2019.

75. Dr Fu helpfully gave evidence at the inquest. She reiterated that the lethal range of methamphetamine is very wide and will be person dependant. She was able to indicate that as a newborn AN would have been naïve to drug exposure. Dr Fu said that a lower exposure of methylamphetamine in the mother could translate into a higher amount found in AN, due to the very small size and weight of the baby, and the additional risk of exposure AN experienced due to the fact that the placenta was unable to be immediately clamped.

76. After hearing the evidence of Dr Pokorny, Dr Fu remained confident on balance that AN's death was as a result of methylamphetamine toxicity. In her some eight years of practice she gave evidence that she had some 10 like cases, but AN's toxicity was the highest she had witnessed in a newborn which immediately caused her concern.

77. Dr Fu gave evidence that there are limited studies and results specifically addressing toxicity in newborn babies. Her evidence highlighted the fact that the risk of methylamphetamine exposure to any baby in utero could be lethal, and at a minimum, can causes critical organ developmental issues.

78. In relation to drinking methylamphetamine Dr Fu opined that in her experience this is very rare form of administration of the substance. It is extremely bitter and unpleasant to taste, some of the desired affects will be lost through this method of ingestion, and she indicated that it is a very unlikely choice of administration of this drug.

79. Considering the available evidence, including AN's mother's disclosures about exposure to a bitter tasting liquid at a residence where illicit drugs were being used, it seems likely that there was some intake of the drug in sufficient concentration in the day or days prior to AN's birth that the drug transmitted to her from the mother in levels that she could not tolerate.

Findings

80. As a result of the expert evidence, cause and manner of death have been established. On balance AN was exposed to methylamphetamine prior to her birth. It was at a level in her toxicological results that were within lethal ranges. As Dr Fu opined, AN had no methylamphetamine administration experience, and the detected levels of methamphetamine contributed to her death.

81. I am satisfied that the autopsy was unable to identify any other contributor to her cause of death. The pulmonary hypertension raised by the treating doctors without any other cause identified at autopsy, is consistent with methylamphetamine toxicity.

This is an important message to any mother of an unborn child that the exposure to any amount of methylamphetamine, even a small exposure can have detrimental and indeed lethal effects as it passes in higher concentrations to the unborn child.

Acknowledgements

82. To Coronial Advocate Mr Welsh, for his preparation of the material and presentation of the inquest.

83. To the Officer in Charge for a thorough and careful investigation. Detective Batten was able to obtain critical evidence to assist in determining the manner of death for AN through excellent police work.

Recommendations

84. I make no recommendations in relation to this matter.

Formal findings

Section 81 Coroners Act 2009

The identity of the deceased

The deceased person was AN

Date of death

1 September 2019

Place of death

Canterbury Hospital, 575 Canterbury Road, Campsie, New South Wales

Cause of death

Methylamphetamine toxicity

Manner of death

*Misadventure (Complications of methylamphetamine exposure)*⁵

I extend my sincere condolences to the parents of AN and to her siblings and family for such a sudden and unexpected loss of such a little baby.

I now close this inquest.

Deputy State Coroner

Magistrate E Kennedy

22 August 2023