IN THE CORONERS COURT
OF VICTORIA
AT MELBOURNE

Court Reference: COR 2014 / 6367

FINDING INTO DEATH WITHOUT INQUEST

Form 38 Rule 60(2)
Section 67 of the ***Coroners Act 2008***

I, JACQUI HAWKINS, Coroner having investigated the death of Audrey Florence Eleanor Ebbage

without holding an inquest:
find that the identity of the deceased was Audrey Florence Eleanor Ebbage
born on 16 June 2013
and the death occurred on 15 December 2014
at the Royal Children's Hospital, 50 Flemington Road, Parkville, Victoria, 3052
from:

1 (a) DILATED CARDIOMYOPATHY

Pursuant to section 67(1) of the **Coroners Act 2008**, I make findings with respect to **the following circumstances**:

1. Audrey Florence Eleanor Ebbage was born on 16 June 2013 to Angela and Matthew Ebbage. She was born following a vaginal delivery at term with no significant antenatal or perinatal complications associated with her birth.

2. Audrey's growth and development was within normal parameters. She was immunised according to the Australian schedule. Her parents report that she was relatively healthy and only suffered the usual childhood ailments such as colds and ear infections for which she received treatment and review at the South Morang Medical Clinic.

3. Audrey was a happy and an inquisitive child who loved having stories read to her. She attended family day care regularly and bonded well with her carer.

4. In April 2014, following a bout of gastroenteritis, an ear infection and febrile convulsion, Audrey was taken by ambulance to the Northern Hospital but not admitted. Later that month,

she was admitted to the Royal Children's Hospital Intensive Care Unit (ICU) suffering from croup. X-rays obtained during this admission demonstrated no abnormalities.

5. On 6 December 2014, Audrey's parents took her to the Austin Hospital because she was pale, sweaty and had vomited. The hospital was very busy and a lengthy wait was indicated to Audrey's parents by the triage nurse. After waiting some time Audrey's condition appeared to improve and her parents left the hospital. Audrey was not seen by a doctor on this occasion.

6. A few days later, on 11 December 2014 at approximately 5.53pm, Audrey's parents took her to the Northern Hospital Emergency Department as Audrey was lethargic and her breathing was rapid and noisy (stridor). She was triaged as a Category 3 which meant that she should have ideally been seen within 30 minutes of her presentation to the hospital.

7. An examination was conducted at the Northern Hospital by Dr Lisa Cheng which revealed Audrey was lethargic, sleepy, irritable and crying when disturbed. Audrey was febrile at 38 degrees Celsius with tachypnoea, tachycardia, normal oxygen saturations, tracheal tug, no stridor at rest but audible upper airway sounds when upset, a peripheral capillary return of 3 seconds, no central cyanosis, appeared well-hydrated and bilateral wheeze on chest auscultation with some upper airway transmitted breath sounds. Dr Cheng's differential diagnosis was croup or a first presentation of asthma.

8. Dr Cheng commenced therapy of inhalational salbutamol (Ventolin), oral prednisolone and had Audrey reviewed by the Emergency Department Consultant, Dr Herodotou.

9. Following therapy with salbutamol, Audrey's breathing improved and she had minimal wheeze on chest auscultation.

10. Audrey was reviewed in the Emergency Department by Dr Perelini, Ward Registrar at 9.50pm. Dr Perelini assessed Audrey as having croup. Dr Perelini requested the standard management for croup with minimal handling and cessation of salbutamol. Dr Perelini cancelled the plan for a chest x-ray and prescribed inhalation adrenaline if there was clinical deterioration, which she required prior to transfer to the paediatric ward.

11. Audrey was reviewed on the ward by the day paediatric team at 9.45am on 12 December 2014. Audrey was noted to be alert, had mild subcostal recession and a mild inspiratory stridor. She was administered oral dexamethasone. She was reviewed again by the paediatric registrar at 1.30pm who withheld further nebulised adrenaline due to an improvement in her clinical condition.

12. Audrey was reviewed later in the day at 7.00pm by Dr Tucker, Paediatric Registrar, who noted improvement with no audible stridor and minimal increase of work of breathing. A plan was made for discharge in the morning.

13. On Saturday 13 December 2014 at 10.50am, Audrey was reviewed by Dr Penno, Paediatric Resident. Dr Angela Ebbage noted that Audrey was still not her usual self and had a worsening cough. The plan for discharge was postponed, with oral intake encouraged and a plan for review later in the afternoon. According to Dr Ebbage by midday and through the afternoon, they felt that Audrey was deteriorating further and they expressed their concerns to the nursing staff.

14. The paediatric registrar, Dr Doherty reviewed Audrey at 3.15pm due to persisting lethargy. Dr Doherty documented the concerns of Audrey's parents that she had reduced activity during the day, was sleeping more than normal and was not asking for food and drink, although she was taking it when offered. Dr Doherty's impression was that Audrey's decrease in activity was secondary to a viral illness which would also account for the croup. Dr Doherty reassured Audrey's parents, planned for on-going paediatric review and deferred her discharge home.

15. Audrey was reviewed multiple times by Northern Hospital medical staff over the next 12 hours. She had on-going abnormal vital signs but was not thought to look toxic. The working diagnosis was a viral illness. The documented plan was to encourage analgesia and oral intake, to monitor work of breathing and notify the paediatric team if there were further concerns.

16. In the early morning at approximately 4am, Audrey woke and was quite distressed and appeared to be deteriorating further. Dr Ebbage was very concerned about Audrey and one of the nursing staff asked a doctor to look at her. According to Dr Ebbage he came into the room, stood over Audrey's bed and left approximately two minutes later. No further investigations were conducted.

17. At approximately 6am, Dr Ebbage activated the emergency alarm. Audrey was noted to be dusky, barely breathing and limp. A Code Blue was called at 6.05am. An intraosseous (IO) cannula was inserted at 6.10am. At 6.16am, her heart rate was noted to be 45 bpm and cardiopulmonary resuscitation (CPR) was commenced. Adrenaline was given via the IO cannula and CPR was momentarily ceased. Audrey was intubated at 6.24am. The Paediatric, Infant and Perinatal Emergency Retrieval (PIPER) service were contacted at 6.30am. Audrey

had no detectable blood pressure at 6.32am. CPR was recommenced at 6.47am. Multiple boluses of adrenaline were given and an adrenaline infusion was started at 7.12am, which was gradually increased over the next hour.

18. The first rhythm check is documented at 6.56am, implying application of defibrillator pads on or around this time. Multiple rhythm checks are noted in the record between 7 and 8am, with rhythm thought to be pulseless electrical activity (PEA). The PIPER service was again contacted at 7.30am, they arrived at about 7.50am. From 8.01am, Ventricular Tachycardia (VT) was noted. An electrical shock was provided at 8.04am. Audrey was transferred to the Royal Children's Hospital with the PIPER team shortly after this with on-going CPR.

19. Audrey arrived at the Royal Children's Hospital at 8.50am on Sunday 14 December 2014. Once there she required a further three electrical shocks for Ventricular Fibrillation (VF) and her pupils were fixed and dilated. Audrey was cannulated for veno-arterial extracorporeal membrane oxygenation (VA-ECMO) and started on renal replacement therapy. A computed tomography (CT) scan of her brain showed global cerebral and cerebellar oedema/infarct in keeping with severe hypoxic ischaemic injury.

20. Following discussion between the Royal Children's Hospital ICU team and Audrey's parents regarding her severe brain injury, active therapy was withdrawn. Audrey passed away at 4.05pm on 15 December 2014. She was 18 months old at the time of her death.

THE PURPOSE OF A CORONIAL INVESTIGATION

21. The Coroners Court of Victoria (Coroners Court) is an inquisitorial jurisdiction.[1] The purpose of a coronial investigation is to independently investigate a reportable death to ascertain, if possible, the identity of the deceased person, the cause of death and the circumstances in which death occurred.[2] The cause of death refers to the medical cause of death, incorporating where possible the mode or mechanism of death. For coronial purposes, the circumstances in which the death occurred refers to the context or background and surrounding circumstances to the death, but is confined to those circumstances sufficiently proximate and causally relevant to the death and not to all circumstances which might form part of a narrative culminating in death.[3]

[1] Section 89(4) *Coroners Act 2008* (Vic).
[2] Section 67(1) *Coroners Act 2008* (Vic).
[3] *Harmsworth v The State Coroner* [1989] VR 989, *Clancy v West* (unreported 17/08/1994, Supreme Court of Victoria.

22. Section 67 of the *Coroners Act 2008* (Vic) (Coroners Act) requires that a coroner must find, if possible, the identity of the deceased, the cause of death and the circumstances of the death. The Victorian Court of Appeal has determined that the term "*if possible*" makes it obligatory that the coroner must "*pursue all reasonable lines of inquiry*".[4] Further, the Coroners Court must act as an "*independent*" and "*active investigator*" and "*do anything possible to determine the cause and circumstances of the death*".[5]

23. The broader purpose of coronial investigations is to contribute to a reduction in the number of preventable deaths, the promotion of public health and safety and the administration of justice.

24. It is not the role of the coroner to lay or apportion blame, but to establish the facts.[6] It is not the coroner's role to determine criminal or civil liability arising from the death under investigation or to determine disciplinary matters.

25. A coroner may comment on any matter connected with the death, may report to the Attorney-General and may make recommendations to any Minister, public statutory authority or entity, on any matter connected with the death, including recommendations relating to public health and safety and the administration of justice.[7]

26. This finding draws on the totality of the material produced as part of the coronial investigation into Audrey's death, including the coronial brief, statements, medical records and expert reports. In writing this finding I do not purport to summarise all of the evidence but refer to it only in such detail as appears warranted by its forensic significance.

CORONIAL INVESTIGATION

Forensic medical investigation

27. On 16 December 2014, Dr Sarah Parsons, Forensic Pathologist at the Victorian Institute of Forensic Medicine conducted an autopsy on the body of Audrey. Dr Parsons reported that Audrey "*had cardiomegaly with a heart weight nearly 2 times greater than that expected for a child of her age. At hospital she also had pericardial and pleural effusions.*" She reported that this was in keeping with a poorly functioning heart and heart failure, however this is a clinical diagnosis and she recommended review of this case by a cardiologist.

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[4] *Priest v West & Anor* [2012] VSCA 327 at p2
[5] *Priest v West & Anor* [2012] VSCA 327 at p6
[6] *Keown v Kahn* (1999) 1 VR 69.
[7] Section 72(1) and (2) *Coroners Act 2008* (Vic).

28. Dr Parsons indicated that:

> *given the histology of the heart shows evidence of widespread fibrosis and granulation tissue formation. The widespread distribution of the inflammation, along with normal EM findings and together with the clinical history of a significant viral infection in April 2014 is consistent with a diagnosis of a resolving myocarditis. However given that no acute inflammation is identified another cause for the cardiomyopathy cannot be entirely excluded.*

29. Myocarditis generally causes decreasing myocardial function with enlargement of the heart and heart failure. Dilated cardiomyopathy is often a complication of myocarditis.

30. Dr Parsons provided an opinion that the medical cause of death of Audrey was 1a) DILATED CARDIOMYOPATHY and that her death was due to natural causes.

Family concerns and request for inquest

31. Dr Angela and Matthew Ebbage wrote to the Coroners Court on 16 March 2015 and submitted a Request for Inquest into death with supporting documentation about concerns they held in relation to their daughter's care and management at the Northern Hospital. They wrote again on 29 April 2015 and outlined a number of concerns they held about the medical care and management of their daughter Audrey which assisted me to focus the direction of my investigation on these issues.

32. Some of the concerns raised by the Ebbages were as follows:

- Blood pressure was not taken to assist diagnosis.
- A MET call was not activated and blood pressure was not taken with a resting heart rate of 160bpm.
- Further investigations were not conducted when Audrey's condition deteriorated hours prior to her cardiac arrest.
- No differential diagnosis was considered other than croup and a viral infection.
- There was no escalation to a more senior paediatrician.
- There appeared to be no procedures for assessing the critically ill.
- Staff appeared to be insufficiently trained in resuscitation.
- Lack of follow up by the Northern Hospital.

Concerns of Associate Professor James Tibballs

33. On 17 December 2014, Associate Professor James Tibballs, Intensivist-in-Charge, Paediatric Intensive Care Unit, Royal Children's Hospital wrote to the Coroners Court and outlined concerns he held in relation to whether Audrey may have been misdiagnosed and whether her death may have been avoidable.

34. On 27 December 2015, Associate Professor Tibballs provided a statement to the Coroners Court[8] raising questions of misdiagnosis and preventability of Audrey's death. Associate Professor Tibballs commented that "*an alternative diagnosis ought to have been considered to explain the cardiorespiratory symptoms and signs. Investigations ought to have included as a minimum, a chest x-ray, electrocardiograph and the measurement of blood pressure.*"

35. In his statement, Associate Professor Tibballs advised that in 2002, the Royal Children's Hospital introduced a system whereby urgent assistance could be provided to staff members in the management of a child on the ward, outside the intensive care unit environment. The aim of the system was for clinicians to be able to recognise and treat a child before the occurrence of a cardiac arrest because once cardiac arrest occurs, brain damage is the most likely outcome. He indicated that:

> *in most cases and irrespective of the causal illness, cardiac arrest in children is preceded by warning aberrations in vital signs before cardiac arrest. If the child is treated promptly and well, cardiac arrest may be prevented. However, on occasion staff have difficulty recognising that a child has a deteriorating condition, or are unable to effectively treat the child or are unable, unwilling or are prevented from summoning expert assistance.*

36. The Medical Emergency Team System (MET system) or Rapid Response Team has been adopted widely around the world by paediatric and adult hospitals which care for children. Associate Professor Tibballs stated that the system has been recently adopted by all hospitals in Victoria and noted that a MET system consists of triggers to 'call MET' and a mandatory response by an expert team available from other locations in the hospital. The 'call MET' triggers are:

- Transgression of a key physiological variable (respiratory rate, heart rate, blood pressure); or
- Signs including apnoea, respiratory distress, stridor, cyanosis, convulsions, extremes of temperature; or

[8] Statement of Associate Professor James Tibballs dated 27 December 2015, coronial brief, p22

- Hypoxaemia;
- Worry about a child's condition by any staff member or parent.

37. Associate Professor Tibballs stated:

> *If Audrey's initial heart rate (170) and respiratory rate (60) are plotted on an appropriate chart ... it may be observed that these signs are both beyond the 99th centiles, while blood pressure was not apparently measured. This information implies that unless her condition responded to the treatment chosen, cardiac arrest was predictable and it would not have been appropriate to admit her to a ward which did not have at least facility for high-dependency care.*

38. He further opined the fact that she suffered a cardiac arrest after reports of tachycardia, prompting medical review on a ward with no change in management, highly suggests that her diagnosis was incorrect or that the warning signs of impending cardiac arrest were not recognised or were not acted upon.

Coroners Prevention Unit[9]

39. As a result of the concerns raised by the Ebbage family and Associate Professor Tibballs, I referred this matter to the Coroners Prevention Unit (CPU) to review the care and management of Audrey whilst at the Northern Hospital. The role of the CPU is to assist coroners investigating deaths, particularly deaths which occur in a healthcare setting. The CPU is staffed by healthcare professionals, including practising physicians and nurses, who are independent of the health professionals and institutions under consideration. The CPU professionals draw on their medical, nursing and research experience to evaluate the clinical management and care provided in particular cases by reviewing the statements, medical records, the autopsy report and any particular concerns which have been raised.

40. The CPU conducted an investigation, reviewed the medical records of Audrey and suggested appropriate further investigations.

Directions Hearing – 26 November 2015

41. On 26 November 2015, I held a directions hearing and determined it was appropriate to conduct an inquest into the death of Audrey. The purpose of the directions hearings was to determine the scope of the inquest, ascertain what further investigative material was required to be obtained and identify any potential witnesses. It became apparent that it was necessary to obtain a large number of statements from the clinicians involved in Audrey's care and

[9] I am grateful for the assistance of the CPU with my investigation into this death, particularly Dr Tim Ford and Dr Siobhan O'Sullivan who assisted me identify the key issues and themes and obtain the expert report of Dr McAdam.

management whilst at the Northern Hospital and an expert opinion from a Consultant Paediatrician and Paediatric Cardiologist.

42. The proposed scope of the inquest was identified as follows:

- Presentation to the Austin Hospital on 6 December 2014.
- Assessment, diagnosis, treatment and management plan of Audrey at the Northern Hospital.
- Handover and communication between clinicians and continuity of care at Northern Hospital.
- Absence of Senior Consultant Paediatrician over a weekend period at Northern Hospital.
- Escalation plan and MET protocols at Northern Hospital.
- Paediatric resuscitation at Northern Hospital.
- Staff rostering at Northern Hospital.
- Any potential prevention opportunities.
- Would Audrey have survived had she been diagnosed earlier or transferred to the Royal Children's Hospital sooner?

Further coronial investigations[10]

43. Throughout the early part of 2016, all the statements, further documents and evidentiary material including an expert report from Dr Catherine McAdam, Consultant General Paediatrician and Department Head of General Paediatrics at Monash Children's Hospital were obtained and collated into a coronial brief, which I summarise below. During this time, great efforts were also made by the Coroners Court to obtain an expert opinion from a Paediatric Cardiologist which were to no avail.

44. On 5 May 2016, the Coroners Court was advised by lawyers acting on behalf of Northern Health that they had obtained an expert opinion from Dr Terry Robertson, Paediatric Cardiologist from the Women's and Children's Hospital in South Australia, which I have summarised below.

[10] I would like to thank Sergeant Sharon Wade from the Police Coronial Support Unit for her assistance and support during my investigation.

Expert Opinion of Dr Catherine McAdam

45. Dr McAdam reviewed the coronial brief and provided an expert opinion to the Coroners Court.[11]

46. Dr Adam noted that Audrey "*presented with a rare and fatal condition masquerading as a common paediatric respiratory infection*". She added "*whilst the outcome may not have been different if it was diagnosed earlier, it does highlight that systems in the Child and Adolescent Health Unit at the Northern Hospital were inadequate to detect and respond to her deterioration earlier*".[12] Dr McAdam considered the resuscitation seemed to have followed Australian Resuscitation guidelines reasonably closely.

47. Dr McAdam's report highlighted a number of issues worth noting in this finding.

Overall assessment and management

48. Despite Audrey being tachycardic and tachypnoeic and having her oxygen saturations and temperature recorded, her blood pressure was not recorded throughout her whole admission. Dr McAdam noted that this was a "*significant oversight in an unwell child, but appears to have been avoided in the context of minimising distress to a child with an upper airway problem.*"[13] Further, "*whilst hypotension is a late sign of circulatory failure in children, it may have alerted the staff to her underlying diagnosis if it had been recorded.*"[14]

49. A differential diagnosis was not considered by Dr Perelini, even though she made pertinent notes. Dr Penno does appear to consider a differential diagnosis of epiglottitis or retropharyngeal abscess and lower respiratory tract infection. Dr Doherty assessed Audrey and ruled out sepsis on the basis of a general inspection and normal capillary refill but did not appear to have examined other parts of the cardiovascular system.

50. Nursing staff did escalate for medical review on a number of occasions and there was handover from one shift to the next between junior medical staff however, Dr McAdam notes that Audrey was not reviewed by a consultant paediatrician until her demise of the final day of her admission. Despite the lack of senior medical review, Dr McAdam stated "*I believe that the junior medical staff treating Audrey Ebbage treated her to the best of their ability and*

[11] Expert report of Dr Catherine McAdam, Consultant General Paediatrician and Department Head of General Paediatrics at Monash Children's Hospital dated 5 March 2016, coronial brief p177
[12] Ibid, p188
[13] Ibid, p179
[14] Ibid, p179

experience at all times, but were not adequately supervised or aware of the need to seek guidance from the paediatrician."[15]

Validity of the diagnosis of croup

51. The initial diagnosis by Dr Cheng was croup. Dr McAdam noted that tachypnoea is a little unusual in children with croup and also of interest was that there was no barking seal-like cough noted by medical staff which is a common symptom of croup. Further, Audrey was reported to have made a grunting sound and according to Dr McAdam, grunting is not usual in children with croup.

52. Dr McAdam considered that the initial diagnosis of croup and response to an adrenalin nebuliser and oral steroids was reasonable, however she considers a differential diagnosis could have been entertained, as the history was of two weeks of cough, whereas croup is usually an illness with a much shorter history of 1-2 days of being unwell, with barking cough and stridor. Dr McAdam considered that croup was a reasonable working diagnosis at the early stages of Audrey's presentation.

53. By Friday 12 December 2014, "*tachypnoea [was] the only sign Audrey had to indicate the need for further investigation ... and the stridor became less prominent throughout her admission [and] lethargy became the primary concern.*" Dr McAdam believed that Audrey's lethargy was also unusual, as children with croup usually brighten up in the daytime and are more distressed at night or with sleep. Audrey's symptoms did not have the typical diurnal variation usually seen in croup. Further, she considers that other diagnoses should have been considered at this stage and a chest x-ray should have been considered at this point due to the persistent tachypnoea.

54. Of note, Dr McAdam stated that Audrey was reviewed frequently by various junior medical staff however despite ongoing tachypnoea and tachycardia, with intermittent grunting, lethargy and parental concern, the only differential diagnosis considered was bacterial sepsis which was ruled out due to Audrey having no fever and no toxic appearance. Dr McAdam was also critical that physical examination did not go beyond the respiratory system and no other investigations were performed. Persisting tachypnoea should have been a sign that something more serious was going on.

[15] Ibid, p179

No consultant paediatrician review

55. Despite the fact that Audrey was admitted under the care of Dr O'Dea, Consultant Paediatrician, according to the medical record there was no notification to Dr O'Dea of the admission of this patient and therefore he had no opportunity to review the patient with the treating doctors and nurses.

No MET call was initiated until Audrey reached Code Blue

56. Although one or two criteria in the MET call range were present for several hours, nobody initiated a MET call until the Code Blue was called. Dr McAdam reported that the failure to call a Paediatric MET response meant that a paediatric consultant was not notified. She commented that "*this represent[ed] a missed opportunity for a fresh review of the case by a doctor with more seniority*".

57. In Dr McAdam's opinion "*a mild or intermittent tachypnoea associated with either distress or fever is common in children with croup, but usually settles promptly. In Audrey's case, the failure of the respiratory rate to consistently fall to the normal range is unusual and the significance was not appreciated by the junior medical staff caring for the patient.*"

58. According to Dr McAdam, a consultant paediatrician should have been informed of her deterioration, particularly at 7.50pm on 13 December 2014. She commented that ultimately "*the delay in making a MET call for this child and initiating resuscitation delayed the recognition of the true diagnosis and timely transfer to a tertiary facility.*"

Resuscitation provided to Audrey

59. The Australian Resuscitation Council Guidelines (Guidelines) provide information on best practice for resuscitation. Dr McAdam was asked to comment on the resuscitation of Audrey and noted that "*any resuscitation, particularly an unexpected resuscitation, is a stressful event for all involved. Provision of care takes priority over documentation with the resources and personnel available. With the documentation provided, it does show close resemblance to the guidelines.*" Further, Dr McAdam was not critical of the resuscitation of Audrey and considered that it followed Guidelines.

Would Audrey have survived if she had been diagnosed earlier?

60. Whilst qualifying that she is not a Cardiologist, Dr McAdam stated that she cannot comment specifically on the likelihood of survival from various forms of dilated cardiomyopathy, however "*the delay in diagnosis of the condition, meant that Audrey was not transferred to a*

tertiary children's hospital for cardiology evaluation prior to her demise." Further, "*earlier cardiology input may have allowed treatment with medications to enhance cardiac function, prevent or treat arrhythmia and work her up for a potential heart transplant.*" Dr McAdam reported that "*dilated cardiomyopathy is a rare condition with a prevalence of about 1 in 2,500-5000 in the community.*" Additionally, "*cardiac transplantation carries significant mortality risk and is not commonly available in infants, so the ultimate outcome may not have been different.*"

61. Dr McAdam noted that cardiomyopathy may have developed over a matter of weeks to months, given the fibrosis and granulation tissued observed at post mortem.

Clinical governance systems

62. At the time of Audrey's admission to the Northern Hospital, there appears to have been a large number of junior medical staff rostered on duty. The nature of junior medical staff is that as part of their training they rotate in and out of hospitals for a short period of time. Therefore familiarisation and orientation to the hospital's policies and procedures can be difficult and according to Dr McAdam, creates a strong reliance on nursing staff to highlight relevant policies and procedures to their medical colleagues. The Northern Hospital appears to have many policies and procedures relating to paediatric care and management. However, Dr McAdam commented that "*this relies on a strong culture of team work across disciplines.*"

Expert opinion of Dr Terry Robertson

63. Lawyers acting for Northern Health obtained an expert opinion from Dr Terry Robertson[16], Paediatric Cardiologist. Dr Robertson stated that on Audrey's presentation on the evening of 11 December 2014, it was his opinion that the diagnosis of acute croup in this setting was appropriate, based on the documented history and observations. He confirmed in making the diagnosis it was appropriate to minimise handling of Audrey and, as such, a more thorough clinical assessment of other systems including the cardiovascular system were not performed. Likewise, the performing of a chest x-ray or any other investigations was not indicated.

64. Dr Robertson noted that:

> *the first 24 hours of Audrey's admission would fit with the presumed diagnosis of croup, however the deterioration noted during the 13th December does not. Typically a child with croup doesn't look particularly ill, and while Audrey was not considered to be overly unwell, she was obviously lethargic and had deteriorated since being admitted.*

[16] Expert Opinion of Dr Terry Robertson, Paediatric Cardiologist undated, coronial brief, p207

Whilst lethargy is a sign of increasing airway obstruction, it is clear that Audrey at no stage had any other signs of major airway obstruction. It is clear from the written notes, the number of medical reviews and the increased frequency in documented observations that there was increasing concern about Audrey's condition during this time.

65. Further, he noted it was during this period that reassessment of the diagnosis and possible further investigations, including a chest x-ray could have been considered.

Would a chest x-ray have made a difference to Audrey's management and outcome?

66. Dr Robertson considered that if a chest x-ray had been performed it is very likely to have shown an increased cardiothoracic ratio, which would have indicated either cardiomegaly or a substantial pericardial effusion. He believes it is also likely to have shown pulmonary oedema and the presence of pleural effusions. Further, "*it is likely a mobile [chest x-ray] would have been performed which while more limited than a radiological departmental x-ray, should have been sufficient to show at least some of these features*".

67. Dr Robertson noted that with this new information available the diagnosis and treatment would have been significantly different. Whilst a definitive diagnosis of dilated cardiomyopathy could not have been made on the chest x-ray alone, he believes it would have been clear there was a cardiac cause to Audrey's condition. He was unsure if an urgent echocardiogram could have been arranged locally, however Dr Robertson considers the treatment options of oxygen, IV access, diuretics and blood gas analysis and plans to have Audrey transferred to the Royal Children's Hospital for urgent tertiary paediatric cardiac assessment did occur.

68. Once at the Royal Children's Hospital the diagnosis and optimal investigations and treatment would have been instigated. Dr Robertson considers it is probable that such treatment would have stopped Audrey arresting when she did, however both short and long term outcomes would have remained very guarded.

69. According to Dr Robertson, long-term outcome for paediatric dilated cardiomyopathy has been well documented including in a 2013 study looking at outcomes from the Australian Population Based Study of Childhood Cardiomyopathy. This showed a survival (free from death or transplant) of 74% at 1 year, 62% at 10 years and 56% at 20 years. It can be safely assumed that Audrey would have had very poor cardiac function at the time of presentation to the Royal Children's Hospital and this was a predictor of worse outcome. Similarly, Audrey had no evidence of lymphocytic infiltration at the time of autopsy, which was a predictor of better outcome.

70. In summary, Dr Robertson considered there was a reasonably high chance that Audrey would have either died or required a cardiac transplant despite an appropriate diagnosis.

Further directions hearing – 9 May 2016

Concessions made by Northern Hospital

71. On 9 May 2016, I held a further directions hearing to discuss whether or not an inquest was required following the completion of the coronial brief and the provision of two expert opinions regarding Audrey's clinical care and management.

72. Counsel for Northern Health made the following concessions:

- Audrey's blood pressure should have been recorded on at least one occasion during the course of her admission to hospital.
- Audrey should have been reviewed by a consultant paediatrician during the course of her admission to the paediatric ward.
- By 3.15pm on 13 December 2014 a differential diagnosis should have been more actively considered (including consideration of the need to perform further diagnostic investigations) in the context of Audrey's documented lethargy and parental concern.
- By 7.50pm on 13 December 2014 a paediatric MET call should have been initiated in light of Audrey's documented heart rate and respiratory rate.
- Dr and Mr Ebbage should have been contacted by the hospital following Audrey's death as part of the open disclosure process.

73. On this basis, I determined based upon all of the material that had been obtained, including the concessions made by the Northern Hospital, I did not consider that an inquest was necessary. These concessions were welcomed by the Ebbage family. Counsel for the Ebbages requested some time to consider their position in light of the concessions and expert opinion. On 23 May 2016, I received Submissions on Behalf of the Family, which I have carefully considered.

Changes that have been implemented at the Northern Hospital since Audrey's death

74. Ms Jodie Ashworth, Director of Nursing and Program Director for Women's and Children's Services at the Northern Hospital made a statement about the changes that have been implemented at the Northern Hospital. Ms Ashworth noted that at the time of Audrey's admission, the paediatric ward was about to implement the Victorian Children's Tool for

Observation and Response (VICTOR chart) and the chart was being printed. The VICTOR chart has now been implemented in the paediatric ward and in the Emergency Department.

75. The VICTOR chart is a set of four age-specific 'track and trigger' paediatric observation charts designed to assist in recognising and responding to clinical deterioration in children. These 'track and trigger' charts mandate a response by the clinician once the child's observations reach a designated 'zone'. If a child's observation transgresses the orange and purple zone, an escalation of care response is triggered in accordance with Northern Health's Paediatric Escalation Process Policy and the Acute Care Paediatrics Policy, which was implemented in July 2015.

76. These policies outline a three-tiered paediatric Emergency Response: Code Blue, MET and Pre-MET. If a Code Blue is initiated it is mandatory for a paediatric consultant to be contacted out of hours via the hospital switch. Further, if there are more than two clinical reviews in an eight hour period a consultant is notified.

77. A MET call is initiated for any of the following incidents:

- Any observation in the purple zone.
- Three or more simultaneous orange zone criteria.
- Staff member is very worried about the child's clinical state.
- A family member is very worried about the child's clinical state.

78. If a MET call is initiated, it is mandatory for the paediatric consultant to be contacted by the paediatric NIC/registrar and then an update given to the consultant by the registrar.

79. Following Audrey's death the hospital identified the need to change the process of clinical ward rounds and clinical reviews to ensure paediatric consultants attend a minimum number of bedside rounds per day. The current practice is that when more than one clinical review is required within an eight hour period, the registrar is to discuss the patient with the on-call consultant. The nurse caring for the patient is to be present when the registrar/resident reviews the patient and the nurse in charge is to be informed by the nurse caring for the patient of all impending clinical reviews and outcomes.

Northern Hospital's follow up procedures following a paediatric death

80. Dr and Mr Ebbage reported that when Audrey died, the Northern Hospital did not contact them which left them feeling extremely upset and disappointed with the lack of

communication. Ms Ashworth stated that "*it is regrettable and we recognise that Northern Health should have also contacted Mr and Mrs Ebbage, and we have apologised to them for this.*"

81. Ms Ashworth stated that Northern Health's Open Disclosure Policy informs staff of the procedure for communicating with patients and carers openly, honestly and empathically in instances where an adverse event has occurred. The policy has undergone review in April 2015 to highlight that Program Directors and/or Clinical Program Directors of the relevant program in which the adverse event occurred are responsible for the open disclosure process. Organisational training on Open Disclosure has now been conducted to key clinical and non-clinical staff.

82. Dr Loren Sher, Consultant Paediatric Emergency Physician and the Chair of Paediatric Resuscitation Committee provided a statement[17] to the Coroners Court which outlined the changes that have been implemented at the Northern Hospital in the interests of improving the management of paediatric resuscitation, which included the following:

- Education Changes
  - i. It is now a requirement that ICU, Emergency, Paediatric and Anaesthetic medical and nursing staff have completed the RESUS4KIDS paediatric life support training program. This course provides the skills required for basic paediatric life support with the additional focus on team leadership.
  - ii. Paediatric and Emergency nursing staff working in dedicated paediatric areas are required to hold a current Paediatric Life Support certificate.
  - iii. It is a requirement that senior medical and nursing staff involved in paediatric resuscitation and education complete either an Advanced Paediatric Life Support course or a Paediatric Basic ICU course.
  - iv. The establishment of a Simulation Resuscitation Program to provide staff with an opportunity to practice paediatric resuscitation. This is currently run as a multi-disciplinary simulation every alternate week.
- A paediatric scribing tool has been introduced to assist the staff member documenting the resuscitation in ensuring that all pertinent information is recorded.

[17] Statement of Dr Loren Sher, Consultant Paediatric Emergency Physician and the Chair of Paediatric Resuscitation Committee dated 15 March 2016, coronial brief, p195

- The Monash Children's Hospital Paediatric Emergency Medication Book is now utilised at the hospital, which outlines the specific medication and dosing requirements for paediatric resuscitation. This book is located in multiple areas throughout Northern Health and on the Code Trolleys from both ICU and the Emergency Department.
- Northern Health's Code Response Team (ICU and ED) have paediatric defibrillator pads which are compatible with their manual defibrillator. Northern Hospital also has standardised its response to Code Blue's outlining the specific criteria for calling a Code Blue in line with the VICTOR chart. This includes specifying the staff and equipment required to attend each Code Blue.
- Northern Health is also looking to purchase a Broselow trolley for the paediatric ward in order to standardise the equipment and the layout of equipment that is required during paediatric resuscitation.

Royal College of General Physicians acceptance for Northern Health to continue paediatric care

83. Ms Ashworth noted that in June 2015, Northern Health was made aware that the Royal Australasian College of Physicians (RACP) had significant concerns for medical paediatric trainees at Northern Health and called into question the suitability of Northern Health continuing as a secondment hospital in the Royal Children's Hospital joint training program. The concerns were raised via formal feedback from medical trainees and a site visit in June 2015.

84. Ms Ashworth reported that following receipt of a report from the RACP, Northern Health responded to the concerns from RACP and significantly changed it systems and processes. In March 2016 the three tertiary site Directors of Paediatric Education (DPEs) in Victoria, Dr Margot Nash and Dr Mike Starr of the Royal Children's Hospital and Dr Rob Roseby of Monash Children's Hospital wrote to the RACP providing a recommendation that the Northern Hospital continue to be accredited as a secondment site for Basic Paediatric Training in Victoria. It was noted by the DPEs that the changes described in Northern Health's report had taken place and had translated into an improved training experience for junior medical staff.

Matthew and Angela Ebbage Statement

85. Dr Ebbage was invited to address the Coroners Court at the further directions hearing with any further comments and concerns. The Ebbages felt that they were concerned about their daughter throughout her admission at the Northern Hospital which was reflected in the number of times Audrey was reviewed by clinical staff, however they "*never felt heard*". The Ebbages strongly believe that parents are the best placed people to know when their child is not well and that their concerns should be taken seriously, acted upon and reviewed by senior medical staff.

86. Whilst the Ebbages were extremely disappointed with the lack of communication after the death of Audrey, they are happy to see that several policy changes have been implemented around the issues that have been investigated. However, it is their greatest concern that the implementation of these changes will not be coupled with a 'cultural' change at the Northern Hospital. Dr Ebbage suggested a recommendation to ensure that responsibilities and accountabilities are clearly communicated to all staff, and all aspects of the policies are practised and monitored through compliance and audit programs.

FINDINGS

87. In making my findings, the appropriate standard of proof to apply is articulated in *Briginshaw v Briginshaw*[18] which requires me to be satisfied on the balance of probabilities.

88. I find that Audrey Florence Eleanor Ebbage died on 15 December 2014 from 1a) DILATED CARDIOMYOPATHY. I find that her death was due to natural causes. I note Dr McAdam's comments that "*Audrey presented with a rare and fatal condition, which masqueraded itself as a common paediatric respiratory infection*". I find based upon all of the available evidence, that Audrey would most likely have needed a heart transplant to survive. However, I am unable to determine had Audrey been transferred to the Royal Children's Hospital and received earlier treatment whether she would have survived.

89. I find that the care and management of Audrey at the Northern Hospital was sub-optimal. I find that her clinical care throughout her admission was provided by nursing staff who escalated their concerns regarding Audrey's presentation to the junior medical staff on a number of occasions. I find that the junior medical staff treating Audrey were not adequately trained and supervised by a Consultant Paediatrician. The lack of escalation to a Consultant

[18] (1938) 60 CLR 336

Paediatrician was a missed opportunity to consider a differential diagnosis and order further investigations, including referral to the Royal Children's Hospital. I make no adverse finding regarding the junior medical staff involved in Audrey's treatment, they treated Audrey to the best of their experience and ability.

90. Based upon the expert report of Dr McAdam I find that the resuscitation of Audrey was in compliance with the relevant standards. I acknowledge how distressing and chaotic it would have been for those clinicians involved in the efforts to save her life and for Dr and Mr Ebbage to witness.

91. I also acknowledge that the death of a child for the clinical staff involved in her care and management is distressing and can have a profound and lasting impact on their lives.

92. I commend Northern Health for their assistance with obtaining statements from many junior medical staff who have since moved on from their position at Northern Hospital and for their full and frank concessions as to their system failures which related to Audrey's admission to the Northern Hospital. I also acknowledge the many improvements and changes to systems and policies and procedures that have been implemented since Audrey's death. Further, the concessions made by Northern Health avoided the necessity of an Inquest.

93. From the very early stages of this investigation I was guided by the Ebbages as to where to focus my investigations. I am sincerely grateful for this, it helped me effectively focus on the pertinent issues.

94. Finally, I wish to express my sincerest sympathies to the Ebbage family for the loss of their precious Audrey.

COMMENT

Pursuant to section 67(3) of the **Coroners Act 2008**, I make the following comment connected with the death:

A hospital's culture is integral to its effective operation. This should be led and driven by the most senior people within a hospital environment. As leaders of the organisation, they have the capacity to have the greatest impact on culture. Given the expertise they hold, they must be approachable and effectively communicate their knowledge. Junior medical staff should feel encouraged to seek assistance from senior medical staff without fearing negative repercussions. The best way to train physicians of the future is for senior clinicians to lead by

example and to impart their knowledge. Audrey's death serves as a timely reminder of the importance of a culture of open communication and respect.

RECOMMENDATION

Pursuant to section 72(2) of the **Coroners Act 2008**, I make the following recommendation connected with the death:

> This case has highlighted a broader issue of training junior medical staff. In light of the Royal Australasian College of Physicians confirmation of Northern Health's accreditation as a secondment site for Basic Paediatric Training in Victoria, I RECOMMEND THAT Northern Health use this case as a training example for junior medical staff to highlight the importance of differential diagnoses, particularly when a patient's clinical condition does not improve, conducting thorough assessments and examinations, listening to nursing staff and parent's concerns, escalating to senior staff and familiarisation and understanding of the hospital's policies and procedures, particularly Medical Emergency Team protocols.

I direct that a copy of this finding be provided to the following:

- Dr Angela and Matthew Ebbage
- Northern Hospital
- Royal Children's Hospital
- Austin Hospital
- Consultative Council on Paediatric Mortality and Morbidity
- Royal Australasian College of Physicians
- Associate Professor James Tibballs
- Dr Catherine McAdam
- Dr Terry Robertson
- Sergeant Sharon Wade, Police Coronial Support Unit

Signature:

JACQUI HAWKINS
Coroner
Date: 30 May 2016