QUEENSLAND COURTS

OFFICE OF THE STATE CORONER

FINDINGS OF INQUEST

CITATION:	**Inquest into the death of Mia Davies**
TITLE OF COURT:	Coroners Court
JURISDICTION:	Brisbane
FILE NO(s):	2010/1279
DELIVERED ON:	28 September 2012
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HEARING DATE(s):	15 March 2012, 6 to 10 August 2012
FINDINGS OF:	John Lock, Brisbane Coroner
CATCHWORDS:	Coroners: inquest, Child Birth, CTG Tracing Interpretation, whether Caesarean section should have been escalated

REPRESENTATION:

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Glossary of Terms

Cardiotocography (CTG Tracing)

CTG tracing is a device which is attached to the mother as a screening tool for the purpose of intrapartum fetal monitoring. It records the fetal heartbeat and uterine contractions. CTG tracing is an important tool to assist in clinical decision making about fetal condition. The purpose of such monitoring is to prevent fetal morbidity due to reduced oxygen levels to the fetus (hypoxia). It is not required for low risk pregnancies.

There are five elements, which need to be assessed in the course of interpreting CTG tracing including the baseline, accelerations, variability, decelerations and the duration and frequency of contractions.

RANZCOG Guidelines for Fetal Monitoring and Cardiotocography (CTG Tracing)

This section has been reproduced from the comprehensive submissions of Counsel Assisting Ms Martens.

Definitions in relation to fetal monitoring of the fetal heart rate ("FHR") are contained in Appendix E of the Royal and New Zealand College of Obstetrics and Gynaecology (RANZCOG) guidelines[1]. They are as follows:

Term	Definition
Baseline fetal heart rate: Normal Baseline Bradycardia: Tachycardia:	The mean level of the FHR when this is stable, excluding accelerations and decelerations. it is determined over a time period of 5 or 10 minutes and expressed in bpm. Preterm fetuses tend to have values towards the upper end of this range. A trend to a progressive rise in the baseline is important as well as the absolute values. · FHR 110 160 bpm · <110 bpm · >160 bpm

[1] Exhibit E1

Baseline variability :	The minor fluctuations in the baseline FHR. It is assessed by estimating the difference in beats per minute between the highest peak and lowest trough of fluctuation in one minute segments of the trace.
Normal baseline variability:	· 5 – 25 bpm between contractions
Reduced baseline variability:	· 3 – 5 bpm
Absent baseline variability	· < 3 bpm
Increased baseline variability	· > 25 bpm
Sinusoidal:	A regular oscillation of the baseline FHR resembling a sine wave. This smooth, undulating pattern is persistent, has a relatively fixed period of 2 -5 cycles per minute and an amplitude of 5 -15 bpm above and below the baseline. Baseline variability is absent and there are no accelerations.
Accelerations:	Transient increases in FHR of 15 bpm or more above the baseline and lasting 15 seconds. Accelerations in the preterm fetus may be of lesser amplitude and shorter duration. The significance of no accelerations on an otherwise normal CTG is unclear.
Decelerations:	Transient episodes of decrease of FHR below the baseline of more than 15 bpm lasting at least 15 seconds, conforming to one of the patterns below:
Early decelerations:	Uniform, repetitive decrease of FHR with slow onset early in the contraction and slow return to baseline by the end of the contraction.
Variable decelerations:	Repetitive or intermittent decreasing of FHR with rapid onset and recovery. Time relationships with contraction cycle may be variable but most commonly occur simultaneously with contractions.
Complicated variable decelerations:	The following additional features increase the likelihood of fetal hypoxia: · Rising baseline rate or fetal tachycardia. · Reducing baseline variability. · Slow return to baseline FHR after the end of the contraction. · Large amplitude (by 60bpm or to 60 bpm) and/or long duration (60 secs). · Loss of pre and post deceleration shouldering (abrupt brief increases in FHR baseline). · Presence of post deceleration smooth overshoots (temporary increase in FHR above baseline).
Prolonged decelerations:	Decrease of FHR below the baseline of more than 15 bpm for longer than 90 seconds but less than 5 minutes.
Late decelerations:	Uniform, repetitive decreasing of FHR with, usually, slow onset mid to end of the contraction and nadir more than 20 seconds after the peak of the contraction and ending after the contraction. In the presence of a non-accelerative trace with baseline variability <5, the definition would include decelerations <15 bpm

The RANZCOG guideline notes as a good practice for women receiving continuous electronic fetal monitoring, the CTG should be reviewed at least every 15 – 30 minutes. It should be regularly recorded, either by written or electronic entry, in the medical record that the CTG has been reviewed.

The RANZCOG guideline contains the following good practice note for assessing CTG's:

The normal CTG is associated with a low probability of fetal compromise and has the following features: · Baseline rate 110 – 160 · Baseline variability of 5 – 25 bpm · Accelerations 15bpm for 15 seconds · No decelerations All other CTG's are by this definition abnormal and require further evaluation taking into account the full clinical picture
The following features are unlikely to be associated with significant fetal compromise when occurring in isolation: · Baseline rate 100 – 109 · Absence of accelerations · Early decelerations · Variable decelerations without complicating features
The following features may be associated with significant fetal compromise and require further action, **such as described in Guideline 10:** · Fetal tachycardia. · Reduced baseline variability. · Complicated variable decelerations. · Late decelerations · Prolonged decelerations
The following features are very likely to be associated with significant fetal compromise and require immediate management , **which may include urgent delivery:** · Prolonged bradycardia (<100 bpm for > 5 minutes) · Absent baseline variability · Sinusoidal pattern · Complicated variable decelerations with reduced baseline variability See Appendix E for definitions

A deceleration is not automatically a cause for alarm and it happens particularly in labour when the baby is being squeezed by the uterus.

The RANZCOG guideline number 11 notes that in clinical situations where the FHR is considered abnormal, immediate management includes: identification of any reversible cause of the abnormality and initiation of appropriate action

(eg., correction of maternal hypotension, cessation of oxytocin) and initiation or maintenance of continuous electronic fetal monitoring. Consideration of further fetal evaluation or delivery should occur if a significant abnormality persists.

The RANZCOG guideline also recommends using fetal blood sampling ("FBS") to reduce the rates of increased intervention associated with electronic fetal monitoring.

Fetal Blood Sampling

Fetal Blood Sampling is a procedure used during labour to confirm whether fetal oxygenation is sufficient. It is performed by creating a shallow cut to the scalp and taking a blood sample. Two constituents that are commonly tested by this procedure are pH and lactate. A low pH and high level of lactate indicate there is acidosis, which is associated with hypoxia.

Syntocinon

Syntocinon is a synthetic form of oxytocin, a natural hormone released in large amounts during labor, facilitating birth. The synthetic version is used for labour induction.

Introduction

Baby Mia Davies was born on 14 April 2010 at Royal Brisbane and Women's Hospital (RBH).

CTG monitoring had previously been conducted over a number of days in the antenatal period and these were described at times as "abnormal".

At 36 weeks and four days gestation there was a premature rupture of the mother's membranes. An induction was decided upon and syntocinon was introduced. CTG monitoring continued to note an abnormal CTG trace, but this was not acted upon.

After a long labour, a vacuum extraction and then a forceps delivery were unsuccessfully attempted. At this point an emergency Caesarean section was performed.

When baby Mia was delivered she showed no signs of life. The clinical impression was of significant hypoxic damage to the brain that was irreversible. After discussions with her family, supportive treatment was withdrawn and she died the next day.

There was considerable uncertainty concerning the circumstances leading up to her death, and particularly whether there were earlier clinical signs of compromise to baby Mia which should have alerted medical and midwifery staff to undertake further reviews and to escalate the birth.

Accordingly, I decided to hold an inquest into her death. The issues identified at the pre-inquest conference to be explored at the inquest were:

- The findings required by section 45(2) of the *Coroners Act 2003*, namely the identity of the deceased, when, where and how she died and what caused her death;

- The adequacy of the care provided to Baby Mia's mother, Mrs Gayle Davies, and to Baby Mia by the staff at Royal Brisbane and Women's Hospital during labour including the interpretation of the CTG tracing; and;

- Whether there were any indications during the labour that a caesarean section should have been performed earlier;

- Whether any medical or nursing staff should be referred for disciplinary action pursuant to s 48.

These findings seek to explain how the death occurred and consider whether any changes to policies or practices could reduce the likelihood of deaths occurring in similar circumstances in the future.

The scope of the Coroner's inquiry and findings

There has been considerable litigation concerning the extent of a coroner's jurisdiction to inquire into the circumstances of a death. The authorities clearly establish that the scope of an inquest goes beyond merely establishing the medical cause of death.

An inquest is not a trial between opposing parties but an inquiry into the death. In a leading English case it was described in this way:- *"It is an inquisitorial process, a process of investigation quite unlike a criminal trial where the prosecutor accuses and the accused defends… The function of an inquest is to seek out and record as many of the facts concerning the death as the public interest requires."* [2]

The focus is on discovering what happened, not on ascribing guilt, attributing blame or apportioning liability. The purpose is to inform the family and the public of how the death occurred with a view to reducing the likelihood of similar deaths. As a result, the Act authorises a coroner to make preventive recommendations concerning public health or safety, the administration of justice or ways to prevent deaths from happening in similar circumstances in future.[3] However, a coroner must not include in the findings or any comments or recommendations, statements that a person is or maybe guilty of an offence or is or maybe civilly liable for something.[4]

The Admissibility of Evidence and the Standard of Proof

Proceedings in a coroner's court are not bound by the rules of evidence because the Act provides that the court "*may inform itself in any way it considers appropriate."*[5] That does not mean that any and every piece of information however unreliable will be admitted into evidence and acted upon. However, it does give a coroner greater scope to receive information that may not be admissible in other proceedings and to have regard to its origin or source when determining what weight should be given to the information.

This flexibility has been explained as a consequence of an inquest being a fact-finding exercise rather than a means of apportioning guilt: an inquiry rather than a trial.[6]

A coroner should apply the civil standard of proof, namely the balance of probabilities but the approach referred to as the *Briginshaw* sliding scale is applicable.[7] This means that the more significant the issue to be determined, the more serious an allegation or the more inherently unlikely an occurrence, the clearer and more persuasive the evidence needed for

[2] *R v South London Coroner; ex parte Thompson* (1982) 126 S.J. 625
[3] Section 46 of the Coroners Act 2003 ("the Act")
[4] Sections 45(5) and 46(3) of the Act
[5] Section 35 of the Act
[6] *R v South London Coroner; ex parte Thompson* per Lord Lane CJ, (1982) 126 S.J. 625
[7] *Anderson v Blashki* [1993] 2 VR 89 at 96 per Gobbo J

the trier of fact to be sufficiently satisfied that it has been proven to the civil standard.[8]

It is also clear that a coroner is obliged to comply with the rules of natural justice and to act judicially.[9] This means that no findings adverse to the interest of any party may be made without that party first being given a right to be heard in opposition to that finding. As *Annetts v McCann*[10] makes clear that includes being given an opportunity to make submissions against findings that might be damaging to the reputation of any individual or organisation.

If, from information obtained at an inquest or during the investigation, a coroner reasonably believes that the information may cause a disciplinary body for a person's profession or trade to inquire into or take steps in relation to the person's conduct, then the coroner may give that information to that body.[11]

The Investigation

Overview of investigation

Baby Mia's death was reported to the Office of the State Coroner.

An autopsy examination was conducted and the cause of death was confirmed as being due to peripartum hypoxia.

Statements from all nursing and medical staff involved in the delivery and also antenatal care were requested by my office.

A Root Cause Analysis was conducted by RBH and the report provided to my office.

In a report to the Coroner prepared by Dr Sekar, a consultant obstetrician and gynaecologist at RBH, who was Mrs Davies' treating obstetrician, she noted "that it appears that the treating team did not fully appreciate the significance of interpreting the intrapartum Cardiotocography (CTG tracing)." This assisted in narrowing the issues required for investigation.

On receipt of the bulk of the evidence I requested an independent expert review by Dr Andrew Child. He is the Clinical Director of Women's Health, Neonatology and Paediatrics, Sydney Local Health District and the Clinical Stream Director for the Royal Prince Alfred Hospital. He has supervised registrars and consultants for the last 25 years.

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[8] Briginshaw v Briginshaw (1938) 60 CLR 336 at 361 per Sir Owen Dixon J

[9] *Harmsworth v State Coroner* [1989] VR 989 at 994 and see a useful discussion of the issue in Freckelton I., "Inquest Law" in *The inquest handbook*, Selby H., Federation Press, 1998 at 13

[10] (1990) 65 ALJR 167 at 168

[11] Section 48(4) of the Act

Dr Douglas Keeping also provided an expert report after being briefed by the legal representatives for Dr Elharmeel. Dr Keeping is a senior obstetrician in Queensland who has been practising in the field of obstetrics for about 40 years.

Unsurprisingly Dr Child and Dr Keeping agreed with each other's opinions in most respects. Any differences on clinical issues were on matters of personal preference or about issues where reasonable minds might differ.

Overview of adverse outcomes in health care and management

Common with my experiences in many health care related deaths, a number of factors contributed to Mia's death, and not just one individual or one critical decision was responsible.

Negative features often associated with adverse outcomes in health care include communication problems between clinicians and/or the failure to convey accurate information at handovers, on the ward or in the medical records.

It is understood there is clearly a place for more junior staff to rely on the opinions of more senior and experienced staff. What is evident is that adverse outcomes sometimes occur when there is evidence of a failure to communicate, to communicate accurately and fully, or to speak up and question. Usually this is due to different personalities but sometimes issues of culture and power within the various medical and nursing professions or in the organisation itself are evident. Historically there have been some tensions in the relationship between midwives and Doctors. A reference to "Graded Assertiveness" in subsequent internal reviews is often the alert that there may have been such issues present in a particular case.

Such features of communication difficulties were evident in this case. They contributed to the clinical decisions that were made and resulted in a failure to adequately manage the labour, which resulted in Mia's death. This inquest examined how this occurred and what can be done to help prevent it happening in the future.

Hospital practices, procedures and guidelines.

The Hospital had a number of professional guidelines, policies and procedures applicable to Fetal monitoring and CTG tracing in place.

The Hospital's policy on Fetal Monitoring current at the time of Mia's birth noted a number of antenatal and intrapartum risk factors that may increase the risk of fetal compromise. Mrs Davies met a number of the antenatal and intrapartum risk factors. The policy recommended that whenever a risk factor for fetal compromise has been detected, continuous monitoring will be conducted and the monitoring will be reviewed every 15 minutes. Despite this policy, two midwives gave evidence it was their understanding continuous monitoring was to be documented in the medical records every 30 minutes.

In this case, that in itself was not contributory to the outcome, as an abnormal CTG was monitored appropriately throughout Mrs Davies' labour, it was just not acted upon.

The Hospital policy on Fetal Monitoring current at the time of Mia's birth detailed the benefit of Fetal Blood Sampling (FBS) to avoid increased intervention however the policy did not provide details on when this should occur.

The Hospital had a policy on induction, augmentation and stimulation of labour at the time of Mia's death.

Policy on continuous CTG monitoring chart

At the time of Mia's birth, a continuous CTG monitoring chart was being trialled at the Hospital. It was essentially for novices and new staff to see the RANZCOG guidelines and determine when they needed to refer the CTG on or seek additional assistance from a medical officer. According to CM Bennett, most completed the document after the birth. There was evidence from a number of witnesses that this document was used by midwives and not reviewed by the doctors as they would review the actual CTG trace.

Handovers

The main clinical handover occurred at 815 every morning. The handover is attended by the outgoing night registrar/s, the incoming morning team of registrars, incoming and outgoing on-call consultants, obstetric consultants, paediatric consultants and anaesthetic consultants, registrars and residents. All medical staff and the Team Leader of midwives would attend this handover and midwives would attend if their caseload permitted. This meeting was not documented although it would be expected if there was a change to the management plan this would be documented in the patient's record.

The handover between the registrars for the afternoon and night shift was provided by either the outgoing registrar or the midwife team leader at the white board in the birth suite.

There was also a handover between the outgoing and incoming on-call consultants at 1630 at the whiteboard. Where possible, the registrars and team leader would also attend this handover.

Reviews by medical staff

If a midwife had a concern the first call would be to contact the registrar. If the midwife was not satisfied with the response from the registrar they could contact the consultant, however CM Bennett said only a few staff would do this.

There was no expectation of a regular review of patients by the consultant. The consultant would become involved as a result of being contacted by either the midwife or registrar. For high risk patients a consultant might initiate a review but this varied from consultant to consultant.

Examination of the Issues

The adequacy of the care provided by the staff at Royal Brisbane and Women's Hospital during labour including the interpretation of the CTG tracing

Antenatal Care

Dr Child considered that the antenatal management and care provided to Mrs Davies by her general practitioner, the midwives and doctors at the hospital and the pathology and ultrasound staff was very well done. His opinion is accepted and is uncontroversial. For this reason I will not consider that care in any detail other than providing some background to the development of one important piece of information, which information influenced subsequent decisions made at the time of labour.

Baby Mia had been diagnosed in utero with two significant congenital defects. The first of those was an apparent duodenal atresia (termination of the small bowel shortly after the stomach).

The second defect was an atrioventricular septal defect consisting of a large hole between the right and left sides of the heart involving both the upper and lower chambers (the atria and ventricles).

Neither of these defects was thought to be life-threatening in utero or immediately following delivery, but would require surgery to correct them shortly after birth.

There had been regular monitoring throughout her pregnancy by a cardiologist and an obstetrician. An amniocentesis had not detected any underlying chromosomal abnormalities.

Dr Child considered the abnormalities in the fetus were recognised very early and were appropriately managed.

Mrs Davies developed increased amniotic fluid (polyhydramnios) from 29 weeks. This was not unexpected given the gastrointestinal abnormalities. At 36 weeks, amniodrainage was planned after antenatal steroid injections.

Mrs Davies had been admitted to Hospital on several times and CTG tracing had been commenced on a number of occasions over 26 and 27 March and between 10 and 13 April 2010.

The CTG assessments were variously characterised by a fetal heart baseline of between 110 and 120. Variability was described at different times as under 3, between 3 and 5 and under 5. This reduced variability was appropriately regarded as abnormal.

Some assessments noted accelerations as present whereas others did not. No decelerations were noted on the assessments with the exception of one deceleration on one CTG trace. When these CTG assessments where

categorised in Mrs Davies' medical records, they were noted as being abnormal. This pattern of FHR was the norm over that earlier period and relatively unchanged when Mrs Davies was admitted for labour.

Dr Elharmeel was involved with Mrs Davies' care and management on 10 April 2010 when she attended the hospital for a planned antenatal steroid. When Mrs Davies presented there was also some bleeding. A CTG was commenced that day.

As Mrs Davies' CTG was noted to have reduced variability, attempts were made to increase the variability by having Mrs Davies consume food and water. Despite this, the reduced variability remained.

As a result of her concern for this abnormal CTG, Dr Elharmeel says she contacted Dr Sekar, Mrs Davies' treating obstetrician.

Dr Elharmeel says Dr Sekar stated Mrs Davies did not require a further CTG and could be administered the second round of steroids. Dr Elharmeel says Dr Sekar told her she was happy about the fetal well being as she (Dr Sekar) had performed a scan on 9 April and was able to see good fetal movements.

According to Dr Elharmeel, Dr Sekar stated she was reassured and that Mrs Davies "*would never have a normal CTG as the baby had multiple anomalies and massive polyhydramnios*". This was the crucial piece of information which came out of the antenatal care, which later influenced decisions being made in labour.

Notwithstanding that advice, Dr Elharmeel still suggested Mrs Davies be admitted and a repeat CTG performed that evening. Dr Sekar accepted this plan. Mrs Davies remained in hospital. Amniotic fluid reduction was conducted on 12 April 2010 by Dr Sekar and Mrs Davies was discharged later that day.

Dr Sekar has no recollection of the above conversations other than she recalls querying why a CTG was performed at this time but was satisfied when she was told there was some bleeding.

Mrs Davies gave evidence nursing staff were always concerned about the CTG however she would tell them that Mia had a dodgy heart, which information must have been conveyed to her by someone.

Further, CM Bennett recalls working on another shift with Dr Elharmeel and CM O'Beirne and discussing Mrs Davies' presentation between 10 and 14 April 2010. According to CM Bennett, Dr Elharmeel stated she had notified Dr Sekar and Dr Sekar questioned why a CTG had been done on 10 April 2010 and Dr Sekar told Dr Elharmeel that it was known that Mrs Davies' trace would be abnormal because of the conditions of the baby.

Given this evidence, and although Dr Sekar has no recollection of the discussion about this with Dr Elharmeel, I have no difficulty in concluding this

information or information to that effect, was conveyed by Dr Sekar to those treating Mrs Davies during the antenatal admission.

Labour Presentation

Mrs Davies presented to the Hospital in the early hours of 13 April 2010, with a leak of clear fluid. Although it was not confirmed as a spontaneous rupture of membranes she was appropriately admitted to the Hospital. CTG tracing was commenced. Due to Mia's anomalies, the labour was to be led by the obstetric consultants and registrars, rather than by the midwives.

Dr Sekar at first considered delaying an induction but she changed her mind and decided to induce Mrs Davies that day.

Although Dr Keeping and Associate Professor Kimble consider a caesarean section should have been considered at this point, Dr Child says the decision to induce Mrs Davies was appropriate for reasons given by Dr Sekar that because there was a high leak of liquor with a significant risk of developing infection around the baby, and that steroids had been given to help the development of the baby's lung maturity and the gestation was at 36 – 37 weeks. Dr Child also says it was reasonable to attempt vaginal delivery particularly as the baby was developing head first.

Handovers at 815 and 1630

Dr Sekar says that Mrs Davies' induction was discussed with the team at handover at 815 and a caesarean section was discussed for obstetric indication.

Dr Sekar is unclear who was present at the handover, which was not recorded or documented. It is now evident, neither Dr Elhameel, Professor Jones, CN Bennett nor RM Sidhu, all main players in the events that followed, were present.

Dr Sekar gave evidence that her understanding of the CTG trace up until Mrs Davies went into labour was that it had minimal variability, accelerations were present and there were no decelerations. She stated that babies with anomalies do not have a typically normal trace.

According to Dr Sekar, there was no indication that Mia's delivery would be complicated, it was not expected that Mia would be born unwell and most babies with congenital anomalies tolerate labour very well.

Dr Sekar says at the handover she gave a summary of Mrs Davies' antenatal history including the previous abnormal CTG.

Dr Sekar gave evidence that she told those at the handover to monitor the baby as a normal baby. Dr Sekar recalls one of the consultants asking "would you deliver on CTG abnormalities" and Dr Sekar stated "I would deliver on CTG abnormalities, like any other obstetric baby".

Dr Minuzzo was the consultant for the birthing suite from 800 to 1630. She attended the 815 handover. Her recollection about the CTG was that it

showed diminished variability but Dr Sekar was satisfied notwithstanding this as there were reactive fetal movements. Dr Minuzzo had no impression of any concerns from the handover. Dr Minuzzo did not recall the specific discussion Dr Sekar detailed about delivering on the basis of CTG anomalies.

Dr Yerrisani was a first year registrar working the day shift in the birth suite. He seems to have had no personal role in the care of Mrs Davies on his shift. He did not recall mention of what the CTG trace was expected to be or that the delivery should be treated differently. He did not give a handover to Dr Elharmeel as he was in theatre.

Dr Sekar stated she now believed her colleagues had assumed that the intrapartum CTG was related to the antenatal CTG and they assumed the decelerations were normal and that they did not understand that in the intrapartum period a baby is managed as any other baby.

Dr Sekar agreed this would suggest that the information she conveyed at the handover was not as clear as it could have been or had broken down through the handover process.

Dr Sekar stated that notes from this meeting would not have been recorded in Mrs Davies' medical records because Mrs Davies was still a patient in the labour ward, however if she had been in the birth suite there would have been notes made of the handover information. Whatever is the case, a management plan should have been documented, including a clear reference as to how to interpret the CTG trace. This was not done.

For the medical and nursing staff not at this handover to be aware of the information provided by Dr Sekar, they would have had to receive this via a verbal handover from other staff.

CM Bennett stated she would not have changed her management plan if aware of the information communicated by Dr Sekar as her practice was always to check an abnormal trace. RM Sidhu says she was not given any information about previous CTG's that had been conducted.

Professor Jones and Dr Elharmeel, the two doctors providing clinical care at the crucial time when decisions needed to be made over the afternoon and evening of Mia's birth, were unaware of the information that was conveyed by Dr Sekar at the handover, in particular that Mia was to be treated like any other baby in labour. Dr Elharmeel says she found this out after Mia's death

Dr Elharmeel says that if she had been aware of this information, she would have rung the consultant suggesting that a caesarean section be performed rather than inducing Mrs Davies. She also testified that if she was aware of this information at her 1430 vaginal examination, she would have spoken with the consultant to determine whether to still proceed to labour or whether a caesarean needed to be performed.

Dr Minuzzo played little part (in hindsight she regrets this) in the labour and did not provide a handover to Professor Jones.

Professor Jones says he received a handover, presumably with the midwife team leader, at some time from 1630 – 1715 at the whiteboard. He stated that "we" were told about the anomalies the baby had and were told about the difficulties in interpreting Mrs Davies' CTG and what stage of labour she was in. Professor Jones did not recall the specific information he was provided about the CTG except he formed the impression there was not a normal CTG due to Mia's congenital anomalies.

Dr Minuzzo says she later saw Professor Jones in the hallway and asked if he wanted to go back to the whiteboard and have a handover. Professor Jones said no, he was aware of what was happening.

Professor Jones stated if he had been aware that Mrs Davies was to be treated as a normal labouring patient then that would have meant performing FBS.

Professor Jones did not review the high risk patients himself because he was satisfied with the information that he had been provided with. Professor Jones was more concerned about another high risk patient who was delivering twins. He did not personally attend and speak to Mrs Davies at the commencement of his shift.

Dr Keeping was of the opinion that Mrs Davies was not managed well at all in this period. He believed it would have been helpful for a clear management plan to have been communicated in the medical chart. Dr Keeping thought that whoever made the decision to continue with the labour should have been the person on call and making decisions regarding the progress of labour.

Dr Child commented that it seemed to him that there were quite a number of registrars involved during the management of labour and there were at least three or possibly four senior obstetric staff in some way contributing to the decision making and planning of management. Whilst having multiple inputs from a variety of people can often be useful in terms of suggestions and lateral thinking about some of the issues, his view was that in this particular case it was not helpful and that having a senior person taking the ongoing responsibility from the induction of labour to the time of delivery would have been helpful.

The suboptimal handovers and absence of a clear management plan, combined with the failure by the consultants to review a high risk patient such as Mrs Davies were crucial opportunities missed.

Presentation to Birthing Suite

A CTG was commenced at 1000 soon after presentation in the Birthing Suite. Registered Midwife ("RM") Sidhu noted that Mrs Davies' CTG showed a baseline of 125 and then 120, variability of less than 5 with a few accelerations and no decelerations.

Dr Mooring, an obstetric registrar who was rostered to an antenatal clinic, came to the birth suite to see if she could assist as she knew it was busy. RM Sidhu requested Dr Mooring, to review Mrs Davies as the birth suite registrar had been busy. This occurred at around 1220. Dr Mooring noted in the medical records that the CTG was "normal", which she described in evidence as being "similar to the antenatal CTGs". Dr Mooring conducted an artificial rupture of membranes.

Dr Mooring said the CTG was reactive to tactile stimulation of the head, which was reassuring. Dr Mooring placed a fetal scalp electrode for better monitoring and thought variability was initially improved. Dr Mooring said she discussed her actions with Dr Minuzzo.

Dr Minuzzo did not make any entry in the progress notes or CTG trace that she actually saw Mrs Davies or reviewed the CTG trace. Her statement signed 28 May 2010 also does not reveal this. In her evidence she says she has some recollection of reviewing the CTG with Dr Mooring at 1245 and then at 1445 but she could not be certain of this. It is probable she did not actually review the CTG. In any case, if she did review the CTG at these times it did not lead her to think any escalation was required.

Dr Elharmeel commenced her shift at 1300. She says she was of the opinion there was no specific plan in relation to the abnormal CTG's. Dr Elharmeel recalled the medical records containing comments about the abnormal CTG being linked to Mia's anomalies. The message she interpreted from the medical records were that the previous CTG's, whilst not fitting within the guidelines, had been accepted. The decreased variability had existed for a long time.

Dr Elharmeel stated that the background knowledge of Mrs Davies' previous CTG's coloured her expectation significantly and that the CTG's had never fulfilled the criteria however nothing further had been done. Dr Elharmeel confirmed that she was not told at any time to ignore abnormalities in the CTG because the baby had some anomalies.

I accept this was the position for Dr Elharmeel. She was aware of the background from her involvement in the antenatal care and I accept this coloured her expectations. She had not received any handover from the day registrar or the consultant. It is not clear what she would have been told anyway, given the handover information at 800 is either uncertain or at best was broken down in the process to be of little use.

Reviews of the CTG during the first and second stages of labour

There were a number of reviews of the CTG in this period by the midwives and Dr Elharmeel and it is not intended to set these out in detail. There may have been a policy of 15 minute reviews rather than the 30 minute reviews which in general were performed but I accept RM Sidhu and later CM Bennett were monitoring the CTG appropriately and had sufficient concerns at times to request a review by Dr Elharmeel.

There was some contention about whether CM Bennett provided updates to Dr Elharmeel or requested Dr Elharmeel to review Mrs Davies, and whether in doing so she was expressing any urgency or concern. The use of the language expressed in the records noting the request was suggested as being of significance.

Team Leader McClosky's statement indicates a recollection of CM Bennett being concerned about the CTG during the labour and escalating these concerns to the Registrar.

Dr Elharmeel stated that at no time did CM Bennett express any concern to her about the CTG. I find this most unlikely.

I am not critical of CM Bennett at all on this issue and accept when she made reference in the records suggesting she notified or requested a review she did so because she had some concerns. CM Bennett was an experienced midwife and it is unlikely she requested a review if she was not concerned.

In any event Dr Elharmeel did review Mrs Davies on each occasion the midwives made such request.

At 1430 and upon receiving a request to review, Dr Elharmeel attended, reviewed the CTG and performed a vaginal examination. Dr Elharmeel's statement notes there had been an ongoing abnormal CTG but the baby was reactive to the internal examination and she considered this to be reassuring in regards of fetal well being. Her plan was to continue and re-assess Mrs Davies in 4 hours and took the view that the CTG was the same as it had been antenatally which had been "accepted".

RM Sidhu completed the CTG documentation at 1430 and 1500 noting in the comments: "however FH reactive, abnormal unlikely" because there was only one feature of abnormality and Mia had reacted to tactile stimulation.

CM Bennett commenced her shift at 1415 and there was a handover between the incoming midwives and the outgoing team leader. CM Bennett recalls being told that Mrs Davies' CTG trace was abnormal due to Mia's conditions and RM Sidhu stated "it has been reviewed many times".

CM Bennett says she looked at the CTG tracings and saw a pattern of reduced to poor variability which she did not consider reassuring. Her management plan was to monitor Mrs Davies' condition and the CTG trace extremely closely and notify the registrar if she had a concern. She said she did not discount any concerns she had about the CTG because of Mia's anomalies.

There was little change over the next couple of hours although CM Bennett noted in the medical records on a number of occasions that the CTG had periods of reduced variability and non-reactivity and Dr Elharmeel had been notified or asked to review.

Dr Elharmeel signed the trace at 1610 and says it remained the same to those, which previously had been accepted. Dr Minuzzo says at 1600 she was informed by Dr Elharmeel that the CTG was acceptable and that the patient continued to labour. In her evidence Dr Minuzzo says she asked Dr Elharmeel "are you happy with the trace?" and Dr Elharmeel had replied "yes".

At 1630 CM Bennett spoke to Dr Elharmeel about an epidural request. She informed Dr Elharmeel that the CTG had not improved and Dr Elharmeel said words to the effect "this is to be expected with this baby".

Dr Elharmeel could not recall what she stated to CM Bennett, however I accept she said something along those lines. It is consistent with her impression the CTG would never be normal.

CM Bennett says "I recall my thoughts during this time of being somewhat slightly comforted due to the fact that all of the doctors involved were taking notice, but were not taking action, indicating to me that they were not overly concerned about the CTG".

This review period is significant as Dr Child noted that as the contractions became more frequent from about 1500, there were recurrent variable decelerations which become progressively more worrying around 1610 when the contractions were occurring very frequently (hyperstimulation). Dr Child was of the opinion that a scalp lactate or pH levels should have been tested around 1600 to 1700 by performing FBS.

Dr Elharmeel signed the CTG at 1730 which seemed to show recovery after the hyperstimulation. Dr Elharmeel was "accepting" of the CTG and I accept she passed this information onto CM Bennett.

At 1750, Dr Elharmeel says she discussed labour ward events with Professor Jones and "would" have told Professor Jones about the CTG never fulfilling the criteria and having reduced variability. Dr Elharmeel believed that the management plan that was agreed to was allow an hour for descent then active pushing and re-assess.

At some time between 1730 and 1755 Dr Minuzzo (who had concluded her shift as the on-call consultant at 1630), Dr Elharmeel and CM Bennett describe conversations about Mrs Davies being fully dilated. There is some contention as to who was present, when and what was said particularly about the CTG..

CM Bennett says she opened the door to find Dr Elharmeel and found Dr Minuzzo was near the staff desk. CM Bennett thought Dr Minuzzo was the consultant on call and was aware of the abnormal CTG results,and accordingly did not say anything about it.

Dr Minuzzo asked how the patient was. CM Bennett says she advised Mrs Davies was fully dilated and she could see a tiny amount of fetal head but

things were the same. Dr Minuzzo said words to the effect of “I am really relieved”. Dr Minuzzo believes she said “that’s great” because it would mean Mia would be delivered at a reasonable hour.

CM Bennett recalled that Dr Elharmeel was not present for this conversation., Dr Minuzzo does not recall who was present.

Dr Elharmeel says CM Bennett came out of the room very excited because Mrs Davies was fully dilated. Dr Minuzzo stated she was relieved because she was concerned about a high risk patient being induced at midday rather than early in the morning. Dr Minuzzo then asked “Are you happy with the CTG?”. CM Bennett said it was still the same, the variability has never been great and there were some variable or early decelerations. Dr Elharmeel then said “but the baby’s reactive to the internal?” and CM Bennett said “Yeah, we are all good, we are fine.”

Dr Minuzzo rejected Dr Elharmeel’s version

Whatever version is correct, this was an opportunity, which was missed, for a review of the CTG and of the management plan, such as it was, with the midwife, Registrar and a Consultant.

Dr Minuzzo agrees she should have done more prior to her leaving the shift. In a retrospective review of the CTG she believed from 1600, Mrs Davies was hyperstimulated and Mia was not responding to this. Dr Minuzzo believed this was information she should have been aware of prior to her leaving. Dr Minuzzo agreed with Dr Child’s view that FBS should have occurred, between about 1630 and 1730.

Dr Elharmeel says that between 1800 and 1810, she reviewed Mrs Davies and the trial of pushing was abandoned after minimal descent and Dr Elharmeel instructed CM Bennett to wait an hour for passive descent.

The CTG was still regarded as abnormal unlikely because there was some variability in between the contractions. Dr Elharmeel says all findings were discussed with Professor Jones. Professor Jones stated that he “would have” been told that Mrs Davies was fully dilated and about the decision to allow passive descent.

I am unable to determine with any confidence what was said by either of them, but it certainly did not escalate any review by Professor Jones or change the management plan.

The experts were asked to comment on the decision to allow passive descent for an hour. Dr Keeping says if the clinician was not happy with the CTG trace then waiting an hour was not appropriate. Dr Keeping was not happy with the whole labour, but in the context of being happy about the previous 4 days of CTG tracing, his view was that waiting an hour was appropriate. Dr Keeping had the same view in relation to the issue of Mrs Davies being fully dilated at 1730 and not pushing until 1930.

Dr Child says if the FBS was normal then it was appropriate to wait one hour for the head to descend but in order to wait almost 2 hours from full dilation to commence to push, the clinician would need to be confident of the well being of the baby.

Dr Child says the first stage of labour was not managed well. Contractions were coming too frequently and causing some distress to Mia and this should have been managed by reducing or stopping syntocinon and taking note of changes in the FHR and performing FBS.

At 1910 CM Bennett conducted a vaginal examination and noted Mrs Davies had a narrow pubic arch, the presenting part was still high, she believed Mia was not likely to be delivered soon and it would be difficult for the head to descend. I accept CM Bennett says she notified Dr Elharmeel to examine the CTG and to advise of her vaginal examination findings. CM Bennett began preparing paperwork for a caesarean.

Dr Elharmeel attended and reviewed Mrs Davies. Dr Elharmeel did not advise CM Bennett of her findings. When later advised by Dr Elharmeel to start a trial of pushing, CM Bennett thought she had got her vaginal examination wrong.

Dr Elharmeel says that Mrs Davies was fully dilated with the baby in a cephalic presentation, station was at the spines and the position of the baby was left occipito anterior. There was 1+ caput and 1+ moulding. Dr Elharmeel also observed a narrow pubic arch. Dr Elharmeel stated that during her abdominal palpation the head was one-fifth or less palpable. Her opinion was that this was a grey area about whether the head will actually descend or not.

Dr Elharmeel left the room and advised Professor Jones Mrs Davies may need an assisted delivery considering her narrow pubic arch. According to Dr Elharmeel, Professor Jones advised that they would need to be careful about the instrument and that in general forceps are preferred over vacuum in this situation on a preterm baby. Dr Elharmeel recalled there was no specific recommendation at that point, other than they needed to let Mrs Davies have a proper trial of pushing to see if she could deliver the baby on her own.

Between 1930 and 1955, Mrs Davies continued active pushing and despite good contractions and maternal effort there were no signs of descent or progress. CM Bennett did not notify Dr Elharmeel or the consultant about the lack of descent, expecting one of them to return to review.

Assessment by Dr Elharmeel and Professor Jones at approximately 2020

It is agreed Dr Elharmeel and Professor Jones assessed Mrs Davies at 2020. There is disagreement as to in what circumstances this was initiated and what was said.

CM Bennett says she saw Dr Elharmeel with Professor Jones at the staff desk in conversation and she notified Dr Elharmeel of no progress and that the

CTG needed review and words to the effect of “you have got to come in.” As a result Dr Elharmeel and Professor Jones immediately attended Ms Davies.

Dr Elharmeel says she wanted to know what was happening in Mrs Davies’ room. and recalls requesting Professor Jones’ permission to be excused to go next door.

Dr Elharmeel says she noted a pathological CTG, with absent variability and ongoing deceleration with contraction and heavily blood stained urine draining into the catheter bag. Dr Elharmeel performed an abdominal examination and noted 1/5 of the fetal head was palpable above the symphysis pubis. Dr Elharmeel performed a vaginal examination and noted Mrs Davies was fully dilated with a cephalic presentation, at station spine to +1 and the position of the fetus was left occipitoanterior 2+ caput, 1+ moulding. Dr Elharmeel says “knowing Professor Jones was in the room next door I elected to run next door and inform him about the findings rather than ringing the emergency alarm for a category 1 caesarean section.”

Dr Elharmeel says she went next door and told Professor Jones that he had to come and see Mrs Davies right away, “we have a horrible CTG, the variability is just flat, no more variability, we have caput moulding, high head, urine is just red. I need you to see her right now I’d like to do a cat 1 caesar please.”

Professor Jones did not have an independent recollection of what was said about the CTG, denies the substance of this version but then did not dispute it outright.

Professor Jones says he looked at the last 20 minutes or so of the CTG. The baseline was within the normal range, there were some accelerations but the variability was reduced. Professor Jones believed the decelerations were normal for this stage of a patient in advanced labour and was pushing. He described the CTG as being abnormal, unlikely to be associated with fetal compromise.

Professor Jones performed an abdominal palpation which revealed Mia’s head was 1/5 out of the pelvis. His vaginal examination showed Mrs Davies’ cervix was fully dilated and the fetal head descended to station plus 1. Professor Jones noted the lower pelvis was reduced in size. He stated in evidence that whilst he noted Mrs Davies’ reduced pelvis that you might be concerned an average size baby would get stuck. Given Mia was a smaller than average he would expect it to be delivered in a smaller than average pelvis. He was able to move Mia’s head up and down which indicated Mia’s head was not stuck.

Dr Elharmeel says that Professor Jones advised the head would come out easily with a vacuum extraction. Professor Jones’ management plan was for Dr Elharmeel to take Mrs Davies to the operating theatre and perform a trial of vacuum delivery or forcep delivery. He made the decision for the trial to occur in theatre in case there were any difficulties, a caesarean could be performed.

Professor Jones stated he would have thought that Mia would be delivered within half an hour but he did not convey this information to Dr Elharmeel.

Professor Jones did not voice any concerns about the condition of the baby because he did not hold any such concerns.

Again I am unable to say with any confidence what is the true version of events.

Whatever version is correct, and although Professor Jones' assessment was the complete opposite to Dr Elharmeel's she did not raise with Professor Jones that her assessment had been different, and she accepted the fact that he was more experienced.

Dr Elharmeel says that once Professor Jones provided his view she completely trusted her consultant and his experience and followed his management plan.

Events in the operating theatre

Mrs Davies was ready for transfer at 2030 and the epidural was topped up prior to departure.

CM Bennett provided a verbal handover to CM Torrielle and both agreed that CM Bennett made reference to the CTG having been poor all day and there was no variability.

Dr Elharmeel says there was no urgency in theatre because after Professor Jones stated it was a trial. That view seems to have been followed by the other theatre staff but I am not critical of them. No-one expected Mia to need extensive resuscitation.

There were a few problems in the theatre. The Chorometric CTG was not working so a Fetal Doppler was used. Later a wardsman arrived with replacement Phillips CTG however CM Torrielle did not know how to use a Phillips CTG and therefore continued to use Doppler. In this time CM Torrielle had a scribe record the time of events and the FHR on a scrap piece of paper.

The matters raised above were ultimately the subject of recommendations for improvements by the Hospital and are mentioned in that context. These problems certainly did not allow for optimal treatment but did not affect the outcome.

This is because Dr Child thought the initial gas levels of Mia would suggest that she had been compromised for some considerable time. He also said that the monitoring during the instrumental vaginal delivery by merely noting the FHR was inappropriate and that FBS should have been taken much earlier.

Between 2106 and 2118 Dr Elharmeel applied the vacuum and applied 4 pulls with each contraction. At this time, Dr Schmidt entered the theatre.

Dr Schimdt went to see Professor Jones in the birth suite to inform him about the progress of the vacuum extraction and to ask him on behalf of Dr Elharmeel for permission to proceed with a forceps delivery.

The outcome was they could try one pull with forceps and if this did not work to perform a caesarean section. Essentially this is what occurred.

Professor Jones now says he was surprised the baby had not been delivered by this stage but he was not concerned because he did not think Mia was compromised. He was not given nor did he seek any information about the well being of Mia. Professor Jones says he did not ask whether Mia's head had been descending with the vacuum attempts and this was an error.

Neither Dr Keeping nor Dr Child was critical of the number of attempts at the vacuum delivery or forceps. Both experts agreed the choice of instrument is an individual's decision.

It seems at this stage Dr Schmidt asked about the condition of the baby by stating "is the baby happy?" Dr Elharmeel replied that it was "not happy". Dr Elharmeel says she advised Dr Schmidt that the CTG was pathological. Whatever was said Dr Schmidt telephoned Professor Jones who agreed that it was now appropriate to proceed to an emergency lower segment caesarean section.

There was some issue as to whether this was made a "Category 1 caesarean section" and I accept that Dr Schmidt felt there was no need to make the category 1 caesarean phone call because everyone who was required to be present was already in attendance in theatre.

It may have been that more senior staff from the intensive care nursery and paediatricians would have attended but in not calling a category 1 caesarean this did not contribute to Mia's death, as it is clear her condition before that time was already compromised.

Mia's birth and resuscitation

Mia was born at 2152. She was pale with no tone present and no signs of any attempt to breath.

Resuscitation was commenced and a heart rate was achieved at 9.5 minutes of age. At 30 minutes of age, following the administration of adrenaline and further CPR, the heart rate increased from 40 beats to about 100 beats per minute but there was no evidence of spontaneous respiration.

Dr Bostock, a neonatologist arrived at 13 minutes of age and Mia had a heart rate of 100 bpm, however she had no muscle tone, no spontaneous breathing and no movements. The cord analysis showed severe acidosis, with a pH of 6.6 indicative of intrauterine asphyxia and associated with hypoxic ischaemic encephalopathy and permanent neurological damage. A pH of 6.6 has a very poor prognosis for survival.

This was discussed with her parents and that death was likely and if Mia did survive there would be severe neurological impairments. Active measures were subsequently ceased.

Dr Bostock was of the opinion that Mia's congenital anomalies alone would not have caused Mia to be born in this condition and could not have contributed to her clinical picture at birth.

There is no suggestion the resuscitation attempts were not competently and professionally conducted.

Were there any indications during labour that a caesarean section should have been performed earlier?

Although Dr Child thought the decision to induce Mrs Davies was appropriate and it was reasonable to attempt a vaginal delivery, he acknowledged a lot of people would opt for a caesarean section. This was on the basis of delivering Mia at a definitive time to allow for plans to be made for her surgery. Another reason might be due to concern on the CTG because the stress of labour might add another factor to the potential risk to the baby.

Dr Child stated he personally would have favoured a short trial of labour of about 6 to 8 hours given that during labour there is a significant development of lung function. He agreed the fact that Mrs Davies had steroid injections was a positive feature and would make a caesarean section safer and less risky.

Dr Keeping was of the opinion this was a high risk pregnancy. Mia had two anomalies that were detected antenatally and polyhydramnios, combined with a flattish trace for 4 days. He says that most obstetricians would not have subjected Mia to the stress of labour and would have performed a caesarean section much earlier.

Associate Professor Kimble agreed when she testified that here they were putting a baby into labour who had demonstrated reduced variability and they did not know whether Mia will cope with labour. She says that she would have offered a caesarean on the basis that the baby was stressed, had demonstrated some changes to the CTG even before the stress of labour and in the process of induction the previous abnormality had not improved sufficiently.

Dr Keeping was of the view that on 10 April 2010, a decision should have been made about what to do about the CTG trace. The trace could be described as "maybe" associated with fetal compromise so therefore this needed to be acted upon.

Dr Child and Dr Keeping agree the baseline of the CTG in labour remained with reduced variability and was not a significant change from the antenatal CTG's.

Dr Keeping says that there were dips in the FHR near the end of first stage and into second stage. These dips (although it is not always possible to work

out how they correspond to contractions) seemed to be of the "type 1" variety or early decelerations which are regarded as resulting from compression of the head in labour and to be a "normal" variation in late labour.

Dr Child noted that as the contractions became more frequent from about 1500, there were recurrent variable decelerations which become progressively more worrying around 1610 when the contractions were occurring very frequently but they were not disastrous or drastic.

Dr Keeping says the CTG trace was acceptable at the 1600/1610 mark. It was the same as it had been previously, with flat variability, no significant accelerations and not really any significant decelerations.

Dr Child was of the opinion that a scalp lactate or pH levels should have been done around 1600 to 1700. He indicated FBS should have been considered at this time to get a baseline. Dr Keeping stated that if the CTG had got suddenly worse then the correct option would be to do FBS.

Dr Child says the CTG between 1800 and 2020 remained not totally healthy and warranted further assessment. Dr Keeping says there were dips but they return to the baseline. According to Dr Keeping, there was nothing new or concerning that would indicate to the clinician to change the management plan.

Both Dr Child and Dr Keeping were of the view that the CTG at 2020 was not "pathological". The both agreed with Professor Jones' assessment of the CTG. Dr Child would have performed FBS to determine whether a trial of instrumental deliver could occur.

Dr Child says that given the circumstances it was appropriate to justify instrumental delivery and it was a good decision to trial instrumental delivery in the operating theatre.

Dr Keeping was of the view it was alright to attempt an instrumental delivery however there would be concerns about whether the baby could be delivered vaginally and it would not be an easy procedure. Dr Keeping was of the opinion, ignoring the CTG trace for the previous 4 days, nothing indicated a caesarean should have been performed at this time. He was not critical of how Dr Elharmeel managed the case in those circumstances.

Interpretations by other Clinicians of the CTG and actions that should have been taken

Dr Sekar gave evidence that following Mia's death she reviewed the CTG for the labour period. She was of the view that the CTG during labour was different to what it had been antenatally because there were no accelerations and decelerations were present.

Associate Professor Kimble was of the opinion that the CTG was abnormal at the 1630 mark and required intervention. Associate Professor Kimble agreed

with Dr Child's assessment that FBS should have occurred at this time as did Dr Minuzzo.

Dr Minuzzo was of the view that the CTG from at least 1940 showed a hyperstimulated mother and a baby that was significantly compromised. She categorised the CTG as abnormal very likely and would want to deliver the baby as soon as possible. She would have assessed Mrs Davies to determine if it was possible to deliver vaginally or whether she needed to perform caesarean. Dr Minuzzo would not have performed FBS at this time because Mia needed to be delivered as soon as possible.

Associate Professor Kimble stated that the CTG from 2000 to 2020 showed absent variability, complicated decelerations with no accelerations. This would be categorised as abnormal, very likely associated with fetal compromise. Associate Professor Kimble believed the CTG indicated delivery needed to be expedited and at the very least, FBS should have been undertaken at this time. Associate Professor Kimble was of the view it was appropriate to perform a vaginal examination to assess the patient's progress and determine whether the appropriate mode of delivery would be to do an operative vaginal delivery. Associate Professor Kimble stated it would be entirely appropriate, prior to calling a category 1 caesarean, to go next door to speak to the consultant first.

Associate Professor Kimble was given findings of vaginal examinations performed at that time and stated that she would have performed a caesarean section, the urgency or category to be determined after performing FBS.

Professor Jones indicated that one of the lessons learnt was that FBS should have been performed earlier in labour. He also stated that they had learnt that the assumption that the CTG was abnormal due to Mia's structural issues with her heart was incorrect.

Autopsy Examination

Dr Urankar performed a full internal autopsy on 15 October 2009.

The autopsy examination confirmed the duodenal atresia but in addition a further anomaly in the form of oesophageal atresia was also found. This essentially prevented the normal passage of fluid or food from the oesphageous to the stomach and combined with the duodenal atresia the stomach was essentially sealed off.

The oesophageal and duodenal atresia should not have contributed to the difficult delivery or to death although they would have contributed to the development of excess amniotic fluid.

The heart also demonstrated an atrioventricular septal defect and this would have altered the normal flow of blood to the heart. It was considered that this would not have created a significant problem in utero but would have required surgical corrective treatment soon after birth. The defects in the

gastrointestinal system would also have required corrective surgery within the first two days of life.

An examination of the brain confirmed a subarachnoid haemorrhage which was likely to have been caused as the consequence of terminal hypoxia. The subarachnoid haemorrhage was simply an indication of the hypoxia and not as a result of trauma from the childbirth. This occurred during the peripartum period considered as during labour, and particularly the second stage of labour. Dr Urankar confirmed that the hypoxic injury definitely occurred between 1245 and 2153 but more likely towards the second stage of labour.

Dr Keeping noted the autopsy findings of prolonged hypoxia. He does not know whether if a caesarean section had been performed earlier whether Mia would have been drastically better but the answer to this was probably or possibly yes.

Dr Child stated that the gas levels indicated there had been fetal hypoxia for at least half an hour and possible up to four hours.

Subgaleal haemorrhage was also found under the scalp which was likely to be a consequence of the difficult delivery including the obstructed labour and the consequent forceps and vacuum extraction. This was a contributing factor to the death in that it may have caused her blood volume to drop and may have affected Mia more than a child without her existing anomalies. It was not the cause of death.

There was evidence in the brain there had been some pro-longed hypoxic complications, which may have been related to the underlying congenital cardiac abnormality however there was no way this could have been predicted prior to examination of the brain. Mia's low birth weight and head circumference indicated that there had been a long-standing process affecting her. The neuropathology report identified the evidence of intrauterine hypoxia. This would have existed more than a week prior to Mia's delivery but this did not cause her death.

Dr Urankar considered the cause of death was Peripartum hypoxia leading to a probable hypoxic ischaemic insult to the brain. The effects of the prolonged delivery may have been worsened by the underlying congenital cardiac abnormality although this was not expected to have had any complications at birth.

Reviews conducted after Mia's death and changes made

Review by Associate Professor Kimble

Associate Professor Kimble is the Clinical Director of Obstetric Services and is responsible for clinical governance in close liaison with the patient safety and quality officer.

Following Mia's death, Associate Professor Kimble conducted an informal review with the medical staff involved, namely Professor Jones, Dr Sekar, Dr

Minuzzo and Dr Elharmeel. This was a general discussion about who received what information and where gaps might have been. It was agreed that things could have been done better, such as better communication, better handover and acting on a trace that was overtly abnormal.

On reviewing the records an immediate cause for concern were the actions of Dr Elharmeel because it appeared that she had ignored or not noticed the non-reassuring trace and had not reported it to Dr Minuzzo. Associate Professor Kimble concluded neither Dr Sekar nor Dr Minuzzo told Dr Elharmeel to ignore or discount the abnormal CTG in this case.

Associate Professor Kimble noted Mrs Davies' management plan did not comment specifically on the CTG.

Associate Professor Kimble's opinion was that communication from Dr Sekar, the Maternal Fetal Medicine specialist, could perhaps have been clearer as to the abnormality of the CTG trace antenatally and that interpretation of the CTG and actions taken ought to have happened according to the Hospital's accepted practice based on the current guideline and processes in place.

Associate Professor Kimble thought the CTG interpretation by the on duty staff was there was possible reassurance, albeit falsely, of the fetal status based on an ultrasound by Dr Sekar suggesting a well baby in the setting of an abnormal CTG trace two days earlier. It should have been reinforced by Dr Sekar that normal perinatal procedures were to apply.

Associate Professor Kimble considered that there was apparent suboptimal consultant review and supervision of the labour and CTG monitoring by the consultant on duty of this complex situation. She was critical of both Dr Minuzzo and Professor Jones about not knowing what was happening in all of the rooms. In hindsight, given the antenatal history and congenital abnormalities in this case, she thought closer consultant involvement should have occurred.

Associate Professor Kimble was of the opinion that there should have been a discussion between Dr Elharmeel and Professor Jones at the time of the 2020 assessment about how to manage the delivery from this point on, including the well-being of the baby and whether the baby needed to be delivered straight away.

Associate Professor Kimble was of the view that it appears to have taken 40 minutes to take Mrs Davies to theatre. Even in the absence of a category 1 caesarean section being activated this was too long particularly in view of the trace which indicated at least an expedited category 2 caesarean section should have occurred.

Once in theatre, it still took 50 minutes to effect delivery. Whilst it is not unreasonable to trial operative vaginal delivery, the delivery should not be delayed and repeated attempts should not occur.

It was Associate Professor Kimble's view the urgency and degree of abnormality of the CTG trace appears not to have been appreciated.

Associate Professor Kimble stated she considered the care provided was substandard and apologised to the family for what had happened and for their loss.

Associate Professor Kimble's statement was valuable. Her views largely accord with the facts as determined in this inquest and with other experts. Without being critical of her personally, her statement was not provided to this office until after 1 June 2012, and well after the inquest had been set down. A much earlier provision of her statement may have assisted the investigation and even alleviated the need for holding an inquest. An earlier statement may have assisted Mr and Mrs Davies who have been rightly critical of the lack of information they were given after Mia's death.

Root Cause Analysis ("RCA")

A RCA was conducted. As will become immediately apparent, I have concerns as to the process utilised in conducting the RCA.

A number of statements of staff, which were prepared for the coronial investigation, were apparently forwarded to the RCA team. The RCA team did not interview, it would appear, any of the relevant staff.

Dr Graves was of the opinion that even though statements were provided, this did not preclude the RCA team from contacting the relevant people directly and in a privileged environment. Dr Graves was of the opinion that this should still occur.

Dr Graves provided a statement indicating that she was aware the Coroner had concerns regarding the input from relevant people into RCA's within Queensland Health. This has been ongoing for some years.

On 5 July 2012, in the matter of the inquest in relation to Patient A, I commented that *wherever possible, Root Cause Analysis processes should be conducted such that relevant members of a treating team, if they wish to participate, are provided an opportunity to be interviewedand are provided with feedback as to the outcome of the RCA.*

As a result of my concerns, Dr Graves has now tightened the process to ensure that consent is obtained and relevant people are also contacted directly by the RCA team to see if there is any additional information they wish to provide (in a confidential environment). It has been reinforced in general the importance of interviewing relevant people.

This remains an ongoing statewide issue for all coroners and the Office of State Coroner has since the inquest consulted with Dr Wakefield, Director of the Patient Safety Unit regarding a degree of loss of confidence in the RCA process. This consultation process will continue.

Notwithstanding the process flaws the RCA team was able to make some uncontroversial findings.

The RCA team acknowledged the fact the CTG was abnormal in the antenatal phase and identified by 1900 the CTG trace had deteriorated and not been acted upon after review by medical staff. The RCA team were unable to establish why the RANZCOG protocol for abnormal CTG tracing was not followed. FBS was not documented as having been attended and this may have assisted with the decision making process.

The RCA concluded that a contributory factor was the adequacy of CTG monitoring, escalation and response and decision making around the delivery of the baby. The RCA recommended that policy and guidelines be reviewed to reflect prescriptive measures with monitoring, recording and escalation of any risk issues relevant to phase 1-2-3 of delivery. The outcome measure for this recommendation was a review or policy and guidelines that impact delivery procedures with particular focus on CTG monitoring and response protocols to be in line with RANZCOG guidelines.

Another recommendation made by the RCA team was that a review of competency, training and credentialing occur. The outcome measure of this recommendation was for a review of competency/credentialing for medical staff and curriculum based processes for nursing staff particularly around 2nd phase of delivery and intrapartum surveillance.

The RCA team identified in the lessons learnt an issue around escalation and response and decision making around the delivery of the baby. The recommendation in relation to this issue was processes and training for graded assertiveness and escalation of issues are reviewed by the multidisciplinary teams. Associate Professor Kimble stated she believed this was in relation to all staff, midwifery and medical.

An update on the implementation of these recommendations noted that graded assertiveness is available to all midwifery staff as it is a component of HEAPS training. The update noted that all midwifery staff in the birthing suite are familiar with the process for escalating concerns.

Changes made

CM Bennett stated there had not been training directed at encouraging assertiveness on the part of nursing or midwifery staff.

In July 2010, CN Torrielli and a number of other midwives underwent a short inservice training course in how to use the Phillips CTG machine.

CM Torrielle also told the court that there was now an assisted delivery form (as distinct from a scrap piece of paper used here) that is located in the birth suite and operating theatre to record attempts at instrumental delivery and the FHR.

As a result of her review, Associate Professor Kimble reiterated within the department that in future, all deliveries of babies with suspected congenital abnormalities would be led by the consultant on duty with the assistance of the obstetric registrar.

Associate Professor Kimble requested that Maternal Fetal Medicine services strengthen communication by having a system of a bright coloured folder with all relevant Maternal Fetal Medicine plans to facilitate assessment and action plans for on duty obstetric staff.

Dr Sekar gave evidence that now a special form for Maternal Fetal Medicine patients where it is recorded information about the baby and there is an inclusion that if vaginal delivery happens to treat the baby like any other obstetric baby. CM Bennett and Dr Minuzzo confirmed this rider was now in place at the Hospital.

Additionally all staff dealing with complex cases are required to enter this into the Action Plan of the Statewide Pregnancy Health Record (implemented in August 2010).

The Maternal Fetal Medicine specialists are now always required to attend the 815 handover. Associate Professor Kimble stated that clear and concise documentation of action plans by specialists in the hand held pregnancy record have facilitated better communication.

It appears some progress has been made in relation to the RCA recommendations although it may be more needs to be done in relation to Graded Assertiveness training.

The current Hospital policy on Fetal Surveillance now contains a flow chart providing a summary of abnormal Fetal Heart Rate (FHR) management. If the CTG is not normal, the flow chart suggests assessing the CTG for reversible causes and taking action to initiate corrective actions. It further recommends that if the problem does not resolve, further interventions such as continuous CTG, obstetrician consultation, FBS and/or expediting birth should be considered. The policy notes FBS is recommended in the presence of a FHR, which remains abnormal despite appropriate corrective actions, unless there is clear evidence of acute compromise. Any clinician who is asked to provide an opinion on the trace should: *"note their interpretation (normal/abnormal) on the CTG, note their interpretation of the trace and the proposed actions in the health record and include the date, time and their signature".*

Morbidity and Mortality Meeting

Mrs Davies' presentation was discussed at a morbidity and mortality meeting ("the meeting") on 14 June 2012.

The meeting noted that current and ongoing budget constraints were seriously affecting the Hospital's ability to deliver education including Fetal Surveillance to all staff especially by the medical staff. There were concerns that the expectation of attendance at mandatory training and education in relation to

fetal surveillance impacts significantly on service provision due to chronic understaffing particularly at consultant level. The outcome in relation to this issue was to put in place better resources and support in 2013.

A further outcome measure is that all consultants, registrars and midwives access and provide documentary evidence in their performance review which includes sign off attendance at the RANZCOG training and completion of the online RANZCOG Modules and K2 program. This is to be implemented in 2013.

There was also a request that a recommendation is escalated through the submission of a business case to the executive to provide consultant support to reduce clinical risks within the obstetric environment.

Another issue that was noted was clinical handover and assertiveness. An outcome measure is that a multidisciplinary clinical handover occur at 815 and 1630. The morning handover is a formal situation where cases in birth suite and gynaecology admissions are discussed, creating an opportunity for clinical education and peer review. The afternoon handover occurs at the midwives station in birth suite in front of the whiteboard. The midwifery team leader is to be present at the morning and afternoon handover to ensure any midwifery issues can be relayed to the appropriate staff. This meeting is to be attended by the incoming and outgoing registrars and covering consultants. These measures are all currently in place.

As I stated previously more needs to be done in relation to Graded Assertiveness as the meeting recommended clinical staff have access to HEAPS training and that covering staff are empowered in providing direct communication to the medical team and/or consultant when recognising the need to escalate if they are unsure or unhappy with the current plan of care. Education on graded assertiveness was recommended to be provided to new staff and included in the medical induction programs.

Dr Kimble stated this was to ensure that the Hospital's culture empowered midwifery staff to escalate concerns to the consultant if they were not happy with the registrar's management plan.

Comments and conclusions

Mia's tragic death has seriously distressed her parents. There is also no doubt the staff involved in Mrs Davies' labour have seriously considered their role in the outcome.

There is no absolute view about the appropriate management of different aspects of Mrs Davies labour. In particular, Dr Keeping and Associate Professor Kimble would have offered a caesarean section in the first instance. Dr Child was not critical of a short trial labour, although he accepted many obstetricians would have proceeded with a caesarean. In anyone's language what occurred was not a short trial.

There was also differing views about the categorisation of the CTG at various times during the labour, reflecting Dr Child's comment about CTG interpretation being an art and not a science. The interpretation and use of these monitoring devices is certainly not straightforward, and as this case indicates, prone to misinterpretation.

What is clear from the evidence, and whatever may have been the view about the CTG, there were numerous opportunities, where if different action had been taken by the relevant clinicians, a different outcome may have resulted.

Mrs Davies' CTGs for a number of days prior to her labour were abnormal. Other than evidence reporting fetal movement, there was no other information or reassurance sought regarding Mia's well being. Although I am satisfied that there was appropriate monitoring and reviews undertaken in relation to the CTG, and notwithstanding the confusion over the expectation the CTG would always be abnormal, other action should have occurred to ascertain Mia's well being prior to allowing the labour to progress. Fetal Blood Sampling, a simple and accurate testing procedure, was in reality never seriously contemplated.

The information or expectation that Mrs Davies' labour was to be treated as normal was not clearly communicated to the staff caring for Mrs Davies. There should have been a clear management plan, detailed in Mrs Davies' medical records, outlining Dr Sekar's expectations regarding CTG abnormalities antenatally and during labour. What was communicated at the 815 handover is unclear and in any event was not passed on to the main players.

It is most likely that if this information had been communicated appropriately, further action would have been taken in relation to the abnormal CTG by seeking reassurance about Mia's well being. FBS would have been conducted and it is more than likely this would have picked up much earlier there were signs of fetal compromise.

It was reasonable, on the part of Dr Elharmeel to take the position that the reduced variability had been acknowledged on previous occasions and to assume that this was "normal" for Mrs Davies on the basis that no further action had been taken in the past.

I am not so certain this should be the same position for Professor Jones, given his seniority, but I accept he was given insufficient information to alert him to taking further action. He and Dr Minuzzo, as consultants agree they should have done more.

Mrs Davies' pregnancy was complicated and her labour was high risk and warranted regular review and monitoring by the consultants on call. A review of the management plan should have been conducted at each handover and then noted in the record. This may have resulted in a different management plan being adopted or at least regular reviews with the assistance of input from the midwives, registrar and consultant.

There is disagreement about the assessment of the CTG at 2020. Some of the witnesses described the CTG as pathological or abnormal very likely, whereas others described the CTG as abnormal. All now agree further investigation should have occurred to ensure Mia's well-being.

Despite Professor Jones' view it was appropriate for a trial instrument delivery to take place being in complete contradiction to Dr Elharmeel's view, she did not engage in any discussion with him about this. I accept his seniority together with the fact he had just performed his own review was a significant factor in not questioning the decision.

There should have been a much more detailed discussion between Professor Jones and Dr Elharmeel about how to manage the delivery from this point on, including the well-being of Mia and whether the baby needed to be delivered straight away and the time frame.

It took almost 1.5 hours for Mia to be delivered after a decision was made to trial an instrumental delivery. Even though there are a number of factors which offer some explanation for the delay, this was too long. It is difficult to say if the delay had any impact on the outcome. It is probable there was significant fetal compromise before the decision was made, but the delay was suboptimal treatment.

Findings required by section 45

1. In accordance with section 45 of the *Coroners Act 2003* ('the Act'), a coroner who is investigating a suspected death must, if possible, make certain findings.

2. On the basis of the evidence presented at the inquest, I am able to make the following findings:

    a. the identity of the deceased person is Mia Davies;

    b. Mia died as a result of result of being deprived of oxygen at some point during her labour, most likely during the second stage of labour. There were numerous opportunities for Mia's well-being to have been reviewed and ascertained, however this did not occur and Mia was born in such a compromised condition that was irreversible and not compatible with life.

    c. the date of death of Mia's death was 15 April 2010;

    d. the place of death was the Royal Brisbane and Women's Hospital, Brisbane;

    e. Mia's cause of death was peripartum hypoxia. A number of conditions contributed to Mia's death including her congenital anomalies of atrioventricular septal defect, oesophageal atresia, duodenal atresia and a subgaleal haemorrhage.

Recommendations in accordance with section 46

Section 46 of the Act provides that a coroner may comment on anything connected with a death that relates to:

a. public health and safety,

b. the administration of justice, or

c. ways to prevent deaths from happening in similar circumstances in the future.

There have been a number of reviews undertaken by the Hospital and there have been a number of improvements and suggested changes recommended.

I agree with Ms Martens' submissions that I recommend the Hospital consider the suggestions made at the Mortality and Morbidity Meeting in order to ensure as many of the suggestions for improvement can be implemented.

Both Dr Child and Dr Keeping were of the opinion that Mrs Davies was not managed well. There was not a clear management plan communicated at handovers or recorded in the medical chart. Both of them were critical that no one person was making decisions regarding the progress of labour.

Given it is unlikely that there will be sufficient resources available in the short to medium term to have consultant led care for all patients or even for the consultants to review all patients in the birth suite, changes still need to be made so that other parents do not have to face the same tragic outcomes as Mr and Mrs Davies experienced. At the least, the on-call consultant should conduct a review of all of the high risk patients when they commence a shift.

Given Mrs Davies met the criteria for being defined as a "high risk patient" I agree with Ms Marten's submissions and recommend the Hospital adopt a policy, procedure or practice that at the changeover of shifts between consultants (i.e. at 815 and 1630) that a consultant (either the outgoing or incoming) personally review all high risk patients to satisfy themselves of the ongoing management plan and that the management of the patient is appropriate.

The Statewide Pregnancy Health Record now provides a central document for clinicians to refer to in an emergency. The management plan is contained in this document and is used in 41 facilities across the state. It would seem appropriate that it is in this document that the plan of management and a record of any change to the plan should be set out.

I am not convinced it is practical to have the handovers for each patient recorded and documented. What is important is that a management plan is documented in the first place and any changes, whether arising from a handover or some other review are documented in the record.

The Hospital now has a policy that any clinician asked to review a CTG should note their interpretation of the trace on the trace itself and in the medical records and also note the actions to be taken. Given I have now heard evidence in two recent cases involving Queensland Health facilities, which suggests this practice has not universally been adopted, I agree with Ms Martens' submission and recommend the Hospital should conduct an audit to ensure that this is occurring satisfactorily.

I also agree with Ms Martens' submissions that given Mia's death was as a result of the failure to adequately manage Mrs Davies' labour and was not the responsibility of any one individual no-one should be referred to the Australian Health Practitioners Regulation Agency.

I close the inquest. I offer my condolences to Mr and Mrs Davies.

John Lock
Brisbane Coroner
BRISBANE
28 September 2012