Midwife, RM C

Bay of Plenty District Health Board

A Report by the

Deputy Health and Disability Commissioner

(Case 18HDC00384)

Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Contents

Executive summary

1. This report concerns the care provided by a midwife and Bay of Plenty District Health Board (BOPDHB) to a woman during her pregnancy, and the services provided to her daughter in the days following her birth. The Deputy Commissioner highlights the importance of appropriate systems for staff, and the need for comprehensive management plans in complex cases, co-operation among providers to ensure continuity of care, and consideration of a woman's care holistically. Importantly, this needed to encompass appropriate cultural support.

2. The woman's pregnancy was difficult — she lost weight and required multiple hospital admissions for severe morning sickness, and her baby's growth was restricted. However, the midwife did not record the woman's weight or fundal height at every antenatal assessment. The midwife continued to review the woman when secondary services were involved, but did not document when she formally handed over care to the Obstetrics team.

3. The woman's care by BOPDHB lacked a formal management plan and clear guidelines for staff on the management of severe morning sickness[1] and malnutrition. When the baby was born, she was recognised as an "at-risk" baby owing to her low birth weight. However, her blood glucose level was not monitored in a timely manner, and a paediatric review was not requested. In addition, she was administered a higher than recommended dose of phenobarbitone.

Findings

4. The Deputy Commissioner was critical of the midwife's lack of clarity about her role as Lead Maternity Carer (LMC) when the woman was receiving care by the Obstetrics team, and consequently that this was not conveyed to the woman and her whānau clearly and a plan documented when transfer was indicated.

5. The Deputy Commissioner found BOPDHB in breach of Right 4(1) of the Code. The Deputy Commissioner was critical that transfer from the LMC to the Obstetrics team was not clear, a formal management plan was not documented, the BOPDHB policy on hyperemesis and malnutrition was inadequate, BOPDHB's policy on paediatric review and blood glucose monitoring was not followed, and the dose of phenobarbitone administered to the baby was not consistent with the guidelines.

6. The Deputy Commissioner was also critical that opportunities were missed to provide cultural support to the woman and to seek specialist advice about a baby who was significantly small for gestational age.

Recommendations

7. The Deputy Commissioner recommended that the midwife provide an update on the Midwifery Council of New Zealand's Order Concerning Competence.

[1] Hyperemesis.

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8. The Deputy Commissioner recommended that BOPDHB provide an update on the implementation of the nausea and vomiting in pregnancy guidelines; consider developing a relevant guideline for when consultation with a multidisciplinary team and development of a formal plan is required for a significantly small for gestational age baby or a woman with severe symptoms; consider developing a relevant guideline for when a woman with a small for gestational age fetus requires referral to a fetal medical specialist or a larger centre for tertiary subspecialist opinion; consider the need to provide appropriate cultural support in complex cases; provide staff training on the use of the hypoglycaemia kit and the management of neonatal hypoglycaemia; review the guideline for administering phenobarbitone and ensure that all relevant staff are aware of the guideline; and provide a written apology to the woman.

Complaint and investigation

9. The Health and Disability Commissioner (HDC) received a complaint from Ms B about the services provided to Ms A by Registered Midwife (RM) C and BOPDHB. Ms A supports the complaint. The following issues were identified for investigation:

- *Whether RM C provided Ms A with an appropriate standard of care between Month2[2] and Month8 2017.*
- *Whether Bay of Plenty District Health Board provided Ms A with an appropriate standard of care between Month5 and Month8 2017.*
- *Whether Bay of Plenty District Health Board provided Baby A with an appropriate standard of care in Month8 2017.*

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

11. The parties directly involved in the investigation were:

Ms A	Consumer
Ms B	Complainant/aunt
RM C	Midwife and Lead Maternity Carer (LMC)
BOPDHB	Provider

12. Further information was received from:

Dr D	Obstetrician and gynaecologist
Dr F	Obstetrician and gynaecologist
Dr E	Paediatrician

[2] Relevant months are referred to as Months 1–11 to protect privacy.

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Also mentioned in this report:

RM F	Back-up midwife
Dr G	Obstetrician
Dr H	Obstetrician and gynaecologist
Dr I	Neonatologist
Dr J	Metabolic diseases specialist

13. Expert advice was obtained from RM Nicky Emerson (Appendix A), obstetrician and gynaecologist Dr Celia Devenish (Appendix B), obstetrician and gynaecologist Dr Meera Sood (Appendix C), and paediatrician Dr Philip Moore (Appendix D).

Information gathered during investigation

Background

14. In 2017, Ms A, aged in her twenties, became pregnant with her first child. Her estimated due date was 18 Month8.

15. On 23 Month1, Ms A engaged a self-employed registered midwife, RM C, as her Lead Maternity Carer.

16. This report concerns the care provided by RM C and BOPDHB to Ms A during her pregnancy, and the services provided to her daughter, Baby A, in the days following her birth.

Antenatal care

17. During her antenatal period, Ms A was seen by RM C on 11 occasions (four of these visits occurred while Ms A was a patient in hospital). RM C's back-up midwife, RM F, also saw Ms A when RM C was on leave.

18. During her pregnancy, Ms A had multiple admissions to the public hospital, where she was cared for by the Obstetrics team. She presented to the Emergency Department (ED) on four occasions, and on five occasions she had two- to three-day hospital admissions. Ms A had seven appointments with an obstetrician at the Antenatal Clinic, and attended on six occasions.

19. At the booking visit on 23 Month1, RM C recorded that Ms A's weight was 79.9kg and that she was 9+2 weeks' gestation.

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20. RM C saw Ms A on 27 Month2 (13+6 weeks' gestation) and noted that she was experiencing hyperemesis (severe morning sickness). RM C prescribed metoclopramide[3] for Ms A's symptoms.

21. On 27 Month3, RM C gave Ms A a form for an anatomy ultrasound scan, which Ms A attended on 9 Month4 (at 21 weeks' gestation). No abnormalities were noted.

22. On 24 Month4 (22+1 weeks' gestation) RM C reviewed Ms A and noted that she was still experiencing hyperemesis. RM C provided Ms A with a further prescription for metoclopramide.

First presentation to hospital 2–4 Month5

23. On 2 Month5 (23+3 weeks' gestation), RM C referred Ms A to the ED with a two-week history of vomiting and nausea. Ms A was admitted to the Maternity Unit under obstetrician and gynaecology consultant Dr D. On examination, Ms A had a dry white tongue owing to dehydration. She was treated with antibiotics for a UTI[4] and given intravenous (IV) fluids, including potassium[5] replacement and anti-emetics[6] for hyperemesis gravidarum.[7] A hospital midwife reviewed Ms A and noted that fetal movements were felt and the FHR was 145–160 beats per minute (bpm),[8] which was reassuring.

24. On 4 Month5, obstetrician Dr G reviewed Ms A and noted that she was taking fluids and food. Ms A reported that she was feeling well and wanted to go home. She was discharged with follow-up from RM C, and advised to return to the ED if her symptoms worsened.

25. On 6 Month5 (24 weeks' gestation), Ms A presented to ED again with vomiting. Dr D reviewed Ms A and noted that she had dry lips and a red tongue and was dehydrated. Ms A's bloods were taken and she was given IV fluids and potassium supplements. Dr G reviewed Ms A on 8 Month5 and recorded a plan for Ms A's intake and output to be recorded, and for her to receive electrolytes[9] and 3 litres of fluid per day. However, Ms A did not wish to remain in hospital and self-discharged. Ms A was prescribed an anti-emetic and potassium and advised to return to hospital early if vomiting continued.

Admission to hospital

26. On 20 Month5 (27+1 weeks' gestation), Ms A was seen by back-up LMC RM F while in hospital. RM F checked Ms A's blood pressure (100/60mmHg[10]) and the fetal heart rate,

[3] Medication for nausea and vomiting.
[4] Urinary tract infection.
[5] Prolonged diarrhoea or vomiting may cause low levels of potassium.
[6] Medication for vomiting and nausea.
[7] Severe nausea and vomiting during pregnancy.
[8] A normal FHR range is 120–160bpm.
[9] Substances in the blood that help to regulate the balance of body fluids.
[10] Normal blood pressure is around 120/80mmHg.

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and noted that during the assessment Ms A had felt her baby moving. The fundal height[11] and maternal weight were not checked during this visit. RM F noted that Ms A had been vomiting for the past 24 hours and was unable to tolerate anti-emetics, and consulted obstetrician and gynaecologist Dr H. Ms A was then admitted to the Maternity Unit for rehydration and anti-emetics, and her care was handed over to the hospital midwives.

27. During admission, Ms A's bloods were taken and showed that she was "slightly anaemic". Ms A was given IV fluids and prescribed iron tablets for anaemia. It was noted that she wanted to be discharged home. A hospital midwife consulted Dr H, who advised that if Ms A was well she could be discharged. Ms A was discharged home that evening.

28. On 22 Month5, Ms A did not attend an appointment with RM C. RM C noted that Ms A had self-discharged from the hospital, and made a referral to a social worker.

29. RM C told HDC:

> "When I got back from being on leave I was shocked to find that [Ms A] had been quite significantly unwell. I was made aware by [my back-up LMC], upon my return from leave, that she had [Ms A] admitted to hospital as she had lost a lot of weight, had a swollen tongue, was anaemic and malnourished. I had never cared for a pregnant woman with all these unusual conditions at the same time and I was confident the Obstetrician/hospital team (Secondary care) were caring for [Ms A] to the best of their abilities."

Admission 27–30 Month5

30. On 27 Month5 (28 +1 weeks' gestation) Ms A presented to ED with vomiting, chest pain, shortness of breath, coughing, and lower abdominal pain. An ECG[12] and chest X-ray were taken, and Ms A was admitted to Acute Care. A general physician reviewed Ms A and advised treatment for hyperemesis gravidarum and transferred her care to obstetrician Dr D.

31. Dr D reviewed Ms A and ordered an ultrasound of her bladder. It was noted that Ms A's abdominal pain was being caused by retained urine. Ms A was catheterised and placed on a restricted fluid balance, and the abdominal pain resolved. Dr D recorded her plan to give Ms A anti-emetics, thiamine,[13] clexane,[14] and antibiotics, and to monitor her intake and output.

32. During this admission, Ms A was reviewed by a general surgeon. An ultrasound scan showed gallstones in Ms A's gallbladder, and blood tests indicated that her haemoglobin[15] was down from 112 to 90. Ms A was advised to eat a low-fat diet and referred as an

[11] Measurement of the distance from the mother's pubic bone (symphysis pubis) to the top of the womb. The measurement is then applied to the gestation and compared with normal growth on a customised growth chart.
[12] An electrocardiogram records the electrical signal from the heart to check for heart conditions.
[13] Vitamin B1.
[14] An anticoagulant or blood thinner to treat and prevent blood clots.
[15] A protein in the blood necessary for the transport of oxygen to the tissues.

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outpatient to General Surgery for management of her gallstones following the birth of her baby.

33. Ms A was also seen by Māori Health Services and a social worker. The family raised concerns about Ms A's nutrition, and requested a review by a dietician. It was recorded that Ms A had a supportive whānau, and no further need for social worker involvement was identified.

34. On 30 Month5, Dr D reviewed Ms A and noted that her observations were stable and she appeared well. Ms A was discharged home with a prescription for thiamine and potassium, a referral to a dietician, and a follow-up appointment with the Outpatient Antenatal Clinic on 14 Month6.

35. BOPDHB stated that Dr D had overall responsibility for Ms A's secondary care and management.

Admission to hospital 2–4 Month6

36. On 2 Month6 (29 weeks' gestation), RM C referred Ms A to the Maternity Unit because of swelling in her legs. Ms A was reviewed by Dr D and admitted to hospital. It was noted that Ms A had pitting pedal oedema[16] and a headache. A vaginal swab was reported as positive for Group B Streptococcus[17] (GBS). Bloods were taken to test for pre-eclampsia,[18] and Ms A was commenced on iron tablets, clexane, and metronidazole for the GBS infection.

37. On 4 Month6 (29 +1 weeks' gestation) a CTG[19] was noted as reassuring, and Ms A's weight was recorded as 73.75kg, down from 79.9kg at the booking visit. Ms A was discharged home with the discharge plan from 30 Month5, including the follow-up appointment with the Outpatient Antenatal Clinic and referral to a dietician, and RM C was advised of the plan.

38. On 7 Month6 (29+4 weeks' gestation), Ms A was seen by a dietician at the Antenatal Clinic. Ms A's weight was 73kg, down from 73.75kg five days previously. Ms A was given advice about a low-fat diet and healthy eating in pregnancy.

39. Later that day, RM C met Ms A at the hospital, as Ms A was complaining of bleeding. A speculum examination showed no abnormalities, and RM C recorded that Ms A had haematuria.[20] RM C consulted with Dr H, and the recommended plan was to send an MSU[21] to the laboratory and to observe Ms A. RM C recorded Ms A's blood pressure (110/70mmHg), fetal movements, and the fetal heart rate. RM C noted that Ms A had an appointment at the Antenatal Clinic the following week.

[16] Skin swollen from excess fluid remains indented when pressed.
[17] A bacteria commonly found in the lower intestine and genitourinary tract. GBS can cause serious infections in newborn babies.
[18] A complication in pregnancy characterised by high blood pressure.
[19] Cardiotocograph — electronic monitoring of the fetus.
[20] Blood in the urine.
[21] A midstream urine test.

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40. A dietician reviewed Ms A on 7 Month6, and on 10 Month6 sent a letter to RM C asking her to "please monitor weight and low fat diet adherence" and to prescribe iodine for Ms A. However, RM C told HDC that she did not receive a letter from the dietician requesting that she weigh Ms A. RM C said that had she seen the dietician's letter she would have liaised with the hospital Obstetrics team regarding a plan to monitor Ms A's weight.

Appointment at Antenatal Clinic on 14 Month6

41. On 14 Month6, Ms A attended an outpatient Antenatal Clinic appointment and was seen by obstetrician Dr G. Ms A's blood pressure was recorded as 102/71mmHg, and a urine test was positive for bacteria. Arrangements were made for Ms A to attend the Maternity Unit daily for five days to receive an antibiotic (ertapenem) via an intravenous infusion. Ms A's fundal height was recorded as 28cm (normal). An informal ultrasound showed that the baby was active, and a normal heart rate was recorded. Dr G documented her plan for ultrasound scans at 31 and 35 weeks' gestation to assess growth, and follow-up Antenatal Clinic appointments at 32 and 36 weeks' gestation. A request was made to Ms A's GP to monitor her folate and vitamin B12 levels. RM C was advised of Dr G's plan.

42. On 25 Month6, at 32+1 weeks' gestation, an ultrasound scan indicated that although the liquor volume was within normal limits and the biophysical profile[22] normal, the estimated weight of the baby was 1411grams, which was under the 3rd centile on a population growth chart. The scan report recommended that close clinical surveillance be undertaken and a scan repeated in two to three weeks' time. A copy of the scan was sent to RM C and Dr G.

43. On 27 Month6, at 32+3 weeks' gestation, RM C saw Ms A and recorded her fundal height as 27cm and her weight as 72kg, down from 73kg on 7 Month6. RM C documented that the ultrasound scan had shown that the baby was not growing, and noted that Ms A had "lost a lot of weight recently with being sick".

44. On 28 Month6, at 32+4 weeks' gestation, Dr D and Dr G discussed the poor growth of Ms A's baby and documented a plan to monitor the baby's growth closely with:

- Ultrasound scan of liquor and Doppler[23] in the coming week
- Growth scans two weekly
- CTG, BP, urine dipstick tests weekly.

45. RM C was informed of the plan and asked to discuss it with Ms A and arrange a date for a CTG and a blood pressure check.

46. BOPDHB stated that owing to concerns about the growth of Ms A's baby, Ms A was considered high risk, and as her pregnancy progressed she was monitored more closely with regular antenatal checks, ultrasounds, and CTG monitoring. The DHB said that Ms A's

[22] Measurement of the health of a fetus during pregnancy.
[23] A Doppler is a hand-held ultrasound transducer used to detect the fetal heart rate.

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malnourished state was of considerable concern to all who cared for her, and every effort was made to encourage Ms A to eat a high-protein, low-fat diet.

47. RM C stated:

> "I was aware that [Ms A] had lost a significant amount of weight and I was concerned. As she was being seen in an obstetric antenatal clinic, I was aware they would continue to monitor her weight. For this reason and the reason of using different scales, I did not see the value in weighing her as this was being monitored via secondary care team."

48. In relation to fundal height, RM C stated:

> "I routinely measure fundal-symphysis pubis height when providing standard antenatal care [f]or women from 24–26 wks. In this case I did not measure [Ms A's] fundal height at every appointment. I did not see [Ms A] between 22 and 29 weeks. [RM F] was my locum midwife at that time. [RM F] saw her many times on the ward, due to acute admissions for hyperemesis. By the time I returned from leave she was booked for ante-natal clinic (ANC) follow ups with the obstetrician. I measured her fundal height at the first visit after my annual leave as '27'[cm] at 32.3[24] weeks gestation."

49. RM C said that from 30 weeks' gestation Ms A was having regular Antenatal Clinic reviews of her weight and fetal growth, and continued to have frequent acute Maternity Unit admissions with obstetric palpations and reviews of fetal growth. Her 32-week scan showed restricted growth, and this was managed by the Obstetrics team with frequent serial growth scans and CTGs, twice a week. RM C advised that in view of this level of surveillance, at this stage she did not see that "formal fundal measurements would change any plan to her care".

Month7 care

50. On 3 Month7 (33+3 weeks' gestation), RM C recorded that she happened to be in the hospital when Ms A was there to see a specialist. RM C noted: "[B]ig concerns that baby is on the 3%. USS very soon, CTGs 2 x a week & another obstetric appointment in a week."

51. On 7 Month7 (34 weeks' gestation) Ms A attended the Antenatal Clinic for an ultrasound scan and Doppler examination, and was seen by a locum obstetrician and gynaecologist. It was noted that the amniotic fluid and Doppler were reassuring, but that Ms A's baby was "constitutionally and unusually small". The locum recorded that the CTG taken one week ago was reassuring, and that she advised Ms A to return if she had any concerns.

52. Ms A also had an appointment with a dietician that same day, but did not attend.

[24] A normal fundal height at 32 weeks' gestation is between 30cm and 34cm.

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53. On 9 Month7 (34+2 weeks' gestation) the Obstetrics team plotted Ms A's fundal height on the GROW chart as 30cm, and the EFW[25] as 1870g. RM C saw Ms A that day and checked her blood pressure and urine and listened to the fetal heart. RM C recorded that the Obstetrics team was "keeping a close eye on baby with regular CTGs and appointments", and that the "baby had grown a small amount".

54. On 10 Month7 (34+3 weeks' gestation), Dr G reviewed Ms A at the Antenatal Clinic and noted that the 7 Month7 growth scan was "an obvious concern", although the amniotic fluid and Dopplers remained normal. It was recorded that Ms A would be monitored closely to reduce the chance of complications for her baby or a still birth, and an induction at 38 weeks' gestation was planned. Dr G recorded a plan for weekly ultrasound scans and twice-weekly CTGs.

55. On 23 Month7, at 36+2 weeks' gestation, an ultrasound scan report noted that the EFW was 2354g, now on the 8th percentile. A copy of the report was sent to Dr G and RM C.

Antenatal Clinic review

56. On 24 Month7, at 36+3 weeks' gestation, Ms A was seen by obstetrician Dr F at the Antenatal Clinic. Ms A complained of heartburn and regurgitation, for which she was prescribed omeprazole. Ms A reported that she had had no vomiting or nausea and felt better. Dr F noted that although growth had improved, Ms A's baby remained small for gestational age. Dr F documented her plan for blood tests and a scan in two weeks' time, and that if the scan showed normal growth, an induction at 39 weeks' gestation was recommended.

57. Dr F told HDC that this was her first consultation with Ms A. Dr F stated that Ms A's baby was growing, and the Doppler investigations were normal, and according to the relevant guideline, there was no need for an induction prior to 38–39 weeks' gestation. Dr F said that it was difficult for Ms A to take her iron supplements because of her hyperemesis. Dr F stated that in Month6 Ms A had macrocytic anaemia[26] and was seen by Dr G, who requested that the GP monitor Ms A's folate and B12 levels. Dr F said that in retrospect, she could not locate any results on CHIP,[27] so bloods were not taken. She said that had bloods been taken, then perhaps a diagnosis of megaloblastic anaemia[28] would have been made two weeks earlier, but she doubts that this would have affected the outcome.

Admission to hospital 30 Month7 to 1 Month8

58. On 30 Month7 (37+2 weeks' gestation), Ms A was referred by her GP to the Obstetrics team, owing to concerns about her electrolytes, B12, and folate results. On admission to ED it was noted that Ms A presented with a swollen and painful tongue, lethargy, blurred vision, and ongoing pain from gallstones, and that although her hyperemesis had settled for two weeks, she was eating only a little. It was documented that Ms A stated that she

[25] Estimated fetal weight.
[26] A type of anaemia that causes large blood cells that have low haemoglobin.
[27] Clinical Health Information Portal.
[28] A type of anaemia characterised by very large red blood cells and a decrease in the number of those cells.

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was taking no medications. Ms A was admitted to the Maternity Unit and given two units of blood, oral electrolytes, and multivitamins. A CTG was reassuring.

59. On 31 Month7, Dr D reviewed Ms A and documented a diagnosis of macrocytic anaemia secondary to malnutrition. A further two units of blood were given, following which Ms A's haemoglobin was 102 (up from 90[29] on 27 Month5) and her potassium level had returned to normal. Dr D consulted an on-call General Medicine consultant, who advised that Ms A's anaemia was likely secondary to malnutrition, and to replace any deficiencies until delivery. It was suggested that further investigation into the potential causes of anaemia would be warranted if postnatal anaemia remained an issue.

60. Ms A was seen by a social worker, who told Ms A that she would advise the dietician to clarify any advice around her diet.

61. On 31 Month7 (at 37+3 weeks' gestation) RM C saw Ms A while she was a patient on the ward. RM C noted that the Obstetrics team was monitoring Ms A, and that more scans and appointments were planned. On the following day, RM C saw Ms A on the ward again, and observed that she had a poor appetite and was struggling to eat anything. RM C noted the plan for an induction at 38 or 39 weeks' gestation.

62. On 1 Month8 (37+4 weeks' gestation), Ms A was discharged home with a prescription for multivitamins, folic acid,[30] and ferrous sulphate tablets,[31] and a follow-up appointment four days later for an ultrasound and a blood test. Ms A was advised to contact RM C or seek medical attention if she had any concerns.

63. Dr F told HDC that on this admission, concerns were raised about Ms A's poor eating habits, and that she may have been depressed. Dr F said that Ms A denied any concerns in relation to depression or poor eating habits. Dr F stated that it was her impression that Ms A understood that she needed to improve her diet to recover from her symptoms of anaemia and severe malnutrition. Dr F said that Ms A assured her that on discharge she would take the prescribed medication.

Antenatal Clinic

64. On 5 Month8, at 38+1 weeks' gestation, an ultrasound scan report noted that interval growth was evident and fetal weight was on the 10th centile, with all the growth parameters below the 20th centile. Ms A was then seen by a doctor at the Maternity Clinic. The doctor recorded:

> "[Dr F] — happy with current management and improvement of bloods and CTG. Needs to be induced before 39 w [weeks] →team aware, she has been booked for Monday. Plan: Home today, with oral potassium, induction on Monday. [39 weeks' gestation]."

[29] A normal blood haemoglobin level for a woman ranges from 115 to 160g/l.
[30] For the treatment of anaemia.
[31] For the treatment of iron deficiency.

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65. Ms A had an Antenatal Clinic appointment on 8 Month8, but did not attend. No further appointment was made, and RM C was informed.

Delivery

66. On 11 Month8 (at 39 weeks' gestation), Ms A's labour was induced as planned, and she proceeded to a normal vaginal delivery at 3.22am on 12 Month8. Baby A was born in good condition with Apgars[32] of 9 and 10, but weighing 2505g.

Postnatal care

Month8

67. Initially, Baby A progressed normally. Her initial observations were normal and she appeared to be feeding well. At 5.30am (2 hours and 8 minutes after birth), Baby A's blood glucose level (BGL) was taken because of her low birth weight, and the result was normal (3.99mmol/L).[33]

68. At 8.30am (5 hours and 8 minutes after birth), Baby A's second BGL was 1.7mmol/L, which is low. A hospital midwife gave Baby A 3ml of dextrose gel[34] and 10ml of formula milk to increase her BGL.

69. At 9.15am (5 hours and 53 minutes after birth), a third BGL reading was 5.6mmol/L, and Baby A's observations were normal. A hospital midwife recorded her plan for three-hourly feeds and BGL readings.

70. At 11.20am (7 hours and 58 minutes after birth), a fourth BGL reading was taken, and this was 3.6mmol/L.

71. The fifth BGL reading was taken at 3.35pm (12 hours and 13 minutes after birth), and this was 4.3mmol/L. No further BGL readings were taken in response to the low BGL at 8.30am that day.

72. On 13 Month8, a lactation consultant visited to support Ms A to establish breastfeeding. It was noted that Baby A was feeding well over the following days. At 11.40am on 14 Month8, a blood sample was taken from Baby A for a Guthrie card screening test[35] and posted to the National Testing Centre.

73. On the evening of 15 Month8, the clinical notes record that Baby A was unsettled at times but was feeding well and producing wet and dirty nappies.

[32] Scoring system that describes the baby's condition immediately following birth, based on the baby's colour, heart rate, reflex irritability, muscle tone, and respiration.
[33] When babies are only one to two hours old, the normal level is just under 2mmol/L, but it should rise to adult levels (over 3mmol/L) within two to three days.
[34] To increase blood glucose levels.
[35] A screening test for metabolic disorders.

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16 Month8

74. At 6am on 16 Month8 (day four postnatal) Baby A was noted to be floppy, difficult to rouse, and cold. At 6.25am, Baby A was transferred to SCBU.[36]

75. On arrival at SCBU, Baby A was hypothermic, her blood sugar was low, and her heart rate was 70bpm, which is slow. Baby A was placed on the Giraffe warmer[37] and given 1.25ml of 40% dextrose gel to increase her BGLs, in accordance with the protocol.[38] The on-call paediatrician, Dr E, was called immediately to attend.

76. At 6.56am, Dr E attended the hospital and reviewed Baby A. Dr E told HDC that on examination, Baby A was unresponsive and floppy. He gave her a bolus of 10ml of 10% glucose to treat severe hypoglycaemia.[39] Dr E told HDC: "I did not take blood tests prior to giving the glucose as it was clear [Baby A] was seriously ill and any delay could have meant she would have passed away." Baby A's BGL was taken, and this had increased to 6.1mmol/L.

77. At 7.10am, Baby A was administered 2ml of 10% dextrose infusion, after which her BGL was 6.7mmol/L and her vital signs were normal. An IV infusion of 5% dextrose and 0.9% saline was commenced.

78. At 7.24am, Dr E recorded that his working diagnosis was severe hypoglycaemia related to known growth restriction. The plan was to continue IV fluids, place a nasogastric tube, and observe Baby A carefully.

79. At about 7.45am, the initial blood results showed profound hypoglycaemia. At 8.16am, additional blood results showed a mild compensated metabolic acidosis.[40]

80. At 9am, Baby A's observations and temperature were normal, and her BGL was 6.8mmol/L.

81. Baby A's observations at 11am and 1pm were normal, but at 3.10pm she was noted to be lethargic, and her BGL had fallen to 2.8mmol/L.

82. At 5.00pm, Baby A's BGL was 2.9mmol/L, and ongoing lethargy had been noted since mid-afternoon. At 5.45pm, Dr E was called to attend.

83. Dr E examined Baby A at 6.10pm and noted that her blood glucose levels were borderline, her vital signs were normal, and she was sluggish, lethargic, and not responding to stimulation. Fluid therapy for dehydration was commenced.

[36] Specialist Care Baby Unit.
[37] An infant warmer used in neonatal intensive care units.
[38] The ADHB Guidelines for the Management of Hypoglycemia — these guidelines were available to BOPDHB staff.
[39] Low blood sugar.
[40] Occurs when the body produces too much acid.

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84. Dr E consulted the on-call neonatologist, Dr I, at another district health board (DHB2). Dr E told HDC that he had a detailed discussion with Dr I. Dr E documented: "D/W [Dr I], Markedly hypoglycaemic, Encephalopathic,[41] watch for seizures, repeat hypoglycaemic events." Dr E told HDC that he was not advised to perform any further tests on Baby A or transfer her care to DHB2. He said that the plan was to monitor Baby A for seizures and further low blood glucose levels.

85. At 7.26pm, Baby A had rhythmic hiccoughs, sighing respirations, an extended neck, jaw trembling, and right arm movements. Dr E told HDC that he believed these movements were seizure related. He prescribed an initial dose of 40mg/kg of phenobarbitone[42] intravenously for seizures.

86. Dr E stated:

> "The dose for neonatal seizures using phenobarbitone is 20 to 40 milligrams per kilogram. The dose chosen on this occasion reflected the severity of the situation in a rapidly deteriorating unresponsive infant. The phenobarbitone was given by slow IV push. There was no sudden change in her breathing although the seizures were controlled. We anticipated further clinical deterioration and with the development of blood stained nasal secretions 15 minutes later we gave respiratory support."

87. At 7.40pm, Baby A had blood-stained nasal secretions, was pale, and collapsed. She was intubated and ventilated, and a resuscitation call was made. A second paediatrician and an anaesthetist attended promptly to assist.

88. At 7.50pm, a nurse documented, "had phenybarb", and that Baby A's BGL was 1.2mmol/L.

89. At 7.55pm, Baby A was intubated and given a further 20ml bolus of 10% dextrose owing to low blood sugars. At 7.59pm, her BGL had increased to 14.9mmol/L.

90. At 8.40pm, Baby A's observations were taken again and her BGL was 9.0mmol/L.

91. At 8.59pm, Baby A's blood results were consistent with severe metabolic acidosis. Dr E consulted Dr I again, and it was agreed to transfer Baby A to DHB2 urgently. At 10.10pm, the DHB2 Neonatal Intensive Care retrieval team arrived, and Baby A was transferred to DHB2.

92. Dr E told HDC that following Baby A's deterioration at approximately 6.00pm, he had contact with Dr I on at least three occasions, but these discussions were not documented. Dr E said that the ongoing monitoring of Baby A and his discussions with Dr I led him to consider that Baby A did not need to be transferred to another hospital earlier.

[41] Hypoglycaemic encephalopathy is a brain injury that results from prolonged or severe hypoglycaemia.
[42] Phenobarbitone is a drug that depresses the central nervous system.

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16–17 Month8 — DHB2

93. Baby A was admitted to DHB2 Neonatal Intensive Care Unit (NICU) at appropriately 11.15pm. Blood and urine samples were taken to investigate a metabolic condition.

94. At 6am on 17 Month8, the test results showed extremely high serum ammonia levels, and indicated a likely urea cycle disorder.[43] Baby A's care was discussed with Dr J, a metabolic diseases specialist. Dr J noted profound hypoglycaemia, prolonged extreme hyperammonaemia, severe acidosis, and the need for inotropic support of blood pressure.

95. A whānau meeting was held on 17 Month8, and a decision was made to withdraw intensive care. Sadly, Baby A passed away at 6.10pm.

Subsequent diagnosis

96. On 4 Month9, a meeting was held with Dr E, Ms A, and Ms A's whānau. Dr E expressed his condolences to Ms A and her whānau for their loss.

97. In Month11, Dr J explained to Ms A that the cause of the disease was an extremely rare series of events that commenced with severe maternal riboflavin deficiency[44] secondary to malnutrition and a likely underlying maternal riboflavin-transporter genetic enzyme defect. The maternal enzyme defect also reduces the passage of riboflavin from mother to fetus and leads to severe riboflavin deficiency in the newborn. This deficiency results in a transient riboflavin-responsive fatty acid oxidation disorder in the neonate which, if severe (as it was in this case), is associated with neonatal cardiomyopathy,[45] with hypoketotic hypoglycemia[46] and liver dysfunction developing within the first few days or weeks of life, which can be fatal.

Further comment — RM C

98. RM C told HDC that Ms A's multiple admissions to the public hospital meant that she was referred to secondary care, and there was "no requirement for a formal letter". RM C said that the referral to secondary care occurred while she was on leave. She stated: "My understanding was that she [Ms A] was a full secondary care obstetric patient, with me providing primary midwifery aspects of her care." RM C said that it was standard to have a follow-up appointment in the obstetric clinic when a woman has frequent admissions to hospital.

99. In relation to scans ordered by secondary care, RM C stated: "I am actually only responsible for primary care scans, such as nuchal and anatomy but try to keep up to date with secondary care scans as well to provide quality care." RM C said that she received copies of the secondary care scans on 25 Month6 and 5 Month8, but it can take up to 24 hours until the results of the scans can be accessed on her electronic DHB maternity

[43] A urea cycle disorder is an inherited metabolic disorder that makes it difficult for the body to break down proteins.
[44] A vitamin B2 deficiency.
[45] A rare heart condition.
[46] A condition that presents with symptoms of low blood sugar and low blood levels of ketones.

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record. RM C further stated that she does not receive copies of secondary care scans performed at the DHB, as this is not accessible via HealthLink.

100. RM C said that although it is unusual for a midwife to attend obstetric appointments, it is her usual practice to attend at least one appointment to support the woman. RM C stated that she attended an obstetric appointment with Ms A, and expressed regret that she was not able to attend any further appointments.

101. With regard to Ms A's blood transfusion organised by the hospital Obstetrics team, RM C stated: "I was not aware of bloods ordered by the secondary care team as I don't get a copy of these."

102. RM C told HDC that she has made a number of changes to her practice (outlined below), and acknowledged that the changes may have helped Ms A to feel better cared for by her, as her midwife. RM C apologised for this, and said that she hopes that this investigation will bring Ms A some closure to a very challenging pregnancy and devastating outcome for her precious pēpi.

Midwifery Council of New Zealand (MCNZ)

103. In October 2019, following notification of this investigation, MCNZ commenced a competence review in respect of RM C. MCNZ considered RM C's competence review report and issued an Order Concerning Competence[47] to RM C, which included:

- A period of supervised practice
- Monthly case reviews for a minimum of 12 months
- A review of current evidence on fetal monitoring
- Documentation
- A reflection on changes made to practice
- Training on working with women in Aotearoa.

104. In May 2020, MCNZ told HDC that the RM C is engaging with the Order.

Further comment — Dr D

105. Dr D said that she treated Ms A on multiple occasions, and this included arranging her admission to hospital for treatment, and providing the treatment required. Dr D believes that Ms A's condition was managed appropriately and taken seriously.

106. Dr D stated that Ms A was cared for by a team of practitioners that included doctors from Internal Medicine, Emergency Medicine, Surgery, and the on-site Obstetrics and Gynaecology specialists (Dr D, Dr G, Dr F, and Dr H). Dr D said that a team of Obstetrics

[47] MCNZ issues an Order Concerning Competence when a midwife has failed to meet the required standard of competence.

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specialists and a midwife had daily discussions about Ms A's management and made decisions about her care, prior to reviewing Ms A.

107. Regarding the management of Ms A's hyperemesis, Dr D said that referrals were made to teams[48] that would not usually be involved in the management of hyperemesis.

108. In relation to discharge, Dr D said that Ms A was discharged only when the team was satisfied that she had improved enough to go home, or when she discharged against medical advice.

Further comment — Dr F

109. Dr F believes that Ms A's care was taken seriously and her condition was considered thoroughly, but that unfortunately Ms A found it difficult to follow the advice given. Dr F stated:

> "I deeply regret the loss of [Baby A] but in retrospect, I cannot see that the care given by midwives and obstetricians at the public hospital was inappropriate in any way or that another course of action could have improved the tragic outcome."

Further comment — BOPDHB

110. BOPDHB stated that it does not know whether Ms A understood the importance of her diet or of taking medications as prescribed, and that at times Ms A told the medical staff that she was not taking any medications as prescribed. BOPDHB said that there were contact issues with Ms A, and she would not stay in the hospital for long, she would discharge against medical advice, and she would not attend appointments.

111. BOPDHB acknowledged that the involvement of a Māori social worker would have been ideal. However, it said that this intervention could not be assured, and Ms A stated on her hospital admission forms that she had no cultural or spiritual needs relevant to her care.

112. BOPDHB stated that following each admission to hospital, RM C and her back-up midwives were advised of any changes to Ms A's treatment and plans. In addition, BOPDHB said that copies of clinic letters and hospital discharge summaries were sent to Ms A's GP.

113. BOPDHB told HDC that it accepts that continuity of care was not ideal, and stated:

> "We acknowledge a high use of locums is required in [the public hospital], however this is not a result of system problems in [the DHB], it relates to recruitment challenges of specialists to rural areas and smaller DHB's. We are continually monitoring and reviewing our strategies to address these challenges."

114. In relation to each of Ms A's presentations to hospital, BOPDHB stated that the seriousness of her condition was responded to appropriately and comprehensively, including the diagnosis of gallstones. Regarding an SGA[49] fetus during pregnancy, BOPDHB said that

[48] Internal Medicine and physicians.
[49] Small for gestational age.

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while diagnostic options could have been offered, this was unlikely to diagnose such a rare congenital condition.[50]

115. BOPDHB stated:

> "While we respect all patients have the right of choice and self-determination, we are sorry that the outcome was so poor for [Ms A]. All the staff involved had come to know [Ms A] very well during her pregnancy due to her frequent admissions, and were also personally affected by the tragedy of [Baby A's] sudden death at 5 days old."

Further comment — Dr E

116. Dr E told HDC that following these events he discussed the use of phenobarbitone and the dose administered in this case with Dr I. Dr E said that Dr I advised him that the choice of phenobarbitone, and the dosage and its administration, were correct. Dr E stated that Dr I advised that a dosage of phenobarbitone is up to 40mg/kg, but usually the initial dose is 20mg/kg, and that he would not expect a 40mg/kg dose to result in a collapse, except in a child who is dying.

Changes to practice

RM C

117. RM C told HDC that she has reflected on the issues raised by this complaint and has taken the complaint very seriously. RM C said that she has made the following changes to her practice.

- She documents palpation and maternal weight even when serial growth scans are undertaken and obstetric care is involved.
- She attended an NZCOM workshop on documentation, and subsequently undertook self and peer auditing of her documentation (with confidentiality of the women maintained).
- She engaged with a rural mentor, and has increased the frequency of her Midwifery Standard Reviews.
- She attended further education on the Growth Assessment Protocol, record-keeping, and the RANZCOG FSEP Full Program.

Bay of Plenty DHB

118. BOPDHB told HDC that since these events it has implemented a protocol to guide staff in their care of women who present with nausea and vomiting in pregnancy. The Nausea and Vomiting (NVP) in Pregnancy Care Bundle has been implemented in both emergency departments.

Dr E

119. Dr E told HDC that since these events, the SCBU has implemented a kit for severe, delayed hypoglycaemia cases or when hyperammonaemia metabolic conditions are suspected.

[50] Discussed further at paragraph 152 below.

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This includes all the appropriate blood tubes, volumes of blood required, and the processes and guidelines required to investigate such a case. Dr E said that the nursing and medical staff are aware of this kit within the SCBU, and of when it should be accessed.

Bay of Plenty DHB policies

120. BOPDHB told HDC that the following policies and guidelines were accessible by staff at the public hospital at the time of events.

- Hyperemesis: www.uptodate.com/contents/treatment-and-outcome-of-nausea-and-vomiting-of-pregnancy
- IURG/Small for gestation (SGA): www.uptodate.com/contents/fetal-growth-restriction-evaluation-and-managment
- Auckland DHB Guidelines for the Management of Hypoglycaemia (2018):

  "Diagnosis

  1. Monitor at-risk infants

  All infants <10th centile or >95th centile

  2. When to monitor

  Measure blood glucose at 1–2 hours of age, 4 hours, and then 4 hourly, preferably before feeds.

  3. How long to monitor

  If feeding well — At least 12 hours

  Any recorded hypoglycaemia — At least 12 hours after last low level

  Treatment

  Delivery Suite, Post Natal Ward or PACU

  1. All at risk infants (see above) should receive milk feedings (either breastfeed or formula — maternal preference) or intravenous dextrose as soon as feasible, and always within the first 2 hours of life.

  2. If glucose between 1.2–2.5mM on first testing (1–2 hours)

     1. rub 0.5 ml/kg of 40% dextrose gel into buccal mucosa
     2. then feed the baby (breastfeed or formula; maternal preference)
     3. recheck glucose within 30min.

  3. If glucose between 1.2–2.5mM on subsequent testing

     1. rub 0.5 ml/kg of 40% dextrose gel into buccal mucosa
     2. then feed the baby (breastfeed or formula; maternal preference)
     3. recheck glucose within 30min.

  4. If glucose between 2.0–2.5mM on subsequent testing

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1. feed the baby a bottle of formula or EBM 12 ml/kg (90 ml/kg/day)
2. recheck glucose in 1 hour

5. If glucose below 1.2mM at any stage; below 2.0mM despite two doses of oral dextrose gel; below 2.6mM despite two doses of oral dextrose gel and a bottle of formula/EBM; or if feeds not tolerated, admit the baby to NICU.
6. If the glucose is <2.0mM at any stage notify the neonatal paediatric service.
7. Dextrose gel must be prescribed on a medication chart either by a midwife, nurse specialist — neonatal advanced practice, or medical practitioner.

NICU

1. Start IV Dextrose 10% at 60ml/kg/day (=4.2mg/kg/min glucose)
2. Consider a bolus of 1–2ml/kg 10% Dextrose IV
3. Recheck glucose within 1 hour

Recurrent or persistent hypoglycaemia not responding to above measures — increase IV dextrose concentration or volume e.g. 12.5 or 15% dextrose and continue feeding if tolerated."

- *Phenobarbitone:* New Zealand Formulary (NZF) for Children — Phenobarbital

  "Dosing regimen

  All forms of epilepsy except typical absence seizures

  Oral or by intravenous injection (as phenobarbital sodium)

  Neonate initially 20 mg/kg by *slow intravenous injection* then 2.5–5 mg/kg once daily either by *slow intravenous injection* or by *mouth*; dose and frequency adjusted according to response

  Status epilepticus, as phenobarbital sodium

  Slow intravenous injection (no faster than 1 mg/kg/minute)

  Neonate initially 20 mg/kg then 2.5–5 mg/kg once or twice daily"

121. In response to the provisional opinion, BOPDHB advised that in addition to the Auckland DHB protocols available to its staff, the following policies were also available in Month7, as a link to National Women's Health:

- Hypoglycaemia — Flowchart for Management of infants at risk
- Hypoglycaemia — Flowchart for weaning of infants receiving Dextrose
- Hypoglycaemia — Guideline for investigation of severe hypoglycaemia

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122. BOPDHB said that the hypoglycaemia policies above are now accessible via a link with Starship Hospital policies, and that this is the only link available to staff regarding the management of hypoglycaemia in neonates.

Responses to provisional opinion

123. Ms A and her whānau, BOPDHB, and RM C were all given the opportunity to respond to relevant sections of the provisional report. Their comments have been incorporated into the report as appropriate. In addition, I note the following comments:

Ms A and whānau

124. Ms A's whānau stated:

> "[T]here needs to be an acknowledgement that [Baby A] was never given an opportunity to grow and mature. They say that time heals all wounds, but I can say that the whānau will never 'get over' the passing of [Baby A] … At no point did the whānau want to lay blame on individuals and acknowledge that during the period there were some amazing health professionals involved. The whānau would like to reiterate that it was a lack of appropriate resources and procedures that caused this and, we, as a whānau, would like assurance that this will not be the case for any future pregnant mothers who find themselves in that position."

125. Ms A's whānau stated that overall they are "comfortable" with the findings in the provisional report. However, they strongly reject that Ms A did not take her diet seriously. They said that Ms A tried to eat well but this was near impossible because of the persistent vomiting that developed during her pregnancy. Ms A's whānau stated: "Her mental health through this period should have been taken into consideration in particular the effects of being so unwell for such a long period of time." In relation to taking anti-nausea medication, Ms A recollected that she told a nurse that soon after taking the medication she would vomit, and it was agreed that there was no benefit from continuing to take the medication.

RM C

126. RM C accepted the provisional opinion and the recommendations in the provisional report. RM C told HDC:

> "As a result of this investigation, I have now become more aware of my responsibilities as LMC and of how to provide primary care alongside the secondary care. I now carry out a full midwifery primary assessment, regardless of the level of secondary care and have amended my practice as a result of this case."

BOPDHB

127. In response to paragraph 98 above, BOPDHB stated that all referrals to its Obstetrics & Gynaecology Service should be documented and should provide full information to secondary services, irrespective of whether the referral was via telephone, clinic, or the ED. BOPDHB acknowledged that sometimes there are challenges to providing timely secondary care responses back to LMCs. For example, LMCs do not have secure email for

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the DHB to provide the information directly, and more timely solutions are being sought. BOPDHB said that where there is a lack of communication from a secondary service in response to a referral, it would be reasonable for an LMC advocating for her client to seek clarification.

128. In response to paragraph 153 below, BOPDHB stated that it was recognised that Baby A was small at 32 weeks' gestation and that repeat scans showed growth at 34 weeks' and 38 weeks' gestation. BOPDHB said that had the growth scan at 34 weeks' gestation shown a further decline in growth, then consideration would have been given to a discussion with the Maternal Fetal Medicine Network.

129. In relation to the cultural support provided to Ms A (discussed in paragraphs 155–158 below), BOPDHB stated that Ms A was referred to Māori Health and Social Work Services, and acknowledged that a continued multidisciplinary team holistic approach may have ensured continued cultural support. BOPDHB said that in 2017, Te Pou Kōkiri staff were not available to the extent they are in 2020. BOPDHB said that there are now eight Te Pou Kōkiri staff to provide cultural support across all services; however, there are no specific kaupapa social workers at the public hospital.

130. In relation to the monitoring of BGL, BOPDHB stated that a review of the hypoglycaemia protocol is planned, and this will include a flow chart of guidelines of escalation requirements to the Paediatrics service. It has implemented the national Early Warning Score chart, and this includes the management of hypoglycaemia.

Opinion: RM C — adverse comment

131. Ms A was in her twenties and in her first pregnancy. It was a very difficult pregnancy, and she required multiple hospital admissions for hyperemesis, abdominal pain, gallstones, anaemia, maternal malnutrition, and a urinary tract infection. As her pregnancy progressed, her baby's growth was restricted, and she required additional surveillance to monitor her nutrition and her baby's growth.

132. In the antenatal period, Ms A was seen on 13 occasions by either her LMC, RM C, or locum midwife RM F. Based on the contemporaneous clinical documentation, my clinical advisor, RM Nicky Emerson, considers that Ms A was seen by RM C and her locum an acceptable number of times in the antenatal period.

Transfer to secondary care

133. Ms A was under the care of the Obstetrics team for hyperemesis during her first admission on 2 Month5, and subsequently the Obstetrics team ordered ultrasound scans and monitored her baby's growth. Communication between the Obstetrics team, RM C, and Ms A's GP was maintained regarding Ms A's well-being and her baby's growth. However, there is no documented record of a formal transfer of Ms A's care from RM C to the

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Obstetrics team, and it appears that at times the care was shared between the LMC and the Obstetrics team.

134. The Ministry of Health *Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines)* are clear that the transfer of clinical responsibility requires timely and full communication between the LMC and the Obstetrics team. 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 three-way conversation between the LMC, the woman, and the specialist, to determine that the transfer of care is appropriate and acceptable.

135. There is potential for the LMC to retain a role in providing care, as in Ms A's case, but it is essential that there is a clear discussion and a documented decision about the nature of the ongoing role of the LMC. I am concerned that during the early months of Ms A's pregnancy it is not clear if or when Ms A's care transferred to the Obstetrics team and, again, there is no documented plan later in the pregnancy when clearly transfer was necessary.[51] I am critical that the roles were not set out clearly and conveyed to Ms A and her whānau. In these circumstances, more clarity would have been helpful for Ms A and those involved in providing her care.

Fundal height measurements

136. I accept that much of the monitoring of Ms A's high-risk pregnancy was undertaken by the Obstetrics team, especially after 32 weeks' gestation. However, I note that RM C continued to provide care, and throughout the pregnancy she completed some aspects of Ms A's assessments, such as blood pressure, urinalysis, and fetal heart auscultation,[52] but she documented the fundal height on only one occasion. RM Emerson advised that the measurement of fundal height is a central expectation for midwives who provide antenatal assessment, and, in her view, it was a fundamental omission not to have recorded the fundal height, particularly following the identification of an "at-risk" baby. I accept that advice, and I am critical that RM C did not carry out a full antenatal assessment each time she saw Ms A.

Weight

137. Ms A suffered significant weight loss during her pregnancy. While I acknowledge RM C's view that it was not necessary to duplicate the measuring of Ms A's weight, especially as she was using different scales from those in the hospital, it is concerning that RM C was asked by the dietician to monitor Ms A's weight and did not receive that request. In my view, RM C should have recorded Ms A's maternal weight as part of her full antenatal assessment of Ms A's pregnancy. This information may have supported Ms A to understand the concerning picture developing about her malnutrition during her pregnancy.

[51] The *Referral Guidelines* require that transfer is recommended to the mother when the EFW is less than the 10th percentile on a customised growth chart.

[52] Listening to the fetal heart.

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Oversight of care

138. RM Emerson advised that she is concerned about the following comments made by RM C to HDC:

> "I am actually only responsible for primary care scans, such as nuchal and anatomy but try to keep up to date with secondary care scans as well to provide quality care …
>
> I don't get copies of secondary care scans done at [the DHB] and therefore didn't get a copy of this scan (doesn't come via Health link) …
>
> I was not aware of any bloods ordered by the secondary care team as I don't get a copy of these."

139. While acknowledging that the Obstetrics team ordered the scans and blood tests and were responsible for following them up, RM Emerson considers that RM C — as LMC — remained responsible for liaising with secondary services. RM Emerson advised that if the DHB scans, blood tests, and investigations were not readily available to RM C, then it was an omission of care for her not to follow them up.

140. However, overall, RM Emerson considers that with the exception of measuring fundal height, the midwifery care provided by RM C was in keeping with accepted practice. I accept that advice, but I am critical of RM C's lack of clarity about her role as LMC when Ms A was receiving secondary care. In my view, RM C's comments about liaising with secondary services demonstrates a lack of understanding about her responsibilities as the LMC. I note that RM C has made several changes to her practice in relation to documentation, and has undertaken education on growth assessment and documentation, and has increased the frequency of her Midwifery Standard Reviews. I consider these changes to be appropriate. I note that following a competency review with the Midwifery Council of New Zealand, RM C is undertaking further education and a period of supervised practice. I also consider this to be appropriate.

Opinion: Bay of Plenty DHB — breach

Introduction

141. This opinion considers the care provided by BOPDHB to Ms A antenatally, and to Baby A following her birth, as set out below. I acknowledge that this extremely rare sequence of events for Ms A and her whānau led to a tragic outcome for them with the loss of their baby. Although it is not possible to determine whether the outcome could have been changed, I am critical that BOPDHB did not ensure that staff were supported with adequate systems to guide and deliver appropriate care, including a requirement to develop comprehensive management plans in such complex cases. This case highlights the importance of co-ordinated care planning, led by an obstetrician and LMC in consultation with a multidisciplinary team to ensure continuity of care among providers.

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Antenatal care

Transfer to secondary care

142. Ms A had been receiving care from the Obstetrics team in relation to her hyperemesis since her first admission on 2 Month5, and as Ms A's pregnancy progressed it was the Obstetrics team who ordered ultrasound scans and monitored the growth of her baby. I note that BOPDHB communicated with RM C and Ms A about Ms A's hospital admissions and the monitoring of the growth of her baby. However, there is no documented record of a formal transfer of Ms A's care from the LMC to the Obstetrics team. BOPDHB stated that Dr D was responsible for Ms A's care, but this is not clear in the documentation. It appears that at times the care was shared between the Obstetrics team and the LMC.

143. The *Referral Guidelines* state that a critical part of the process for transfer of clinical responsibility for care 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 three-way conversation between the LMC, the woman and the specialist to determine that the transfer of care is appropriate and acceptable".

Management of hyperemesis and malnutrition

144. From 2 Month5, Ms A experienced severe hyperemesis and malnutrition. She had multiple hospital admissions and was treated for dehydration and malnutrition. Ms A lost 7kg during her pregnancy and was seen by a dietician. Further follow-up appointments were made, but Ms A did not attend. Ms A also developed an iron deficiency and megaloblastic anaemia,[53] which was managed with iron supplements and blood transfusions. Dr D consulted an on-call General Medicine consultant about Ms A's anaemia, and was advised to replace any deficiencies until delivery and to undertake further investigations at a later time. On 27 Month6, an ultrasound scan showed that Ms A had gallstones, and the General Surgery team arranged for this to be managed following delivery of her baby.

145. My clinical adviser, consultant obstetrician and gynaecologist Dr Celia Devenish, noted that throughout Ms A's pregnancy:

> "There was no individualised forward planning for [Ms A's] persistent hyperemesis, and no documentation of severity of symptoms including weight loss. There was no Multidisciplinary Team established or charged with making an ongoing management plan, led by the Obstetrician responsible for care. There was no recognition or a response to the degree of malnutrition and weight loss, as pregnancy progressed, and no plan to correct the iron deficiency or megaloblastic anaemia, prior to blood transfusion in the late stages of pregnancy prior to delivery."

146. Dr D told HDC that in her view Ms A's condition was managed appropriately. Dr D noted that further advice about the management of hyperemesis was sought from the General Medicine, Emergency Medicine, and General Surgery teams.

[53] In Month6, Ms A was diagnosed with macrocytic anaemia, which later developed into megaloblastic anaemia.

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147. I acknowledge that the public hospital specialist teams were involved, but also note that Ms A was monitored and reviewed by no less than five obstetricians during her pregnancy, and Ms A's GP and LMC were also involved in monitoring aspects of her progress. I also acknowledge that multiple locums were involved in providing care to Ms A, and consider that the challenges faced by locums must be managed appropriately. BOPDHB acknowledged a high use of locums owing to difficulty recruiting specialists to rural areas and smaller DHBs, and said that it is continually monitoring and reviewing its strategies to address these challenges.

148. In this complex scenario, not only involving multiple DHB staff, but also Ms A's GP and LMC, I accept Dr Devenish's advice that a formal management plan should have been developed to guide all providers in their care and ensure a seamless service. This should have included a clear record of the transfer to the Obstetrics team and the ongoing role of the LMC midwife, as noted above. In my view, a management plan was indicated when Ms A first presented with hyperemesis in Month5. An overall plan would have provided clarity about the roles and responsibilities of the staff involved, and may have improved the management of Ms A's hyperemesis and reduced the physical and psychosocial impact on her.

149. In addition, Dr Devenish advised that the guidelines within the public hospital did not assist specialists or the multidisciplinary team with their assessment and management of nausea and vomiting in pregnancy. I am critical that the guidelines available to BOPDHB staff did not provide adequate guidance to assist staff to manage Ms A's hyperemesis and malnutrition. Had the guidelines been sufficiently robust, the clinicians involved in Ms A's complex care may have been encouraged to seek more applied expertise to guide their management and decision-making.

150. I note Dr Devenish's comment that the newly implemented BOPDHB guidelines for nausea and vomiting in pregnancy is a comprehensive document.

Monitoring of growth

151. On 25 Month6, at 32+1 weeks' gestation, an ultrasound scan showed Ms A's baby's declining trend in interval growth pattern since the scan at 20 weeks' gestation. The estimated weight of the baby was 1411 grams, which was less than the 3rd centile on a population growth chart. The scan was reviewed by two obstetricians at 32+4 weeks' gestation, and a plan was made to monitor the growth of Ms A's baby closely. At 34 weeks' gestation, a scan indicated that although Ms A's baby was noted to be constitutionally and unusually small, the liquor and Dopplers were normal. Another obstetrician reviewed Ms A at 34+3 weeks' gestation, and a plan was made for weekly ultrasounds, twice-weekly CTGs, and an induction at 38 weeks' gestation. A follow-up scan at 36+2 weeks' gestation showed that the fetal weight had increased and was on the 8th centile, and the liquor and Dopplers were normal. This was reviewed by an obstetrician the following day and an induction was advised by 39 weeks' gestation. A further ultrasound scan at 38+1 weeks' gestation showed good interval growth, an increase in the fetal weight to the 10th centile, and normal liquor and Dopplers. BOPDHB stated that because Ms A was considered to be high risk, she was monitored closely as her pregnancy developed.

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152. On this aspect of the care, I also sought advice from gynaecologist and obstetrician Dr Meera Sood, as an obstetrician operating within in a secondary-level hospital. Dr Sood advised me that in a secondary-level hospital, the standard practice for the management of a small for gestational age (SGA) baby is to follow the New Zealand Maternal Fetal Medicine Network (NZMFMN) guideline on management of SGA. Dr Sood considers that in these circumstances, BOPDHB staff adhered to the NZMFMN guideline on SGA. Dr Sood further advised: "SGA and their management is a very common scenario for an Obstetrician and I believe most/all of us will be very capable of managing it."

153. However, Dr Devenish considers that in a situation such as this, when significant SGA has been identified, the accepted standard of care is to make a referral to a fetal medicine specialist, or to a larger centre for tertiary subspecialist opinion, to consider whether there is an underlying cause. Dr Devenish advised that although early diagnosis of fetal conditions may not change the outcome, it may optimise the care during pregnancy and around delivery.

154. I note that the public hospital is a secondary-level hospital, and that Dr Sood's advice relates to the standard of care in this operating environment. While I acknowledge Dr Sood's advice that this aspect of the care was of an acceptable standard for a secondary-level hospital, and I accept that staff followed the NZMFMN guideline, I remain concerned by Dr Devenish's comments. I consider that in complex cases such as this, it would be prudent to consider contacting a tertiary hospital or having a discussion with a fetal medicine specialist.

Overall management of Ms A's care

Cultural support

155. During Ms A's various presentations to hospital she was seen by Māori Health on one occasion, and by a social worker on two occasions. BOPDHB acknowledged that although the involvement of a Māori social worker would have been ideal, this could not be assured. BOPDHB said that during admission, Ms A indicated on her admission forms that she had no cultural needs relevant to her care.

156. BOPDHB does not know whether Ms A understood the importance of her diet or of taking prescribed medications. BOPDHB stated that there were contact issues with Ms A, and she would not stay in hospital for long, she would discharge against medical advice, and she did not attend some appointments.

157. Dr Devenish advised that a woman's quality of life can be adversely affected by hyperemesis and nausea and vomiting in pregnancy (NVP), and sources of psychological support should be considered. Dr Devenish stated: "I believe Māori social worker involvement from the outset could have assisted attendance at appointments and communication within a wider team."

158. I acknowledge the distress that would result from a pregnancy such as Ms A's. I note that Ms A's whānau were very involved in her care, and the staff at BOPDHB knew Ms A well. However, I also note BOPDHB's concerns about Ms A's compliance with the plan of care

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and issues with contact, and in my view there was an opportunity to intervene and provide cultural support to Ms A and her whānau to facilitate compliance with her plan of care. This may have supported Ms A's needs more holistically and provided significant benefit in terms of the psychosocial issues she was experiencing. I am concerned at the missed opportunity to provide appropriate cultural support.

Paediatric care

Management of hypoglycaemia

159. The Auckland DHB guidelines for the investigation and management of hypoglycaemia (2016) state that at-risk infants should have their BGL measured at 1–2 hours of age, 4 hours of age, and then 4 hourly, and that BGL should be monitored for at least 12 hours after the last low level.

160. My expert paediatrician, Dr Phillip Moore, advised that following birth, Baby A was recognised as an "at-risk" baby appropriately, owing to her low birth weight. Dr Moore said that the initial observations and BGL were taken just over 2 hours after birth (with the guideline recommending within 1–2 hours), and that the second BGL was not checked until 5 hours and 8 minutes after birth, which is a departure from the recommended guideline of 4 hours after birth.

161. The second BGL reading was 1.7mmol/L, which is low. A hospital midwife gave Baby A 3ml of dextrose gel,[54] and her low blood sugar was managed with formula milk and dextrose, which increased her BGL to 5.6mmol/L. Dr Moore advised that Baby A's low BGL was managed appropriately and corrected the BGL. However, he considers that the low BGL should have prompted a call to the Paediatrics team to notify it of a baby who required monitoring, as recommended in the DHB guidelines. While Dr Moore considers this to be a minor departure from recommended care, I am critical that a paediatric review was not requested when this was indicated by the DHB guidelines.

162. The final BGL was taken 7 hours after the low BGL of 1.7mmol/L, while the guideline recommends that BGL should be monitored for at least 12 hours after the last low level. I note Dr Moore's comment that "it was entirely reasonable to consider this hypoglycaemia was related to the intrauterine growth restriction and glycogen stores expected in this situation". However, Dr Moore considers that not monitoring for the full 12 hours after the low BGL was a minor departure from the standard of care.

163. Dr Moore advised that overall the management of Baby A from birth to transfer to SCBU was of a very good standard. I also note that Dr Moore considers that there were minor departures from the standard of care, and that identification of these may have led to earlier paediatric review. I agree. While I note that Baby A was identified as an at-risk baby appropriately, I am critical of the monitoring of Baby A's BGLs. The guidelines on monitoring the BGL of an at-risk baby are clear.

[54] To increase blood glucose levels.

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164. I am concerned that BGL monitoring was not timely, and critical that the guidelines for when a paediatrician should be called were not adhered to.

16 Month8 — care in SCBU

165. Baby A was transferred to SCBU at 6.25am on 16 Month8 (day four postnatally), after she was noted to be floppy and difficult to rouse. On-call paediatrician Dr E reviewed Baby A and administered a bolus injection of dextrose to treat her severe hypoglycaemia. Dr E then commenced a dextrose infusion of glucose, and by 7.10am Baby A's blood glucose and observations were all normal.

Administration of phenobarbitone

166. The NZF for Children[55] recommended dose of phenobarbitone for a neonate is 20mg/kg by slow IV injection, and then 2.5–5mg/kg once daily.

167. At 7.26pm, Baby A showed possible seizure activity, and an initial dose of 40mg/kg (88mg) phenobarbitone was given by slow IV injection. Dr E stated that because of the severity of the situation and Baby A's rapidly deteriorating and unresponsive condition, he gave a dose of 40mg/kg, noting that the dose for phenobarbitone is 20–40mg/kg for neonatal seizures.

168. Dr Moore advised that the standard loading dose of phenobarbitone for the management of neonatal seizures is a 20mg/kg loading dose by slow IV infusion over 30 minutes.[56] Dr Moore advised that if the initial 20mg/kg dose is ineffective, additional doses of 5–10mg/kg can be administered until the seizures have ceased or a total dose of 40mg/kg has been given.

169. Dr Moore said that Baby A was administered a higher than normal initial dose of phenobarbitone. He stated:

> "Phenobarbitone is a central nervous system depressant drug. In very high doses it can cause apnoea, respiratory depression and hypotension. Although [Baby A] was already a very sick baby I am concerned that this aspect of her management may have contributed to her sudden deterioration at about [7.40pm]."

170. Dr Moore considers that this represents a minor departure from the standard of care.

171. While I acknowledge the severity of Baby A's condition when Dr E examined her, and Dr Moore's advice that the phenobarbitone dose given was a minor departure, I am critical that the initial dose administered to Baby A was not consistent with the relevant guidelines and was higher than recommended.[57]

[55] Guideline provided by BOPDHB.
[56] Auckland DHB guideline for the management of neonatal seizures.
[57] New Zealand Formulary for Children — phenobarbitone.

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Administration of dextrose

172. At 7.50pm, Baby A's BGL was 1.2mmol/L, which is low. She was given a 20ml bolus of 10% dextrose to increase her blood sugars, and her BGL increased to 14.9mmol/L.

173. Dr Moore advised that a dose of 20ml of 10% dextrose following a low BGL would be considered high by paediatricians. He stated that the BGL reading was high at 14.9mmol/L, and advised that "there was a danger of inducing high insulin levels and sustaining a rebound fall in sugar level". He considers that this represents a minor departure from the standard of care.

174. I accept Dr Moore's advice that this was a minor departure. I note that SCBU has implemented changes specifically for the circumstances when severe hypoglycaemia is present or when metabolic conditions are suspected.

Documentation

175. At around 6.10pm on 16 Month8, Dr E consulted Dr I at DHB2. Dr E documented: "D/W [Dr I], Markedly hypoglycaemic, Encephalopathic, watch for seizures, repeat hypoglycaemic events." Dr E told HDC that he consulted Dr I further on at least three occasions, but did not document each discussion.

176. Dr Moore advised that the contemporaneous documentation of the initial discussion with Dr I is brief. Further, Dr Moore noted that the information shared with Dr I to reach the decision to continue care at the public hospital and not undertake further testing is not documented. Dr Moore considers that the standard of documentation on this matter is poor. I agree, and I am critical of the contemporaneous documentation of the discussions with DHB2.

Conclusion

177. BOPDHB had a responsibility to provide services to Ms A and Baby A with reasonable care and skill. I consider that the following aspects of the antenatal care provided to Ms A, and the paediatric care provided to Baby A, were suboptimal:

a) There was a lack of clarity about when Ms A's care was transferred to the Obstetrics team, and no documented discussions about the decision.

b) There was no documented coordinated formal management plan to guide all providers in their care of Ms A and ensure a seamless service.

c) The guidelines on the assessment and management of hyperemesis and malnutrition were inadequate.

d) The BGL monitoring of Baby A was not timely, and a paediatric review was not requested in accordance with the guidelines.

e) The initial dose of phenobarbitone administered to Baby A was higher than recommended and not consistent with the guidelines.

178. While individual staff members hold some degree of responsibility for their failings, I consider that cumulatively the deficiencies outlined above indicate a pattern of poor care.

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Accordingly, in my opinion, BOPDHB failed to provide services to Ms A and Baby A with reasonable care and skill, and, as such, breached Right 4(1) of the Code of Health and Disability Services Consumers' Rights.[58]

Other issues — adverse comment

179. I consider that there were missed opportunities to provide cultural support to Ms A and to seek specialist advice about a baby who was significantly small for her gestational age. Ms A had frequent admissions to hospital, and there were concerns about compliance with the plan of care and issues of contact. In light of this, it would have been prudent for providers to consider Ms A's needs more holistically, in particular her cultural needs. I am also concerned that when significant SGA was found, the opportunity to seek specialist advice from a fetal medicine specialist or tertiary hospital was missed. As part of my recommendations (outlined below) I will be asking BOPDHB to provide HDC with an update on its cultural support in the situation of complex antenatal cases, and to consider developing a guideline for instances of significant SGA.

Recommendations

180. I recommend that RM C provide HDC with an update on the Midwifery Council of New Zealand Order Concerning Competence, within three weeks of the date of this report.

181. I recommend that within three months of the date of this report, BOPDHB undertake the following and report back to HDC:

a) Review compliance with the nausea and vomiting in pregnancy guidelines developed since this complaint.

b) Consider developing a relevant guideline for when concerns about significant SGA or the severity of a woman's symptoms may require consultation with a multidisciplinary team to develop a plan.

c) Consider developing a relevant guideline for when the management of an SGA fetus may require a referral to a fetal medicine specialist, or to a larger centre for tertiary subspecialist opinion.

d) Consider Dr Devenish's comments (as identified in her report) regarding the need to provide appropriate cultural support in complex cases.

e) Arrange training for all new staff on the use of the hypoglycaemia kit implemented since this complaint, and provide further training to current maternity staff on the management of neonatal hypoglycaemia, with an emphasis on the indications for paediatric notification and the recommended duration of monitoring BGLs.

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

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f) Review the guideline for administering phenobarbitone, and ensure that all relevant staff are made aware of the guideline.

182. I also recommend that BOPDHB provide a written apology to Ms A, to be sent to HDC within three weeks of the date of this report, for forwarding.

Follow-up actions

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

184. A copy of this report with details identifying the parties removed, except Bay of Plenty DHB and the experts who advised on this case, will be sent to the Ministry of Health, the Perinatal and Maternal Mortality Review Committee, and the Royal Australasian College of Physicians in Paediatrics, and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.

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Appendix A: Independent advice to the Commissioner

The following expert advice was obtained from RM Nicky Emerson:

"**1.** Thank you for the request that I provide clinical advice in relation to the complaint from [Ms A's] Aunty [Ms B] about the care provided by LMC Midwife [RM C] and [the public hospital]. In preparing the advice on this case to the best of my knowledge I have no personal or professional conflict of interest. I agree to follow the Commissioner's Guidelines for Independent Advisors.

2. I have reviewed the documentation on file: [the public hospital], admission and discharge summary 27 [Month5], 2 [Month6], 29 [Month7], 30 [Month7], 11 [Month8], 30 [Month8], 23 [Month10], 9 February 2018: Dietician letter 10 [Month6]: Physiotherapy assessment 30 [Month5]: Letter to LMC [RM C] from clinic obstetrician 14 [Month6], 7 [Month7], 10 [Month7], 24 [Month7], 8 [Month8], Clinical notes [to [Month8]; Letter from [Dr J], GROW chart, Bay of Plenty Quality and Patient Safety Manager 4 April 2018 Letter [BOPDHB], Chronological timeline 2 [Month1]–17 [Month8]; Statement from [DHB midwife] 23 March 2018, Statement from [Dr F] O& G Consultant [the public hospital] 20 March 2018, letter from [Dr E] Bay of Plenty Consultant Paediatrician 28 March 2018, Letter from [Dr D] 3 April 2018, Bay of Plenty informed consent standards, NZCOM assessment of fetal well being during pregnancy — consensus statement, MOH Observation of mother and baby, Newborn services clinical guideline, Hypoglycaemia flow chart, CTGs from Antenatal period and labour, Complaint response including test results, antenatal records, scan reports, [RM C] 4 April 2018, Notes from [the] Medical Centre, Complaint from [Ms B] 2 [Month9], Advice from Celia Devenish O&G Consultant 2 July 2018.

3. Background

[Ms A], a [woman in her twenties] in her first pregnancy, and [her partner] had good Whānau support. Her BMI was 28 at booking, no medical or family history of note. [Ms A] smoked at the beginning of her pregnancy but stopped in early pregnancy. She experienced multiple hospital admissions with Hyperemesis and gallstones. As her pregnancy progressed the Baby's growth was restricted and she was under additional surveillance from [the public hospital] to monitor her baby's growth and her nutrition. [Ms A's baby] was born following an induction of labour on 12 [Month8]. [Baby A] initially progressed normally, however became floppy on day 4 following birth. [Baby A] became unresponsive over the period of the day and was transferred to [DHB2] where later she sadly died. The complainant is [Ms A's] aunt. She states that the care throughout [Ms A's] pregnancy and following the birth was inadequate. In particular I have been asked to comment on the care provided by LMC midwife [RM C].

Questions:

I have been asked to comment on care provided to [Ms A] by [RM C], **specifically, the management of her Hyperemesis.**

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1. Consistently cancelled/postponed scheduled appointments with [Ms A]

In the complaint received [Ms A's] aunt states that [RM C] cancelled many of her scheduled visits with [Ms A]. I have reviewed [RM C's] clinical notes, notes from [BOP] DHB and [RM C's] complaint response whilst considering my opinion on this concern. [RM C] states the following in her complaint response (4 April 2018):

> *Due to the unpredictability of births and other midwifery obligations to families, occasionally appointments need to be rescheduled. If this did occur, I am genuinely sorry for any inconvenience for [Ms A] or her whānau. However, in referring to clinical notes, both [RM F] and I had regularly seen [Ms A], including several times and on consecutive days on the ward.*

In reviewing the material provided by the HDC, I note that [Ms A] was seen on 13 occasions in the antenatal period by either [RM C] or locum midwife [RM F]. The dates [Ms A] was seen antenatally span from 23 [Month1] (9 weeks and 2 days) to 11 [Month8] (39 weeks) and five of these visits occurred on the hospital ward. In addition to these LMC antenatal appointments, [Ms A] was seen frequently in the hospital emergency department, clinics and admitted on several occasions.

I cannot comment on whether [RM C] cancelled or rescheduled any of her appointments with [Ms A] as there is no contemporaneous documentation to verify a change in appointments. The nature of LMC Midwifery care does unfortunately lead to changing of appointments at times. This is due to prioritising obstetric emergencies and labour over routine antenatal appointments.

I note however that there is no contemporaneous documentation regarding a discussion between [RM C] and [Ms A] at booking regarding the possibility of appointment changes. It would be considered accepted practice to have this discussion at a booking visit when explaining the way LMC midwifery is undertaken in the particular practice. This is part of a larger discussion regarding availability and ways to contact a midwife.

This discussion may have occurred and has not been documented. I discuss documentation further at the end of this report.

Based on the contemporaneous clinical documentation provided, [Ms A] was seen an acceptable amount of times in the antenatal period by [RM C] and her locum. In my opinion, this is in keeping with accepted midwifery practice with no departures from accepted practice.

(Requested postnatal notes and awaiting)

2. Did not arrange specialist care when the baby had abnormal growth

I. [Ms A] was in her first pregnancy, booking with [RM C] at 9 weeks and two days gestation. Hyperemesis with secondary malnutrition and gallstones were a

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feature of the pregnancy, first documented (Hyperemesis) at 13 weeks and six days ([RM C] clinical notes 27 [Month2])

II. Ultrasound scan at 32 weeks and 1 day (scan report 25 [Month6]) showed a declining trend in [Baby A's] interval growth since the 20 week scan. The scan report recommended close clinical surveillance and a repeat scan in two to three weeks time. Scan copies sent to GP and [RM C].

III. Ultrasound scan report on 23 [Month7] at 36 weeks and 2 days plots [Baby A] on the 8th centile on a population chart. The comment on the report is: *it is recommended that the referrer plot the estimated fetal weight (EFW) on a customised chart for improved accuracy.* For this scan, the referrer was [Dr G] and the customised growth chart had appropriately commenced by [BOP] DHB on 25 [Month6]. Scan copy sent to [RM C].

[Ms A] had been under the care of the Obstetric team since her first admission with hyperemesis on 2 [Month5] and it was the obstetric team that ordered and monitored [Baby A's] growth. [Ms A] received secondary care (Obstetric care) in relation to the growth of her baby when it was noted to be declining. Communication between the obstetric team at [the public hospital] and [RM C] was maintained regarding [Ms A's] well being and fetal growth.

Whilst secondary (Obstetric care) was appropriately in place for [Ms A] and to monitor the growth of [Baby A], I am critical of the documentation and monitoring from [RM C] regarding this.

There are 13 consultations documented in [RM C's] clinical antenatal notes (23 [Month1]–11 [Month8]). There is only one recorded fundal height measurement in this period of time (27 [Month6]) and [Ms A] has only been weighed twice. 23 [Month1] (80kg) and 27 [Month6] (72 kg).

I note a specific request from [the dietician] for [RM C] to monitor [Ms A's] weight in light of her weight loss and gallstones in pregnancy. *[RM C] can you please monitor weight and low fat diet adherence?* (Dietician letter 10 [Month6]).

Whilst specialist care was arranged when the baby had abnormal growth, [Baby A] was monitored by [BOP] DHB. In my opinion this aspect of [Ms A's] care has not departed from accepted practice and [RM C] has not departed from accepted practice in her care.

I am critical however of the absence of documentation regarding fundal height and Maternal weight in [RM C's] clinical notes.

- [Ms A] had been unwell throughout her pregnancy with several hospital admissions for hyperemesis. Her weight had reduced by 8 kilos in five months (23 [Month1]–27 [Month6]). Despite the request from the dietician for [RM C] to monitor [Ms A's] weight I can find no clinical documentation to verify that this has occurred.

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- [Baby A] was known to be small for gestational age from 32 weeks and 1 day gestation and I can find no documentation to support that fundal height was measured by [RM C] except on one occasion at 32 weeks and 3 days.

If it is accepted that the monitoring of [Ms A's] high risk care now resided with [the public hospital] and it was no longer necessary to duplicate the measuring of fundal height and maternal weight by [RM C] then in my opinion this is a moderate departure from accepted midwifery practice for the following reasons.

- [RM C] remained responsible for [Ms A's] primary care. [RM C] has completed some aspects of her assessments (BP, urinalysis, fetal heart auscultation) throughout the pregnancy but has not documented the fundal height or [Ms A's] weight.
- The measurement of fundal height is a central expectation for midwives providing antenatal assessment. Some midwives (although not recommended practice) will annotate that the fundal height (using a =) as 'equal to clinical dates', however in this case neither the measured fundal height (in centimetres) nor the clinical estimation of the fundal height is recorded.

  From 24 weeks it is recommended that the fundal-symphysis height should be measured and recorded in centimetres at each antenatal appointment, preferably by the same person. Midwives using NZ Customised Growth Charts should be conversant with their conditions and limitations. If there is a decision to use a customised growth chart it is commenced beyond 24 weeks gestation
  (NZCOM Consensus statement — Assessment of fetal well being during pregnancy Feb 2012)

[RM C] was specifically requested to monitor [Ms A's] weight and whilst I accept that she was only seen outside of the hospital on one occasion following this request, the weight is not documented on that occasion. In the period from 27 [Month2] to 27 [Month6] [Ms A] has lost eight kilos and [Ms A's] weight has not been documented in the intervening period.

Summary

From 13 weeks and 6 days gestation [Ms A] was documented to be suffering from hyperemesis. She had several hospital admissions and her nutrition was compromised.

A growth restricted baby was identified at 32 weeks and this potentially may have been identified earlier had fundal height measurement been completed by [RM C]. I acknowledge that [RM C] and [RM F] visited several times on the hospital ward however on these occasions only some aspects of the antenatal assessment have been documented; they include blood pressure, urinalysis, assessment of fetal lie and presentation. In my opinion it was a fundamental omission of antenatal care not to have recorded the fundal height particularly following the identification of an 'at risk'

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baby. [Ms A] remained under LMC care as evidenced by the communication between [BOP] DHB and [RM C]. I am unable to find evidence that care was transferred to secondary services; rather care was shared between the LMC and secondary services (consultation). In my opinion the final outcome of [Baby A's] death was not impacted by the care received by [RM C] and could not have been foreseen however regardless of the outcome, the omission in recording fundal height is a moderate departure from accepted Midwifery practice.

3. Did not offer advocacy support for [Ms A] when dealing with the Hospital

4. Did not support [Ms A] with her ongoing health issues

In the complaint received [Ms A's] Aunt states that [RM C] did not offer advocacy support for [Ms A] when dealing with the hospital and did not support [Ms A] with her ongoing health issues.

In considering this concern I have reviewed the following

- Timeline provided by [the public hospital]
- [RM C's] clinical notes
- [RM C's] complaint response
- [Public hospital] clinical notes

It is difficult to ascertain how further advocacy and support could have been provided by [RM C] to [Ms A]. Following review of clinical notes and timeline from [the public hospital], [RM C] clinical notes, scan results and clinical letters, it is evident that communication has taken place between [the public hospital] and [RM C] following all of [Ms A's] clinical interactions. [Ms A] has been seen by [RM C] or her locum on 5 occasions whilst an inpatient in [the public hospital] (20 [Month5], 7 [Month6], 3 [Month7], 31 [Month7], and 1 [Month8]) and [RM C] has attended one consultation appointment.

In her complaint response (4 April 2018) [RM C] acknowledges that she did not offer a SANDS pack to [Ms A] following [Baby A's] death. She states that she is *truly sorry for this*.

[RM C's] clinical notes document her communication with [Ms A's sister-in-law]) and condolences in the days following the transfer and subsequent death of [Baby A]. **(I am currently awaiting further postnatal notes as requested)**

From a clinical perspective, in my opinion there is no departure from accepted practice in the advocacy support that [Ms A] received from [RM C]. I do however acknowledge that [Ms A] and her whānau do not feel that advocacy and support was offered and I am genuinely sorry to hear this. **I would be willing to revisit my advice if the concern was more specific.**

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5. Hyperemesis

I have been asked to comment specifically regarding the management of care by [RM C] regarding [Ms A's] hyperemesis.

I. Hyperemesis is first noted at 13 weeks and 6 days ([RM C] clinical notes 27 [Month2]). A prescription for an antiemetic is given to [Ms A] at that appointment.

II. A further prescription for an antiemetic is given to [Ms A] on 27 [Month4].

III. On 2 [Month5] [RM C] advised [Ms A] to present in the emergency department for her hyperemesis. She did so and was admitted for 2 days.

IV. On return from leave [RM C] was informed by her locum that in her period of absence [Ms A] had been admitted to hospital and treated for Hyperemesis on several occasions.

Following the admissions for hyperemesis (coupled with the recognition of significant weight loss and malnutrition) it was reasonable to assume that the care for [Ms A] in regards to the hyperemesis fell outside of midwifery scope. The hospital rehydrated [Ms A] on several occasions and organised consultation with the dietician. I note that the obstetric opinion sought by the HDC (Celia Devenish 2 July 2018) is critical of the lack of an obstetric led multidisciplinary team responsible for recognition and management of [Ms A's] hyperemesis and its sequelae.

In my opinion it was reasonable for [RM C] to prescribe an antiemetic (metoclopramide — appropriate in pregnancy) to [Ms A] initially. Once it became evident that the vomiting was persistent admission to ED was also reasonable. Following the initial admission it became evident that the hyperemesis required obstetric specialist management. In my opinion the management of [Ms A's] hyperemesis by [RM C] was in keeping with accepted midwifery care however I remain critical of the lack of fundal height measurement and recording of [Ms A's] weight. I have addressed this aspect of care previously (summary question 2).

Summary

In completing this report I have been asked to comment on several aspects of the care provided by [RM C] to [Ms A] in her pregnancy. Regarding the questions asked. In my opinion there is no departure from accepted Midwifery care in regard to the specific questions asked above.

Further Comment

I do however have remaining concerns regarding [RM C's] documentation and the omission of recording [Ms A's] fundal height during her pregnancy. I consider this to be a moderate departure from accepted practice.

I am further concerned with regard to comments made in [RM C's] complaint response.

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I am actually only responsible for primary care scans, such as nuchal and anatomy but try to keep up to date with secondary care scans as well to provide quality care.

I don't get copies of secondary care scans done at the DHB and therefore didn't get a copy of this scan (doesn't come via Health link).

I was not aware of any bloods ordered by the secondary care team as I don't get a copy of these.

I have considered these comments and acknowledge that [RM C] goes on to state which scans she received and her subsequent clinical actions, however I am concerned with her underlying viewpoint. I am also aware that the person who orders the investigation is responsible for following up results. I have considered NZ Midwifery Council Competency two as outlined below.

Competency two

The midwife applies comprehensive theoretical and scientific knowledge with the affective and technical skills needed to provide effective and safe midwifery care.

***2.2** confirms pregnancy if necessary, orders and interprets relevant investigative and diagnostic tests, carries out necessary screening procedures, and systematically collects comprehensive information concerning the woman's/wahine health and wellbeing*

In my opinion the LMC remains responsible for liaising with secondary services (if they have not contacted her). If DHB scans and Blood tests and investigations are not readily available to her then in my opinion it is an omission of care not to chase results.

Care was not formally transferred to secondary services in [Ms A's] pregnancy therefore in my opinion the LMC remains responsible to maintain an overview even if some aspects of the pregnancy fall outside of her expertise.

I note that the birth plan made on 27 [Month6] states that [Ms A] would like a water birth. This plan is made at 32 weeks and 3 days. Antenatal notes state

Birth plan completed today. USS show that baby wasn't growing. [Ms A] has lost a lot of weight recently with being sick. No f/u appointment. Will chase. Script for clocreme 3day. Sounds like thrush.

I note that the Intrapartum Fetal Surveillance clinical guideline — Third addition 2014 recognises suspected or confirmed intrauterine growth restriction as an antenatal risk factor. Intrapartum cardiotography is recommended. In my opinion a water birth would not be recommended.

I recommend that [RM C] undertake a Fetal surveillance programme such as FSEP or K2 (online — if available) if she has not done so in recent years.

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The guideline for the management of suspected small for gestational age singleton pregnancies and infants after 34 weeks gestation (NZMFM) may also provide useful information. This can be obtained online from the NZMFM website.

Despite the recommendations above, in my opinion the midwifery care was in keeping with accepted practice with the exception of measuring fundal height and Maternal weight. Whilst this is noted, given the regular hospital appointments and scans, I do not believe that this omission would have impacted on the final outcome.

Lastly, I extend my heartfelt condolences to [Ms A], [her partner] and their whānau for the loss of their precious baby [Baby A].

I hope this report helps to answer some of their remaining questions.

Nicky Emerson BHS
Midwifery Advisor
Health and Disability Commissioner"

The following further advice was provided on 30 September 2019:

"I have reviewed [RM C's] response to my advice (25 July 2019) and am responding to your request below

- Does the information provided by [RM C] on 26 July 2019 in any way change the expert advice you provided on 11 September 2018?

I acknowledge the following. In [RM C's] response she has reflected on and reviewed her Midwifery practice making the following changes to her practice.

1. Includes documentation of palpation and maternal weight even when serial growth scans and obstetric care is involved
2. Attendance at NZCOM documentation workshop. Subsequent self and peer auditing of documentation (women's confidentiality maintained)
3. Engagement with a rural mentor, more frequent Midwifery Standard Reviews
4. Completion of Growth Assessment Protocol (GAP Training)
5. RANZCOG FSEP Full Program

Whilst [RM C] has reflected that changes in her practice would not have changed the outcome in this case, she states that had she incorporated these changes in her practice at the time of care of [Ms A]

1. [Ms A] may have felt better cared for by [RM C] and she apologises for this
2. [RM C] has taken the complaint very seriously and has engaged in further education as a result.

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I have reviewed my advice and acknowledge [RM C's] comments regarding the care plan in relation to a water birth for [Ms A]. It is clear that [RM C] has reflected deeply and has fully engaged with practice changes and appropriate education as a result of this case.

I have no changes to my original advice at the time of writing."

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Appendix B: Independent advice to the Commissioner

The following expert advice was obtained from an obstetrician and gynaecologist, Dr Celia Devenish:

"02 July 2018

…

Re: **[Ms A]/Bay of Plenty District Health Board**
Reference: C18HDC00384

I have been asked to provide an opinion to the Commissioner for the above. I have read the Commissioner's guidelines and I agree to follow these guidelines.

I am a Specialist Obstetrician and Gynaecologist, working within a generalist scope of practice, and have been accredited with Fellowship of both RANZCOG and RCOG.

I have practised as a Consultant in both Obstetrics & Gynaecology for 36 years in both tertiary and secondary provincial centres, in public, academic, rural and private practice sessions.

I have worked in a joint clinical and academic position, as a Specialist at Dunedin Hospital for 18 years. I have also been Clinical Leader in Obstetrics.

As an Otago University Lecturer, I am involved in research and teaching in the Dunedin School of Medicine at undergraduate and postgraduate levels. I am an elected RANZCOG Board and Council member where I chair and sit on various committees including the FRANZCOG and DRANZCOG Examination Committees. I also sit on the New Zealand Committee and SIMG interview panels for New Zealand and Australia. I am involved in specialist training and organise various workshops in NZ.

…

1. The management of [Ms A's] hyperemesis and malnutrition throughout her pregnancy.

The notes describe maternal weight loss of approximately 7 kg during pregnancy, which was associated with iron deficiency and a megaloblastic anaemia. Admissions to correct dehydration and electrolyte imbalances occurred during hyperemesis. It is not possible to determine to what degree the known gallstones impacted on and compounded [Ms A's] symptoms of hyperemesis, which, by definition, commenced in the first trimester of pregnancy.

a) The expected standard of care and accepted practice for hyperemesis is to quantify and document the symptoms of hyperemesis. To arrange for stepwise use of medications, often used in combination, alongside interventions to maintain hydration and adequate nutrition, to minimise symptoms. To engage a

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multidisciplinary team approach, and for the Obstetric team to follow up as often as required, and to refer for further advice as needed from a secondary or tertiary centre, should parenteral or enteral feeding become necessary via a pic line or other mechanism. The aim being to maintain nutrition, avoid significant weight loss, and ensure maternal wellbeing as far as possible.

Ambulatory care in the community, with regular review can be as suitable as hospitalisation, where this option can be arranged. This depends on local recourses, the degree of symptoms and how much these affect daily life, nutrition and normal weight gain in pregnancy.

The RCOG Greentop Guideline No. 69 suggests such management guidelines. They are incorporated into most DHB guidelines and protocols, but I am not aware what is available as a guideline in [the public hospital].

b) I believe there was a major departure from these expected standards of care. I believe this because there was no clear plan going forwards after the first admission, and no communication regarding what the possible management options might be. There is no documentation of the degree of symptoms, eg PUQE scores (duration of nausea each day, frequency of vomits or dry retching each day). There was no referral to seek advice about parenteral or enteral feeding, or the option of corticosteroids. There was no multidisciplinary team established for discussion of ongoing care, and no plan to be followed up by same, in light of ongoing symptoms with weight loss, megaloblastic anaemia and iron deficiency, e.g., designated obstetric specialist, LMC, GP, ED doctor, dietician or core maternity midwife. There was no communication with or referral to a General Surgeon re the known gallstone history and degree, to which this may have impacted on symptoms.

c) I believe my peers would agree with this opinion.

d) In future, I recommend that protocols and guidelines be established for care of persistent hyperemesis if not currently available. Such a guideline should be made in consultation with a multidisciplinary team, as outlined above, led by the Obstetric Unit consultants and midwives, and shared with GPs, LMCs and ED doctors in [the local community].

2. Whether additional measures should have been taken, given [Ms A's] multiple presentations to [the public hospital] and her persisting malnutrition.

a) The standard of care is that additional measures should have been taken, including discussion and consultation with a wider team of specialists, both locally and in secondary and tertiary centres. e.g. including involvement of [the regional hospital] or a tertiary centre.

b) I believe there was a major deviation from the expected standard of care. I believe this because once the weight loss, metabolic disturbance, malnutrition

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and fetal concerns were noted, the range of options including parenteral or enteral feeding are not recorded as being discussed. Use of a nasogastric tube for feeding can also be effective. Over the hospital admissions, there was no recognition noted or action taken in regard to anaemia and an iron infusion was not discussed. Corticosteroids were not discussed, as a treatment for refractory hyperemesis. Only in late pregnancy (29 [Month7]) was the option of a 4 unit blood transfusion offered. The iron deficiency could have been treated by IV infusion earlier in pregnancy than this, as the haemoglobin at booking was 106g/l, but this dropped consistently throughout pregnancy to 74g/l towards term, and only oral iron tablets were offered, which was not optimal, given [Ms A's] gastrointestinal symptoms.

I believe Māori social worker involvement from the outset could have assisted attendance at appointments and communication within a wider team e.g. the dietician and LMC to enable attendance at appointments.

If, despite persistent hyperemesis and its sequelae, longer term hospitalisation was not possible or acceptable to [Ms A], then options of review, as a day assessment patient, could have been effected, preferably with consistency of a nominated carer or at least a consistent care plan/with, e.g. dietary intake review, maternal weighing and general wellbeing assessment and psychosocial and financial support as needed.

c) I believe my peers would agree with this opinion.

d) I recommend that escalation of concern should be part of the required protocol/ guideline for management of hyperemesis in [the public hospital]. Such a guideline should also outline optimal management of iron and vitamin deficiency and outpatient hydration options, eg a pic line. Māori Social Worker involvement should be part of the package of care in such women requiring frequent review, with financial assistance, as required.

3. The appropriateness of actions taken in response to [Ms A's] growth scans.

a) I believe that the standard of care is that referral be made to establish if any cause is found for a fetus significantly SGA. This can be by the Obstetrician with the patient present e.g. at a teleconference. Whilst such referral may not have been acceptable to [Ms A], the opportunity for a further specialist or subspecialist review should be offered and documented. In this case the fetal outcome could not have been changed, but the opportunity to discuss potential causes for a small for gestational age fetus with the family was missed.

b) I believe there was a significant departure from the expected standard of care. I believe this because there were no referral options offered or discussed. Referral regarding SGA could have been to a larger centre or for tertiary subspecialist opinion for diagnostic options, and to exclude some anomalies. The fetal anomaly scan showed no abnormality and the fetus was of average size at the 19 week

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scan. From 27 weeks gestation, subsequent scans showed growth below the 10th centile ranging from 3rd to 10th centiles. There is no evidence of customised growth scans being used in the antenatal clinic. It is noted Blood flow to the fetus during pregnancy, as measured by Dopplers remained normal, but the fetus was significantly small for gestation.

c) I believe my peers would agree with this opinion.

d) I believe a guideline for management of SGA fetus should be implemented, as part of the local [hospital] guidelines and consistent with Maternal Fetal Network recommendations, and the RANZCOG and RCOG Guidelines for SGA. Discussion via a virtual or teleconference 'clinic visit' with an expert Obstetrician (if not an actual visit) should have been a continuum throughout this difficult pregnancy. Perhaps information regarding the options for telemedicine, video teleconferences and a list of appropriate specialists to contact for advice should be part of any locum or visiting doctor's brief.

4. The overall management of [Ms A's] pregnancy by the maternity service.

a) I believe the required Standard of care is to provide seamless, continuity of care led by an Obstetrician and LMC in consultation with a multidisciplinary team, with regular discussion and referral to appropriate specialists as required when there are concerns re SGA fetus and severity of symptoms.

b) I believe this was a significant departure from the accepted standards of care. I believe this because there was no individualised forward planning for [Ms A's] persistent hyperemesis, and no documentation of severity of symptoms including weight loss. There was no Multidisciplinary Team established or charged with making an ongoing management plan, led by the Obstetrician responsible for care.

There was no recognition or a response to the degree of malnutrition and weight loss, as pregnancy progressed, and no plan to correct the iron deficiency or megaloblastic anaemia, prior to blood transfusion in the late stages of pregnancy prior to delivery.

There was no referral to specialist or subspecialist care following diagnosis of SGA (small for gestational age), which may have led to further assessment or Tertiary level discussion or referral. Surgical opinion re gallstone care was not followed through.

Follow up plan or non attendance at clinics was not documented or evidence of social worker input to this.

c) I believe my peers would agree with this opinion.

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d) I would recommend in future that when a local hospital, such as [this], is short staffed, and locum specialists are required, access to clear guidelines for accessing and optimally managing both hyperemesis and the SGA fetus, alongside other common problems in an Obstetric Unit. Referral pathways for further advice should be clearly available. Referral to General Surgery to manage a pregnant woman, who presents with gastrointestinal symptoms early in pregnancy with a previous history of gallstones should also be recommended from the obstetric Unit. Māori Social Worker with LMC discussions in the Antenatal clinic at the time of the visit are also best practice.

Referral and discussion with a larger secondary or tertiary centre with experience in severe hyperemesis management should be made, in such circumstances.

The above would allow optimal management and prevention of severe malnutrition and weight loss, with anemia.

Since Locum specialists are not able to provide continuity of care in person a clearly documented ongoing management plan covering a range of potential events should be made, and discussed with all parties involved in care. Clear communication with LMC and Social Worker about this plan and the indications for referral back to obstetric unit should also be clearly documented, and copies given to all concerned including the pregnant woman.

Board of hospitals should ensure turnover of staff and locums does not impact on standard of care provided to women.

Summary:

In this maternity case, malnutrition and significant weight loss appear to have resulted from poorly managed Hyperemesis Gravidarum (HG), which was also complicated by the known previous diagnosis of gall stones.

Maternal experience in pregnancy could have been improved and care better organised. The unfortunate neonatal outcome related to a congenital disorder, could not have been changed however. Diagnostic options could have been offered for the SGA fetus during pregnancy, however, they were unlikely to diagnose such a rare congenital condition.

Departure from expected standards of care were, in part, a result of systems problems in the DHB and the need for locum specialists, which impacted on continuity of care. The underlying reasons for these problems should be reviewed.

Failure to document details of HG, e.g. using PUQE index of duration of nausea and frequency of vomiting/dry retching per day contributed to the difficulty in recognising lack of improvement over time. Such a record would allow a succession of different obstetricians to recognise a deteriorating patient.

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Failure to establish or refer to local multi-disciplinary team, e.g. Emergency Doctors, LMCs, Obstetric Surgical specialists, GP, Social Workers and dietician, meant there was no overall plan for this pregnancy.

When discharged from hospital admissions, there was failure to make a plan regarding the indications for review by the obstetric team, or organise an ambulatory care option or reasons for hospitalising or escalating the level of care.

Advice about subsidised transport and early social worker involvement may also have facilitated better access to care.

There was failure to make an ongoing plan for care of HG, including options for parenteral or enteral feeding or referral to tertiary centre re significant or SGA. Also failure to refer to secondary or tertiary specialist or subspecialist assessment. However, there was evidence of surgical referral to plan for definitive surgery re gallstones postpartum, which did eventuate in a timely manner.

Celia Devenish
Consultant Obstetrician & Gynaecologist

Electronically reviewed & signed"

The following further advice was obtained on 1 October 2019:

"Thank you for the opportunity to respond to [BOPDHB advisor's] letter of the 20th September 2019, along with the 'soon to be introduced' [DHB] guidelines attached.

I do not wish to change my opinions from the 2nd July 2018. I believe there was a moderate deviation from the expected standard of care.

I welcome the future introduction of the care bundle for nausea and vomiting in pregnancy. As previously noted, the absence of guidelines within [the public hospital] regarding nausea and vomiting in pregnancy and its assessment and management, did not assist specialists or the multidisciplinary team in providing this woman's care. However, these can be accessed via the RCOG, RANZCOG and NICE websites by all Fellows. I enclose the latest version of the SOMANZ 2019 Guidelines in respect to integrated care for such problems.

Whilst I acknowledge the difficulties of ensuring an antenatal care system enables continuous care for women, with provision of supporting social services, this is ultimately the responsibility of the DHB working alongside the LMC and Lead Consultant for each woman.

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In reply to [the BOPDHB advisor's] response, please see my comments below:

1. The future Care Bundle for nausea and vomiting in pregnancy (NVP) is a comprehensive document, which will address women presenting with NVP. However, it is not clear whether the community healthcare providers will have access to this. It would be helpful if the GPs and well as LMCs and hospital staff were able to access details of this Care Bundle. Reference to the current SOMANZ Guidelines of 2019 would be helpful. These are evidence based and relevant to Australia and NZ.

2. There is no assurance from the DHB that in future staff and locums will be advised of the means to access all such guidelines and care plans for maternity cases.

3. The links to Health Navigator for patient information may be helpful for women to receive, but there is no evidence this was offered to [Ms A].

4. There is no reference to the comprehensive RANZCOG/RCOG/NICE guidelines appropriate for Fellows and NZ Specialists to use. Whilst UptoDate can provide background information, it should be noted that American College Guidelines are individuals' statements and, as such, are not necessarily evidence based opinion. Furthermore, they are written for a very different model of maternity care. Hence, the general view that RANZCOG/RCOG/NICE Guidelines as being evidence based, are preferred and appropriate for the NZ model of Maternity care.

   I believe there should also be reference to the RCOG's Green Top Guideline 69 (as referenced below), as well as RANZCOG 2015 Clinical Handover Statement.

5. The Clinical Director Network (CDN) has met face to face four times a year for several years, and emails are regularly exchanged most weeks by this group, including smaller hospitals, e.g. the West Coast. [The public hospital] is also invited to attend this forum of discussion. Guidelines are regularly shared and compared within this RANZCOG chaired CD Network. All DHBs have access to each other's guidelines and are able to make local adaptions to these, as appropriate. The [DHB] O&G Leadership Team have access to this network's resources, which establish the expected standards of care and the advice of other CDs at all times. This is why I can state that my peers agree with these standards of care. Invitation to attend and participate in these collegial meetings has been extended to [the public hospital] again.

6. The differential diagnosis of an SGA baby includes the risk of fetal anomaly. Referral to, or discussion with, a Fetal Medicine Specialist via the MFM Network, is recommended practice and an expected standard of care. This enables early diagnosis of fetal conditions which is beneficial to many women's experience. Whilst this cannot change an outcome, it does give the opportunity to optimise care during pregnancy and around delivery. The need for equity of access for all

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women should ensure that this option is offered, even if a woman does not wish to engage with such a referral.

7. With reference to [the BOPDHB advisor's] opinion re whether peers agree with my opinions. This statement is based on the current opinion of my peers, whose opinion has been sought, the current CD Network views, which confirm a consistent NZ wide standard of care. This standard is confirmed in the availability of DHB guidelines available, as above. These, in turn, are based on the evidence within the RANZCOG/RCOG/NICE College and SOMANZ evidence based Guidelines relating to antenatal care and NVP.

   I have enclosed examples of Hyperemesis guidelines and pathways from some DHBs which consistently illustrate the standard of care and availability of information to all Practitioners. Of interest Auckland Hospital has one which enables GP involvement and payment for care given. All guidelines emphasise the importance of communication within the multidisciplinary team for patients with persistent symptoms of hyperemesis. This is particularly true when the woman finds engagement with the unit difficult, for whatever reasons. This factor in itself, is associated with increased risk of maternal and neonatal morbidity.

   My comments in the 2nd July 2019 HDC response, 1a&b, 2a&b, 3a&b, 4a&b, are based on the Green Top Guideline 69 2016 and NICE and RANZCOG statements and guidelines, as attached below. These do not differ greatly from UptoDate, but do have an emphasis regarding 'wrap around care'.

8. Re system risks posed by a high rate of staff turnover and locums impacting on the standards of care to women. Whilst unavoidable systems issues, such as staff shortages, may occur from time to time, the standard of documentation, communication and handover within the unit's multidisciplinary team should ensure the safety and optimal care of all pregnant women. The DHB is responsible for ensuring that all staff have ready access to guidelines regarding the current expected standard of care for women in pregnancy, and that locums are advised of these, including those staff practising in other departments. I attach references to the RCOG Green Top Guideline, and others which reflect from DHBs elsewhere in NZ.

9. Recommended standards of care include that units should consider NVP and provide multidisciplinary support as in points 8) & 11) from RCOG Guideline available at the time of [Ms A's] pregnancy.

   8.1 What is the role of the multidisciplinary team?

   In women with severe NVP or HG, input may be required from other professionals, such as midwives, nurses, dieticians, pharmacists, endocrinologists, nutritionists and gastroenterologists, and a mental health team, including a psychiatrist.

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What is the effect of NVP and HG on quality of life?

A woman's quality of life can be adversely affected by NVP and HG and practitioners should address the severity of a woman's symptoms in relation to her quality of life and social situation. Practitioners should assess a woman's mental health status during the pregnancy and postnatally and refer for psychological support if necessary. Women should be referred to sources of psychosocial support. Practitioners should validate the woman's physical symptoms and psychological distress.

Women should be advised to rest as required to alleviate symptoms.

Executive Summary:

Women with NVP and HG should have an individualised management plan in place when they are discharged from hospital.

Women with severe NVP or HG who have continued symptoms into the late second or the third trimester should be offered serial scans to monitor fetal growth.

Ref RCOG Greentop Guideline 69 attached
Dunedin Public Hospital guideline for Hyperemesis attached

Celia Devenish
Consultant Obstetrician & Gynaecologist
MBBS FRCOG FRANZCOG

Electronically reviewed & signed"

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Appendix C: Independent advice to the Commissioner

The following expert advice was obtained from an obstetrician and gynaecologist, Dr Meera Sood:

"12 August 2020

…

Complaint: Anonymous

Your ref: 18HDC00384

I have been asked to provide an opinion to the Commissioner on case number 18HDC00384. I have read and agree to follow the Commissioner's Guidelines for Independent Advisors. I am not aware of any conflicts of interest.

I am a practising Obstetrician and Gynaecologist in a Secondary DHB for the last 14 years. My qualifications are MBBS, FRCOG (UK), FRANZCOG (NZ).

I have been asked to comment on:

1. **What is the standard practice when an SGA baby is identified in a secondary hospital?**
2. **Would it be standard practice to make contact with a tertiary unit when SGA is identified and if this was not done what is the level of departure?**

In 2017, [Ms A], aged [in her twenties], became pregnant with her first child. Her due date was 18 [Month8]. She was cared for by the LMC midwife and the secondary tertiary Hospital ('the Hospital') by the Obstetrics team.

She had hyperemesis from 13+ weeks, which was treated with anti-emetics. She had five admissions to the Hospital.

The admissions were at 23+3, 24 and 27+1 weeks, where she was treated for hyperemesis leading to weight loss and electrolyte imbalance, UTI and anaemia.

Her further admission was at 28+1 weeks with vomiting, coughing, chest pain and breathlessness. She was reviewed by the Physicians, Surgeons and the Obstetricians. She also had urinary retention which was managed. The investigations revealed gall stones and she continued to be managed with anti-emetics, electrolyte and vitamin supplementation for vomiting in pregnancy. She was also referred to Māori Health and social worker after discharge.

At 29 weeks, she was readmitted with oedema of her legs and headache. Investigations were done to exclude pre-eclampsia. She had lost significant weight since her booking visit. A referral and review by a dietitian was arranged and a plan also made to follow her up in the Obstetrics outpatient clinic.

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She was reviewed by an obstetrician in antenatal clinic at 30+4 weeks where arrangement was made to treat UTI with IV antibiotics through Maternity Ward and scans and follow up visits arranged for fetal wellbeing. The fundal height was documented to be normal.

An Ultrasound at 32+1 weeks revealed that the fetal weight was below the 3rd centile on population growth chart, the liquor volume and dopplers were normal. The scan was reviewed by two Obstetricians at 32+4 weeks and plan was made to closely monitor the fetus with:

- Ultrasound scan for liquor and Doppler in the coming week
- Growth scan two weekly
- CTG, BP, urine dipstick weekly.

The liquor and Doppler were normal on scan at 34 weeks. She was further reviewed by another Obstetrician at 34+3 weeks and twice weekly CTGs were requested/ performed. A plan was also made for induction at 38 weeks.

A follow up scan at 36+2 weeks showed that the fetal weight had improved and was on 8th centile, the liquor and dopplers were normal. This was reviewed by an Obstetrician the following day and induction advised by 39 weeks.

She was diagnosed with macrocytic anaemia at 37+2 weeks. The treatment was commenced after receiving advice from the Physicians.

A further Ultrasound at 38+1 weeks showed good interval growth with baby on the 10th centile and normal liquor and Doppler.

An induction was planned for 39 weeks. [Ms A] had a normal vaginal delivery with baby born in good condition with Apgar of 9 and 10 and birth weight of 2–9th centile i.e. 2505 gm after the induction.

I will not summarise the postnatal care of the baby as that is beyond my scope.

I will respond to the specific questions asked of me as an expert from the Secondary Care Hospital.

1. What is the standard practice when an SGA baby is identified in a secondary hospital?

The standard practice of management of SGA in a secondary hospital is to follow the NZMFM guidelines on management of SGA which was done in this case.

RCOG also provides good evidence based guidelines to follow.

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2. Would it be standard practice to make contact with a tertiary unit when SGA is identified and if this was not done what is the level of departure?

Not at all. SGA and their management is a very common scenario for an Obstetrician and I believe most/all of us will be very capable of managing it.

For our reference, NZMFM provides very comprehensive guidelines to manage these.

The secondary unit would only contact tertiary centre if the fetus needs delivery at a gestation which they are unable to manage in their Special Care Baby unit or there are other associated fetal complications (which was not the scenario in this case).

I hope this information is helpful.

Please do not hesitate to contact me if there are any queries.

Regards

Meera Sood
Consultant Obstetrician and Gynaecologist"

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Appendix D: Independent advice to the Commissioner

The following expert advice was obtained from paediatrician Dr Philip Moore:

"4 January 2019

…

Complaint: [Baby A] (Deceased) 18HDC00384

Thank you for asking me to provide expert advice to the Health and Disability Commissioner (HDC) relating to the care provided to [Baby A] by the Bay of Plenty District Health Board (BOP DHB) in [Month8].

My name is Philip Peter Charles Moore. My qualifications include MBChB (Auckland) 1985, Diploma of Child Health (Otago) 1988 and Fellowship of the Royal Australasian College of Physicians 1993. I have worked as a paediatrician in Hawkes Bay for 25 years with extensive experience in managing newborn babies with acute emergencies such as hypoglycaemia. I have no conflicts of interest to declare.

In providing advice in this case I have reviewed the HDC Guidelines for Independent Advisers and agree to abide by them. I have reviewed the material provided to me: which includes the letter of complaint dated 27/02/18, the BOP DHB responses and a full copy of the BOP DHB clinical records.

The complaint dated 27/02/18 is wide-ranging and questions the adequacy and standard of care for both mother and baby. Many aspects of care are questioned including clinical diagnoses and decisions, communication, cultural safety and follow-up. I note that the HDC has obtained separate independent advice relating to the midwifery and obstetric management. I **will limit my advice to the issues relevant to the paediatric care provided.**

The BOP DHB response includes a detailed time-line of the care provided to [Ms A] (mother) from the time of her booking. The timeline describes a difficult pregnancy, complicated by frequent vomiting, abdominal pain, diagnosed gall stones, urinary tract infection, fetal growth concerns, maternal malnutrition and anaemia. I have reviewed the timeline in detail and cross-referenced it to the clinical notes and it is accurate. I will not include it in my response.

The BOP DHB timeline also includes the care provided to [Baby A] from birth to the time of her transfer to [DHB2]. As this covers the care I have been asked to advise on I will outline **my own detailed version of this timeline** taken from this clinical record, highlighting relevant aspects.

Timeline:

11 [Month8]

[Ms A] admitted for Induction of Labour with Prostin and later Syntocinon augmentation. Epidural placed at 2040 hrs and [Ms A] handed over to the secondary care staff.

12 [Month8]

0100 hrs IV Benzyl Penicillin given (positive Group B Strep swab at 28 weeks).

0210 hrs Commenced pushing

0322 hrs [Baby A] born, 39 week gestation female, Apgars 9 at 1 minute and 10 at 5 minutes, no resuscitation required.

0415 hrs Baby skin to skin, feeding cues noted. **0420 hrs** Baby latched and sucking for 15minutes

0440 hrs Baby weighed at 2505 gms (2–9th %ile). Length 50 cm (50th %ile) and Head Circumference 33 cm (10th %ile). Baby check completed and a full set of normal observations noted (T 36.9, Pulse 152, Resp Rate 48).

0530 hrs Initial blood sugar (2 hours and 8 minutes) 3.9 mmol/l. Vit K given.

0800 hrs Baby asleep in cot. 'Due for a feed'.

0830 hrs Second blood sugar prefeed (5 hours 8 minutes) 1.7 mmol/l (low blood sugar). Given Dextrose Gel 40%. 1.3 mls buccal (0.5 ml/kg) and 10 mls formula via cup. Paediatrics not informed.

0910 hrs Full set of normal observations

0915 hrs Third blood sugar (5 hours 53 minutes) 5.6 mmol/l. First visit from Lactation Consultant. 'Plan for three hourly feeds and blood sugars'.

1120 hrs Full set of normal observations. **Fourth blood sugar (7 hours 58 minutes)** 3.6 mmol/l. Had passed meconium.

1150 hrs Baby not latching and not showing feeding cues. Given total of 2.2 mls of Expressed Breast Milk (EBM)

1310 hrs Further 3.0 mls EBM with finger sucking. **1400 hrs** Second visit from Lactation Consultant

1535 hrs Given 1.5 mls EBM, latched and swallowed for 12 minutes. **Fifth blood sugar (12 hours 13 minutes)** 4.3 mmol/l … note: 'midway through feed as mother had independently started …'. **No further blood sugars taken.**

1915 hrs Given 3 mls EBM then latched for five minutes on left and 15 minutes on right. Passed urine. Passed meconium.

2330 hrs Given 1.5 mls EBM, would not latch, asleep at breast.

13 [Month8]

0300 hrs Baby woken, placed skin to skin, but too sleepy to latch, given 2.6 ml EBM

0545 hrs Given 2mls EBM, skin to skin, then latched for 8 minutes on right, 'fed well'.

1015 hrs Latched and sucked well on right for 10 minutes, then 6mls EBM. Passed urine and stool. Lactation Consultant visit.

1300 hrs Lactation Consultant visit. '[Ms A] managing well, requires support with breastfeeding — lactation establishing'. Given 3mls EBM, latched on right side, not on left. Passing urine and meconium.

1635 hrs Latched and fed 15 minutes

1915 hrs Latched 5 minutes, short feed — good milk transfer.

2050 hrs Latched well on left, 30 minutes, long feed — good transfer. Passed meconium.

2125 hrs Latched well on right, 15 minute, long feed — good transfer.

14 [Month8]

0030 hrs Breast feeding observed, long feed — good transfer, **transitional/changing stool.**

0120 hrs 'still feeding eagerly'.

0430 hrs Mother reported good breast feed

0745 hrs Baby awake, urine and stool, latched well and 'copious swallows heard'. Lactation Consultant visit. [Ms A] 'not sure about going home today'.

1140 Guthrie Card (Neonatal Blood Screening) taken **(56 hours of age) and posted to National testing Centre.** Breast feeding on demand with cluster feeding at times. Ongoing support for [Ms A] documented.

15 [Month8]

0135 hrs Good breast feed, changing stool again noted. Reweigh at 70 hours of age, 2360 gms **(5.7% loss since birth).** Advised and decided to remain in hospital until 16 [Month8].

Further breast feeds at 0500, 0900, 1155, 1430, 1530 … all 'long, with good transfer'. Stools now mustard colour. Hearing screening.

2330 hrs Final breastfeed of the day, no concerns noted. **Long feed ended at 0130 hrs.**

16 [Month8]

0530 hrs DHB midwife suggested to [Ms A] that it was time for baby to feed again.

0600 hrs [Ms A] rang call bell as baby 'appears floppy and difficult to rouse … not like her usual behaviour' … Sa02 99%. Had been stripped and placed skin to skin.

0615 hrs 'Only weak cry when nappy changed'. Hypothermic. Taken to Special Care Baby Unit (SCBU) in bassinette.

0625 hrs Arrived in SCBU. Hypothermic, Blood sugar 'Lo'. Heart rate slow at 70/min. Respiratory rate normal at 38/min. Sa02 normal at 95–100% in room air. Paediatrician on call ([Dr E]) contacted at home immediately. [SCBU nurse] placed [Baby A] under a radiant warmer, began continuous monitoring and gave Dextrose Gel 40% 1.25 mls buccal. Because of slow heart rate also commenced PEEP with Neopuff, then IPPV at 30–40 breaths/min. Increased FiO2 in stages to 60% as heart rate still only 80/min.

0655 hrs Blood sugar still 'Lo'.

0656 hrs [Dr E] arrived and assessed baby, noting history of intrauterine growth restriction.

0705 hrs Intravenous line inserted left hand, **given bolus of 10% dextrose** (unclear from record whether 7.5 mls or 10.0 mls stat). Bloods taken from separate venepuncture of left femoral vein.

0710 hrs Given further bolus of 10% dextrose of 2.0 mls, after which blood sugar 6.7 mmol/l. Heart rate 98/min. Resp rate 40/min. Sa02 98%. BP 81/62. Commenced infusion of 5% dextrose plus 0.9% saline at 120 ml/kg/day (delivering glucose at 4.2 mg/kg/min). Stopped IPPV.

0724 hrs [Dr E] writes clinical note, describing the events and baby's current condition. Working diagnosis was hypoglycaemia related to known growth restriction; hypotonia and lethargy were noted and on-going. A focussed and relevant physical examination is recorded. The plan was to continue IV fluids, place a nasogastric tube and observe carefully. **Antibiotics were not started at this point.**

Approx 0745 hrs Initial blood results confirmed **profound hypoglycaemia** of < 1.0 mmol/l, normal electrolytes and normal CRP of 0.9. The full blood count was normal apart from some neutrophil toxic changes. The liver function tests were normal apart from a mild conjugated hyperbilirubinaemia (bil direct 21, indirect 91).

0800 hrs Observations improving with heart rate 114/min, resp rate 42, temp increasing to 36.2°C and blood pressure normal at 102/79.

0816 hrs Initial Venous Blood Gas shows pH 7.348, PCO2 3.86 kPa, base excess — 8.2, actual bicarbonate of 15.5 … consistent with a **mild compensated metabolic acidosis.** Electrolytes were again normal and serum lactate moderately raised at 7.8.

0900 hrs Observations, including temperature, were now normal. Blood sugar 6.8 mmol/l.

1100 hrs Observations again normal. EBM commenced at 3 mls an hour by syringe. IV remains at 120 ml/kg/day. [Baby A] was weighed (different scales to previous weights) at 2250 gms **(down 10.2% on birthweight).** Baby had cuddles with parents and observations remained stable.

1200 hrs Further EBM of 3 mls given and tolerated. IV infusion rate reduced to 105 ml/kg/day (glucose infusion at 3.6 mg/kg/min).

1300 hrs Baby placed back in incubator. Stable observations and blood sugar 4.3 mmol/l. Further EBM of 3 mls given.

1400 hrs Further 3 mls EBM tolerated. Observations normal.

1510 hrs Given 4 mls EBM, observations normal but blood sugar fallen to 2.8 mmol/l. IV increased back to 120 ml/kg/day. **Baby noted to be lethargic.**

1600 hrs Further 4 mls EBM, vital signs normal but lethargy persisting.

1700 hrs Further 4 mls EBM, blood sugar 2.9 mmol/l. Lethargy persisting.

1745 hrs Paediatrician called to discuss borderline blood sugars and ongoing lethargy noted since mid-afternoon.

1810 hrs [Dr E] attended. He noted stable vital signs and lower (but still normal) blood sugar. He was concerned at the level of lethargy and thought baby was 'dry', making special note of the 10.2% weight loss. A bolus of 0.9% saline of 10 ml/kg was given and IV fluids were increased to 150 ml/kg/day. Oral feeds were withheld. A focussed physical examination is documented. Further medical history relating to [Ms A] is documented.

At this time [Dr E] **phoned the on call consultant at the [DHB2] NICU** ([Dr I]). It was agreed that the likely diagnosis was of a hypoglycaemic encephalopathy, after severe hypoglycaemia of unknown duration. Advice was given to watch carefully for seizure activity. [Dr I] did not suggest any further investigation or immediate transfer.

1926 hrs Possible seizure activity noted. [Baby A] had rhythmic hiccoughs, sighing respirations, extended neck, jaw trembling and right arm movements. Given IV Phenobarbitone loading dose of 40 mg/kg given … not documented at what time or over how long a period.

1940 hrs Baby collapsed, pale, blood stained nasal secretions. Bag and mask ventilation given.

1950 hrs Emergency call 777 sent out. Blood sugar 1.2 mmol/l. [Second paediatrician] arrived promptly to assist.

1955 hrs Endotracheal intubation (ETT), no record of anaesthetic drugs. Sa02 67%. Increased to FiO2 1.00. Ventilated with Neopuff.

1957 hrs Given bolus of 10% dextrose (notes suggests 20mls STAT, 0.8 g/kg). Repeat blood sugar 2.0 mmol/l. Heart rate 173/min, Resp rate 58/min, SaO2 now 99% (in 100% oxygen).

1959 hrs Blood sugar 14.9 mmol/l. Midazolam 0.625 mg IV given (0.25 mg/kg)

2003 hrs Midazolam 0.6 mg IV given. SaO2s now 100% in FiO2 0.55 (55% oxygen)

2011 hrs [Anaesthetist] arrived. **Baby placed on ventilator** with initial settings FiO2 0.54, Pressures 19/5, rate 60/min, Ti = 0.4.

2023 hrs Normal observations documented.

2030 hrs Chest x-ray done, ETT in right main bronchus and pulled back appropriately. Anaesthetist departed.

2040 hrs CXR repeated, **ETT now in good position.** Ventilator settings unchanged. Blood sugar now 9.0 mmol/l.

2059 hrs Second venous blood gas pH 7.048, PCO2 2.15 kPa, P02 20 kPa, BE –26.9 and Bicarb 4.2 … **consistent with a severe metabolic acidosis.** (Note: **incorrectly** entered into [laboratory] System as taken at 0905 hrs on 18 [Month8]). Previously normal liver enzyme tests now abnormal with ALT 241, AST 772. CRP still normal. Lactate very high at 16.0.

Discussed with [DHB2] NICU ([Dr I]). **'Cellular failure, Inborn Error of Metabolism'.** Suggested urgent transfer to [DHB2], bicarbonate IV and IV volume infusion.

2100 hrs Midazolam 0.5 mg IV, ? further seizures. Second IV line inserted right hand.

2110 hrs Ventilator settings Fi02 0.55, Pressures 18/6, rate 60/min. Heart rate 168/min, BP 68/47. SaO2 94%.

2120 hrs Midazolam infusion at 1 mcg/kg/min commenced. Given Bicarbonate 3 mmol diluted with 20 mls water.

2130 hrs Given Bicarbonate 4.2 mmol diluted with 25 mls of water for injection. **2145 hrs** IV Amoxycillin and Gentamycin given.

2150 hrs New IV inserted left foot. **Third blood gas** pH 7.18, BE –19.3 Bicarb **7.8 … slightly improved** but still severe metabolic acidosis. Lactate now 17.0. Electrolytes normal, blood sugar 5.2 mmol/l.

2210 hrs [DHB2] Neonatal Intensive Care retrieval team arrived. **Transported safely.**

2315 hrs (approx) On arrival in [DHB2] NICU pH 6.96, BE –23, Lactate 17. ECHO showed normal heart, cranial USS normal, blood and urine taken for metabolic investigation. Required noradrenalin infusion to support BP.

17 [Month8]

0600 hrs Lab phoned. Serum ammonia level 25754 (extremely high). Likely Urea Cycle Disorder. **Discussed with [Dr J]** (Metabolic Specialist) who noted several adverse features including profound hypoglycaemia of uncertain duration, prolonged extreme hyperammonaemia, severe acidosis and need for inotropic support of blood pressure.

After a Whānau meeting decision made to withdraw intensive care.

1230 hrs [Baby A] was extubated into the parents' arms. She continued to breathe with shallow breaths but no movements until she **died at 1810 hours.** Rest In Peace. Whānau then returned her to [their home town]. No post-mortem was arranged.

Subsequent Diagnosis:

An initial meeting was held on 04/10/17 with [Dr E], mother [Ms A], [father] and other family supporters. Condolences were expressed and blood samples requested for genetic testing overseas. A second meeting was planned, but unfortunately due to a communication breakdown, this never occurred. I understand the BOP DHB have apologised for this serious oversight.

The Whānau did meet with [Dr J] (Metabolic Disease specialist, [main centre hospital]) on 30 [Month9]. [Dr J] commented that the [local] Lab are not able to do serum ammonia levels. He was not aware of the earlier blood gas at 0816 hrs on 16 [Month8] which was only mildly acidotic. The metabolic profiles now available (from the Guthrie Card taken on 14 [Month8] and analysed a week later, and the sample taken on 17 [Month8] in [DHB2]) suggested a rare condition called multiple acyl co-A dehydrogenase deficiency (MADD). However, gene testing did not reveal a known fatty acid oxidation disorder and the search turned towards even rarer problems.

[Dr J] then wrote to [Ms A] in [Month11] to report that he suspected 'an extremely rare series of events' starting with severe maternal riboflavin deficiency secondary to malnutrition, compounded by a specific genetic defect in the SLC52A1 gene which reduces the passage of riboflavin from mother to fetus and leads to severe riboflavin deficiency in the newborn. This in turn leads to a kind of fatty acid disorder with a similar metabolic profile to MADD. **Some confirmation is awaited, but if this is the cause of disease in this case, it is one of only a handful ever reported around the world.**

It is excellent news that this can be prevented in future pregnancies with early vitamin supplementation.

Specific Questions:

1. Was there a timely escalation of care for a paediatric review following [Baby A's] birth?

The accepted standards of care for the management of neonatal hypoglycaemia in New Zealand are set out in the Auckland DHB 'Guidelines for the Management of Hypoglycaemia' and the 'Guidelines for the Investigation of Hypoglycaemia'.

[Baby A] was appropriately recognised as an at-risk baby. She was breastfed within an hour of birth, had a full set of normal observations soon after and an initial blood sugar at 2 hours and 8 minutes of age. Although slightly over the recommended 1–2 hours of age this first sugar was clearly normal at 3.9 mmol/l.

[Baby A] was then not fed until a second blood sugar was checked at 5 hours and 8 minutes. The Guideline recommends a second blood sugar at 4 hours so this is a departure from recommended care. This blood sugar was low at 1.7 mmol/l. Management of this low sugar was appropriate with dextrose gel, a formula cup feed, a full set of normal observations and a recheck of blood sugar after the interventions (risen to 5.6 mmol/l).

In my opinion the blood sugar of 1.7 mmol/l, although managed appropriately and corrected, should have resulted in a call to the Paediatric team to notify them of a baby who required monitoring. I note the Guideline indicates 'If the glucose is <2.0 mmol/l at any stage notify the paediatric service'. Notification in this case would not have led to any change in management and it is entirely reasonable to consider this hypoglycaemia was related to the intrauterine growth restriction and reduced glycogen stores expected in this situation.

The final blood sugar recorded was 4.3 mmol/l at 12 hours and 13 minutes. However, this was only 7 hours after the low sugar noted above. In my opinion, and according to the Guideline, sugars should be monitored for 'at least 12 hours **after the last low level'.**

These departures from standard of care are unlikely to have changed the outcome of this case. I view these as **minor** departures but both may have led to earlier paediatric review.

I note with approval that the Lactation Consultant was aware of [Ms A] and her baby and initially visited at 6 and then 13 hours of age. The recognised need for breast-feeding advice and support is well documented and there is good evidence that feeding, after initial challenges, progressed well (for instance, early passage of meconium, transitional stools before 48 hours of age, weight loss by Day 3 of only 5.7%, frequent wet nappies, recorded observations of latching and swallowing).

[Baby A] had a long and reportedly effective breastfeed ending at 0130 on 16 [Month8]. Four hours later the midwife woke [Ms A] to suggest it was time to feed again. Completely unexpectedly baby was 'floppy and difficult to rouse' and was cold. Transfer to SCBU was timely and appropriate with baby arriving at 0625 hours.

In my opinion, despite the minor departures noted above, the management of [Baby A] from birth to the point of admission to SCBU was of very good standard. The documentation shows a clear appreciation that this baby was at-risk and that extra

help (both in terms of staff involvement and time in hospital) was needed. Earlier referral to Paediatrics would not have changed the management or outcome.

2. Was the paediatric examination at approximately 0650 hrs on 16 [Month8] and management plan of an adequate standard?

[Baby A] arrived in SCBU at 0625 hours. The paediatrician was called at home immediately. Over the next 30 minutes the SCBU nurse provided excellent care in the circumstances; correctly diagnosing hypothermia and severe hypoglycaemia and taking steps to correct these, performing observations and providing respiratory support in view of the slow heart rate.

[Dr E] arrived at 0656 hours. This is an acceptable response time. The information he had available to him at the time was sufficient to ensure the correct initial actions were taken.

He reacted quickly to address the life-threatening issue of severe hypoglycaemia with prompt IV insertion and bolus injection of 10% dextrose. The recommended dose of 10% dextrose in this circumstance is 200mg/kg (or 2 mls/kg of 10% dextrose) which for this baby would be 5.0 mls. The notes are unclear as to whether baby received an initial 7.5 mls or 10.0 mls, followed by a further 2.0 mls 5 minutes later. In the clinical circumstances in my opinion these higher doses are understandable and acceptable.

He then correctly commenced a dextrose infusion, delivering 4.2 mg/kg/min of glucose. By 0710 hrs the blood sugar was normal, and apart from understandable low tone and lethargy, vital signs and observations were normal and reassuring. A focussed and relevant physical examination is recorded.

Further blood tests had been taken for laboratory analysis. The initial venous blood gas showed a mild compensated metabolic acidosis and moderately raised lactate. These results are in keeping with the clinical presentation including hypothermia. As a general paediatrician I would have been reassured by these results. Plans for nasogastric tube insertion and ongoing monitoring were appropriate.

The true blood sugar before intervention was profoundly low at 0.2 mmol/l. Ideally a blood sugar as low as this, which is lower than one would expect from intrauterine growth restriction alone, should be investigated with blood and urine samples taken at the time of hypoglycaemia. [Dr E], in his own response, says 'I did not take blood tests prior to giving the glucose … as any delay could have meant she would have passed away'. I agree the priority was the treatment.

In any case, most of the recommended tests one would request at the time of hypoglycaemia would not be available to the clinician for a few days and so do not change immediate management.

The only two exceptions to this are a serum ketone and serum ammonia test, both of which can be performed even after the low blood sugar is corrected.

I have already noted that serum ammonia is reportedly not a test available to the paediatricians in [the public hospital]. If it had been, and been checked earlier in the day, the nature of this disease would have been recognised sooner, leading to earlier transfer, but the outcome would not have changed.

Serum ketones should be easily available, most neonatal units have bedside analysers (as used by diabetic patients) to do this, but I cannot see evidence these were checked. In this case, with a fatty acid disorder of some kind the likely finding would be unexpectedly LOW ketone levels and that may also have prompted earlier discussion with the tertiary unit (see later recommendations).

In my opinion, the initial paediatric examination and management plan was of a good standard. Other general paediatricians working with neonates in smaller hospitals would view the interventions as timely and correct. Some paediatricians would have started antibiotics early in this admission but this could be debated.

3. The overall standard of [Baby A's] management following her deterioration at approximately 1745 hrs on 16 [Month8]?

After the initial interventions in the morning there is good clear documentation in the nursing notes. It is clear that vital signs remained stable. Her temperature normalised. Her blood sugars remained normal. As small amounts of EBM were tolerated the IV infusion was cautiously and appropriately reduced. Although in retrospect we now know that baby would have been becoming increasingly acidotic and hyperammonaemic over this time there is nothing in the records to suggest clinical indications of this and outwardly she seemed to be stable and safe.

Following this the blood sugars, although above the normal lower limit of 2.6 mmol/l, were borderline and [Baby A] was noted to be lethargic from mid-afternoon. Given a severe hypoglycaemic insult of uncertain duration this would be expected. However, it was appropriate to contact the paediatrician again at 1745 hours.

[Dr E] then attended at 1810 hours. He correctly noted the increased weight loss, the borderline but still acceptable blood sugar, the normal vital signs, reduced skin turgor and a borderline prolonged capillary refill time. He noted that baby was 'sluggish and lethargic and not responding to stimulation'. He obtained more detailed history relating to the pregnancy, and performed a good general examination. It was reasonable to diagnose dehydration and he was clearly concerned about the possible brain damage done by the hypoglycaemia.

An IV 0.9% saline bolus and increased fluid infusion rate were given. Because of the lethargy seeming to be linked in time to the oral feeds [Baby A] was again made nil by mouth. This is appropriate management.

At this point the advice of the On Call Neonatologist ([Dr I]) at [DHB2] was sought. [DHB2] provides tertiary neonatal services to [the public hospital]. In his own complaint response [Dr E] describes a 'detailed discussion' that resulted in advice to watch baby carefully for seizures and further low blood sugars but did not suggest further tests or transfer of care (see later recommendations).

In my opinion the care and response to this point is of good standard.

At 1926 hours possible seizure activity was noted. A bolus of phenobarbitone (a long-acting barbiturate) was given which is an appropriate first-line drug. The standard loading dose of phenobarbitone (as given in the Auckland DHB Guideline for the 'Management of Neonatal Seizures') is 20mg/kg loading dose by slow IV infusion over 30 minutes. The guideline continues 'if the initial 20 mg/kg dose is ineffective, additional doses of 5–10 mg/kg can be administered until the seizures have ceased or a total dose of 40 mg/kg has been given'.

In this case an initial loading dose of 40 mg/kg (88 mg) has been charted and given at the outset. The charting does not include a recommendation as to rate of administration. There is no clear documentation as to when the infusion of phenobarbitone was started, presumably soon after 1926 hours, but a nursing note timed at 1950 hours (after [Baby A] had collapsed) includes the words 'had phenybarb' (sic). This suggests a possible rapid infusion of the higher than normal initial dose of phenobarbitone.

Phenobarbitone is a central nervous system depressant drug. In very high doses it can cause apnoea, respiratory depression and hypotension. Although [Baby A] was already a very sick baby I am concerned that this aspect of her management may have contributed to her sudden deterioration at about 1940 hours.

Initial bag and mask ventilation was given and a 777 emergency call made to get extra assistance, which arrived promptly. Baby A was intubated and ventilated. Antibiotics were given.

Further low blood sugars were found and at 1957 hours a further bolus of 10% dextrose was given. The notes suggest this bolus was 20 mls in volume (800 mg/kg) which, if accurate, would be considered high by paediatricians in general. The sugar following this was high at 14.9 mmol/l and there is danger of inducing high insulin levels and sustaining a rebound fall in sugar level.

Following this, and after assessment and correction of ETT placement, the vital signs were stable but another set of blood tests alerted the team to the worsening situation and a further discussion with [DHB2] was held (see below).

In my opinion the overall standard of care from the mid-afternoon of 16 [Month8] through to this point is good, with two exceptions. In my opinion the initial dose of phenobarbitone may have contributed to the sudden collapse and the dose of dextrose given to correct the hypoglycaemia is too high. **However, in retrospect and knowing the final diagnosis in this case, I do not believe this changed the outcome and these are minor departures from standard of care.**

4. Was there a timely escalation of care to the tertiary care centre at [DHB2]?

5. The consultations with the on call neonatal consultant at [DHB2] on 16 [Month8] and the appropriateness of the advice provided?

From the timeline above and my earlier comments it was reasonable to assess that [Baby A] had stabilised after the morning interventions and had remained stable until later in the afternoon.

In my opinion the initial call to the tertiary unit at [DHB2], made soon after 1810 hours, was timely.

It is hard to comment about the nature of the consultations and the advice provided. As above, in his own complaint response [Dr E] describes a 'detailed discussion' that resulted in advice to watch baby carefully for seizures and further low blood sugars but did not suggest further tests or transfer of care.

On the other hand the handwritten contemporaneous note of this discussion is brief:

'D/W [Dr I], Markedly hypoglycaemic, Encephalopathic, watch for seizures, repeat hypoglycaemic events'.

I find it impossible to say from this what information was shared that led to the decision to continue care in [the public hospital] without further testing.

Also in his later complaint response [Dr E] indicates that he 'had contact with [Dr I] at least three times that day in the afternoon after [Baby A's] condition appeared to worsen from approximately 1800 hrs'. These later discussions are not documented.

When further blood tests were available at 2059 hrs the full magnitude of the illness was immediately recognised. There was a very severe metabolic acidosis, a very high lactate and abnormal liver function tests. These were all major changes from the mostly reassuring blood results from just over 12 hours previously.

These blood results were discussed with the [DHB2] specialist. The contemporaneous note of that consultation reads:

'D/W [Dr I]

Cellular failure

IEM (inborn error of metabolism)

Blood "plasma?"

FBC U+E

Suggested volume to help lactic acidosis

NaHCO3 2.0 ml in 20 ml water stat'

The later complaint response from [Dr E] indicates that it was also agreed during that phone call for baby to be retrieved by the [DHB2] team and transferred to the [DHB2] NICU. It is unclear whether the dose of bicarbonate and water was stipulated by [Dr I] or whether he recommended any particular type of volume replacement.

A repeat blood gas at 2200 hrs was improved after bicarbonate and fluid but remained severely abnormal.

The [DHB2] team arrived at 2210 hrs and assumed care of [Baby A].

In my opinion, although the documentation is poor, there was timely and appropriate advice sought and received. As later tests showed (e.g. extraordinarily high ammonia level and ongoing acidosis) this was an unsurvivable illness and the timing of transfer to tertiary care made no difference to the outcome.

6. Any other matters in this case that you consider warrant a comment?

Recommendations.

[Baby A] died from a rare and severe metabolic disease that could not have been prevented or predicted. This was a tragedy for her, her parents, and their whānau and friends. Although it is my opinion that her care after birth at [the public hospital] was of overall good standard, and that nothing that was done or not done contributed to her death, that is likely to be of no comfort to those who loved her.

It is important that the health service learns from tragedies. In this case I think there are a number of lessons to be learnt and possible improvements to be made. My recommendations, based on this case and my experience as a paediatrician practising in a similar environment are below …

1. The local policy regarding support of families after a baby or child dies should be reviewed to ensure that all families are appropriately followed-up, and appropriate referral made to support agencies. This is of critical importance.

2. The maternity and paediatric staff at [the public hospital] should consider a joint education session on the management of neonatal hypoglycaemia, with emphasis on the indications for paediatric notification and the recommended duration of sugar monitoring.

3. The paediatric staff should review the recommended bolus doses of 10% dextrose for low blood sugar, and of phenobarbitone for seizures.

4. Inborn Errors of Metabolism are not common but when they present it is usually unexpected and prior preparation is possible. In my unit we have premade kits that include the required blood and urine tubes, instructions as to volumes of blood required, and prefilled in request forms. This 'hypoglycaemia kit' was developed with advice from the laboratory and Starship metabolic team. When possible we use this kit for all cases of severe hypoglycaemia (< 2 mmol/l, and/or glucose requirement over 10 mg/kg/min) and when hypoglycaemia is prolonged or delayed (as in this case). I understand [the public hospital] now ha[s] a similar kit but in my experience all new staff need instruction as to how and when to use it.

5. It is my practice to discuss all babies with a blood sugar of < 0.5 mmol/l with the metabolic specialists at Starship immediately, even if the blood sugar corrects.

6. If a blood ketone analyser is not available on the [public hospital] SCBU consideration should be given to getting one. The presence of high ketones in a hypoglycaemic baby is both reassuring acutely and informative.

7. I recommend that [DHB] staff investigate whether [other smaller peripheral hospitals] have access to serum ammonia assay.

8. Many Inborn Errors are detectable on the Guthrie Screening card tests (using a Tandem Mass Spectrometer). These cards should be couriered to Auckland rather than posted.

Thank you for the privilege of reviewing this case.

Yours sincerely

Dr Philip Moore, BHB, MBChB, DCH, FRACP
Consultant Paediatrician"