

Bay of Plenty District Health Board

Registered Nurse, RN B

Registered Nurse, RN C

**A Report by the
Deputy Health and Disability Commissioner**

(Case 15HDC01330)



Health and Disability Commissioner
Te Toihau Hauora, Hauātanga

Table of contents

| | |
|--|----|
| Executive summary..... | 1 |
| Complaint and investigation | 2 |
| Information gathered during investigation..... | 3 |
| Other relevant standards | 19 |
| Opinion: Bay of Plenty District Health Board — breach | 19 |
| Opinion: RN B — breach | 23 |
| Opinion: RN C — breach | 25 |
| Opinion: Dr D — adverse comment | 26 |
| Recommendations..... | 28 |
| Follow-up actions..... | 29 |
| Appendix A: Independent nursing advice to the Commissioner | 30 |
| Appendix B: Independent paediatrics advice to the Commissioner | 40 |

Executive summary

1. In 2015, Baby A (seven days old) was admitted to a public hospital on Day 1¹ with 11% weight loss since birth, jaundice, and reduced feeding. She was treated with phototherapy on the Children’s Ward.
2. On Day 2, Baby A’s temperature spiked. The consultant paediatrician ordered investigations to try to determine the cause, and decided to commence intravenous (IV) fluids and antibiotics. Junior paediatric registrar Dr D prescribed the antibiotics and IV fluids. Dr D prescribed IV fluids at a rate of 180ml/kg/day, which was higher than the amount recommended by the Bay of Plenty District Health Board (BOPDHB) policy and other national guidelines.
3. On Day 3, registered nurse (RN) RN B cared for Baby A on the evening shift. During the shift, RN B administered Baby A’s antibiotics then recommenced the IV fluids. At about 8.30pm the IV monitor began to flash, saying that there was a “downward occlusion”. RN B and a senior nurse investigated the line and the IV site but did not find any obvious issues. RN B did not clearly document the issues she had with the IV line during the shift, nor did she hand these over to the following shift.
4. RN C took over Baby A’s care at 11.15pm but did not review Baby A for nearly two hours. At around 2.30am, Baby A was due for her next antibiotics. RN C said that there were no signs of phlebitis or infiltration when she commenced the first IV antibiotic. During the administration of the antibiotic, Baby A’s mother noted a blister forming on Baby A’s arm, and the arm immediately swelled.
5. RN C stopped the antibiotics infusing and called for assistance. Baby A was reviewed by a senior house officer and treated for an extravasation² injury. In the morning, Baby A was reviewed by the consultant paediatrician, who noted blistering and a blackened area on Baby A’s wrist. Baby A was transferred to another DHB (DHB2) for plastic surgery review.
6. The paediatric fluid balance charts from throughout Baby A’s BOPDHB admission were not filled in regularly by staff in accordance with the BOPDHB “Fluid balance chart recording standards (Paediatric)” policy.

Findings

7. Overall, it was found that there were a number of failings in the care provided to Baby A by BOPDHB: BOPDHB did not have a clear consensus on which IV fluid guidelines were to take priority; Dr D’s orientation to the IV fluid guidelines was inadequate; multiple BOPDHB staff reviewed Baby A, but did not recognise that her IV fluid prescription was too high; and multiple BOPDHB staff did not fill in Baby A’s fluid balance chart in accordance with the BOPDHB policy requirements. Cumulatively, these factors painted a picture of poor care. Accordingly, BOPDHB

¹ Relevant dates are referred to as Days 1-8 to protect privacy.

² Extravasation is the accidental administration of IV infused medication/fluid into the tissue around an IV site.

failed to ensure that services were provided to Baby A with reasonable care and skill and, as such, breached Right 4(1) of the Code of Health and Disability Services Consumers' Rights (the Code).³

8. RN B did not comply with the BOPDHB policy regarding hourly IV site monitoring and documentation; did not document an accurate description of the issues she encountered or the actions she took in response to the IV pump alarm; and did not hand over the issues she had with the IV pump to the following shift. It was found that RN B did not provide services to Baby A with reasonable care and skill and, as such, breached Right 4(1) of the Code.
9. There was a two-hour delay in RN C reviewing Baby A's IV site at the start of her shift, and RN C did not document phlebitis and infiltration scores in accordance with BOPDHB policy. It was found that RN C did not provide services to Baby A with reasonable care and skill and, as such, breached Right 4(1) of the Code.
10. Criticism was made that Dr D prescribed a rate of IV fluids that was higher than the amount recommended by guidelines.

Recommendations

11. It was recommended that BOPDHB: Establish a clear consensus on which guidelines are to be followed when prescribing IV fluid to neonates, and ensure that this is documented clearly; provide HDC with the results of its six most recent monthly audits of IV access; use this case as an anonymised case study during induction of nursing and medical staff to the Children's Ward and Special Care Baby Unit (SCBU); provide HDC with confirmation that the actions taken to meet the recommendations made in the BOPDHB internal investigations are continuing; and provide a written apology to Baby A's family.
12. It was recommended that RN B undertake an audit of her compliance with fluid balance chart recording standards, and provide a written apology to Baby A's family.
13. It was recommended that RN C provide a written apology to Baby A's family. It was also recommended that, in the event that RN C holds a nursing position in future where she is responsible for administering IV fluids to her patients, that she undertake a self-audit of the standard of her fluid balance chart documentation.

Complaint and investigation

14. The Commissioner received a complaint from Mrs A about the services provided to her infant daughter, Baby A, by Bay of Plenty District Health Board. The following issue was identified for investigation:

³ Right 4(1) of the Code states: "Every consumer has the right to have services provided with reasonable care and skill."

- *The appropriateness of the care provided to Baby A by Bay of Plenty District Health Board in 2015.*
15. The investigation was extended to include the following issues:
- *The appropriateness of the care provided to Baby A by RN C in 2015.*
 - *The appropriateness of the care provided to Baby A by RN B in 2015.*
16. This report is the opinion of Rose Wall, Deputy Commissioner, and is made in accordance with the power delegated to her by the Commissioner.
17. The parties directly involved in the investigation were:
- | | |
|-------------------------------------|-------------------------------|
| Mrs A | Complainant/consumer's mother |
| Bay of Plenty District Health Board | Provider |
| RN B | Registered nurse |
| RN C | Registered nurse |
- Also mentioned in this report:
- | | |
|------|---------------------------------|
| Dr D | Junior paediatric registrar |
| Ms E | Midwife |
| Dr F | Paediatric senior house officer |
| Dr G | Paediatric consultant |
| Dr H | Paediatric registrar |
| RN I | Registered nurse |
18. Information from ACC and DHB2 was also reviewed.
19. Independent expert advice was obtained from registered nurse Elizabeth Nevill (**Appendix A**) and paediatrician Dr Roger Tuck (**Appendix B**).

Information gathered during investigation

20. Mrs A's daughter, Baby A, was nine days old when she suffered an extravasation injury at the public hospital. Extravasation is the accidental administration of intravenous (IV) infused medication/fluid into the tissue around an IV site. Baby A suffered swelling, redness, and blisters on her arm, and had to be transferred to DHB2 for plastic surgery assessment.

Background

21. Baby A was born in 2015 weighing 3280g. On Day 1, Mrs A and Baby A (then seven days old) were seen at home by lead maternity carer (LMC) Ms E. Ms E recorded in

the postnatal notes that Baby A now weighed 2860g, had moderate jaundice,⁴ that she was a “very sleepy baby”, and that she was a poor feeder. Ms E queried whether Baby A was dehydrated. Ms E did a serum bilirubin (SBR) test,⁵ the results of which were high at 353µmol/L.⁶ Ms E telephoned the paediatric on-call team for advice, and they suggested that Baby A be brought into hospital for phototherapy.⁷

Admission to the public hospital

22. Baby A’s parents took her to the Emergency Department (ED) at the public hospital that evening. Baby A was triaged at 10pm at level three,⁸ and it was noted that she had lost weight, and had jaundice and reduced feeding. Baby A was observed by nursing staff at 11pm, 12am, and 1am.
23. Paediatric senior house officer (SHO) Dr F reviewed Baby A at midnight. He noted that Baby A had had 11% weight loss since birth. His plan included Baby A receiving breast feeds with formula top-ups if needed, and for her to be admitted for phototherapy to treat the jaundice.
24. BOPDHB noted that the public hospital has one paediatric house officer on call overnight, who covers paediatric admissions and problems that arise on the paediatric ward or in the special care baby unit (SCBU), as well as deliveries. BOPDHB noted that the shift starts at 10pm, and that a handover takes place at the start of the shift, usually lasting about 30 minutes. BOPDHB stated: “[W]e therefore do not think it was an unreasonably long wait for [Baby A] to be seen by a paediatric SHO given the time of day she presented to the hospital.” BOPDHB acknowledged that ED is not the best place for a young baby to wait, and that children’s assessment units are better suited to their needs; however, the children’s assessment unit at the public hospital is staffed only from 9am to 9pm.
25. At around 2.40am on Day 2, Baby A was admitted to the Children’s Ward, rather than to SCBU, under the care of paediatric consultant Dr G. At the time of Baby A’s admission, SCBU was at full capacity.
26. BOPDHB explained that, as Baby A was seven days old at the time of her admission, admission to SCBU would be at the discretion of the admitting paediatrician rather than an automatic admission. BOPDHB noted that babies are excluded from admission to SCBU if isolation is a priority (ie, if infection is a concern). BOPDHB considered that it was appropriate and in line with its policy “Admission of babies

⁴ Jaundice, a common condition in newborns, refers to the yellow colour of the skin and whites of the eyes, which occurs when there is too much bilirubin in the blood — the bilirubin builds up faster than the newborn’s liver can break it down and pass it from the body.

⁵ A blood test to measure levels of bilirubin. Increased levels of bilirubin indicate jaundice.

⁶ Normal range is 0–100µmol/L.

⁷ The process of using light to eliminate bilirubin in the blood.

⁸ Potentially life-threatening, potential adverse outcomes from delay > 30 minutes, or severe discomfort or distress.

from home”⁹ that Baby A was admitted to the Children’s Ward, as she had jaundice and poor feeding, which could have been a result of infection.

27. Once on the Children’s Ward, Baby A was placed in a BiliBed¹⁰ for phototherapy. Observations were taken throughout the night, and three-hourly breastfeeding was regulated by staff.
28. At about 11.50am on Day 2, Baby A’s temperature spiked to 39°C.¹¹ Dr G ordered a septic screen, which included a number of investigations (lumbar puncture, urine screening, chest x-ray, and blood tests), to try to determine the cause. Dr G stated that during the septic screen, Baby A had four episodes of apnoea (periods of not breathing) and, owing to concern that she was becoming unwell, the decision was made to start IV fluids. Following the septic screen, Dr D prescribed two types of IV antibiotics (cefotaxime and amoxicillin) to be administered four hourly, and IV fluids at 180ml/kg/day (21ml/kg/hr) dextrose 10%.¹² At the time of Baby A’s admission, Dr D was working in her first position as a junior paediatric registrar.
29. The BOPDHB policy “Fluid balance chart recording standards (Paediatric)”¹³ (set out in detail at the end of this section of the report) states that the daily fluid allowance for maintenance IV fluid therapy, for a child weighing between three and ten kilograms, is 100ml/kg/day, or 4ml/kg/hour. The rate in the BOPDHB policy was consistent with the Starship¹⁴ Clinical Guideline “Intravenous Fluids” (the Starship Guideline) that was in place at the time of these events. The Starship Guideline is referenced in the BOPDHB policy.
30. Dr D told HDC that she recalls checking the type of IV fluids required, but not the rate, with Dr G. Dr D stated that her normal practice is to check both, given that the decision was made by Dr G on the consultant ward round, and she regrets that she did not follow her usual practice on this occasion.
31. Mrs A and Baby A were moved to a room closer to the reception area so that staff could monitor them more closely. At 8.30pm on Day 2, Baby A was reviewed by paediatric registrar Dr H, and then reviewed twice overnight by senior house officer Dr F.
32. At 11am on Day 3, Dr G reviewed Baby A on her consultant ward round with Dr D. Dr D recorded that the septic screen was negative, and planned to continue IV antibiotics for 48 hours, continue IV fluids, repeat a serum bilirubin test, and maintain a fluid balance chart.

⁹ Issued October 2014.

¹⁰ A special bed with a light in it that provides phototherapy to the baby.

¹¹ A normal body temperature for babies is around 37°C.

¹² Dextrose is a form of glucose (sugar).

¹³ Issued March 2015.

¹⁴ Starship Children’s Health is Auckland District Health Board’s dedicated paediatric healthcare service, and is a major teaching centre.

33. At 12pm on Day 3, an RN documented that the phlebitis¹⁵ score on Baby A's fluid balance chart was "1", meaning that there was slight pain or redness near the IV site. This was one of only two times on which a phlebitis score was recorded throughout Baby A's admission (the first was at 8am that morning when the score was "0", meaning that there were no signs of phlebitis).
34. The "Fluid balance chart recording standards (Paediatric)" policy states that phlebitis and infiltration¹⁶ scores are to be recorded hourly, the IV pump reading and volume infused each hour is to be recorded hourly, and the child's weight is to be recorded daily.
35. At 3.15pm on Day 3, the RN noted that the IV fluids continued at 21ml/kg/hr. She queried whether to "titrate [the fluids] ↓ to 1/2 maintenance" (ie, reduce the amount of IV fluids) to encourage efficient breast feeds. No action was taken in response to this query.

Evening shift

36. RN B cared for Baby A on the evening shift, which began at 3.30pm and finished at 11.15pm. RN B saw Baby A regularly throughout her shift, and documented Baby A's observations and/or fluid intake at 4.30pm, 5.20pm, 6pm, 7.50pm, 8pm, 9.15pm, and 10pm.
37. RN B said that she flushed the IV line¹⁷ before administering Baby A's first dose of antibiotics at 8.25pm, then flushed the line again before commencing the second dose of antibiotics at 8.30pm. She said that she flushed the line a further time before recommencing IV fluids. At that time, the IV monitor began to flash saying that there was a "downward occlusion".¹⁸ RN B said that she checked the line and there were no obvious issues, and she increased surveillance of the cannula,¹⁹ as she wondered whether it was "tissuing" (ie, whether extravasation was occurring).
38. RN B told HDC that there was no obvious redness or swelling. She said that she asked for assistance from a senior nurse and shift coordinator RN I, and they both flushed and checked the line again. RN I stated:

"I spent much of the shift in [Baby A's] room supporting [RN B] due to the level of input she was needing. There were some issues with her IV luer occluding with fluid and antibiotic infusions. This is not abnormal with IV infusions in neonates. Due to her ongoing IV requirements we were doing our best to maintain the IV luer, so it was unwrapped and examined closely by myself and [RN B]. It appeared to be patent and there were no signs of infiltration or phlebitis. We

¹⁵ Inflammation of a vein.

¹⁶ Infiltration occurs when IV fluid or medication accidentally enters the surrounding tissue rather than the vein.

¹⁷ A saline flush is the method of clearing IV lines of any medicine or other perishable liquids to keep the lines (tubes) and entry area clean and sterile.

¹⁸ The monitor will display "downward occlusion" if it is detecting increased pressure possibly caused by a blockage or kink in the IV line.

¹⁹ A thin tube inserted into the body to administer medication or fluid.

monitored it very closely and both agreed that it was ok to continue using. I have previously worked in NICU environments and cared for very small neonates with IV luers and I am very experienced at identifying a luer that needs to be removed. During the course of this shift I did not see any signs that the IV needed to be removed at all. Both [RN B] and I were in and out of the room regularly checking the baby, her IV luer, and trying to reassure the mother, who was very tired and stressed. [Baby A] was unsettled for much of the shift, but this appeared to me to be normal crying that is consistent with a baby being treated for sepsis.”

39. RN B said that she and RN I put Micropore tape and gauze on Baby A’s lower hand to support the cannula. RN B noted that Baby A was knocking her arm against her face, which made her query whether the line had been knocked. RN B made no clinical notes regarding the monitor alarming, or the re-taping of the IV site.
40. Mrs A said that during that evening, Baby A became extremely agitated and appeared to be in considerable pain, and that this was a marked change from her unwell/exhausted state from being jaundiced. RN B stated that Baby A did get unsettled when her blankets were unwrapped, and she became upset during observations. However, she noted that this is not abnormal in small babies.
41. Mrs A said that she requested paracetamol for Baby A from RN B, and the nurse’s response and body language made her feel that this was an inconvenience. RN B said that she text-paged Dr H to chart paracetamol for Baby A. RN B stated: “As I was unable to do a phone order or standing order due to the age of the baby I had to wait for the [doctor] to arrive on the ward and assess the baby.”
42. Mrs A told HDC that the pump continued to alarm and read “downward occlusion”, and that Baby A became more and more distressed throughout the evening. RN B stated that she asked Mrs A to ensure that Baby A’s arm was kept as straight as possible to avoid kinks in the cannula, and to be aware of the line when handling Baby A. RN B said: “[T]he pump would work for a time [and] stop beeping, however I recall at the time we had to go in often to check ... what we believed to be kinks in the line due to the baby’s movements.”
43. At 9.30pm, Baby A was reviewed by Dr H, who noted that the jaundice had improved compared to the previous day, and that Baby A was “much brighter in herself, waking more frequently”. Baby A was taken off the BiliBed as her bilirubin levels improved. RN B stated that Mrs A did not make further mention of her request for paracetamol to herself or Dr H. RN B said: “[R]egrettably I did not mention it again to the [doctor].”
44. RN B said that from roughly 10pm there were no further issues with the IV line, and she did not return to Baby A’s room again after 10pm. She stated: “[A]s I had no further line issues I believed the issue had been resolved.”
45. At 11pm, RN B completed her clinical notes. She recorded that Baby A appeared more awake. RN B also recorded: “IVAB x 2 line getting stiff/positional.” She stated: “I regret I did not document further the issues I had with the line during the shift ... If

I had correctly documented on the fluid balance chart the phlebitis score would have been 1 (increased surveillance) and 0 for infiltration.”

46. The BOPDHB investigation (detailed further below) found that “[t]here was no bedside handover to the night nurse but that [RN B] thought [RN I] could have passed on the details. When questioned about this [RN B] acknowledged that it wasn’t [RN I’s] responsibility to do so.”
47. RN B stated: “Upon my assessment [the issues with the IV line] had been resolved, although regrettably I did not hand this over personally to the night shift.” RN B said that it would be extremely unusual to do a bedside handover for every patient, owing to the time this would take. She noted that a handover occurs in a room from the shift coordinator to the night shift staff, and that the computer (BOPDHB software) reports that nurses have completed, are handed over. The report for Baby A does not reference the issues with the IV line. RN B was not present at the handover meeting, and cannot recall what she handed over to RN I (the shift coordinator) to present, but considered that it would not have been unreasonable for him to mention the issues with Baby A’s IV line, owing to his involvement in her care.

Night shift

48. RN C told HDC that she took over Baby A’s care at 11.15pm, but because the ward was extremely busy, it was not until 1.00am on Day 4 that she went into Baby A’s room and first saw the IV luer. RN C stated that IV fluids were infusing at this time, and that she removed the bandage to look at Baby A’s hand and arm. RN C said that there were no signs of phlebitis or infiltration at that time. She recorded that she had received Baby A “alert warm + well perfused”,²⁰ but that initially Baby A was a little unsettled, and became more unsettled later in the shift.

Extravasation injury

49. At around 2.30am on Day 4, Baby A was due for her next antibiotics. Mrs A said that Baby A was still not asleep, and was whimpering and screaming as she had been for the past six hours.
50. RN C said that she went back into the room to administer Baby A’s antibiotics, and that she checked the “top, bottom and sides of [Baby A’s] hand and her whole arm to check for any signs of phlebitis or infiltration, of which there were no signs”. RN C said that the IV antibiotics were infused via a pump, and there was a neonatal filter attached to the IV luer, and gauze in place to help with stability and protection. RN C said that she used alcohol swabs and flushed the line per BOPDHB protocol (and there was no resistance) before commencing the first IV antibiotic (cefotaxime).
51. Mrs A said that once Baby A had been given her first dose of antibiotics:

“I noticed a blister on [Baby A’s] arm above the IV bandage, rapidly followed by further blistering and immediate swelling of her entire arm. I yelled at the nurse to

²⁰ To “perfuse” is to supply liquid to an organ or tissue.

draw attention to the blistering and swelling and she pressed the staff assist button to get help.”

52. RN C said that she immediately turned on the lights and saw that Baby A’s upper arm was swollen. She then removed a blanket covering Baby A’s lower arm, noted that it was swollen and red, and immediately stopped the IV antibiotics infusing and pressed the staff assist call button.
53. RN C said that another RN came in to assist, and she held Baby A while RN C cut the tape that was holding a board (for stability) under Baby A’s arm. Around this time, RN C recalls Mrs A saying: “It’s getting worse, it’s getting worse.” RN C said that the tape took 3–4 minutes to cut off as it was taped closely.
54. Dr F arrived to assist while the tape was being cut off. Once the tape was removed, the IV luer was taken out. Dr F noted that there was evidence of significant extravasation into soft tissue. He recorded that Mrs A had told him that Baby A had been unsettled for several hours. He recommended paracetamol, elevating the arm if possible, using a cooling compression, and monitoring for signs of necrosis.²¹ He discussed this management plan with the on-call paediatrician.
55. RN C filled in a reportable event form. She documented:

“When mum noticed some swelling in upper arm, I immediately turned on the lights and saw that there was lots of swelling on the upper arm and the upper arm was quite red looking, I removed blankets that were covering pt’s [patient’s] lower arm and saw the lower arm was also swollen and red. I then stopped IVAB’s immediately, rung staff assist ([another RN] came in) in which she helped me remove IVL, and [Dr F] SHO also came in to see pt’s arm and reviewed her. We elevated her arm & used cooling cares (cold cloths) on her arm (elevation & cooling cares to arm has continued over the night shift). The arm was swollen (lower and upper arm) and there was redness/erythema²² and blisters — biggest blister on top of hand, smaller blisters in ACF area. Pamol²³ was also given to help settle baby as she was distressed ++ Support and reassurance given to Mum +++ Photos taken (will give to [ward nurse manager] CNM). Obs have remained stable since the incident and afebrile.²⁴ It does appear that redness and swelling has started to decrease (0700hrs — [Day 4]).”

56. Mrs A said that the medical staff told her to observe Baby A’s arm for changes, and to keep it elevated and use a cool flannel to reduce the swelling. Mrs A said that the staff were “incredibly casual about what had just happened and didn’t give it any more attention”. She said that a nurse popped in every hour or so to check on Baby A’s arm, with no further action.

²¹ Death of body tissue.

²² Redness of the skin caused by increased blood flow.

²³ Paracetamol.

²⁴ Without fever.

57. RN C told HDC that she stayed with Baby A and her mother for an hour after the incident, and that Baby A was very unsettled at this time but settled after about an hour. RN C said that Baby A's arm was elevated right through the shift, and that cooling cares were stopped after about two hours. RN C said: "I told [Mrs A] that I would continue to be in and out of the room to monitor [Baby A] and her arm every 5–10 minutes which I did do ... I continued to reassure mum throughout the rest of the shift." RN C documented in the clinical notes that Baby A's observations continued to be stable.
58. RN C said that the last time she looked at Baby A's arm was at 7am, and at that time there were no signs of necrosis, the blisters had not worsened, and the swelling and redness appeared to have decreased.

Morning shift

59. Around mid-morning, Dr G and the ward nurse manager came to see Mrs A and Baby A. Mrs A told HDC that both staff said to her and other family members who were present that the injury should never have happened and it was entirely staff error.
60. Dr G recorded that when she reviewed Baby A, her left arm was swollen and she had yellow blisters — one at the elbow, a few on the forearm, and a 1cm x 2cm blackened area on her wrist, which Dr G queried as being necrotic or bruised.
61. Dr G telephoned the plastic surgery team at DHB2 and sent photos of Baby A's injury, and it was arranged for Baby A to be transferred there to be reviewed. Dr G also contacted a paediatrician at DHB2, who was happy to accept Baby A's care.
62. Dr G recorded in the clinical notes, "I have apologised for this truly awful event," and noted that an ACC form was to be completed for medical misadventure (treatment injury).

Documentation

63. The paediatric fluid balance charts from throughout Baby A's admission were not filled in regularly in accordance with the "Fluid balance chart recording standards (Paediatric)" policy. Baby A's weight was not recorded daily. Infiltration scores were never recorded, and the phlebitis score was recorded only twice.

Transfer to DHB2

64. Mrs A and Baby A were transferred by ambulance to the newborn intensive care unit (NICU) at DHB2 mid-afternoon on Day 4. Upon arrival, the plastic surgery team was consulted. The plastic surgery registrar reviewed Baby A's injury and recorded in the clinical notes:

"L arm — necrotic area over dorsum of wrist
blisters over flexor surface of elbow
compartments soft
hand warm + well-perfused, [capillary refill time less than 3 seconds]
Good radial pulse
[Impression] extravasation injury, no evidence of compartment syndrome."

65. The plan was to continue dressings and elevation of the arm. Baby A received some further treatment on a BiliBed for her jaundiced appearance. On the morning of Day 5, Baby A was reviewed by a consultant plastic surgeon who noted that the swelling of her arm continued to improve and that the plastic surgery team was happy for Baby A to be discharged if her bilirubin levels were satisfactory and the paediatrics team agreed.
66. Mrs A said that the care they received in NICU was “incredible”, they were monitored around the clock, and she and her husband were provided with a bed down the hall from NICU.
67. Baby A was discharged on Day 6 with a plan for follow-up with Dr G the following day in the paediatric outpatient department.
68. Dr G reviewed Baby A on Day 7. Dr G noted that there were ongoing concerns regarding Baby A’s weight, and arranged a lactation consultant review. Dr G also noted that Baby A’s wound was healing well, and discussed the ongoing management of the wound with the on-call plastics registrar. Dr G told HDC that the registrar suggested leaving on the dressing that was in place for another two days, with daily review of the wound, then changing the dressing type to Jelonet (a low adherent dressing that allows the wound to drain freely into an absorbent second dressing). Dr G made a referral to the district nursing service that day.

Follow-up care

69. Baby A then received care from the BOPDHB district nurses for her wound dressings.

Further information

Dr G

70. Dr G told HDC that she acknowledged that Baby A’s IV fluids should have been discontinued earlier, as soon as her condition improved enough that she could have had breastfeeds with nasogastric²⁵ supplementation.
71. Dr G also acknowledged that the maximum rate of fluids for Baby A should have been 100ml/kg/day rather than 180ml/kg/day, which was prescribed by Dr D. Dr G noted that Dr D was in her first year of paediatric training at the time of these events. Dr G stated:

“It is not uncommon for junior staff to become confused with regard to fluid requirements in a neonate given there are different guidelines for fluid management that are followed at the public hospital (from Starship Hospital and National Women’s Hospital).²⁶ There were a number of doctors and nurses who

²⁵ A nasogastric tube is a plastic tube inserted in the nose, used for nutritional supplementation.

²⁶ National Women’s Hospital is part of Auckland District Health Board and provides health services for women who need maternity, gynaecology or fertility care. It also provides care to newborn babies. The “Newborn Services Clinical Guideline (January 2007)” states that the recommended volume of IV fluid for newborn babies who are seven days old or more is 150ml/kg/day. The guideline notes that babies admitted to Starship Hospital should be prescribed fluids according to the Starship Guidelines.

reviewed the fluids. The error with the fluid calculation was not identified. I believe this is a systems error.”

72. Dr G stated that Dr D was a competent doctor who asked her advice when she was not sure what to do. Dr G said that she did not discuss the rate of fluid with Dr D, as she assumed Dr D was confident with this.
73. Dr G said that she has been involved in teaching junior doctors and nurses about the risks of IV fluids in small babies, and wherever possible she has been using nasogastric fluids, even in older children.

Dr D

74. Dr D noted that it is unclear between the Starship Guideline and the National Women’s Hospital guidelines at what age to switch from 100–150ml/kg/day total fluids to limiting fluids to 100ml/kg/day intravenously. However, she noted that the Starship Guideline states that children with fever or under a radiant heater often need more fluid. Dr D considered that, as Baby A had a greater fluid requirement given her fever, jaundice, and receiving phototherapy, it would have been reasonable to prescribe fluids at a rate of 120–150ml/kg/day. However, Dr D acknowledged that prescribing fluids at a rate of 180ml/kg/day was an error, and she stated that it was possible that she was confused about the guidelines in regard to Baby A’s requirements.
75. Dr D told HDC that she has since changed her practice to limiting IV fluids to 100ml/kg/day for an infant under 10 kilograms, and gives any supplemental fluids, if required, via a nasogastric tube with daily monitoring of the serum electrolytes while on IV fluids.
76. Dr D stated: “I would like to apologise to [Baby A’s] family for charting the wrong rate of intravenous fluids. I wish her a full recovery from the extravasation injury.”
77. Regarding her orientation, Dr D recalls that she was sent an orientation handbook just prior to starting with the paediatric department. She does not believe that she specifically received any orientation regarding IV fluids other than the handbook. Dr G said that when Dr D started as an SHO with the paediatric team, the teaching was more “ad hoc” than it is currently.

RN B

78. RN B acknowledged that her documentation during her shift was poor. She stated: “[T]here is no other way to put this other than I did not follow hospital policy.” However, RN B also said: “I was checking this baby frequently including arm luer assessment and infiltration risks, knowing full well the higher rate of extravasation injury in neonates.” She stated: “If I felt there was any obvious tissing I would not hesitate to remove the line as an experienced paediatric nurse.”
79. RN B acknowledged that the IV fluid rate of 21ml/hr was high, but she noted that this had been assessed on the consultant ward round, and so she complied with the amount prescribed.

80. RN B noted that during her shift the ward was extremely busy. She stated: “[U]nfortunately [the computer system] did not reflect how busy we were.”
81. RN B told HDC that she had just returned from leave the previous week. She stated that the fluid balance form and observation charts had been changed while she was on leave. She also noted that a family member was sick during the shift on which she was looking after Baby A, and her husband had called to ask if she could come home. RN B said that she felt that she would be leaving her colleagues in a difficult situation given how busy the ward was, so she decided to stay.
82. RN B said that, as a result of this case, she is extremely careful to write down all interventions and record fluid balance chart documentation accurately, including phlebitis and infiltration scores. She said that she now escalates issues promptly and is comfortable seeking assistance from the duty manager.
83. RN B stated:
- “I would like to take this opportunity to formally apologise to the family and [Baby A] for my part in this incident ... Rest assured I have learnt a lot from this incident and I truly believe this will not occur again, not only for me but the rest of my colleagues. All have learnt a valuable lesson about neonatal infiltration risks and the need for clear and concise documentation.”

RN I

84. RN I stated:
- “The shift in question was very busy and we had a number of patients requiring lots of nursing input. [RN B] was the RN looking after [Baby A], as well as caring for the rest of her heavy workload ... Never during this shift did I observe anything that indicated to me that there may be a problem with the IV luer. [RN B] was very attentive in looking after the baby and communicating with the mother what was going on and reassuring her. The level of care she provided for the baby and her family was highly appropriate and professional, especially given the acuity of the ward that evening.”

RN C

85. RN C acknowledged that she had not completed all of the required documentation for IV management as per BOPDHB protocol.
86. RN C also acknowledged that she did not recognise that the prescribed fluid amount for Baby A was incorrect. However, she noted that the fluids had been running since midday the day before the incident, and that these had been directed by the paediatric consultant.
87. RN C stated that she has made the following changes to her practice as a result of this incident:

- “• I ensure that I always complete the required documentation and that is completed accurately such as the IV management documentation.
 - If it is a busy shift (as this particular shift was) and I am getting behind in my work, I do not hesitate to delegate nursing tasks to other nurses.
 - I am now more vigilant with checking the correct dose per [kilogram] for [medications] and IV fluids, even if it has already been infusing before I have taken over from the previous shift/nurse.
 - I re-did my IV certification with the Nurse Educator for the Children’s Ward post the incident occurring.
 - I did my own research at home into extravasation injuries and IV management especially in neonates.
 - I attended available study days with a focus on IV management.
 - I educated other RNs on the ward about IV management (including neonates) and the importance of following protocols and procedures.”
88. RN C stated: “I have spent many hours reflecting on what happened and have made changes to my nursing practice. I have also been pro-active and done some self-directed professional development around this subject.”

BOPDHB

89. On 31 August 2015, BOPDHB representatives met with Mr and Mrs A to discuss the incident, and a follow-up letter was sent after the meeting, which included an apology.
90. Dr G explained that SMOs at the public hospital have always specifically educated the junior staff around using either the Starship Guideline, or the National Women’s clinical guidelines, depending on the clinical scenario. Dr G stated that in some cases they would refer to the Royal Children’s Hospital Melbourne guidelines if there was no guideline available on the Starship or National Women’s websites. Dr G told HDC that the paediatrics team is consistent in the use of the guidelines.
91. Dr G noted that there is ongoing controversy around fluid management in children. She said that the Starship Guideline regarding intravenous fluids was updated recently, with the recommendations being for smaller volumes of fluid than BOPDHB has used in the past. Dr G noted that the Starship and National Women’s guidelines are not consistent regarding when they should be used (particularly regarding when babies are admitted to SCBU), and that this can cause confusion.

Internal investigation

92. On 10 September 2015, the reportable event form was updated to state: “[D]ue to the severity of this event the event is being investigated at an organisational level.” The ward nurse manager was assigned as the investigator, and she completed an analysis of practice against policy. This identified individual performance issues, which led to further investigation into the actions of RN B and RN C (detailed further below). The findings of the analysis included:

1. Information obtained from BOPDHB software suggests that the nursing workloads were manageable during the evening and night shifts of Day 3.
2. Evidence of breaches of BOPDHB policy documents — in particular, regarding the consistency of expected hourly IV luer assessments and documentation.
3. On the evening shift of Day 3 there is a lack of clarity/documentation as to nursing assessments and the management of the IV luer. This relates to both the clinical notes and the fluid balance chart.

BOPDHB investigation — RN B

93. Following the analysis, BOPDHB undertook an investigation into allegations of inadequate care regarding RN B. Its findings included:
 - a) RN B did not check the IV site after 10pm (on Day 3).
 - b) RN B did not document in the clinical notes any information on the issue with the IV pump, nor was this information passed on to the night nurse in a handover. There was no documentation of the nursing actions or interventions that RN B performed.
 - c) Although RN B maintains that she checked the IV line and site regularly, there is no documentation to support this.
94. The investigation concluded that DHB policies were breached, and that there were issues with the care provided. A number of recommendations specific to RN B were made, including that her practice be monitored for a period of six months.

BOPDHB investigation — RN C

95. Following the analysis, BOPDHB also undertook an investigation into allegations of inadequate care regarding RN C. Its findings included:
 - a) RN C did not check the IV luer until 1.30am (on Day 4).
 - b) The reference to a “stiff line” made in the clinical notes (by RN B) was not clear or relevant to the actual issues encountered on the previous shift.
 - c) Although RN C maintains that she checked the IV line and site regularly, there is no documentation to support this.
96. The investigation concluded that DHB policies were breached, and that there were issues with the care provided. A number of recommendations specific to RN C were made, including that her practice be monitored for a period of six months.

Changes made

97. Numerous recommendations were made as a result of the BOPDHB internal investigations completed in October 2015. The following actions have been taken to meet those recommendations:
 - a) All nursing staff were emailed and advised to read the paediatric fluid balance protocol and to sign that they had done so on a provided sign-off sheet.

- b) Additional communication regarding the management of IV luers and fluid balance charts was made to staff via the staff communication book.
- c) Nursing handovers were used as a further forum to discuss this incident. A marked improvement in the IV access form being completed was noted, and the fluid balance charts are being completed correctly (notably in the infiltration/phlebitis column).
- d) All paediatric nursing staff have had recent education regarding their professional responsibilities pertaining to accurate clinical assessments and documentation.
- e) The Paediatric Fluid Balance Chart Recording Standards Protocol was presented in a session at the paediatric study day.
- f) The Children's Ward now undertakes a monthly audit of IV access — in particular, use of the IV access form, patient label, date of insertion, location of IV luer, documentation of phlebitis score, whether the dressing is secure and intact, and whether an IV extension has been used.
- g) As a direct result of this incident, the paediatric nurse educator has developed an information sheet of safe practice guidelines for staff on securing paediatric IV luers.
- h) A video has been made to educate staff about inserting IV cannulas and the best way to secure the lines to allow adequate nursing cares. This video is available on YouTube and is available as a link on the desktops of the computers in the ED and the Children's Ward.
- i) Since this event, the handbook given to house officers before they start their paediatric training has been updated. The handbook states that “it is expected that RMOs, at the beginning of their run, will familiarise themselves with appropriate guidelines”, and gives details on where to find the Starship Guideline, the Royal Melbourne Children's Hospital Guidelines, and other resources.
- j) A formal teaching session on the use of IV fluids in children is now being given to SHOs every six months by a consultant.

BOPDHB policies

98. The BOPDHB policy “Fluid balance chart recording standards (Paediatric)”, issued March 2015, states:

“Standards to be met: ...

- 1. Start of shift
 - At 8am zero IV volumetric infusion pump readings
 - Total previous 24 hour entries and enter balance on new chart
 - At 8am commence new 24 hour chart ...
- 2. Hourly — as close to hour as possible
 - Record phlebitis score and infiltration score

- Each hour record on the same row of the chart: pump reading, volume infused, and cumulative totals (you are recording what has been administered during the previous hour) ...
- 3. Four (4) hourly
 - Input, output and balance should be evaluated, more often if clinically indicated ...

Standards for documentation of fluid balance: ...

- For patients on continuous IV fluids, **input should be recorded hourly (ideally on the hour or as close to the hour as possible)** — this includes recording a site score ...
- All children (<2 years) and those on [IV] fluids must be on a Fluid Balance record ...
- All children on IV fluids should be weighed prior to the commencement of therapy, then daily.
- All infants <2 years require a daily weigh
- Weigh nappies post use to attain an accurate fluid output ...

Maintenance IV Fluid Therapy

| Weight | Daily Fluid Allowance | Hourly Rate |
|---------|-----------------------|-------------|
| 3–10kg | 100ml/kg | 4ml/kg/hour |
| 10–20kg | 50ml/kg | 2ml/kg/hour |

...

Phlebitis score:

| | | |
|---|----------|---|
| IV site appears healthy | 0 | No signs of phlebitis Observe cannula |
| ONE of the following is evident: <ul style="list-style-type: none"> • Slight pain near IV site or • Slight redness near IV site | 1 | Possibly first signs of phlebitis Observe cannula |
| TWO of the following are evident: <ul style="list-style-type: none"> • Pain at IV site • Erythema • Swelling | 2 | Early stage of phlebitis Resite cannula |
| ALL of the following signs are evident: <ul style="list-style-type: none"> • Pain along the path of the cannula • Erythema • Induration (hardening of soft tissue) | 3 | Medium stage of phlebitis Remove cannula Consider treatment |
| ALL of the following are evident and extensive: <ul style="list-style-type: none"> • Pain along the path of the cannula • Erythema • Induration (hardening of soft tissue) • Palpable venous cord | 4 | Advanced stage of phlebitis Initiate treatment Resite cannula |

Infiltration score:

| 0 | 1 | 2 | 3 | 4 |
|-------------|--|---|---|---|
| No symptoms | Skin blanched Oedema <2.5cm in any direction Cool to — touch With or without pain | Skin blanched Oedema 2.5cm to 15cm in any direction Cool to touch With or without pain | Skin blanched, translucent Gross oedema >15cm in any direction Cool to touch Mild or moderate pain | Skin blanched, translucent Skin tight, leaking Skin discoloured, bruised, swollen Gross oedema >15cm in any direction Deep pitting tissue oedema Circulatory impairment Moderate to severe pain Infiltration of any amount of blood product, irritant or vesicant” |

99. The BOPDHB policy “Shared Expectations (Code of Conduct)”, issued July 2013, states:

“Principle Four: Diligence

Employees are required to

- Work safely and to the best of their ability
- Maintain and improve their knowledge and skills, with the support of their manager
- Avoid conduct that could bring BOPDHB into disrepute.”

100. The BOPDHB policy “Care delivery — Team nursing guidelines”, issued October 2014, states:

“3. Communication

The key indicator that a service is delivering team nursing is the communication strategies used at the commencement, throughout, and on the completion of each shift.

3.1 Commencement of shift

a) a brief handover of all patients, including expected admissions, occurs with all team members. This may include a review of handover list with identification of key risks ...

3.2 Bedside handover

a) a more complete handover occurs with oncoming staff visually assessing the patient and receiving a 1:1 handover of more in-depth information at the patient bedside.”

Responses to the provisional opinion

101. In response to the “information gathered” section of my provisional decision, Mrs A explained the damage that this unfortunate event has caused her personally and the profound impact that the experience had on herself, her husband and her other children.
102. BOPDHB, RN B, RN C, and Dr D had no comments to make in response to my provisional decision. RN C told HDC that she is no longer working at BOPDHB, and now works in a different area of nursing. Dr D is no longer working at BOPDHB.

Other relevant standards

103. The Nursing Council of New Zealand Code of Conduct for Nurses (June 2012) states:

“**Principle 4** Maintain health consumer trust by providing safe and competent care

Standards

4.1 Use appropriate care and skill when assessing the health needs of health consumers, planning, implementing and evaluating their care ...

4.7 Deliver care based on best available evidence and best practice.

4.8 Keep clear and accurate records ...

Guidance: Documentation

Keep clear and accurate records of the discussion you have, the assessments you make, the care and medicines you give, and how effective these have been.”

Opinion: Bay of Plenty District Health Board — breach

Introduction

104. BOPDHB and the staff involved in Baby A’s care had a responsibility to ensure that services were provided to her with reasonable care and skill. District health boards are responsible for the operation of clinical services they provide within hospitals, and can be held responsible for any service-level failures. While the individuals who provided care to Baby A bear some responsibility for the deficiencies in the care provided to Baby A, I consider that there were deficiencies arising from systemic issues at the public hospital.

Admission to Children's Ward

105. Baby A presented to the ED at the public hospital at 10pm on Day 1. She was observed regularly by nursing staff, and was reviewed by Dr F at midnight, then admitted to the Children's Ward at 2.40am on Day 2.
106. My expert advisor, paediatrician Dr Roger Tuck, observed that Baby A waited for a long time in ED before admission, and that the admission of newborns to general children's wards is mostly not ideal. He stated:

“There have been longstanding concerns about admitting newborns from the community back into newborn units, but in my opinion it is best to place even a potentially septic neonate from the community back into a newborn unit where they can be effectively isolated, than onto a busy children's ward.”
107. BOPDHB acknowledged that ED is not the best place for a young baby to wait, and that children's assessment units are better suited to their needs. However, the children's assessment unit at the public hospital is staffed only from 9am to 9pm. At the time of Baby A's admission, SCBU was full. BOPDHB noted that babies are excluded from admission to SCBU if isolation is a priority (ie, if infection is a concern). BOPDHB considered that it was appropriate and in line with its policy that Baby A was admitted to the Children's Ward, as she had jaundice and poor feeding, which could have been a result of infection.
108. While I acknowledge Dr Tuck's comments, I am satisfied that in Baby A's presenting circumstances it was appropriate for her to wait in the ED, as the children's assessment unit was unstaffed at the time. I am also satisfied that the decision to admit Baby A to the Children's Ward rather than SCBU was appropriate, as it was in line with BOPDHB policy, and there were no beds available in SCBU at that time. Although Baby A's admission to the Children's Ward could have been more timely, she was reviewed regularly in the ED. Accordingly, I am not critical of this aspect of Baby A's care.

IV fluid prescription and guidelines

109. At about 11.50am on Day 2, Baby A's temperature spiked to 39°C. Dr G ordered a septic screen and decided to start Baby A on IV fluids. Following the septic screen, Dr D prescribed Baby A IV fluids at 180ml/kg/day (21ml/kg/hr). At the time of Baby A's admission, Dr D was working in her first position as a junior paediatric registrar.
110. The BOPDHB policy “Fluid balance chart recording standards (Paediatric)” states that the daily fluid allowance for maintenance IV fluid therapy, for a child weighing between three and ten kilograms, is 100ml/kg/day, or 4ml/kg/hour. The rate in the BOPDHB policy was consistent with the Starship Guideline that was in place at the time of these events, but different from the National Women's Hospital “Newborn Services Clinical Guideline”.
111. Dr D noted that it is unclear between the Starship Guideline and the National Women's Hospital guideline at what age to switch from 100–150ml/kg/day total fluids to limiting fluids to 100ml/kg/day intravenously. However, Dr D accepts that

prescribing fluids at a rate of 180ml/kg/day was an error, and she stated that it is possible that she was confused about the guidelines in regard to Baby A's requirements.

112. Dr G stated:

“It is not uncommon for junior staff to become confused with regard to fluid requirements in a neonate given there are different guidelines for fluid management that are followed at the public hospital (from Starship Hospital and National Women's Hospital). There were a number of doctors and nurses who reviewed the fluids. The error with the fluid calculation was not identified. I believe this is a systems error.”

113. Dr G explained that SMOs at the public hospital have always specifically educated the junior staff around using either the Starship Guideline, or the National Women's clinical guidelines depending on the clinical scenario. Dr G stated that in some cases they would refer to the Royal Children's Hospital Melbourne guidelines if there was no guideline available on the Starship or National Women's websites. Dr G told HDC that the paediatrics team is consistent in the use of the guidelines.

114. Dr D does not believe that she specifically received any orientation regarding IV fluids other than the orientation handbook. Dr G said that when Dr D started as an SHO with the paediatric team, the teaching was more “ad hoc” than it is currently.

115. Dr Tuck advised that there continues to be confusion and controversy surrounding IV fluid management in neonates and children. Dr Tuck stated:

“[Dr D] admitted to an error in her prescribing of [Baby A's] fluids and in so doing highlighted the confusion existing around the interpretation of the various guidelines. I ... would observe that [Dr D's] orientation to the service in terms of fluid guidelines might well have been better. The error and confusion might well have been mitigated by a call to her consultant for advice.”

116. Dr Tuck also advised:

“Given the variation in available guidelines both national and international, it is important therefore for the paediatric consultants in BOPDHB to have their own consensus guidelines and to ensure that their RMOs and the paediatric and neonatal nursing teams have a uniform approach to fluid management and easy access to consultant advice.”

117. I accept Dr Tuck's advice and I acknowledge that the guidelines regarding IV fluid management in neonates are variable. In these circumstances, I think it imperative that BOPDHB paediatricians have a clear consensus on which guidelines are to be followed, in which order, and that this consensus is clearly reflected within the in-house BOPDHB policies — especially, for example, if external guidelines are to take precedence over the BOPDHB guidelines.

118. Dr D's prescription of 180ml/kg/day was an individual clinical error. However, I consider that her orientation to the IV fluid guidelines used at the public hospital was inadequate. Taking into account Dr G's statement that it is not uncommon for junior staff to become confused with regard to fluid requirements for a neonate given the differences between guidelines, I am critical of the inadequate orientation and the lack of clear consensus on the guidelines to be followed at BOPDHB.

Management and monitoring

119. Baby A received IV fluids at a rate of 180ml/kg/hr from around midday on Day 2 until 2.30am on Day 4. Despite Baby A being reviewed on multiple occasions by nursing and medical staff, no BOPDHB staff member recognised that the rate of IV fluids that Baby A was receiving was too high. My expert nursing advisor, RN Nevill, stated: "No documented evidence suggests that the [IV fluid] prescription was discussed with the medical team; this is applicable throughout the period of admission in the BOPDHB Paediatric ward."
120. In addition, when a paediatric patient is receiving IV fluids, BOPDHB's policy requires hourly recording of infiltration and phlebitis scores and cumulative totals of the fluid input, four-hourly calculations of fluid input and output, and daily weighing of the patient. However, the paediatric fluid balance charts from throughout Baby A's admission were not filled in regularly in accordance with the BOPDHB policy. Baby A's weight was not recorded daily, infiltration scores were never recorded, and the phlebitis score was recorded only twice throughout the period of Baby A's admission.
121. Both of my expert advisors have emphasised the need for careful monitoring of paediatric patients receiving IV fluids. Dr Tuck advised that "the management of intravenous fluids in neonates can be extremely challenging and rates of infusion such as those given to Baby A need meticulous monitoring". Dr Tuck further stated that Baby A "received inappropriate intravenous fluid management which was inadequately monitored and suffered a significant extravasation injury causing her and her parents great distress".
122. RN Nevill advised that in this vulnerable patient group, infiltration is not always avoidable. However, she noted that "[c]omplications of infiltration i.e. extravasation can be prevented through reviewing IV sites, documenting changes to the site along with monitoring fluid volume/type infused". RN Nevill also advised that it is minimum standard nursing to perform hourly IV site checks and to document findings in a timely manner. She considered the failure to do so to be a departure from the accepted standard of care.
123. As discussed above, there was a lack of clear consensus on the paediatric IV fluid guidelines that took priority, and when, at BOPDHB. I consider that this lack of clarity is likely to have contributed to the failure of any staff to identify the prescribing error. In my view, this issue, in combination with the persistent failure of multiple staff to complete monitoring documentation as required, meant that Baby A received inadequate IV fluid management and monitoring from BOPDHB.

Conclusion

124. Overall, there were a number of failings in the care provided to Baby A by BOPDHB:
- a) BOPDHB did not have a clear consensus on which IV fluid guidelines were to take priority.
 - b) Dr D’s orientation to the IV fluid guidelines was inadequate.
 - c) Multiple BOPDHB staff reviewed Baby A, but did not recognise that her IV fluid prescription was too high.
 - d) Multiple BOPDHB staff did not fill in Baby A’s fluid balance chart in accordance with the BOPDHB policy requirements.

Cumulatively, these factors paint a picture of poor care. Accordingly, in my opinion, BOPDHB failed to ensure that services were provided to Baby A with reasonable care and skill and, as such, breached Right 4(1) of the Code of Health and Disability Services Consumers’ Rights (the Code).²⁷

Opinion: RN B — breach

125. RN B cared for Baby A on the evening shift of Day 3. Baby A had the right to receive services provided by RN B with reasonable care and skill. My expert advisor, RN Elizabeth Nevill, stated that infusion-related injury and complications are preventable and that, as such, nurses are responsible for protecting patients (especially those who are most vulnerable) from potential harm.
126. RN B administered Baby A’s IV antibiotics at 8.25pm. RN B said that she flushed the IV line before administering the first and second doses of antibiotics, then flushed the line a further time before recommencing IV fluids. At that time, the IV monitor began to flash, saying that there was a “downward occlusion”.
127. RN B stated that she checked the line and considered that there was no obvious redness or swelling, but that she sought assistance from RN I, and they both checked and flushed the line again. RN B asked Mrs A to ensure that Baby A’s arm was as straight as possible to avoid kinks in the cannula. RN B stated: “The pump would work for a time [and] stop beeping, however I recall at the time we had to go in often to check ... what we believed to be kinks in the line due to the baby’s movements.”
128. RN B stated: “I was checking this baby frequently including arm luer assessment and infiltration risks.” However, she did not document hourly infiltration or phlebitis scores on the fluid balance chart. RN B acknowledged that her documentation was poor, but explained that the ward was “extremely busy”, and that recently she had returned from a year’s maternity leave, and the fluid balance form had changed during the time she was away. Although I accept that RN B did monitor Baby A’s IV site,

²⁷ Right 4(1) of the Code states: “Every consumer has the right to have services provided with reasonable care and skill.”

because the monitoring was not documented I cannot determine the extent to which it occurred throughout her shift or the detail of any reviews in terms of what was required by the policy.

129. RN B said that from roughly 10pm there were no further issues with the IV line, and she did not return to Baby A's room again after 10pm. I am concerned that RN B did not monitor Baby A again during her shift, which ended at 11.15pm, given that the BOPDHB "Fluid balance chart recording standards (Paediatric)" policy requires hourly monitoring, and RN B had experienced issues with the line during the shift.
130. RN Nevill criticised RN B's non-adherence to the BOPDHB policy — in particular, that there is no documentation to confirm that the IV site was reviewed regularly. RN Nevill advised that this is a major departure from the accepted standard of care, as reviewing IV sites is a "key element of preventing extravasation injuries and to safely deliver IV therapy".
131. I accept RN Nevill's advice, and I am concerned that RN B did not document her monitoring of Baby A's IV site during the evening shift. In particular, I am concerned that RN B did not document the infiltration and phlebitis scores hourly as required by BOPDHB policy. While I acknowledge RN B's explanations that the ward was extremely busy and that she had recently returned from extended leave, I do not consider it acceptable for this important documentation to have been left incomplete, especially given the issues RN B experienced with the IV line.
132. At 11pm, RN B completed her clinical notes. She recorded that Baby A appeared more awake. RN B also recorded, "IVAB x 2 line getting stiff/positional", but did not document anything further regarding the issues she had with the line during the shift.
133. RN B did not document in the clinical notes any information on the issue with the IV pump or the actions or interventions that she performed. She did not hand over the issues she had with the IV line to the night shift, nor did she note these in the computer report. RN B commented that she did not think it would have been unreasonable for RN I to discuss the issues with Baby A's IV line at handover, but acknowledged that it was not his responsibility to do so.
134. RN Nevill advised that nursing handover from one shift to another is a key element to ensure appropriate ongoing care. She noted that the problems with the IV luer and pump were not communicated to the following shift.
135. I accept RN Nevill's advice that there should have been a handover of the issues with the IV luer and pump to the next shift. I also note that the BOPDHB policy "Care delivery — Team nursing guidelines" requires a brief handover at the commencement of the shift, which may include a review of the handover list (ie, the computer system report) with identification of key risks. I am concerned that RN B did not explicitly hand over the issues that she had with the IV pump to the following shift, and I do not consider that her documentation, "line getting stiff/positional" was an adequate description of the issues she encountered, nor does this explain the actions she took in response to the IV pump alarm. This is information that I would expect to have been

handed over to the following shift, so that the night nurse would be aware to be particularly vigilant when reviewing Baby A's IV site.

136. RN Nevill also expressed concern that RN B failed to recognise that the fluid prescription was incorrect. RN B acknowledged that the IV fluid rate of 21ml/hr was high, but she noted that this had been assessed on the consultant ward round, and so she complied with the amount prescribed. I am concerned that, if RN B did notice that the IV fluid rate was high at the time of these events, she did not question it. I would expect healthcare providers in any role to voice their concerns if they are unsure of a prescription, especially for an unwell seven-day-old baby. However, I acknowledge that RN B did not prescribe the fluids, and no other staff involved in Baby A's care identified the high IV fluid rate. This significantly mitigates this criticism.
137. Overall, there were a number of failings in the care provided to Baby A by RN B:
- a) RN B did not comply with the BOPDHB policy regarding hourly IV site monitoring and documentation;
 - b) RN B did not document an accurate description of the issues she encountered or the actions she took in response to the IV pump alarm; and
 - c) RN B did not hand over the issues she had with the IV pump to the following shift.
138. Accordingly, in my opinion, RN B did not provide services to Baby A with reasonable care and skill and, as such, breached Right 4(1) of the Code.

Opinion: RN C — breach

139. RN C cared for Baby A on the night shift beginning at 11.15pm on Day 3. Baby A had the right to receive services provided by RN C with reasonable care and skill. RN Nevill, stated that infusion-related injury and complications are preventable and that, as such, nurses are responsible for protecting patients (especially those who are most vulnerable) from potential harm.
140. RN C said that because the ward was so busy, it was not until 1.00am on Day 4 that she went into Baby A's room and first saw the IV luer. RN C stated that IV fluids were infusing at this time, and that she removed the bandage to visualise Baby A's hand and arm. RN C said that there were no signs of phlebitis or infiltration at that time. However, she did not document hourly infiltration or phlebitis scores on the fluid balance chart. RN C acknowledged that she had not completed all of the required documentation for IV management as per BOPDHB protocol.
141. At around 2.30am on Day 4, Baby A was due for her next antibiotics. RN C stated that she checked Baby A's arm and there were no signs of phlebitis or infiltration. RN C said that she used alcohol swabs and flushed the line before commencing the first IV antibiotic. Mrs A then noticed a blister and swelling on Baby A's arm, and RN C

said that she immediately turned on the lights and saw that Baby A's upper arm was swollen. RN C immediately stopped the IV antibiotics infusing and pressed the staff assist call button. An RN and Dr F arrived to assist, and the IV luer was removed, and cares were instituted to deal with the extravasation injury. RN C told HDC that she stayed with Baby A and her mother for an hour after the incident.

142. RN Nevill criticised RN C's non-adherence to the BOPDHB "Fluid balance chart recording standards (Paediatric)" policy — in particular, that there is no documentation to confirm that the IV site was reviewed regularly. RN Nevill advised that this is a major departure from the accepted standard of care, and that "IV site monitoring and documentation is considered to be standard nursing care".
143. I am concerned that RN C did not review Baby A's IV site until nearly two hours into her shift, despite the BOPDHB policy requiring hourly recording of phlebitis and infiltration scores and fluid balance. I am also critical that once RN C did review Baby A's IV site, she did not document her findings accordingly. While I acknowledge RN C's explanation that the ward was busy, I do not consider it acceptable for this important documentation to have been left incomplete, especially for an unwell seven-day-old baby. I also acknowledge that the issues with the IV pump alarm were not handed over appropriately by the previous shift. However, I consider that nursing staff should be especially vigilant when monitoring infusion of IV fluids in babies.
144. RN Nevill is also critical that RN C did not recognise that Baby A's fluid prescription was incorrect according to the BOPDHB policy. RN C acknowledged that she did not recognise this. However, she noted that the fluids had been running since midday the day before the incident, and that these had been directed by the paediatric consultant. I am concerned that RN C did not review the appropriateness of the IV fluid prescription. However, I acknowledge that RN C did not prescribe the fluids, and no other staff involved in Baby A's care identified the high IV fluid rate. This significantly mitigates this criticism.
145. Overall, my concerns are that there was a two-hour delay in RN C reviewing Baby A's IV site at the start of her shift, and that RN C did not document phlebitis and infiltration scores in accordance with BOPDHB policy. Accordingly, in my opinion, this meant that RN C did not provide services to Baby A with reasonable care and skill and, as such, breached Right 4(1) of the Code.

Opinion: Dr D — adverse comment

146. At about 11.50am on Day 2, Baby A's temperature spiked to 39°C. Dr G ordered a septic screen and decided to start Baby A on IV fluids. Following the septic screen, Dr D prescribed Baby A two types of IV antibiotics, and IV fluids at 180ml/kg/day (21ml/kg/hr). At the time of Baby A's admission, Dr D was working in her first position as a junior paediatric registrar.

147. The BOPDHB policy “Fluid balance chart recording standards (Paediatric)” states that the daily fluid allowance for maintenance IV fluid therapy, for a child weighing between three and ten kilograms, is 100ml/kg/day, or 4ml/kg/hour. The rate in the BOPDHB policy was consistent with the Starship Guideline that was in place at the time of these events, but different from the National Women’s Hospital “Newborn Services Clinical Guideline”.
148. Dr D told HDC that she recalls checking the type of IV fluids required, but not the rate, with Dr G. Dr D stated that her normal practice is to check both, given that the decision was made by Dr G on the consultant ward round, and she regrets that she did not follow her usual practice on this occasion. Dr D noted that it is unclear between the Starship Guideline and the National Women’s Hospital guideline at what age to switch from 100–150ml/kg/day total fluids to limiting fluids to 100ml/kg/day intravenously. Dr D accepts that prescribing fluids at a rate of 180ml/kg/day was an error, and she stated that it is possible that she was confused about the guidelines in regard to Baby A’s requirements.
149. My expert advisor, paediatrician Dr Tuck, stated that there continues to be confusion and controversy surrounding intravenous fluid management in neonates and children. He acknowledged that there was an error in the prescribing of intravenous fluids for Baby A (in terms of the total requirement per day and the consequent rate per hour). However, he stated:
- “One could argue that this was not such an important issue as might at first seem apparent. This was a volume of fluid that [Baby A] could have coped with physiologically albeit significantly more than she probably needed. The higher the rate of administration of intravenous fluids into tiny neonatal veins, the higher the risk of ‘extravasation’.”
150. Dr Tuck also advised:
- “[Dr D] admitted to an error in her prescribing of [Baby A’s] fluids and in so doing highlighted the confusion existing around the interpretation of the various guidelines. I ... would observe that [Dr D’s] orientation to the service in terms of fluid guidelines might well have been better. The error and confusion might well have been mitigated by a call to her consultant for advice.”
151. I am critical that Dr D prescribed Baby A a rate of IV fluids that was higher than the amount recommended by the BOPDHB, Starship, and National Women’s Health guidelines, and that Dr D did not discuss the rate of Baby A’s IV fluids with Dr G, as would be her usual practice. I acknowledge that there continues to be confusion regarding IV fluid management in neonates, particularly when they are being cared for on paediatric wards, and that this may have contributed to Dr D’s error.
152. My criticism of Dr D is mitigated by the fact that no other BOPDHB staff subsequently caring for Baby A identified that the rate of IV fluids prescribed was incorrect, that the BOPDHB orientation regarding which IV fluid guidelines to use was

inadequate, and that there continues to be confusion regarding IV fluid management in neonates, which may have contributed to Dr D's error.

Recommendations

153. I recommend that BOPDHB:

- a) Establish a clear consensus on which guidelines are to be followed when prescribing IV fluid to neonates, and ensure that this is documented clearly in either the "Fluid balance chart recording standards (Paediatric)" policy, or in a new policy document. The purpose of this recommendation is to ensure that BOPDHB medical and nursing staff in the neonatal and paediatric teams have clear and consistent direction on which guidelines to follow when prescribing IV fluids. A copy of the updated or new policy should be provided to HDC within three months of the date of this opinion.
- b) Within three months of the date of this opinion, provide HDC with the results of its six most recent monthly audits of IV access.
- c) Use this case as an anonymised case study during induction of nursing and medical staff to the Children's Ward and SCBU.
- d) Given the passage of time since the recommendations were made in the BOPDHB internal investigations, I recommend that BOPDHB provide HDC with confirmation that the actions taken to meet those recommendations are continuing. This confirmation should be provided to HDC within three months of the date of this opinion.
- e) Provide a written apology to Baby A's family. The apology should be provided to HDC within three weeks of the date of this opinion, for forwarding to Baby A's family.

154. I recommend that RN B:

- a) Undertake an audit of her compliance with fluid balance chart recording standards. I suggest that this be undertaken by making a random selection of 15 of her patients who were receiving IV fluids in 2017, and checking whether the recording standards were complied with in the documentation completed. Anonymised audit results should be provided to HDC within three months of the date of this report.
- b) Provide a written apology to Baby A's family. The apology should be provided to HDC within three weeks of the date of this opinion, for forwarding to Baby A's family.

155. I recommend that RN C provide a written apology to Baby A's family. The apology should be provided to HDC within three weeks of the date of this opinion, for forwarding to Baby A's family.
 156. In the event that RN C holds a nursing position in future where she is responsible for administering IV fluids to her patients, I recommend that she undertake a self-audit of the standard of her fluid balance chart documentation.
-

Follow-up actions

157. A copy of this report with details identifying the parties removed, except BOPDHB and the experts who advised on this case, will be sent to the Nursing Council of New Zealand, and it will be advised of RN B's and RN C's names in covering correspondence.
 158. A copy of this report with details identifying the parties removed, except BOPDHB and the experts who advised on this case, will be sent to the Health Quality & Safety Commission and placed on the Health and Disability Commissioner website, www.hdc.org.nz, for educational purposes.
-

Appendix A: Independent nursing advice to the Commissioner

The following expert advice was obtained from registered nurse Elizabeth Nevill:

“I hereby confirm that I have received a request from the Health and Disability Commissioner, to provide an opinion on case number [C15HDC01330]; I have read and agree to follow the Commissioner’s Guidelines for Independent Advisors before writing this report.

My qualifications and experience relevant to this case include the following:

2008: MN-Neonatal Massey University, Auckland, New Zealand

1995: B.CUR. HON (Neonatal Science and Advanced Midwifery) University of Pretoria, South Africa

1992: B.CUR Nursing Science (General Nursing, Community Nursing, Psychiatric Nursing and Midwifery) University of Pretoria, South Africa

My neonatal nursing career started in 1992 (South Africa), continued in New Zealand in 1999. I have been employed as a Clinical Nurse Specialist, Middlemore Hospital, and Kidz First Neonatal Care Unit in 2002 (to current). Over my nursing career I have been and remain to be involved in nursing education (including Massey University students). I have been the Kidz First Neonatal Unit, Quality Assurance Team Leader (2006–2010); continue to be involved in guideline development and quality improvement projects in the Neonatal service. My nursing practice is an example of nursing leadership, underpinned by a philosophy of evidence based practice and family centred care.

[...]

Issues

1. Was the standard of nursing documentation and notes in line with clinical guidelines?
2. Were the visual assessments of the IV, fluids and infiltration adequate and performed in a timely manner?
3. Was the extravasation injury the result of any departure in the standard of nursing care provided?
4. Do you have any other comments about the standard of care provided?

For each question the following is to be advised:

- a) What is the standard of care/accepted practice?
- b) If there has been a departure from the standard of care or accepted practices how significant a departure do you consider it is?
- c) How would it be viewed by your peers?

Summary of the case

- Term, 7 day old female admitted to hospital after referral from midwife with concerns of weight loss and jaundice.
- **Birth Weight:** 3280g **Weight on admission:** 2890g **Weight loss:** 390g (11.9%) below birth weight
- Concerns of not feeding well.
- Blood group A+; DAT negative/maternal blood group O negative ABO incompatibility
- Serum bilirubin 353 $\mu\text{mol/L}$ (SM — midwife); 324 $\mu\text{mol/L}$ hospital assessment within treatment range
- Serum Sodium on day of admission 144 mmol/L *indicates normal hydration
- Admission to Paediatric Ward: [Day 2]
 - [Day 2] all aspects of fluid balance sheet not completed.
 - [Day 3]: Fluid balance chart not filled in/completed. Pump reading noted on the chart IV fluids were infusing (18:00 to 01:45). No hourly rate documented.
 - [Day 2] and [Day 3]: No site assessments evident/recorded.
- [Mrs A]: Growing concerns for her baby being in distress/pain communicated to staff.
- Extravasation injury leading to transfer to [DHB2] to further engage with Plastics Department.

1: Was the standard of nursing documentation and notes in line with clinical guidelines?

- a) *What is the standard of care/accepted practice?*
- To follow BOPDHB guideline 1: Fluid balance chart recording standards (paediatric) inclusive of the following:
 - Standards for Documentation, Assessment for Hydration and Maintenance of IV Fluid Therapy
 - Bay of Plenty District Health Board Access Assessment form (7628)
- b) *If there has been a departure from the standard of care or accepted practices how significant a departure do you consider it is?*
- I consider the departure of accepted standard of care to be significant.
 - In my opinion the BOPDHB protocol was not followed
 - No phlebitis scores are evident throughout the provided documentation
 - The standards for documentation of fluid balance was not followed specifically in regards to

- Expected hourly recording of infusion rate
- No clear evidence that the input, output balance was evaluated every 4 hours
- All children on IV fluids should be weighed daily
- No documentation evident to suggest that phlebitis/infiltration scores were done.
- The maintenance fluid for a 3kg patient as per BOPDHB protocol is 100ml/kg/day this calculates to 13.6ml/hr for a 24hr period (using birth weight) yet the patient received 21ml/hr. No documented evidence suggests that the above prescription was discussed with the medical team; this is applicable throughout the period of admission in the BOPDHB Paediatric ward.

c) *How would it be viewed by your peers?*

- My peers will view this incident as significant.

2: Were the visual assessments of the IV, fluids and infiltration adequate and performed in a timely manner?

a) *What is the standard of care/accepted practice?*

- Infusion rate, IV site monitoring and documentation is considered to be standard nursing care^{2,3,4} (Right 4).
- Infusion related injury and complications are preventable, as such nurses are responsible to protect patients (especially those known to be the most vulnerable) from potential harm⁵⁻⁹.

b) *If there has been a departure from the standard of care or accepted practices how significant a departure do you consider it is?*

- I consider the departure of accepted standard of care to be significant.
- In my opinion it is minimum standard nursing to perform hourly IV site checks and to document findings in a timely manner.
- The patient's discomfort and obvious distress as communicated by [Mrs A] was disregarded by the staff, this should have prompted nursing staff to investigate the source of discomfort further as infiltration and developing extravasation was probably causing the discomfort that [Mrs A] was concerned about.
- Down-stream alarms usually indicates raised pressure (most infusion pumps/syringe drivers have safety pressure features), it is well known to investigate the IV infusion site in the first instance and not to assume mechanical failure; yet [Mrs A] was asked to make sure the tube was not kinked.

c) *How would it be viewed by your peers?*

- My peers will view the departure of care in this incident to be significant.

3: Was the extravasation injury the result of any departure in the standard of nursing care provided?

a) What is the standard of care/accepted practice?

- In this vulnerable patient group, infiltration is not always avoidable. Complications of infiltration i.e. extravasation can be prevented through reviewing IV sites, documenting changes to the site along with monitoring fluid volume/type infused^{2, 3, 5, 7-9}.
- To prevent extravasation injury nurses need to be educated to enable recognition of IV site changes.
- Providing safe, evidence based and competent care⁶ (standard 4).
- Working in partnership with health consumers, so as to protect and promote well-being⁶ (Standard 3).

b) If there has been a departure from the standard of care or accepted practices how significant a departure do you consider it is?

- I consider the departure of care to be significant given that in my opinion:
 - [Mrs A's] ([Baby A's] mother) concern for her baby was disregarded.
 - [Mrs A] was given the responsibility to monitor 'kinks' in tubing no further investigation was done to ascertain the problem for the pump alarming i.e. investigating the limb, site, getting a second opinion nor was the peripheral IV luer flushed to ascertain openness/safe to use for ongoing infusion or medication.
 - Ascertaining patency of the site before commencing an infusion for IV antibiotics is standard practice 3; there is no evidence to confirm this was done.
 - In addition a nurse on the afternoon shift prior to the incident occurring documented ([Day 3] at 23:00: 'line getting stiff/positional, infusing via syringe driver'.
 - No evidence to suggest that the site was reviewed at this time or that any action was taken to investigate the problem any further.
 - No documentation evident to accurately describe the site.
 - No evidence to clarify what was meant by 'stiff/positional'
 - Infiltration was probably occurring at this time
 - I question whether this concern was handed over to the night nurse, no evidence to confirm this was done.
 - It is an expectation that all nurses caring for vulnerable patient groups will be vigilant in their assessment of IV site monitoring and recognition of unwanted changes. It is difficult to accept that given [Baby A's] obvious distress in addition to the infusion pump syringe driver

alarming, the IV infusion site could have been normal (in the absence of documentation); or that the staff could not detect happening changes due to reasons that cannot be explained within the context of the given documentation.

c) *How would it be viewed by your peers?*

- My peers will view the standard of care provided and concerns I noted as a significant breach of nursing standards.

4: Do you have any other comments about the standard of nursing care provided?

I have the following concerns:

- It appears that the Bay of Plenty Access Assessment form (listed equipment in addition to recording standard) was not used during [Baby A's] admission from the time of admission until discontinuation of IV fluids (when incident occurred).
 - Enforcing adherence to protocol guidelines and use of a designated documentation could potentially have prevented this incident from happening.

General comments:

Infants within the newborn period are often admitted to Paediatric Wards for various reasons, needing IV fluids and treatment. The standard of care in regards to IV fluid monitoring and prevention of complications therefore should be equally robust independent of where a patient is admitted.

In my opinion the infant's management in hospital could have been different from the outset which would have prevented the incident in the first instance, given the following:

- Administration of IV fluids in this case was excessive (150ml/kg/day calculated by birth weight current weight on admission 170ml/kg/day — for a 7 day old infant that should be taking full enteral feeds, having no contraindication to do so). It is standard practice to manage hydration whilst supporting breast feeding for infants receiving phototherapy by way of supplementing breast feeds (with nasogastric tube milk feeds using expressed breast milk or infant formula) if indicated.
 - The serum sodium on admission as previously stated was within normal range on admission and did not indicate dehydration.
 - Given the amount of clear fluids — 10% dextrose without added electrolytes, there appears not to be any further serum sodium or weight monitoring.
 - The febrile episode could well have been environmental/increased insensible water loss; given phototherapy treatment and that the infant was unsettled at the time, given the absence of further febrile episodes.

Usually managed by giving additional milk via nasogastric tube or by offering suck feeds.

- The reported apnoea could indicate sepsis in a newborn; however the complete septic screen did not confirm the suspicion of sepsis, clinical notes indicated a normal examination at the time.

References:

1. Bay of Plenty District Health Board. Clinical Practice Manual. Fluid balance chart recordings standards (paediatric) [Protocol]. Dated March 2015, version. No. 2.
2. Ingram P, Lavery I. Peripheral intravenous therapy: key risks and implications for practice. *Nursing Standard* 2005; 19(46); 55–64.
3. Hadaway LC. Preventing and managing peripheral extravasation. *Nursing* 2009; 39(10); October; 26–27.
4. The Health and Disability Commissioner. Code of Health and Disability Services Consumers' Rights.
5. Dychter SS, Gold DA, Carson D, Haller M. Intravenous Therapy. A Review of complications and economic considerations of peripheral access. *J of Infusion Nursing* 2012; 35(2); March/April; 84–91.
6. Nursing Council of New Zealand. Code of Conduct for Nurses 2012.
7. Doellman D, Hadaway L, Bowe-Geddes LA, Franklin M, LeDonne J *et.al.* Infiltration and extravasation. Update on prevention and management. *J of Infusion Nursing* 2009; 32(4); July/August; 203–211.
8. Clark E, Giambra BK, Hingl J, Doellman D, Tofani B, Johnson N. Reducing risk of harm from extravasation. A 3-tiered evidence-based list of Pediatric peripheral intravenous infusates. *J of Infusion Nursing* 2013; 36(1); January/February; 37–45.
9. Martin SM. Extravasation of nonchemotherapeutic medications. *J of Infusion Nursing* 2013; 36(6); November/December; 392–396.”

The following further advice was received from RN Neville:

“1. The appropriateness of the care provided by [RN B]
For each matter, it would be helpful if you would advise:

- a) What is the standard of care/accepted practice?
- b) If there has been a departure from the standard of care or accepted practices, how significant a departure do you consider this to be?
- c) How would it be viewed by your peers?
- d) If appropriate, recommendations for improvement which may help prevent a similar occurrence in future

Shift description: Pm shift 14:45–23:15 on [Day 3]. The following highlights concerns in relation to the appropriate/expected standard of care delivered.

- Knowledge of and adherence to BOPDHB guidelines
- No evidence that the expected standard of care was provided
- Failure to recognise that the prescribed fluid volume exceeded volumes outlined in guideline
- No follow up to ensure resolution of IV luer site and pump
- Nursing handover (transfer of care) — did not take place

Knowledge of and adherence to BOPDHB guidelines

- No evidence that the expected standard of care was provided
- Failure to recognise that the prescribed fluid volume exceeded volumes outlined in guideline

a) What is the standard of care/accepted practice?

- To have knowledge of and adhere to BOPDHB guidelines¹: Fluid balance chart recording standards (paediatric) inclusive of the following:
 - Standards for Documentation, Assessment for Hydration and Maintenance of IV Fluid Therapy
 - Bay of Plenty District Health Board Access Assessment form (7628)

b) If there has been a departure from the standard of care or accepted practices, how significant a departure do you consider this to be?

- I consider the departure of accepted standard of care to be major — key element of preventing extravasation injuries and to safely deliver IV therapy
- No documentation evident to confirm that the IV site was reviewed, inability to recognise that the fluid prescription was incorrect.

c) How would it be viewed by your peers?

- My peers would view the departure of care as a major element in providing safe/accepted standard.

d) If appropriate, recommendations for improvement which may help prevent a similar occurrence in future

- Appropriate orientation to staff when returning to the workforce — to ensure knowledge of the expected standard of care and adherence to guidelines.
- The individual returning to work likewise has a personal responsibility to ensure they have updated their knowledge or request assistance to do so; before care of patients is being accepted.
- Education programme: To increase the knowledge and ability to recognise IV site infiltration, so as to prevent extravasation injuries.
- Process if checking fluid prescriptions against BOPDHB guidelines, so as to recognise and address in corrections (the excess fluid rate may have contributed to the significance of the injury that occurred).

Follow up to ensure resolution of IV luer site and pump

- a) *What is the standard of care/accepted practice?*
- To provide follow up care and to ensure resolution of any concerns. To prevent harm and promote health.
 - As per my initial report: Infusion related injury and complications are preventable, as such nurses are responsible to protect patients (especially those from the most vulnerable) from potential harm.^{5-9.}
- b) *If there has been a departure from the standard of care or accepted practices, how significant a departure do you consider this to be?*
- I consider this a major departure of care in the absence of documented evidence that any follow up care was provided.
- c) *How would it be viewed by your peers?*
- My peers will view this as a major departure of care.
- d) *If appropriate, recommendations for improvement which may help prevent a similar occurrence in future.*

As listed above.

Nursing handover (transfer of care) — did not take place

- a) *What is the standard of care/accepted practice?*
- Nursing hand over from one shift to another is a key element to ensure appropriate ongoing care.
- b) *If there has been a departure from the standard of care or accepted practices, how significant a departure do you consider this to be?*
- I consider this as an extremely significant departure of care:
 - a. As the problems of the IV luer and pump was unresolved — yet this was not communicated to the following shift.
 - b. Infiltration could have occurred at this time and potentially would have been recognised during a bedside nursing handover (encompassing the review of fluid and medication prescription, pump settings, when fluids needed to be changed and the IV site).
- c) *How would it be viewed by your peers?*
- My peers will view this as an extremely significant departure of care.
- d) *If appropriate, recommendations for improvement which may help prevent a similar occurrence in future.*
- BOPDHB to establish handover guidelines to support a rigorous handover processes that nursing staff can follow.

2. The appropriateness of the care provided by [RN C]

Shift description: Night shift 22:45–07:15 started [Day 3]. The following highlights concerns in relation to the appropriate/expected standard of care delivered.

Knowledge of and adherence to BOPDHB guidelines

- No evidence that the expected standard of care was provided
 - Failure to recognise that the prescribed fluid volume exceeded guideline
- a) *What is the standard of care/accepted practice?*
- To have knowledge of and adhere to BOPDHB guidelines¹: Fluid balance chart recording standards (paediatric) inclusive of the following:
 - Standards for Documentation, Assessment for Hydration and Maintenance of IV Fluid Therapy
 - IV site monitoring and documentation is considered to be standard nursing care^{2, 3, 4} (Right 4).
 - Infusion related injury and complications are preventable, as such nurses are responsible to protect patients (especially those known to be the most vulnerable) from potential harm⁵⁻⁹.
- b) *If there has been a departure from the standard of care or accepted practices, how significant a departure do you consider this to be?*
- I consider the departure of accepted standard of care to be major — key element of preventing extravasation injuries and to safely deliver IV therapy. No documentation evident to confirm that the IV site was reviewed, inability to recognise that the fluid prescription was incorrect.
- c) *How would it be viewed by your peers?*
- My peers will also view the departure of care to be major.
- d) *If appropriate, recommendations for improvement which may help prevent a similar occurrence in future.*
- Education programme: To increase the knowledge and ability to recognise IV site infiltration, so as to prevent extravasation injuries.
 - Process of checking fluid prescriptions against BOPDHB guidelines, so as to recognise and address in corrections (the excess fluid rate may have contributed to the significance of the injury that occurred).

Nursing handover (transfer of care) — received

- a) *What is the standard of care/accepted practice?*
- Nursing hand over from one shift to another is a key element to ensure appropriate ongoing care.

- Infiltration could have occurred at this time and potentially would have been recognised during a bedside nursing handover (encompassing the review of fluid and medication prescription, pump settings, when fluids needed to be changed and the IV site).
 - There appears to have been a period of time from the start of the shift until when the luer was checked for the first time.
- b) *If there has been a departure from the standard of care or accepted practices, how significant a departure do you consider this to be?*
- I consider the departure from the standard to be a major contribution to the incident that occurred.
- c) *How would it be viewed by your peers?*
- My peers will view this as a major departure of care.
- d) *If appropriate, recommendations for improvement which may help prevent a similar occurrence in future*
- BOPDHB to establish handover guidelines to support a rigorous handover processes that nursing staff can follow.

References:

1. Bay of Plenty District Health Board. Clinical Practice Manual. Fluid balance chart recordings standards (paediatric) [Protocol]. Dated March 2015, version. No. 2.
2. Ingram P, Lavery I. Peripheral intravenous therapy: key risks and implications for practice. *Nursing Standard* 2005; 19(46); 55–64.
3. Hadaway LC. Preventing and managing peripheral extravasation. *Nursing* 2009; 39(10); October; 26–27.
4. The Health and Disability Commissioner. Code of Health and Disability Services Consumers' Rights.
5. Dychter SS, Gold DA, Carson D, Haller M. Intravenous Therapy. A Review of complications and economic considerations of peripheral access. *J of Infusion Nursing* 2012; 35(2); March/April; 84–91.
6. Nursing Council of New Zealand. Code of Conduct for Nurses 2012.
7. Doellman D, Hadaway L, Bowe-Geddes LA, Franklin M, LeDonne J et.al. Infiltration and extravasation. Update on prevention and management. *J of Infusion Nursing* 2009; 32(4); July/August; 203–211.
8. Clark E, Giambra BK, Hingl J, Doellman D, Tofani B, Johnson N. Reducing risk of harm from extravasation. A 3-tiered evidence-based list of Pediatric peripheral intravenous infusates. *J of Infusion Nursing* 2013; 36(1); January/February; 37–45.
9. Martin SM. Extravasation of nonchemotherapeutic medications. *J of Infusion Nursing* 2013; 36(6); November/December; 392–396.”

Appendix B: Independent paediatrics advice to the Commissioner

The following expert advice was obtained from paediatrician Dr Roger Tuck:

“You have asked me to provide an opinion on the above case for the Health and Disability Commissioner. I have read the guidelines for Independent Advisors and agree to abide by them.

I have no conflict of interest in regard to this case.

I graduated MBBS from the University of London (UK) in 1972. I obtained Membership of the Royal College of Physicians (UK) in 1974 in adult medicine. I obtained Fellowship of the Royal Australasian College of Physicians in Paediatrics in 1981 and was admitted to the Fellowship of the Royal College of Physicians of Edinburgh in 1994.

I have been a consultant general paediatrician with the Northland District Health Board and its previous iterations since 1983. During this time I have practised continuously in General Paediatrics and Neonatal Paediatrics at the same level as that provided in BOPDHB. I am very familiar with the clinical challenges such as those described in the management of [Baby A].

Issues requiring advice:

Reasonableness of care provided by:

BOPDHB

[Dr G]

[Dr D]

Any other team member warranting comment.

The adequacy of the BOPDHB policy on the management and recording of fluid administration.

The appropriateness of the changes made as a result of this incident.

Any other matters warranting comment.

For each point advice is sought on:

What is the accepted practice and standard of care.

Whether there has been a significant departure from accepted practice and how significant this might be.

How would the above be viewed by peers.

Any other recommendations for quality improvement.

My first observation would be that 5 hours is a long time for a newborn to wait in a busy general hospital emergency department before assessment and admission

and in [Baby A's] case, too long in my opinion. I am aware that the Special Care Baby Unit was full at the time which would have potentially added to any delay as a suitable admission solution was sought. [Baby A] was potentially quite sick based on the midwife's referral information and this was evidenced by the later observation of fever and the decision to perform a septic workup and commence intravenous antibiotics. Neonatal sepsis would have been high on the list of diagnostic possibilities. I am unaware of whether the BOPDHB has an acute assessment unit for children, as this is one commonly used pathway for the assessment and admission of children to hospital in order to bypass busy, often adult-centric emergency departments. PAAU (Paediatric Acute Assessment Units) provide a clinical environment suited to the needs of children and infants. A busy general emergency department is not an ideal environment for the potentially sick and unstable newborn.

The second observation is that the admission of newborns to general children's wards is mostly not ideal although occasionally unavoidable. There is a significant burden of infectious disease on most children's wards and coupled with the physical environment, which is not usually best suited to the optimal nursing care of neonates, provides a potentially high risk environment. There have been longstanding concerns about admitting newborns from the community back into newborn units, but in my opinion it is best to place even a potentially septic neonate from the community back into a newborn unit where they can be effectively isolated, than onto a busy children's ward. I am unaware of the BOPDHB policy on this, but a newborn unit/SCBU should provide a much more appropriate clinical environment both physical and in terms of specialist nursing care for an infant such as [Baby A]. Nurse to patient ratios are generally more favourable and the nursing staff are trained to be more attuned to the particular challenges of nursing neonates, parenteral (IV) fluid management being one challenge in particular.

As [Dr G] has pointed out, there was an error in the prescribing of intravenous fluids for [Baby A]. This was in terms of the total requirement per day and the consequent rate per hour. One could argue that this was not such an important issue as might at first seem apparent. This was a volume of fluid that [Baby A] could have coped with physiologically albeit significantly more than she probably needed. The higher the rate of administration of intravenous fluids into tiny neonatal veins, the higher the risk of 'extravasation'. The point being, that close and appropriate scrutiny of the intravenous site, given a not unreasonable rate of infusion, would have identified a problem early and before significant amounts of fluid had extravasated. Given that comment, it is common practice to use the minimum amount of parenteral fluid necessary, with frequent re-assessments particularly of any oral or enteral intake, to titrate the rate of infusion of parenteral fluid down to a minimum. This will tend to reduce the risks associated with intravenous therapy. One would expect neonatal nurses in a newborn unit to be more familiar with this than their often much busier paediatric nurse colleagues on a children's ward dealing with much larger patients.

There continues to be confusion and controversy surrounding intravenous fluid management in neonates and children. The current (recently revised) Starship Children's Hospital guideline for fluid administration in children of less than 4

weeks corrected age differs from the National Women's Neonatal fluid guidelines. Moreover, the Starship fluid guidelines, despite advising on the less than 4 week old child, state that the guidelines are not recommended for infants in neonatal intensive care (NICU) or special care baby units (SCBU) and by implication neonates such as [Baby A]. Given the variation in available guidelines both national and international, it is important therefore for the paediatric consultants in BOPDHB to have their own consensus guidelines and to ensure that their RMOs and the paediatric and neonatal nursing teams have a uniform approach to fluid management and easy access to consultant advice.

In [Baby A's] situation, her inpatient site was not optimal, there was confusion surrounding the appropriate choice of intravenous fluids and rates of administration and evidence of inadequate intravenous fluid management and site observation. I would agree with [Dr G's] comment that [Baby A's] IV site was probably deteriorating earlier than what was thought, although at the infusion rate of 21ml/hr, it would not have taken very long to create a significant extravasation injury. The nature of the injury is not only dependent upon the volume of fluid escaping into the tissues, but also the nature of the fluid and any agents or drugs in that fluid. In [Baby A's] case the fluid was 10% dextrose and antibiotics were also being administered intravenously. This would have both increased the risk of vascular injury and also increased the subsequent extravasation injury. It needs to be pointed out that the management of intravenous fluids in neonates can be extremely challenging and rates of infusion such as those given to [Baby A] need meticulous monitoring. This is a big challenge for a busy paediatric ward and one of a number of reasons why neonates are best managed in specialised newborn units.

Was the care of [Baby A] by the DHB reasonable? No, it was not. She spent too long in ED, was admitted to the Children's Ward rather than the newborn unit/SCBU, received inappropriate intravenous fluid management which was inadequately monitored and suffered a significant extravasation injury causing her and her parents great distress. From the time of identification of her injury however, her clinical management was timely and appropriate.

Was [Dr G's] care of [Baby A] appropriate? The admitting consultant has the ultimate responsibility for the management of his or her patient. The performance of RMOs is to a large degree the responsibility of the supervising consultant and consultant team. RMOs joining a service need to be familiarised with service guidelines which would include fluid management. They also need to be encouraged to freely consult when they are unsure. Having said that, RMOs are autonomous practitioners ideally supported and encouraged to make important clinical decisions but are prone to error and misjudgement as we all are. It is up to the consultant team to minimise those opportunities for error and misjudgement. Other than her responsibilities for the performance of her RMOs as mentioned, there is evidence that [Dr G's] care and attention to [Baby A] and her family was of a high standard.

Was [Dr D's] care reasonable? [Dr D] admitted to an error in her prescribing of [Baby A's] fluids and in so doing highlighted the confusion existing around the interpretation of the various guidelines. I have addressed this issue in detail and would observe that [Dr D's] orientation to the service in terms of fluid guidelines might well have been better. The error and confusion might well have been mitigated by a call to her consultant for advice.

Was nursing care and supervision lacking? I am loathe to criticise hard pressed nursing staff on a busy paediatric ward for deficiencies in the nursing care of patients who ideally should be cared for elsewhere. However, it is likely that had [Baby A] been identified earlier as having a failing IV site, the nature of the extravasation would not have been as significant. As always, it pays for all staff to take the expressions of concern of parents nursing their children very seriously. Even under pressure, clinicians should strive to reduce the risk of iatrogenic harm and provide quality care and management's responsibility is to strive to provide appropriate resources to enable quality care to be delivered.

In [Baby A's] case, there has been a significant departure from accepted practice. She is fortunate that she recovered from the extravasation injury without the need for plastic surgical intervention and accompanying significant ongoing disability.

I am sure that the Paediatric Service have taken the learnings from this case and applied them to the appropriate quality improvements, notably with regard to the management of parenteral fluids in infants.

There is constant pressure on in-patient beds for patients of all ages, and nationally, NICU and SCBU are under significant pressure. When patients are managed in beds away from their specialty service the risks of harm increase. This is well known and it is incumbent on DHBs to mitigate this risk where possible.

I would like to take this opportunity to wish [Baby A] and her family well.

Yours sincerely

Dr Roger Tuck FRACP. FRCP(Edin)
Paediatrician