QUEENSLAND COURTS

OFFICE OF THE STATE CORONER

FINDINGS OF INVESTIGATION

CITATION:	**Investigation into the death of Sophie Claire Sparreboom**
TITLE OF COURT:	Coroners Court
JURISDICTION:	Brisbane
FILE NO(s):	2008/541
DELIVERED ON:	5 September 2013
DELIVERED AT:	Brisbane
FINDINGS OF:	John Lock, Brisbane Coroner
CATCHWORDS:	Coroners: Child Birth, Gestational Diabetes, Induction, CTG Tracing Interpretation, Whether Caesarean section should have been escalated.

Counsel Assisting:	Ms Alana Martens, Office of the State Coroner

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Terminology

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

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

c. Definitions in relation to foetal monitoring of the foetal heart rate (FHR) are contained in Appendix E of the RANZCOG guidelines which applied from 2006. They are as follows:

Term	**Definition**
Baseline foetal 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 beats per minute (bpm). Preterm foetuses 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
Baseline variability : Normal baseline variability: Reduced baseline variability: Absent baseline variability Increased baseline variability **Sinusoidal:**	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. 5 – 25 bpm between contractions 3 – 5 bpm < 3 bpm > 25 bpm 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

d. The RANZCOG guideline notes as a good practice for women receiving continuous electronic foetal 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.

e. The RANZCOG guideline contained the following good practice note for assessing CTG's:

The normal CTG is associated with a low probability of foetal 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 foetalo 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 foetal 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

f. 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 abnormality and initiation of appropriate action (e.g., correction of maternal hypotension, cessation of oxytocin) and initiation or maintenance of continuous electronic foetal monitoring. Consideration of further foetal evaluation or delivery should occur if a significant abnormality persists.

g. The RANZCOG guideline also recommends using foetal blood sampling to reduce the rates of increased intervention associated with electronic foetal monitoring.

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

i. Gestational diabetes refers to a condition where someone obviously has a propensity for diabetes, is not a diabetic in the normal course of events but becomes diabetic at some stage during the pregnancy.

Background

1. Mrs Amy Sparreboom was pregnant with an estimated date of delivery of 28 March 2008. She was treated by her GP and the Gympie Base Hospital (Gympie Hospital).

2. During her pregnancy, it was discovered that Mrs Sparreboom was suffering from gestational diabetes.

3. As a result of this, Mrs Sparreboom's care was transferred to Nambour General Hospital (Nambour Hospital).

4. Mrs Sparreboom's labour commenced by way of a planned induction on Saturday, 29 March 2008 at Nambour Hospital.

5. Due to an antepartum haemorrhage and pathological changes in the CTG, Sophie was delivered by way of emergency caesarean. She was born in an extremely poor condition and only survived a few hours.

6. Sophie's death was reported to the Maroochydore Coroner's office. The matter was transferred to Brisbane for the attention of a full time coroner on 9 January 2013. There had been numerous enquiries conducted by police in that time as well as by the Maroochydore Coroner's office but it is fair to say the delay in bringing the investigation to a conclusion has been unfortunate. Given all coronial investigations in Queensland are now undertaken by full time coroners who have available to them investigation staff and lawyers assisting it is expected such delays would not occur in the future.

Material Reviewed

7. The following material has been reviewed:
   - Statements from both parents and a list of concerns
   - Medical Records from Nambour Hospital
   - Relevant Polices and Procedures from Nambour Hospital
   - Root Cause Analysis
   - Response by Dr H, Acting Director of Medical Services
   - Expert report of Dr Edwin Caldwell commissioned by lawyers for the family
   - Expert report of Dr Keeping commissioned by the Office of the State Coroner and Addendum Report
   - Clinical Forensic Medicine Report on appropriateness of Sophie's resuscitation

8. The following statements from the main persons involved at the hospital were obtained:
   - Dr C1;
   - Registered Nurse O;
   - Dr L;
   - Dr V;
   - Dr B;
   - Dr C2; and
   - Midwife P.

Autopsy Report

9. On 1 April 2008, Professor Ellis conducted a post mortem examination.

10. Sophie was a well-nourished, medium sized infant weighing 3.46kg which was in the 50th percentile.

11. Professor Ellis noted in his summary that subsequent blood results taken from Mrs Sparreboom of an elevated D-Dimer level and falling haemoglobin suggested a degree of premature separation of the placenta as causing the foetal distress. Examination of the placenta showed mild changes that were consistent with, although not necessarily diagnostic of, premature separation.

12. Autopsy examination revealed a full term female newborn with no obvious evidence of congenital abnormalities. Toxicological examination only revealed drugs that were recorded as having been given during the attempted resuscitation.

13. Premature separation of the placenta may result in the baby being starved of oxygenated blood just before delivery. No other obvious cause for foetal distress and subsequent hypoxia was detected, and it is therefore that death was the end result of premature separation of the placenta. This may have been a relatively minor separation, explaining why it was only detected at a later stage.

14. Professor Ellis was of the opinion that the cause of death was 1(a) cerebral hypoxia due to or as a consequence of 1(b) placental abruption.

Policies and procedures in place at Nambour Hospital at the time of Sophie's birth

Labour care – first stage

15. This policy was effective from May 2007.

16. The policy notes that women have an absolute right and expectation to be adequately informed at all times. This enables them to make informed choices about their treatment options. It is important that there is timely and accurate documentation. Courteous communication between women, their families and all members of the health care team is essential.

17. The policy notes that all women should be encouraged to be upright and active as they desire. This needs to be negotiated with women requiring continuous foetal monitoring to ensure an accurate CTG trace. They are somewhat restricted but can still stand/rock/sit.

18. The policy requires all observations to be documented on the partogram. Early labour to be documented on the front page and once in active labour, documented on subsequent pages of partogram.

19. Contractions are recorded every 30 minutes once in established labour. The frequency and intensity needs to be considered, as well as the duration when categorising on partogram.

Induction of labour – introduction procedure

20. This policy was effective from May 2007.

21. The policy notes that induction of labour is a joint decision between consultant and woman. The woman's notes must show clearly the

indication for induction of labour, the name of the consultant who has authorised the induction and the proposed method of induction. The notes should also include documentation that the woman understands the reason for and the method and risks of induction of labour.

22. The policy notes 'induction of labour on the weekend should only be considered for urgent indications due to the reduced medical and midwifery resources. If weekend induction is required the woman's consultant must discuss this with the consultant on call for that weekend, and Clinical Nurse Consultant (CNC) Maternity Inpatient Services.' It should be noted Mrs Sparreboom's induction occurred on a weekend. There is nothing in the medical records to reflect that the discussion, as required by the policy, was adhered to.

Induction of labour – oxytocin infusion (syntocinon)

23. This policy was effective from May 2007.

24. It is not clear whether this policy also applies to augmentation of labour, which is how the syntocinon was used with Mrs Sparreboom.

25. The policy states the aim is stimulation of three to four uterine contractions every 10 minutes lasting between 40 and 60 seconds to achieve effacement and dilation of the cervix and descent of the presenting part.

26. The policy notes one of the contraindications for the use of oxytocin prior to six hours following vaginal prostaglandins.

27. The policy notes that the process includes one to one midwifery care in the birth suite. Baseline observations (BP, pulse, foetal heart rate, contraction pattern) are to be taken before commencing oxytocin and every 30 minutes during infusion. CTG monitoring is to be continuous during oxytocin infusion. The policy notes that the midwife is to commence the intrapartum continuous CTG monitoring form and record findings every 30 minutes.

28. The policy requires the midwife to notify a medical officer and consider reducing or ceasing oxytocin if there is a suspicious or abnormal foetal heart rate pattern on CTG and/or uterine hyperstimulation (five or more contractions per 10 minutes or contractions lasting longer than 90 seconds).

29. The policy notes the following relevant side effects: hyperstimulation, increased risk of post partum haemorrhage, abruption placenta and uterine rupture.

30. The policy advises that the management for uterine hyperstimulation with foetal heart rate deceleration or abnormalities is to cease oxytocin, reposition the mother onto her left side, consider tocolysis with Terbutaline if cessation of the oxytocin infusion fails to resolve hyperstimulation and to prepare for immediate vaginal birth or possible caesarean section if the foetal heart rate does not return to normal.

31. The policy advises that the management for uterine hyperstimulation without foetal compromise is to decrease the oxytocin infusion rate and if in doubt cease the oxytocin infusion and reassess the entire clinical situation.

32. Appendix 1 contains a table of oxytocin infusion protocol with Gemini pump

	Dose (in m.i.u/min)	Flow rate of oxytocin infusion (mls/hour)
Commence infusion with 30 international units oxytocin in 500mls normal saline Increase infusion rate as per regimen every 30 minutes to achieve 3 – 4 contractions ever 10 minutes each lasting 40 – 60 seconds	1 m.i.u/min	1 mls/hour
	2 m.i.u/min	2 mls/hour
	4 m.i.u/min	4 mls/hour
	8 m.i.u/min	8 mls/hour
	12 m.i.u/min	12 mls/hour
	18 m.i.u/min	18 mls/hour
	20 m.i.u/min	20 mls/hour
	24 m.i.u/min	24 mls/hour
	28 m.i.u/min	28 mls/hour
	32 m.i.u/min	32 mls/hour

33. Appendix 2 contains a table of oxytocin infusion protocol with syringe driver

	Dose (in m.i.u/min)	Flow rate of oxytocin infusion (mls/hour)
Commence infusion with 15 international units oxytocin in 50mls normal saline Increase infusion rate as per regimen every 30 minutes to achieve 3 – 4 contractions ever 10 minutes each lasting 40 – 60 seconds	1 m.i.u/min	0.2 mls/hour
	2 m.i.u/min	0.4 mls/hour
	4 m.i.u/min	0.8 mls/hour
	8 m.i.u/min	1.6 mls/hour
	12 m.i.u/min	2.4 mls/hour
	16 m.i.u/min	3.2 mls/hour
	20 m.i.u/min	4.0 mls/hour
	24 m.i.u/min	4.8 mls/hour
	28 m.i.u/min	5.6 mls/hour
	32 m.i.u/min	6.4 mls/hour

Caesarean section – emergency pre-op care

34. This policy was effective from May 2007.

35. The policy's purpose is to ensure the woman and her support person understand the reasons for the non-elective caesarean section and are part of the decision making process.

36. The policy notes that the urgency of the lower section caesarean section should be documented using the following standardised scheme to aid clear communication between healthcare professionals regarding the urgency of caesarean:

    - Category 1 was noted as 'immediate threat to life of woman of foetus'. Requires immediate theatre. If theatre occupied, open second theatre.

- Category 2 was noted as ‘maternal or foetal compromise which is not immediately life threatening’. Requires next available theatre. If significant delay anticipated then open second theatre.

- Category 3 was noted as ‘no maternal or foetal compromise but needs early delivery’. Next case in emergency theatre unless delay longer than one hour.

- Category 4 was noted as ‘delivery timed to suit woman or staff’. Requires emergency theatre when other more urgent non-obstetric cases completed.

37. The policy notes that the decision to open a second theatre will usually require direct communication between the obstetric and anaesthetic consultants. This would appear not to have occurred in this instance.

38. The policy notes that guidelines on electronic foetal monitoring suggest that where acute foetal compromise is suspected or confirmed, delivery should be as soon as possible, ideally within 30 minutes.

39. The policy also notes that all emergency lower section caesarean sections delay in delivery of more than 75 minutes is associated with poorer outcomes. This effect is greater with prior maternal or foetal compromise.

40. It is recommended that:

    - Delivery as emergency for maternal or foetal compromise should be accomplished as quickly as possible
    - Decision to delivery interval of less than 30 minutes remains an audit standard for response to emergencies within maternity services
    - A 75 minute decision to delivery interval should be included as an important audit standard and all category 1, 2 and 3 deliveries by lower section caesarean section should occur within this time.

41. The policy required that the decision made for caesarean section by the obstetric registrar in consultation with consultant and operating theatre to be advised of the degree of urgency. Decision time must be documented in the medical record.

42. The policy required the obstetric registrar to contact anaesthetist, peri-operative services and paediatric medical officer. The birth suite midwife was to notify the nurse manager, maternity ward and special care nursery.

Caesarean section – intra-operative guidelines

43. This policy was effective from May 2007.

44. The policy required compliance from ‘all medical, midwifery and nursing staff’.

45. The policy notes that a ‘Paediatrician should always be present for emergency caesarean sections, or where there is foetal risk factor

present for elective caesarean sections'. In this case a Principal House Officer attended and a paediatrician arrived around eight minutes after birth. It is considered this did not impact on the outcome for Sophie.

Evidence from Mr and Mrs Sparreboom

46. Mr and Mrs Sparreboom provided statements to the Queensland Police Service on 19 January 2010.

47. After Mrs Sparreboom found out she was pregnant, she commenced share care (where her GP and Gympie General Hospital shared care).

48. Following routine blood tests, it was determined that Mrs Sparreboom was a negative blood type and Mr Sparreboom was a positive blood type. Mrs Sparreboom would need Anti-D injections, in case the baby had a positive blood group.

49. On 8 January 2008, Mrs Sparreboom completed her one hour glucose challenge.

50. On 20 February 2008, Mrs Sparreboom was contacted by Gympie Hospital and advised she may have Gestational Diabetes Mellitus. Mrs Sparreboom completed a Glucose Tolerance Test and this confirmed the diagnosis of Gestational Diabetes Mellitus. Initially Mrs Sparreboom's blood sugar levels were controlled with diet-based interventions however her blood sugar continued to increase. On 5 March 2008, Mrs Sparreboom was commenced on insulin. She documented her blood sugar levels at least four times a day and her insulin was increased as required.

51. On 5 March 2008, Dr T (an obstetrician at Gympie Hospital) conducted an ultrasound to determine the size of the baby to see if this would be an issue in labour and whether the placenta remained low (it had been low on scans from 18 September 2007 and 2 November 2007). Mrs Sparreboom says she was advised that Sophie was not large like a gestational diabetes baby and everything was within normal limits. Mrs Sparreboom was advised that she would be referred to Nambour Hospital because they were equipped with a Special Care Nursery (Gympie Hospital was not) as there was a chance that for 24 hours following Sophie's birth her blood sugar would drop due to producing extra insulin to deal with the extra sugar she was receiving from Mrs Sparreboom's blood supply.

52. Mrs Sparreboom details the difficulties she had making an antenatal appointment with Nambour Hospital. Her GP made an appointment for her and on 20 March 2008 she was told by the doctor she would be induced as women with gestational diabetes are induced before they get to the 40 week mark. The induction was booked for Saturday 29 March 2008.

53. Mrs Sparreboom attended appointments with the Nambour Hospital's dietician, physician and diabetic educator on 25 March 2008 and her GP on 26 March 2008.

54. Mrs Sparreboom presented as requested at Nambour Hospital on 29 March 2008. At 0745, she was reviewed and monitored with the CTG. An internal examination revealed Mrs Sparreboom was 2cms dilated.

55. At 1500, Mrs Sparreboom represented to the delivery suite and was seen by Dr V. Mrs Sparreboom advised her contractions had moved from the top of her belly to lower and they had become more intense but not painful. She also advised that her contractions had been eight minutes apart and were now six minutes apart. Dr V performed an internal examination and advised she wished to break Mrs Sparreboom's waters to help progress labour faster. Dr V advised Mrs Sparreboom may not require the syntocinon infusion if breaking the waters worked effectively. Mrs Sparreboom was instructed to return to her room and return at 1700.

56. At 1700, Mrs Sparreboom returned to the delivery suite and had observations taken by Midwife P. Mrs Sparreboom advised her pain was about three out of 10 and was not as strong as the period pain she experienced as a result of endometriosis. Midwife P advised she was going to get the syntocinon infusion. Mrs Sparreboom queried why this was needed when Mrs Sparreboom was having contractions that were getting stronger and more frequent.

57. Midwife P returned at 1850 and took a blood sample, inserted an intravenous cannula and took another set of observations.

58. Midwife P returned a short time later with the infusion. Mrs Sparreboom asked if this was required. Mrs Sparreboom gave a pain score as a four – five out of 10. Midwife P advised the infusion was needed to hasten the labour.

59. At probably 1955 Mrs Sparreboom stated she was concerned about the baby's heart rate. Midwife P looked at the CTG and stated Mrs Sparreboom must have moved during the contraction. Mrs Sparreboom stated she did not move after the machine made an alarm the first time.

60. Dr V came in and reviewed the CTG monitor. Mrs Sparreboom heard Midwife P say 'she moved' as she pointed to the printout. Dr V left the room before Mrs Sparreboom had an opportunity to say anything.

61. Mrs Sparreboom recalls Sophie's heart rate dropping again and disappeared for a few seconds. Mrs Sparreboom buzzed for Midwife P who attended and then left.

62. Approximately 10 minutes later, Midwife P returned and sat beside Mrs Sparreboom completing paperwork. Mrs Sparreboom felt two strong contractions and then felt Sophie do what she described as a complete somersault. Mrs Sparreboom advised Midwife P that she believed something was definitely wrong. Midwife P stood up, palpated Sophie and advised that Sophie was getting into position to be born.

63. On the next contraction, it felt like Mrs Sparreboom had lost control of her bladder but it is clear at this point there was some bleeding and the masses were blood clots. Midwife P turned off the syntocinon infusion and hung a new bag of IV fluids.

64. Dr L attended and reviewed the CTG print out. He pointed at the CTG and said 'what was this'. Midwife P replied 'she moved'. Mrs Sparreboom told Dr L she had not moved however he made no comment.

65. Dr L performed an internal examination, which was very painful and attempted to place an electrode on Sophie's head and this really hurt. Mrs Sparreboom was given nitrous oxide gas.

66. Mr Sparreboom says Dr L was unable to place the pad on Sophie's head. He recalls Dr L saying the pad would not attach properly and Dr L could not get a proper reading.

67. Mrs Sparreboom recalls several internal examinations, Dr L checking the CTG and being on the phone.

68. Mrs Sparreboom recalls at one point Dr L providing her with a theatre consent form. She could not understand him and she felt like she was floating. Mr Sparreboom says Mrs Sparreboom did not look like she really understood.

69. Mr Sparreboom recalls Dr L ringing people multiple times for an available theatre but could not get one. Mr Sparreboom felt like everyone was panicking. He recalls Dr L saying 'no she's a category 1'. Mr Sparreboom felt like Dr L wanted to go to a theatre straight away but was not able to for some reason.

70. Mrs Sparreboom was then wheeled into a smaller room and there were more doctors and nurses. The anaesthetist came out and asked if Mrs Sparreboom had been prepped for a spinal. Midwife P advised that Mrs Sparreboom required a general anaesthetic. Mrs Sparreboom felt another strong contraction and more hot fluid. She reported this and was checked.

71. Mrs Sparreboom then heard someone say to go to OT4. Mrs Sparreboom was transferred to the operating table and Midwife P advised the anaesthetist that Mrs Sparreboom had eaten, how much fluid she had received and that she had been given sodium citrate.

72. Mrs Sparreboom recalls being told to count backwards. She then recalls waking and being advised of Sophie's condition, which became more critical as time elapsed.

Initial concerns from the family

73. Mrs Sparreboom's concerns were essentially:

- Whether the transfer from Gympie to Nambour Hospital and subsequent management with Nambour Hospital prior to labour was appropriate and whether all information was available to care providers at Nambour Hospital;
- Whether it was appropriate to induce labour;

- Whether the administration and levels of syntocinon was appropriate, particularly whether it was appropriate to increase syntocinon when foetal distress was detected;
- Whether it was appropriate for Mrs Sparreboom to be monitoring the CTG machine;
- Why no further action was taken when Mrs Sparreboom advised of concerns with Sophie's heart rate;
- Whether the increased movement of Sophie should have alerted staff to the fact that Sophie was in foetal distress;
- Whether the staffing levels were appropriate and whether there were staff on standby to perform an emergency caesarean;
- Whether the delay in opening a second theatre contributed to Sophie's death, and whether if the second theatre had been opened earlier whether Sophie would have survived;
- That both Mr and Mrs Sparreboom (who were in different parts of the theatre) were of the impression that staff were confused about what theatre to proceed to, what anaesthetic to use and the urgency within which to perform the caesarean section;
- Mr and Mrs Sparreboom believe that the reason the caesarean section was delayed was due to theatre staff on duty having another case to attend to, back up theatre staff not being easily attainable, inadequate communication as to the urgency and initial reluctance to open a second theatre;
- What degree did the 1 hour and 20 minutes between the first signs of haemorrhage have on Sophie's chances of being a healthy newborn; and
- Whether the presence or earlier notification of a paediatrician would have influenced the outcome.
- Mrs Sparreboom expressed a number of concerns with respect to the communication and attitude of the midwife throughout the labour.

Medical records from Nambour Hospital and statements

74. The following statements from medical staff were obtained:
    - Dr C1 provided a statement to police on 9 September 2009 (senior Paediatric registrar);
    - Registered Nurse O provided a statement to police on 23 September 2009;
    - Dr L provided a statement dated 1 April 2012 which attached a statement he had provided on 30 June 2009 (he was a third year trainee on the RANZCOG program at the time of Sophie's birth);
    - Dr V provided a statement dated 9 May 2012 (she was a second year trainee on the RANZCOG program at the time of Sophie's birth);
    - Dr B provided a statement dated 16 May 2012 (she was the Consultant Paediatrician);
    - Dr C2 provided a statement dated 24 May 2012 (he was the Director of Neonatology at Royal Brisbane and Women's Hospital);
    - Midwife P provided a statement dated 21 June 2012 (she has been a registered midwife since 1975);

75. There were two separate CTG tracings that have been provided although the first set was almost unintelligible with a second set somewhat more legible.

76. The statements cover aspects of the antenatal care, none of which is concerning or remarkable.

77. On 29 March 2008, Mrs Sparreboom was admitted to Nambour Hospital for induction of labour.

78. At 0815, Mrs Sparreboom's observations were recorded as a temperature of 36.3, pulse of 92, blood pressure of 120/65 and foetal heart rate of 142. Contractions were noted as B/Hx [presumably Braxton hicks] and ROT/P 3/5 [presumably this refers to Sophie's head being three fifths palpable].

79. At 0830, a vaginal examination was conducted. Mrs Sparreboom was noted to be 1 – 2cms dilated and Sophie's head was noted to be in the position of minus 3 and given a Bishop score of 5. Sophie's head was noted to be three fifths palpable. The CTG was said to be reassuring. Prostaglandin was administered to try to induce labour. The medical records reveal Prostaglandin gel was administered at 0815. The medical records note Mrs Sparreboom was to be reviewed at 1430 if no labour before this time.

80. There is an entry on the CTG at 0910 'seen by Dr V'. She says she has no memory of this however from re-reviewing the CTG it was reassuring.

81. At 1100, Mrs Sparreboom's observations were recorded as a temperature of 36.8, pulse of 80, blood pressure of 105/60 and foetal heart rate of 148. Contractions were noted as irregular mild.

82. Midwife P was working a 1430 to 2300 shift. She was allocated the care of Mrs Sparreboom and attended a handover where the above information was provided and introduced herself to Mrs Sparreboom with Dr V at 1515.

83. At 1530, Mrs Sparreboom was seen by Dr V. Mrs Sparreboom is recorded as having 2 – 3 tightenings every 10 minutes. The CTG is said to be reassuring. Sophie's head is noted to still be three fifths palpable, the cervix is 3cms dilated and the membranes are ruptured and clear liquor is observed. A Bishop score of 7 was noted. The instruction was to administer Syntocinon to induce or expedite labour in 2 hours time if not contracting and then continual monitoring.

84. Dr V says she wrote up intravenous orders in the clinical record, being 500mls of normal saline to be administered together with '30' of syntocinon as per protocol.

85. Midwife P notes that at 1530 at the artificial rupture of membranes, clear liquor was observed. The observations were recorded as a foetal heart rate of 150. Contractions were noted as 3 in every 10 minutes, mild. Mrs Sparreboom's blood sugar level was noted to be 5.2.

86. At 1615 and 1715 the observations recorded were unremarkable although there had been little progress.

87. Midwife P says in her statement that 'after a discussion with Amy, I explained that she was here for induction and asked her what she wanted to do. She agreed to syntocinon infusion protocol.' Although there is disagreement by Mrs Sparreboom as to what information was given to her by the midwife and she has concerns regarding the use of syntocinon, it is not intended to set this out in any detail, given the expert opinions that the syntocinon management was appropriate.

88. From 1830 to 2050, Mrs Sparreboom and Sophie's observations are recorded on the partogram. It is not intended to detail the progress of labour until the period around 2050 when the first sign of concerns were evident.

89. Dr L says he attended the 2000 – 2030 handover with Dr V (the day registrar) and Dr N who was present as she had been called to the hospital to manage another patient. It was discussed that the CTG had been normal except for a couple of decelerations that had occurred just prior to handover. During the handover, Midwife P updated with the fact that there had been no further decelerations and the CTG had returned to normal.

90. At 2000, the intrapartum continuous CTG monitoring chart, the baseline is noted as unintelligible [there is one entry which has been written over again by another number], beat to beat variability is 5, neither accelerations nor decelerations were present. This appears to have been completed by Midwife P. In the comments section [it is unclear if this comment applies to the reading at 2000, 2030 or both] there is a note 'a deep variable not witnessed on knees position change'.

91. In a retrospective medical note made on 10 May 2008, Midwife P notes that Dr V was asked to attend as CTG showed 3 variable and 1 late (1950) deceleration noted (not witnessed). Dr V said CTG now ok. This was handed over to Dr L when the doctors changed over at 2000. Dr V says she has no independent recollection however the decelerations occurred at 1954 and 1959. She is of the view that after these decelerations the CTG normalised.

92. Between 2000 and 2030 the foetal heart rate is noted as 150, it is unintelligible what the liquor was, Mrs Sparreboom's pulse is 70. Syntocinon units rate is noted to be 8, contractions are noted to be 4 every 10 minutes lasting between 20 and 40 seconds.

93. At 2030, the intrapartum continuous CTG monitoring chart, the baseline is noted as 140 - 145, beat to beat variability is above 5, accelerations are present and no decelerations were identified

94. Midwife P says in her statement that at 2050 she was palpating the contractions when 4 moderate contractions occurred quickly together. Mrs Sparreboom said there was more fluid and the foetal heart rate is noted as 90.

95. Midwife P checked Mrs Sparreboom's pad which was blood stained. In her statement she indicated there were no clots. Mr and Mrs Sparreboom dispute this. Mrs Sparreboom says she felt a large amount of hot fluid and solid masses pass and Mr Sparreboom says he and Midwife P witnessed large and multiple stringy clots. Mr and Mrs Sparreboom believe that this was observed and if the information had been provided to Dr L the decision to proceed to an emergency caesarean may have been made much earlier than 2120. Given the length of time that has elapsed since Mrs Sparreboom's labour, it is unlikely that Midwife P would recall what she observed in relation to Mrs Sparreboom's bleeding and unlikely that Dr L would recall the information that Midwife P provided to him. It would also be difficult for Dr L to provide an objective answer on whether this piece of information would have affected his decision making given he is aware of the tragic outcome and how important the issue regarding the length of time taken to perform the emergency caesarean has become.

96. Midwife P rang the bell and called out to staff to get Dr L. Midwife P changed Mrs Sparreboom's position, turned off the syntocinon, commenced facial oxygen and connected intravenous fluids. Midwife P says the foetal heart rate recovered to 160. She noted in the records that Mrs Sparreboom should be prepared for an operation.

97. At 2050, in the intrapartum continuous CTG monitoring chart, there is an entry 'variable decels large blood loss prolonged and variable decels'.

98. At 2055, Dr L was asked to review Mrs Sparreboom due to the prolonged deceleration and the bleed. In his statement, Dr L says that the CTG showed a prolonged deceleration, although variability was still present and the CTG for the previous hour or so had been reassuring. Mrs Sparreboom had already been turned to the left lateral position. Dr L requested the syntocinon be ceased and for IV fluids.

99. An abdominal and vaginal examination was performed. Dr L noted that on examination Mrs Sparreboom was 4cms dilated, there was blood on his glove and small clots in the vagina, Sophie's head was well applied, no cord was presenting. Dr L says in his statement the cervix felt slightly oedematous, which added to his suspicion that the blood was coming from the cervix.

100. Dr L says in his statement that after his examination, his assessment was that an abruption was clinically less likely, given that the uterus was soft and relaxed between contractions. His impression was that the prolonged decelerations were due to too much oxytocin stimulation and indeed there were two contractions quite close together whilst he was examining Mrs Sparreboom's abdomen.

101. Dr L thought his diagnosis appeared correct because after ceasing the syntocinon at around 2110, the baseline recovered for a short period to 150 – 160 bpm with normal variability. Nonetheless, at that point, in view of the pathological changes on the CTG, as well as the vaginal bleeding, he decided to perform foetal blood sampling in order to more definitely assess the foetal status to see if a caesarean section was necessary.

102. Dr L attempted foetal blood sampling on the scalp but the view was obscured by a blood clot which he removed but the view obtained was still only of the anterior lip of the cervix and so he tried to manipulate the speculum to find the foetal scalp. This caused Mrs Sparreboom considerable discomfort so the procedure was promptly abandoned.

103. Midwife P says in her statement that Dr L attended at 2055. An attempt at scalp lactate was made however there was too much blood. Midwife P suggested that they should get Mrs Sparreboom to theatre as soon as possible for a category one caesarean section. The Team Leader came in and advised to get Mrs Sparreboom to theatre. Midwife P says that she started preparing Mrs Sparreboom for theatre whilst Dr L was out calling the consultant.

104. Dr L notes that he discussed Mrs Sparreboom with Dr N at 2120 regarding recurrent prolonged decelerations and the inability to perform foetal blood sampling. In his statement he says he also advised Dr N of the vaginal bleeding and the fact the uterus was soft in between contractions. He records in the medical records that Mrs Sparreboom was to have a category 2 caesarean section performed. Dr L says in his statement that he and Dr N agreed Mrs Sparreboom qualified as a category 2 emergency caesarean section (for situations of maternal or foetal compromise but not immediately life threatening where the baby is expected to be delivered between 30 and 60 minutes) however he then goes on to say Dr N made this decision. Neither Dr L nor Dr N considered Mrs Sparreboom qualified as a category 1 as there was no apparent immediate threat to the life of Mrs Sparreboom or Sophie at the time.

105. Dr L records he then discussed Mrs Sparreboom with operating staff to find there was currently another patient on the table for a laprascopic appendectomy, complicated by the surgeon having difficulty finding the appendix, and needing to call in the surgical consultant who was currently not reachable. They were unable to provide an estimate of delay. Dr L asked for a second theatre to be opened (in his statement he says this was because he wanted Sophie delivered within 30 minutes) but was told this was not possible for a category 2 caesarean section. Dr L then discussed Mrs Sparreboom with the anaesthetic registrar who advised that the appendix had just been found and the surgical consultant contacted. Dr L was asked to phone back in 10 minutes.

106. Dr L says that at 2125, whilst speaking to Dr L2 (the anaesthetist registrar), the CTG improved somewhat and was showing a borderline baseline of 160bpm with normal variability. Variable decelerations were present but were of shorter duration compared to previous.

107. Dr L says in his statement that he was proceeding to consent Mrs Sparreboom for the caesarean section whilst the midwives were getting Mrs Sparreboom ready. Just after he had finished discussing the risks of the operation in accordance with the consent form, at around 2130, Sophie had another episode of bradycardia. Dr L says he diverted his efforts to intrauterine maternal-foetal resuscitation and getting Mrs Sparreboom to theatre as quickly as possible and the consent form was

not signed. He says both Mr and Mrs Sparreboom gave verbal permission to proceed with the caesarean section.

108. Dr L says after about two minutes of no recovery from the episode of bradycardia, he spoke with Dr L2 advising him of the bradycardia and that he was upgrading to a category 1 caesarean section. Dr L2 advised the surgical registrar had found the appendix that the surgical consultant had been contacted and they would be closing up.

109. Dr L says he then contacted Dr N to discuss the situation and the upgrade to a category 1 caesarean section. They decided not to administer Terbutaline because there would be an increased risk of bleeding and the possibility of an abruption.

110. Dr L says in his statement that when they arrived at theatre Mrs Sparreboom was taken to an anaesthetic room. Dr L determined that there was still a patient in the operating theatre where they were closing the skin. Anticipating a further delay, Dr L called the birthsuite and asked for the CTG to be brought down. He says they did not originally take a CTG machine because he had thought they would be proceeding directly to a general anaesthetic as soon as they arrived at theatre.

111. Dr L says he went into the operating theatre where they were closing the skin and he spoke to Dr L2 who asked how the CTG was. Dr L advised the bradycardia had resolved but there were still prolonged decelerations occurring. Dr L asked Dr L2 if he was happy to do a general anaesthetic. Dr L2 asked if there was recovery with the decelerations and Dr L advised that they were returning to baseline before they left for theatre. Dr L2 said his consultant was already on his way in and should arrive soon and if the decelerations still had recovery, his consultant would be able to do a spinal anaesthetic just as quickly as a general anaesthetic. Dr L asked one of the other theatre nurses whether they could do this in another theatre however Dr L was advised they would be doing it in the current theatre because they were already finishing. If the consultant anaesthetist did not arrive in time, Dr L planned to ask Dr L2 to do a general anaesthetic so as to avoid any delay.

112. The CTG was plugged in and reconnected to the foetal scalp electrode which was still in situ. A foetal heart rate was recorded but after a short while there was almost absent variability and the heart rate was wandering slowly back to the baseline. By that time, Dr L says he was told the anaesthetic consultant had arrived. Dr L went to the change room and found Dr C3 (anaesthetist) getting changed. Dr L advised Dr C3 about the foetal bradycardia which was not improving and Dr C3 agreed for a general anaesthesia.

113. Mrs Sparreboom was brought to another theatre and a general anaesthetic caesarean section commenced on the arrival of anaesthetic consultant and OT staff at 2150.

114. The anaesthetic record made by the anaesthetic consultant notes the general anaesthetic induction at 2200. The Nambour General Hospital Operation report indicates that the procedure commenced at 2205.

115. At 2209 Sophie was delivered with poor apgars (3, 3 and 4 at 1, 5 and 10 minutes) and a pH of 6.8.

116. Dr L's operation report notes that the indication was a pathological CTG and Mrs Sparreboom was only 4cm dilated. He noted that he observed meconium stained liquor.

117. Sophie's birth was attended by Dr S.

118. After her birth, Sophie always had a heart rate under 100 but she was flat, pale with irregular respiratory effort.

119. Dr S's medical notes indicate that Sophie was intubated at 9 minutes of age and at 10 minutes of age she had some spontaneous respirations.

120. The cord gas showed a pH 6.8, BE-17, pCO2 109 and lactate of 14.

121. Dr C1 was the senior paediatric registrar on call. She arrived at the operating theatre when Sophie was 8 minutes old. Sophie had already been intubated and being given intermittent positive pressure ventilation. Sophie was making some spontaneous respiratory effort. Sophie's heart rate was greater than 100. She was pale and floppy. Dr C1 put a cannula in Sophie's hand and gave 35mls of normal saline as a bolus.

122. At 2255, Dr C1 contacted Dr C2 (the Neonatologist on call for taking calls regarding babies potentially needing retrieval to the Royal Brisbane and Women's Hospital). Dr C1 advised Sophie had been born in poor condition after an emergency caesarean section for foetal distress, having Apgar scores assigned at 3 at 1 minute of age, 3 at 5 minutes and 4 at 10 minutes. Sophie's cord blood gases were indicative of a moderately severe hypoxic/ischaemic insult, showing a severe mixed metabolic and respiratory acidosis. Dr C2 says this, and Sophie's behaviour and resuscitation needs indicated a very high risk of permanent severe neurologic damage or of death and only a very small chance of neurologically intact survival. Dr C2 says his role was to assess the progress and response to the resuscitation before providing advice as to ongoing management. Dr C2 says it appeared to him that Sophie had been appropriately resuscitated.

123. Dr C2 organised the retrieval by organising a doctor and nurse to leave the intensive care nursery with a retrieval cot to travel to Nambour. Dr C2 says there was no helicopter available at the time and QAS was organised. He says there was some delay in QAS availability and in the meantime a helicopter became available.

124. Given a review has not found any concerns with respect to the resuscitation and subsequent retrieval arrangements it is not intended to detail those events.

125. Sophie had a further bradycardic episode at 0320. At this point, Sophie was poorly perfused and her pupils were unresponsive. She was given a further two doses of adrenaline at 0320 and 0322 to which she did not respond. A decision was made to stop resuscitating Sophie and she passed away at 0335.

126. On 30 March 2008 anatomical pathology results were received in relation to Mrs Sparreboom's placenta. The summary notes that the placenta had focal mild chorioamnionitis and focal villus infarction.

Response by Nambour Hospital to Mrs Sparreboom's concerns

127. A response addressing Mrs Sparreboom's concerns was provided by Dr H, Acting Executive Director Medical Services, Nambour Hospital on 17 November 2008.

128. Dr H advised that vaginal delivery was recommended as there was no indication for caesarean section. Women with gestational diabetes are more likely to deliver larger babies and this may cause problems in birth. In women with gestational diabetes requiring insulin treatment, it is standard to recommend induction of labour at 40 weeks gestation.

129. Dr H noted that from a midwifery perspective, the rostering is the same on the weekends as during the week and there is an obstetric and gynaecology registrar present at the hospital at all times. There is also an obstetrician who is on call and contactable for advice/consult and available to come in when required.

130. Dr H commented that Mrs Sparreboom's contractions were assessed as not being adequate to progress labour appropriately, prior to the commencement of syntocinon and that in the absence of effective contractions, the cervix was unlikely to dilate. He noted the risk of infection is increased with an increase in the number of vaginal examinations, particularly when the membranes are ruptured so therefore the standard practice was to commence syntocinon and reassess vaginally after four hours of regular moderate to strong contractions.

131. Dr H stated that as much as possible, the unit provides 'one on one' care for all women in labour, particularly once a syntocinon infusion has commenced, as the mother and baby require closer monitoring. At times the midwife will need to leave the room to gather more supplies, equipment, paperwork or discuss care with a doctor or midwifery team leader. Dr H noted that the midwife left the room for a short period to hand over to the staff coming on to shift at 1900 and at 2000 to inform the medical officers of clinical details at their change over.

132. Dr H says that on reviewing the CTG Sophie's heart rate remained normal until 2050 when the antepartum haemorrhage occurred and the midwife contacted the doctor immediately.

133. Dr H stated that the doctor was constantly informed by midwives and aware of Mrs Sparreboom's progress in labour. The doctor reviewed the CTG following the 1950 drop in heart rate and was happy that the CTG had improved after the change in Mrs Sparreboom's position

134. Dr H was of the opinion that the drop in Sophie's heart rate prior to 2050 was not due to the placenta coming away. The CTG changes due to abruption are normally prolonged.

135. Dr H advised that the Operating Room Suite at Nambour is staffed 24 hours a day, 7 days a week for emergency surgery, including caesarean sections. Between the hours of 0100 and 0700 there are 3 peri-operative nurses on call over the weekend. Dr H stated that at the time theatre staff were notified of the caesarean the nursing staff were busy with another case. Additional staff were called for the operation.

136. Dr H was of the view that earlier notification of a paediatrician would have resulted in a senior paediatric person being present at the birth. Dr H was of the view that this did not have an adverse impact as the anaesthetist and paediatric house officer managed Sophie's resuscitation competently until the senior paediatric registrar arrived.

137. Dr H noted that a RCA had been conducted and this resulted in recommendations in relation to notification of relevant staff when the urgency of a caesarean section increased. A system of uniform language and categorisation for the birthing suite and theatres was recommended and had commenced. There was also a recommendation to review the availability of staff to enable the opening of a second operating theatre during after-hours periods and the outcome of the review was to authorise to extend on-call to every night of the week.

Family response to Dr H's report

138. On 24 January 2009, Mrs Sparreboom responded regarding the report of Dr H. Mrs Sparreboom says that she was happy with some of the responses given by Dr H however her concerns about the administration of syntocinon and the delay in having the caesarean performed had not been addressed.

139. Mrs Sparreboom was concerned about the lack of information regarding the administration of syntocinon. Mrs Sparreboom was advised that this information was provided at the 36 week check up and antenatal classes however Mrs Sparreboom was not transferred to Nambour Hospital until after this.

140. Mrs Sparreboom was concerned about whether the correct drug (syntocinon) was administered but also whether it was prepared and given correctly.

141. The manufacturer recommends all patients receiving syntocinon be under continuous observation by trained personnel. Mrs Sparreboom rejected Dr H's suggestion that the midwife only left the room twice. Mrs Sparreboom says the midwife was only present to take half hourly observations. Mrs Sparreboom also says that the midwife dismissed her concerns without any explanation and made presumptions that Mrs Sparreboom had moved.

142. Mrs Sparreboom remained concerned about the delay taken to take Mrs Sparreboom for a caesarean.

143. Mrs Sparreboom disagreed with Dr H's assessment that there was adequate coverage for emergencies including caesarean sections when

the RCA showed a need to extend on-call to every night of the week so a second theatre could be staffed. She says that if this was identified then clearly there was inadequate staffing on the night of Sophie's death.

Further response from Dr H

144. Dr H says that several factors contributed to the time interval between the decision to perform a caesarean section and the actual birth which included the obstetric team's assessment of the urgent need for the caesarean section, changes to this assessment and the primary emergency theatre being occupied. Dr H says the decision to perform a caesarean section was made at 2125 and the urgency was classified as category 2. Dr H says that as a category 2 case there were adequate resources to perform the operation within the specified time frame (1 hour) as the case being performed in the primary emergency theatre would be expected to be finished within that time. Dr H says that the primary problem was not the availability of the team, it was the change in relation to the urgency resulting in a seeming delay in authorising the opening of a second theatre and calling in staff. The decision to upgrade the caesarean from category 2 to category 1 was made after the CTG deteriorated at 2130 and the registrar spoke to both the anaesthetic registrar and the specialist obstetrician. Mrs Sparreboom arrived in theatre at 2145, anaesthetic was commenced at 2200 and Sophie was born at 2209.

145. Dr H says the perceived delay in authorising the opening the second theatre was not a delay. Sophie was delivered 39 minutes after the operation was categorised as a category 1 procedure. This is not within 30 minutes of this decision as is the expectation. Dr H confirmed that as a result of a review of services and the increasing demand for after hours theatre time, the hospital decided to have a second on-call team available at all times outside business hours as an added safety measure. This was noted as a risk in the RCA, even though it did not apply in these circumstances. Dr H also noted that there had been further changes to the after hours on-call system, rostering a second on-call anaesthetist to assist manage fatigue risk management.

146. Dr H conceded Mrs Sparreboom's points regarding the lack of information including contraindications to syntocinon that were provided to her and the lack of information she received as she did not transfer her care to Nambour until 38+6 weeks (thereby missing the information given at the 36 week check up and antenatal classes) were valid points and would be referred to the Maternity Services team for consideration.

147. Dr H addressed concerns regarding the syntocinon infusion. Given both independent experts consider the management of syntocinon is not an issue of concern it is not intended to examine the response in any detail.

148. Dr H says that the recording that '250ml of syntocinon infusion was delivered in 2 hours and 20 minutes' is incorrect and reflects poor documentation on the fluid order sheet during this period when the focus was on providing patient care. The partogram shows syntocinon was infused at a rate of:

- 1ml/hr for 30 minutes (1900 – 1930) = 0.5ml
- 2ml/hr for 30 minutes (1930 – 2000) = 1ml
- 4ml/hr for 30 minutes (2000 – 2030) = 2ml
- 8ml/hr for 20 minutes (2030 – 2050) = 2.6ml

149. Thus in total just over 6ml of the syntocinon infusion was infused. At 2050 hours the infusion was ceased and alternate IV fluids were commenced. The alternate IV fluid is not recorded on the fluid sheet either.

150. Syntocinon can cause hyperstimulation of the uterus which can lead to foetal distress and/or abruption. Hyperstimulatoin is defined as a persistent pattern of more than 5 contractions in 10 minutes, contractions lasting 2 minutes or more or contractions of normal duration occurring within 1 minute of each other. The partogram records the maximum uterine activity as being 4 contractions per 10 minutes with these contractions lasting 20 – 40 seconds. The CTG tracing taken at the same time confirms the frequency and duration of the contractions.

151. Dr H says 250mls of Syntocinon would not have been delivered because if it had been infused at a rate to achieve this, the uterus would have been hyperstimulated and shown intense prolonged or even continuous contractions. The CTG tracings show this did not occur.

152. There are multiple factors associated with an increased risk of placental abruption including acute events (trauma, rapid uterine decompression), medical and obstetric risk factors (hypertensive disorders, premature rupture of membranes, chorioamnionitis, previous placental abruption, small for gestational age infant, preeclampsia), cocaine use and cigarette smoking. The largest cause is idiopathic, that is a cause that is unknown and which can occur spontaneously.

153. Dr H stated that the cause of the placental abruption cannot be determined with certainty. Hyperstimulation increases the risk of abruption. Dr H said the partogram and CTG show no evidence of hyperstimulation. Unfortunately there is no way of accurately predicting placental abruption and there is no way of effectively preventing abruption.

154. Dr H accepts the family's recollection of when Midwife P was present. He says that a patient undergoing continuous monitoring should receive one-to-one nursing care. This was provided but with apparent episodes where no midwife was present. Again whilst this may be less than ideal, in his view, it was not causal in the complication or the outcome.

155. Dr H says that it is clear Mrs Sparreboom felt the feedback and responses from Midwife P were inadequate.

156. Dr H says a patient's concerns should be listened to and even checked, where possible to assist in allaying fears however care must be based on best available evidence. Dr H says that the first sign of abruption is usually vaginal blood loss. Abruption can present in different ways:

uterine contractions can commence, there may be abdominal pain, foetal distress on a CTG or loss of foetal movements. Increased foetal movement is not a recognised sign of abruption.

157. Dr H notes that there is a paediatrician on call at all times. There is a paediatric registrar or principal house officer on duty at all times. Deliveries where a baby may be distressed are attended by the Paediatric Registrar/Principal House Officer unless it is considered to be a high risk, in which case the Specialist is called to attend. It is likely the Paediatrician got mixed messages as the clinical situation and the urgency category of the caesarean section changed as events unfolded.

158. Dr H says that there are no hard and fast rules about what a foetus can cope with (in terms of having a 'reserve' and what risk a foetus is under). Sometimes the answer is unknown and cannot be provided.

159. Dr H says that the average time from decision to perform an emergency caesarean section and the performance of the operation at Nambour Hospital is unknown.

160. Mrs Sparreboom indicated a concern that it took Dr L 30 minutes on the phone expressing the need for an emergency caesarean and it took him this time to get permission and this was the timeframe the emergency caesarean should have been performed in. Dr H says that Dr L attended at 2055 and needed to interpret the CTG, perform a vaginal examination and attempt to obtain foetal blood sample to allow an informed decision as to the best management. Once Dr L obtained this information he contacted Dr N and a decision was made to proceed with caesarean delivery at 2125. 30 minutes was spent in assessment. Dr H says with the benefit of hindsight, one could speculate that if this assessment had not been performed and a decision had been made to proceed immediately to a caesarean section, Sophie may have survived. However if this was done in all such cases, many unnecessary caesarean sections would be performed and the morbidity and mortality for both mothers and babies would be increased.

161. Dr H says that the reason for taking Mrs Sparreboom to OT3 (the one in use) is not documented. The RCA found it was initially thought that the case in OT3 was so close to completion that it would be available before OT4 would be set up. When OT4 was set up prior to OT3 becoming available, OT4 was used. The placement of Mrs Sparreboom in the anaesthetic room for OT3 did not contribute to the delay in the operation.

162. Dr H says that many anaesthetists can perform a spinal anaesthetic as quickly as a general anaesthetic. A spinal anaesthetic has less associated risks. It is the anaesthetist's decision as to which form of anaesthesia is the most appropriate in the particular situation. As a spinal tray had not been set up this decision did not need to be made as setting up for a spinal would have caused delay and the general anaesthetic proceeded.

163. Nambour Hospital tries to limit booked inductions to two per day. This is to try and ensure staffing numbers are adequate to cope with the workload. If additional inductions are required, these would be limited to

an additional induction on a week day or an induction on the weekend, depending on midwife availability.

Expert report of Dr Caldwell

164. On 28 April 2010, Dr Edwin Caldwell provided an expert report to the family's solicitors.

165. Dr Caldwell says that in spite of the fact that Mrs Sparreboom had gestational diabetes, there was no written estimation of foetal size at the examination on 5 March 2008.

166. Dr Caldwell says that from viewing Mrs Sparreboom's antenatal notes, her blood sugars were well controlled as is most desirable. If a gestational or type 1 diabetic, when pregnant has well controlled blood sugar levels they avoid most of the malignant effects of diabetes on pregnancy.

167. Dr Caldwell says that whilst some experts allow diabetic pregnant women to go to term if their blood sugars are very well controlled there are some who will induce labour earlier than full term because of the slight chance of infrequent inexplicable foetal death in utero. If Mrs Sparreboom had been induced earlier, perhaps there could have been a different outcome. He says that arguably, Mrs Sparreboom's labour could have been induced earlier than at term.

168. Dr Caldwell says that when it was observed Mrs Sparreboom was suffering from an antepartum haemorrhage, correctly the syntocinon infusion was ceased and the CTG showed deep prolonged variable dips. At this time, the treating team were faced with the following factors: a diabetic patient on insulin, labour being induced at term, an antepartum haemorrhage, deep prolonged dips on CTG, most likely pathological. Dr Caldwell says in his opinion, Mrs Sparreboom should have been delivered by caesarean section as early as possible. Later in his report he says, ideally Mrs Sparreboom should have been delivered by caesarean section within 20 to 30 minutes.

169. Dr Caldwell says that in this case, Sophie was delivered 1 hour and 10 minutes later. If Sophie had been delivered earlier, it is difficult to say what would have been the outcome.

170. Dr Caldwell says he is unable to say the exact cause of Mrs Sparreboom's antepartum haemorrhage. He noted that a number of features that are usually present with an antepartum haemorrhage (very tender uterus, severe abdominal pain and at the time of delivery there are usually blood clots) were not reported in Mrs Sparreboom's case.

171. Dr Caldwell was asked a number of questions by the family lawyers and the following answers were provided:
    - Dr Caldwell says that Mrs Sparreboom's diabetes was treated correctly. The only query he had was whether Mrs Sparreboom should have been induced earlier, e.g., 7 days before term.
    - Dr Caldwell says the decision to induce labour was correct. Mrs Sparreboom's history of endometriosis and uterine tightenings at 27

weeks were irrelevant. The only query Dr Caldwell had was questioning if there should have been an earlier induction.

- Dr Caldwell says that the use and dosage of the syntocinon infusion was correct as Mrs Sparreboom's contractions were described in the notes as incoordinate. A syntocinon infusion is often used to remedy this type of ineffective uterine contractions.
- As previously indicated, Mrs Sparreboom should have been delivered urgently once the CTG abnormalities and the antepartum haemorrhage were seen. The antepartum haemorrhage could have become more severe at any time.
- As to the cause of Mrs Sparreboom's antepartum haemorrhage, Dr Caldwell was unable to say.

Expert report of Dr Keeping

172. Dr Keeping provided a report to the Office of the State Coroner dated 18 April 2013 however it was not received until 30 April 2013.

173. Dr Keeping notes that any diabetic patient, real or gestational, has a pregnancy with more risk than someone who is not diabetic. He was of the view that even a gestational diabetic who is well controlled on insulin would be regarded as having some degree of a high risk pregnancy.

174. Dr Keeping stated that it was conventional wisdom that a straightforward pregnancy can be allowed to go overdue for up to 10 – 14 days in the absence of any risk factors. Depending on the control and severity of the diabetes, one would think of inducing a diabetic patient a bit earlier than someone without any risk factors. Dr Keeping was of the view that with a badly controlled diabetic, one would consider delivering the baby at 38 weeks. Even in a well controlled gestational diabetic it would still be considered that there would be some degree of risk in post-maturity and therefore there is a limit on how far a patient should be allowed to go. Dr Keeping was of the opinion that allowing Mrs Sparreboom to go one day over her due date was within acceptable limits however he would have considered inducing Mrs Sparreboom a little earlier.

175. Dr Keeping noted that Sophie's head was recorded as three fifths palpable and the vaginal examination also recorded that Sophie's head was very high. Dr Keeping was of the opinion that this was unfavourable in terms of a vaginal delivery and induction. He was of the opinion that this does not mean the induction should not be considered, however staff would need to have in the back of their minds that this was not a good start to labour. He also noted that the Bishop score was five indicating the cervix was not particularly favourable. In all circumstances, the induction was being embarked on in fairly unfavourable circumstances. The other alternative was to wait longer but given Mrs Sparreboom's gestational diabetes, this was probably not acceptable. Dr Keeping was of the opinion it was still acceptable to induce labour even with an unfavourable cervix however it was another adverse factor to be programmed into the equation.

176. Dr Keeping reports that an antepartum haemorrhage just means that there is some bleeding per vaginum. More often than not, it cannot be

worked out at the time where the bleeding is coming from or the significance of it. In itself it is not a marker to suggest some major change in the delivery plan, but it is another adverse factor to be put into the equation.

177. Dr Keeping was of the opinion that foetal distress was the main issue of concern. He noted that he had not been provided with the CTG and was relying on the interpretation of the CTG in the medical records. Dr Keeping says that the medical records indicate there was concern regarding the CTG from 2050 when there was a comment to prepare for the operating theatre. Dr Keeping says there is an implication in the records that the classification of a category 2 caesarean meant that the second operating theatre could not be opened. Dr Keeping is of the opinion that the semantics of how the degree of urgency was categorised and subsequent delay by the theatres was the undoing of Sophie. Whilst people were discussing categories, hospital policy towards categories and sending faxes to theatres, Sophie was becoming increasingly distressed. When the category was finally upgraded to category 1, consideration was then given to opening a second theatre. Given the fact that there will always be some delay in opening a second theatre, this was way too late.

178. Dr Keeping noted that the paediatric senior registrar arrived 8 minutes after delivery. He was of the view that this was a case that had quite a number of risk factors; there had been foetal distress for a long time; a delay in getting a theatre and with an expectation that Sophie may come out flat. Given that there had been 1 hour and 20 minute delay in getting to theatre, Dr Keeping was of the view that there was ample time to have paediatric support at the caesarean section.

179. In conclusion, Dr Keeping says that the delay in performing the caesarean section was unconscionable. He says that categories and semantics mattered more than the outcome of the baby. He was of the view that but for the delay, there is every reason to believe Sophie would have been fine.

Addendum report from Dr Keeping

180. Dr Keeping was provided with additional information (namely the CTG) and provided an additional opinion on a number of issues. Dr Keeping provided his report on 1 August 2013. The questions that were raised and Dr Keeping's responses are detailed below.

The appropriateness of no CTG between 1530 and 1900

181. Dr Keeping was of the opinion that given Mrs Sparreboom was a gestational diabetic, most centres would have continuous CTG monitoring onwards because this is considered to be a significant risk factor.

182. In retrospect, the CTG was fine when it was resumed so Dr Keeping was not concerned about the lack of monitoring between this period.

Whether there was any signs of foetal distress prior to 2050

183. Dr Keeping made the following comments based on the CTG tracing:
    - 0745 – 0910: CTG tracing was fine

- 1445 – 1530: CTG tracing was fine
- 1905 – 1950: CTG tracing was fine
- 1950: there was one reasonable sized 'dip', this recovered well, was made when the patient was changing position, so that is acceptable.
- 2000 – 2050: the CTG tracing was fine
- 2050: there was a fairly large 'dip', the foetal heart recovered upwards briefly, then there is another dip lasting to about 2100. At this point the CTG is becoming concerning. Basically from there on in until delivery the CTG trace was worrying and would be considered 'non-reassuring'. The foetal heart was dipping more than it was up at the normal level
- 2120: there is another large dip
- 2129: from here on until the end of the trace there is a fairly catastrophic trace. This continued until the tracing ceased at about 2156.

Comment specifically on the decelerations that occurred between 1950 and 2000 and Mrs Sparreboom's recollection that she did not move compared to the entry made on the CTG by Midwife P that Mrs Sparreboom moved

184. Dr Keeping noted that there was one large dip which was recorded and the CTG trace was then ok so there was no need to intervene at this point. Dr Keeping detailed that at various times in labour the baby's heart rate will dip as a once-off and is sometimes attributed to the mother going to the toilet, moving positions, being on her back or just because the baby wished to do that. Dr Keeping did note that those caring for Mrs Sparreboom would store in the back of their mind the fact that there had been that one dip.

Whether a change from abdominal CTG to foetal scalp electrode is evident on the CTG and whether there is normally a loss of contact, etc when this occurs

185. Dr Keeping noted that the CTG tracing is old however he did not think that the changing from abdominal to scalp electrode played any major part in Mrs Sparreboom's labour.

Whether Dr Keeping could determine from the records what the administration of syntocinon was and whether this administration was appropriate

186. Dr Keeping noted that this was a red herring. He was of the opinion that the administration of Syntocinon was entirely appropriate.

187. Dr Keeping states that there is no correct dose of Syntocinon and every hospital has its own regime and they all differ in the fine detail. The basis is that a low level of Syntocinon would be administered and escalated upwards, monitoring the contractions so that the uterus is not over-stimulated. Once the appropriate level of contractions has been reached and the mother is in good labour, the dose would be maintained at that level.

188. Dr Keeping says that it is a titration using the strength and frequency of the contractions as a measure of the appropriate effect of Syntocinon.

He could see no evidence that it was an issue during Mrs Sparreboom's labour.

Was the delay to proceed with a caesarean reasonable

189. Dr Keeping says that this was the main issue around which the case revolves. This revolved around the fact that it was at 2055 the CTG showed concerns and the decision to proceed to caesarean section was made at 2125. It was noted there were steps being undertaken to ascertain the well-being of Sophie but that Dr L was a third year registrar who needed to consult with Dr N.

190. Dr Keeping is of the opinion that the CTG was concerning or non-reassuring from around 2050, which got worse and was fairly catastrophic from around 2129.

191. Dr Keeping reported his experience of different hospitals – small regional hospitals and large tertiary hospitals and how decisions can be made about how long a non-reassuring trace can be closely monitored before making a decision. In small regional hospitals the decision needs to be made far earlier because the ability to access a theatre and personnel will be slower whereas in large tertiary hospitals the patient can be taken to an available theatre much more quickly. He then commented that he had not worked at Nambour Hospital so he had no knowledge of the systems in place.

192. Dr Keeping noted that the foetal heart was a concern at 2050 and that if only one theatre was going to be available or it would take a while to open the second theatre then someone needed to take steps at 2100 to get the ball rolling that an urgent caesarean might be needed quite soon. As it was, the decision to perform a category 2 caesarean was not made until 2120, which in itself did not start any preparation towards having a theatre available. At 2129, a fax was sent to theatre suggesting the caesarean section be upgraded to category 1. Dr Keeping noted that the CTG trace was catastrophic at this point however if Mrs Sparreboom could have been in theatre in 5 minutes, the situation might have been able to be retrieved. He further stated that if at that point there needs to be arrangements to open a second theatre such that the baby is not delivered for another 40 minutes (as was the case with Sophie) then that is a misreading of the situation by the people involved.

193. Dr Keeping is of the view that if the theatre had been alerted at around 2100 that there was a likely caesarean for foetal distress and the caesarean was done at around 2130 then in all probability, Sophie would have been fine.

Root Cause Analysis (RCA)

194. Following Sophie's death, a RCA was conducted at Nambour Hospital. The RCA was completed on 26 May 2008.

195. The first causal statement was '*Current practise regarding weekend availability of ORS staff and requirements to open a 2nd operating room*

contributed to a delay. Potentially increasing the likelihood of complications and the baby dying'.

196. Recommendation one was to develop a business case addressing options available for increasing the staffing in ORS to enable a second theatre to be available after hours and weekends within a 20 minute timeframe. Management was noted to have concurred with this recommendation noting it was for further discussion post business case.

197. The second causal statement was *'two versions of the caesarean category system contributed to confusion and a subsequent delay in opening a second operating room. Potentially increasing the likelihood of complications and the baby dying.'*

198. Recommendation two was to have a laminated table of the emergency caesarean category system placed in the operating theatre and birth suite and for a staff survey on the awareness of this system to be produced and completed. Management was noted to have concurred with this recommendation.

199. The third causal statement was '*having no system to raise awareness of a category 1 caesarean contributed in staff being unaware of the escalation. This contributed to the on call senior paediatric registrar/consultant not being present at the birth, potentially increasing the likelihood of complications and the baby dying.'*

200. Recommendation 3 was for an emergency caesarean category system to be developed into a workplace instruction with version controls. Management was noted to have concurred with this recommendation.

201. The fourth causal statement was '*breakdown in communication regarding incomplete information contributed to the on call senior paediatric registrar/consultant not being present at the birth, potentially increasing the likelihood of complications and the baby dying'.*

202. Recommendation 4 was to develop a workplace instruction for optimising the care of a critically ill child to include assessment of a child by the on call senior registrar/consultant. Management was noted to have concurred with this recommendation.

203. The RCA team noted in lessons learnt that having a CTG machine in theatre for continuity of tracing would be ideal. This would require the birth suite changing to one type of machine so a match could be purchased for theatre. The RCA team recommended that a business case be supported for this to occur.

204. On 4 June 2008, there was a perinatal and maternal mortality and morbidity meeting which discussed Sophie's death. The meeting discussed the RCA findings and recommendations.

Update on RCA recommendations and current policies and procedures

RCA

205. On 27 February 2013, Nambour Hospital responded to a request to provide an update on the implementation of recommendations, copies of policies and procedures that existed at the time of Sophie's death and the current policies and procedures.

206. Recommendation 1 has been fully implemented. A second theatre registered nurse and on call theatre registered nurse are now rostered on in the operating rooms after hours and on weekends. After hours, Nambour Hospital can open a second operating theatre within 20 minutes after receiving notification of the emergency requirement to open a second theatre.

207. Recommendation 2 has also been fully implemented. The emergency category system is prominently displayed in birthing suites and the operating suites. Additionally, the hospital's emergency theatre booking form has a separate section to provide a rating of the clinical priority of the procedure. This is the form that is faxed to theatre.

208. Recommendation 3 has been fully implemented. The health service has drafted the amalgamated caesarean procedure that sets out the detail of the emergency category system and the process to be followed once categorisation of an emergency caesarean procedure is determined. The O&G Registrar handbook also sets out the procedure. A paging system has been implemented for category 1 caesarean section so that when a caesarean is deemed a category 1, a call is made to the hospital switchboard and a group category 1 page is sent to the on call obstetric consultant, on call obstetric registrar, on call anaesthetist consultant, on call anaesthetist registrar, on call paediatric registrar, nursery and operating theatre coordinator.

209. Recommendation 4 has also been fully implemented. The on call paediatric registrar is notified of a category 1 caesarean section via the category 1 page. The paediatric registrar must as a matter of priority respond to the page and obtain the clinical details of the emergent caesarean section, condition of the neonate and then escalate the birth to the on call paediatrician. The on call paediatrician will then make a clinical decision on whether to attend.

Queensland Maternity and Neonatal Clinical Guideline: Induction of labour

210. The policy is effective from September 2011 and is apparently effective in the Sunshine Coast Health Service District.

211. The policy notes that when offering induction of labour there is a need to consider the service capabilities of the facility, ensure availability of health care professionals appropriate to the circumstances and continuous electronic foetal heart rate monitoring and uterine contraction monitoring should be available.

212. The policy makes the following recommendations in relation to mothers with gestational diabetes or diabetes mellitus:

- Until quality evidence becomes available, offer delivery at 38 weeks to women with diabetes requiring insulin.
- Advise women with well-controlled, diet controlled gestational diabetes, and no foetal macrosomia or other complications, to await spontaneous labour unless there are other indications for induction of labour.

213. The policy also notes that syntocinon should not be commenced within six hours of administration of vaginal prostaglandin and an artificial rupture of membranes should occur beforehand.

214. The policy requires the following monitoring to occur
- Provide one to one midwifery care
- Use continuous electronic foetal heart rate monitoring
- Titrate dose to achieve 3 – 4 strong regular contractions in 10 minutes
- Assess maternal observations and foetal heart rate prior to any increase in the infusion rate
- Maternal observations (more frequently if clinically indicated)
- Temperature 2 hourly
- Blood pressure hourly
- Pulse hourly
- Vaginal loss hourly
- Maintain fluid balance
- Assess pain relief requirements

215. The policy notes that the following should occur for the administration of oxytocin:
- Use a volumetric pump to ensure an accurate level of infusion
- A standard dilution of oxytocin should always be used
- Individual protocols should specify maximum doses
- The dose should be titrated against uterine contractions – titration should occur at 30 minute or greater intervals and should aim for 3 – 4 contractions in a 10 minute period with duration of 40 – 60 seconds and resting period of not less than 60 seconds
- Use the minimum dose required to establish and maintain active labour
- Record the dose in milliunits per minute
- Mark changes to dose clearly and contemporaneously on the CTG and/or intrapartum record

216. The policy requires a review by an obstetrician should occur before exceeding a dose of 20 milliunits per minute.

217. The policy recommends ceasing the oxytocin infusion if uterine activity becomes hypertonic, resting uterine tone increases, foetal compromise occurs (any concerning foetal heart rate abnormality) and to consult with an obstetrician before recommencing infusion.

218. The policy notes that the ideal dosing regime of oxytocin is unknown. The policy provides the following suggested regime:

Time after starting	Oxytocin dose (milliunits per minute)	Volume infused (mL/hour)		
		10IU in 500mL	20IU in 1000mL	30IU in 500mL
0	1	3	3	1
30	2	6	6	2
60	4	12	12	4
90	8	24	24	8
120	12	36	36	12
150	16	48	48	16
180	20	60	60	20
Obstetrician review prior to exceeding 20 milliunits per minute				
210	24	72	72	24
240	28	84	84	28
270	32	96	96	32

Queensland Maternity and Neonatal Clinical Guideline: Normal birth

219. This policy came into effect in April 2012. It only applies to normal birth which is defined as spontaneous in outset, low-risk at the start of labour, remaining low-risk throughout labour and birth, the newborn is born spontaneously, in the vertex position and between 37 and 42 completed weeks gestation.

220. The policy notes that due to the spectrum of birth experiences, the normal birth guideline or aspects thereof may be applicable to women and newborns that have or develop risk factors.

Sunshine Coast Health Service District Procedure 'Caesarean Section'

221. There are three classifications for emergency caesarean sections:
    - Category 1: immediate. Immediate threat to life of the woman or foetus. Requires immediate theatre transfer. If theatre occupied, open a second theatre
    - Category 2: emergency. Maternal or foetal compromise which is not life threatening. Requires next available theatre. If significant delay is anticipated then open a second theatre.
    - Category 3: urgent. No maternal or foetal compromise, but needs early delivery. Next case in emergency theatre unless delay longer than 1 hour.

222. The procedure notes that the decision to open a second theatre will usually require direct communication between the obstetric and anaesthetic consultants.

223. The procedure notes that guidelines on electronic foetal monitoring suggest that where acute foetal compromise is suspected or confirmed, delivery should be as soon as possible, ideally within 30 minutes.

224. The procedure also notes that for all emergency caesarean sections delay in delivery of more than 75 minutes is associated with poorer outcomes. The effect is greater with prior maternal or foetal compromise.

225. The procedure recommends that:
    - Delivery as emergency for maternal or foetal compromise should be accomplished as quickly as possible.
    - Decision to delivery interval of less than 30 minutes remain an audit standard for response to emergencies within maternity services
    - A 75 minute decision to delivery interval should be included as an important audit standard and all category 1, 2 and 3 delivers should occur within this time.

226. The procedure sets out the steps to be undertaken when a decision is made to proceed via emergency caesarean section. It notes that the decision for emergency caesarean by an obstetric registrar be made with consultation with consultant and operating theatre to be advised of the degree of urgency. The decision time must be documented in the medical records.

227. The procedure notes in the section that deals with midwifery care during a caesarean section that a paediatrician should always be present for an emergency caesarean section (category 1 – 3) or where there is a foetal risk factor present for an elective caesarean section.

228. The procedure makes the following recommendations in relation to paediatric attendance at caesarean section:
    - An appropriately trained practitioner, in addition to the obstetrician and the anaesthetist, whose responsibility is to administer appropriate resuscitation to the newborn, should be present at all births by caesarean section;
    - Health care facilities must ensure that staff attending births have adequate and appropriate training in newborn resuscitation;
    - A paediatrician with advanced skills in neonatal resuscitation, including intubation should attend all medium and high risk births (medium risk defined as indicate that foetal or maternal factors have evolved in the short term, creating risk which necessitates delivery best undertaken by caesarean section. High risk defined as indicate a significant risk to mother and or foetus and time is critical).
    - There should be appropriate communication between obstetrician and paediatrician on matters or risk analysis and procedure planning to achieve neonatal outcome
    - The obstetrician must take responsibility for categorisation of risk on each separate caesarean deliver and plan care accordingly.

Emergency Caesarean categories

	Code green (category 1)	Urgent (category 2)	Routine (category 3)
Action	If theatre not already available then open another theatre immediately	Caesarean section must be performed within 1 hour of notification	Caesarean section to be performed in next available theatre
Process	• Obstetric registrar contacts on duty obstetric consultant to confirm category 1 • Obstetric registrar	• Obstetric registrar to confirm category 2 with obstetric consultant and the notify anaesthetic registrar, theatre	Routine notification of theatre and relevant staff by phone and blue form

	contacts switch ti send obstetric category 1 group page • Obstetric registrar discusses case directly with anaesthetic registrar and paediatric registrar • Birth suite organises immediate transfer of patient to theatre	floor coordinator and paediatric registrar by phone • If patient not on operating table within 45 minutes of notification then floor coordinator to advise obstetric registrar who will activate category 1 procedure to open another theatre	
Examples (guide only)	Vasa praevia, cord prolapse, moderate or severe placental abruption, abnormal CTG (any pathological trace including prolonged bradycardia), foetal acidosis (scalp lactate >4.8) failed instrumental delivery, difficult delivery of second twin	Failure to progress with normal CTG, severe preeclampsia, labour with previous caesarean section where unsuitable for VBAC, malpresentation in labour or with membrane rupture (breech, transverse or oblique)	Not in labour and requiring caesarean section e.g. ruptured membranes, growth restriction with normal CTG, preeclampsia not serve, previous caesarean section

Sunshine Coast Wide Bay Health Service District Procedure – Foetal Monitoring – Intrapartum Care

229. This procedure notes it is effective from December 2008.

230. This procedure would appear to indicate the following relevant classes where there is an indication for continuous intrapartum CTG: induced labour, diabetes, antepartum haemorrhage, oxytocin augmentation.

231. The procedure requires that during CTG monitoring, the CTG features are recorded every 30 minutes on the intrapartum continuous CTG Monitoring Record including CTG classification.

232. The procedure notes that the management of CTG abnormalities should be in accordance with the RANZCOG algorithm (appendix 3). Suspicious changes (see RANZCOG algorithm) should be reported directly to the duty obstetric and gynaecology registrar.

233. The procedure requires any intrapartum events that may affect the foetal heart rate e.g., vaginal examination, obtaining a foetal blood sample, maternal position change etc should be documented contemporaneously on the CTG trace and on the partogram as the CTG may fade over time.

234. The appendix to this policy is not attached.

Sunshine Coast Health Service District Procedure on Electronic Foetal Monitoring

235. This procedure is effective from November 2011.

236. The procedure refers to the Queensland Maternity and Neonatal Clinical Guidelines – Intrapartum foetal surveillance for the mode of intrapartum foetal surveillance flowchart.

237. The procedure requires the CTG to be interpreted as either 'normal', 'abnormal unlikely foetal compromise' or 'abnormal likely foetal compromise'.

238. The CTG features are reviewed and described as per CTG interpretation attachment 1 (which uses the RANZCOG guidelines) and recorded on the intrapartum continuous CTG monitoring form (attachment 2) every 30 minutes.

239. The intrapartum continuous CTG monitoring form is similar to the form adopted by Toowoomba Base Hospital following another death investigated by the OSC.

240. Any signs of likely foetal compromise must be reviewed by the registrar.

241. Any intrapartum events that may affect the foetal heart rate (for example vaginal examination, maternal position change or temperature) should be documented contemporaneously on the CTG.

242. Any concerns about the interpretation of the CTG trace are to be escalated to the consultant on call.

243. The procedure also details a process whereby the original CTG is to be filed and photocopied when a number of scenarios have occurred. One of the requirements for the original CTG to be photocopied is when there is a significant morbidity of the baby or death and category 1 caesarean sections.

Clinical Forensic Medicine Unit (CFMU) report

244. A CFMU report was sourced to provide an opinion on the appropriateness of Sophie's resuscitation. The report was provided on 21 June 2013.

245. Dr Hall noted that as a result of physiologic changes that occur in the transition from intrauterine life as a foetus and extra uterine existence as a newborn, it is understood that blood oxygen levels in uncompromised babies do not reach extra uterine values until approximately 10 minutes after birth. This means that in a healthy newborn, there is generally enough 'reserve' from the foetal blood flow to maintain oxygenation for 10 minutes before it is critical that oxygen is breathed from the air to maintain healthy oxygen supply. In situations where foetal distress has already begun in the womb, one cannot accurately predict at what point oxygenation becomes critical.

246. Dr Hall noted that Dr S was a Principal House Officer which is a registrar role that is not engaged in a training position under the College

of Physicians however in order to undertake the role of PHO, the doctor must be credentialed, satisfying key performance and clinical experience criteria.

247. Dr Hall noted that Dr S's notes are concise and well ordered, recording an appropriate resuscitation in the circumstances.

248. Dr Hall was not concerned with the anaesthetist performing the intubation on Sophie and that this was not unusual for a flat infant given the anaesthetist has far more experience in intubation.

249. Dr Hall also noted that Dr C1's notes were well ordered and record an appropriate resuscitation.

250. Dr Hall was of the opinion that the paediatric input was appropriate and within acceptable timeframes. He was of the view that there was no indication that the delivery required more senior support at the time and even if there was a more senior paediatric registrar or consultant available at the time of the delivery, the outcome would be unchanged. Dr Hall commented that in the circumstances he regarded the paediatric support provided to Sophie after her birth as exceptional in the circumstances.

251. Dr Hall agreed with Dr C2's view that even if a road ambulance had been immediately available, the team would have arrived at Nambour Hospital at the same time the retrieval team arrived via helicopter. Dr Hall was satisfied that the logistics in arranging emergency transport did not influence the outcome.

Conclusions

252. The antenatal care provided to Mrs Sparreboom was unremarkable and appropriate. She had been appropriately diagnosed with gestational diabetes, which was recognised as a risk factor and requiring monitoring. There had been some difficulty in her obtaining an appointment at Nambour Hospital, but one was eventually made and this delay did not impact on the later events.

253. A decision was made for her to be induced at essentially full term. Dr Caldwell and Dr Keeping both considered she could have been induced a little earlier but are not particularly critical of this aspect of the care.

254. Neither of them were critical of the management of the induction including CTG monitoring and the use of syntocinon until around 2050 hours. At this time ante-partum haemorrhage was noted with an unreassuring CTG. Dr Caldwell and Dr Keeping both considered Sophie should have been delivered by caesarean section as early as possible and within 20 to 30 minutes. There was a delay until 2130 before a decision was made to upgrade the caesarean section to category one and then Sophie was not delivered until another 40 min later. Dr Caldwell considered that if Sophie had been delivered earlier it was difficult to say what would have been the outcome. Dr Keeping was of the view that if the theatre had been alerted at around 2100 hours and a caesarean done within 30 min then in all probability Sophie would have been fine.

255. There are no concerns with respect to the resuscitation and paediatric management or retrieval arrangements after Sophie was born.

256. What is apparent is that Sophie should have been born by 2130 hours. Although it is not possible to be absolute as to whether the outcome would have been different, it is more probable than not it would have been a much better outcome for Sophie if she had been born earlier.

257. A Root Cause Analysis has identified some key issues concerning the delay associated with the problems in commencing the caesarean section in a timely manner and a number of other policy initiatives have been introduced , which may go a significant way to preventing a similar outcome occurring in the future.

Findings required by s45

Identity of Deceased	Sophie Claire Sparreboom
How She Died	Sophie's mother had attended at Nambour Hospital for a planned induction of birth due to a diagnosis of gestational diabetes. Due to an antepartum haemorrhage and pathological changes in the CTG, Sophie was delivered by way of emergency caesarean. There was a delay in the emergency caesarean being undertaken and as a result Sophie was born in an extremely poor condition and only survived a few hours.
Place of Death	Nambour Hospital, Hospital Road, NAMBOUR QLD 4560 AUSTRALIA
Date of Death	30 March 2008
Cause of death	1 (a) Cerebral Hypoxia (b) Placental Abruption

John Lock
Brisbane Coroner
BRISBANE
5 September 2013