QUEENSLAND COURTS

OFFICE OF THE STATE CORONER

INVESTIGATION FINDINGS

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Non-Inquest Findings for Elsie Robertson

Contents

Introduction

Elsie Robertson was born prematurely on 8 October 2012 and died soon after birth.

Elsie was a preterm twin neonate born at 30 weeks gestation and survived for 9 hours 43 min. She was the surviving twin of a monochoroidal diamniotic twin pregnancy. This developed into Twin to Twin Transfusion Syndrome (TTTS), culminating in emergent fetoscopic laser ablation of anastomotic placental vessels at 23 weeks gestation, with the expected loss of the co-twin soon after. The pregnancy was monitored regularly and appropriately post procedure to monitor growth and to watch for potential complications.

At about 28 weeks gestation there developed a spontaneous rupture of membranes and partial leakage of amniotic fluid, which is a recognised complication of the fetoscopic laser procedure. This was promptly managed by the mother's admission to hospital to monitor for signs of infection, administer prophylactic antibiotics and steroids to assist with the early maturation of the baby's lungs in preparation for an imminent delivery. Magnesium sulphate was also given to reduce potential of neurological sequelae. During this time, the pregnancy was continued to be monitored with regular ultrasounds and intermittent CTG readings all of which were reported to be appropriate.

On 7 October 2012, labour commenced with mild contractions, which prompted admission to the birthing suite, where it was noted the mother had a mild temperature. Fetal heart monitoring was said to be normal until just after midnight on 8 October while the mother was being prepared for intravenous antibiotics. The fetal heart rate dropped to 80 – 100/min prompting a decision for an urgent Caesarean section. In theatre, the fetal heart rate dropped further, and on delivery, Elsie was cyanosed, with no sign of life and requiring resuscitation.

There was an initial delay to commencement of resuscitation caused by confusion as to Elsie's identity, however she responded quickly to resuscitation attempts. Nonetheless there was evidence of abnormal and unrecoverable neurologic activity in the neonatal intensive care. After discussion with her parents, artificial ventilation was ceased some hours later.

Review by Clinical Forensic Medicine Unit

Dr Gary Hall of the Clinical Forensic Medicine Unit (CFMU) was requested and provided a detailed review of the medical records.

Elsie was a second twin. The first twin died in utero around 17 August 2012 at 23 weeks gestation. The twin girls shared a placenta, but had separate amniotic sacs. There is an inherent risk that the twins may develop a twin to twin transfusion syndrome (TTTS), whereby one twin acts as a donor and the other a recipient of nutrition from the placenta. One twin becomes large at the expense of the other with a high risk of neurologic abnormalities after birth in both twins.

Dr Len Yared was the obstetrician. He informed the family GP on 14 June 2012 that he had discussed the matter of TTTS with the mother and that he would be monitoring for the potential of the syndrome from about 16 weeks onwards.

Around 17 August 2012, an ultrasound scan revealed there was a significant size discrepancy with the twins. After discussion with the parents it was decided to try and ablate the shared vessels to separate the twins' placental circulation. This was performed at the Mater Hospital on 17 August by Dr Scott Petersen, a specialist in Maternal Fetal medicine. Routine scanning the following day revealed that the smaller twin had died. The second twin Elsie was well and a subsequent MRI showed no demonstrable neurological deficits.

Throughout the pregnancy twin 1 was the identity given to the deceased twin and twin 2 the surviving twin.

The mother's pregnancy was monitored closely over the ensuring weeks. Ultrasound scans confirmed that twin 2 was progressing well with good growth and normal amniotic fluid volume. The mother was then admitted to hospital on 18 September 2012.

On the evening of 7 October 2012, the mother developed a mild temperature. She was admitted to the birthing suite for consideration of intravenous antibiotics. Whilst assessing the cervix, the fetal heart rate dropped from 150 to 80 – 100 bpm. A decision for an urgent Caesarean section was made and this was carried out under spinal anaesthetic procedure. Whilst preparations were made for the operation the fetal heart rate dropped to 40 bpm.

A Caesarean section was conducted and Elsie was born at 00:37 hours but was not in good condition.

Elsie was transferred to the resuscitation nurse with a statement that this was "twin 1". The resuscitation nurse was expecting twin 1 to be deceased. As Elsie was handed to her she noted that she was blue and had no palpable umbilical pulsation, appeared to be lifeless and had some malodour. This was confirmed by the paediatric registrar.

Soon after, the midwife/theatre nurse told the resuscitation team that the first delivered twin was twin 2 and needed resuscitation and was not twin 1.

The estimation in time lost in commencement of resuscitation by the resuscitation nurse and paediatric registrar was 30 seconds. However the time of commencement of resuscitation according to the hand written notes was 00:41 hours. This means that there could have been up to 4 minutes passed between birth and the commencement of oxygen delivery and resuscitation.

Resuscitation including intubation and ventilation and cardiac compressions and adrenaline took place. Elsie was transferred to the neonatal intensive care unit where a significant brain injury due to poor circulation or hypoxia was noted. After discussion with the family, a neonatologist having explained the severity

of the brain injury and poor prognosis, artificial life support was removed. Elsie died later that day.

Dr Hall noted that in a healthy newborn there is generally enough reserves from the fetal blood flow to maintain oxygenation for 10 minutes before it is critical that oxygen is breathed from the air to maintain healthy oxygen supply. However, in this case fetal distress has already occurred and premature babies are particularly vulnerable because of immature lungs, which are difficult to ventilate.

What has been clearly established in the resuscitation notes is that once resuscitation commenced, Elsie responded reasonably quickly. She had a heart rate of 77 within 2 minutes and 120 by 4 minutes and her oxygen saturations were above 80% by 5 minutes. Thus the resuscitation was successful.

However, there is some question regarding what occurred between the time of birth at 00:37 hours and when resuscitation was first recorded at 00:41 hours. This four-minute interval was recalled by staff involved as 30 seconds but recorded differently and therefore suggests a potential delay between 30 seconds and 4 minutes. There was clearly a miscommunication about which twin was being delivered.

Autopsy examination

An autopsy examination was conducted at the Mater Hospital by Dr Jane Armes on 10 October 2012. This was an in-house hospital autopsy requiring the consent of the parents. The death was subsequently reported to the Office of State Coroner on 12 October 2012. As a consequence arrangements were made for the autopsy report to be peered reviewed by Dr Nathan Milne, forensic pathologist attached to Forensic and Scientific Services. Dr Milne also reviewed histology slides taken.

The examination report found the body was normally formed. In commentary the pathologist noted that the lack of abnormal growth parameters, or evidence of long-standing ischaemic brain injury, indicate that the pregnancy of this twin developed normally after the death of the co-twin.

Placental examination and microbiology indicated acute chorioamnionitis, secondary to ascending infection with E. coli. An in-utero severe fetal response to the infection occurred, as evidenced by the acute stage two funisitis and a fetal inflammatory response within the choroidal placental vessels.

Within the neonate there was ample evidence of sepsis. The pathologist considered that the ascending infection is the likely cause of the preterm labour and fetal bradycardia. Neonatal sepsis was well-established by the time of death and is the most likely cause of neonatal death. E. coli is known to cause significant and severe neonatal infection.

There was no macroscopic or microscopic evidence of long-term or more acute ischaemic brain injury. There was mild left cardiac ventricular dilatation. It is

possible that this is secondary to prior cardiac stress in the recipient twin following the severe TTTS.

The cause of death was considered to be due to E. coli sepsis with the underlying cause being twin to twin transfusion syndrome treated with laser photocoagulation.

Statements of Clinical Medical and Midwifery Nursing Staff

Statements were requested by the coroner of all Clinical Medical and midwifery staff involved in the birth.

Registered Midwife Margaret Enright

She was very experienced and registered since 1969.

She was working in admissions for the neonatal intensive care unit at the time. She was asked by the team leader to go down and retrieve a twin from a patient having a Caesarean section. She was informed that twin one had died.

She proceeded to the resuscitation room and checked the equipment. They retrieved an open cot for the dead baby and put this beside the resuscitation cot. A midwife came through with the first born baby and placed this baby on the resuscitation trolley. She recalls the resuscitation team asking words to the effect “is this twin one which twin is this”. She does not recall the midwife answering and she then walked back into theatre. The neonatal team checked the baby and noted there was no heart rate. She can recall the baby was quite smelly and the colour was a dusky pink. The baby was moved into the open cot.

She believes they were waiting a brief time, approximately 15 seconds, before an operating theatre nurse came in with a kidney dish holding a placenta. The nurse said words to the effect "here's the fetus" and she lifted the placenta and the fetus was underneath.

The first born twin was quickly retrieved from the open cot and placed back on the resuscitaire. The resuscitation, and the timer, were commenced. She cannot now recall how long it was between delivery of the first born twin to the resuscitation room and the commencement of resuscitation but she made an entry in the chart that it may have been delayed by about 30 seconds.

Elsie did not need a lot of resuscitation and cardiac massage. Once she was intubated and given one dose of adrenaline the heart rate picked up. The baby was then placed on a ventilator and taken to the neonatal unit.

Statement of Dr Preeti Suresh

Dr Sureesh is a neonatal fellow. As the mother was a private patient the plan had been for a private paediatrician to attend the delivery, however they had not arrived in time so she was asked to attend the delivery. She arrived in the resuscitation room about 2 to 3 minutes prior to delivery. Other nursing staff were already setting up the baby's resuscitation. She assisted. She was aware

that one twin had died in utero and there had been an emergency Caesarean section due to fetal heart abnormalities.

A midwife then brought the first born twin into the room and placed the baby on the resuscitation trolley and said "this twin one". She observed the baby was completely cyanosed and had no signs of life. She palpated the umbilical chord for about 15 seconds and noted there was no pulsation. Nurse Van Dyck said to the midwife words to the effect "if this is twin one the cot is there because this resuscitaire is for the live twin". The midwife then moved the first born twin to the open cot and left the resuscitation room. The midwife would have been in the room for about 20 to 30 seconds on that occasion. The baby did not appear macerated but was cyanosed with no heart rate and had an unpleasant odour, common with babies who carry an infection from chorioamnionitis. She accepted that this was twin one and based on the history who had passed away earlier.

What felt to be a few seconds later, but was without the benefit of any timing device, another theatre nurse came in carrying a kidney dish in her hand and said words to the effect "the dead baby is here." This nurse moved the placenta to show the neonatal team the fetus underneath. The scrub nurse said words to the effect that the baby on the open cot is meant to be the live one.

The first born twin was quickly moved to the resuscitaire and resuscitation was commenced. The timer was commenced at this point. She estimates the time of bringing the first born twin into the resuscitation room, to commencement of the resuscitation starting, to be about 1 minute. Resuscitation was successful and a heart rate commenced after 30 seconds and oxygen saturations reach 90%. The baby's APGAR scores were 0 at 1 min, 3 at 5 min and 4 at 10 min.

She called Dr Elisabeth Hurrion, the private neonatal consultant and told her they were taking the baby to the Neonatal Intensive Care Unit (NICU).

Statement of Lynette Edwards

She has been a registered nurse since 1964 and a midwife since 1965. She commenced her shift at 22:45 hours on the evening of 7 October 2012. She was aware of the medical history. She had been informed that a recent ultrasound indicated the live twin was the baby that was presenting, meaning the baby likely to be born first.

Dr Yared confirmed with her following a vaginal examination that the live twin was still the presenting twin. Dr Yared was intending to give the mother intravenous antibiotics in case she was getting an infection. However, as that was being attended to the fetal heart rate dropped on the CTG monitor. It was significant and had not recovered.

Dr Yared left the room to call theatre and she prepared the mother for theatre.

Statement of Heidi Llewellyn

She had been a midwife since 2009. She only became involved as the mother was being prepared to be taken to the operating theatre. She assisted in this

process. She went into theatre. The obstetrician obtained a fetal heart rate with a Doppler which was at the time 80 to 90 bpm. As he scrubbed she placed a Doppler on the abdomen and the fetal heart rate was 40 bpm. She passed this information on to the obstetrician and he said okay. She then rang the team leader of the Neonatal Intensive Care Unit (NICU) to tell them to come down because the heart rate was not great.

She then went and scrubbed and gowned, which took about 2 minutes and when she came back in, the obstetrician was already incising the uterine wall.

She was holding the sterile wrap out ready to receive the first born twin. Dr Yared said "this is twin 1". She confirmed with the scrub nurse that this is what Dr Yared had said and this was confirmed back to her. She believes it was 20 seconds at most between delivery of the first born twin and handing the baby to her. The baby showed no signs of life and was blue in colour. It looked like it had died in utero sometime before.

Her understanding of the identification of twins is that it is based on the time of birth. That is twin 1 is the first twin that is born but she is now aware that different obstetricians may have different systems of identification. She was of the belief that the second born twin would be the live twin. She believed the first born twin was the twin that had died in utero.

She then took the first born baby to the resuscitation room and said this is twin 1. The neo-intensive nurse asked to confirm that this was twin 1 and she confirmed this was the case. She recalls the NICU intensive care nurse and paediatric fellow saying words to the effect ”well don't put twin 1 on the resuscitation trolley. Twin 1 is the dead twin”.

When she went back into the operating theatre the obstetrician was already suturing the incision. She asked the Scout nurse where was twin 2. The Scout nurse said words to the effect that twin 2 was gone. She then followed the Scout nurse into the resuscitation room to review the placenta. She had not seen the placenta in a kidney tray in the operating theatre. The Scout nurse lifted the placenta and pointed to the fetus and said "that's twin 1". She then went to the first born twin and said "well that must be twin 2".

The NICU team commenced resuscitation. She is not able to say how long it was between delivery and commencement of the resuscitation but she understands the first born was born at 00:37 hours according to the operating room clock, and she commenced scribing the resuscitation at 00:41 hours, according to the resuscitation room clock. She believes the resuscitation may have commenced at the 30 seconds prior to starting to scribe. She believes it may have been between 90 seconds and 2 minutes between delivery of the first born and commencement of the resuscitation of the first born. However, she was in shock at the time and is not confident that this time frame is accurate. She recalls the resuscitation was one of the best she had seen and the NICU team worked very well together.

A debrief occurred between the NICU team, Dr Yared, herself and the team leader about two hours after the incident. Dr Yared informed them that he was unaware of any confusion with identification of the twins until that debrief. During the debrief she told Dr Yared that the fetal heart rate had been 40 bpm just prior to the operation and that she told him this. Dr Yared said that he had not heard her say that in the operating theatre.

Statement of Colleen Van Dycken

She is also an experienced midwife having been registered since 1987.

She has worked in the neonatal intensive care area for 23 years.

She was the code nurse on the night of 7 October 2012. She had been given a history by Dr Yared during the evening.

She then received information that NICU had received a call from the delivery suite about the emergency Caesarean section and she attended with RM Enright and Dr Suresh. She is aware that there was one viable twin that had fetal bradycardia on the CTG.

When she arrived in the resuscitation room, the equipment had been prepared and the anaesthetist was inserting an epidural.

Shortly after her arrival, Dr Yared came into the resuscitation room and told herself, Dr Suresh and RM Enright that twin 1 was the twin who had died, that this had been a twin to twin transfusion and twin 2 was for resuscitation. She had not been given any information concerning at what stage of the pregnancy the death had occurred.

An operating staff member came in with a Perspex cot and stated that this was for twin 1, the deceased twin. Two separate sets of paperwork for the two babies had been placed in the resuscitation room and she took the paperwork and placed twin 1's paperwork with the Perspex cot and twin 2's paperwork with the resuscitation cot.

A short time afterwards a scrubbed midwife came into the resuscitation room carrying the first born twin. This twin was white, pale, floppy, not crying and appeared to have no obvious signs of life. The midwife placed the baby on the resuscitation cot and said "this is twin 1". Dr Suresh felt the cord and reported there was no heartbeat. She then said words to the effect "I'm sorry but if this is twin 1 this is the IUFD baby and needs to be placed in the cot as this resuscitaire is ready for twin 2." She then carried the baby to the open perspex cot and went back into the theatre.

She felt uncomfortable that the first born twin had been left unattended and Dr Suresh went to the first born twin to start to dry the baby. She then offered to attend to this. She recalls making a comment that the baby was very smelly and was misshapen in the face.

When the midwife returned to the room she recalls she said "I hope the placenta has been sent for this baby because the baby really smells". The midwife then said words to the effect "I'm sorry but this is the baby you should be resuscitating". At about the same time an operating theatre nurse came into the resuscitation room with the placenta and fetus in a kidney dish.

Immediately after being told this information she carried the first born twin to the resuscitation cot and commenced neonatal resuscitation. She believes it was only a short period of time between when the midwife left the resuscitation room after delivering the first born twin to the NICU team, to the time when she returned to the resuscitation room and the resuscitation of the baby commenced. It was certainly no more than a couple of minutes.

Dr Len Yared

Dr Yared provided a statement detailing the history.

Importantly he stated that up until 2 October 2012, the deceased twin, twin 1, had always been the presenting twin. On palpation of the abdomen, he then formed the view that the surviving twin, twin 2, was now the presenting twin and he confirmed this with a bedside scan in the labour ward. This was also confirmed by a scan conducted by the Maternal Fetal Medicine Unit on 2 October 2012.

He saw the mother on the morning of 6 and 7 October and there were no signs of any infection and her condition remained stable.

In the evening of 7 October 2012 he was contacted with the information she was in early labour. This had not surprised him and he knew she would be transferred to the delivery suite where he planned to consult with the mother when he had finished in the operating theatre.

He arrived in the delivery suite just before midnight and was informed that the fetal heart rate was within normal limits and she had a mild temperature of 37.7°.

He considered she may need intravenous antibiotics. He performed a vaginal examination to assess the labour and established that the cervix was 3 cm long and 2 cm dilated. He could feel the presenting head and knew that twin 2 was the presenting twin.

He was in the process of inserting an intravenous cannula to administer the antibiotics when the midwife drew his attention to a sudden drop in the heart rate of around 160 – 170 bpm to 80 bpm. He stopped inserting the cannula. He left the room to make arrangements to perform an emergency Caesarean section, which involved contacting the operating theatre, anaesthetist, the intensive care unit nursery and finding an assistant.

He then went back into the birthing suite to obtain the mother's consent for a Caesarean section and then went to the operating theatre.

A spinal anaesthetic was administered. He knew the fetal heart rate had not returned to anything above 100 bpm. He was not aware that just before the Caesarean section the fetal heart rate was recorded as 40 bpm. He does not dispute that the midwife advised him of this, but with all the noise in the operating theatre he did not hear it.

Once the anaesthetic was effective a routine Caesarean section was performed. The ultrasound report had identified twin 1 as the deceased fetus and twin 2 as the surviving fetus. He was aware that twin 2 was the presenting twin. This had been noted clinically and on ultrasound prior to the onset of labour. When he delivered the live first twin and handed it to the midwife he said "this is twin 1" by which he meant this is the first twin which he has delivered. Unfortunately, Dr Yared says this caused some brief confusion as the midwives and others expected twin 1 to be the deceased twin. He delivered the remaining twin and placenta. This was in fact twin 2, the deceased twin. There was no more than 1 minute between delivery of the first live twin, twin 2, and the second deceased twin, twin 1.

Dr Yared stated that he was not fatigued because he had a full night of sleep on 4 and 5 October 2012 and short sleeps in accordance with his usual practice on 6 and 7 October 2012.

Root Cause Analysis

Mater Mothers Hospital conducted a Root Cause Analysis.

The Root Cause Analysis noted that a contributory factor to this case was inconsistent labelling practices of twins in utero. It recommended that a system be established so that a single, consistent, standardised process of labelling multiple foetuses in utero occurs.

When the system is established it was to include changes to the policy and communicate the changes to all Mater Mothers clinical staff including visiting medical officers.

A second contributory factor was that there was fragmented documentation and there is no current requirement to complete a succinct problem page – summary page outlining the history associated with a complex patient.

It was recommended that strategies be explored that are current, readily accessible, succinct and which detail in summary form a patient's clinical risk management plan. In this context, the recommendation suggested consideration of the creation of a single health record for maternity care, which would address the relevant summary requirements and incorporate clinical cues and forcing functions.

Interestingly, a further contributory factor noted there was a possible delay of 45 min in attaching the patient to CTG when the patient was still in the ward. There was also no summary entered into the system during the two hours that the CTG was in place while the patient was in the birth suite and CTG data

parameters were not entered into the Guardian system. Hence a pathological CTG trace was not flagged in the system or notified to clinical staff.

It was also noted that there was an acceptance by clinical staff that the Visiting Medical Officer (VMO- Dr Yared) was in the operating theatre assisting with a Caesarean section and it was not recognised at 22:30 hours, that it was a pathological CTG tracing or that at 23:15 hours there was a further increase in the fetal heart rate to 170 bpm and that the CTG had continued to be pathological until discontinuation of the CTG tracing at 23:55 hours. This may have led to the VMO not being asked to review the patient at 22:30 hours.

Further contributory factors included the fragmented clinical communication/continuity of carer. This was due to the midwife, operating theatre nurse, and the neonatal team in attendance were not collectively fully aware of the patient's clinical history including the estimated weight of the birth fetus and which twin was presenting. The midwife who had been caring for the patient in birth suite was not allocated to go to the operating theatre. There was also no discussion about the current documented estimated weight of the twins or the length of time the deceased twin had been demised.

The VMO assumed the birthing suite midwife was aware that twin 1 was the live twin. There was limited time for the Neonatal Fellow to review the health record as the Neonatal Fellow was busy getting equipment ready for the emergency category one Caesarean section. This all potentially led to the neonatal team receiving limited and potentially inaccurate handovers. The Neonatal Fellow and neonatal nurse thought the demised twin had died two weeks earlier as opposed to seven weeks earlier. The operating nurse did not receive full details of the patient's clinical history because the operating theatre’s role is primarily to care for the mother the baby.

A further contributory factor was confusion over which twin was the live twin at birth. It was clear in the mind of the VMO that the presenting twin could only be the live twin and the VMO would not give the demised twin to the baby receiving midwife for transfer to the neonatal resuscitation team. Because of the size and gestation of the surviving twin and the demised twin and because the VMO stated "this is twin 1" there was an assumption that the receiving staff were aware this was the live twin, although the language used was potentially confusing. It noted a recommendation that it was the responsibility of the surgeon to use clear, unambiguous language in situations where there is a surviving infant in a multiple pregnancy.

There was no confirmation on delivery that twin 2 was in fact the live twin and the midwife receiving the baby did not get a full handover including when the demised twin had deceased and she was of the understanding that the firstborn twin was not the live twin.

Various recommendations were made by the RCA team, all of which have been implemented.

Report by Dr David Cartwright

Dr Cartwright is a Consultant Neonatologist and Director of Neonatology at Royal Brisbane and Women's Hospital and was requested by the Office of State Coroner to provide an independent expert opinion.

Dr Cartwright was of the view that the evidence supports that the delay in resuscitation did not contribute substantially to the death.

He also considered that prematurity as contributory was negligible.

Elsie had two problems additional to prematurity, being maternal chorioamnionitis and the effects of labour, which she could not tolerate well. Had Elsie not been resuscitated successfully her birth would be classified as stillborn. He regarded resuscitation, once commenced, went smoothly.

He noted the confusion with staff in relation to the nomenclature of twins. Dr Cartwright stated that the confusion over the twins' nomenclature pervaded into all aspects of the hospital documentation. He stated that there was considerable confusion, to the extent that he found the confusion confusing. He stated there should not have been such confusion. He would expect all experienced obstetric and neonatal staff to be quite aware that the nomenclature of twins refers to their birth order, and the birth order of twins delivered by Caesarean section is often different from that expected had a vaginal birth ensued, yet in this case the birth order was exactly as expected for at least the preceding week.

At the time of birth Elsie was not just in poor condition but without signs of life. This was indicative of severe compromise occurring before birth.

The only evidence for this pre-birth compromise recorded in the hospital charts is the sudden onset of fetal bradycardia at an unstated time around 00:05 to 00:10 hours. This was at a time when Dr Yared was preparing to insert an intravenous cannula, followed by persistent deteriorating bradycardia last recorded as 40 bpm just before the Caesarean section commenced. At this point it is immaterial whether Dr Yared heard the information conveyed to him regarding this heart rate, as the operation could not have proceeded any more swiftly than it did.

Dr Cartwright however indicated that from reading the RCA it is evident the RCA team had further information available to them, not recorded in the chart, about the CTG between 22:15 and 00:00 hours, suggesting that there were signs of fetal compromise throughout that period, which were not reported to Dr Yared and perhaps were not recognised. This may further explain Elsie's poor condition at birth.

Dr Cartwright stated that the fetal bradycardia that occurred is indicative of significant intrauterine hypoxia, and the bradycardia appears to have persisted and in fact worsened over a period of approximately 30 minutes, culminating in cessation of heartbeat some short time before her birth.

Dr Cartwright took the view that the predominant signs in life was of a severe brain insult. He suspects that the term "sepsis" is used loosely in the autopsy report, to mean infection, as by definition it has a meaning of severe systemic inflammatory response, usually due to infection, characterised by a hypotension and multiorgan dysfunction. The evidence for sepsis present at the autopsy was of pneumonia seen as inflammation in the lungs, and of chorioamnionitis and funistitis with micro abscesses in the placenta. Dr Cartwright noted the growth of E. coli without evidence of inflammation in those organs with the exception of the lungs and the placenta, and this most likely represented proliferation of organisms after death, and in the two days between death and the autopsy. Blood cultures taken in the neonatal intensive care unit did not grow any organisms, making it impossible to make a diagnosis of septicaemia bacteraemia at birth. Elsie was just a short step away from E. coli septicaemia at birth in his estimation and this has a high mortality rate of approximately 25%.

He classed the main problem as hypoxic ischaemic encephalopathy as in the original cause of death certificate with E. coli pneumonia listed as another condition. Other maternal conditions present were the previous twin to twin transfusion with laser therapy, chorioamnionitis and funisitis.

He concluded it is likely that any short delay in resuscitation played some role, but quite a minor role in his view. The major players were the poor tolerance of labour, chorioamnionitis and early neonatal infection.

Other issues identified by Dr Cartwright

In addition, Dr Cartwright stated he would like to have seen that the neonatal consultant was present at the delivery, or at least on the way coming in from home, to assist with decision making and any practical issues that might arise.

He also stated he would expect as follows: –

- that the neonatal unit would hold a list of women in the antenatal ward with problems likely to result in nursery admission for their baby, with a brief history
- when a woman enters birth suite in pre-term labour, the neonatal unit would be advised very soon after her admission
- the neonatal unit would then familiarise themselves with her history so that the consequent admission need not be a surprise
- that a system for organising a category 1 Caesarean section would result in early notification of the neonatal resuscitation team, and thus give time for their adequate briefing
- he was surprised that there seemed to be no avenue for direct communication between the obstetrician and neonatal team in the operating theatre
- he was surprised that there does not appear to have been any bacteriological specimens taken from Elsie to attempt to determine the cause of the chorioamnionitis. If the autopsy had not been done, where would the knowledge of the E. coli have come from?

Dr Cartwright also noted an issue with antibiotic administration. He stated that in the case of a malodorous baby from a mother with chorioamnionitis,

administration of antibiotics becomes an urgent priority. In this case records indicate that gentamicin may not have been given until 04:00 hours. He considers the aim should have been for antibiotics to be given within 30 minutes of birth. He does not think that the three-hour delay played a role in her death, however, had she not had the severe neurologic problem, which resulted in ceasing her ventilatory support, it may have made her pneumonia more difficult to control over the ensuring hours and days. The presence of a neonatal consultant at this time may well have emphasised the urgency for antibiotic administration and assisted in achieving that.

Response from Mater Hospital

1. Lack of consultation with the neonatologist in relation to issues surrounding the timing of an inevitably early delivery and the best timing of a delivery

A neonatologist did meet with the mother at 28 weeks gestation to discuss the possible neonatal care that would be required for her baby with the invitation for her to come back and discuss the outlook as the pregnancy progressed. The hospital considered it would not be useful to discuss the timing of delivery as that would be influenced by acute events and the management of this was in the hands of her obstetrician.

The hospital noted the management of premature rupture of membranes is to try to prolong the pregnancy while monitoring for signs of infection or premature labour. The aim would be to prolong the pregnancy until about 34 weeks and this is what was done in this case. Unless circumstances changed, further neonatal consultation about this management plan was not needed.

2. Was there an avenue for direct communication between the obstetricians and neonatal teams in the operating theatre?

The neonatal team is briefed by the obstetrician before the Caesarean section commences. The neonatal resuscitation room is located between the two obstetric theatres. The advantage of using this precise patient room is that it is better suited to resuscitating and stabilising babies, particularly with multiple births as both the babies can be stabilised in the same room. Obstetric theatres are not designed to have an area for baby resuscitation and it is considered more optimal to have a separate resuscitation room. There is no intercom system between the theatre and resuscitation room but communication is easy as there is a swing door between the two.

3. Why was the neonatal consultant not present at the delivery or at least on the way in from home to assist with decision-making and any practical issues that might arise?

The hospital advised that the information that was available to the neonatal resuscitation team before birth was that a category one Caesarean section was being performed because of fetal distress with a single live 30 week baby. Based on this information, the hospital advised there was no need to call in a consultant neonatologist as the resuscitation team have all the knowledge and

skills needed to resuscitating and stabilise a 30 week gestation baby. Only when the situation escalated and there was a severe fetal bradycardia did that situation change. By then there was no time for the consultant to get to the hospital in time to the birth. In any event the resuscitation team members had all the skills needed to stabilise such a baby.

In this instance the hospital was unaware when the neonatal consultant was informed of the baby's condition but this happened and she came into hospital and was present whilst baby was being stabilised in the neonatal unit.

4. The neonatal unit should hold a list of women in the antenatal ward with problems likely to result in nursery admission for their baby with a brief summary

The hospital stated the neonatal unit had a number of sources of information regarding upcoming births that may need this care. This includes that the unit is notified of all expected births either via birth suite, the pregnancy assessment or the antenatal ward. The unit keeps a diary with details of upcoming births the babies who are expected to need neonatal care. There is also a secure intranet site, accessible by the neonatal unit where birth plans of individual mothers are located. All the neonatologists and the unit team leaders are e-mailed with details of planned births where it is likely to need neonatal unit admission. All maternal-fetal medicine scans are on the hospital's clinical portal which is accessible on all computers.

5. When a woman enters birth suite in preterm labour, the neonatal unit would be advised very soon after admission and the neonatal unit would have familiarise themselves with her history so that the consequent admission would not be a surprise

The hospital stated this occurs routinely. For women in very premature labour, one of the neonatal medical staff attend the birth suite discussed management and possible outcomes with the mother.

6. A system for organising a category one Caesarean with the result in the early notification of the neonatal resuscitation team and in time for their adequate briefing

The hospital stated the clinical notes indicate the resuscitation team was called in to ensure a full briefing. The entry states that one of the nurses was called at the same time as the entry documentation concerning the decision to perform the Caesarean section.

Although there was no delay in this case, the system is being optimised in accordance with the RCA recommendations being:

- the neonatal team will be notified by a code call as soon as the decision is made to do a category one Caesarean section
- the team will go to theatre
- there will be a briefing given by the obstetrician
- The briefing is to be part of the Obstetric Surgical Safety Checklist

7. There does not appear to have been any bacteriological specimens taken to attempt to determine the cause of the chorioamnionitis. If the autopsy had not been done, where would the knowledge of the E. coli have come from?

A blood culture was taken. A placental swab was taken and grew E. coli so there was a bacteriological specimens taken to determine the cause of the chorioamnionitis. There was no indication to take other bacteriological specimens.

Skin swabs and gastric aspirate that used to be taken commonly are no longer part of neonatal care as they do not assist in determining whether there is an infection. They merely show that the baby's skin is colonised. This is extremely common.

At autopsy there was found to be pneumonia. This is diagnosed clinically by taking account of the blood culture, the chest x-ray, the clinical condition of the baby, the full blood count and C reactive protein taken on the second day. The placental swab identified the likely organism but does not assist in diagnosing whether there was actually an infection.

8. Antibiotic Administration

The hospital considered that the urgent management issue with Elsie was to stabilise her following the severe asphyxia insult and reinstate circulation. This involved positive pressure ventilation, insertion of umbilical catheters, measuring her acid/base status and administering a saline bolus. This took until about 03:00 hours.

Staff present were concentrating on this aspect of her stabilisation. Her presentation was that of severe asphyxia, not of severe sepsis, and the management concentrated on this. Upon reflection of the management it is acknowledged that antibiotics could have been given earlier.

Response by Dr Yared

Consultation with neonatologist

Dr Yared stated that he did not consider it was necessary or desirable to have a joint discussion with a neonatologist and the mother to discuss issues surrounding timing of an inevitably early delivery.

This was because there were no clinical signs or symptoms of chorioamnionitis. Although the mother had two major conditions, which often are associated with this condition, before labour commenced she did not have any of the recognised signs and symptoms such as a raised temperature, a raised pulse rate, a raised white cell count, uterine pain or an offensive discharge. Once he knew she was in labour and had no signs of chorioamnionitis, he was still planning for a vaginal birth given the mother had already had two successful previous child births.

Communication

Dr Yared stated there is an avenue for direct communication between the obstetrician and neonatal paediatrician, which often occurs hours to days before the birth takes place.

In a category one Caesarean section the direct communication routes are completely different. It was only when he learned that the mother had a raised temperature and signs of chorioamnionitis, that he was keen to check on the status of her labour and to administer antibiotics. While this was being done, he made the decision she required an emergency Caesarean section. He needed to arrange a theatre, assistant and an anaesthetist. The labour ward staff usually ring the after-hours theatre manager who contacts the neonatal nursery and neonatal paediatrician.

In these circumstances any communication between the obstetrician and neonatal team is rather hurried, face-to-face and verbal. His consultation with the neonatal paediatrician in this case was in that category. The neonatal team confirmed that a verbal handover was provided.

When he handed the first twin delivered to the resuscitation nurse, his expectation was this twin would receive immediate resuscitation. He was not aware of any confusion on the issue until a debriefing that was held two hours later.

The hospital has conducted a detailed Root Cause Analysis. His understanding is that the hospital is presently developing further protocols and documents to ensure clear communication of the mother's circumstances and babies are likely to occur between the obstetrician, paediatrician and neonatal team.

Report of Dr Daniel Challis

Dr Challis is an Associate Professor in Obstetrics and Gynaecology and a specialist in the areas of general obstetrics and maternal fetal medicine.

Dr Challis was asked to comment on the monitoring and treatment by Dr Yared of any infection or potential infection in the mother. He stated that between the mother’s admission and her going into labour, she was seen regularly by Dr Yared and regularly documented the progress and clinical findings. He could not identify any deviation from standard and usual care in the monitoring and treatment of the mother for infection or potential infection.

Dr Challis was asked to comment as to whether the birth should have occurred earlier following the further rupture of the amniotic membrane on one October 2012. He stated it was not clear that any specific rupture took place around that time. In reviewing the records there were no concerns that would have indicated delivery, and in his opinion management was appropriate.

Dr Challis was asked to comment on the issues regarding the CTG tracing and should she had been reviewed earlier by medical officer or any additional interventions implemented by nursing and medical staff. He stated that the

mother appears not to have reported concerns until 21:30, at which time the mother complained of possible early labour, and the fetal heart rate was normal at 152 bpm. A decision was made to transfer the mother to the birthing unit for more intensive monitoring. Dr Yared was on his way to the operating theatre for another case and was briefly unavailable. Dr Challis agrees that the CTG tracings were concerning by 23:50 hours but given the midwives knew Dr Yared would be attending soon to review the mother, he believes the decision not to escalate to another medical officer was reasonable.

In relation to whether the mother should have been administered intravenous antibiotics in the immediate period preceding the birth, Dr Challis considered it would be common practice for intravenous antibiotics to be administered to a mother in labour where there is maternal pyrexia of over 38° or where there is a clinical suspicion of chorioamnionitis. He believes most obstetricians would have administered intravenous antibiotics about 23:00 and 24:00 hours in this case. Dr Challis stated that it is clear from the autopsy, that given the very advanced infection found, that antibiotics, even had they been given by 23:00 hours, would have made no difference to the outcome of the baby by that stage.

Dr Challis agreed generally with the comments of Dr Cartwright, and the hospital's response was also reasonable.

Dr Challis noted that there is frequent confusion relating to which twin is A or B or 1 or 2. Eventually twins are numbered by the birth order, but during pregnancy they will often change position, and sometimes number. He stated there was no easy solution to this. He stated that whilst this was a very unfortunate case, it is not really surprising that clinical staff, in the scenario of a category 1 Caesarean section, assumed initially it was the demised baby first presented. Dr Yared was concentrating on performing a rapid and safe delivery, which he achieved. He could not have been expected to predict the error of the paediatric resuscitation staff and would have assumed they would have begun resuscitating the baby. He stated he had never heard of another similar case of confusion around fetal demise, so this must be a very rare scenario.

He agrees with Dr Cartwright that the cause of death was a combination of an intra-partum event and sepsis. He also agrees that it is likely that the delay in resuscitation was of minor significance and unlikely to have altered the outcome.

Furthermore, it is his opinion that the deterioration in the Elsie's condition was a sudden and unpredictable event, as evidenced by the sudden bradycardia at 00:01 hours on 8 October. It is not clear if this resulted from a cord accident/compression; from a chronically stressed baby or the placenta was unable to tolerate the additional acute stress of labour.

Dr Challis stated that other than minor and clinically insignificant delays in the care of the mother and baby, he was unable to identify any departures from standard of care in this case. His impression was of an attentive, responsive and appropriate clinical care. He also stated the excellent and exhaustive RCA process undertaken by the hospital provides evidence of a high standard of

clinical governance, and in his view has identified all of the communication issues and system improvement opportunities. Dr Challis was unable to suggest any additional recommendations for consideration.

Conclusion

The investigation into the death of Elsie Robertson has been a complex matter.

A comprehensive RCA has resulted in significant practice changes at Mater Mothers.

There were however a number of issues which required investigation. These included the decision of the timing of the delivery and the administration of antibiotics; concerns regarding the CTG; the contribution of any delay in resuscitation; the mix up over which was the live twin and communication issues between obstetric staff and the neonatal team. Of particular note was clarification of the cause of death, including whether the primary cause of death was hypoxic ischaemic encephalopathy or sepsis.

These matters have been addressed by the further investigation and the expert opinions of Dr Cartwright and Dr Challis.

The cause of death was considered by the pathologist to be due to E. coli sepsis with the underlying cause being twin to twin transfusion syndrome treated with laser photocoagulation. Drs Cartwright and Challis considered the cause of death was a combination of an intrapartum event and sepsis. I concur and have amended the cause of death accordingly.

It is evident there were some delays in the resuscitation of Elsie due to a confusion over which was the surviving twin. That should not have occurred but it is the opinion of the experts that earlier resuscitation would not have changed the outcome in this case.

It is also evident there was an unreasonable delay in delivery of antibiotics to the baby. There were sufficient red flags indicating that sepsis was a likely complicating factor for the baby including maternal pyrexia of over 38° and a clinical suspicion of chorioamnionitis. As well on delivery there were a number of clinicians who noted the baby was malodorous, a clear sign of sepsis.

However, the expert opinions were consistent in that they considered such delays were minor and/or insignificant in respect to any contribution to the ultimate cause of death.

Accordingly, although this investigation commenced with a view that holding an inquest was likely, the outcome of the investigation is such that the issues for investigation have been resolved such that findings can be made on these issues. No other recommendations that have not already been made in the course of the RCA are likely to result.

This however is a case that has the requisite public interest to warrant publishing the findings on the Office of State Coroner’s website in the same

manner as inquest findings are published. Elsie's parents have been consulted and agree with that process.

Findings required by s. 45

Identity of the deceased – Elsie Robertson

How she died – Elsie Robertson died soon after she was born from complications of Twin to Twin Transfusion Syndrome resulting in sepsis and from an intra-partum event causing hypoxic ischaemic encephalopathy.

Place of death – Mater Mothers Hospital Raymond Terrace South Brisbane.

Date of death– 08 October 2012

Cause of death – 1a. Main condition in neonate: Hypoxic ischaemic encephalopathy due to intra-partum event; E. coli sepsis
b. Other conditions in neonate: E. coli pneumonia; treated twin to twin transfusion syndrome; prematurity
c. Main condition in mother: Acute E. coli chorioamnionitis
d. Other conditions in mother: Retained fetal death in utero; rupture of membrames; pre-term labour
2. Underlying cause of death: Twin to twin transfusion syndrome (treated with laser photocoagulation).

I close the investigation.

John Lock
Deputy State Coroner
Brisbane
22 February 2016