CORONERS ACT, 2003

SOUTH *AUSTRALIA*

FINDING OF INQUEST

An Inquest taken on behalf of our Sovereign Lady the Queen at Adelaide in the State of South Australia, on the 29th, 30th and 31st day of March and the 1st, 8th, 11th and 14th days of April 2022 and the 30th day of August 2023, by the Coroner's Court of the said State, constituted of Ian Lansell White, Deputy State Coroner, into the death of Logan Scott Fergusson.

The said Court finds that Logan Scott Fergusson aged 6½ weeks, late of 30 Symonds Crescent, Modbury North, South Australia died at the Women's and Children's Hospital, 72 King William Road, North Adelaide, South Australia on the 15th day of June 2016 as a result of hypoxia and reduced pulmonary perfusion complicating congenital heart disease. The said Court finds that the circumstances of his death were as follows:

1. Introduction

1.1. Logan Scott Fergusson was born at the Women's and Children's Hospital[1] on 29 April 2016. During his mother's pregnancy two foetal echocardiograms were conducted that showed Logan had serious heart defects, including a ventricular septal defect[2] and pulmonary atresia.[3]

1.2. Logan's heart defects needed urgent cardiac surgery. Therefore, only four days after his birth, he was transferred from the WCH to the Royal Children's Hospital in Melbourne[4] for urgent cardiac surgery which was performed on 5 May 2016.

[1] WCH
[2] A defect in the membrane wall separating the ventricles of the heart (VSD)
[3] Obstruction of outflow of blood from the heart to the lungs due to a closed pulmonary valve
[4] RCHM

1.3. Following surgery and time in the Paediatric Intensive Care Unit[5] of the RCHM, Logan was moved to the cardiology ward. Unfortunately, on 12 May 2016 he was readmitted to the PICU at RCHM for a chest infection.

1.4. On 1 June 2016 Logan was transferred back to the WCH where he stayed before being discharged on 3 June 2016. At the time of discharge an outpatient cardiology appointment was made with consultant cardiologist Dr Terry Robertson for 10 June 2016.

1.5. That appointment was kept as arranged and Logan showed positive signs of improving health, such as weight gain. An electrocardiogram[6] was conducted and his heart produced a normal result.

1.6. The ECG and weight gain allowed an assessment to be made at that time that Logan was progressing well from the difficult start of his life.

2. Events immediately preceding Logan's death

2.1. I shall now describe in brief the last two days of brave little Logan's life.

2.2. 14 June 2016

2.3. Logan's mother took him to the WCH Emergency Department[7] at 4pm. He was vomiting, had diarrhoea and was sweating profusely at times. His oxygen saturation levels were the lowest recorded since surgery at RCHM. WCH quickly rated his condition Priority 1[8] status on this basis.

2.4. At 4:20pm WCH ED paged Dr Alex Gordon who had seen Logan on 10 June 2016. At 4:25pm Logan was placed on continuous positive airway pressure.[9] Dr Gordon responded promptly and began assessing Logan at 4:30pm.

2.5. At his presentation to Dr Gordon, Logan was suffering tachycardia. His heart rate was 170 beats per minute.[10] He was irritable and breathing rapidly.

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[5] PICU
[6] ECG – This test is non-invasive and records the electrical activity of the heart
[7] ED
[8] Most urgent
[9] CPAP
[10] bpm

2.6. Logan was admitted to the WCH Rose Ward[11] at 6:42pm.

2.7. Logan's acceptable oxygen levels were set at a minimum of 65%. A pulse oximeter was attached to his foot to alert treating staff if the oxygen saturation level dipped below 65%.

2.8. The issue of setting the oxygen saturation level at 65%, together with the length of time it should have been seen as an acceptable minimum standard, was a significant issue at this Inquest.

2.9. 7pm 14 June - 9am 15 June 2016

2.10. Logan's oxygen saturation levels were monitored throughout that night. During this 14-hour time period 18 readings of his oxygen saturation levels were formally recorded in his observation chart by WCH nursing staff. This is in addition to the constant readings from the pulse oximeter.

2.11. Only five of the 18 manual readings taken by WCH in this period were at or above the 65% level. At 3:50am and 6:55am on 15 June 2016 the oxygen saturation level was at 40%.

2.12. Logan's oxygen saturation levels during this time period became a significant issue at the Inquest. In ED Dr Gordon has set a four-hour limit on the 65% level, which expired at about 9pm. After that time 13 further manual readings were taken, of which 11 were below 65%.

2.13. Logan had six manual oxygen saturation readings taken between 8pm and 1am. All fell below the 65% level.

2.14. At 9:15pm a medical review was conducted of Logan's condition. Blood test results were examined and showed a normal white cell count. This indicated that infection did not seem to be a cause of his low oxygen saturation levels.

2.15. At 11:45pm Paediatric Cardiac Consultant, Dr Gavin Wheaton, conducted a review. WCH notes suggest he and the Registrar reporting to him had been alerted by nursing staff about the readings.

[11] Specialist babies ward

2.16. At 11:41pm a chest Xray was performed. This showed clear lungs and no change in the size of Logan's heart from previous records. In other words, still no cause had been discovered for Logan's low oxygen saturation levels.

2.17. At 8:45am on 15 June 2016 Dr Gordon saw Logan. He was assessed as appearing cyanotic.[12] An echocardiogram[13] was ordered and performed. The results showed Logan's deteriorating condition was explicable by a narrowing of his left pulmonary artery,[14] which had been operated on in Melbourne. This meant he needed to return to the RCHM as he did not have enough blood flowing from his heart to his left lung through that artery.

2.18. Urgent arrangements were made for Logan to go to the WCH PICU for anticoagulation therapy using heparin before his transfer to RCHM.

2.19. At 11:18am Logan's condition deteriorated very suddenly. He stopped breathing at 11:23am. The WCH life support team attended at 11:26am. They found his heart rate was less than 40 bpm and he had a weak pulse. Despite CPR for 30 minutes, Logan could not be rescued. His death was recorded as having occurred at 11:55am.

3. Post-mortem examination

3.1. A post-mortem examination was conducted by Dr Jill Lipsett at the WCH on 22 June 2016. In Dr Lipsett's post-mortem examination report she noted that Logan was '*small*' for his age. Her opinion was that the cause of Logan's death should be described as '*complications of congenital heart disease*'.[15]

3.2. The clinical findings supporting that general cause of death was:

> '… cardiorespiratory / hypoxic with evidence of reduced pulmonary perfusion … There is evidence of some intravascular thrombus downstream (R lung particularly) and some perfusion variability in the lungs. It is likely that thrombosis played a role in demise, with risk of thrombosis increased by the presence of the foreign graft, and ? viral illness/element of dehydration. There are features in keeping with acute but not significant chronic heart failure.' [16]

[12] Blue colouring on skin
[13] Also known as a cardiac ultrasound. Its purpose is to produce live images of the heart and, in particular, to gauge the functioning of the heart valves.
[14] LPA
[15] Exhibit C2a
[16] Exhibit C2a, page 2

4. Legal basis for Inquest

4.1. Logan's death was reported to the State Coroner pursuant to the Coroners Act 2003.[17] Pursuant to section 21 of the Act, the State Coroner considered it was '*necessary or desirable*' to hold an Inquest to '*ascertain the cause or circumstances*' of his death.

4.2. On 7 June 2021, section 3(3) of the Act came into operation. This states that:

> 'For the purposes of this Act, a reference to the circumstances of an event may be taken to include matters related to or arising out of the event or its aftermath.'

4.3. As this Inquest began after 7 June 2021, section 3(3) must be considered and applied. There is no definition of '*cause or circumstances*' in the Act. Therefore, it is important to outline guidance from the Supreme Court of South Australia[18] concerning the interpretation of the phrase '*cause or circumstances*'. I refer to the decision of WRB Transport and others v Chivell[19] where Lander J stated:

> 'In my opinion, the jurisdiction given by the Act to the Coroner is quite extensive. It is not limited, as suggested, to a particular inquiry into the direct cause of death of the deceased. The Coroner has a jurisdiction and, indeed, an obligation to inquire into all facts which may have operated to cause the death of the deceased and as well to inquire into the wider circumstances surrounding the death of the deceased.'

He also went on to say with respect to '*cause*':

> 'In determining those events which may be said to give rise to the cause of death, the Coroner is not limited by concepts such as 'direct cause', 'direct or natural cause', 'proximate cause' or the 'real or effective cause'.'

and:

> 'The Coroner, therefore, has to carry out an inquiry into the fact surrounding the death of the deceased to determine what, as a matter of common sense, has been the cause of that person's death. The inquiry will not be limited to those facts which are immediately proximate in time to the deceased's death. Some of the events immediately proximate in time to the death of the deceased will be relevant to determine the cause of death of the deceased. But there will be other facts less proximate in time which will be seen to operate, in some fact situations, as a cause of death of the deceased.'

[17] the Act
[18] Supreme Court
[19] [1998] SASC 7002

I am mindful of this guiding statement from the Supreme Court in considering the evidence and issues raised in this Inquest.

5. Finding as to cause of death

5.1. In light of the post-mortem examination report I make a formal finding that the cause of death was 'hypoxia and reduced pulmonary perfusion complicating congenital heart disease'.

6. Witnesses called at Inquest

6.1. I wish now to set out the witnesses called at the Inquest. They can be conveniently dealt with on the basis of those involved in treating Logan at the WCH and two experts who have reviewed the treatment of Logan. The overall evidence to be considered included statements, WCH notes, RCHM notes and expert reports.[20]

6.2. WCH witnesses

6.3. I heard evidence from the following medical and nursing staff witnesses, namely:

i. Dr Alex Gordon, a general paediatrician;[21]

ii. Dr Wint Thant, registered medical officer, after-hours evening registrar;[22]

iii. Dr Terrance Robertson, a paediatric cardiologist;[23]

iv. Dr Gavin Wheaton, consultant paediatric cardiologist;[24]

v. Ms Janet Evans;[25]

vi. Ms Debbie Giannoni.[26]

6.4. Expert witnesses

6.5. I heard evidence from two expert witnesses engaged by the Court:

i. Dr Robert Justo, paediatric cardiologist;

ii. Dr Andrew Berry, paediatric cardiologist.

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[20] Exhibits C1 to C13
[21] Transcript, pages 29-100
[22] Transcript, pages 131-157
[23] Transcript, pages 451-472
[24] Transcript, pages 222-368
[25] Transcript, pages 160-216
[26] Transcript, pages 102-127

6.6. Department of Health and Wellbeing evidence

6.7. Samantha Farrugia, Director of Clinical Governance, Commissioning and Performance, Department for Health and Wellbeing.[27] Ms Farrugia provided an affidavit to the Court concerning the review of the format of observation charts at WCH, especially when modifications are made to oxygen saturation levels such as occurred for Logan.

6.8. The issues at Inquest must be viewed in the background of the delicate condition of Logan after his operation at RCHM. The operation was a success and his treatment at RCHM was not an issue. Further, after his discharge from WCH on 3 June 2016 it seemed Logan's delicate state of health improved significantly, in particular through weight gain, feeding well and the presence of a shunt murmur noted on 10 June 2016 by WCH. This indicated that good blood flow was occurring.

6.9. Within a week of these positive signs, unfortunately Logan deteriorated until his death on 15 June 2016.

6.10. Therefore, his readmission to WCH on 14 June 2016 until his death was the subject of extensive evidence and exploration of issues such as his oxygen saturation levels and whether the treatment he received was reasonable in the circumstances by WCH.

7. Hindsight bias and outcome bias

7.1. I warn myself concerning two vital considerations in the assessment of the evidence and any potential criticisms of witnesses in this Inquest, namely hindsight bias and outcome bias.

7.2. A description of '*hindsight bias*' is given in the Australasian Coroners Manual, namely as:

> 'The tendency after the event to assume that events are more predictable or foreseeable than they really were. What is clear in hindsight is rarely as clear before the fact. If it were, there would be far fewer mistakes made. It is an obvious point, but one that nonetheless bears repeating, particularly when Coroners are considering assigning blame or making adverse comments that might damage a person's reputation…

[27] Exhibit C13, no oral evidence

> Hindsight, of course, is a very useful tool for learning lessons from an unfortunate event. It is not useful for understanding how the involved people comprehended the situation as it developed. The distinction needs to be understood and rigorously applied.' [28]

7.3. As stated, I am very mindful of this warning when considering evidence of treatment and care by WCH staff and in particular Dr Wheaton, the most senior clinical medical person involved.

7.4. I also am very mindful of outcome bias. That is, the terrible outcome of Logan's death should not lead me to more harshly assess the evidence of Logan's treatment at the WCH. In other words, the outcome of Logan's death must not overwhelm or unduly influence my task of assessing the evidence about the issues in this Inquest.

8. Issues concerning treatment

8.1. It was suggested that the following issues were crucial concerning Logan's treatment at WCH, namely whether:

1. An echocardiogram should have been performed on him in outpatients on 10 June 2016.

2. On 14 June 2016 when he was readmitted, he should have been taken to the PICU immediately, rather than to the Rose Ward.

3. His oxygen saturation levels on 14 and 15 June 2016 were too low to be an acceptable standard and the level of care was not of sufficient intensity in the circumstances.

4. The investigations into his health were done in a timely fashion in the background of his oxygen saturation levels being low to very low. This issue concentrates on whether an echocardiogram should have been performed, whether oxygen and heparin were given to him in a timely manner.[29]

5. Logan's death was preventable in the circumstances.[30]

8.2. In order to properly examine all of those issues, it is important to return to consider Logan's health and treatment at WCH after returning to Adelaide from RCHM. These

[28] The Australasian Coroners Manual, page 10
[29] Heparin is a medication used to prevent blood clots
[30] Transcript, page 536, closing submissions of counsel assisting

periods were on 1 and 3 June 2016, his outpatient appointment on 10 June 2016 and his parents presenting Logan again to the WCH on 14 June 2016.

9. 1 June 2016 – Logan's return to WCH from RCHM

9.1. The WCH handwritten medical notes[31] indicate Logan was doing well from his admission on 1 June 2016 to the Rose Ward at 5:45pm having arrived from Melbourne via the Royal Flying Doctor Service.[32]

9.2. Examination of those notes[33] detail Logan was feeding well, both by his mother's breast milk and by bottle, with emphasis given that he needed to '*catch up growth*'.[34] An echocardiogram was performed on 2 June 2016.[35] By the morning of 3 June 2016 he was noted to be '*quite stable overnight, feeding well, WT*[36] *↑25gms … examined well*'.[37] This note was made by Dr Gordon who was satisfied that he could be prepared for discharge that afternoon.

9.3. At 2pm a WCH dietician met with Logan's parents to discuss his nutritional needs on discharge, in particular to '*catch up growth*' and '*increase calories with his feeds*'.

9.4. On 3 June 2016 at 5pm, Logan was discharged into the care of his parents and was scheduled to return for an assessment on 10 June 2016.

10. 3 June to 10 June 2016

10.1. In the week Logan was at home he achieved the following positive signs, namely:

i. Gained 340 grams in a week.[38]

ii. Breastfeeding well.

iii. Also having 1-3 bottles a day.

iv. Antibiotics twice a day with no fevers.

v. Personal development of smiling.

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[31] Exhibit C3
[32] RFDS; see also Exhibit C3, nursing note at page 212
[33] Exhibit C3, pages 212-220
[34] Exhibit C3, page 215
[35] Exhibit C3, page 39
[36] Weight
[37] Exhibit C3, page 218
[38] Transcript, page 35 - Dr Gordon; Exhibit C3, pages 29-30

11. 10 June 2016 WCH assessment

11.1. Dr Gordon noted Logan's outpatient assessment on 10 June 2016 as showing '*an encouraging state of health*'.[39] In addition, the noted presence of a continuous shunt murmur indicated that blood was flowing to his lungs which had been a problem prior to his surgery at RCHM.[40]

11.2. His oxygen saturation levels were at 72-75% without the assistance of an oxygen supplement. That is, those saturation readings were based on his own breathing.[41]

11.3. His medications were reviewed and set for his return home.

11.4. Overall, as stated by Dr Gordon, when Logan left hospital that day no immediate urgent medical treatment was prescribed. The ECG report of 2 June 2016 was analysed but Dr Gordon was '*unable to assess QT, otherwise* ⓝ'.[42] Dr Gordon's final notes were that Logan was '*progressing well*'.[43] Dr Robertson was the consultant paediatric cardiologist overseeing this consultation.

11.5. Dr Wheaton explained the term 'QT' as follows:

> 'So, the QT interval is the time between the QRS complex on the ECG, which is conduction of the impulse through the ventricles, causing the heart to contract, and the end of the T wave; and the T wave represents recharging or repolarisation of the heart prior to the next heartbeat. And so, the QT interval is a measure of the time it takes for the heart to repolarise or recharge … and if it is prolonged, we take very careful note of that, because prolongation of the QT interval can be a serious condition and can lead to serious arrhythmias.' [44]

11.6. Paediatric cardiologist Dr Justo who reviewed Logan's treatment and care considered the issue of the inability to assess the QT intervals from the ECG on 2 June 2016 and believed:

> 'That's a very rare genetic abnormality where children are predisposed to arrythmias. Not particularly associated with pulmonary atresia. So I think that's not relevant to this case, no.' [45]

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[39] Transcript, pages 36-37; Exhibit C3, pages 29-30
[40] Transcript, page 37
[41] Known as 'room air' or 'RA'
[42] Exhibit C3, page 30
[43] Exhibit C3, page 30
[44] Transcript, page 314
[45] Transcript, page 394

12. Dr Terrance Robertson

12.1. Dr Robertson is a paediatric cardiologist who graduated with a Bachelor of Medicine and Surgery from Queensland in 1998. In 2003 he became a Fellow of the Royal Australasian College of Physicians and in particular the paediatric cardiology discipline.

12.2. He has been a paediatric cardiologist at the WCH since 2004 after working in other hospitals around Australia.[46]

12.3. Dr Robertson was part of WCH medical staff that took care of Logan on his return from RCHM. On 2 June 2016 he ordered an echocardiogram be performed on Logan which did not cause concern or affect his ultimate discharge on 3 June 2016.

12.4. He ensured that Logan had an outpatient appointment on 10 June 2016.

12.5. He confirmed that on 10 June 2016 Logan saw Dr Ritchie from the infectious diseases team concerning a wound infection that occurred at RCHM after the operation. He outlined that Dr Gordon, as registrar, saw Logan subsequently. He had no specific memory of seeing Logan himself on 10 June 2016.[47] He agreed that Logan's oxygen saturation levels were '*low*'[48], stating that if that trend continued '*we would be looking at further - maybe potentially redoing this shunt yet again in the not-too-distant future*'.[49]

12.6. He believed this is the reason he organised Logan's next appointment to be on 17 June 2016.

12.7. He did emphasise that Logan's weight gain, smiling and shunt murmur was '*reassuring*'.[50] However, the oxygen saturation levels were '*a little bit worrying*', therefore he believed Logan should be seen in 7 days by WCH rather than 14 to 21 days. 17 June 2016 was also timely for Logan's wound and its treatment to be examined and reviewed.

[46] See also curriculum vitae of Dr Robertson, Exhibit C11
[47] Transcript, pages 445-446
[48] Transcript, page 458
[49] Transcript, page 458
[50] Transcript, pages 457-459

12.8. He confirmed that Logan's echocardiogram on 2 June 2016 was routine based on his return from RCHM and gave similar evidence to Dr Wheaton concerning the QT interval not being a '*major concern*'.[51]

12.9. In answering queries about why an echocardiogram was not performed on 10 June 2016, he explained an echocardiogram would not have:

> '… changed my thought process of what to do. It wouldn't have changed any plans. I would not have been intervening in any different way, based on an echocardiogram, so I would not have thought an echocardiogram would've been needed at that stage.' [52]

12.10. He did not believe than an echocardiogram on 10 June 2016 would be enough of a time period to see whether Logan's LPA had been subject to a re-stenosis.[53] That investigation could only be achieved by a CT angiogram.[54]

12.11. He emphasised that echocardiograms are not the '*win all*' and can be very difficult to do measurements of the size of the branched pulmonary arteries.

12.12. Dr Robertson again commented that a drop in saturations would need '*investigation with a CT angiogram, but at this stage*[55] *I'm not rushing to do that*' because of the risk from radiation and anaesthesia.[56]

12.13. Dr Robertson did not see Logan after 10 June 2016.

13. <u>10 June to 14 June 2016</u>

13.1. At this time Logan was home with his parents. He was due to be reviewed by WCH on 17 June 2016.[57] The plan was to cease a diuretic that Logan was taking called furosemide and in two weeks remove an attached Broviac line[58] that he needed. However, Logan became ill on 13 June 2016.

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[51] Transcript, pages 460-461
[52] Transcript, page 462
[53] Stiffening and narrowing
[54] Transcript, pages 468-469
[55] 10 June 2016
[56] Transcript, page 470
[57] Exhibit C3, page 30
[58] This allows intravenous ingestion of medication

13.2. I will now refer to a description of Logan's health on 13 June 2016 given by his mother, Celeste Fergusson:[59]

> 'Approximately 11pm Logan would not settle and seemed to be getting really upset, this was out of character. He was crying and sweating from his head, we finally calmed him and put him down to rest but I remember Ben and I were contemplating calling cardiology then. When Logan awoke for his 2am feed he seemed okay.' [60]

13.3. On Tuesday, 14 June 2016 Ms Fergusson recorded the following matters concerning that day prior to Logan's readmission to WCH, namely:

i. The RDNS nurse came to Logan's house and administered his antibiotics.

ii. Logan was taken to a CAFHS[61] appointment for a hearing test which produced a normal result.

iii. Upon return home from CAFHS preparations were made for Logan's six-week vaccinations when he '*got really upset again (like the previous night with sweating)*'.[62]

iv. Ms Fergusson called the cardiology unit at WCH and spoke with Dr Gordon who advised that if she and Logan's father were worried, to take him into the WCH ED which they did.

13.4. Dr Gordon made a summary of the events involving Logan from the moment his mother called the WCH on 14 June 2016 and was quickly advised in a return telephone call to bring Logan to the ED. The circumstances of this note showed that it was made after Logan died, specifically for a future Inquest to allow Dr Gordon to:

> '… help my own memory in the future should I be asked questions about what happened that day that I couldn't remember. So, I wrote these notes myself and kept them for that purpose.' [63]

13.5. As this note sets out accurately, Logan's oxygen saturation levels[64] reflected a developing issue that became more acute during the night and following early morning.

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[59] At this time she was known as Ms Work
[60] Exhibit C10
[61] Child and Family Health Services
[62] Exhibit C10
[63] Transcript, page 42
[64] Called sats in Exhibit C5

13.6. As she noted when seeing Logan again in the ED:

> 'He was afebrile, but sats were lower than usual, sitting in the 60's in air. He had sats in the 80's when he returned from Melbourne, and in the 70's in my clinic a few days prior. Other than that, he looked quite well with no other focal signs on examination. He had an obvious shunt murmur. Due to his low saturations, I asked Dr Gavin Wheaton to come to ED and review him with me. He did. He agreed that his low sats were unusual. We decided to admit him, and chase up his bloods taken by ED. I did this, and rang the after-hours medical registrar, asking them to check on him later and call Dr Wheaton with an update.' [65]

13.7. As is evident, this note covers a considerable time period on 14 June 2016 concerning the treatment Logan received at WCH.

14. Logan's admission to the Rose Ward at WCH - 14 June 2016

14.1. Whether Logan should have been taken to PICU immediately upon admission has become an important topic in the Inquest. Before exploring that in more detail it is important to outline the treatment he did receive in Rose Ward and the decision to modify his acceptable oxygen saturation levels to 65%.

14.2. Nursing care

14.3. I will first consider the evidence of Logan's nursing care at WCH once the oxygen saturation levels had been modified.

14.4. The Inquest heard from two nurses, namely Ms Debbie Giannoni and Ms Julie Evans. Ms Giannoni graduated in 2014 with a Bachelor of Nursing Degree from the University of South Australia. Post graduation she was employed at the WCH, predominantly in the Neonatal Intensive Care Unit,[66] before obtaining a position in the RCHM working in the ED in August 2016.

14.5. By reference to the WCH notes[67] she confirmed that Logan was admitted to the Rose Ward at 7pm and was '*unsettled on admission*'. She noted the oxygen saturation level modifications for a minimum of 65%, but further described Logan was '*sitting 55-70%, increased HR and RR, BP okay*'.[68]

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[65] Exhibit C5
[66] NICU
[67] Exhibit C3, page 98
[68] HR is heart rate; RR is respiratory rate and BP is blood pressure

14.6. She recorded that Ms Fergusson breastfed Logan, but he had a large vomit and only tolerated a small feed after the vomit. She further noted that Logan was to be reviewed by the doctors concerning his low oxygen saturation levels. His parents were concerned about them. This note was made at 8:55pm. By reference to Logan's observation charts she was able to confirm that the two oxygen saturation levels she observed at 7pm and 8pm, were 70% and 56% respectively. Both readings were on room air. Her evidence was that an alarm that would be raised if Logan's levels dropped below the 65% mark. They were '*very loud, you'd be able to hear them, you can hear them outside of a room with the door shut*'.[69]

14.7. The manual observations at 7pm and 8pm by Ms Giannoni were recorded on an observation chart that originated in the ED.[70] A secondary observation chart was made by Rose Ward. Her observations were transferred from the ED chart to the Rose Ward chart.[71]

14.8. Ms Giannoni finished her shift at 9:30pm that evening and was not further involved in Logan's care. However, she gave some important evidence on general matters, namely:

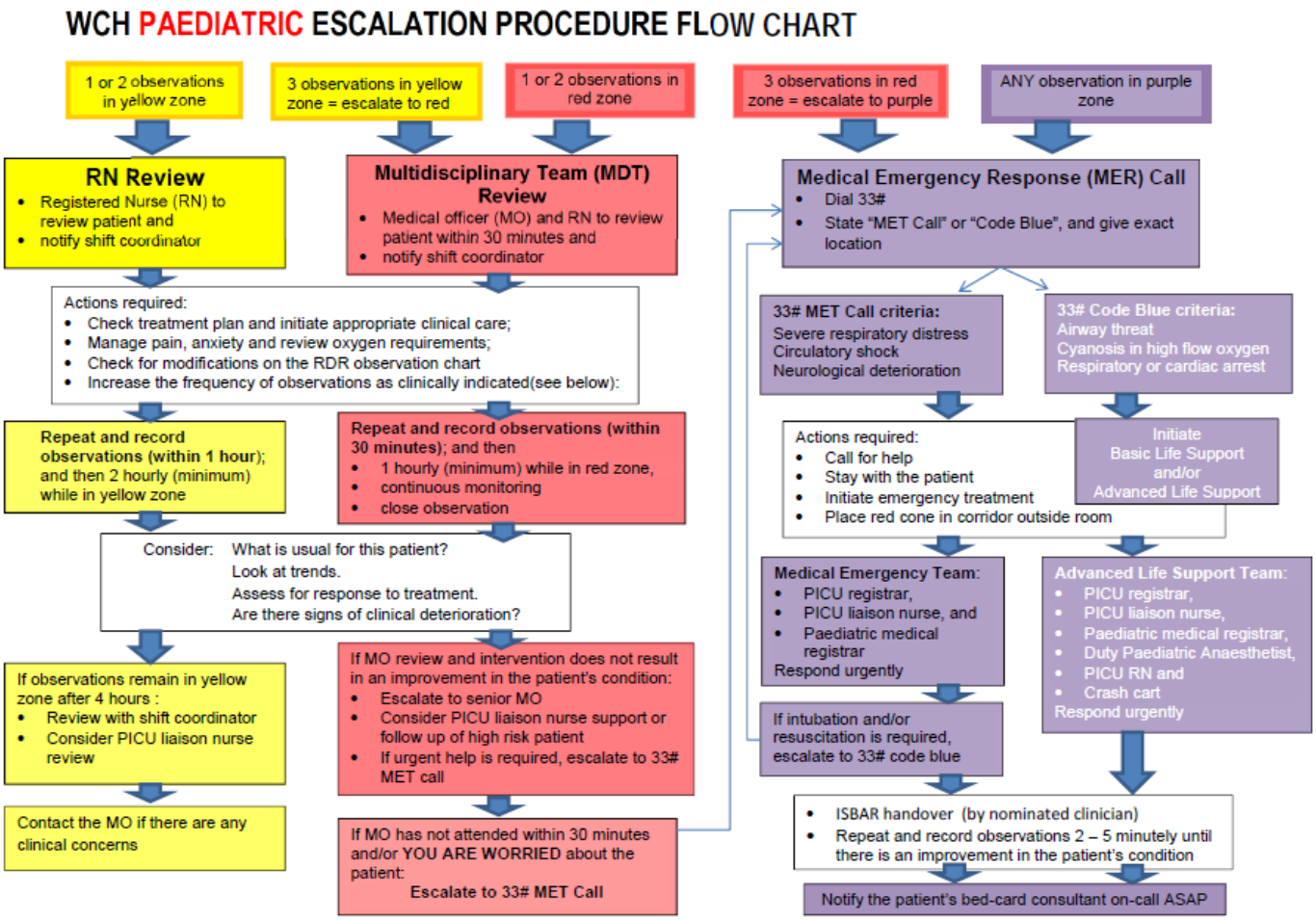
1. That generally one nurse was '*responsible for one patient alone*'.[72]

2. By reference to the Rose Ward chart, she explained the escalation principles of care are colour-coded white, yellow and red. White has no need of escalation. Three observations in the yellow zone would escalate into the red zone requiring a review by the multi-disciplinary team.[73] Three observations in the red zone would require escalation to a medical emergency response[74] call. This is classified in the chart as the purple zone.[75]

14.9. However, if a modification was put into action, such as for Logan, then there is no guiding principle in the policy document of WCH, called Escalation of Care for the Deteriorating Clinical Patient.[76]

[69] Transcript, page 108
[70] Exhibit C3, Page 85
[71] Exhibit C3, page 141
[72] Transcript, page 119
[73] MDT
[74] MER
[75] Transcript, pages 119-120
[76] Exhibit C6

14.10. I set out below the chart to explain the actions required. This was issued on 2 June 2016, just 12 days before Logan was admitted on 14 June 2016.[77]



14.11. Between 7pm and 8pm Logan's respiratory rates were in the '*red zone*' which should lead to an MDT review.[78]

14.12. <u>9:15pm - Ms Julie Evans</u>

14.13. At 9:15pm Ms Giannoni was shortly to end her shift at 9:30pm. As is common around that time, a handover of nursing care occurs between nursing shifts. The incoming nurse would be given information concerning the patients to be under his/her care. Although Ms Evans, a registered nurse since 1986, did not have a specific memory of the handover of care for Logan, she gave evidence that this was '*standard practice*'.[79]

[77] Exhibit C6, page 10
[78] Transcript, page 125
[79] Transcript, pages 164-165

Her evidence was that her shift began at 9pm[80] and that she was from time to time given the role as shift coordinator. She described this role as being responsible for:

> '… clinical support and coordinating the nurses on the ward with their patients, the senior person for them to come to, to ask questions and support, and it's a management role in the sense of patients coming and going and bed movement and bed management and you liaise with the nurse manager.' [81]

14.14. 9:15pm medical review – Dr Thant

14.15. I shall now divert to concentrate on this important event. The medical review coincided with the results of Logan's blood tests taken earlier that day. Dr Thant recorded those results in the WCH notes.[82] Dr Thant described this review in evidence.

14.16. Dr Thant obtained her qualifications in Myanmar in 2005 and subsequently worked in Jamaica for five years, primarily in paediatrics. In 2015 she had her qualifications recognised in Australia by passing a qualification exam. She then worked in Tasmania in 2014 and 2015 before becoming a registered medical officer at the WCH in April 2016.[83]

14.17. Her primary role at WCH was as the after hours / evening registrar. At the time of the Inquest she was a qualified general practitioner working in Townsville. She does not have an independent memory of caring for Logan,[84] but accepted that she had performed a review on him at 9:15pm on 14 June 2016.[85]

14.18. As noted, she recorded the results of Logan's full blood test taken earlier that day, finding that his white cell count and platelet levels were normal.[86] His liver function, liver enzymes and kidney functions were all shown to be in the normal range. His heart rate was stable. She noted that in the preceding hour his oxygen saturation levels fluctuated between 56-65% and his heart rate was stable.[87]

14.19. The blood test indicated that, other than a slightly low haemoglobin level, there was no infection in the blood. He was not dehydrated, was alert and looked settled. A shunt

[80] Transcript, page 164
[81] Transcript, page 164
[82] Exhibit C3, pages 98-99
[83] Transcript, page 131
[84] Transcript, page 132
[85] Transcript, pages 132-133
[86] Transcript, page 134
[87] Transcript, page 134

murmur was present and his chest sounded clear.[88] She documented a plan having discussed it with the cardiology consultant.[89] A review was to be done by the night cover registrar within the next two hours from 9:15pm. Her usual shift ended at 10pm.

14.20. It was planned that Logan would have a feed either by breast feeding or bottle and his intake should be monitored. Finally, she noted that his abdomen was not distended and was soft. This tended to exclude heart failure and sepsis.[90]

14.21. She accepted that she did not note the extension of the modifications of Logan's oxygen saturation levels in the relevant chart, found first recorded in the ED,[91] accepting that it '*should have been written by me for another (sic) review doctors*'.[92]

14.22. The observation charts showed that at 8pm, 9pm, 10:30pm and 11:30pm Logan's oxygen saturation levels dropped below the modified minimum. The most significant drop was at 10:30pm when it was recorded as 45%.

14.23. <u>9:30pm-5am - Ms Julie Evans</u>

14.24. Ms Evans was responsible for Logan's nursing care in this time period and throughout that night. The evidence suggests, despite the lack of documentation about the continuance of the modified levels past 9pm, Ms Evans worked on the basis that they were still relevant.

14.25. The observation charts clearly did not cater for prescribed responses for acceptable modified levels of oxygen saturation, and in particular the responses applicable should those levels not be met by a patient.

14.26. At 10:30pm, when Logan's oxygen saturation level was at 45%, Ms Evans categorised this as a persistent desaturation rather than a transient one. This caused her to respond by seeking a review from the cardiologist and medical registrar as well as a PICU liaison. She recorded this formally in the observation chart[93] together with the required response of '*fall in BP, comfort feeds, observe, aim for saturations greater than 65% and chest Xray*'.[94]

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[88] Transcript, page 135
[89] Whom she does not remember
[90] Transcript, page 141
[91] Exhibit C3, page 87
[92] Transcript, page 146
[93] Exhibit C3, page 140
[94] Exhibit C3, page 140; Transcript, page 168

14.27. The chest Xray occurred in the ward with a portable Xray machine.[95]

14.28. From 10:30pm to 1am on 15 June 2016 Logan's blood pressure was taken four times on all limbs.

14.29. Ms Evans classified Logan's 11:30pm oxygen saturation reading as a '*transient desaturation*'.[96] At that time he was '*clinically improving*' with his heart rate and respiratory rate at an acceptable level and looking '*clinically well*'.

14.30. Ms Evans accepted that on occasions she was alerted by alarm to Logan's oxygen saturation levels dropping and responded immediately.[97] An assessment would be made as to whether it was a transient situation and by the time of getting to his room he was '*back up to the normal range*'.[98]

14.31. As stated earlier, 13 manual readings taken from 8pm to 9am on 15 June 2016 recorded levels below the modifications made for Logan. During the night Ms Evans conducted hourly safety checks[99] and, despite the fluctuations, noted '*he was settled, he was asleep, he was looking clinically well*'.[100]

14.32. From 3am Ms Evans had noted that he had '*demanded a feed*' which was given, however following this he was '*a little bit unsettled*'.

14.33. Ms Evans gave evidence that at 3:50am - 4am she was with him. She completed a set of observations which led her to believe he was '*still clinically well*' and any dip below the modified level was transient.

14.34. At 5am he had '*settled into a sound sleep*'[101] with his oxygen saturation levels at 73%. Ms Evans made a detailed progress note at 5am on 15 June 2016 noting that Ms Fergusson was '*rooming in and very anxious*'.[102] I shall deal with Ms Fergusson's perspective of that night in due course.

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[95] Transcript, page 169; Exhibit C3, page 100
[96] Transcript, page 169
[97] Transcript, page 171
[98] Transcript, page 171
[99] Transcript, page 176
[100] Transcript, page 176
[101] Transcript, page 177
[102] Exhibit C3, page 100

15. Dr Gavin Wheaton

15.1. Dr Wheaton obtained his degree in a Bachelor of Medicine and Surgery at the University of Adelaide in 1981. He immediately went into training and practising in paediatric medicine, commencing in 1982 at the WCH before going to the Northern Territory and working as a paediatrician from 1993 to 2003.

15.2. In 2003 Dr Wheaton became the consultant cardiologist at the Department of Cardiology at the WCH and Head of Cardiology from 2006 to 2017. In 2021 he became Executive Director of Medical Services at WCH.

15.3. I received Dr Wheaton's curriculum vitae[103] which indicated a number of important committees he was part of and academic publications where he was listed as a contributor. He became Executive Director of Medical Services in 2021, whilst also maintaining his clinician status at the WCH.

15.4. He described the role of a cardiology consultant at the WCH, explaining that the consultant takes '*responsibility for inpatients and so for all acute admissions*'.[104]

15.5. Services are also provided to a range of other hospitals including the Flinders Medical Centre[105] and hospitals in Port Augusta, Mount Gambier and even the Northern Territory.[106]

15.6. He outlined the services provided by the WCH, including ECGs, ultrasound, cardiac magnetic resonance imaging[107] and a catheterisation service.[108] The WCH provided a '*limited range of surgical procedures but as most people will know … in the main, refer to Melbourne for surgical services for open heart surgery for our patients*'.

15.7. He told the Inquest that the WCH worked '*very closely*' with the RCHM on a '*continuous daily basis*'.[109] There are regular meetings[110] by videoconference with RCHM to discuss current cases as well as newly referred patients, so a '*shared decision*'

[103] Exhibit C8 CV
[104] Transcript, page 224
[105] FMC
[106] Transcript, page 224
[107] MRI
[108] Transcript, page 224
[109] Transcript, page 225
[110] Either weekly or fortnightly

can be made about care and treatment.[111] He confirmed that this was the system in 2016.

15.8. He outlined the structure of the Department of Cardiology as follows, namely:

i. Four consultant cardiologists.

ii. One full time equivalent[112] registrar. The registrars will vary in training and seniority from a pre-exam trainee in paediatrics through to an advanced trainee in that area.[113]

iii. One 0.5 FTE registrar who is shared with the Rheumatology Department.[114]

15.9. Dr Wheaton further explained that:

> '… all care provided to every patient ultimately is supervised by a consultant, so a consultant has final responsibility for all decisions that are made, for all treatment, for all investigations. And our system is such that every patient in our service is allocated to a cardiologist.' [115]

15.10. Consistent with this evidence Dr Wheaton made it clear at the Inquest that he was ultimately responsible for the care and treatment for Logan. He had responsibility for all the '*significant decisions*'.[116]

15.11. Dr Wheaton described Logan's condition of pulmonary atresia to be '*very uncommon*', expected about once in every seven thousand births.[117] He defined pulmonary atresia as the failure of the pulmonary valve to develop properly, so that there is no connection, or patent connection, between the right side of the heart, the right ventricle and the lungs.

15.12. After Logan was born Dr Wheaton discussed his condition with Dr Brizard, Head of Surgery at RCHM. They came to the conclusion, based on Dr Brizard's preference, that the necessary operation to insert a shunt[118] would happen when Logan was around five days old, which was standard practice.[119]

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[111] Transcript, page 225
[112] FTE
[113] Transcript, page 228
[114] Transcript, page 227
[115] Transcript, page 229
[116] Transcript, pages 229-230
[117] Transcript, page 232
[118] A shunt is an artificial tube to allow blood flow supply from the right side of the heart to the left
[119] Transcript, page 239

15.13. Logan's surgery was considered a success. He was progressing well until he had to be brought in to the WCH ED on 14 June 2016.

15.14. Dr Wheaton's involvement from 14 June 2016

15.15. Dr Wheaton saw Logan in the ED that afternoon with Dr Gordon. The history given to them was of feeding troubles, loose stools, vomiting, sweats and diarrhoea. This was classified as a '*fairly non-specific presentation*'.[120] Other issues of note were:

1. Logan did not have a fever.
2. Logan's heart rate and respiratory rate had increased, a continuous shunt murmur was present with a clear chest.
3. Oxygen saturation was documented between 65%-70% with mild *'worker breathing*'.
4. A blood gas test indicated a borderline result concerning lactic acid.[121] He regarded this as an '*important measure*' and that '*you would probably prefer to see a lactate of less than one*'. Despite this, Dr Wheaton was not '*alarmed*' by that result.[122]

15.16. Dr Wheaton considered the shunt murmur result to be '*very important*' in a positive manner. He considered Logan's complications post-surgery to be '*very important background information*'[123] for the assessment of care on 14 June 2016, in particular setting the oxygen saturation levels. He described that such a decision is '*not a precise science*'.[124]

15.17. He admitted Logan to the WCH for observation and monitoring. He chose to admit Logan to the Rose Ward which served children from 0-12 months as a specialist babies ward, including many babies with cardiac issues. He considered that Rose Ward '*functions like our cardiac ward for babies with congenital heart disease*'.[125] There is no dedicated cardiology or cardiac ward at the WCH due to insufficient numbers.

[120] Transcript, page 243
[121] Recorded in WCH notes, Exhibit C3, page 97 as LAC 1.8
[122] Transcript, page 244
[123] Transcript, page 248
[124] Transcript, page 249
[125] Transcript, page 252

15.18. Dr Wheaton believed he would have considered PICU as well, saying:

> '… I think certainly the question will have been in my mind as to whether Logan should have gone to the intensive care unit later in the evening. I'm not so sure about at presentation.
>
> …
>
> but clearly I felt, on clinical grounds, that admission to Rose Ward and monitoring there was reasonable. ' [126]

15.19. 11:45pm - 14 June 2016

15.20. At 11:45pm Dr Wheaton conducted a '*face to face*' assessment and review of Logan with registrar Dr Briest.[127] Dr Wheaton was aware of Logan's '*desaturations through the evening*'.[128] The presence of Dr Wheaton meant that the planned registrar review had been elevated to a consultant view at that time.[129] A shunt murmur was observed and graded as $^{3}/_{6}$ which meant it was '*easily heard*'.[130] A chest Xray was performed which on inspection did not reveal '*any significant features of pneumonia or infection in the lungs*'.[131] However, what was noted at the time was that there was:

> '… a very subtle difference in perfusion of the lungs with some reduction of blood flow to the left lung but Dr Linke as a very experienced radiologist did not report that.'

He viewed this as:

> '… a potential reason for lower saturations .. If you have reduced flow to one lung but normal aeration of that lung you have what we call a mismatch between perfusion, so blood flow and ventilation and that may lead to abnormal saturations.' [132]

15.21. Despite that observation he believed this situation of perfusion would be unlikely to require '*urgent intervention*'. He also noted it was unlikely to be an explanation of a cause for acute dips in oxygen saturation levels.

15.22. Dr Wheaton ordered IV fluids to prevent dehydration, understanding that the risk of thrombosis in the shunt would be increased.[133]

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[126] Transcript, page 252
[127] Transcript, page 257; see also as documented in Exhibit C3, page 99
[128] Transcript, page 257
[129] Transcript, page 257
[130] Transcript, page 258
[131] Transcript, pages 258-259
[132] Transcript, page 259
[133] Transcript, page 263

15.23. Dr Wheaton suggested normal feeding on demand overnight with continuing observation and monitoring.

15.24. He had no actual memory of '*what my thinking was*',[134] but reconstructed that, given the desaturation in the prior hours before 11:45pm, he would have considered moving Logan to PICU. However, on balance and being influenced by the presence of a '*good shunt murmur*', together with the findings of the Xray, he made the clinical decision to keep Logan in Rose Ward.[135]

15.25. On the crucial topic of whether an echocardiogram should have been ordered and performed at that review, Dr Wheaton candidly admitted that he could not remember:

> '… exactly what the thought process was, but given that I was confident about the shunt, clearly I've made a decision that the scan did not need to happen at that moment.' [136]

This factor was weighted against the previous levels of desaturation which would be a significant factor towards ordering an echocardiogram.

15.26. I accept that these clinical decisions by Dr Wheaton were in the setting of having to make a decision in the background of competing and contrasting factors concerning Logan's state of health at the time.

15.27. He was satisfied that '*significant infection*' was unlikely,[137] but could not exclude a viral infection based on the results of the blood test.

15.28. He accepted that the cause of the desaturations to 66-68% were unknown. He clarified that oxygen saturation as defined is not a '*direct measurement of the actual oxygen concentration or tension in the blood*' but is a measure of oxygen that is bound to haemoglobin. In his words:

> '… in the blood there is saturated haemoglobin or haemoglobin that has oxygen attached to it and desaturated haemoglobin. So the percentage refers to the percentage of blood that is saturated.' [138]

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[134] Transcript, page 264
[135] Transcript, page 264
[136] Transcript, page 265
[137] Transcript, pages 265-266
[138] Transcript, page 267; see also page 268

15.29. A further factor to consider with Logan, as compared to a child that is healthy with normal oxygen levels, is that the healthy child suffering:

> '… a 10 point drop in oxygen saturation … is more significant than having a 10 point drop if you're further down the curve. It means that there has been a larger change in the actual oxygen level in your blood.' [139]

I understood this evidence to mean that the drop in oxygen levels by Logan both from previous levels up to this review needed to be properly understood and assessed in the context of him not being healthy at the time these levels were taken.

15.30. He commented on the feeding problems Logan had including vomiting, noting that '*most babies who are very sick and possibly acidotic will not usually be feeding normally*'.[140] Importantly, at his next review at 8:45am on 15 June 2016, he considered the oxygen saturation levels after his 11:45pm review, in particular from 1am, when Logan was under the nursing care of Ms Evans.

15.31. Dr Wheaton based his evidence of the discussions at that 8:45am review on the notes made by Dr Gordon on Logan's file.[141] He noted several matters that were important to him, namely Logan was:

i. No longer irritable.

ii. Having 50mls of milk every three hours without a resultant vomit or diarrhoea.

iii. Low desaturations into the '*40s*'.

iv. Respiratory rate was '*just within the acceptable range*'.[142]

v. Heart rate '*comfortably within the acceptable range*'.[143]

vi. Continuous shunt murmur.

15.32. He reconstructed that he would have looked at the observation charts from overnight and noted that both Logan's respiratory and heart rate had '*settled back into the normal range through the night and for quite a prolonged period*'[144] which would not be consistent with a '*very sick baby*'.

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[139] Transcript, page 268
[140] Transcript, page 268
[141] Exhibit C3, pages 100-101
[142] Transcript, page 272
[143] Transcript, page 272
[144] Transcript, page 270

15.33. These factors needed to be considered together with the previous chest Xray and blood tests from 14 June 2016. Dr Wheaton found it appropriate to order an echocardiogram be performed on Logan which was carried out that morning. The results of that echocardiogram were documented in Logan's notes at 11am.[145] Dr Wheaton believed that the echocardiogram was performed at about 9:45am.[146] He described the results of the echocardiogram showed '*two important features*', namely that the shunt placed in by RCHM was visible and showed there was blood flow through it with no evidence of obstruction.

15.34. However, the flow into the right pulmonary artery[147] was greater as compared to the LPA. An echocardiogram cannot quantify the difference of blood flow between the RPA and LPA, but the difference was readily apparent. This concerned him and also provided a plausible explanation for the oxygen desaturations Logan was suffering.

15.35. He contacted Dr Brizard at RCHM and talked about Logan's situation, and in particular the latest echocardiogram findings. It was decided Logan should be taken to PICU and placed on heparin in preparation for further surgery at RCHM at the '*end of the week*'.[148]

15.36. Dr Wheaton ordered that oxygen treatment be commenced but that it '*did not make a difference*'.[149] This was '*not unexpected*' to him.

15.37. <u>Reasons for modification of oxygen saturation to 65% at 5pm on 14 June 2016</u>

15.38. Dr Wheaton does not have a specific memory of the reasons that influenced the setting of that level at that time. He reconstructed that he would have been '*confident*' of reviewing his previous saturation levels of 70-79% and 72-75% when he assessed Logan as '*doing well*'.[150] He would have been influenced by the outpatient's review reading on 10 June 2016. He commented that a baby with a shunt like Logan having '*saturations in the 70s within a few weeks of operation*'[151] would be likely to need a further operation sooner than desired.

15.39. He accepted that WCH were aware of declining saturations since his return from RCHM. Further he confirmed that the Xray results that he reviewed and interpreted

[145] Exhibit C3, page 101
[146] Transcript, pages 273-274
[147] RPA
[148] Transcript, page 275
[149] Transcript, page 276
[150] Transcript, page 297
[151] Transcript, page 299

were not a signal to the thrombus in Logan's right lung, rather that there was a reduced blood flow through the narrowed LPA.[152] If perfusion of the lung had been identified at that time it possibly would have led to the commencement of heparin use by Logan at that stage. Similarly, if an echocardiogram had been performed at that time, heparin may have been administered then and Logan potentially moved to PICU.[153]

15.40. Logan's deterioration at 11:20am on 15 June 2016

15.41. Dr Wheaton began evidence on this topic by stating it was still '*very difficult six years on to understand exactly what happened ... that morning*'. He acknowledged that '*we had not at that time diagnosed the presence of thrombus in the right lung*'.[154] He believed Logan's primary problem was hypoxia and perhaps a shunt blockage had formed since the echocardiogram. He noted this was not confirmed in Logan's post-mortem examination, but still commented it was '*not inconceivable that that's what happened*' as the blockage may have moved during attempted resuscitation.

15.42. He believed that the thrombus found in the right lung was a factor in Logan's arrest. As he put it, it was:

> '… very likely implicated … but probably not the sole cause, and it may be that it was that combination of things. So a baby with major cyanotic congenital heart disease who probably had some re-narrowing of the left pulmonary artery with some reduction of flow to that lung, and who also then developed thrombus in an artery in the right lung which further compounded the problems with oxygen saturation.' [155]

15.43. He acknowledged that Dr Lipsett's post-mortem report identified that the thrombus in the right lung had been present for 24-48 hours. If heparin had been commenced earlier following his admission, it was the '*one treatment that could have made a difference. I don't think it's possible to say with confidence that it would have, but it may have*'.[156]

15.44. He told the Inquest that an echocardiogram would not identify the thrombus. A test for protein in the blood[157] or a CT angiogram were the two ways that '*might alert us to the*

[152] Transcript, pages 352-353
[153] Transcript, pages 353-354
[154] Transcript, page 277
[155] Transcript, pages 278-279
[156] Transcript, page 279
[157] Called D-dimer

presence of thrombus in that lung'.[158] These were not ordered because a thrombus '*was not suspected*'.[159]

15.45. The only symptom of a thrombus that Logan displayed was irritability, but that of itself is a very non-specific symptom, '*particularly in a young baby*'.[160]

15.46. Dr Wheaton made comments on other significant topics, namely:

i. The observation charts do not provide clear criteria regarding advice and responses to breaches of modified standards within those charts. He referenced the RCHM observation chart system[161] which provides '*more explicit advice in relation to response when there is a modification*'.[162] In other words, I understood his evidence to mean that it is a superior document to the observation charts in use in WCH in 2016.

ii. He reviewed the format of the escalation of care chart[163] that was introduced by WCH two weeks before Logan's death. He agreed that there was no direction about how a patient's care should be escalated if observations by clinical staff show that there have been breaches of the modified standards by the patient.[164]

iii. He assessed Logan's operation at RCHM and subsequent treatment to be '*stormy*' due to the very significant chest infection[165] and the subsequent operation to debride the surgical wound. Further, the infection he sustained at RCHM was resistant to '*a number of antibiotics*' including penicillin.[166]

16. <u>Expert evidence – Dr Andrew Berry and Dr Robert Justo</u>

16.1. The Inquest heard expert evidence that reviewed the care and treatment of Logan, in particular his readmission on 14 June 2016 at the WCH. Both experts were engaged by the State Coroner. Dr Berry and Dr Justo were careful and proper to acknowledge reluctance to overly criticise or disagree with decisions made by WCH medical staff. This was on the basis that they did not have the important factor of seeing and being

[158] Transcript, page 280
[159] Transcript, page 280
[160] Transcript, page 281
[161] Exhibit C4, page 352
[162] Transcript, page 290
[163] Exhibit C6
[164] Transcript, page 292
[165] Called Mediastinitis
[166] Transcript, page 294

able to clinically assess Logan at the WCH, as opposed to viewing the WCH records and, necessarily, having calm preparation and reflection to form their respective opinions regarding Logan's care and treatment. I will also have in mind the important factors of hindsight and outcome bias in assessing their evidence.

16.2. Having said that, both men gave evidence very thoughtfully and with respect to the roles and experience of the WCH clinicians, in particular Dr Wheaton.

16.3. Dr Robert Justo

16.4. Dr Justo is a paediatric cardiologist practising at the Queensland Children's Hospital. I received Dr Justo's curriculum vitae[167] that outlined a distinguished career specialising in paediatric cardiology. He graduated from the University of Queensland in 1982 with a Bachelor of Medicine and Surgery and obtained his Fellowship in Paediatrics in 1991 before practising in the Hospital for Sick Children in Toronto, Canada for three years before returning to Queensland in 1995 to the Prince Charles Hospital in Brisbane as a paediatric cardiologist from 1995 to 2005 and then as Director of Paediatric Cardiac Services from 2006 to 2008. He has held visiting rights in a number of hospitals within Queensland up to the time of giving evidence. In 2008 he was Director of Paediatric Cardiology at Mater Children's Hospital in Brisbane until 2014 where he became Director of Paediatric Cardiology at Queensland Children's Hospital in Brisbane.

16.5. He has contributed to a number of publications (78) and public extracts (64). In addition to his clinical achievements, he is also Associate Professor of Paediatrics and Child Health at the University of Queensland having obtained that position since 2012.

16.6. Materials received for expert review

16.7. Dr Justo received all relevant material concerning Logan's treatment and care at RCHM and WCH. In addition, he received an email from Logan's parents to the State Coroner dated 4 December 2016.[168] Prior to giving evidence Dr Justo read the evidence of Dr Wheaton together with '*80% of the transcript*' of the Inquest up to the time of giving

[167] Exhibit C9
[168] Exhibit C10

evidence.[169] He knows Dr Wheaton and has had a professional association with him '*probably throughout my career*'.[170]

16.8. Prior to giving evidence he provided a written report based on the materials he received prior to the Inquest commencing.[171]

16.9. Dr Justo's report

16.10. Dr Justo acknowledged that Logan had '*complex congenital heart disease*'. He found the surgery by RCHM to be '*appropriate*' but there were questions over the:

> '… quality of the pulmonary arteries as there was narrowing of the LPA from birth, a large shunt was required to achieve 02 sats of 75% immediately postoperatively, and ECMO was required to manage desaturation with surgery for mediastinitis. These early issues would raise some concern regarding long-term progress, accepting with this course you can still get good pulmonary artery growth.'

16.11. He noted the '*trend of decreasing saturation in Adelaide*' on Logan's return up to and including 10 June 2016. According to him these saturations were '*acceptable … but in the lower range*'. He postulated on 10 June 2016, given Logan's history, restenosis of the LPA may have explained the decreased saturations. This could have been identified if an echocardiogram had been performed at that time.

16.12. 14 June 2016

16.13. He noted Logan's condition at presentation to WCH ED and believed that the differential diagnosis[172] for the lower oxygen saturations could have been viral illness and/or dehydration, or reduced lung perfusion through the shunt or to the LPA. Empirical therapies that might have been considered would be IV fluids, subnasal oxygen and intravenous heparin with appropriate escalation strategies to place Logan in PICU if his condition deteriorated. He accepted that the 11:45pm review was done at a time when '*his saturations were more favourable*'.[173]

16.14. He commented about the narrowing of the LPA identified by echocardiogram as an explicable cause of Logan's reduced saturations, particularly if it existed with the presence of a clot which could not be identified by echocardiogram.

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[169] Transcript, page 378
[170] Transcript, page 379
[171] Exhibit C9b, Report of Dr Robert Justo dated 22 July 2021
[172] A range of possible medical causes
[173] Exhibit C9b

16.15. Dr Justo commented that heparin reduces the risk of clot formation and progression. He considered it an appropriate empirical therapy for a child with a shunt and low oxygen saturation levels.

16.16. He noted that Logan's acceptable oxygen saturation levels of 78% at WCH on 1 June to 3 June 2016 was '*highly appropriate*'[174] as was a revision to 74-75% when he was asleep.

16.17. Dr Justo noted that the outpatient review on 10 June 2016 was conducted earlier than most of the reviews he had experienced in Queensland, namely of about two to three weeks. He accepted that WCH '*probably did have an amount of concern about him so they did bring him back for an earlier review than other children might have*'.[175] As Logan's last echocardiogram was on 2 June 2016 he would have ordered an echocardiogram on 10 June 2016 '*with these lower saturations*'.[176] He supported this view by reference to the '*difficult surgery*' in Melbourne[177] where '*the risk of long-term issues is greater*'.

16.18. However, he went on to say that the failure to order an echocardiogram on that day was a:

> '… very reasonable decision. I think it's clinical judgment, it's looking at the child, it's synthesising the whole picture and obviously I'm just reading notes and … Narrowing of that PA in that timeline would be unusual, can occur but would be unusual. Similarly blockage of a shunt can occur in that timeline but with a good shunt murmur that is very reassuring.' [178]

16.19. <u>Logan's admission to WCH on 14 June 2016</u>

16.20. Dr Justo examined the WCH notes of Logan's admission into ED.[179] He believed that the following matters were of note/concern, namely:

i. Logan's respiratory rate of 60-80 is elevated.

ii. His oxygen saturation of 65-70% in room air was low.

16.21. He was asked to comment on the fact that Logan, shortly after presenting to ED, had a 55% saturation reading. He considered that to be '*concerningly low*', which meant to

[174] Transcript, page 390
[175] Transcript, page 394
[176] Transcript, page 396
[177] Transcript, page 396
[178] Transcript, pages 397-398
[179] Exhibit C3, page 96

him that Logan's oxygen levels are '*lower than you would like them to be*'.[180] He agreed with Dr Wheaton that the administrating of oxygen to Logan by CPAP could cause improvement in oxygen saturation levels, but only a very small difference if there was an absence of chest infection.[181] At that time, namely the afternoon of 14 June 2016, he believed a differential diagnosis would involve intercurrent viral illness on top of Logan's congenital heart disease, dehydration or reduced lung perfusion through the shunt or LPA.

16.22. On that basis he agreed with the order of Dr Wheaton[182] that blood tests be conducted.[183] The other question he would have contemplated was performing an echocardiogram on Logan '*at that point*'[184] as it would have given '*a baseline of what's happening with the shunt and the LPA*'. This would have exposed a narrowing of the LPA, if present, any issues with the shunt if they existed and react to whatever findings the echocardiogram showed. Therefore he concluded it would be '*a reasonable investigation to do at that point*'.[185]

16.23. He was unable to say whether Logan's LPA had narrowed by 10 June 2016. He cautioned that even if an echocardiogram had been done and the LPA had narrowed, that '*it's not as easy as it sounds to pick on echo*'.[186] He supported this general observation by highlighting the following matters, namely:

i. Logan's chest infection can impair the imaging.

ii. The size of the arteries are extremely small, namely from 2mm to 4mm.

iii. echocardiogram images are affected by the level of cooperation of a child.

16.24. In light of the above matters his opinion was that you cannot definitively expect that a narrowing of a pulmonary artery would be identified by this method.

16.25. He further commented that a CT angiogram, which is a '*routine investigation in Queensland*' is regarded as a '*second level investigation*' to either confirm or rule out issues raised by an earlier investigation such as an echocardiogram.

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[180] Transcript, pages 399-400
[181] Transcript, page 401
[182] Exhibit C3, pages 5 and 97
[183] Transcript, page 402
[184] Transcript, page 403
[185] Transcript, page 404
[186] Transcript, page 405

16.26. In summary, on this topic about whether an echocardiogram should have been ordered and performed on 14 June 2016, he concluded that there was '*a much stronger case*'[187] for doing that. By consequence, a failure to order one on that day was '*less supportable*' than that similar decision on 10 June 2016. He tempered his opinion by showing respect for the fact that paediatric cardiologists have clinical judgments to make, but he favoured that an echocardiogram on 14 June 2016 when an escalation of care was occurring was his preference.[188]

16.27. Empirical therapies

16.28. Empirical therapies are treatments given based on experience, without precise knowledge of the cause or nature of the medical issue.

16.29. It is clear at the time of Logan's presentation on 14 June 2016 his precise medical conditions causing his presentation at that time were not known. These therapies would work within the scope of differential diagnoses and the presenting condition.

16.30. Dr Justo mentioned intravenous fluid to deal with hydration issues that may have occurred due to diarrhoea and to provide '*a little bit of protection by increasing or protecting your intravascular volume and giving protection for your shunt*'.[189] Secondly, the introduction of oxygen '*might ... improve saturations by 1 or 2%*'.[190]

16.31. Thirdly, the introduction of heparin reduces the risk of any '*progressive issues with either the shunt or the left pulmonary artery while you're working out what's going on*'.

16.32. Heparin's effect would be to thin the blood and in doing so prevent a clot occurring. He noted that heparin will not dissolve an existing clot.[191] Therefore he believed that for a narrow or narrowing pulmonary artery, heparin will prevent further narrowing through clotting.[192]

16.33. Having considered the empirical therapies above, Dr Justo noted that he most likely would have started intravenous fluids on admission, but stated it was very hard to reconstruct what he would have done without seeing Logan '*clinically in front*' of him.[193]

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[187] Transcript, page 407
[188] Transcript, page 408
[189] Transcript, pages 409-410
[190] Transcript, page 410
[191] Transcript, page 410
[192] Transcript, page 410
[193] Transcript, page 415

16.34. Logan's right lung thrombus

16.35. Dr Justo made the following comments about the thrombus on Dr Lipsett's post-mortem examination, namely:

i. Logan's oxygen saturation levels could have been affected by the presence of the thrombus.

ii. The thrombus could have compounded oxygenation of the blood difficulties created by the re-narrowing of the LPA.

iii. Logan's presentation on 14 and 15 June 2016 would not have caused him to consider a thrombus had formed in the lung, noting that he was '*not sure I've ever encountered that complication*'[194] and therefore he has no criticism for it not being identified in that time.

16.36. He commented that a thrombus would have been identified by a CT angiogram, but that would not have been ordered by him unless Logan '*remained persistently blue and there was an echocardiogram that showed narrowing of the left pulmonary artery*'.[195]

16.37. Dr Justo was asked to comment about a number of clinical decisions made concerning Logan which I will set out below as follows:

i. He believed the decision to admit Logan to Rose Ward from ED was reasonable.[196]

ii. The results of the blood test he considered '*benign*' noting that significant infection was excluded by the results, which in turn placed an increased likelihood in a cardiac cause for his condition.[197]

iii. The lack of use of empirical therapies for Logan was '*not wrong*' but '*you'd be thinking very carefully about it*'.[198]

iv. It '*would have been good*' to have performed an echocardiogram sometime during the evening of 14 June 2016.[199]

[194] Transcript, page 412
[195] Transcript, page 413
[196] Transcript, page 420
[197] Transcript, pages 422-423
[198] Transcript, page 425
[199] Transcript, page 425

v. The use of IV fluids was a reasonable decision.[200]

vi. The Xray image of Logan's left lung displayed perfusion, but it was '*pretty subtle*',[201] to the extent that he was not sure it was '*something I would have commented on and I don't think it would have influenced my management greatly*', concluding that it was not a '*significant issue*'.[202]

vii. He commented that the oxygen saturation level of 65% was at the '*lower end of the range*' and therefore there was less margin of error for tolerance of Logan not meeting that minimum standard.[203]

viii. He did acknowledge it was a very difficult decision to make concerning children with cyanotic congenital heart disease.[204]

ix. He acknowledged that once Logan's narrowed LPA was identified on the echocardiogram on 15 June 2016, oxygen, fluids and heparin was the appropriate preparation for surgery at RCHM. He further acknowledged that in Queensland it is easier to prepare for such a situation, as cardiac surgery occurs within the State rather than transporting to RCHM.

x. Finally, he acknowledged his role as looking at Logan's situation in hindsight together with his acceptance that it is a '*very complex decision process*' for decisions about escalation of care as described by his overnight oxygen saturation levels. However, he believed Logan had '*borderline*' levels throughout that night. He further acknowledged that babies with Logan's conditions are '*very sick*' and the difficulties of deciding to intervene, or not intervene, with further levels of care is a '*very subjective thing*'.[205]

16.38. <u>Dr Andrew Berry AM</u>

16.39. The final witness in this Inquest was Dr Andrew Berry AM, a neonatal specialist which he describes as a speciality that '*involves intensive care of a newborn and … is a branch or a subbranch of paediatrics generally and focuses on the sick newborn who needs intensive care technically up in the first four weeks of life*'.[206]

[200] Transcript, page 425
[201] Transcript, page 427
[202] Transcript, page 427
[203] Transcript, pages 436-437
[204] Transcript, page 435
[205] Transcript, page 447
[206] Transcript, pages 479-480

16.40. His curriculum vitae[207] outlines a distinguished career since graduating from the University of Adelaide in 1975 with a Bachelor of Medicine and Surgery. His entire career has been devoted to paediatrics and SIDS and included 10 years as the Head of Neonatology at the Royal Alexandra Hospital for Children.

16.41. He is also the State Director for the Newborn Emergency Transport Service (NSW), having held that role since 1995.[208]

16.42. NETS' role is to transport children in emergency from newborn up to the age of 16 years. It also provides guidance by teleconferencing to treatment of children in distress in remote areas.[209] Dr Berry provided a report concerning Logan's medical treatment and care during his life based on supplied materials of the WCH casenotes,[210] RCHM casenotes,[211] Logan's parents' email to the coroner dated 4 December 2016[212] and medical imaging of Logan.

16.43. He was provided with the evidence of Dr Wheaton at the Inquest, together with other evidence presented in the first two days.

16.44. Dr Berry's report came to the following conclusions, namely that the '*early care*' around Logan's birth, including his referral to RCHM, was '*appropriate and complete*'. He noted that Logan's first operation was conducted in an appropriate timeframe and was done with an expectation that he would have further surgery at around one year of age. With regard to Logan having to be operated on at RCHM, he made the following observation, namely:

> 'South Australia, Western Australia and the Northern Territory do not have open heart cardiac surgical services as the population size does not justify or sustain super speciality services like these. They rely on a close relationship with Melbourne to jointly manage conditions like these. Such centralisation of care is known to improve success and the quality of outcomes based on the larger caseload possible in a state with a much larger population. As in any care delivered across several hospitals, there is an inherent of a degree of disruption to continuity of care; whether in terms of the transfer of medical information or the assessment of clinical deterioration by the 'full team'. That is, the cardiac surgical team as well as the clinical team in Adelaide.' [213]

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[207] Exhibit C12
[208] NETS
[209] Transcript, pages 481-483
[210] Exhibit C3
[211] Exhibit C4
[212] Exhibit C10
[213] Exhibit C12a

I note this view was supported by Dr Wheaton in his evidence and by an open letter of which Dr Wheaton was one of a number of signatories on behalf of the Women's and Children's Health Network of South Australia dated 25 October 2020.[214] This letter expressed the same arguments and positions as quoted above in Dr Berry's report.

16.45. WCH care

16.46. Dr Berry considered the entirety of Logan's care and treatment from WCH after his return from RCHM on 1 June 2016.

16.47. In short, he considered Logan's care and treatment from 1 June to 3 June 2016 to be '*appropriate*'.[215]

16.48. He considered the outpatient's review on 10 June 2016, by which time Logan had increased his weight by 340 grams, to be correctly judged as a '*beneficial weight gain*' that allowed WCH to stop diuretics. On the outpatients review he noted the descending levels of oxygen saturation and concluded that '*may well have been a beginning of a trend*'.[216]

16.49. 14-15 June 2016

16.50. Dr Berry's report[217] set out the timeline of the presentation of Logan to WCH ED beginning at 4:09pm.

16.51. In evidence he commented on the history and the presentation of vomiting and diarrhoea with sweatiness and elevated heart rate, together with low saturations.

16.52. The lactate level of 1.8 from Logan's blood test taken at 4:25pm was of significance to him. He told the Inquest that the lactate level '*should be less than one*' and was a:

> '… non-specific indication of a reduction in infusion of the tissues with oxygen, often associated with infection, significant infection, but can actually be caused by inadequacy of the heart to pump blood to the tissues … It's the sort of change that occurs normally in healthy people when they exercise significantly and their exercise exceeds the body's capacity to bring oxygen to the blood, the body tissues.' [218]

[214] Exhibit C8b
[215] Transcript, page 487
[216] Transcript, page 488
[217] Exhibit C12a
[218] Transcript, page 489

16.53. He concluded that given Logan's condition the lactate level was '*an important early sign to there being something serious and something worth checking subsequently*'.[219]

16.54. The confirmation of a normal white cell count meant that infection was '*much less likely to be the cause of the problem*'.[220]

16.55. Dr Berry believed that the lactate level result of 1.8 should have been followed by a subsequent blood lactate test well before '*his deterioration*'[221] noting that:

> 'I would have thought that a test during the evening would most likely, given that saturation dips were occurring in the late evening, have been a worthwhile test to do … as I said earlier, there wasn't really a hypothesis that I can see about why he was unwell and why he was getting worse.' [222]

16.56. He also briefly commented that the decision to admit Logan to Rose Ward rather than PICU had some difficulties from his perspective because the reason for Logan's condition was not known. He emphasised that PICUs are:

> '… not just about places of providing intensive care. They're also places for patients whose trajectory is unclear and uncertain particularly in young infants who are far more unpredictable in their trajectory of illness as was the case for Logan.' [223]

16.57. In general, Dr Berry had concerns about Logan's condition throughout the night and early morning in Rose Ward and that his care was not escalated. However, he acknowledged the difficulties of clinical care. He further made comment about his preference for Logan's admission to PICU over the Rose Ward by saying:

> '… it's really difficult to get a big picture view of the trajectory of a patient like this when you're moving to a ward which doesn't have the same level of attention that an intensive care has.' [224]

16.58. <u>Delay of oxygen therapy to Logan</u>

16.59. Dr Berry was critical of WCH not supplying oxygen therapy to Logan when there was a '*clear deterioration in oxygen saturations*' coupled with an increased heart rate and respiratory rate.[225]

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[219] Transcript, page 490
[220] Transcript, page 491
[221] Transcript, page 493
[222] Transcript, pages 493-494
[223] See also extensive answer at Transcript, pages 494-496
[224] Transcript, page 497
[225] Exhibit C12a; Transcript, page 499

16.60. He further criticised the response by Rose Ward staff to Logan's deterioration overnight where he had '*worsening desaturations*'.[226] He also believed a medical review that occurred was not formally activated consistent with the policy document.[227] This raised the inadequacy of the observation charts to deal with modified situations of care as was occurring for Logan.[228]

16.61. 11:45pm - 14 June 2016 review

16.62. Dr Berry was concerned that at the time of this review the cause of Logan's presentation was unknown and that no further medical review occurred by any medical staff until 8:45am on 15 June 2016.

16.63. Given the oxygen saturation levels overnight were as low as in the 40s, even accepting they were transient, he would have expected an escalation of care during the night.[229] Finally, Dr Berry noted that the attempts to save Logan from 11:20am when his condition dramatically declined, were '*appropriate, comprehensive and complete*'.[230] Unfortunately it occurred too late and may not have been effective if the main problem was occlusion of the pulmonary arteries with clot.

16.64. Conclusion

16.65. As can be seen from the summary of his report and evidence, Dr Berry was more critical of WCH's care and treatment during this night than Dr Justo.

17. Celeste and Ben Fergusson

17.1. Celeste and Ben Fergusson were Logan's parents. They were present for the Inquest through an audio-visual connection to the Court. They took an active interest in the evidence and by my invitation emailed the Court with issues for the Inquest to consider. Evidence of their correspondence and statements were tendered.[231]

17.2. As Ms Fergusson put it in her statement:

> 'Ben and I understand that significant events to us may not be seen as equally prominent in the memory of others, which is completely understandable, given as though we were

[226] Transcript, page 500
[227] Transcript, page 500
[228] See Exhibit C6; Transcript, pages 500-501
[229] Transcript, page 507
[230] Transcript, page
[231] Exhibit C10, email to the Coroner dated 4 December 2016; Exhibit C10a, statement of Ms Fergusson

> Logan's parents and from losing him we have replayed the last 24hrs of our interpretation of his life repeatedly. '

In this statement Ms Fergusson had two significant times when she believed '*medical intervention was definitely needed*', namely at 10:30pm on 14 June and 6:55am on 15 June 2016. In her assessment of Dr Wheaton's evidence, she stated:

> 'Dr Wheaton's witness statement was truthful and satisfactory to us. We do feel that with the information relayed to him, and from what we have heard of the documentation and evidence over the night prior to Logan's passing, Dr. Gavin Wheaton provided the best possible care he was able to.'

17.3. Their charitable statements continued concerning their assessment of Dr Gordon's and Dr Thant's evidence.

17.4. They were upset by the evidence of what Logan's oxygen saturation levels were on the night of 14 June 2016 and expert opinions that escalation of care was needed. This coincided with Ms Fergusson's feelings on the night in Rose Ward when she was described as '*very anxious*' by Ms Evans.[232] She made the comparison of the intense escalation of activity once in the ED when Logan presented on 14 June 2016. Ms Fergusson stated that she knew during '*the entire night he was not doing well*'[233] by reference to the observation charts, and felt an escalation of care was warranted many times throughout that long night for her.

17.5. She outlined a feeling that their '*concerns were not being listened to*'. She raised the interesting point that:

> 'Perinatal and congenital conditions are the leading cause of death in infants in Australia under a year old, surpassing that of sudden infant death syndrome and congenital heart disease is the most common congenital disorder in newborns. With such a prevalence surely specialised ward with cardiology trained staff may assist too (sic) and bridge a gap between paediatric general care and paediatric intensive care, something that may benefit others in Logan's case or with similar congenital heart conditions.'

17.6. I am grateful for the input of her and her husband into this Inquest so many years after Logan's death. It is one of the most obvious signs of their love and devotion for their little boy who struggled so much and so bravely with his very serious health condition.

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[232] Exhibit C3, page 100
[233] Exhibit C10a

18. Findings relevant to the cause and circumstances of Logan's death

18.1. The following findings will be set out in accordance with the issues identified earlier in section 8 of this document.

18.2. I make these findings on the basis that I was comfortably satisfied each of them were established on the evidence, including the opinion evidence of paediatric cardiologist Dr Robert Justo and paediatrician neonatologist, neonatal and paediatric transport specialist, Dr Andrew Berry.

18.3. Some of these findings may be categorised as adverse to some of the witnesses who had a caring role for Logan at the WCH, in particular on 14 and 15 June 2016. In coming to this decision I was continually aware of the potential adverse consequences for the witness concerned, including the potential for damage to that witness' reputation. I am very mindful of the need to be satisfied that such a finding can only be made based on evidence presented at the Inquest being accepted as reliable and compelling. I have also applied the principles expressed by the High Court of Australia in **Briginshaw v Briginshaw**[234] and the recent Supreme Court decision of **SJ Berry Pty Ltd v McEntee**.[235]

18.4. The circumstances of Logan's death

18.5. Logan was born on 29 April 2016 with a known congenital heart condition. This was identified during his mother's pregnancy. Logan was born via caesarean delivery at the WCH.

18.6. It was known that Logan suffered pulmonary atresia and that he would need to have surgery at RCHM as soon as safely possible after his birth.

18.7. By consultation with Dr Brizard of RCHM and Dr Wheaton of WCH it was decided that Logan would be airlifted from Adelaide to Melbourne for surgery. Logan was transferred via MedSTAR in a Royal Flying Doctor Service[236] aeromedical aircraft to RCHM on 3 May 2016.

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[234] (1938) 60 CLR 336 and in particular Dixon J at 362
[235] [2022] SASCA 133
[236] RFDS

18.8. On 5 May 2016 Logan underwent surgery and had a 3.5mm Gore-Tex tube inserted to connect the aorta with the pulmonary artery, LPA augmentation, and ductus ligation.

18.9. Following surgery Logan spent two days in the PICU at RCHM before being moved to the cardiology ward on 7 May 2016.

18.10. On 12 May 2016 Logan was readmitted to PICU due to an infection of his chest cavity which is a known possible side effect and complication from his surgery. Logan required further surgery to debride an infected wound in his sternum to remove dead, damaged or infected tissue. During this surgery he suffered a fall in his oxygen saturation levels requiring him to be connected to an extracorporeal membrane oxygenation[237] machine which was needed for the first two days of a six-day admission to PICU at RCHM.

18.11. Post-surgery management of this infection was prescribed to be six weeks of intravenous antibiotics through a Broviac line which was inserted at RCHM on 25 May 2016.

18.12. Logan had a further issue to be treated post-surgery, namely a right femoral artery thrombosis which was dealt with by a 10-day course of anticoagulation medication.

18.13. On 1 June 2016 Logan was discharged from RCHM and transferred back to Adelaide via MedSTAR and RFDS. The discharge summary from RCHM recorded Logan's oxygen saturation levels as stable between 80% to 92%. His femoral artery thrombosis issue had resolved.

18.14. On the evening of 1 June 2016 Logan was readmitted to the WCH Rose Ward. His acceptable oxygen saturation level was set at a minimum of 78%. On 3 June 2016 Logan was discharged from WCH with a change of care plan in that intravenous antibiotics, followed by oral antibiotics, was extended from four to six weeks.

18.15. During his stay at WCH on this three-day admission his oxygen saturation levels were greater or equal to 75%. An outpatient cardiology appointment was booked for him on 10 June 2016.

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[237] ECMO

18.16. In the period between 3 June and his presentation to WCH as planned on 10 June 2016, Logan had progressed well with his health. On 10 June 2016 WCH noted his weight gain, the presence of a shunt murmur to indicate good blood flow and developmental progression to smiling. It was assessed by WCH that based on this appointment Logan was '*progressing well*'.[238] An echocardiogram was not performed. This decision by Dr Robertson was reasonable in the circumstances. I note Dr Robertson has no independent memory of this consultation in outpatients with Logan.

18.17. It was intended that Logan be reviewed by WCH in one week, namely 17 June 2016. This further review was set earlier than the conventional period of two to three weeks due to Logan's lower oxygen saturation levels, in particular the downward trend of those levels since returning from RCHM.

18.18. From 10 June to 14 June 2016 Logan was cared for at home by his parents. Unfortunately, Logan became ill on 13 June 2016 at about 11pm. He mounted a brief recovery on 14 June 2016. His mother contacted WCH and spoke with Dr Gordon who advised Logan be taken to WCH ED. I accept the clinical accuracy of Dr Gordon's evidence concerning Logan's presentation to ED, in particular that his oxygen saturation levels were '*lower than usual, sitting in the 60s*'.[239] I accept that she requested Dr Wheaton to attend on Logan in ED at that time which he did. Logan was admitted and a blood sample was taken from him for testing.

18.19. Logan was admitted to the Rose Ward at 7pm as directed primarily by the decision of Dr Wheaton. His oxygen saturation levels had been modified to a minimum of 65%. By 8:55pm Logan had been breast fed but followed it with a large vomit. A smaller feed occurred. At 7pm his oxygen saturation level was 70% and at 8pm it was 56%.

18.20. The modified oxygen saturation levels were recorded in the observation charts of the Rose Ward. At around 9:30pm there was a change of nursing shift from Ms Giannoni who recorded a '*nursing note*' at 8:55pm in the progress notes. She noted that Logan was to be reviewed by '*doctors due to maintaining of low sats/parents concerned about sats*'.[240] At 9:15pm a medical review was conducted by Dr Thant. Dr Thant observed that Logan was '*alert*' and '*looked settled*'.[241] Further, she noted it was the aim to keep

[238] Exhibit C3, page 30, note of Dr Gordon
[239] Exhibit C5, notes of Dr Gordon
[240] Exhibit C3, page 98
[241] Exhibit C3, page 99

saturation levels above 65%. Readings at 8pm and 9pm showed that Logan's levels were at 56% and 58% respectively. As said, 13 of 18 manual readings were below 65%.[242]

18.21. Logan's oxygen saturation level reading at 11:30pm was 60% which was an improvement from his 10:30pm reading of 45%. At 11:45pm Dr Wheaton ordered that Logan be supplied with intravenous fluid throughout the night at 15ml per hour with on-demand feeding. Dr Wheaton was aware in general of low saturation ranges between 40% and 60% prior to this meeting and that Logan had had a large vomit after feeding.

18.22. Logan was not subject of any further medical review until 8:45am on 15 June 2016.

18.23. I find that given Logan's history of low oxygen saturation levels in June 2016 the decision to Xray his chest and commence intravenous fluids was appropriate.

18.24. The result and examination of the Xray tended to exclude infection as a source of Logan's condition.

18.25. Logan's oxygen saturation levels between the 11:45pm review and the review at 8:45am should have been reported to Dr Wheaton who was likely to have escalated Logan's level of care.[243]

18.26. At 11:45pm it would have been preferable that Logan had an echocardiogram, especially as none had been performed on him since 2 June 2016 when he was clearly in a healthier state than at 14 and 15 June 2016.

18.27. I find that it would have been preferable if Logan had been admitted to PICU rather than the Rose Ward on admission on 14 June 2016. In making this finding I emphasise that the clinical decision of Dr Wheaton to ultimately choose admission to Rose Ward was a reasonable decision. In making this finding I have taken into account that this clinical decision was not easy. Rose Ward had extensive experience with babies affected by cardiac issues. Similarly, it would have been preferable if empirical therapies of heparin infusion and oxygen supplementation for Logan had been administered. I find that the clinical decision not to resort to these empirical therapies

[242] Refer paragraphs 2.12 and 14.31 of this Finding
[243] Transcript, page 357

was reasonable, although not preferable. I find that the thrombus found in Logan on his post-mortem examination was not easily identifiable from the Xray of 14 June 2016 at 11:45pm.

18.28. It would have been preferable had Logan been subject to a scheduled medical review between the 11:45pm review on 14 June 2016 and the following one at 8:45am on 15 June 2016.

18.29. At about 11am on 15 June 2016, upon an echocardiogram confirming that Logan's LPA had narrowed, urgent arrangements were made to prepare him for further surgery at RCHM, including transfer from Rose Ward to PICU. I find it was likely that an echocardiogram would have likely identified the narrowing of the LPA if it was performed earlier. The sudden deterioration of Logan was treated with appropriate urgency by WCH and the attempts to resuscitate him were correct and timely for that situation.

18.30. I find that if Logan had not deteriorated suddenly at 11am there was still a significant risk of not being able to stabilise him appropriately for the surgery at RCHM.

18.31. I find that the proposed further surgery at RCHM was a significant escalation of care that involved potential significant risk to Logan. This finding is based on the evidence of Drs Justo, Berry and Wheaton, which I accept.

18.32. I find that Dr Wheaton was a caring paediatric cardiologist who still ponders and reflects upon Logan's death. He made potential admissions against interest and never sought to put responsibilities for Logan's care on anyone but himself. I find that he has reflected carefully upon Logan's death and his clinical decisions which in hindsight he wished were more proactive.

18.33. I find that Dr Wheaton's decisions when properly understood and not assessed with hindsight or outcome bias, were reasonable for this brave but very sick little boy.

18.34. In particular, I find that it could not be expected that the thrombus in Logan's right lung could have been identified prior to his decline at 11am on 15 June 2016.

18.35. Even allowing for earlier identification of the narrowing of the LPA from an earlier echocardiogram, there is no evidence to support a contention that Logan's preparation

for further surgery in RCHM would have been successful.[244] However, conversely it is not possible to exclude that Logan's death was potentially preventable by an early identification of the narrowing of the LPA. I find that the fact that Ms Fergusson was '*very anxious*'[245] during the night concerning Logan's general state was justified, particularly during the periods when Logan was awake and his oxygen saturation levels were very low compared with being asleep. Her evidence supports in general the concept that Logan's care should have been elevated throughout that night.

18.36. WCH conceded at the Inquest[246] that:

> '… there were earlier opportunities where it would have been appropriate to alter the plan for managing Logan, in particular at the time of admission to Rose Ward and at the time of the review conducted … at 2345 on 14 June 2016. Changes to the plan may have included one or a combination of undertaking an echocardiogram, admission to the Paediatric Intensive Care Unit (PICU), heparin therapy, provision of IV fluids or oxygen therapy. The case for altering the plan was stronger at 2345 than at 1900.' [247]

18.37. I find that those submissions were proper in the circumstances by WCH.

18.38. Further, I find, consistent with the submissions of WCH, that Ms Evans should have notified a medical officer about Logan's oxygen saturation levels despite them being transient and Logan's general improvement from about 12am on 15 June 2016.

18.39. However, even assuming a medical review had occurred, there is no certainty Logan's care would have been intensified.

18.40. I find that the concerns of Logan's parents, in particular Celeste Fergusson who was present overnight in Rose Ward with Logan, were understandable and appropriate concerning, in particular, his oxygen saturation levels. Their concerns, combined with the oxygen saturation levels did warrant a further medical review.

18.41. I accept that the modifications of Logan's oxygen saturation levels rendered the interpretation of his observation charts and mandated escalation of care to become difficult.

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[244] Exhibit C9b Dr Justo; Exhibit C12 Dr Berry, Transcript, pages 279-280 Dr Wheaton
[245] Exhibit C3, page 100
[246] via written submissions
[247] 7pm was when Logan was admitted to Rose Ward

18.42. Thrombus in Logan's right lung

18.43. I find that this was a rare complication of Logan's medical condition. I accept the opinion of Dr Lipsett that it was only likely to have been there in a 24-to-48-hour period before his death.

18.44. I accept Dr Justo's opinion about the rarity of this situation,[248] supported by the fact that he had never clinically experienced such a complication before and would not have ordered a CT angiogram to detect a thrombus.

19. Was Logan's death preventable?

19.1. This is really the core issue of this Inquest. In the end the answer to this issue cannot be certain. I have carefully regarded Dr Justo's comments and opinions on this topic in the Inquest.[249] Certainly Logan was a very sick little boy. If more was done earlier in terms of elevation of care through empirical therapies, then he had a better chance of being adequately stabilised for a re-transfer to RCHM.

19.2. Dr Wheaton conceded that there was a '*good case*'[250] for these empirical therapy interventions. He continued to explain in a rhetorical question:

> 'What is of course unknown is whether any of those things would have influenced the outcome.' [251]

19.3. In light of this evidence and in particular the complication of thrombus in his right lung, I cannot say with certainty whether Logan's death was preventable. The highest I am willing to accommodate is consistent with Dr Justo's opinion that it was 'potentially preventable'.

20. Recommendations

20.1. Pursuant to section 25(2) of the Coroners Act 2003 I am empowered to make recommendations that in the opinion of the Court might prevent, or reduce the likelihood of, a recurrence of an event similar to the event that was the subject of the Inquest.

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[248] Transcript, pages 412-413
[249] In particular Transcript, pages 440-441
[250] Transcript, page 363
[251] Transcript, page 365

20.2. Counsel at the Inquest concentrated on the issue about the observation charts and their unsuitability for patients with modified saturation levels. I have already gone into great detail concerning this in this Finding. However, in light of affidavit evidence from Ms Farrugia,[252] I am satisfied this issue has been examined carefully by the Department for Health and Wellbeing and changes were scheduled for 1 August 2022. These changes have been implemented as foreshadowed. I am satisfied that proper attention has been brought to this issue with the outcome that it should not reoccur.

20.3. In light of this development, I have no recommendations to make.

Key Words: Hypoxia; Congenital Heart Disease

In witness whereof the said Coroner has hereunto set and subscribed his hand and Seal the 30th day of August, 2023.

Deputy State Coroner

Inquest Number 18/2021 (1099/2016)

[252] Exhibit C13