Southern District Health Board

Registered Midwife, RM A

Obstetric Registrar, Dr C

Paediatric Registrar, Dr D

A Report by the

Deputy Health and Disability Commissioner

(Case 17HDC01543)

Health and Disability Commissioner

Te Toihau Hauora, Hauātanga

Contents

Executive summary

1. This report concerns the midwifery and obstetric care provided to a woman during her labour, and the neonatal care subsequently provided to her baby, who, tragically, died 22 hours after she was born.

Findings summary

2. The Deputy Commissioner found a number of omissions in the woman's care after her Lead Maternity Carer (LMC) rang the emergency bell when she noted meconium in the liquor following a spontaneous rupture of membranes. The Deputy Commissioner considered that the LMC's lack of clarity regarding her ongoing role and responsibility and the handover to secondary care contributed to the omissions. The LMC was found in breach of Right 4(1) of the Code.

3. The Deputy Commissioner considered that aspects of the system in place at the district health board also contributed to the omissions, including an inadequate policy for handover of care from an LMC to the obstetric service, and the lack of standardisation in documentation of the interpretation of CTGs. The Deputy Commissioner was also critical of aspects of the care provided by the hospital midwife who assisted with the labour.

4. A paediatric registrar administered an incorrect dose of midazolam to the baby, and was found in breach of Right 4(1) of the Code. However, the Deputy Commissioner noted mitigating circumstances for which the DHB is responsible. The DHB was also held responsible for several aspects of sub-standard care provided to the baby by multiple clinicians, and the Deputy Commissioner found the DHB in breach of Right 4(1) of the Code.

Recommendations

5. The LMC, the DHB, and the paediatric registrar were all asked to provide a formal written apology to the family. The DHB is developing guidelines that set out the transfer of care process from primary to secondary maternity care at the hospital. A new sticker is also being developed to standardise documentation of CTG interpretation.

6. The LMC has undertaken a number of actions to meet the requirements of the Midwifery Council competence programme. The Midwifery Council will also consider whether a further review of her competence is warranted.

Complaint and investigation

7. The Health and Disability Commissioner (HDC) received a complaint regarding the services provided to Mrs B and her baby daughter, Baby B, by Registered Midwife (RM) RM A and Southern District Health Board (SDHB). The following issues were identified for investigation:

- *The appropriateness of the care provided to Mrs B by RM A in 2016.*
- *The appropriateness of the care provided to Mrs B by Dr C in 2016.*
- *The appropriateness of the care provided to Mrs B by Southern District Health Board in 2016.*
- *The appropriateness of the care provided to Baby B by Southern District Health Board in 2016.*
- *The appropriateness of the care provided to Baby B by Dr D in 2016, in respect of the midazolam error.*

8. This report is the opinion of Deputy Commissioner Rose Wall, and is made in accordance with the power delegated to her by the Commissioner.

9. The parties directly involved in the investigation were:

RM A	Registered midwife/lead maternity carer
Mrs B	Consumer/Baby B's mother
Mr B	Consumer's husband/Baby B's father
Southern District Health Board	Provider
Dr C	Obstetric registrar
Dr D	Paediatric registrar

10. Further information was received from:

Dr E	Obstetrician
RM F	Registered midwife
Dr G	Neonatologist
Dr H	Paediatrician
RN I	Registered nurse
ACC	
The Midwifery Council of New Zealand	
The Medical Council of New Zealand	
The Coroner	

11. Also mentioned in this report: Dr J, Neonatologist.

12. Independent advice was obtained from RM Billie Bradford (Appendix A), obstetrician Dr Ian Page (Appendix B), and neonatal paediatrician Dr Phil Weston (Appendix C).

Information gathered during investigation

Introduction

13. This report concerns the midwifery and obstetric care provided to Mrs B during her labour, and the neonatal care provided to Mr and Mrs B's baby daughter, Baby B. Tragically, Baby B died 22 hours after she was born.

Background

14. Mrs B was in her thirties and in her first ongoing pregnancy. The pregnancy was uneventful, and she went into spontaneous labour on her due date. She was admitted to the delivery suite at the public hospital at 8am. Mrs B's LMC was RM A.

Labour

15. At 8am, core midwife RM F documented Mrs B's blood pressure, pulse, and temperature, all of which were normal. RM F noted that Mrs B was contracting three times every ten minutes, with the fetal heart rate being 152 beats per minute (bpm) following a contraction.

16. RM A arrived at 8.30am. At 8.45am, RM A performed a vaginal examination and found that Mrs B was 4cm dilated with intact membranes. At 10.25am, Mrs B got into the bath, and RM A noted that this provided good pain relief.

17. At 11.45am, RM A performed a vaginal examination while Mrs B was in the bath. RM A documented: "9cm dilated, ridge of cervix felt anteriorly. Show[1] noted — small." RM A advised that she was confident with her findings at that time.

18. Mrs B exited the bath, and at 12.30pm her membranes ruptured spontaneously and meconium liquor[2] was noted. RM A pressed the call bell to request assistance. In RM A's opinion, this is when transfer to the obstetric service was triggered. However, RM A acknowledges that she did not document in the notes that care and responsibility had been transferred to the hospital team, and she continued to provide care to Mrs B.

19. RM F attended in response to the call bell. CTG[3] monitoring was commenced, and at 12.40pm a fetal heart rate deceleration to 80bpm was heard. RM F said that RM A asked for assistance to attach a fetal scalp electrode, as she did not know how to do this. However, RM A advised that although she asked for assistance, she is confident in attaching fetal scalp clips, and does so regularly. In response to the provisional opinion, RM A added that she

[1] A discharge of mucous streaked with blood from the vagina.
[2] Meconium is the first faeces passed by a newborn, and is green/black in colour. In some circumstances, the baby passes meconium while still inside the uterus. This may be a sign of distress, or can also be a normal process in a post-mature baby.
[3] Cardiotocography (CTG) monitoring is the combined monitoring of the baby's heartbeat in utero and the mother's uterine contractions, if any. This allows for an interpretation of the fetal heart rate, either alone or in relation to the contractions, and may be used to assist with the identification of fetal well-being and/or distress.

asked RM F to assist "simply due to the number of matters which needed to be done urgently at the time and given the rapidly changing urgent situation".

20. RM F stated that she put on the fetal scalp clip quickly without doing a full vaginal assessment. She said that a full vaginal assessment would have interfered with the fetal scalp clip picking up the fetal heart rate, and her clinical priority at the time was to assess the fetal heart rate, as it had been only 80bpm.

21. RM F stated:

> "The fetal scalp clip was easy to apply; I felt a vertex presentation and did not feel any prolapsed tissue. Straight after I had applied [the] clip [RM A] informed me that [Mrs B] was 9cm with an anterior rim recently and was most likely fully dilated now, so she felt I did not need to do a further vaginal examination. I had no reason to doubt [RM A's] assessment, she is a colleague I respect and have trusted her judgement in the past therefore I did not perform a second vaginal examination and therefore did not note dilation or head position."

22. RM A's understanding was that RM F undertook a vaginal examination at the time she attached the fetal scalp electrode. In response to the provisional opinion, RM A added that in order to attach a fetal scalp electrode it is necessary to determine that it is correctly attached to the baby's head, and not the cervix, and as such "it would be incorrect to attach a [fetal scalp electrode] without doing a [vaginal examination]".

23. RM F noted that the fetal heart rate recovered to 120bpm. She told HDC that she did not assess Mrs B's pulse, and that whilst she was applying the fetal scalp clip, RM A checked Mrs B's pulse. RM F documented on the CTG tracing at 12.40pm: "mec liquor, scalp clip, fully dilated, pushing." She said that RM A had verbally stated to her that [Mrs B] was fully dilated and pushing.

24. RM A told HDC that as the documentation of full dilation was not written by her, and she has no recollection of assessing that Mrs B was fully dilated, there is no basis to consider that she made the assessment that the second stage of labour had been reached. RM A said that she did not advise Mrs B to commence pushing, and that the pushing was spontaneous and Mrs B "felt an urge to push".

25. In response to a review of the information gathered in the provisional opinion, Mrs B said that neither she nor her husband have any recollection of telling RM A that Mrs B felt the urge to push at that time. Rather, Mrs B recalls saying that she was feeling pressure, and questioning RM A whether she was to start pushing.

26. RM F left the room to inform the obstetric registrar, Dr C, of the meconium liquor and scalp clip application, and at 12.50pm RM F and Dr C returned to the room.

27. Dr C documented that the fetal heart rate had recovered to 120bpm, that Mrs B was pushing, and that the vertex of the baby's head was visible. Dr C stated that she was told

that Mrs B was fully dilated. Dr C documented the plan to have a paediatrician at the delivery, and noted that she would remain nearby in case of further decelerations.

28. Dr C told HDC:

> "I recall seeing what I believed to be fetal head bulging at the introitus with each contraction, as I remember thinking it would be a straightforward ventouse if another prolonged deceleration were to occur as it looked like the head just needed to make it around the final corner of the pelvis.
>
> Given that the fetal heart rate had normalised, and I had believed [Mrs B] was fully dilated as she had just been examined by an experienced midwife who had placed the fetal scalp electrode (FSE), and I had never seen vaginal prolapse at the introitus in a woman in labour before, I did not closely inspect the presenting part and nor did I complete a digital vaginal examination."

29. RM A considers that it was Dr C's responsibility to perform a vaginal examination at this time, and told HDC that as there had been a handover to Dr C, she (RM A) would undertake a vaginal examination only at the request or instruction of the registrar.

30. RM F stated:

> "It was my understanding that birth would happen soon, based on the recorded observations and [Mrs B's] presentation. As a first time mother, [Mrs B's] labour was occurring as I would have expected.
>
> I stood at the back of the room and monitored the heart rate. My intention was not to interfere with [RM A's] birthing partnership with [Mrs B]. My role was to keep an eye on the fetal heart rate so that I could let [Dr C] know if there was any further decelerations … I was also keeping an eye on the rest of the ward and intermittently left the room."

31. Dr C told HDC that she telephoned the obstetric consultant on duty, Dr E, to advise that she would stay in the delivery suite until Mrs B's baby was born. However, Dr C was then called to theatre to assist with another patient. Dr C advised RM F that she would be in theatre, but could return to Mrs B if required.

32. RM F documented at 12.55pm: "Pushing effectively, descent visible on pushing"; at 1.10pm: "FHR 135 following contraction"; at 1.30pm: "FHR 137 following contraction"; at 1.50pm: "head visible on perineum with pushing, FHR 120 following contraction"; and at 2.15pm: "lots of head visible on pushing FHR 130 following contraction".

33. RM F said that RM A was "monitoring the CTG trace and contractions and stayed close by the woman providing woman centred care". However, RM A advised HDC that all the assessments between 1.50pm and 2.15pm that the head was visible were made by RM F, and that she trusted that assessment as RM F was a very experienced midwife.

34. In contrast, RM F advised that she regrets that she did not personally examine the bulge at the perineum until later on. She said that from her perspective, RM A was managing the situation well, and there were no clinical indications that caused her to question RM A's judgement.

35. RM A recalls that at 2.15pm she was thinking that more progress should have been made at that time. She told HDC that she said something to RM F along the lines of: "[I]s that head? I don't think that's head. I think that's vaginal wall."

36. RM F told HDC:

> "[At 2.30pm] [RM A] asked me whether I thought it was a vertex presentation. At this stage I came forward from the back of the room and assessed the presentation and confirmed I did not think it was the head coming down."

37. RM F then contacted Dr C to review the situation, and documented: "[P]rolapsed ? tissue in front of baby's head, FHR 152."

38. Dr C left theatre and attended Mrs B at around 2.45pm. Dr C recalls being surprised that the baby had not been born. She recorded that the fetal heart rate baseline had risen from 120bpm to 155bpm, with some variable decelerations. Dr C performed a vaginal examination and observed that Mrs B had an anterior vaginal wall prolapse, and that the fetal head was at station –3 and Mrs B was actually only 6cm dilated, with a very odematous cervix. Dr C noted that at that stage Mrs B had been pushing from 12.45pm to 2.50pm.

39. Dr C recognised that there was loss of contact on the CTG, so she reattached the fetal scalp electrode. She told HDC: "An acceleration was noted when the FSE was applied. The baseline rate had increased and there was good variability."

40. Dr C then discussed her findings with Dr E, and at 3pm the agreed plan was for Mrs B to avoid pushing, have continuous CTG and IV fluids, and to be reviewed in one hour's time to see whether there was improvement in the oedema and dilation. Dr E stated that she recommended that Mrs B have an epidural if she was in too much pain or was finding it difficult to refrain from pushing.

41. Following her review, Dr C left to assist Dr E with an urgent assessment of another patient on the delivery suite.

42. RM F said that she did not have any further involvement after Dr C's review, as she finished her shift.

Tocometry

43. The tocometer on the CTG did not begin recording Mrs B's contractions until 2.40pm, and after this time it was recording contractions poorly.

44. RM F told HDC that she was not aware that the tocometer was not recording Mrs B's contractions. RM F stated: "I could see the [fetal heart rate] number on the CTG. The rest of

my view was obstructed as the LMC was standing in front of the CTG blocking the view of the CTG trace." RM F also told HDC that she "was not asked at any time to review the CTG trace by the LMC so assumed she was happy with the tracing and what it was recording".

45. In response to the provisional opinion, RM A disagrees that she would have been blocking RM F's view of the CTG trace.

46. Dr C stated that she was not aware that the CTG was not recording contractions until 2.40pm, and noted that she was out of the room from 12.50pm until 2.45pm. Dr C said that when she arrived at 2.45pm, she was concerned about the quality of the trace and whether potentially it was picking up the maternal heart rate, so the tocometer was adjusted. She believes that this is why the tocometer then started recording. Dr C stated that between 2.40pm and 3.10pm there were no clear decelerations for which a contraction would have been useful to help to define.

47. In response to the provisional opinion, RM A said that she was not aware that the CTG was not recording contractions, and that had she been aware of this, she would have made an adjustment.

Further labour care and delivery

48. RM A advised that from 12.30pm onwards she was never alone in the room without a DHB staff member. However, following RM F's departure after the review at 2.45pm, there is no record of a DHB midwife being in the room prior to the decision to proceed to Caesarean section at 4.45pm. In response to the provisional opinion, RM A stated that at least one other midwife came on duty at 3pm, and another midwife was in and out of Mrs B's room during the shift. RM A said that although the other midwife did not write any notes, she "was fully aware of the situation in the room".

49. At 3.15pm, RM A documented: "FSE losing contact. Position adjusted. Clear now [baseline rate] 155 BPM."

50. At 3.30pm, Dr C checked the CTG trace and signed it. She stated that the trace was accelerative. She told HDC that Mrs B still had the urge to push, so she encouraged her to have an epidural in the hope of avoiding pushing. Dr C said that she was then busy with other acute patients on the delivery suite for approximately an hour.

51. At 4.10pm, an anaesthetist attended and sited an epidural for Mrs B.

52. The CTG between 3.45pm and 4.30pm was non-reassuring and showed late decelerations. Dr C said that she was not notified that the CTG trace was abnormal. RM A advised HDC that in her view it was not her role to assess the CTG after 12.30pm.

53. Dr C said that when she next viewed the CTG trace at 4.30pm, she was very concerned about it and noted that the tocometer had not been picking up contractions well since her last review. She told HDC that she proceeded to examine Mrs B even though her epidural was not yet working, and that had she not been concerned about the trace, she would have waited for the epidural to take effect.

54. At 4.45pm, Dr C documented that no progress had been made, and that the CTG was non-reassuring with recurrent decelerations, one to 60bpm. Dr C discussed her findings with Dr E, and the agreed plan was to proceed to a category two Caesarean section.

55. Dr E said that at the public hospital, the aim is to commence category two Caesarean sections within 30 minutes. Dr C said that she booked the Caesarean section, but as the acute theatre was in use, a second team was called in, in accordance with after-hours processes. She noted that usually this takes 15 to 20 minutes. Dr C then returned to Mrs B's room, went through the consent process for the procedure, and took Mrs B to the theatre entrance to minimise the time between the theatre being ready and the team being present. The CTG was disconnected during the transfer to theatre, from 5.19pm to 5.38pm.

56. Mrs B and Dr C arrived in theatre at 5.38pm. The CTG was reattached, and Dr E noted that it showed a baseline of 150bpm with reduced variability and shallow decelerations. Dr C said that the Caesarean section was straightforward, and she delivered Baby B without difficulty at 5.48pm.

Neonatal care

57. Baby B was born in unexpectedly poor condition — she was pale and making no respiratory effort. Paediatric registrar Dr D was in attendance, and immediately attempted suctioning. He said that he dried and stimulated Baby B and provided five breaths of intermittent positive pressure ventilation (IPPV) via the Neopuff, noting that Baby B's heart rate was below 100bpm but above 60bpm. Dr D said that he gave regular IPPV at a rate of about 60bpm, and continued to assess his resuscitation approximately every 30 seconds. Baby B's Apgar scores were one at one minute, and three at five minutes.[4]

58. Dr D told HDC that he had been gradually weaning up the oxygen level to 100% FiO2,[5] but there was no significant change in Baby B's oxygen saturations. He requested that the Neonatal Unit be called for assistance with the resuscitation.

59. At approximately eight minutes of life, Dr D requested that his consultant be called, as he was going to intubate Baby B. At nine minutes of life, as he undertook the intubation, neonatal nurses arrived, and the intubation was completed by 10 minutes of life. Dr D said that Baby B's heart rate improved to above 100bpm, and her oxygen saturations picked up to 70%. At 10 minutes of age, Baby B's Apgar score was three.

60. A few minutes after completing the intubation, the tube became dislodged, so Dr D removed it and re-started IPPV via Neopuff while a nurse set up equipment to reattempt intubation. Dr D said that during this time he was always able to achieve good chest wall movements with his ventilation. The paediatric consultant, Dr H, arrived at around 20 minutes of life, by

[4] An index used to evaluate the condition of a newborn infant based on a rating of 0, 1, or 2 for each of the five characteristics of colour, heart rate, response to stimulation of the sole of the foot, muscle tone, and respiration, with 10 being a perfect score.
[5] The volumetric fraction of inspired oxygen.

which time Dr D had reintubated Baby B successfully. Dr D told HDC that at that time Baby B's saturations again picked up to 70% and her heart rate was above 110bpm.

61. At 6.44pm (55 minutes of age) Baby B had a period of no heart activity and required chest compressions. A consultant neonatologist, Dr G, arrived to assist. Baby B was given two doses of adrenaline, and her heartbeat returned.

62. Baby B was admitted to the Neonatal Intensive Care Unit (NICU) at 7.10pm and treated for hypoxic-ischaemic encephalopathy (HIE). She was placed on a ventilator and initially cooled passively in an open incubator, and then, at 10pm, on an active cooling mattress.

Venous access

63. Dr D placed an umbilical venous catheter (UVC)[6] to enable venous access. An X-ray taken at 10.22pm showed that the UVC was not in a satisfactory position. Dr H changed the length of the UVC slightly, and ordered dobutamine[7] and bicarbonate infusions to be given via the UVC.

64. Dr H told HDC that she regrets not having documented her strong intention to replace the UVC with a peripherally inserted central catheter (PICC)[8] line early the following morning. Dr H stated:

> "I arrived much earlier than the morning's ward round to further optimise [Baby B's] care including replacing the UVC with a PICC line. As we sometimes use low-lying [UVCs] temporarily in the NICU, it had seemed reasonable to manage with what we had overnight. Unfortunately [Baby B's] condition began to unravel more quickly in the morning … there did not seem to be the stability in acuity I was hoping for to scrub up and attend to the central venous access."

65. Dr H noted that she was confident in inserting PICC lines in neonates, but believes that Baby B's venous access would have been challenging given her recent cooling. Dr H commented that most of her paediatric SMO colleagues also would have had the relevant skills for this procedure.

66. SDHB accepts that PICC line placement in Baby B's case would have been ideal, and that placement should have been attempted. However, SDHB noted that Baby B's condition deteriorated and there was not time to place the catheter.

Blood pressure support and treatment for seizures and coagulopathy

67. During the night, Baby B experienced seizures and was given anticonvulsants. At 10am on Day 2, Dr H consulted with Dr G, and it was decided to re-warm Baby B because of coagulopathy[9] and pulmonary haemorrhage[10] that was difficult to control.

[6] A catheter placed through the umbilical vein.
[7] Used to increase cardiac output.
[8] A catheter inserted into a vein in the arm, neck, or leg.
[9] A condition affecting the blood's ability to coagulate.
[10] Bleeding in the lungs.

68. Baby B required blood pressure support, and Dr H said that she used a lower limit of 40mmHg as the criterion for treatment of hypotension in prescribing medication. Dr H stated that during her training, she had been taught that a baby's gestational age in weeks is a reasonable minimum aim for a blood pressure target in the neonatal period. Dr G commented that a lower limit of 40mmHg is commonly used in neonatal intensive care, and that the intention is to achieve blood pressure significantly above that limit.

69. Dr G was contacted shortly before 3pm, because Baby B's condition was deteriorating — her blood pressure was low, her oxygen requirements had increased, and a significant amount of blood was being aspirated from the endotracheal tube. Dr G attended the hospital.

Midazolam overdose

70. At 3pm, Baby B experienced another seizure. Dr D gave Baby B a dose of midazolam. He had intended to give a 648mcg dose, but accidentally gave a dose of 3,250mcg, which was five times the intended dose.

71. Dr D charted the dose of midazolam that he intended — 0.65ml of a 1mg/ml solution, based on Baby B's weight. He said that this was taken from the NICU medication manual, which included two possible concentrations of the drug — 1mg/ml or 15mg/3ml.

72. Dr D said that he requested the midazolam at a concentration of 1mg/ml, but because several other medications and fluids were also required, nursing staff were unable to organise the medication rapidly. Dr D's recollection of events is as follows:

> "After a period of time the consultant asked if the medication had been given, and as it had not been … I went out of the room and asked the nurses to draw up the midazolam so that I could give it to the baby … the nurse handed me the syringe and I asked if that was the midazolam, which she confirmed it was. I said that I would like to administer the medication because they were busy. I got the medication and confirmed on the drug chart that it was the right volume that I had charted, but regretfully did not confirm that it was at the right concentration."

73. RN I stated that for a number of years prior to, and at the time of, the incident, NICU had stocked midazolam only in the concentration of 15mg/3ml. RN I said that Dr D asked whether she had drawn up the dilute midazolam, and RN I advised that she had not, and that she had only the concentrate midazolam. RN I's recollection is as follows:

> "[Dr D] said we need a stat dose … I asked him to tell me what he wanted and I could draw it up. [Dr D] then verbally requested me to draw up 0.65mls, which I did. I held up the syringe in one hand for him to check the amount and I held up the ampoule in the other hand … I then clearly stated I could not give the drug because I had not checked it. [Dr D] didn't say anything but took the syringe from my hand and went into the room where [Baby B] was."

74. RN I stated that Dr D "absolutely never verbally mentioned a concentration of 1mg/ml. If he had … I would have been alerted to the fact he did not know [the public hospital's] NICU

standard stock." RN I said that she was the only nurse available at the time of these events, and there were no other nurses present, as suggested by Dr D.

75. Dr D told HDC that he accepts that he was at fault for not confirming that the medication was counter checked before administering it. He stated that had RN I informed him that it had not been checked, he would not have given it, and he disagrees that RN I told him that she would not administer the medication. Dr D stated:

> "I very much regret that this occurred. Whilst I consider that I took all appropriate steps in requesting the correct dosage and ensuring that I was clear in my instructions to the nurses, it would have been prudent to check the dosage before I administered it. This however was a highly pressured and emergency situation, which required urgent/immediate action."

Deterioration

76. Baby B's seizures stopped, but her hypoxia and hypotension did not improve despite treatment. Dr H and Dr G agreed that Baby B's condition was irretrievable, and they considered that her management should be redirected to comfort cares. Tragically, Baby B died later that afternoon, aged 22 hours.

77. The cause of death recorded on the death certificate was birth asphyxia, with coagulopathy, seizures, and meconium aspiration also noted as secondary causes.

Further events

78. Baby B's death was not discussed with the Coroner at the time of these events. However, following a serious adverse event (SAE) review (detailed further below), Baby B's death was reported to the Coroner.

Further information

SDHB's SAE review

79. SDHB undertook an SAE review of this case. It was assigned a Severity Assessment Code (SAC) of 2. The report found the following:

> "**Root Cause — management of labour**
> The clinical impression of imminent delivery following spontaneous rupture of membranes with meconium liquor and an associated fetal heart deceleration was not confirmed with a comprehensive vaginal examination to assess cervical dilatation. This resulted in a delayed diagnosis of incomplete cervical dilatation.
>
> Inadequate monitoring of fetal wellbeing resulting in an incorrect assessment of fetal distress.
>
> **Root Cause — drug error in neonatal intensive care**
> Correct process around checking the drug dose was not followed by medical and nursing staff.
>
> **Contributory Factors to drug error**

> The protocol for IV midazolam should reflect only the concentration that is stocked and it is recommended this be 1mg/ml."

80. Recommendations were made to address these findings. The changes made by SDHB in response to the recommendations are summarised later in this report.

81. The review also found that the anaesthetic service had not been informed of Baby B's death, which caused distress to the family when the service telephoned to ask for feedback on the care it had provided. It was recommended that SDHB undertake a review of processes following the death of a baby, to ensure that all relevant parties are informed.

82. A consultant neonatologist from another district health board was asked to review Baby B's care for the SDHB SAE review. Regarding the midazolam error, he commented:

> "I cannot exclude that the drug error accelerated this baby['s] demise but I think it unlikely given the baby was deteriorating prior to its administration and that this trajectory continued at the same pace after the drug was given."

83. However, the neonatologist considered that given that Baby B had been born in such a poor condition and there had been a medication error, discussion with the Coroner was warranted.

Transfer of care

84. Regarding the transfer of care from primary to secondary care, the Clinical Director of Obstetrics and Gynaecology at SDHB stated:

> "The usual method of transferring care from an LMC Midwife is that the LMC would speak either to the Consultant (Senior Medical Officer) On Call or the Registrar On Call when a problem arises in labour. It may require only advice, with the LMC continuing with care, but usually from that point onwards the Consultant would consider that care had been transferred to Secondary from then onwards and would continue to be involved. Generally handover from the LMC midwife care to the hospital team is formal verbal request. The case records show that [Dr C] O&G Registrar was first called at 12:43 [Day 1[11]] by the LMC Midwife. Strictly speaking this would be regarded as 'handover' to secondary care. From that time onwards, the Consultant (Senior Medical Officer) On Call for Obstetrics should be regarded as being responsible for further management."

85. He also told HDC:

> "[R]egarding … the method of transfer of care from LMC to Obstetric Team during labour, this is always a formal verbal request from the LMC to either the registrar or consultant on duty and to the ACM on duty. It appears this transfer occurred very late in this labour."

[11] Relevant dates are referred to as Days 1–2 to protect privacy.

86. RM F stated:

> "[As only one registrar is on duty at a time] it is unrealistic for care of a woman to be fully handed over to the obstetric service as there is simply not enough staff available to be able to facilitate this. Generally what happens is that LMC's will consult with the Registrar and they remain caring for the women whilst the Obstetric team will oversee the care provided.
>
> There are also limited Core Midwives available so it is rare for LMC's to hand over complete care in [the hospital] when midwifery care becomes secondary. On this particular shift, delivery suite was very busy and we were short staffed. We normally only have two midwives on delivery suite with seven birthing rooms. Core midwives are also required to staff theatre meaning that one midwife is taken away from delivery suite whenever a woman goes to theatre, leaving limited resources on the floor.
>
> Ideally [Mrs B's] care would have been transferred over at 1250 hours when the Obstetric team became aware of the deceleration and meconium liquor but unfortunately the unit was busy and [Dr C] got called away to theatre. The Obstetric team was consulted again at 1430 hours when the prolapsed tissue was identified. I am unclear whether care was transferred to the obstetric service then as I had finished my shift."

87. RM A told HDC that after she pushed the bell for assistance and the core midwife arrived, and then the obstetric registrar arrived for review, "the transfer of care to the obstetric service was complete and unequivocal". She stated that while she is aware of the New Zealand College of Midwives Transfer Guidelines, commonly at the public hospital there is no formal discussion when the obstetric service assumes care, and the typical level of documentation of "the acceptance of clinical responsibility" is to see records written by the core midwife, then the obstetric registrar, as occurred in this case. RM A said that SDHB does not have a written policy or guidelines with regard to transferring care from a primary care LMC to SDHB.

88. RM A stated that her role in being present was "to continue to be there in support of the woman only". While RM A did accompany Mrs B to theatre, she said that she "continued not to be involved in any clinical decisions". RM A also submitted that "following the hand over of care and the regular management by the Obstetric Registrar and the core midwife, it was no longer appropriate for [her] to undertake th[e] role" of assessing the CTG trace or providing comment on it.

89. RM A stated that from the point at which she rang the call bell, SDHB staff were always in attendance in the delivery room, and "there was always either an SDHB midwife or the Obstetric Registrar or both in attendance". However, following RM F's departure after the review at 2.45pm, there is no record of an SDHB midwife being in the room until the Caesarean section was requested at 4.45pm.

90. As part of a competence review process (detailed further below), the Midwifery Council wrote to RM A stating:

> "There was at least five hours between the SROM when the core midwives entered the room and the transfer to theatre while [RM A] remained within the room providing midwifery care until the point of physical transfer. Unless there is clear communication between midwives regarding roles and responsibilities, there is a risk that care will be omitted or that no one will take responsibility as there is an assumption that the other midwife is completing tasks, monitoring the woman etc. Communication is vital in the provision of safe and effective clinical care."

Clinical advice reports for ACC

91. ACC notified the Midwifery Council of a Treatment Injury Event in relation to the services RM A provided to Mrs B. This was described as a "delay/failure to provide treatment". The Midwifery Council then referred the matter to HDC under section 64 of the Health Practitioners Competence Assurance Act 2003. Mrs B supported the complaint referral, and provided HDC with ACC's clinical advice reports regarding the midwifery and obstetric care she received, and the neonatal care provided to Baby B.

92. HDC has reviewed the reports for ACC from a midwife, an obstetrician, and a neonatologist (Dr J). The midwife's and obstetrician's reports are largely consistent with the advice reports provided to HDC. Although in some areas Dr J's report is inconsistent with the advice provided to HDC, HDC's advisor acknowledged that he was provided with additional information to support his advice.

Changes made since these events

<u>SDHB</u>

93. SDHB advised that the following changes have been implemented to its service:

- The 15mg/3ml midazolam formula has been removed from the NICU controlled drug cupboard, and replaced with the 1mg/ml concentration.
- The NICU medication manual has been updated to include only the 1mg/ml concentration of midazolam.
- A multidisciplinary medication committee has been established to review, implement change, and maintain high medication standards in NICU.
- Flumezanil (a midazolam antagonist) is now stocked in NICU.
- Staff now use a new line on the NICU fluid prescription chart for each infusion, to reduce potential confusion where a critically ill infant is receiving multiple infusions.
- Regular team discussions occur in NICU to ensure that all team members are aware of medication administration and prescribing practices.
- In line with recent national correspondence from the Coroner, SDHB now discusses all encephalopathy-related infant deaths with the Coroner, and it intends to discuss with the Chief Coroner that this be extended to all neonatal deaths in NICU.

94. Regarding CTG education, SDHB stated that it contracts with RANZCOG to provide annual fetal surveillance education to core and LMC midwives, and in order to increase exposure to CTG education (including interpretation and documentation) this is now included in the annual maternity study day attended by all core midwives. The Clinical Director of Obstetrics and Gynaecology said that there are weekly CTG presentations for training purposes, where interpretation of actual CTGs and management are discussed by consultants and registrars.

95. SDHB told HDC that its guidelines for encephalopathy, and the blood pressure guidelines for NICU, will be amended to specify why blood pressure is to be monitored, and the circumstances under which it should be treated.

RM A

96. RM A said that she will no longer undertake vaginal examinations while a woman is in the bath. She stated that she now formally records in the progress notes when care is transferred to the obstetric team. She acknowledged that Mrs B did not have her observations taken other than on admission, and she said that she now uses a partogram for all labours to assist with undertaking baseline observations of blood pressure, pulse, and temperature.

97. The Midwifery Council required RM A to complete a competence programme that included the following components:

- A Prompt course on emergency care;
- A Midwifery Council approved course on documentation, and a self-audit of her clinical notes;
- A review and reflection on the referral and transfer processes outlined in the *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)*[12] and within SDHB; and
- A course on fetal heart rate monitoring that covers intrapartum intermittent auscultation and continuous monitoring.

98. In 2019, the Midwifery Council confirmed that the requirements of the competence programme had been completed and the matter closed with the Council.

99. In response to the provisional opinion, RM A confirmed that she plans to enrol in the RANZCOG Fetal Surveillance Education programme.

RM F

100. RM F told HDC that she has reflected on this case and changed her practice in the following ways: if she is asked to put a fetal scalp clip on a patient, she will do a full vaginal examination regardless of whether the LMC has done one recently; she will fully document her findings even when the LMC is making notes as well; and, if she is in a birthing room as a second

[12] Ministry of Health. 2012. *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)*. Wellington: Ministry of Health.

midwife, she will make sure she can see all that is happening in the room rather than relying on another practitioner's judgement.

101. RM F also underwent a competency review with the Midwifery Council, and the Council decided to take no further action.

Dr C

102. Dr C told HDC that since this case, when reviewing a CTG she documents her findings against the "Dr C BRAVADO"[13] checklist. She stated that if she notes that the tocometry is not picking up well, she will document that contractions need to be marked on the CTG trace instead, as having no record of contractions is unacceptable. Dr C said that she now examines a labouring woman herself if she is consulted or involved in a woman's care, regardless of the attending LMC's experience. Dr C is now training in a different area of medicine.

Dr D

103. Dr D told HDC that whenever administering medication he has drawn up himself, he ensures that another practitioner confirms/checks the medication and then countersigns the medication chart before the medication is given. He said that in situations where he does not draw up the medication, he verbally confirms the medication with the nurse and asks to see that the medication has been countersigned on the chart. He ensures that a label is attached to the medication with the dose, volume, and concentration recorded on it. If these steps do not occur, he does not give the medication.

Response to provisional opinion

Mr and Mrs B

104. Mr and Mrs B were provided with a copy of the "information gathered" section of the provisional opinion. Their comments have been incorporated into the report where appropriate.

RM A

105. RM A's response to the provisional opinion has been incorporated into the report where appropriate.

RM F

106. RM F advised that she accepts the findings of the provisional opinion relating to her.

Dr D

107. In response to the provisional opinion, Dr D stated:

> "I have spent a lot of time reflecting on this case, the outcome and what I could have done differently to save [Baby B's] life. I continue to feel a deep regret for the unfortunate events that occurred. While my error was made during a high-pressure

[13] This stands for: Define risk, Contractions, Baseline, Rate, Variability, Accelerations, Decelerations, Overall impression.

> situation, and there was an urgency to give medication, this is an error that should not have happened and on that I deeply regret."

108. Dr D advised that he has reviewed the provisional opinion and expert advice carefully and "taken onboard the comments made regarding [his] care". Dr D has provided a written letter of apology.

RN I

109. In response to the provisional opinion, RN I reiterated her recollection that she clearly told Dr D that she had not checked the midazolam and could not give it. RN I's lawyer stated:

> "The issue is that [Dr D] gave a verbal order for .65ml that involved a neonatal drug calculation, no matter what the concentrate strength, and that this calculation and checking process had not yet occurred when he gave the drug."

110. Further, RN I's lawyer stated:

> "It is the neonatal nurse's role to give medication ordered by doctors, especially in times of urgent treatment when doctors are involved in providing medical treatment. There was no reason for [Dr D] to pre-empt [RN I's] role to give it after she would have checked it."

111. However, RN I's lawyer stated that because Dr D took the medication before RN I could check it, she was unaware that the dose was too high, and therefore "it is not appropriate to criticise [RN I] for not warning [Dr D] that the dose was high". RN I's lawyer said that it is not reasonable to expect nurses to rely on their memory given the number of drugs they have to administer, and there are "stringent checking procedures in the neonatal unit which nurses follow prior to administration of all the drugs". RN I's lawyer added that because Dr D took the medication so quickly, RN I did not have a chance to question him about it.

112. RN I's lawyer noted that the SDHB medication policy listed two concentrations of midazolam, despite only one being available on the ward, and "[t]hat was a fault in the DHB system itself".

113. RN I expressed her condolences to Mrs B and her family for their experience and loss.

SDHB

<u>Care provided to Mrs B</u>

114. SDHB accepts the finding that it breached the Code in relation to the care provided to Mrs B.

115. SDHB stated that it expects all maternity service staff to be familiar with, and work to, the *Referral Guidelines*, but it accepts that it would be helpful to have a guideline for transfer of clinical responsibility. SDHB advised that it is in the process of drafting a guideline, and that a sticker to document handover of clinical responsibility will be developed as part of this package.

116. SDHB said that the obstetrics and midwifery services agree that the documentation of CTG interpretations was not standardised by all parties, and that some concerning features were not noted and acted upon in a timely manner. SDHB advised that a suitable CTG label has been accessed from another hospital, and this will be adapted for use at SDHB.

117. SDHB further advised that the Neonatal Death Documentation and Checklist will be updated to include notification of services involved in the care of the mother and baby.

Care provided to Baby B

118. SDHB accepts the finding that it breached the Code in relation to the care provided to Baby B.

119. SDHB advised that the Child Health service accepts that the UVC was in a suboptimal position and that no other attempt was made to find an alternative central access point at the time. SDHB said that the NICU team has reviewed all central line guidelines and has combined these into one document for staff. Further, SDHB stated: "[A]ll senior staff working in the NICU are competent to place central lines in acutely unwell infants."

120. In relation to treatment options available to support Baby B's low blood pressure, SDHB said that the Child Health service agrees that there were more options available, and that the encephalopathy guidelines did not specify when and why to treat low blood pressure. SDHB advised that both the blood pressure and encephalopathy guidelines have been reviewed and updated.

121. In relation to the discrepancy between the NICU medication manual and the stock of midazolam available, SDHB advised that the Child Health service agrees that this contributed to the error. SDHB stated: "Both the medication manual and the stock available have been reviewed, updated and streamlined to ensure that there is no discrepancy."

122. Further SDHB stated:

> "The medication safety committee has been initiated after [Baby B's] death with monthly medication reviews, protocols and incident forms reviewed as part of a Clinical Practice Improvement process."

123. SDHB also advised that the Child Health service agrees that Baby B's death should have been referred to the Coroner, and that the current policy is now to refer all cases to the Coroner. Further, it advised that the Chief Medical Officer has communicated this expectation to all SMOs, and that this has been discussed at SMO meetings and NICU executive meetings with the wider team.

RN I

124. SDHB noted that the provisional comments on RN I's care were "made without a wider understanding of the context for the nursing staff present on the day, including the very infrequent use of midazolam".

125. SDHB noted that Dr D prescribed the midazolam on the drug chart, and that RN I prepared the medication "using the only strength that was available in the unit, which was different from the strength that [Dr D] intended, and expected". SDHB noted that RN I has been very clear that she had not checked the medication before Dr D took it, and "[t]he error occurred when [Dr D] took the unchecked and undiluted dose from [RN I] despite being told that the drug had not been checked".

126. SDHB stated:

> "It is established unit policy that all medications are checked by another staff member prior to administration of the medication, to ensure that everything relating to the medication is correct. This step did not happen.
>
> …
>
> It is accepted that the person administering a medication must be personally confident that everything about the medication is correct before the medication is administered."

127. The SDHB Chief Executive Officer stated:

> "I would like to pass on our sincere condolences on the death and loss of [Baby B] and apologize unreservedly for the inadequate care which both [Mrs B] and [Baby B] received.
>
> …
>
> I would also like to thank the family and the HDC for raising concerns about the care of [Mrs B] and [Baby B] with us, as this helps us to reflect on the care provided, and also on how we can improve the service we deliver in the future to our mothers and children."

Dr C

128. Dr C expressed her condolences to Mrs B and her family for their loss.

Relevant standards

Referral Guidelines

129. These guidelines provide LMCs with a list of conditions and criteria about referring pregnant women for consultations with other clinicians, transferring clinical responsibility for care to specialists, as well as transferring care in emergencies.

130. The "Conditions and referral categories" section of the guidelines lists "5011: Fetal heart rate abnormalities" and "5018: Moderate or thick meconium liquor" in the "Consultation" referral category. Consultation can be in the form of a discussion between the LMC and the specialist by telephone or letter, and/or by the specialist seeing the woman.

131. At the time of the consultation, the responsibility for maternity care remains with the LMC. The specialist may advise the LMC of recommended monitoring, or provide a care plan to be agreed in a three-way conversation between the specialist, the LMC, and the woman. The specialist may be responsible for management of the specific condition if that is appropriate and warranted.

132. The "Conditions and referral categories" table lists "5020: Obstructed labour" in the "Transfer" category, indicating that the LMC must recommend transfer of clinical responsibility from the LMC to a specialist. Once clinical responsibility for care has been transferred, clinical decisions and decisions on the roles and responsibilities of all other practitioners involved with the woman's care rest with the specialist, taking into account the needs and wishes of the woman. There is potential for LMCs to retain a role in providing care for the woman, especially where the LMC is a midwife. Continuity of care should be preserved wherever possible.

133. A critical part of this process is documentation of the point at which responsibility for coordination and provision of maternity care is formally transferred from the LMC to the specialist. This requires:

a) A three-way conversation between the LMC, the woman, and the specialist to determine that the transfer of care is appropriate and acceptable;

b) The LMC to provide all relevant information, including any relevant maternity notes, test results, and histories, to the specialist; and

c) A discussion and documented decision about the nature of the ongoing role of the LMC, or whether all care, including midwifery care, is transferred to the specialist and the DHB midwifery team.

New Zealand College of Midwives *Transfer Guidelines* (NZCOM *Transfer Guidelines*)

134. The NZCOM *Transfer Guidelines* state:

> "Women still require midwifery care, even when there has been a *transfer of care* to the obstetric team. Following a *transfer of care*, a decision is made about who the most appropriate midwife to care for the woman is. It may be the LMC or it may be the core midwife, or a combination of both. The decision is made following a negotiation between the woman, the LMC, the specialist service and the core midwifery team. If appropriate, there may be a *transfer of midwifery care*, which means that the LMC is no longer responsible for providing midwifery care to the woman and hands that responsibility to the core midwifery staff."

Opinion: RM A — breach

135. RM A was Mrs B's LMC throughout her pregnancy and for much of her labour. RM A had a responsibility to provide Mrs B services with reasonable care and skill. I have significant concerns about some aspects of the care RM A provided to Mrs B, as outlined below.

Transfer to secondary care

136. At 12.30pm on Day 1, RM A pushed the call bell to request assistance when Mrs B's membranes ruptured and meconium liquor was noted. Core midwife RM F and obstetric registrar Dr C arrived to assist. A fetal heart rate deceleration to 80bpm was heard, and then it recovered to 120bpm. In RM A's opinion, this is when transfer to the obstetric service was triggered. RM A acknowledges that she did not document in the notes the transfer of care and responsibility to the hospital team, and she continued to provide care to Mrs B.

137. RM A stated that at the public hospital, commonly there is no formal discussion when the obstetric service assumes care, and the typical level of documentation of "the acceptance of clinical responsibility" is to see records written by the core midwife, then the obstetric registrar, as occurred in this case. RM A said that the DHB does not have a written policy or guidelines with regard to transferring care from a primary care LMC to the DHB.

138. RM A stated that her role in being present was "to continue to be there in support of the woman only". RM A said that although she did stay with Mrs B and later accompanied her to theatre, she "continued not to be involved in any clinical decisions". RM A submitted that "following the hand over of care and the regular management by the Obstetric Registrar and the core midwife, it was no longer appropriate for [her] to undertake th[e] role" of assessing the CTG or providing any comment on it. RM A stated that from the point at which she rang the call bell, SDHB staff were always in attendance in the delivery room.

139. RM F's view is that as there is only one registrar on duty at a time, it is unrealistic for care of a woman to be fully handed over to the obstetric service, as there is simply not enough staff available to facilitate this. She said that generally what happens is that LMCs consult with the registrar and continue to care for the woman whilst the obstetric team oversees the care provided.

140. RM F made notes in Mrs B's clinical records between 12.55pm and 2.15pm. RM F said that she stood at the back of the room and monitored the fetal heart rate. She told HDC that her intention was not to interfere with RM A's birthing partnership with Mrs B. RM F stated:

> "My role was to keep an eye on the fetal heart rate so that I could let [Dr C] know if there was any further decelerations … I was also keeping an eye on the rest of the ward and intermittently left the room."

141. SDHB's Clinical Director of Obstetrics and Gynaecology stated that the usual method of transferring care from an LMC midwife is for the LMC to speak to either the consultant or registrar on call when a problem arises in labour. It may require only advice, with the LMC continuing with care, but usually from that point onwards the consultant would consider

that care had been transferred to secondary from then onwards, and generally handover from the LMC midwife to the hospital team is via a formal verbal request. There is no evidence that RM A made a formal verbal request for Mrs B's care to be transferred.

142. My expert advisor, RM Billie Bradford, advised that the situation whereby the use of the call bell to summon assistance in the delivery suite "automatically and unequivocally results in a transfer of care without consideration of the particular clinical circumstances, or the wishes of the woman would be considered highly unusual and quite unsatisfactory in other DHBs".

143. The *Referral Guidelines* constitute a consensus of accepted usual practices for consultation and transfer of care in New Zealand. RM Bradford noted that the presence of meconium in the liquor is a relatively common occurrence in labour. Under the *Referral Guidelines*, fetal heart rate abnormalities and the presence of moderate or thick meconium in the liquor fall into the "Consultation" referral category, whereby the LMC must recommend to the woman that she have a consultation with a specialist. At the time of consultation, the responsibility for maternity care remains with the LMC. The specialist may advise the LMC of recommended monitoring, or provide a care plan to be agreed in a three-way conversation between the specialist, the LMC, and the woman. A critical part of the process is the documentation of the point at which responsibility for coordination and provision of maternity care is formally transferred from the LMC to the specialist. There is no documented evidence in the clinical records that care was transferred in accordance with the *Referral Guidelines*.

144. In addition, the NZCOM *Transfer Guidelines* state:

> "Women still require midwifery care, even when there has been a *transfer of care* to the obstetric team. Following a *transfer of care*, a decision is made about who the most appropriate midwife to care for the woman is. It may be the LMC or it may be the core midwife, or a combination of both. The decision is made following a negotiation between the woman, the LMC, the specialist service and the core midwifery team."

145. RM Bradford commented:

> "The situation at Southern DHB where unwritten 'shared-understandings' (which apparently are not shared) around consultation and transfer of care are said to exist, can result in blurred boundaries and role confusion, which is a risk to both staff and patients."

146. RM Bradford advised: "[RM A] remained present and continued to provide labour care after the point at which she suggests midwifery care was transferred." RM Bradford further noted the Midwifery Council of New Zealand's Midwifery Scope of Practice statement, which provides: "In all settings the Midwife remains responsible and accountable for the care she provides" (MCNZ, 2004).

Conclusion — transfer of care

147. In my view, as Mrs B's LMC, ultimately it was RM A's responsibility to ensure that there was complete clarity regarding the ongoing roles of those providing care, and any handover of care. This did not occur, and I am critical of RM A for failing to ensure clarity of her role and responsibility with respect to Mrs B's care at the public hospital.

148. I acknowledge that the process for transferring care from LMCs to secondary care at the DHB was suboptimal in that there was not a formal written policy, and there were differing views about how the handover process usually occurred. However, RM A did not make any formal record of transfer of care, as set out by the *Referral Guidelines*, nor is there any evidence that she made a formal verbal request for Mrs B's care to be fully transferred to the obstetric service in line with the process described by the Clinical Director of Obstetrics and Gynaecology. Further, RM A stayed with Mrs B and continued to provide labour care after the time at which RM A says she transferred care. For example, at 3.15pm RM A documented that the FSE was losing contact and that it was adjusted. In my opinion, RM A continued to be Mrs B's LMC, and retained overall responsibility for her care, until 4.45pm — the point at which the decision was made for Mrs B to have a Caesarean section.

Staying as a support person

149. RM A has submitted that she stayed with Mrs B in a support capacity, and was not involved in any clinical decisions after the call bell was pressed. While I do not accept that RM A remained present in a supporting role only, I consider it necessary to discuss the point.

150. The Midwifery Council has advised me that in the event that a midwife acts as a support person, the midwife "must act if she sees a deteriorating situation and cannot say 'I am here as a support person only'. The midwife is not able to remove [herself] from a detrimental situation, but must act as a midwife."[14] This reflects the midwifery scope of practice statement that in all settings the midwife remains responsible and accountable for the care she provides. I agree with the comments made by the Midwifery Council to RM A that unless there is clear communication regarding roles and responsibilities, there is a risk that care will be omitted, or that no one will take responsibility. In my view, the failure of RM A to clarify her role and responsibility contributed to omissions in Mrs B's care.

151. Even if RM A was staying with Mrs B in a support capacity, RM A still had a responsibility to act in response to issues that arose during Mrs B's labour (discussed further below). RM A cannot absolve herself of taking responsibility for Mrs B's care after the point at which she believes that the care transfer occurred. As a midwife in the room, she remained fully responsible for her actions and omissions at all times.

152. I note that in September 2018, in response to an earlier investigation (15HDC01534), the Midwifery Council published a "Statement on support and role of the midwife", which gives clear guidance on this issue.

[14] 15HDC01534 (issued 21 June 2018).

Vaginal examination in bath, and failure to check for full dilation

153. At 11.45am, while Mrs B was in the bath, RM A undertook a vaginal examination and assessed Mrs B as being 9cm dilated. Three hours later, Mrs B was found to be only 6cm dilated. RM Bradford advised that it is not uncommon for midwives to perform a vaginal examination in the bath, particularly if birth is thought to be imminent. However, she stated: "[T]his is acknowledged to be a less than optimal position for comprehensive assessments."

154. It is clear that RM A's initial assessment of 9cm dilation was incorrect, and this failure had a significant impact on Mrs B's labour management. I accept that it is not uncommon for midwives to perform a vaginal examination in the bath, but consider it appropriate that RM A has since changed her practice, and no longer undertakes vaginal examinations when the woman is in the bath. However, I remain very concerned at the inadequacy of the vaginal examination.

155. At 12.40pm, RM F documented that Mrs B was fully dilated and pushing. RM A understood that RM F had undertaken a vaginal examination at the time she attached the FSE, and said that she has no recollection of assessing that Mrs B was fully dilated. RM F said that RM A told her that Mrs B was fully dilated and pushing, and Dr C said that she was told that Mrs B was fully dilated.

156. RM Bradford advised that the pushing stage generally lasts for one to two hours in a first-time mother, and midwives generally check for full dilation at the commencement of pushing or soon after if delivery is not imminent or obvious progress is not being made. RM Bradford considers that there has been a departure from the standard of care in that RM A did not check for full dilation at the commencement of pushing, nor after an hour without delivery. RM Bradford stated:

> "[RM A's] peers would consider it unacceptable that [Mrs B] was allowed to push for as long as two hours, without confirmation of full dilatation at any stage and in the context of a history of prolonged fetal heart decelerations and thick meconium liquor."

157. I accept RM Bradford's advice. As I have set out above, I consider that RM A retained overall responsibility for Mrs B's care, as her LMC, until 4.45pm. Therefore, RM A had a responsibility to check that Mrs B was fully dilated, and I am critical that she did not do so. In making this criticism, I acknowledge that everyone in the room was of the impression that Mrs B was fully dilated and considered that the other/s had made this assessment.

Failure to interpret and escalate abnormal CTG

158. Mrs B had CTG monitoring undertaken from around 12.40pm. The tocometer did not begin to record contractions until 2.40pm, and after this time it was recording contractions poorly. In response to the provisional opinion, RM A confirmed that she was not aware that the tocometer was not recording Mrs B's contractions, and had she been aware she would have made adjustments.

159. However, RM A submitted that it was not appropriate for her to provide any comment on the CTG trace or to be involved in assessing it after she pushed the call bell, "as following

the hand over of care and the regular management by the Obstetric Registrar and the core midwife, it was no longer appropriate for [her] to undertake this role".

160. RM Bradford noted that RM A had not made any subsequent interpretation or appraisal of the CTG tracing. RM Bradford stated that the CTG trace became "increasingly abnormal up until the time of birth". RM A did not document at any point that she had observed emerging abnormalities, and apart from her initial request at the time she pressed the call bell, she did not consult with Dr C about the fetal heart rate. RM Bradford advised that when midwives use CTG monitoring in the care of women during labour, the midwife is responsible for the technical maintenance of the recording, and, where there are abnormalities, the midwife is expected to consult the obstetric service.

161. RM Bradford noted that no apparent attempts were made to improve the quality of the tocometry recording, and at 2.15pm the fetal heart rate baseline was rising, and there were late decelerations at 3.45pm. These features were not brought to the attention of the obstetric team at the time they occurred. However, Dr C attended at 2.45pm and found that the baseline had risen from 120bpm to 155bpm, and then attended at 4.30pm and found that the CTG was non-reassuring, with recurrent decelerations, and that the tocometer had not been recording well since her last review. At that time, the decision was made to proceed to Caesarean section.

162. RM Bradford advised:

> "Persistent failure to ensure tocometry and failure to notify the registrar or consult with core midwifery staff when new abnormalities emerged (rising baseline at 1415 and late decelerations at 1545) are significant departures from accepted standard of practice."

163. RM Bradford stated: "Failure to document the appearance of fetal heart rate abnormalities in the progress notes and consult about these in a timely manner would be considered unacceptable." RM Bradford also commented: "[T]hat [S]DHB staff made intermittent comments on *some* aspects of the CTG does not absolve [RM A] of all responsibility for fetal monitoring."

164. I accept RM Bradford's advice, and strongly disagree with RM A's submission that it was not appropriate for her to provide any comment on the CTG trace or get involved in assessing it after the time she considered that handover had occurred. As discussed above, I consider that RM A remained responsible for Mrs B's midwifery care, and even if she believed that she remained with Mrs B in a support capacity, she still had a responsibility to act in response to issues that arose during Mrs B's labour.

165. I am therefore highly critical that RM A did not identify that the tocometer was not recording until 2.40pm, and thereafter did not take steps to improve the adequacy of the tocometry recording. I am also concerned that she did not consult Dr C at the time the FHR baseline was rising at 2.15pm, or when late decelerations were present at 3.45pm.

Documentation

166. RM Bradford commented that RM A's documentation would not be considered acceptable by her peers because the following information was not recorded:

- The time at which the FHR was first heard to be 80bpm;
- A discussion with Mrs B regarding consent for the fetal scalp electrode placement;
- The frequency and length of contractions;
- The fetal status before and after the epidural was placed; and
- The maternal observations before and after the epidural was placed.

167. This is in addition to the failure to document the transfer of care.

168. I accept RM Bradford's advice, and I am concerned at the lack of documentation of these points by RM A. I note that these omissions in documentation do not comply with the Midwifery Council Competencies for Practice criterion 2.17, which states that the midwife "provides accurate and timely written progress notes and relevant documented evidence of all decisions made and midwifery care offered and provided".

Maternal observations

169. Throughout her labour, Mrs B did not have her temperature or pulse recorded by RM A. RM F took Mrs B's observations on admission, before RM A arrived at the hospital. RM Bradford advised that this was a minor departure from accepted practice, where blood pressure and temperature are expected to be recorded four hourly, and pulse every one to two hours and at the commencement of CTG monitoring.

170. I am critical that RM A did not record Mrs B's maternal observations regularly throughout her labour. I consider it appropriate that RM A now uses a partogram for all labours to assist her with taking baseline observations.

Mistaken viewing of the fetal head

171. Dr C advised that she was informed that Mrs B was fully dilated, and documented at 12.50pm that the vertex of the baby's head was visible on pushing. RM F documented at 12.55pm, 1.50pm, and 2.15pm that the baby's head was visible on pushing. RM F and RM A both told HDC that the other was making the assessment that the head was visible. At around 2.15–2.30pm, RM F and RM A both recall discussing whether they were seeing the vaginal wall rather than the baby's head, and Dr C was called back.

172. Given the discrepancies in the accounts provided to HDC, I cannot make a finding as to whether RM F, RM A, or both midwives viewed what they thought was the head visible on pushing. I note that Dr C said that at 12.50pm she viewed what she believed to be the fetal head bulging at the introitus, but she said that she did not inspect the presenting part closely.

173. While it is certainly concerning that the vaginal wall was mistaken for the fetal head, I acknowledge that RM F, RM A, and Dr C were all under the impression that the fetal head was visible. In my opinion, the confusion around this assessment was contributed to by the fact that at this point, the people present in the room had different understandings about who was taking responsibility for Mrs B's care.

Conclusion

174. As set out above, I have numerous concerns about the care provided to Mrs B by RM A. Ultimately, as Mrs B's LMC, it was RM A's responsibility to ensure that there was complete clarity regarding the ongoing roles of those providing care, and any handover of care. As a midwife in the room, she was fully responsible for her actions and omissions at all times. I consider that RM A failed to provide services to Mrs B with reasonable care and skill for the following reasons:

- RM A failed to ensure clarity regarding handover to secondary care, and her ongoing role and responsibility. This failure contributed to omissions in Mrs B's care.
- RM A failed to assess whether Mrs B was fully dilated at any stage.
- RM A did not identify that the tocometer was not recording until 2.40pm, and thereafter did not take steps to improve the adequacy of the tocometry recording and therefore the interpretation of the CTG. In addition, she did not consult Dr C at the time the FHR baseline was rising at 2.15pm, or when late decelerations were present at 3.45pm.
- RM A's documentation fell short of acceptable standards.
- RM A did not record Mrs B's maternal observations regularly throughout her labour.

175. As a consequence of those omissions, the progress of Mrs B's labour and the condition of her unborn baby were not interpreted correctly, and opportunities to identify the issues and respond appropriately were missed. Accordingly, I find that RM A breached Right 4(1) of the Code of Health and Disability Services Consumers' Rights (the Code).[15]

Opinion: RM F — adverse comment

176. RM F was a core midwife on duty when Mrs B presented to the public hospital at 8am. RM F's shift finished at 3pm. RM F was involved in Mrs B's care from around 12.40pm until 3pm, and between 12.55pm and 2.15pm RM F made records relating to the fetal heart rate in the clinical notes. RM F told HDC:

> "I stood at the back of the room and monitored the heart rate. My intention was not to interfere with [RM A's] birthing partnership with [Mrs B]. My role was to keep an eye on the fetal heart rate so that I could let [Dr C] know if there was any further

[15] Right 4(1) provides: "Every consumer has the right to have services provided with reasonable care and skill."

> decelerations … I was also keeping an eye on the rest of the ward and intermittently left the room."

177. As discussed above, I consider that in her role as LMC, RM A remained responsible for Mrs B's midwifery care after the time the call bell was pressed until the decision for Caesarean section was made. However, as RM F was present in the room and involved in Mrs B's care, RM F also had a responsibility for her own actions or inactions. I note the Midwifery Council of New Zealand's Midwifery Scope of Practice statement: "In all settings the Midwife remains responsible and accountable for the care she provides" (MCNZ, 2004).

CTG monitoring

178. Mrs B had CTG monitoring from around 12.40pm. The tocometer did not begin to record contractions until 2.40pm, and after this time it recorded contractions poorly. At 2.15pm, the CTG showed that the FHR baseline was rising, and Dr C noted at 2.45pm that it had risen from 120bpm to 155bpm.

179. RM Bradford advised:

> "In the period following placement of the scalp clip (between 1240 and 1430) [RM F] documented the fetal heart rate was at four separate intervals, on three of these adding that this rate was 'following a contraction'. This does not constitute adequate documentation of a CTG. As noted, during this period there was no tocometer (contraction monitor) recording being carried out. It appears that neither [RM A] nor [RM F] noticed this omission. However, the responsibility for ensuring this, primarily rested with the LMC and initiator of the CTG recording, [RM A]. LMC midwives may from time-to-time request core midwives provide a second opinion on a CTG tracing. It is nowhere documented that [RM A] requested [RM F] provide a second opinion on the CTG, or assist with CTG management other than attachment of the clip."

180. I accept that responsibility for the interpretation of the CTG primarily rested with RM A, and that there is no evidence that she specifically asked RM F to provide a second opinion on the CTG. However, I note that RM F recorded details of the fetal heart rate following a contraction on several occasions, and I accept RM Bradford's advice that this documentation was not adequate. RM F was also present during the time the tocometer was not recording, and when the baseline was rising. In my view, she also shared a responsibility to take action in relation to these findings, and I am critical that she did not.

Mistaken viewing of the fetal head

181. Dr C documented at 12.50pm that the vertex of the baby's head was visible on pushing. RM F documented at 12.55pm, 1.50pm, and 2.15pm that the baby's head was visible on pushing. RM F and RM A both told HDC that the other was making the assessment that the head was visible. RM F and RM A both recall that at around 2.15–2.30pm they discussed whether they were seeing the vaginal wall rather than the baby's head, and Dr C was called back.

182. Given the discrepancies in the accounts provided to HDC, I cannot make a finding as to whether RM F, RM A, or both midwives were determining that the head was visible on

pushing. I note that Dr C said that at 12.50pm she viewed what she believed to be the fetal head bulging at the introitus, but she also said that she did not inspect the presenting part closely.

183. While it is certainly concerning that the vaginal wall was mistaken for the fetal head, I acknowledge that RM F, RM A, and Dr C were all under the impression that the fetal head was visible. In my opinion, the confusion around this assessment was contributed to by the fact that at that point the people in the room had different understandings about who was taking responsibility for Mrs B's care.

Opinion: Southern District Health Board — breach

184. SDHB was responsible for ensuring that Mrs B and her baby were provided with services that complied with the Code, and for having in place adequate systems to ensure that the care provided to them was safe, appropriate, and timely. In my view, a number of the failures in the care provided to Mrs B and Baby B arose from systemic issues at the DHB, and these issues meant that the care provided to Mrs B and Baby B fell short of acceptable standards.

Care of Mrs B

Transfer of care

185. At 12.30pm on Day 1, Mrs B's LMC, RM A, pushed the call bell to request assistance when Mrs B's membranes ruptured and meconium liquor was noted. Core midwife RM F, and then obstetric registrar Dr C, arrived to assist. In RM A's opinion, this is when transfer to the obstetric service was triggered. RM A acknowledges that she did not document in the notes the transfer of care and responsibility to the hospital team, and she continued to provide care to Mrs B.

186. RM A stated that at the public hospital, commonly there is no formal discussion when the obstetric service assumes care, and the typical level of documentation of "the acceptance of clinical responsibility" is to see records written by the core midwife, then the obstetric registrar, as occurred in this case. RM A said that the DHB does not have a written policy or guidelines with regard to transferring care from a primary care LMC to the DHB.

187. The DHB's Clinical Director of Obstetrics and Gynaecology stated:

> "The usual method of transferring care from an LMC Midwife is that the LMC would speak either to the Consultant (Senior Medical Officer) On Call or the Registrar On Call when a problem arises in labour. It may require only advice, with the LMC continuing with care, but usually from that point onwards the Consultant would consider that care had been transferred to Secondary from then onwards and would continue to be involved. Generally handover from the LMC midwife care to the hospital team is formal verbal request. The case records show that [Dr C] O&G Registrar was first called at 12:43

> [Day 1] by the LMC Midwife. Strictly speaking this would be regarded as 'handover' to secondary care. From that time onwards, the Consultant (Senior Medical Officer) On Call for Obstetrics should be regarded as being responsible for further management."

188. RM F had a different view, and stated:

> "[As there is only one registrar on duty at a time,] it is unrealistic for care of a woman to be fully handed over to the obstetric service as there is simply not enough staff available to be able to facilitate this. Generally what happens is that LMC's will consult with the Registrar and they remain caring for the women whilst the Obstetric team will oversee the care provided."

189. RM Bradford advised that the situation whereby the use of the call bell to summon assistance in the delivery suite "automatically and unequivocally results in a transfer of care without consideration of the particular clinical circumstances, or the wishes of the woman would be considered highly unusual and quite unsatisfactory in other DHBs".

190. RM Bradford noted that the presence of meconium in the liquor is a relatively common occurrence in labour. Under the *Referral Guidelines*, the presence of fetal heart rate abnormalities and moderate or thick meconium in the liquor fall into the "Consultation" referral category, whereby the LMC must recommend to the woman that she have a consultation with a specialist. At the time of consultation, the responsibility for maternity care remains with the LMC. The specialist may advise the LMC of recommended monitoring, or provide a care plan to be agreed in a three-way conversation between the specialist, the LMC, and the woman. A critical part of this process is documentation of the point at which responsibility for coordination and provision of maternity care is formally transferred from the LMC to the specialist. The clinical records contain no documented evidence that care was transferred in accordance with the *Referral Guidelines*.

191. RM Bradford commented:

> "The situation at Southern DHB where unwritten 'shared-understandings' (which apparently are not shared) around consultation and transfer of care are said to exist, can result in blurred boundaries and role confusion, which is a risk to both staff and patients. In the spirit of seeking to learn from this case, at the centre of which it must be remembered is a bereaved family, it is apparent that a review of process and practice around consultation and transfer of care, including documentation of same is warranted at Southern DHB. The Referral Guidelines which constitute a consensus of accepted usual practices for consultation and transfer of care in New Zealand should be used to guide this review."

192. I accept RM Bradford's advice. I am critical that SDHB did not have in place a written policy with regard to transferring care from a primary care LMC to SDHB, and that, by some accounts, the process followed at SDHB was not consistent with the national standard set out in the *Referral Guidelines*. As discussed above in relation to the care provided by RM A, I do not consider that the transfer of care to the obstetric team took place until 4.45pm,

when the decision was made for a Caesarean section. Notwithstanding that, at times in the intervening period, care was provided to Mrs B by RM A, RM F, and Dr C.

193. In my opinion, the lack of clarity as to when the formal transfer of care to the SDHB obstetric service occurred contributed to confusion between these providers about who was taking responsibility for Mrs B's care. In particular, it contributed to critical errors in assessment of whether Mrs B was fully dilated, and whether the baby's head was visible on pushing, as all of the statements suggest that the providers assumed that the other/s were taking responsibility at these points.

CTG interpretation documentation

194. RM A, RM F, and Dr C all made records in Mrs B's clinical notes relating to monitoring of the fetal heart rate. The tocometer on the CTG did not begin recording Mrs B's contractions until 2.40pm, and after that time it recorded contractions poorly.

195. RM Bradford advised:

> "The standard of documentation of the CTG by all parties was left wanting. This contributed to poor communication between personnel involved and likely delayed the decision for operative delivery. Many hospitals use tools to standardise documentation of CTGs such as stickers, stamps or mnemonics listing the features of a CTG systematically so that an appraisal of all aspects can be documented clearly. Use of such a tool would have assisted in this case."

196. I accept RM Bradford's advice. In my opinion, if more standardised documentation had been used by all of the providers involved in Mrs B's care to record the features of the CTG, concerning features of the CTG such as the fact that it was not picking up contractions may have been recognised earlier.

Communication with family

197. The SAE review found that the anaesthetic service had not been informed of Baby B's death, and when the service telephoned Mrs B to ask for feedback on the care provided, this caused distress to the family. RM Bradford commented that this could have been avoided with improved systems.

198. I am critical that the anaesthetic service was not aware of Baby B's death, and I agree that the follow-up telephone call would have been particularly distressing for Mrs B and her family.

Conclusion — care of Mrs B

199. In my opinion, multiple aspects of the care provided to Mrs B by SDHB fell short of acceptable standards. Notwithstanding the personal responsibilities of the individual providers in Mrs B's care, communication issues, which I consider were SDHB's responsibility, led to confusion about who was taking responsibility for Mrs B's care. I am particularly concerned about the following issues:

- SDHB did not have in place a written policy regarding transfer of care from an LMC to the obstetric service, and by some accounts the process followed at SDHB to transfer care was not consistent with the *Referral Guidelines*.
- Documentation of the interpretation of CTGs by all parties was not standardised, which led to the concerning features of the CTG not being recognised in a timely manner.
- The anaesthetic service was not aware of Baby B's death, and this led to a distressing follow-up telephone call to Mrs B.

200. These issues meant that SDHB did not provide care of an appropriate standard to Mrs B. Accordingly, I find that SDHB breached Right 4(1) of the Code.

Care of Baby B

Central venous access

201. Once Baby B was transferred to NICU, Dr D inserted a UVC to enable venous access. An X-ray taken at 10.22pm on Day 1 showed that the UVC was not in a satisfactory position, and Dr H changed the length of the UVC slightly and ordered dobutamine and bicarbonate infusions to be given via the UVC. Dr H intended to replace the UVC with a PICC line the following morning, but Baby B's condition deteriorated, and there was not time to do this. When Dr G arrived in the afternoon of Day 2, he attended to other priorities in Baby B's care, and did not insert a PICC line. SDHB accepts that PICC line placement in Baby B's case would have been ideal, and that this should have been attempted.

202. My expert advisor, paediatrician Dr Phil Weston, commented on the difficulty of placing the UVC tip in a central position, and noted that in his experience it is achieved in about 70% of attempts. He said that if the catheter tip falls short of its central position, any medications delivered are subject to passage through the liver and metabolism in the liver, "hence it is an unwelcome compromise to be forced to use the short UVC". He stated that a better option is to find a different route of central venous access via a PICC line into a visible vein in the arm, leg, or scalp. Dr Weston acknowledged that this is a technically challenging and time-consuming procedure.

203. Dr Weston considered that an attempt to insert a PICC line should have been made at the time of the first dobutamine administration (late on Day 1) because the effectiveness of the dobutamine would have been doubtful via the unsatisfactorily placed UVC. He advised that there was a departure from the standard of care in Baby B's case, "because no other attempt was made to find an alternative central access point".

204. I accept Dr Weston's advice, and am critical that despite Baby B's treating clinicians being aware that the UVC was not in a satisfactory position, no other attempt was made to find an alternative central access point to deliver important medications. I note that most paediatric SMOs at the public hospital would have had the relevant skills to attempt to insert a PICC line.

Blood pressure support

205. During Baby B's time in NICU, she required blood pressure support. Dr H said that she used a lower limit of 40mmHg as the criterion for treatment of hypotension in prescribing medication. Dr H stated that during her training, she had been taught that a baby's gestational age in weeks is a reasonable minimum aim for a blood pressure target in the neonatal period. Dr G commented that commonly a lower limit of 40mmHg is used in neonatal intensive care, and that the intention is to achieve blood pressure significantly above that limit.

206. Dr Weston stated:

> "If the blood pressure is low, then it signifies that the heart is not working sufficiently well to drive the blood around the body. In a term baby, we hope for a mean blood pressure of 50 mmHg, and when it is not achieved, specific medicines (usually infusions) are given to try to stimulate the heart to pump harder."

207. Dr Weston commented that regardless of whether the blood pressure target was 40 or 50 mmHg, Baby B was failing to meet the blood pressure target specified by her clinicians, and more effective blood pressure support was indicated. Dr Weston suggested that dopamine was indicated earlier on Day 2, and there were opportunities to consider this during consultations with Dr G before 3pm, but this was not done.

208. Dr Weston noted that in any case there was not a satisfactory venous route to provide dopamine, and that SDHB's guidelines for encephalopathy were silent as to why and when to treat low blood pressure.

209. I accept Dr Weston's advice, and I consider that the clinicians involved in Baby B's NICU care could have done more to support her low blood pressure. I am also critical that SDHB's guidelines did not specify why and when to treat low blood pressure. I note that SDHB has undertaken to update the guidelines.

Midazolam error

210. The NICU medication manual specified that two concentrations of midazolam were available (1mg/ml and 15mg/3ml), when only one concentration (15mg/3ml) was stocked in NICU.

211. In my view, this contributed to the medication error where Baby B received a dose of midazolam that was five times higher than Dr D had intended. I consider that the discrepancy between the manual and the stock concentration led to confusion, as Dr D thought he was administering midazolam at the 1mg/ml concentration, but RN I had drawn up the medication at the only concentration available — 15mg/3ml.

212. I consider it appropriate that the NICU medication manual has since been updated to reflect only the 1mg/ml concentration, and that now only the 1mg/ml concentration is stocked in NICU.

Conclusion — care of Baby B

213. Multiple DHB clinicians were involved in Baby B's care and treatment in NICU. In my opinion, Baby B's care was suboptimal in a number of respects, as set out below. I consider that overall these failings were the responsibility of SDHB. I note that it is not possible or appropriate for me to comment on whether any of these failures contributed to Baby B's death.

- Despite Baby B's treating clinicians being aware that the UVC was not in a satisfactory position, no other attempt was made to find an alternative central access point.
- There was a failure to do more to support Baby B's low blood pressure, and SDHB's guidelines for encephalopathy did not specify why and when to treat low blood pressure.
- There was a discrepancy between the NICU medication manual and the stock available, which led to confusion and contributed to the midazolam error.

214. For these reasons, I find that SDHB did not provide services to Baby B with reasonable care and skill. Accordingly, I find that SDHB breached Right 4(1) of the Code.

Adverse comment — discussion with Coroner

215. Baby B's death was not discussed with the Coroner at the time of these events, but was referred to the Coroner after the SAE review.

216. Dr Weston commented:

> "I was disappointed to find that the case was not referred to the Coroner immediately. This was an unexpected death, in terms of the pre-birth expectations, and there were questions to be asked about how the baby became so unwell as to have an unsurvivable condition … In addition, the incorrect dose of midazolam was something that should have lowered the threshold for immediate coronial review."

217. I agree with Dr Weston's comments, and I consider that Baby B's death should have been discussed with the Coroner at the time. I note that SDHB now discusses all encephalopathy-related infant deaths with the Coroner, and has also extended this to include all neonatal deaths in NICU.

Opinion: Dr C — no breach

Review at 12.50pm

218. Dr C became involved in Mrs B's care at 12.50pm after being informed of the presence of meconium in the liquor, and after the scalp clip application by RM F. Dr C stated that she was told that Mrs B was fully dilated. Dr C documented that Mrs B was pushing, and that the vertex of the baby's head was visible. Dr C told HDC:

> "I recall seeing what I believed to be fetal head bulging at the introitus with each contraction, as I remember thinking it would be a straightforward ventouse if another prolonged decelaration were to occur as it looked like the head just needed to make it around the final corner of the pelvis.
>
> Given that the fetal heart rate had normalised, and I had believed [Mrs B] was fully dilated as she had just been examined by an experienced midwife who had placed the fetal scalp electrode (FSE), and I had never seen vaginal prolapse at the introitus in a woman in labour before, I did not closely inspect the presenting part and nor did I complete a digital vaginal examination."

219. My expert advisor, obstetrician Dr Ian Page, stated that "the error (mistaking the vaginal wall for the vertex) at that point was significant. Careful visual inspection should enable identification of the head or the vaginal wall." However, he also stated:

> "It would be easy to criticise [Dr C's] decision not to undertake a vaginal examination at this time, given the outcome. However maternity care is given by a team, who have to trust each other. As the fetal heart rate had returned to normal, and the situation was consistent with the previously documented findings, I think most obstetric registrars would have acted as [Dr C] did."

220. I accept Dr Page's advice. In the circumstances, I consider it was acceptable that Dr C did not undertake a digital vaginal examination. While I note that Dr C was mistaken in seeing what she believed to be the baby's head bulging at the introitus, this was also the observation of the midwives in the room.

CTG monitoring

221. The tocometer on the CTG did not record Mrs B's contractions until 2.40pm, and after this time it recorded contractions poorly. Dr C stated that she was not aware that the CTG was not recording contractions until 2.40pm, and noted that she was out of the room from 12.50pm until 2.45pm. Dr C said that when she arrived at 2.45pm she was concerned about the quality of the trace, and that potentially it was picking up the maternal heart rate, so the tocometer was adjusted. She believes that this is why the tocometer then started recording. Dr C stated that between 2.40pm and 3.10pm there were no clear decelerations that a contraction would have been useful to help to define.

222. Dr C signed the CTG at 3.30pm, and next viewed it at 4.30pm, at which time she was very concerned about the trace. She noted that the tocometer had not been picking up contractions well since 3.30pm, and that she had not been called to say that the CTG trace was abnormal. She then discussed her findings with her consultant, Dr E.

223. Dr Page commented that both midwives and doctors should be able to recognise a CTG that is not being performed correctly (ie, if the tocometer is not recording contractions). However, he stated that it is the midwives who apply the CTG equipment and ensure that the trace is suitable for interpretation.

224. I am satisfied that Dr C took appropriate action by adjusting the trace when she attended at 2.45pm, and by contacting Dr E to make a management plan after becoming concerned about the CTG trace at 4.30pm.

Management plans

225. Dr C reviewed Mrs B at 2.45pm and performed a vaginal examination. Dr C found that Mrs B had an anterior vaginal wall prolapse, and that the fetal head was at station –3 and Mrs B was actually only 6cm dilated. Dr C reattached the fetal scalp electrode and discussed her findings with Dr E. The plan was for Mrs B to avoid pushing, to have continuous CTG monitoring, IV fluids, and an epidural if she was in too much pain or was finding it difficult to refrain from pushing, and for her to have further obstetric review.

226. Dr Page advised that this management plan was appropriate at the time, and I accept this advice.

227. After reviewing the CTG at 4.30pm and finding it to be non-reassuring with recurrent decelerations, Dr C discussed her findings with Dr E. The agreed plan at 4.45pm was to proceed to a category two Caesarean section.

228. Dr Page stated:

> "I consider that, at 4.45pm, the CTG showed evidence of fetal compromise, but that it was not immediately life-threatening. Hence defining the urgency as category two was correct. I commend [Dr C] for her initiative in arranging for the second theatre team to be called in to the hospital prior to obtaining [Mrs B's] consent for the procedure."

229. I accept this advice, and consider that the decision to proceed to a category two Caesarean section at that time was appropriate.

Conclusion

230. I am satisfied that Dr C's involvement in Mrs B's care was reasonable and appropriate. While it is unfortunate that she erred in believing that she had viewed the baby's head at her 12.50pm review, I note that she was working as part of a wider maternity team who had all made the same observation. Accordingly, I do not find that Dr C breached the Code.

Opinion: Dr D — breach

231. Baby B's condition was deteriorating, and at 3pm on Day 2, she experienced another seizure. Dr D gave Baby B a dose of midazolam. He had intended to give a 648mcg dose, but accidentally gave a dose of 3,250mcg, which was five times the dose he intended.

232. Dr D asked RN I to draw up 0.65ml of midazolam, which she did. RN I and Dr D have provided different accounts of what was discussed between them regarding the concentration of the midazolam and whether the dose had been checked.

233. Dr D then charted the dose of midazolam that he intended — 0.65ml — based on Baby B's weight and his understanding that the dose would be drawn from a 1mg/ml solution. This was taken from the NICU medication manual, which included two possible concentrations of the drug — 1mg/ml or 15mg/3ml. However, RN I stated that for a number of years prior to, and at the time of, the incident, NICU had stocked midazolam only in the concentration of 15mg/3ml.

234. Dr D stated: "I got the medication and confirmed on the drug chart that it was the right volume that I had charted, but regretfully did not confirm that it was at the right concentration." He said:

> "Whilst I consider that I took all appropriate steps in requesting the correct dosage and ensuring that I was clear in my instructions to the nurses, it would have been prudent to check the dosage before I administered it. This however was a highly pressured and emergency situation, which required urgent/immediate action."

235. My expert advisor, paediatrician Dr Phil Weston, advised that as Dr D was the person who gave the drug, "judging that it was reasonable to short-cut the usual checks, the responsibility lies with him". Dr Weston also commented:

> "The error is understandable in context, but it was an error nonetheless. I feel confident that it had nothing to do with [Baby B's] death, which was inevitable in my view from a much earlier stage."

236. Dr Weston stated:

> "The dose was not checked by two clinicians against the written instruction. The doctor judged that urgency was such that immediate administration was required. This is undoubtedly a high risk situation for error, but also a high risk situation for failure to administer medications in a timely manner. Within the context of these competing priorities, the error was made."

237. I accept Dr Weston's advice. I am critical that Dr D administered Baby B a dose of midazolam that was five times the amount he intended, because he failed to check that the concentration of midazolam was correct. However, I note that there are mitigating circumstances. In particular, this was a time-pressured situation; the NICU medication manual referred to two different concentrations of the drug being available when only one concentration was stocked; and Dr D believed that he had requested the correct dosage be drawn up by RN I.

238. Notwithstanding the mitigating factors, it was Dr D's responsibility to ensure that the dose of medication he requested for Baby B was correct, and he failed to do this. Accordingly, I find that Dr D did not provide services to Baby B with reasonable care and skill, and breached Right 4(1) of the Code.

Opinion: RN I — other comment

239. On Day 2, Dr D asked RN I to draw up midazolam for Baby B. RN I stated that Dr D requested that she draw up 0.65ml, which she did from the concentration of 15mg/3ml stocked in NICU. Dr D intended for the dose to be drawn up from a concentration of 1mg/1ml. Dr D then administered the medication, which was 3,250mcg — five times the intended dose of 648mcg.

240. RN I said that Dr D asked whether she had drawn up the dilute midazolam, and RN I advised that she had not, and that she had only the concentrate midazolam. However, she also told HDC: "[Dr D] absolutely never verbally mentioned a concentration of 1mg/ml. If he had … I would have been alerted to the fact he did not know [the] NICU standard stock." RN I's recollection is as follows:

> "[Dr D] said we need a stat dose … I asked him to tell me what he wanted and I could draw it up. [Dr D] then verbally requested me to draw up 0.65mls, which I did. I held up the syringe in one hand for him to check the amount and I held up the ampoule in the other hand … I then clearly stated I could not give the drug because I had not checked it. [Dr D] didn't say anything but took the syringe from my hand and went into the room where [Baby B] was."

241. Further, in response to the provisional opinion, RN I's lawyer stated:

> "The issue is that [Dr D] gave a verbal order for .65ml that involved a neonatal drug calculation, no matter what the concentrate strength, and that this calculation and checking process had not yet occurred when he gave the drug."

242. Dr D accepts that he did not check that the concentration of the dose was correct. However, he also stated that had RN I informed him that the medication had not been checked, he would not have given it, and he disagrees that RN I told him that she would not administer the medication.

243. In the absence of any documentation or any third party witnesses, I am unable to make a finding as to exactly what was discussed between RN I and Dr D.

244. It is unfortunate that RN I did not question Dr D when he took the medication from her, knowing that it had not been through the correct checking procedures. However, I note that the situation was time pressured. Ultimately, I agree with the statement made by SDHB in response to the provisional opinion that "it is accepted that the person administering a medication must be personally confident that everything about the medication is correct before the medication is administered". Dr D has also accepted this.

Recommendations

245. I acknowledge the actions already taken by RM A to meet the requirements of the Midwifery Council competence programme. I further recommend that RM A:

a) Provide a written apology to Mr and Mrs B for the failings identified in this report. The apology should be sent to HDC within three weeks of the date of this report, for forwarding.

b) Provide HDC with a written reflection on the requirements for completing and documenting transfer of care adequately. This should be provided to HDC within three months of the date of this report.

246. I recommend that the Midwifery Council of New Zealand consider whether a further review of RM A's competence is warranted, after reviewing the findings in this report.

247. I recommend that SDHB:

a) Provide a written apology to Mr and Mrs B for the failings identified in this report. The apology should be sent to HDC within three weeks of the date of this report, for forwarding.

248. I note that in response to the provisional opinion, SDHB agreed to:

b) Create a guidance document that sets out the transfer of care process from primary to secondary maternity care at the public hospital, which will align with the requirements in the *Referral Guidelines*. SDHB also agreed to create a sticker to be used in the clinical records to denote when transfer of care has occurred.

I recommend that SDHB update HDC on the progress of this guideline, within three months of the date of this report.

c) Update the Neonatal Death Documentation and Checklist to include notification of services involved in the care of the mother and baby.

I recommend that SDHB provide HDC with a copy of the completed document within three months of the date of this report.

d) Review all central line guidelines and combine these into one document.

e) Develop a new sticker to help to standardise CTG interpretation.

I recommend that SDHB provide HDC with a copy of the completed sticker within three months of the date of this report.

249. I note that all deaths in NICU are now referred to the Coroner.

250. Dr D has provided a written apology to Mr and Mrs B for his part in the midazolam error. The apology has been forwarded to the family.

Follow-up actions

251. A copy of this report will be sent to the Coroner.

252. A copy of this report with details identifying the parties removed, except the experts who advised on this case, will be sent to the Midwifery Council of New Zealand, and it will be advised of RM A's name in covering correspondence.

253. A copy of this report with details identifying the parties removed, except the experts who advised on this case, will be sent to the Medical Council of New Zealand, and it will be advised of the names of Dr C and Dr D in covering correspondence, for the purpose of communicating the outcome of my decision.

254. A copy of this report with details identifying the parties removed, except the experts who advised on this case, will be sent to ACC, the Health Quality & Safety Commission, the Royal Australasian College of Physicians, and the New Zealand College of Midwives, and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

Appendix A: Independent advice to the Commissioner

The following expert advice was obtained from RM Billie Bradford:

"Thank you for your request for advice on the standard of midwifery care provided to [Mrs B] around the birth of her daughter [Baby B] in [2016]. [Baby B] was born at term in very poor condition and sadly died at just 22 hours of age. I am a midwife of almost 20 years' experience having worked as an LMC midwife, a core midwife in secondary and tertiary care settings and as a DHB clinical educator. In a previous role I led perinatal morbidity and mortality review for 10 years and I am also a midwife researcher, currently in the final stages of a PhD. I have familiarised myself with the case notes provided by your office and I can confirm that none of the parties are known to me. I have no conflicts of interest and feel able to comment on the case.

You have asked me to comment on the standard of care provided to [Mrs B] by Midwives [RM A] and [RM F] and by Southern DHB, including whether or not there has been a departure from the expected standard of care or accepted practice, recommendations to prevent similar reoccurrence and a view as to what point [Mrs B's] care was handed over to Southern DHB. The sequence of events has been summarised well in the documents provided and I will not attempt to reiterate the timelines but simply to respond to your specific questions.

1. The appropriateness of care provided by [RM A];

a) Regarding adequacy of vaginal examinations

[RM A] undertook two vaginal examinations. The first was soon after [Mrs B's] admission at 0845. This was appropriate.

The second vaginal examination was conducted three hours later in the bath, where [RM A] determined that [Mrs B] was 9cm dilated, with an anterior lip of cervix present, suggesting that the first stage of labour was near its end. Some three hours later [Mrs B] was found to be just 6cm dilated, meaning [RM A's] earlier assessment was incorrect. The mother's position during the examination (in the bath) was less than optimal which likely contributed to this error, something [RM A] acknowledges in hindsight.

[Mrs B] left the bath at 1230 whereupon her waters broke and meconium liquor was seen, indicating increased likelihood of fetal distress. [RM A] then (time not documented) listened to the fetal heart and heard it drop to 80 beats per minute (normal fetal heart rate is between 110 and 150 bpm) and rang the call bell to summon assistance. The Core Midwife [RM F] responded to the call bell and attached the fetal scalp clip as requested. She then requested the Registrar attend urgently.

The time at which the fetal heart was first heard at 80bpm is not documented however, the recorded period of fetal heart rate at 80–85 beats per minute stretches for three and a half minutes, with a brief period of 20 seconds in the middle where the heartbeat was not detected. As this recording was commenced after the deceleration was first heard it can be assumed that the period of slowed fetal heart was longer than recorded.

A fetal heart deceleration of 5 minutes or more is termed a bradycardia and is considered a pathological sign.

At this juncture vaginal examination was indicated. It was reasonable for [RM A] to prioritise recording of the fetal heartrate and to expect the Registrar as the person most likely to carry out an emergency delivery to undertake a vaginal assessment at this time. The fetal heartrate reverted to normal 60 seconds prior to the Registrar entering the room and there were two further prolonged decelerations recorded over the next 15 minutes. It is difficult to understand why the Registrar did not perform a vaginal examination at this time. [Mrs B] was documented by the Registrar to be pushing at this time. [Mrs B] then continued to push for two hours before it was determined that she was only 6 cm dilated with a now swollen cervix from premature pushing efforts. From subsequent accounts it seems all practitioners were of the impression that [Mrs B] was fully dilated, and that birth was imminent, despite no person checking full dilation.

What is the standard of care/accepted practice?

It is not uncommon for Midwives to perform a vaginal examination in the bath, particularly if birth is thought to be imminent and the midwife wishes to ensure she is prepared for delivery. However, this is acknowledged to be a less than optimal position for comprehensive assessments.

The pushing stage generally lasts 1–2 hours in a first-time mother. Midwives generally check for full dilation at commencement of pushing **or** soon after if delivery is not imminent, or obvious progress is not being made.

Has there been a departure from the standard of care or accepted practice, how significant a departure do you consider this to be?

There has been a departure from standard care in that [RM A] did not check for full dilation at commencement of pushing nor after an hour without delivery.

How would it be viewed by your peers?

Conducting a vaginal examination in the bath would be considered acceptable. However, [RM A's] peers would consider it unacceptable that [Mrs B] was allowed to push for as long as two hours, without confirmation of full dilatation at any stage and in the context of a history of prolonged fetal heart decelerations and thick meconium liquor.

b) Regarding adequacy of CTG interpretation.

[RM A] commenced continuous electronic fetal heart monitoring via cardio toco graph (CTG) due to meconium liquor and a prolonged deceleration/bradycardia but made no subsequent interpretation or appraisal of the CTG tracing. The CTG trace became increasingly abnormal up until the time of birth. At no point did [RM A] document that she had observed emerging abnormalities. Nor is there any evidence she consulted with the registrar about these abnormalities other than the initial consultation.

The technical aspects of the CTG were poor, in particular the tocometer (the 'T' in CTG) was initially not attached for two hours, meaning length and frequency of the contractions was not being recorded. Once commenced, the quality of the tocometry recording was poor. This can often be corrected by adjusting the position of the toco receiver. There is no documented reason for this or evidence of efforts to improve the quality of the tocometry recording, suggesting this was neglected. Further it is possible that recognition that fetal heart decelerations had become repetitive and 'late' in character (ie increasingly abnormal) prior to siting of the epidural was delayed due to poor tocometry. Had this abnormality been recognised sooner (apparent at 1545) the decision for operative delivery might have been made sooner.

What is the standard of care/accepted practice?

Midwives caring for women during labour with CTG monitoring are responsible for technical maintenance of the recording. When there are abnormalities midwives are expected to consult with the obstetric service.

Competency Two of the Midwifery Council of New Zealand Competencies for Midwives criterion 2.6 states '[The midwife] identifies factors in the woman/wahine or her baby/tamaiti during labour and birth which indicate the necessity for consultation with, or referral to, another midwife or a specialist medical practitioner.'

Has there been a departure from the standard of care or accepted practice, how significant a departure do you consider this to be?

Persistent failure to ensure tocometry and failure to notify the registrar or consult with core midwifery staff when new abnormalities emerged (rising baseline at 1415 and late decelerations at 1545) are significant departures from accepted standard of practice.

How would it be viewed by your peers?

Failure to document the appearance of fetal heart rate abnormalities in the progress notes and consult about these in a timely manner would be considered unacceptable.

c) Regarding the standard of care in relation to the epidural.

The anaesthetist has documented that the epidural test dose was administered at 1610. [RM A] documented at 1645 'BP as per protocol' recording six blood pressure measurements with no times alongside. Maternal blood pressure is normally recorded prior to epidural (for a baseline recording) and at five-minute intervals following the test dose for 20 minutes. The note at 1645 is likely to be retrospective but should have included the times at which the epidural measurements were taken.

[Mrs B] was assessed by the Registrar soon after the placement of the epidural and the decision was made to go to theatre for caesarean section. It is acceptable therefore that no further epidural related observations were made by [RM A] as [Mrs B] was then transferred to theatre who continued epidural care.

What is the standard of care/accepted practice?

It is difficult to comment on the epidural care itself as the documentation is incomplete.

d) Regarding the standard of documentation

The standard of documentation falls short in that the following were not documented: the time that the fetal heart was first heard to be 80bpm, the ensuing discussion with the woman and consent for fetal scalp electrode placement, ongoing interpretation of the CTG, frequency and length of contractions, fetal status prior and post epidural placement, maternal observations prior and post epidural placement.

What is the standard of care/accepted practice?

According to the MCNZ Competencies for Practice. Criterion 2.17 '[The midwife] provides accurate and timely written progress notes and relevant documented evidence of all decisions made and midwifery care offered and provided.' This did not occur.

The prolonged deceleration/bradycardia necessitated immediate response. In a situation such as this retrospective documentation would be expected. None was provided by [RM A]. When a CTG is ongoing it is usual to comment on the trace approximately every 15–30 minutes in the progress notes. The CTG tracing requires a full appraisal of all features hourly or where a change has occurred. Frequency and length of contractions are also recorded hourly.

Has there been a departure from the standard of care or accepted practice, how significant a departure do you consider this to be?

Yes, there has been a departure from standard practice.

How would it be viewed by your peers?

The standard of [RM A's] documentation would not be considered acceptable by her peers.

e) Regarding the standard of observations

[Mrs B] did not have a temperature or pulse recorded other than at admission.

What is the standard of care/accepted practice?

This falls short of the expected standard of care where blood pressure and temperature are recorded four hourly and pulse 1–2 hourly. In addition, maternal pulse was not recorded at commencement of the CTG, which is normal practice especially where there is a fetal bradycardia and need to differentiate fetal from maternal pulse.

How would it be viewed by your peers?

This departure would be considered minor.

2. The appropriateness of care by the core midwife [RM F];

a) Regarding adequacy of vaginal examinations.

At 1240 [RM F] was asked by [RM A] to attach a fetal scalp clip. Core midwives are frequently asked by LMC midwives to place scalp clips as some LMCs are not confident with the procedure which is more commonly undertaken by core midwives. [RM F] promptly attached the clip as requested. This procedure is undertaken per vaginum but does not in itself routinely involve checking for labour progress. When asked why she did not go on to determine progress of labour [RM F] responded, *'my clinical priority was to assess the fetal heart rate as it had been 80 bpm'* adding *'I was also aware that I would be informing the Registrar of the fetal heart deceleration down to 80 beats per minute and that the Registrar would more than likely want to assess dilation herself'.*

At 1430 [RM F] was asked by [RM A] if she thought the baby was presenting by the vertex (ie head first). On visual inspection [RM F] determined that she did not think that she could see fetal head at the entrance to the vagina but rather maternal tissue, perhaps a prolapsed vaginal wall. At this point [RM F] could have done a vaginal examination, but instead both midwives agreed that the Registrar should be called. In my view it was acceptable that [RM F] did not conduct any vaginal examination.

b) Regarding the adequacy of CTG interpretation.

In the period following placement of the scalp clip (between 1240 and 1430) [RM F] documented the fetal heart rate was at four separate intervals, on three of these adding that this rate was 'following a contraction'. This does not constitute adequate documentation of a CTG. As noted, during this period there was no tocometer (contraction monitor) recording being carried out. It appears that neither [RM A] nor [RM F] noticed this omission. However, the responsibility for ensuring this, primarily rested with the LMC and initiator or the CTG recording, [RM A]. LMC midwives may from time-to-time request core midwives provide a second opinion on a CTG tracing. It is nowhere documented that [RM A] requested [RM F] provide a second opinion on the CTG, or assist with CTG management other than attachment of the clip.

In my view the standard of care provided by [RM F] was acceptable, although the method of documenting the fetal heart rate following contraction suggests knowledge deficits about CTG interpretation/documentation.

c) The standard of care provided in relation to the epidural.

Epidural care was provided by [RM A]. [RM F] was not present at the time the epidural was sited as her shift was finished and she had left the hospital.

d) The standard of documentation.

It is usual when undertaking a procedure to document the reason, that consent has been sought and granted and whether the procedure was effective or not. When called to place a scalp clip, a speedy response was needed. Retrospective documentation of the above would have been preferable. Although somewhat thin, the standard of [RM F's] documentation would be considered acceptable by her peers.

e) The standard of observations.

There was no evidence that [RM F] was requested to perform any observations.

3. The point at which care would normally be considered to have been transferred to Southern DHB.

In her statement via her lawyer [RM A] has stated that care was transferred to the DHB when she rang the call bell for assistance, *'… given the presence of meconium liquor, it was [RM A's] clear understanding that when she called for assistance and the core midwife arrived, that this was the point of transfer of midwifery care and clinical responsibility from [RM A] as the LMC midwife to the hospital obstetric service'.* Although there is no documented evidence of a transfer of care in the file [RM A's] lawyer goes on *'… it is [RM A's] experience at [the DHB] that the normal method of transfer of care to the obstetric service is the call made for assistance, followed by the arrival of the core midwives and hospital obstetric staff. There is commonly no formal discussion when the obstetric service assumes care.'*

As an independent advisor, I have no personal experience of the culture and practices at Southern DHB and therefore cannot comment on what is usual in that context, however I will offer the following observations.

Firstly, the situation whereby use of the call bell to summon assistance in delivery suite automatically and unequivocally results in a transfer of care without consideration of the particular clinical circumstances, or the wishes of the woman would be considered highly unusual and quite unsatisfactory in other DHBs. Meconium liquor for example, this is a relatively common occurrence in labour and whilst some increased risk is attached, in most cases a normal birth outcome follows. Automatic transfer of care, without discussion, in all cases, would mean women are denied continuity of care by their chosen midwife, and a burden placed on the DHB who then need to provide midwifery staff to carry out full labour care with no clinical justification for transfer.

Secondly, The Ministry of Health national document Guidelines for Consultation with Obstetric and Related Medical Services, commonly known as the 'Referral Guidelines' outlines expected processes for consultation and transfer of care. The guideline lists four categories of referral including: primary, consultation, transfer and emergency. In 'Table 2: Conditions and referral categories', Section 5000–6000 'Labour and Birth — first and second stage', the conditions: 'Meconium liquor' and 'Fetal heart rate abnormalities' are both listed as conditions requiring 'Consultation' only. The referral guidelines outline the consultation process as follows 'where a consultation occurs, the decision regarding ongoing care, advice to the LMC on management, and any recommendation to subsequently transfer care must involve a three-way conversation between the specialist, the LMC and the woman … The specialist will not automatically assume responsibility for ongoing care. This responsibility will vary with the clinical situation and the wishes of the woman'. If transfer of care were to occur in the manner described by [RM A's] lawyer this would be at odds with Ministry of Health Guidelines.

Thirdly, [RM A's] assertions around the manner of transfers of care at Southern DHB does not match the statement made by the Core Midwife who states *'… it is unrealistic*

for care of a woman to be fully handed over to the obstetric service as there is simply not enough staff to be available to be able to facilitate this. Generally, what happens is that LMC's will consult with the Registrar and they remain caring for the women whilst the Obstetric team will oversee the care provided'.

Finally, [RM A] remained present and continued to provide labour care after the point at which she suggests midwifery care was transferred. In normal circumstances when full transfer of care occurs, the LMC documents that midwifery care has been handed over generally naming and thanking the receiving midwife and physically leaves. If the LMC has elected to stay on as a support person ie remains present but in a non-clinical capacity this is clearly documented and the LMC no longer provides clinical care. [RM A] remained present providing clinical care including consultation for epidural and being the sole practitioner managing the CTG for extended periods and is accountable for the care she provided. As per the concluding statement of the Midwifery Council of New Zealand's Midwifery Scope of Practice 'In all settings the Midwife remains responsible and accountable for the care she provides' (MCNZ, 2004).

It is my view that [RM A] remained the LMC following consultation for meconium liquor and deceleration/bradycardia, as per the Ministry of Health's referral guidelines, the usual process at Southern DHB (as described by the Core Midwife) and as evidenced by her ongoing presence in the delivery room, providing midwifery care. Care was subsequently transferred at 1645 when the decision was made for a caesarean section, which following a three-way conversation about the progressively abnormal situation and agreement about the need for operative birth.

4. Recommendations for improvement at Southern DHB.

The standard of documentation of the CTG by all parties was left wanting. This contributed to poor communication between personnel involved and likely delayed the decision for operative delivery. Many hospitals use tools to standardise documentation of CTGs such as stickers, stamps or mnemonics listing the features of a CTG systematically so that an appraisal of all aspects can be documented clearly. Use of such a tool would have assisted in this case. Mandatory attendance of all staff providing labour care at CTG education such as the K2 fetal surveillance programme provided by RANZCOG would help to improve communication around CTGs. In particular delayed recognition of the presence of late decelerations perhaps secondary to a technically poor tocography recording contributed to delays.

In addition, two areas of systems improvement around the epidural care are apparent. An epidural audit form normally completed following birth was not completed in this instance resulting in [Mrs B] receiving a phone call the day after her baby's death enquiring about her satisfaction with her epidural. This was likely to be distressing for [Mrs B] and could have been avoided with improved systems.

Secondly, in many hospitals an agreement exists between anaesthetic and obstetric departments that prior to placement of a labour epidural a CTG will have been in progress for at least 20 minutes and fetal status (interpretation of the CTG) clearly

documented by the midwifery/obstetric staff so that all parties are aware of fetal condition at that time, offsetting any potential confusion as to timing or reason for fetal deterioration following epidural. Had this occurred, practitioners may have become aware that [Baby B's] condition was worsening and decision for operative birth might have been taken sooner.

In summary, the care by [RM F] was acceptable. The care by [RM A] fell short in a number of aspects, including documentation of care, observations, vaginal examination in second stage, management of CTG (both technical and in terms of interpretation and documentation). Failure to document the time of initial fetal bradycardia and likely length of this event, allowing the woman to push for two hours without checking for full dilatation and failing to identify the presence of repetitive late fetal heart decelerations and notify the Registrar about these in a timely manner would be viewed as moderate departures.

In addition to addressing these shortfalls [RM A] is also recommended to familiarise herself with the referral guidelines and MCNZ Competency statement around midwives' ongoing responsibilities when women require input from another practitioner and the New Zealand College of Midwives Transfer Guidelines.

Thank you for the opportunity to comment on this case.

Yours Faithfully,

Billie Bradford RM, MMid, PhD Candidate.

References used in preparing this report.

RANZCOG (2014). Intrapartum Fetal Surveillance. Clinical Guideline — Third Edition. Royal Australian and New Zealand College of Obstetricians and Gynaecologists.

MCNZ. Competencies for Entry to the Register. Midwifery Council of New Zealand.

NZCOM (2008). Transfer Guidelines. New Zealand College of Midwives."

The following further advice was received from RM Bradford:

"Thank you for the opportunity to comment on the letter dated 10th of April 2019 provided by [RM A's lawyer] who is responding on behalf of her client [RM A]. My response below is limited to key aspects of the case.

Regarding confirmation of full dilatation

My assessment stated, as quoted by [RM A's lawyer] in point 14 '… there has been a departure from the standard care and that [RM A] did not check for full-dilatation at commencement of pushing *nor after an hour without delivery*' [my italics].

[RM A's lawyer] responds: RM Bradford's assessment … is inconsistent with her earlier statement that at the time [Mrs B] was documented by the Registrar to be pushing that

RM Bradford stated '… it is difficult to understand why the Registrar did not perform a vaginal examination at this time.'

My response: there is no inconsistency here. Any party, including the Registrar, [RM A] or [RM F] could have undertaken a vaginal examination at the time of commencement of pushing but none did. However, **after an hour of pushing** (see italics above), with no delivery and in the knowledge that no assessment of full-dilation have been made at commencement of pushing, and with indications for concern about fetal wellbeing, assessment of dilation was indicated and [RM A] as the midwife present did not undertake this, which I maintain is a departure from standard.

Mismanagement of CTG and lack of consultation around new abnormalities in CTG

My original assessment stated, as quoted by [RM A's lawyer] in points 28, 29, and 30.

That there is no 'evidence [RM A] consulted with the Registrar about these abnormalities *other than the initial consultation* [my italics]'.

And further, that [RM A] 'made no *subsequent* interpretation or appraisal of the CTG tracing' [my italics].

And that 'at no point did [RM A] document that she had observed *emerging abnormalities* [my italics]'

In response, [RM A's lawyer] offers:

'It is very clear that [RM A] did not fail to notify the Registrar or consult with Southern DHB core midwifery staff. [RM A] requested assistance appropriately and immediately upon the abnormal and worrying presentation of thick, dark meconium liquor.'

My response: it is not disputed that [RM A] consulted at the time meconium was first seen (ie the initial consultation — see italics). My comments refer to the **subsequent** and **emerging** abnormalities which were not identified, documented, or acted upon by [RM A].

Further to this point, [RM A's lawyer] provides a transcript of entries in the progress notes where comments have been made on the fetal heart rate, stating:

> 'It is therefore quite clear from the annotation on the CTG tracing and from the progress notes that the Obstetric Registrar and the core midwife had fully taken over responsibility for the care and for the assessment of the CTG trace.'

My response: Indeed, this is far from clear. It is usual for numerous health professionals to record aspects of their care in the progress notes. The act of writing in the progress notes does not in itself denote sole responsibility for all aspects of the care by the parties annotating, as [RM A's lawyer] appears to believe. Furthermore, that [DHB] staff made intermittent comments on *some* aspects of the CTG does not absolve [RM A] of all responsibility for fetal monitoring, as either the LMC, or the sole health professional

present during periods of emerging abnormalities. Indeed, the entries made by other staff do not constitute adequate documentation or interpretation of the CTG and my original report shows that I was critical of standard of CTG documentation by all parties involved.

Transfer of care

Whether or not transfer of care occurred is a persisting question in this case. The Ministry of Health document *Guidelines for Consultation with Obstetric and Related Medical Services* known as 'The Referral Guidelines' clearly designate the clinical indicators in labour of 'meconium liquor' and 'fetal heartrate abnormalities' as conditions requiring 'consultation' and not 'transfer of care' (see original report). The referral guidelines further clarify that where consultation leads to subsequent transfer of care, a three-way conversation occurs between the specialist, the LMC and the woman before it is agreed that care will be transferred and that 'the specialist will not automatically assume responsibility for ongoing care'.

[RM A's lawyer's] argument is that despite the clinical conditions not being consistent with the expectation of transfer of care (according to the professional consensus presented in the referral guidelines), no documentation of a three-way conversation, and no explicit documentation that a decision had been made to transfer care: transfer of care nevertheless occurred due to an unwritten 'shared-understanding' amongst [DHB] staff and contractors that transfers of care occur in this manner. However, that such a 'shared-understanding' exists at Southern DHB is at odds with the statements made by the core midwife [RM F] who clearly stated her belief that the call bell was rung to request assistance, adding that any expectation of complete handover of care would be 'unrealistic', and regularly referring to [RM A] as 'the LMC' in her recollection of events.

The situation at Southern DHB where unwritten 'shared-understandings' (which apparently are not shared) around consultation and transfer of care are said to exist, can result in blurred boundaries and role confusion, which is a risk to both staff and patients. In the spirit of seeking to learn from this case, at the centre of which it must be remembered is a bereaved family, it is apparent that a review of process and practice around consultation and transfer of care, including documentation of same is warranted at Southern DHB. The Referral Guidelines which constitute a consensus of accepted usual practices for consultation and transfer of care in New Zealand should be used to guide this review.

Regardless of whether or not [RM A] believed she remained the LMC after having consulted, she remained responsible for the care she did provide, which fell short in the aspects mentioned in my original report.

Expert reviewer lack of relevant experience

[RM A's lawyer] has commented that, I have 'no experience of established practices at Southern DHB … and am '… ignorant of the established processes'. Further suggesting, '… it seems unlikely that Ms Bradford has ever had any experience in the transfer of

patients to a core team from an independent LMC maternity care to a tertiary environment.'

Response: Indeed, it appears that [RM A's lawyer] herself is ignorant of HDC processes in contracting expert advisors. Expert advisors are expected to be experienced, without conflict of interest and supported by their peers. Had she taken the care to read the opening paragraph of my original review she would have noted that I am 'a midwife of almost 20 years' experience having worked as an LMC midwife, a core midwife in secondary and tertiary care settings and as DHB clinical educator.'

Furthermore, as a midwife who had not previously worked at the particular DHB in question and had no prior relationship with any of the parties involved, I was comfortable to state in my report that 'I have no conflicts of interest and feel able to comment on this case', which remains the case. What has not yet been mentioned is that I am also supported by my peers and have been nominated to the role of expert advisor by my professional college and indeed [RM A's lawyer's] client's professional college the New Zealand College of Midwives.

Having carefully reviewed the response by [RM A's lawyer] and considered my original report I can confidently state that my views are unchanged.

Thank you for the opportunity to clarify the above points.

Yours Faithfully,

Billie Bradford, RM, MMid."

Appendix B: Independent advice to the Commissioner

The following expert advice was obtained from obstetrician Dr Ian Page:

"Thank you for your letter of 21 May 2018 and the enclosed documents, requesting expert advice to the Commissioner on the obstetric care provided to [Mrs B] by Southern DHB and its staff [in 2016]. I have read and agree to follow the Commissioner's Guidelines for Independent Advisors.

I am a practising Obstetrician & Gynaecologist and have been a consultant for 30 years. I obtained my MRCOG in 1985, my FRCOG in 1998 and my FRANZCOG in 2002. I have been employed for the past 18 years by Northland DHB. I have been a member of the Royal Australia and New Zealand College of Obstetrics & Gynaecology (RANZCOG) Expert Witness register since 2012.

Background

After a normal pregnancy [Mrs B] went into spontaneous labour at term. She was admitted to the delivery suite of [the public hospital]. Her baby's heart rate became abnormal during the labour, and so the baby was delivered by caesarean section. [Baby B] was born in a poor condition and died at 22 hours of age.

Advice Requested

You asked me to review the documents and advise whether the care provided to [Mrs B] by Southern DHB, [Dr C] and [Dr E] was reasonable in the circumstances, and why. You also asked me to comment specifically on:

1. Whether it was appropriate for [Dr C] not to undertake a vaginal examination when she reviewed [Mrs B] at 12.50pm.
2. The management plan made following [Dr C's] 2.45pm review.
3. The adequacy of fetal monitoring.
4. The decision to proceed to a category two caesarean section.
5. Any other matters I think warrant comment.

Sources of Information

In assessing this case I have read:

- Response from Southern DHB dated 4 October 2017 and all enclosures.
- [Mrs B's] clinical records.
- Letter of response from [RM A] dated 19 October2017.
- Medical certificate of causes of fetal and neonatal death.
- Statement from [Dr C] dated 3 October 2017.
- Letter to HDC from [Dr C] dated 30 October 2017.
- Statement from [Dr E] dated 10 November 2017.
- Statement from [RM F] dated 28 May 2018.

Summary of the Case

[Mrs B] was [in her thirties and] in her first ongoing pregnancy. She is said to have had an uneventful pregnancy and went into spontaneous labour on her due date, [Day 1]. She was admitted to the delivery suite at [the public hospital] at 8am.

At 8.45am [RM A] noted [Mrs B] was 4cm dilated with intact membranes. At 10.25am [Mrs B] got into the bath. At 11.45am she was examined in the bath by [RM A] who considered [Mrs B] was 9cm dilated with an anterior lip of cervix present.

[Mrs B] exited the bath and at 12.30pm spontaneous rupture of the membranes occurred and meconium was seen. [RM A] pressed the call bell and core midwife [RM F] attended. A fetal heart rate deceleration was heard and [RM F] attached a scalp electrode. The obstetric registrar, [Dr C], was called and attended at 12.50pm.

[Dr C] noted that the fetal heart rate had recovered. She performed an abdominal examination and noted the fetal head was not palpable in the maternal abdomen. [Mrs B] had begun to push and [Dr C] states she was told the vertex was visible on pushing, so she did not perform a vaginal examination. She recorded that she would remain nearby in case of further issues.

At 12.55pm [RM F] documented that descent *(of the fetal head)* was visible on the perineum with pushing. At 1.50pm [RM F] documented the head was visible on the perineum with pushing, and at 2.15pm that lots of head was visible on pushing. At 2.30pm [RM F] documented that there was possible prolapsed tissue in front of the baby's head and that the fetal heart rate was 152bpm. [Dr C] was called back.

[Dr C] attended at 2.45pm and noted the fetal heart baseline had risen from 120 to 155bpm with some variable decelerations and that it was still accelerative. On examination she noted there was an anterior vaginal wall prolapse, the fetal head was at station -3 and that [Mrs B] was only 6cm dilated with a very oedematous cervix. An FSE was attached to improve the quality of the fetal heart rate trace.

[Dr C] discussed her findings with consultant [Dr E] and the agreed plan was for [Mrs B] to stop pushing, have continuous CTG and IV fluids, and an epidural if desired.

At 4.20pm an epidural was sited. At 4.45pm [Dr C] reviewed [Mrs B] again and noted no progress had been made, and that the CTG was non-reassuring with recurrent decelerations and no accelerations. [Dr C] discussed her findings with [Dr E] and the agreed plan was to proceed to a category two Caesarean section.

[Mrs B] was transferred to theatre at 5.30pm and the operation commenced at 5.45pm. In theatre [Dr E] noted the CTG prior to transfer showed a baseline of 160bpm with reduced variability and shallow, late decelerations. In theatre she noted the CTG showed a baseline of 150bpm with reduced variability and ongoing decelerations.

[Baby B] was born at 5.48pm in poor condition. She required resuscitation and intubation and was transferred to the neonatal intensive care unit. Sadly, [Baby B] died at 22 hours of age.

My Assessment

You asked me to review the documents and advise whether the care provided to [Mrs B] by Southern DHB, [Dr C] and [Dr E] was reasonable in the circumstances, and why. You also asked me to comment specifically on:

1. *Whether it was appropriate for [Dr C] not to undertake a vaginal examination when she reviewed [Mrs B] at 12.50pm.*

It would be easy to criticise [Dr C's] decision not to undertake a vaginal examination at this time, given the outcome. However maternity care is given by a team, who have to trust each other. As the fetal heart rate had returned to normal, and the situation was consistent with the previously documented findings, I think most obstetric registrars would have acted as [Dr C] did.

It is not clear from the notes how [Dr C] was aware the vertex was visible, but from her statement of 30 October she would appear to have seen [Mrs B's] vulva bulging with each contraction. Whether it was [Dr C], or [RM F], who decided that the vertex was visible is not clear from the notes. Subsequent entries in the notes from [RM F] continue to state she thought the vertex was visible until 2.40pm, when she thought there was some prolapsed tissue in front of the baby's head.

I think the error (mistaking the vaginal wall for the vertex) at that point was significant. Careful visual inspection should enable identification of the head or the vaginal wall, and the failure to achieve that would be viewed as a mild to moderate departure from accepted standard of care. It would therefore be viewed with mild to moderate disapproval by both obstetricians and (I believe) midwives.

2. *The management plan made following [Dr C's] 2.45pm review.*

There are three aspects to consider here.

The first is the general care of [Mrs B], who by then had been pushing for nearly two hours. Administering IV fluids was a very reasonable plan, along with the provision of adequate analgesia.

[Mrs B] had a desire to push, and this needed to be dealt with. The offer of epidural analgesia was highly appropriate for this. I cannot tell from the notes why this was not requested until about 4.15pm by [RM A].

[Dr C] considered the CTG to be reassuring, albeit noting that the baseline rate had increased.

She discussed [Mrs B's] situation with the consultant ([Dr E]), her management plan was approved and she was to return to review [Mrs B] after about one hour.

Overall I think her management plan was appropriate.

3. The adequacy of fetal monitoring.

The use of intermittent auscultation was appropriate at the beginning of labour, and was documented as normal. Once the membranes ruptured and meconium was noted, CTG monitoring was undertaken.

The quality of the CTG is poor. The tocodynamometer did not record contractions until 2.40pm, some two hours after the CTG was commenced. I would view that as a moderate departure from the expected standard of care, which needs uterine activity (the T in CTG) to be recorded as well as the fetal heart rate. I think midwives would also view it in the same light.

I found it impossible to determine when contractions were occurring from the start of the CTG until after 4pm, as even when the tocodynamometer had been applied its trace was often inadequate. Whilst this is not an uncommon situation it is still less than ideal practice, and would be viewed as a moderate departure from the accepted standard of care.

4. The decision to proceed to a category two caesarean section.

Defining the urgency with which a caesarean section needs to be performed is fraught with difficulty. The guidance from RANZCOG says that a category two caesarean section is appropriate where there is maternal or fetal compromise that is not immediately life-threatening. The guidance also recommends against putting specific timeframes against the categories, noting that each case should be decided on its merits.

I consider that, at 4.45pm, the CTG showed evidence of fetal compromise, but that it was not immediately life-threatening. Hence defining the urgency as category two was correct. I commend [Dr C] for her initiative in arranging for the second theatre team to be called in to the hospital prior to obtaining [Mrs B's] consent for the procedure. This shows an awareness of the whole situation in the hospital, and the service limitations that apply there. The CTG did worsen between the decision and the birth, but the opportunity to accelerate the process was limited and I cannot be sure that the changes would have been viewed as immediately life-threatening to the baby (which would have warranted upgrading to a category one call).

5. Any other matters I think warrant comment.

The management of [Mrs B's] labour after her membranes had ruptured was initially determined by the belief that her cervix was 9cm dilated when she was examined in the bath by [RM A]. This assessment would appear to have been incorrect. Although this will be a matter I expect your midwifery advisor will consider, most obstetricians would query the accuracy of such assessments. This simply reflects the difficulty in performing the examination thoroughly and accurately when the woman is in the bath.

I do not have any personal or professional conflict of interest to declare regarding this case. If you require any further comment or clarification please let me know.

Yours sincerely,

Dr Ian Page MB BS, FRCOG, FRANZCOG
Consultant Obstetrician & Gynaecologist
Whangarei Hospital."

The following clarifying advice was received from Dr Page:

"Both midwives and doctors should be able to recognise if a CTG is not being performed properly (i.e. having the T in place). Uterine contractions can always be palpated by the midwife, who can then mark on the trace where they are occurring, should it not be possible to use the T belt to get an adequate trace. If it is not possible to monitor the fetal heart rate by ultrasound then application of a fetal scalp electrode (by either midwife or doctor) usually permits an adequate trace to be obtained.

In this case most of the issues related to not monitoring/recording the uterine contractions, although that failure did not (in itself) lead to the poor outcome. My comment was around the general principle of doing things properly, as not doing so may imply not believing in the value of the CTG."

The following further advice was received from Dr Page:

"Thank you for your email of 7 August 2019, and the response from [Dr C] dated 25 October 2018. You asked me to advise whether it causes me to add to or amend the conclusions drawn in my initial advice, or make any additional comments.

I have reviewed my advice, and [Dr C's] thoughtful comments. With regard to my response to your first question I clearly was not quite clear. I repeat what I wrote here.

'I think the error (mistaking the vaginal wall for the vertex) at that point was significant. Careful visual inspection should enable identification of the head or the vaginal wall, and the failure to achieve that would be viewed as a mild to moderate departure from accepted standard of care. It would therefore be viewed with mild to moderate disapproval by both obstetricians and (I believe) midwives.'

My criticism of the failure to correctly identify the fetal head or vaginal wall was directed at the midwife, rather than [Dr C]. I had previously noted that maternity has to function as a team, and a good deal of trust has to be in place for it to function effectively. I hope that, despite these events, [Dr C] will continue to trust her colleagues.

With regard to the adequacy of the fetal monitoring my criticism was of the midwifery care, as it is usually the midwives who apply the CTG equipment and ensure the trace is suitable for interpretation. This is why I suggested that midwives would view the inadequacy in the same light.

So, in summary, I really do not have any criticism of [Dr C].

Yours sincerely,

Dr Ian Page MB BS, FRCOG, FRANZCOG
Consultant Obstetrician & Gynaecologist
Whangarei Hospital."

Appendix C: Independent advice to the Commissioner

The following expert advice was obtained from neonatal paediatrician Dr Phil Weston:

"I am asked to provide expert advice on whether the neonatal care provided to [Baby B] was reasonable in the circumstances, and why. I am asked to particularly respond to 5 specific prompts, which I shall take in turn.

I am a neonatal paediatrician at Waikato Hospital, a position I have occupied for 30 years. I hold the qualifications of MBChB (Otago), FRACP, and M.Med.Stats. In my clinical experience I have cared for many babies with the condition of hypoxic ischaemic encephalopathy. I have also been a leader of the Child Health service for 17 years at Waikato Hospital, a position I relinquished in 2012 to pursue research interests.

My information about this case arises solely from material provided to me by the HDC. I consider that I have enough material to make a reasonable assessment of the management of this case.

The initial resuscitation process

[Baby B] was born in unexpectedly poor condition. By this comment, I mean it was not anticipated that her condition would be extremely bad. She was delivered by caesarean section due to obstetric concerns about the progress of the labour, but the declared acuity of the caesarean section was not of the highest level. There had been evidence of fetal distress, failure to progress, and meconium in the liquor. This situation is common in every tertiary obstetric unit, and paediatric team members are frequently in attendance at such delivery. The usual outcome for a term baby is a good one, and it was reasonable in my view that the attending paediatric staff would have had a low expectation of difficulties. Please note that my expertise is not in obstetrics, and I draw no conclusion at all regarding the propriety of the decision to undertake the caesarean section in the way that it was.

The paediatric doctor in attendance was [Dr D], a paediatric registrar with 4 years experience in paediatrics. As such, it would be reasonable to expect that he would have the skills and experience to handle this situation effectively.

To everyone's surprise, [Baby B's] condition at birth was extremely bad. She made no breathing movements, and did not respond to suction and stimulation. Her heart was beating, but at a slow rate. [Dr D] initiated resuscitative manoeuvres in a way (according to his written report) that reads well to me. The heart rate and oxygen saturations were monitored, assisted breaths were given, and cardiac compressions were not given as the heart rate was above 60 beats per minute throughout. The attendance of neonatal nurse support and a senior paediatrician was called at 8 minutes. Intubation was achieved at 10 minutes, but the tube became dislodged shortly afterwards, and was replaced at about 20 minutes. The senior paediatrician [Dr H] arrived at 20 minutes.

In the times when the ventilating tube was not in place, [Dr D] maintained positive pressure ventilation via neopuff and face mask, a technique which is a reasonable alternative, and one that would generally result in spontaneous improvement in most babies.

These standard measures of respiratory support were continued, and her heart initially continued beating, but it was of concern that [Baby B] remained very compromised. She had stopped any spontaneous breathing movements, and then had a period of no heart activity at 55 minutes. Chest compressions were commenced, and an IV was inserted to give adrenaline. Two doses were administered, 5 minutes apart, along with normal saline and dextrose boluses. The heart rate returned after the second dose (given at 63 minutes of age).

What is the standard of care? Babies who are born in a depressed condition require resuscitation according to the principles of airway, breathing, and circulation. [Dr D] undertook the resuscitation in a satisfactory manner, and called for assistance appropriately. It would have been better, in hindsight, if the intubation had been maintained without becoming dislodged, but this imperfection does not detract from what was a real-world situation managed satisfactorily in a real-world manner.

Departure from standard of care? No.

Viewed by peers? Imperfect, but still very good. All of us will have been at resuscitations where our tubes have fallen out. The important thing is maintaining adherence to the principles of resuscitation, which was done here.

Recommendations for improvement? None.

The overall treatment of [Baby B's] condition

The clinical team were working against very adverse odds, in trying to achieve a quality survival outcome for [Baby B]. At the time of the initial resuscitation, it was not clear what was going on to explain her poor condition (and in fact it never did become clear). Neonatologists are frequently put in the position of having to do the best they can with an adverse situation in front of them. It is entirely reasonable to first expect that the outcome might be okay when faced with a baby in poor condition. But very quickly in this case, additional information came to light that would have made the clinical team suspect that their best efforts may not be sufficient. The degree of compromise that a baby has suffered is reflected in the apgar scores, and in the initial acid–base balance on the early blood tests. [Baby B's] apgar scores were low: 1, 3, and 3 at 1, 5, and 10 minutes. These are fearsome scores, although admittedly there is some subjectivity in ascribing them. The failure to maintain stability in the first hour, with a cardiovascular collapse requiring full CPR at 55 minutes is another indicator of a severely ill baby. The other helpful indicator is the acid–base balance, and the first result was obtained at 1.4 hours of age. The pH of 6.67, the base deficit of 29 mmol/L, and the lactate of 24 mmol/L all suggest a baby with an extremely severe asphyxia condition, for whom survival and

quality of survival become grave uncertainties (see table below). Nonetheless, intensive therapeutic measures was the appropriate choice, to see what could be achieved.

[Baby B's] diagnosis

[Baby B] suffered from acute birth asphyxia, also called hypoxic-ischaemic encephalopathy. The latter term arises because the brain ('encephalo…') is disturbed ('…pathy') by a combination of assaults from low oxygen delivery ('hypoxic') and from poor perfusion to the cells ('ischaemic'). We use the acronym 'HIE' for this condition, and we grade it into 3 stages: 1 is minor, and does not usually require treatment, whereas 3 is major, with little responsiveness. The outcome from grade 3 HIE is generally very poor, and it appears that [Baby B] suffered from this degree.

The tragedy of this condition is that it generally arises in a perfectly well fetus, who has grown and matured normally over 9 months of pregnancy, only for adversity to strike at the last moment. [Baby B] would probably be alive and well today if she had been delivered earlier by caesarean section (prior to labour), but it is not possible to predict which babies will follow this path into HIE, and is therefore impossible to prevent entirely. Attention to risk indicators during labour helps but does not eliminate the problem.

From my own NICU, I have extracted outcome data on our admissions over the last 10 years, where the diagnosis was HIE (grade 2 or 3), and an initial pH was available. The following table shows that survival in my NICU with the start that [Baby B] had would have been unlikely, in that only 17% of babies who had a pH below 6.7 survived.

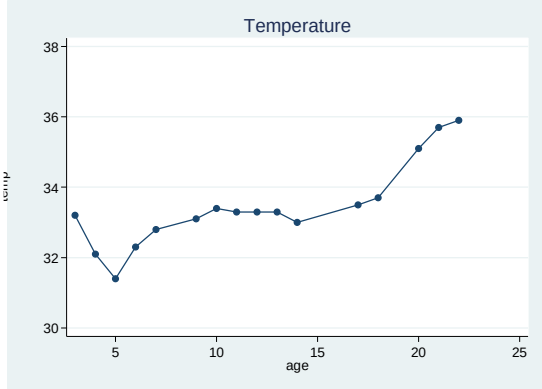
Table: Mortality from HIE in the Waikato NICU.

pH	number	deaths	mortality (%)
<6.7	18	15	83%
6.7 to 7.0	53	23	44%
>7.0	60	17	28%
all	131	56	43%

Therapeutic hypothermia

The use of therapeutic hypothermia has been a relatively recent addition to our therapies (10 years), and the only one which specifically addresses the problem of HIE. It has been well-researched, and although its use is clearly advantageous at a population level (ie it achieves success more often than if it is not used), it offers no guarantee to individual babies. In the Cochrane review of therapeutic hypothermia, 27% of 467 babies died with cooling, compared to 37% of 475 babies those not cooled. The group assessed includes babies with less severe HIE than that which [Baby B] experienced. Even so, it was entirely appropriate to initiate treatment with therapeutic hypothermia as part of the interventions.

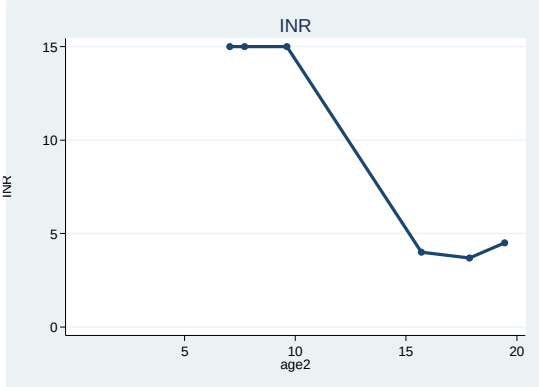
The following plot shows her rectal temperature, as recorded on the hourly nursing records. Ideally we would generally seek a cooled temperature in the range 33.5–34.5 (the [DHB] guidelines agree), and a normal temperature in the range 36.5 to 37. For the official cooling period of [Baby B's] life (age 0–16 hours) the temperature was just a little below ideal range. Once it was decided to rewarm her (at 16 hours), the rewarming process is deliberately slow, so it is not strange that she did not reach normal temperature before she died.



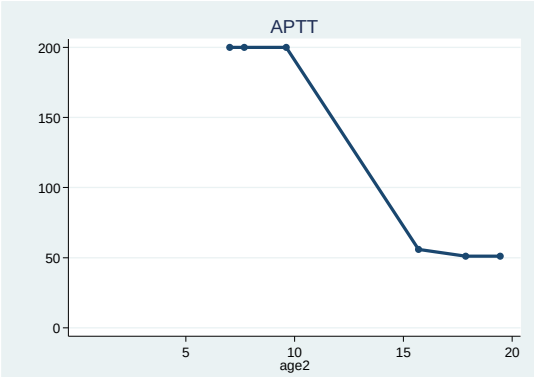
The appropriateness of the stoppage of the hypothermia is less established in research. However, it may be the case that the use of therapeutic hypothermia makes abnormalities of blood clotting ('coagulopathy') more likely. The Cochrane review was not able to be clear about this (31% vs 28%), but severe clotting disorders can and do result in serious spontaneous bleeding into important organs including the brain. Such an event could only have made [Baby B's] situation worse. It is also the case that the coagulopathy in [Baby B's] case was severe (see below), and as such the risk of bleeding was judged to overrule the risk of normal-temperature management. This was a clinical judgement made at the time, for which no clear agreed protocol exists. The decision to cease cooling was not consistent with [DHB] guidelines for Encephalopathy (which instead focus on active coagulopathy treatment). The national guidelines for the management of HIE (see appendix) also do not specify coagulopathy as a reason to reverse cooling, but they do advise caution. The decision to reverse the cooling was a judgement that was understandable and not unreasonable.

Coagulopathy

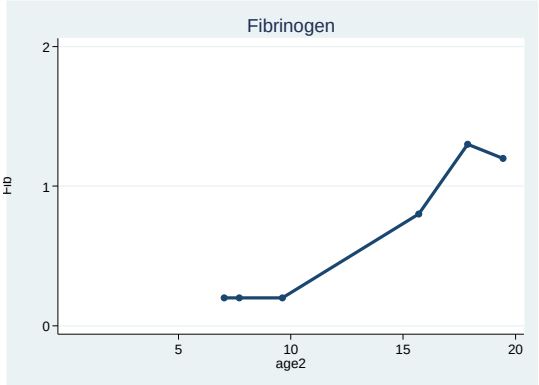
The following plots address the coagulopathy, but I have plotted INR levels reported as '> 10' as 15 and APTT levels reported a '>100' as 200, just to get those results on the graphs:



The INR stands for 'International Normalised Ratio', an assessment of a subset of the clotting factors. The normal range in a newborn is 1–1.5. These results are all much too high, indicating severe derangement of this subset of the clotting mechanism. Treatments for this problem are vitamin K, and fresh frozen plasma (FFP), both of which were given.



The APTT stands for 'Activated Partial Thromboplastin Time', and again is an assessment of a subset (different from the INR) of the clotting mechanism. The normal range in a newborn is up to 50 seconds, so these results are all much too high, until corrective measures are in place from 15 hours onwards. Treatment for this is FFP, which was given.

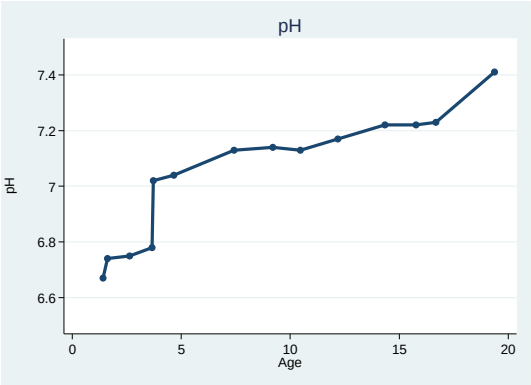


The Fibrinogen is one element of the clotting mechanism, and requires specific replacement with cryoprecipitate solution to achieve normal levels (above 1.5). The levels of this part of the coagulopathy were partially restored with the treatments provided.

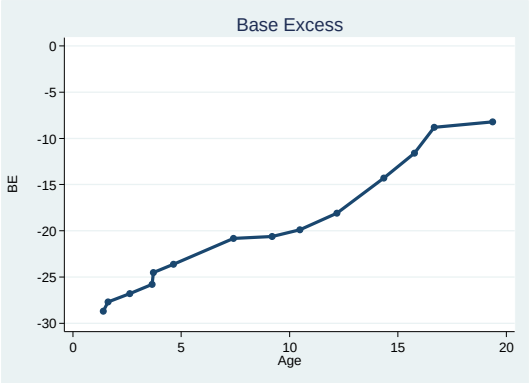
These three measures of the clotting mechanism indicate severe and persistent derangement of the clotting mechanism, in spite of substantial active attempts to restore the clotting to normal. The treatments given were Fresh frozen plasma (FFP) at 12.7h and 19.7h, and cryoprecipitate at 14.0 and 16.1 h. It is reassuring to read that vitamin K was given by injection at birth, as is routine in all babies. In the face of severe cellular disturbance (as indicated by the persistent acidosis and lactataemia), it was not possible to restore the clotting (or indeed any element of the baby) to good health.

Acid–base imbalance

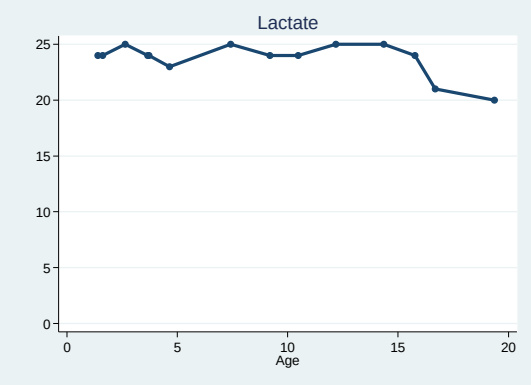
I believe that clinical restoration of health in [Baby B's] case was outside of the capability of any neonatal health provider. Her clinical condition and laboratory results all suggest that she was delivered at a time too late to be of assistance to her (not that this was known at the delivery-decision time). I say this because of the protracted acidosis and lactataemia, the extreme coagulopathy, and her inability to maintain oxygenation and perfusion in spite of maximal intensive care support. I find the following graphs helpful in understanding this.



The pH plot shows that the pH remained adverse (<7.25) right up until the last result. The steep climb at 4 hours was due to a ventilator change and a sharp reduction in carbon dioxide, and therefore somewhat artificial.



The Base Excess plot supports the idea that the acid–base balance remained adverse throughout, never achieving a normal range of –5 to 0.

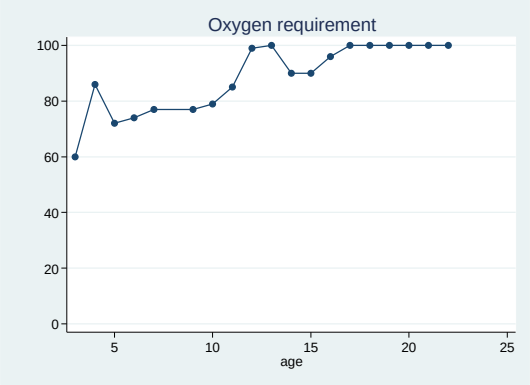


The lactate levels remained remarkably high throughout — the normal expectation in the first day is between 0 and 3 mmol/L. These results are stubbornly and amazingly high, and suggest ongoing inability of the cells to utilise oxygen for aerobic metabolism. This was probably due to poor oxygen uptake in the lungs, and poor perfusion, a situation which evidently could not be reversed.

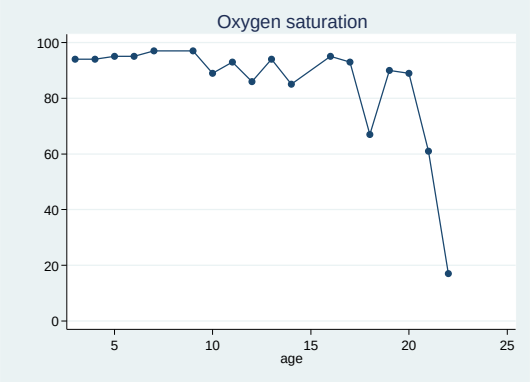
Of the above depictions, the most telling is the ongoing high lactate levels. In spite of all attempts to improve [Baby B's] condition, the lactate did not respond at all. This suggests that the basic essential metabolic processes remained disturbed throughout her body, including the muscles of the heart, so that eventually the heart was unable to maintain its function.

Cardiovascular

The other element of illness that warrants mention is oxygenation. It was the case that assisted ventilation was required throughout [Baby B's] short life, because her lungs were unable to manage the critical issue of normal gas exchange on their own. This may have been due to primary lung disease (meconium overload, pneumothorax) but there was not enough corroboratory evidence on the chest Xrays to make this likely. Instead, her inability to deliver oxygen through the arterial circulation, as evidenced by her low oxygen saturations in spite of aggressive ventilation and low carbon dioxide levels was likely due to heart-lung dysfunction.



The oxygen requirement is the percentage of oxygen made available to [Baby B]. Air contains 21%, and the maximum that can be given is pure oxygen (100%). This graph shows that [Baby B's] condition was initially poor and deteriorated further through her admission.

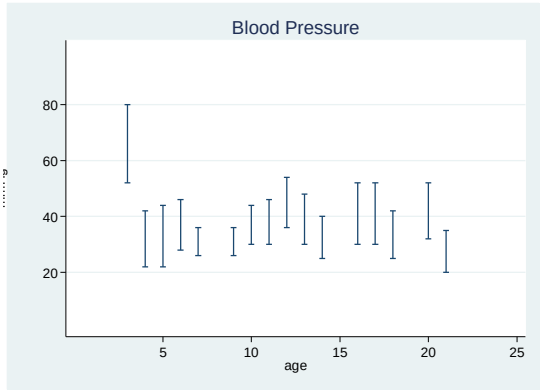


The oxygen saturation is a measure of how much oxygen is being carried by the blood. We expect the blood to be 95% saturated, or better, and it is apparent that it became increasingly difficult to achieve this, in spite of maximum intensive care support.

An echocardiogram was performed on the evening of the admission to evaluate heart function. The exact time is not given, but the date is recorded as [Day 1], so [Baby B] cannot have been older than 6 hours when it was done. At this time, her heart had some suggestive features of mild dysfunction (mild septal flattening, right ventricle mildly dilated, systolic function mildly impaired). These findings are consistent with raised

pulmonary pressures, and are likely to have progressed to frank cardiac dysfunction by the subsequent day.

A more readily available method of cardiac function is the blood pressure. It is not necessarily a good one if normal, but if the blood pressure is low, then it signifies that the heart is not working sufficiently well to drive the blood around the body. In a term baby, we hope for a mean blood pressure of 50 mmHg, and when it is not achieved, specific medicines (usually infusions) are given to try to stimulate the heart to pump harder. The following graph shows that [Baby B's] blood pressure was low in every measure apart from the first one (visualise the midpoint of the vertical bars as the mean blood pressure and note how many are below 50). Her heart was not able to function sufficiently well to maintain cellular function and hence the high lactate. An attempt was made to improve the cardiac function with the use of dobutamine given via the umbilical venous catheter. This was started at 5 hours of age initially at a dose of 5 micrograms (mcg)/kg/min, and then increased to 12.5 mcg/kg/hr at 6 hours, then to the usual maximum dose of 20 mcg/kg/min at 8 hours of age. The graph shows that these steps made no impact on the blood pressure. I would not have expected to see a change in blood pressure with the use of dobutamine, which is not a strong supporter of blood pressure even though it is known to improve cardiac output by improving the contractility. If it had been effective, then the measure of effectiveness would have been urine output (the nurses' handwritten notes say there was none) and reducing lactate concentration (which did not happen). I do not think that the dobutamine was effective in this baby's care, and it would have been reasonable to consider an alternative inotrope at an early stage. The doctors did order an alternative inotrope (dopamine), at 21 hours of age when death was imminent, but I think it was indicated much earlier at the same time as the dobutamine.



What is the standard of care? In the 20 hours of care given, there were many interventions required and judgements to be made. The majority of the decisions made here were within the expectations for such a baby in any NICU, but I think more attention to blood pressure support would have been better practice. The route of administration (misplaced UVC — see below) was an imperfection also.

Departure from standard of care?

1. The decision to rewarm was not an unreasonable judgement, even if not consistent with what most clinicians would do.

2. The failure to drive the blood pressure harder was a departure from standard practice in my opinion, although I note that [DHB] encephalopathy guidelines do not specify a target blood pressure, merely that it should be monitored. The national guidelines are also unhelpful 'Inotropes may be cautiously used to maintain blood pressure and renal blood flow'.

3. The decision to accept the misplaced UVC (see below) without attempt to find a better central route is a departure.

Viewed by peers? An extremely difficult case, starting with a high likelihood of success (prior to the birth) and quickly changing to a low likelihood of success, and thence to failure. We have all seen such cases who do not response, in spite of our best efforts.

Recommendations for improvement? Greater attention to blood pressure — it may not have worked, but it would have been better to have tried. The [DHB] guidelines would be more helpful if they specified why blood pressure is to be monitored, and under what circumstances it should be treated.

The midazolam overdose

This event occurred in the context of the baby entering a final stage of deterioration. [Dr D] charted (prescribed) the intended dose of 200 mcg/kg = 658 mcg = 0.65 ml of a 1 mg/ml solution. It was intended that the nurse would draw it up and administer it, but the nurses were preoccupied with other requirements for the baby. A written statement from [RN I] suggests that she was under some pressure to draw it up into a syringe, when she was aware that the written prescription had not been done at that time. [Dr D] told her the volume to draw up, and she did so, while he wrote the prescription. [RN I] reports that she declined to give the drug as it had not been double checked. [Dr D] took it upon himself to give the midazolam, and did so. The mistake was that the drug was drawn from a syringe of higher than expected concentration (15 mg/3 ml rather than 1mg/mg). As [Dr D] was the person who gave the drug, judging that it was reasonable to short-cut the usual checks, the responsibility lies with him.

If the usual process of nurse administration had been followed, I have confidence that the mistake would have been recognised, as the nursing process of double checking against the prescribed dose in mcg rather than ml would likely have identified the problem. On the other hand, I think that it would have taken up important minutes to go through those checks, a luxury that the clinicians did not think they had.

The error is understandable in context, but it was an error nonetheless. I feel confident that it had nothing to do with [Baby B's] death, which was inevitable in my view from a much earlier stage. However, we must all do all that we can to ensure avoidance of drug

error, and this is an example of how easily things can go wrong, even with the best of intentions.

What is the standard of care? Medications are charted by a prescriber, drawn up, double checked, and administered by a clinician (either doctor or nurse). In almost all situations in a NICU, the drugs are administered by nurses, but this is not universal, and particularly in the situation of extreme emergency, doctors do take on the role.

Departure from standard of care? Yes, the dose was not checked by two clinicians against the written instruction. The doctor judged that urgency was such that immediate administration was required. This is undoubtedly a high risk situation for error, but also a high risk situation for failure to administer medications in a timely manner. Within the context of these competing priorities, the error was made.

Viewed by peers? A mistake. Somewhat understandable in the circumstances, and in this instance not critical in terms of the outcome. But a mistake even so. Peers would likely view this mistake as a personal reminder to take special care in such situations, understanding that any of us are more vulnerable to error when there are competing priorities in an emergency.

Recommendations for improvement? None required — this is a situation with considerable precedent, and structures are in place to minimise its occurrence. However, minimise does not mean eliminate, and here is one case where it still occurred.

Any comment necessary in relation to standard of care provided by individual medical staff members.

[Dr H] and the misplaced UVC.

I want to discuss the matter of the umbilical venous catheter (UVC). This is a common procedure in a critically unwell neonate, and is used to create a simple vascular entry for administration of fluids and medications. When it is well placed, the tip lies at the entrance to the heart, where medications are quickly dispersed throughout the circulation.

Sadly, it is not always possible to place the tip in that central spot, and achieving the perfect position requires that the catheter passes through a fetal channel, the ductus venosis. Negotiating this channel is done blindly, and it is rather a matter of luck if it can be achieved. Nonetheless, it is achieved in about 70% of attempts in my experience. Which is to say that I expect all clinicians to have experienced failure with this technique.

If the catheter tip fails to negotiate the ductus venosis, then instead the tip lies in the large portal veins of the liver, and any medications delivered here are subject to passage through the liver, and metabolism (and potentially inactivation) by the liver. Hence, it is an unwelcome compromise to be forced to use the short UVC.

A better option is to find a different route of central venous access, and this can generally be achieved percutaneously (passing a long line into a visible vein in the arm, leg, or scalp and threading it through into a central position). This is a technically challenging procedure, somewhat time-consuming, and also fraught with failure risk. Even so, given that multiple infusions were required and the situation was extreme, I think it was reasonable to attempt to find an alternative route of access, having noted that the UVC was short.

The first Xray was taken at 4 hours and it is readily apparent that the UVC was short. [Dr H] (the senior doctor) noted this. There is no written discussion of alternative thoughts. It would have been reasonable to use it for glucose and fluid administration, but not for drugs unless there was no alternative. It was used to give an infusion of dobutamine (a drug to assist the pumping of the heart) from 5 hours of age and it is possible that the effectiveness of this medication was seriously compromised by the route of its administration, as it is broken down in the liver. The UVC was also used to give bicarbonate at age 5.7 and 9.8 hours, and again it is likely the effectiveness of this was reduced by its route of administration. In fact, there was no appreciable change to the blood gas results after administration of the bicarbonate, and I suspect this was due to the route used.

Even so, the continued use of the short UVC would be an acceptable compromise (ie better than nothing) if other attempts had been made to find an alternative route. I think it fell to the senior doctor to make this attempt at a better route, so I have to identify [Dr H] here as having failed to identify that an alternative central access route was required, and having failed to make efforts to find that alternative access.

I'm aware that [Dr H] did call for assistance from [Dr G] who came and offered verbal advice on the evening and in the morning.

I cannot in all honesty suggest that I believe it would have made a difference. I am hopeful that the administration of dobutamine via a better central route from 5.2 hours onwards might have offered assistance to a heart that was struggling to deliver a satisfactory output, but I think it is more likely that the heart was already in irretrievable trouble at that time. It would also have been the case that a successful attempt to obtain a different line would have taken some time (at least another hour), so the dobutamine could not have started until later anyway. Finally, I acknowledge that I have dealt with cases like this where I have been forced to use an imperfect short UVC, but only after extensive expert attempts to find an alternative.

What is the standard of care? The choice of UVC for central vascular access is the standard of care. If the UVC fails to achieve a central position, it is removed, except in situations where there are no other choices and the clinical situation is so extreme as to accept compromise.

Departure from standard of care? Yes, because no other attempt was made to find an alternative central access point.

Viewed by peers? Somewhat critical, I think, that no attempt was made to find an alternative central access point, and that the imperfect UVC was used to give dobutamine without having sought an alternative route.

Recommendations for improvement? That [the] NICU ensures that it has the human resources available to attempt central access from a peripheral vein. I do not know if this is within [Dr H's] skills, and I would not be critical of [Dr H] if it were not, given that [the] senior doctors are also general paediatricians by and large (and I observe that the general paediatricians that work in my hospital do not have these skills). Nor does [the] NICU have access to on-site paediatric surgeons to assist. Nonetheless, effective NICU care does require technical skills to be available on a 24 hours basis, and there should be a mechanism to ensure that these technical skills can be called upon whenever they are required. Anaesthetic specialists are often skilled in these vascular access problems, and might be an option to explore. There does need to be technical skills in Southern DHB, readily available when called upon at all times of the day, to ensure that the best efforts are made to achieve successful central venous access in the NICU. This is a fundamental requirement of being a NICU.

Any other matters.

I was disappointed to find that the case was not referred to the coroner immediately. This was an unexpected death, in terms of the pre-birth expectations, and there were questions to be asked about how the baby became so unwell as to have an unsurvivable condition. I cannot presume that answers to this question might have been easy, but they were certainly reasonable to put. The answers may have been assisted by a detailed examination of [Baby B's] body, but this option was not available because of the delayed referral. In addition, the incorrect dose of midazolam was something that should have lowered the threshold for immediate coronial review.

What is the standard of care? The rules for coronial referral are specified (see appendix 1) for health practitioners to use. It remains a judgement call in many cases as to whether a death meets any of the included criteria.

Departure from standard of care? Because this is a judgement call, there is no clear departure. However, note is made that the doctors would have had to have thought 'no' to the question 'Did the death occur while the person was under anaesthetic (or does it appear to have been the result of administration of an anaesthetic)'. Given that midazolam is sometimes uses as an anaesthetic, this question could just as easily have warranted a 'yes' response.

Viewed by peers? I understand that different clinicians have different thresholds for determining the propriety of a coronial referral. Given that this was an unexpected death after a normal pregnancy, and followed immediately after a drug error (even though I agree that the drug error did not cause the death) I think most peers would feel that referral was appropriate in this case.

Recommendations for improvement? I recommend that [the] NICU negotiates an understanding with the chief coroner that each and every death that occurs in the NICU is notified to the duty coroner, and the duty coroner makes the decision about taking jurisdiction or not. I accept that this might become tedious for clinicians and coroners both, but the number of cases will be small. I recommend that the director of [the] NICU maintains a record of the outcome of all such notifications (whether accepted or not), and that a further discussion with the chief coroner occurs at a time not less than 12 months later, actual time to be agreed with the chief coroner, with a view to relaxing this understanding."

Appendix 1: copy of national coroner's notification form for hospital deaths.

RECORD OF DEATH (and Notification of Death to the Coroner if required)

Hospital name:	**SURNAME:** **NHI No:** **OTHER NAMES:** **SEX: M / F** **AGE:** **DOB:** **ADDRESS:** (or attach patient label)

Date of death:		How long was the patient in hospital during this admission?		*Days / Hours / Weeks / Months*
Time of death: (24 hr clock)		How long was the patient in your care?		*Days / Hours / Weeks / Months*
Transferred from:		**Consultant:** (with whom you discussed this death)		

Did the patient undergo surgical or dental operation, or a medical procedure, or a procedure requiring anaesthesia, during this admission or prior to transfer?	**YES / NO**	Date and time of operation:	
If **YES** specify operation etc:			

Account of this admission (<50 words – please print clearly)

In your opinion, what was the cause of death?		*(circle one option)*	
Unknown cause, Suicide, Unnatural, etc	Was the death: without known cause / suicide / unnatural / violent / due to injury or was patient admitted due to injury? *(If YES, indicate which of the above applies)*	**YES**	**NO**
Medical/Dental treatment, Care, Pregnancy, Childbirth	Did the death occur during operation or procedure noted above?	**YES**	**NO**
	Does death appear to be result of that operation or procedure or other treatment?	**YES**	**NO**
	Did the death occur while the person was under anaesthetic (or does it appear to have been the result of administration of anaesthetic)?	**YES**	**NO**
	Was the death while giving birth, or a result of being pregnant or giving birth?	**YES**	**NO**
Drugs and Alcohol	Was admission and/or death due to drug or substance abuse?	**YES**	**NO**
	Was patient detained in an institution under Alcoholism and Drug Addiction legislation?	**YES**	**NO**
Official Custody or Care	Was patient admitted from custody of Police / Prison / Security Officer?	**YES**	**NO**
	Was patient a child or young person in official custody or care?	**YES**	**NO**
	Was patient subject to compulsory treatment order under Mental Health legislation?	**YES**	**NO**
	Was patient in compulsory care under Intellectual Disability legislation?	**YES**	**NO**
Certificate	Are you/any medical practitioner prepared to sign a doctor's certificate *(BDM50)*?	**YES**	**NO**
Police	If not signing doctor's certificate *(BDM50)*, have the Police been notified?	**YES**	**NO**

Any response in the grey boxes means the death MUST be reported to the Coroner.
(If you are in any doubt or have any reservations about this death please discuss the matter with the Coroner.)

Are you aware of:-

(a). Any person expressing concern as to cause of death or hospital treatment of the deceased?	**YES**	**NO**
(b). Any reason (such as ethnic origins, social attitudes or customs, or spiritual beliefs) the requirement of a post-mortem examination might cause distress to persons connected with the deceased?	**YES**	**NO**
(c). Any member of deceased's family expressing the wish that a post-mortem should be performed?	**YES**	**NO**

Contact Details: *Cellphone:* *Locator:* *Fax:*

Reporting Medical Officer *(Please use capitals)* Signature *(must be medical practitioner)* Date & Time *(24 hr clock)*

For Hospital use only			**For Coroner's Use only**		
Faxed to Coroner?	☐ **YES**	☐ **NO**	*Discussed with Doctor?*	☐ **YES**	☐ **NO**
Received back from Coroner?	☐ **YES**	☐ **NO**	*Name of Doctor:*	*Time:*	
Clinical team notified of response?	☐ **YES**	☐ **NO**	*Coroner's Jurisdiction?*	☐ **YES**	☐ **NO**
GP Notified?	☐ **YES**	☐ **NO**	*Post-mortem (subject to objection)?*	☐ **YES**	☐ **NO**
Family notified of death?	☐ **YES**	☐ **NO**	*Doctor's report in-lieu of PM?*	☐ **YES**	☐ **NO**
			Coroner:	Date:	Time:

The following further advice was received from Dr Weston:

> "I am asked to provide further expert advice on this case. I previously forwarded advice dated 16/7/2018, and I am now asked to comment on further documentation received by the HDC, and whether it causes me to add to or amend my previous conclusions.
>
> **The initial resuscitation process**
>
> The further documentation does not cause me to add to or amend my previous conclusions on the initial resuscitation process.
>
> Only two contributions are received on this matter — [Dr D] acknowledged my comments as appropriate. [Dr J] in his ACC response was more critical than I of the resuscitation, with a factual account that differed from mine — he said the paediatric team was not called until 8 minutes, whereas I said that [Dr D] was present at the birth. I have reviewed the clinical records, and I believe that [Dr J] is incorrect — It is clear that [Dr D] was present prior to the birth.
>
> Adequacy of policies and procedures: I note that I do not have a policy document on infant resuscitation so no comment is forthcoming.
>
> Adequacy of changes since the event: The only information provided is from [Dr D] who indicates that he has continued to participate in resuscitation scenarios and undertake education. This is as I expect.
>
> *Any other matters* — no.
>
> *What is the standard of care?* Babies who are born in a depressed condition require resuscitation according to the principles of airway, breathing, and circulation. [Dr D] undertook the resuscitation in a satisfactory manner, and called for assistance appropriately. It would have been better, in hindsight, if the intubation had been maintained without becoming dislodged, but this imperfection does not detract from what was a real-world situation managed satisfactorily in a real-world manner.
>
> *Departure from standard of care?* No.
>
> *Viewed by peers?* Imperfect, but still very good. All of us will have been at resuscitations where our tubes have fallen out. The important thing is maintaining adherence to the principles of resuscitation, which was done here.
>
> **The overall treatment of [Baby B's] condition**
>
> For the purposes of this response, I will focus on the treatment of the blood pressure. My first report traversed a number of aspects of [Baby B's] clinical condition, which were largely non-contentious. It is only the blood pressure management that drew criticism from me and was addressed by some respondents.
>
> I said that the failure to drive the blood pressure harder was a departure from standard practice, and warranted greater attention. I noted that the [DHB] guidelines would have

been more helpful if they specified why blood pressure was to be monitored and under what circumstances it should be treated.

[The NICU Clinical Director] noted my comment and [agreed to] amend the encephalopathy and the blood pressure guidelines accordingly. [Dr G] said that the written prescriptions specified a target of 40 mmHg. He suggested my target of 50 mmHg was debatable. He said that at the time of his involvement at 1500 hours, he did identify that dopamine should be started, but it did not have the desired effect. [Dr H] takes the view that my suggestion of 50 mmHg is unsupported, and that other guidelines in operation have the target as 40 mmHg.

I do not wish to debate here the best target — whether it was 40 or 50, the issue was still that [Baby B] was failing to meet the target, and that more effective blood pressure support was indicated. [Dr H] infers in a letter in response to [Dr J's] report that dopamine would have been useful in the morning of [Day 2], but instead he treated the blood pressure with volume expansion. In any case, there was not a satisfactory route available for dopamine administration. [Dr G] acknowledged he advised dopamine from 1500 hours, but he had an earlier opportunity to recommend this also, having been consulted several times earlier (1000 and 1230 hours).

Adequacy of policies and procedures: I noted in my previous report that the encephalopathy guideline (7/6/13) was silent on when and why to treat a low blood pressure, and that comment remains. I see that the blood pressure guideline (15/4/15) had more detail although it recommended a target of 30 mmHg — I consider this to be too low for a term baby, and at variance with the normal data also described in the same guideline where a normal mean blood pressure for a term baby is reported to be 60.

Adequacy of changes since the event: [The NICU Clinical Director has agreed to] attend to changing the guidelines and I am satisfied with this undertaking.

Any other matters — no.

Departure from standard of care? The failure to drive the blood pressure harder was a departure from standard practice in my opinion.

Viewed by peers? An extremely difficult case, starting with a high likelihood of success (prior to the birth) and quickly changing to a low likelihood of success, and thence to failure. We have all seen such cases who do not response, in spite of our best efforts.

Recommendations for improvement? Greater attention to blood pressure — it may not have worked, but it would have been better to have tried.

The midazolam overdose

In my first report I said that a mistake was made by [Dr D] in giving an incorrect dose of midazolam. I said the mistake was not critical in terms of the outcome. I described the

scenario as I understood where [Dr D] had requested the drug to be given, and had then undertaken to give it himself, due to the timeliness issues.

[Dr D] in his response has accepted fault, but then provided context which tends to diminish fault — he describes that nurse [RN I] had not told him that the dose had not been checked. He recalls that he always intended to give the medication himself as he detected that the nurses were busy with other tasks. [Dr D] has described changes to his practice, following the usual guidelines for ensuring the correct dose is prepared, and promising that there will be no repeat of this error in the future. This is scenario (a).

[RN I] has a different recollection. She says she drew up a dose of 0.65 ml on [Dr D's] verbal request. He wrote the prescription but required the medication immediately. He indicated that she should go and give it, which she declined to do as she had not checked it sufficiently (viewing the written order, accessing a second nurse), so [Dr D] took it from her hand and went to give it himself. She said that she did tell him specifically that she had not checked the medication. This is scenario (b).

Based on scenario (a), my original advice is unchanged. This is a regrettable mistake, understandable in the circumstances, but a mistake even so. Even so, I am unconvinced that any practitioner should ever be 100% certain that an error will not occur in the future.

Based on scenario (b), I am disappointed that [Dr D] has sought to diminish his responsibility by reconstructing the situation by inaccurate recollection. It remains a regrettable mistake, understandable in the circumstances, but this mistake is now compounded by a serious attempt to diminish accountability afterwards and I would be disappointed in the personal ethics of such a doctor.

Personally, I prefer [RN I's] account, but I have no means of being sure.

What is the standard of care? Medications are charted by a prescriber, drawn up, double checked, and administered by a clinician (either doctor or nurse). In almost all situations in a NICU, the drugs are administered by nurses, but this is not universal, and particularly in the situation of extreme emergency, doctors do take on the role.

Departure from standard of care? Yes, the dose was not checked by two clinicians against the written instruction. The doctor judged that urgency was such that immediate administration was required. This is undoubtedly a high risk situation for error, but also a high risk situation for failure to administer medications in a timely manner. Within the context of these competing priorities, the error was made.

Viewed by peers? A mistake. Somewhat understandable in the circumstances, and in this instance not critical in terms of the outcome. But a mistake even so. Peers would likely view this mistake in more serious terms if it transpires that the doctor sought to diminish accountability by fanciful recollection.

Recommendations for improvement? None required — this is a situation with considerable precedent, and structures are in place to minimise its occurrence. However, minimise does not mean eliminate, and here is one case where it still occurred.

The misplaced umbilical venous catheter

In my previous report, I was concerned that no attempt was made to find an alternative central access point, and that the imperfect UVC was used to give dobutamine without having sought an alternative route.

[Dr G] agreed this would have been optimal treatment, but doubted that it would have been successful. For himself, there was no opportunity when he became involved at 1515 hours, as there were higher priorities for him.

[Dr H] wrote that he identified the need for a PICC line on the first night, and came in early the next day for the express purpose of doing it. He then decided not to do so because 'we sometimes use low-lying UVS's temporarily in the NICU, it had seemed reasonable to manage with what we had overnight'.

I agree that the insertion of a PICC line in the context of an acidotic cooled baby would have been very challenging, and I'm not sure that I could have managed it either. However, I do feel sure that an attempt should have been made from the time that the line was used for dobutamine administration, because the effectiveness of the dobutamine would have been very doubtful via this route. Therefore an attempt should have been made, not at 0600 in the morning (if that's the time that [Dr H] arrived with the express intention of doing so), but at 2300 hours on the previous evening when the dobutamine was to be commenced.

I also wrote of uncertainty regarding the availability of line insertion skills in [the public hospital], but I am reassured by the responses of [the NICU Clinical Director, Dr G and Dr H] that those skills are readily available.

What is the standard of care? The choice of UVC for central vascular access is the standard of care. If the UVC fails to achieve a central position, it is removed, except in situations where there are no other choices and the clinical situation is so extreme as to accept compromise.

Departure from standard of care? Yes, because no other attempt was made to find an alternative central access point.

Viewed by peers? Somewhat critical, I think, that no attempt was made to find an alternative central access point, and that the imperfect UVC was used to give dobutamine without having sought an alternative route.

[Dr J's] ACC opinion on the resuscitation

[Dr J] was critical of the delay time to intubation (10 minutes), the lack of description of chest movement, the delay in seeking further assistance from NICU, the delay in calling the NICU team in the first place (8 minutes), the delay in obtaining vascular access (55 minutes).

My assessment of the resuscitation was quite different, both in fact and in interpretation. I have reviewed the original documentation. I continue to view the resuscitation phase of the treatment to be reasonable in the circumstances, and I disagree with [Dr J's] assessment.

[Dr J's] ACC opinion on the rewarming decision

[Dr J] was critical of the decision to maintain cooling in the presence of pulmonary hypertension and coagulopathy. He suggested that the decision to rewarm should have been taken at 0400 hrs, whereas it was actually made at 1000 hours. He draws a comment in the [DHB] guidelines for encephalopathy which specifies that babies should be excluded from cooling if they have an FiO2 > 80% or disturbed coagulation.

I read the guidelines as specifying these exclusions at the time of initiation of cooling (ie to not commence cooling), and not as indications for rewarming having already taken the decision to cool. The decision to abandon the cooling treatment is a major one, deserving considerable thought about the risks and benefits of each course of action. Taking that decision in the context of a ward round with the ability to think clearly about the pros and cons and consult with others is in my view a better approach."