

**St John Ambulance Service  
Paramedic, Mr B**

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

**(Case 19HDC01293)**

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## Executive summary

1. This report concerns the care provided to a woman and her baby daughter by a paramedic and St John Ambulance Service (St John). It highlights the importance of ensuring that paramedic services have adequate equipment, staff are trained adequately, and there are robust systems in place to support the delivery of safe and appropriate paramedic services to patients.
2. In 2018, the woman went into labour while travelling to hospital. She rang for an ambulance. St John attended, and the woman was transferred to the ambulance to continue on to hospital. The woman gave birth to her baby while in transit. Shortly after the baby was delivered, another ambulance officer arrived to assist with driving.
3. The paramedic assessed the baby. He documented that she cried and moved her limbs soon after being born, and although she was blue, she “pinked up within 15 [minutes]”. In contrast, the woman told HDC that the baby never cried, and was quiet and still. During the ambulance trip to hospital, the paramedic determined that the baby needed some oxygen, which was administered using the “blow-by” method.
4. The woman’s blood pressure was found to be low, and the ambulance pulled over to allow the paramedic to gain intravenous access and administer saline. On arrival at hospital, there was a delay of several minutes in the woman and her baby being transferred from the ambulance to the Delivery Suite. Oxygen for the baby was discontinued prior to her transfer to the Delivery Suite.
5. Subsequently, the baby was transferred to another district health board and diagnosed with brain damage caused by oxygen deprivation.

## Findings

6. The Commissioner found the paramedic in breach of Right 4(1) of the Code for failing to undertake a complete assessment of Baby A at birth; for administering oxygen to the baby using the “blow-by” method instead of manual ventilation; and for failing to continue to provide oxygen to the baby during her transfer to the Delivery Suite. The Commissioner was also critical that the paramedic did not take a full set of vital signs when he provided treatment to the woman.
7. The Commissioner found St John in breach of Right 4(1) of the Code for the following reasons: St John did not have robust dispatch policies in place at the time of events, namely the dispatch of an ambulance was not determined by the severity of a patient’s condition, and initially the paramedic was in a single-crewed ambulance, which meant that he was cognitively overloaded having to provide care to both the woman and her baby; St John’s neonatal guidelines and training provided inadequate support for its staff in the assessment, monitoring, and treatment of newborn babies; and the ambulance was not supplied with appropriate equipment, namely a neonatal pulse oximetry probe.

## Recommendations

8. The Commissioner recommended that should the paramedic return to practice as a paramedic, he undertake further training on the updated St John Clinical Procedures and Guidelines and training material related to paediatric assessment, neonatal resuscitation, and the general management of obstetric emergencies. The Commissioner also recommended that the paramedic provide a written apology to the woman.
  9. The Commissioner recommended that St John consider reviewing its Guidelines to include a connection between the special considerations in young children and neonatal resuscitation; provide an update around equipping frontline and patient transfer services with neonatal-specific equipment; and apologise to the woman in writing.
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## Complaint and investigation

10. The Health and Disability Commissioner (HDC) received a complaint<sup>1</sup> from Ms A about the services provided to her during her labour and the birth of her daughter, Baby A, by St John Ambulance Service (St John) and an ambulance paramedic, Mr B. The following issues were identified for investigation:
  - *Whether Mr B provided Baby A with an appropriate standard of care in 2018.*
  - *Whether Mr B provided Ms A with an appropriate standard of care in 2018.*
  - *Whether St John Ambulance Service provided Baby A with an appropriate standard of care in 2018.*
  - *Whether St John Ambulance Service provided Ms A with an appropriate standard of care in 2018.*
11. The parties directly involved in the investigation were:

Ms A	Complainant
St John Ambulance Service	Provider
Mr B	Provider/paramedic/Station Manager
12. Further information was received from:

MidCentral District Health Board	
Midwifery Leader, Hospital 1	
Dr C	Medical Director for St John Ambulance
Complainant's sister	

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<sup>1</sup> The complaint about St John Ambulance was referred to HDC by the Nationwide Health & Disability Advocacy Service.

13. Independent expert advice was obtained from an intensive care paramedic, Mr Don Banks (Appendix A).

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## Information gathered during investigation

### Introduction

14. This report discusses the care provided to Ms A when she telephoned emergency services in 2018 requesting an ambulance.

### Background

15. At the time of events, Ms A (then aged in her forties) was in her second ongoing pregnancy, and maternity care was being provided by her lead maternity carer (LMC) at the Maternity Unit of a small public hospital (Hospital 1). Ms A was classified as advanced maternal age, in obstetric terms, and the plan was for an induction of labour at 40 weeks' gestation.

### Presentation at Hospital 1 Maternity Unit

16. At 10.03am, Ms A (39 weeks and 6 days' gestation) met the LMC at Hospital 1 for a labour assessment after having been unwell for 48 hours with diarrhoea, vomiting, and irregular contractions.
17. The LMC consulted the obstetric registrar at the main centre hospital (Hospital 2), where Ms A was planning to birth, and it was agreed that Ms A needed to be assessed there. The LMC relayed this discussion back to Ms A and suggested that she make her own way there by car to be driven by her sister as Ms A was not in labour. The LMC told Ms A to contact her or an ambulance if her condition changed or her labour progressed.

### Ambulance review

18. Ms A and her sister left for Hospital 2 at 10.50am. Shortly after they left, Ms A's labour commenced and progressed quickly. At 11.11am an ambulance was called for urgent assistance.
19. A single-crewed ambulance crewed by paramedic Mr B from St John was dispatched at 11.13am. The final patient status was classified as "3 — Unlikely threat to life". At the time of events, the dispatch of an ambulance was determined by the closest ambulance available to an incident, and, if needed, additional resources were dispatched. St John told HDC that Mr B's ambulance was the only one available to respond in the vicinity of the incident, as all other ambulances were committed to other incidents at the time.

### Mr B

20. At the time of these events, Mr B was employed as a Station Manager and had the authority to practise at the level of a paramedic. As part of his role, he was expected to be able to manage multiple priorities to the required standards.

21. In 2014, Mr B completed specific neonatal resuscitation training and he was studying towards a Bachelor of Health Science, which he completed in 2019. St John was unable to provide HDC with a copy of the training materials provided in 2014, but explained that this training was likely based on the Clinical Procedures and Guidelines in place at the time. The 2014 Guidelines focus on assessing the adequacy of breathing and circulation, and provided concise mapping of oxygen saturation levels and heart rate to management strategies.

#### **Initial assessment of Ms A**

22. On arrival at 11.21am, Mr B recorded that Ms A was having contractions every four to five minutes. Mr B transferred Ms A to the ambulance and placed her in a left tilted position. Ms A's sister accompanied her in the back of the ambulance.
23. Mr B recorded Ms A's history, which stated: "[P]atient has been unwell for 48 [hours] with flu like illness, lethargy, fever and vomiting." Ms A's vital signs were then taken and Mr B documented her pulse (120 beats per minute (bpm)) and blood pressure (120/106mmHg) as being elevated, and her oxygen saturation, which was within the normal range (99%).<sup>2</sup> However, Mr B did not take Ms A's temperature or capillary refill time,<sup>3</sup> as required by St John Clinical Procedures and Guidelines (set out in Appendix B<sup>4</sup>).
24. At 11.37am, Mr B requested another crew for driving assistance because he was crewing the ambulance on his own. Mr B continued to drive to Hospital 2.

#### **Delivery of baby**

25. Approximately halfway to Hospital 2, Ms A indicated that she wanted to push, and the ambulance pulled over to the side of the road. Mr B recorded in the medical notes that on examination, the baby was crowning,<sup>5</sup> and with the next contraction the baby was delivered "normally without issue". Baby A was delivered at 11.50am.

#### **Initial assessment of baby**

26. Mr B documented in the Ambulance Summary that Baby A cried and moved her limbs soon after being born, and although she was blue, she "pinked up within 15 [minutes]". Baby A was dried and wrapped in towels and placed in the arms of Ms A's sister.
27. In contrast, Ms A told HDC in her complaint that Baby A "never cried, was unsuccessfully put to the breast, not moving. The only sounds she made were weak gasping sounds, in an effort to breathe." Ms A's sister told HDC that Baby A "did not make any sound or move any of her body parts", and that she "remained quiet and still".

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<sup>2</sup> Normal vital signs for a healthy adult are as follows: temperature around 37°C; oxygen saturation near 100% without supplementary oxygen; heart rate 60–100 beats per minute; blood pressure 90/60–120/80mmHg.

<sup>3</sup> A test to measure the time taken for colour to return to an external capillary bed after pressure is applied, typically by pressing the end of a finger with the thumb and forefinger. Normal capillary refill time is usually 2 seconds or less.

<sup>4</sup> Section 1.19 Vital Signs.

<sup>5</sup> When the cervix is fully dilated and the baby's head becomes visible in the birth canal. This usually indicates that the baby is ready to be pushed out.

28. Shortly after Baby A was born, the second ambulance arrived at 11.53am crewed by an ambulance officer<sup>6</sup> to provide driving assistance. The ambulance then recommenced transport to Hospital 2 with Mr B providing patient care in the back and with the ambulance officer driving.

**Ambulance trip — monitoring of Baby A and Ms A**

29. The ambulance transporting Ms A, her sister, and Baby A travelled without the use of lights or sirens to Hospital 2. St John told HDC that it believes it was appropriate for the ambulance to travel without the use of lights and sirens, “because at that time neither [Ms A] or [Baby] A were being treated for an immediately life-threatening problem and given the nature of the road ... at that time, travelling with lights and sirens would not have resulted in a clinically significantly reduction in the time to reaching hospital”.
30. During the trip to hospital, Mr B noted that Baby A was breathing, making sounds, and becoming pinker in colour following delivery. However, he recorded that her respiratory rate was slightly irregular. Ms A said that on a couple of occasions her sister commented that she was concerned about Baby A’s breathing (which Mr B, through St John, has acknowledged). Ms A’s sister told HDC that when Baby A was born her skin was “grey and purple” and she did not open her eyes. She was not moving or making any sounds when positioned at Ms A’s breast. Ms A’s sister explained that while she was supporting the baby during transport:

“[Baby A] began taking short sucking in type breaths by moving her bottom lip only. There was no sound of her breathing out. It appeared to me that the duration between [Baby A’s] sucking air in seemed too long between each. I noticed a tiny amount of meconium around the edges of [Baby A’s] lips and advised [Mr B] of this. [Baby A] still looked grey/purple ... her eyes remained closed, she remained quiet and still. I told [Mr B] that I did not think [Baby A’s] breathing was right.

...

[Mr B] checked (visually) [Baby A’s] chest within the towel approximately three times during the trip and each time commented she was doing well. [Baby A] continued to remain silent and still, with her eyes closed — moving only her bottom lip.”

31. Mr B determined that Baby A required some oxygen, which was administered using the “blow-by” method.<sup>7</sup> St John told HDC that Mr B administered the oxygen by holding the oxygen tubing close to Baby A’s face without a mask. Mr B noted that Baby A’s colour improved, and her breathing became regular. In contrast, Ms A’s sister told HDC that Mr B gave her the oxygen tube and told her “to hold it near [Baby A’s] mouth, and to wave it side to side”. St John stated that Mr B did not assess Baby A’s heart rate, and noted that this assessment should have occurred.

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<sup>6</sup> At the time of events, he was an Ambulance Officer (Emergency Medical Technician).

<sup>7</sup> The “blow-by” method involves an oxygen tube being held at the correct distance from the mouth and nose to achieve the desired increase in oxygen.

32. Ms A's sister told HDC that after oxygen was provided to Baby A:
- “[She] began to slowly gain a little pink colour to her skin. Her breathing continued with little sucks of air inward at the same spaced out rate however ... [Baby A] continued to remain silent and still, with her eyes closed — moving only her bottom lip.”
33. At around 12.10pm, Mr B recorded that Ms A complained of being cold and appeared shaky. Mr B noticed a drop in her blood pressure post-delivery.<sup>8</sup> He repeated her other vital signs and recorded her pulse (110bpm) and oxygen saturation (100%) as being within the normal range. In order to address Ms A's low blood pressure, the ambulance pulled over to allow Mr B to gain intravenous (IV) access and administer 500ml of 0.9% saline fluid with “good effect”. The time recorded on the Ambulance Care Summary states that this occurred between 11.44am and 11.50am. However, St John has advised that the time was recorded incorrectly, and likely occurred later when the ambulance was closer to the hospital. St John reviewed the decision to administer saline fluid, and found that it “was appropriate and complie[d] with [its] Clinical Procedures and Guidelines”, and that the incorrect time “does not have any significant implications for this case”. Ms A told HDC that she believes Mr B gained IV access “three blocks from [Hospital 2]”.
34. While in transit, the ambulance officer telephoned Hospital 2 regarding access to the Delivery Suite. St John told HDC that the elevator from the ambulance area to the Delivery Suite is very slow, so they called ahead hoping that it would be awaiting their arrival to enable a smooth and timely transfer, as Baby A required oxygen and Ms A had yet to deliver the placenta.

### **Presentation at Hospital 2**

35. There was a delay of several minutes in Ms A and Baby A being transferred from the ambulance to the Delivery Suite, because the elevator had not been activated as requested. St John told HDC that oxygen for Baby A was discontinued as they exited the ambulance. In response to the provisional opinion, Ms A told HDC that contrary to St John's submission, Baby A's oxygen was discontinued several blocks prior to reaching the hospital. St John told HDC that oxygen should not have been discontinued while they were exiting the ambulance. However, St John's Medical Director, Dr C, stated that he understood why Mr B did this, as he was expecting to meet hospital personnel at the lift. St John and Dr C have stated that the discontinuation of oxygen for a few minutes is highly unlikely to have altered the outcome for Baby A.

### **Subsequent events**

36. A midwife recorded that on arrival at the hospital at 12.27pm, Baby A was in a very poor condition and required immediate neonatal assistance. The midwife noted that Baby A was floppy, pale, grunting, and had low oxygen saturations. Baby A was admitted to the Neonatal Unit.

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<sup>8</sup> Ms A's blood pressure had fallen from 120/106mmHg to 93/43mmHg.



37. An attempt was made to birth Ms A's placenta, but this was unsuccessful. Ms A required surgery to remove the placenta manually. She was diagnosed with sepsis secondary to an infection of the placenta and the amniotic fluid (chorioamnionitis).
38. At 4.30pm, Baby A was transferred to another district health board for ongoing neonatal care. Baby A was diagnosed with brain damage caused by oxygen deprivation (hypoxic ischaemic encephalopathy).<sup>9</sup>

#### **Further comment**

39. St John has made significant changes to remove all single-crewed ambulance responses. In 2017, St John introduced a four-year project entitled "Double Crewing/Service Delivery Model". St John completed the Double Crewing project on 30 June 2021. As of 1 July 2021, all ambulance responses have been double crewed. St John reviewed the prioritisation of ambulance dispatch in late 2018, and the dispatch of an ambulance is now determined by the most appropriate personnel skill level for an incident, even if the ambulance is slightly further away from the incident location.
40. St John has acknowledged that it could have provided better treatment for Baby A in some areas, but it believes that it is unlikely that this would have changed the outcome. Dr C considers that the treatment provided to Baby A was reasonable in the circumstances, but that there were some minor deviations from what St John would expect, including that oxygen should have been administered using a face mask. Dr C stated that the administration of oxygen via oxygen tubing is a historical method of administration that is no longer taught or practised. He considers that there were several contributing factors to these minor deviations, as follows: Mr B was distracted by having to provide treatment to both Ms A and Baby A at the same time, the Clinical Procedures and Guidelines at that time did not provide adequate guidance on monitoring a baby's heart rate and oxygen saturation, and the training in the assessment and treatment of newborn babies at the time was also inadequate.
41. Mr B advised that he finished his employment with St John in 2019, and since then has not worked in the health sector in any capacity. He noted that the reasons for this were complex, and the "stress associated with this complaint caus[ed] a significant reduction in [his] personal health and wellbeing".

#### **Responses to provisional opinion**

42. Ms A was given an opportunity to respond to the "information gathered" section of the provisional opinion. Where appropriate, her response has been incorporated into this report. Ms A told HDC: "I hope that after the final report, all involved can gain closure and will not carry this with them as a lifelong burden." She stated: "I am happy to see St John's have made some acknowledgement in the way the incident was handled and welcome whole heartedly the changes they have made."

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<sup>9</sup> Hypoxic ischaemic encephalopathy can lead to severe developmental or cognitive delays, or motor impairments that become more apparent as the child continues to develop.

43. Mr B and St John were each given the opportunity to comment on the relevant sections of the provisional opinion.
  44. Mr B had no further comment to make.
  45. St John said that it accepts the proposed recommendations and follow-up actions.
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## **Opinion: Mr B — breach**

### **Introduction**

46. In order to assist my assessment of the care provided to Ms A and Baby A, I sought independent advice from an expert paramedic, Mr Don Banks. Mr Banks has highlighted that this was a complex case where initially a single ambulance officer was required to drive the ambulance and manage Ms A's illness, in addition to managing her labour and the birth of her baby. Sadly, Baby A did not receive the immediate neonatal respiratory support that she required at birth. Mr Banks advised that childbirth in an ambulance is a rare occurrence, and is practised infrequently. He also highlighted a number of factors present in this case, including that Mr B was single crewed at the start, which resulted in a "high cognitive workload and thus a risk to safe and efficacious decision making".

### **Care provided to Baby A**

#### *Assessment of Baby A*

47. En route to Hospital 2, Mr B recorded that Baby A was breathing, making sounds, and becoming pinker in colour following delivery. Although he also recorded that her respiratory effort was slightly irregular (which prompted the oxygen delivered by the blow-by method), the general impression from Mr B's clinical notes is that both mother and baby were stable, and there were no significant concerns. By contrast, Ms A and her sister told HDC that Baby A never cried following the delivery, and was "quiet and still". The midwife's and other clinical notes also record that when Baby A arrived at Hospital 2 she was pale and grunting, and had very low tone, weak respiratory effort, meconium staining on her skin, and low oxygen saturations (at only 50%). She required immediate resuscitative measures.
48. As the foregoing paragraph shows, there is an apparent conflict in the evidence as to Baby A's condition following her birth. Nevertheless, I have little difficulty concluding that Baby A's respiratory function was compromised following her birth, and that her poor and serious condition was not fully recognised (and therefore not acted upon adequately) by Mr B. In particular, I base this conclusion on Baby A's first assessment on arrival at Hospital 2, and my expert's advice (which I accept). I consider it more likely than not that some or all of the symptoms identified at the initial hospital assessment (pale, grunting, low tone, weak respiratory effort, meconium staining, and low oxygen saturations) were present during Baby A's time in the ambulance.

49. The St John Clinical Procedures and Guidelines that applied for ambulance staff at the time (as set out in Appendix B) specify the standards of assessment of neonatal patients. Section 7.1 (special considerations in young children) sets out the paediatric assessment triangle (PAT), which is to be used as part of the assessment to help determine the severity of illness or injury. The PAT involves an assessment of activity (movement, interaction, and muscle tone), breathing (respiratory rate and work of breathing), and circulation (heart rate, perfusion (skin colour)). Section 7.3 (neonatal resuscitation) sets out the steps to be taken for neonatal resuscitation.<sup>10</sup> Section 1.15 sets out five different options for oxygen administration devices.<sup>11</sup> The Guidelines state that “for most patients nasal prongs or a simple mask will be sufficient [and] manual ventilation bags should be reserved for patients requiring assistance with their breathing”.
50. My expert advisor, Mr Banks, considers that Mr B did not meet the standards of assessment of neonatal patients as outlined in section 7.1 and section 7.3. Mr Banks advised that the fact that Mr B recorded that Baby A was crying and moving her limbs indicates that he assessed her activity. I accept this opinion to a point. At least initially Mr B undertook this assessment and formed an impression that Baby A was active. However, it is evident from her presentation at hospital (very poor tone), and also from the witness statements of Ms A and her sister (quiet and not moving) that Baby A’s “activity” was not sustained during the ambulance transfer — indicating that further monitoring of the infant either did not occur or she was not assessed properly, and/or the level of her activity was misinterpreted.
51. Mr Banks further advised that Mr B needed to assess and record Baby A’s heart rate and respiratory rate, and any signs of distress she displayed. Mr Banks explained that in order to meet the PAT standards, Mr B needed to consider Baby A’s “respiratory rate, respiratory sounds such as grunting, and signs of increased workload such as intercostal indrawing [muscles between the ribs pulling inward]. Mr B’s notes make no mention of the presence or absence of these signs.” I note Ms A’s sister’s evidence that Mr B did look at Baby A’s chest, which would imply that he was assessing, in part, Baby A’s respiratory effort.
52. Mr Banks advised that “it is probable that [Mr B] failed to recognise or has misinterpreted the seriousness of [Baby A’s] presentation”, which resulted in Mr B failing to employ “a structured approach to gather and/or analyse the information demanded by the [PAT]”, and instead led him to follow the more general Guidelines at 7.3 to keep the baby warm if the baby is “crying and/or active”. Mr Banks noted that this misinterpretation may have influenced Mr B’s decision to focus on monitoring Ms A, and thus Mr B “failed to provide continual monitoring of [Baby A’s] heart rate, respiratory status and level of activity”.

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<sup>10</sup> Section 7.3 (neonatal resuscitation) outlines that the clinician needs to measure the baby’s heart rate (best monitored using pulse oximetry or ECG leads) in order to figure out the next appropriate steps. In this case, Baby A’s heart rate was not measured. The Guidelines state that the baby should be kept warm and, if the baby is crying or active, then no specific interventions are required. The Guidelines also state that the blood glucose concentration should be measured if the baby’s activity is not normal, and only if the baby does not require resuscitation.

<sup>11</sup> The five oxygen administration devices are as follows: nasal prongs, simple mask, nebuliser mask, reservoir mask, and manual ventilation bag.

53. St John agrees with Mr Banks' findings that Mr B did not assess Baby A appropriately, and that because of this, he did not recognise how unwell she was. St John told HDC: "[Mr B] did not assess [Baby A's] heart rate and we agree that this assessment should have occurred." St John also acknowledged that there were no neonatal pulse oximetry probes in the ambulance. These instruments would have provided objective information regarding Baby A's heart rate and oxygen saturation levels.
54. Ultimately, Mr Banks considers that Mr B's omission to carry out a structured, more complete assessment represents a severe departure from the accepted standard of care.
55. I agree that the initial assessment undertaken by Mr B was inadequate and did not meet the requirements of 7.1 and 7.3 of the Guidelines. By failing to undertake a complete assessment initially, the opportunity to ascertain Baby A's condition was compromised, and on the basis of what he did do, Mr B appears to have failed to recognise, or he misinterpreted, Baby A's condition. Additionally, the ongoing monitoring of Baby A was inadequate in that while Mr B identified her need for oxygen, there was no monitoring of her heart rate, and inadequate assessment of her respiratory status and level of activity. Had there been adequate monitoring, this may have alerted Mr B to Baby A's respiratory distress.

#### *Oxygen provided to Baby A*

##### Oxygen provided in ambulance

56. Oxygen was administered to Baby A using the "blow-by" method, which involved holding the oxygen tubing close to Baby A's face without a mask. Mr B said that he administered the oxygen to Baby A, although Ms A's sister said that she assisted. Both Mr B and Ms A's sister noted that after oxygen was administered, Baby A's colour improved. Mr B noted that her breathing became regular.
57. It is not necessary to resolve the factual disparity as to who provided oxygen to Baby A, as it is nevertheless clear that the "blow-by" method was used.
58. Mr Banks advised that had the seriousness of Baby A's symptoms been recognised, she should have received mechanical ventilation via a bag-mask with positive expiratory pressure.<sup>12</sup> Section 7.3 of the Guidelines (neonatal resuscitation) also suggests that if breathing is inadequate or if the heart rate is less than 100bpm, a manual ventilation bag should be used. However, Mr Banks acknowledged that, in the setting where the seriousness of Baby A's symptoms was not recognised, the use of a mask or nasal prongs would have been appropriate. He commented further that the "blow-by" method is no longer advocated, and there is no mention of the "blow-by" method in the Guidelines. While this method may be effective, it requires undivided attention to ensure that the oxygen flow is properly directed and held at the "correct" distance. It is further noted that the provision of oxygen in this manner may have improved Baby A's colour, but given the findings at the delivery suite, it was not sufficient to address her underlying respiratory issues.

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<sup>12</sup> Mechanical ventilation via a bag-mask is the process of using a mask to provide oxygen. A positive expiratory pressure device is used in addition to manual ventilation to improve oxygenation.

59. As discussed above, Mr Banks advised that Mr B likely misinterpreted his findings, and so did not realise the seriousness of Baby A's symptoms. Mr Banks considers that in light of Mr B's misinterpretation of Baby A's symptoms, and that he had not considered this to be an emergency intervention, the use of the "blow-by" method was a mild departure from the accepted standard of care.
60. I accept Mr Banks' advice in this respect. I note that this mild departure from the standard of care was a flow-on effect from what I consider to be the key failure in this matter — the failure to undertake an adequate assessment and ongoing monitoring, and Mr B's mistaken belief that Baby A was stable.

#### Lack of oxygen provided during transfer from ambulance to hospital

61. While in transit, a call was made to Hospital 2 regarding access to the Delivery Suite to enable a smooth and timely transfer of Ms A and her baby. In response to the provisional opinion, Ms A told HDC that Baby A's oxygen was discontinued several blocks prior to reaching the hospital. St John told HDC that oxygen was discontinued as they exited the ambulance. The elevator was not ready as requested, which resulted in a delay of several minutes in the transfer. St John told HDC that oxygen should not have been discontinued while they were exiting the ambulance. However, St John stated that it understood why Mr B did this, as he was expecting to meet hospital personnel at the lift.
62. I note the different accounts about precisely when the oxygen for Baby A was discontinued. On the evidence available to me, I am unable to determine whether the oxygen for Baby A was discontinued prior to arriving at the hospital or as they exited the ambulance. Nevertheless, it is evident that oxygen was discontinued prior to Ms A and her baby's arrival in the Delivery Suite.
63. Mr Banks advised that the Guidelines offer no direct advice on the continuation of oxygen during handover. He explained that the "common practice for ambulance staff [is] to continue monitoring and treating clients up to the point of formal handover to clinical staff and for longer, should this be required during the physical transfer of the client to the hospital environment". Mr Banks considers that in light of Mr B failing to recognise the severity of Baby A's symptoms, the failure to provide oxygen (or other forms of treatment) during the transfer represents a mild departure from the accepted standard of care.
64. I accept Mr Banks' advice and I am critical that oxygen was not provided to Baby A continuously until her care was handed over to clinical staff. I agree with and accept Mr Banks' advice that in the specific context, this was a mild departure from the accepted standard of care.

#### **Conclusion**

65. I acknowledge that Mr B was an experienced paramedic and that this was a complex and rare situation. As discussed below, he was not well supported by St John in his clinical decisions and actions. As the sole paramedic responsible for two patients, there is little doubt that Mr B had an increased cognitive and practical workload. Although guidance was available, in some respects it was deficient for the situation, and key instruments, namely

neonatal pulse oximetry probes, were not available. Nevertheless, in my view, there were matters for which Mr B must take responsibility. Specifically, he failed to provide services to Baby A with reasonable care and skill for the following reasons:

- a) He did not undertake a complete assessment of Baby A at birth, specifically her heart rate, respiratory rate, and any other signs of distress she displayed, which led to a failure to recognise the severity of Baby A's symptoms;
- b) He should have administered oxygen to Baby A by manual ventilation using a bag, or by using a nasal prong or mask, instead of using the "blow-by" method; and
- c) He should have continued to provide oxygen to Baby A until her care was handed over to clinical staff.

66. As a consequence of the matters noted above, there was a delay in providing appropriate emergency treatment. Accordingly, I find that Mr B failed to provide Baby A with care of an appropriate standard, and, as such, breached Right 4(1) of the Code of Health and Disability Services Consumers' Rights (the Code).<sup>13</sup>

#### **Assessment of Ms A — adverse comment**

67. The Guidelines, at section 1.18, state that the paramedic "must fully assess the patient, including taking a history, performing a primary survey and secondary survey and measuring appropriate vital signs". Further direction is given in section 1.19 (vital signs) and section 1.20 (the primary and secondary survey).

#### *Recording of medical history and vital signs*

68. Mr B recorded Ms A's history, including: "[P]atient has been unwell for 48 [hours] with flu like illness, lethargy, fever and vomiting." He recorded her pulse, blood pressure, and oxygen saturation twice on the journey to Hospital 2.

69. Mr Banks advised that Mr B should have provided further detail in the notes about how Ms A's history of "flu like symptoms" was related to her symptoms in the ambulance. Mr Banks said that although Mr B recorded Ms A's heart rate, respiratory rate, blood pressure, and oxygen saturation to meet the requirements laid out in section 1.19 of the Guidelines (vital signs), he also needed to record her temperature and capillary refill time. Mr Banks noted that section 1.19 advises that vital signs should be acquired every 20–30 minutes in this setting.

70. Mr Banks considers that in light of Mr B's workload, his colleagues would understand that the initial records may not have incorporated Ms A's temperature and capillary refill time, but they would expect a review later on during the trip or during the transfer. Mr Banks considers the failure to record Ms A's temperature and capillary refill time to be a minor departure in the setting of Mr B's high workload.

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<sup>13</sup> Right 4(1) states: "Every consumer has the right to have services provided with reasonable care and skill."



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71. I agree with Mr Banks' advice. Notwithstanding Mr B's high workload looking after two patients, I am nonetheless critical of his omission to take a full set of vital signs when he provided treatment to Ms A.

**Other comment**

72. Other issues relating to the ambulance transfer were considered in the course of my investigation. Specifically, Ms A raised concerns about the speed at which she and Baby A were transported to Hospital 2, calling into question whether the ambulance should have travelled under lights and siren. Additionally, I have considered whether the management of Ms A's hypotension (low blood pressure) identified at about 12.10pm was appropriate.
73. Mr Banks advised that he would have expected the use of lights and siren to have been considered, but he noted that there were a number of variables, and the use of lights and siren would have had a minimal impact on the length of time taken to reach the hospital. I accept that Mr B considered this issue, and that his assessment that the use of lights and siren was not warranted was reasonable in these circumstances.
74. The facts are unclear as to what time Mr B gained IV access and administered saline to treat Ms A's low blood pressure. Based on the information before me, I find it more likely than not that IV access occurred later than was recorded. Mr Banks advised that the treatment of Ms A's low blood pressure was appropriate despite being close to the hospital at that time. I accept that advice.

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**Opinion: St John Ambulance Service — breach**

75. As a healthcare provider, the ambulance service is responsible for providing services in accordance with the Code. In addition, the ambulance service has a responsibility to support its staff with robust systems and policies that guide and support good decision-making. As discussed above, there were individual failings in this case. However, I also consider that the errors that occurred indicate broader systems and organisational issues at the ambulance service. I am concerned about the adequacy of the dispatch policies, the neonatal guidelines and training for staff, and the equipment in the ambulance, which contributed to the inadequate assessment and monitoring of Ms A and her baby.
76. St John acknowledged that systems issues affected the care provided by Mr B. Dr C identified several contributing factors, including that Mr B was distracted by having to provide treatment to both Ms A and her baby at the same time, the Clinical Procedures and Guidelines at that time did not provide adequate guidance on continual monitoring a baby's heart rate and oxygen saturation, and the training in the assessment and treatment of newborn babies at the time was inadequate. Following these events, St John made changes to address these issues, as set out below.

### **Ambulance dispatch**

77. Both Dr C and Mr Banks identified that the need for Mr B to provide treatment to both Ms A and her baby at the same time contributed to deficiencies in the care provided. Mr Banks noted that this was a complex case where a single-crewed paramedic was required to manage Ms A's illness in addition to her labour and Baby A's birth. The fact that Mr B managed the early part of this case single crewed contributed to a high cognitive workload and was a risk to safe and effective decision-making.
78. At the time of events, St John was dispatching single-crewed ambulances, and the dispatch of an ambulance was determined by the closest ambulance available to the incident, rather than the severity of the patient's condition.
79. Mr Banks advised that while a double-crewed ambulance may not have changed the outcome for Ms A and her baby, it may have reduced the cognitive workload and provided an opportunity for Mr B to review the circumstances, assessments, and management strategies as the case unfolded. Mr Banks commented that the "increased amount of double crewed emergency ambulances [is] an excellent improvement".
80. I acknowledge that the changes made by St John will better support staff when responding to incident call-outs.

### **Neonatal guidelines and training**

81. Mr B completed neonatal resuscitation training in 2014. St John advised that it no longer has copies of this training material, but explained that it would have been based on the Clinical Procedures and Guidelines available at the time. Dr C acknowledged that those guidelines provided inadequate guidance on ensuring that the baby's heart rate and oxygen saturation were monitored continually if the baby's activity or breathing was abnormal following the first minute of life, and that St John's training in the assessment and treatment of newborn babies had not been adequate. St John has since made changes to its neonatal guidelines and training, and stated: "[W]hile the content is primarily the same, more points have been added and more guidance is provided to promote personnel to be looking for changes in the baby's condition."
82. My expert advisor, Mr Banks, noted: "[I]t is difficult to comment on the adequacy of the training Mr B received in 2014 given St John were not able to provide the training materials." However, Mr Banks advised that the updated "training material and increased structure and commentary within the [Guidelines] might mitigate against errors associated with this".
83. Mr Banks highlighted that the information on assessment and subsequent response is contained in two separate sections of the Guidelines. He considers that the new Guidelines offer a more structured approach to the assessment of babies, and notes that they also include guidance for ongoing monitoring of heart rate and oxygen saturation. Mr Banks advised that St John could further enhance this guidance by providing an explicit connection between section 7.1 (special considerations in young children) and 7.3 (neonatal resuscitation).



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### Neonatal equipment

84. Mr Banks advised that the lack of neonatal pulse oximetry probes<sup>14</sup> available to Mr B may have compounded the issues relating to the care Mr B provided in observing and monitoring Baby A. Mr Banks stated:

“There is no guarantee that the availability of a neonatal probe would have altered [Mr B’s] actions with respect to the assessments he made of [Baby A’s] symptoms; however, if it had been available it may have provided objective information that would have emphasised her respiratory distress and hypoxic state.”

85. Mr Banks highlighted that section 7.3 of the Guidelines refers to the use of pulse oximetry to determine the levels of treatment, and provides a table of expected oxygen saturations, but the probe specific to this setting is not provided in St John’s ambulances.
86. In my view, St John bears the responsibility for ensuring that its ambulances are supplied with the necessary equipment to undertake assessments for neonatal care.

### Conclusion

87. It is the responsibility of healthcare organisations to ensure that adequate equipment is available, staff are adequately trained, and there are robust systems in place to support the delivery of safe and appropriate services to patients. In my view, there were systemic issues that, collectively, satisfy me that St John failed to provide services to Baby A with reasonable care and skill, as follows:
- a) St John did not have robust dispatch policies in place at the time of events. The dispatch of an ambulance was not determined by the severity of a patient’s condition, and Mr B was in a single-crewed ambulance, which meant that he was cognitively overloaded having to provide care to both Ms A and her baby.
  - b) St John’s neonatal guidelines and training provided inadequate support for its staff in the assessment, monitoring, and treatment of newborn babies.
  - c) The ambulance was not supplied with appropriate equipment, namely a neonatal pulse oximetry probe.
88. For the reasons set out above, I find that St John breached Right 4(1) of the Code.

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<sup>14</sup> Neonatal pulse oximetry probes are small infant-sized wraps with a sensor that measures oxygen saturation of the blood.

## Changes made

89. As outlined above, since these events St John has made significant changes, as follows:
- a) As of 1 July 2021, St John ambulances are double crewed. St John completed the Double Crewing/Service Delivery Model project on 30 June 2021.
  - b) St John has changed the guidance and procedures within the Neonatal and Obstetric sections of the Clinical Procedures and Guidelines.
  - c) St John has reviewed the prioritisation of ambulance dispatch, and the dispatch of ambulances is now determined by the most appropriate personnel skill level for an incident.
  - d) In September 2019, St John provided further neonatal resuscitation training for all frontline ambulance personnel, along with an online video learning resource that is available to personnel at any time. Further neonatal resuscitation training packages were provided to ambulance stations in October 2020.
90. I welcome these changes.
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## Recommendations

91. I recommend that Mr B:
- a) Provide a written apology to Ms A for his breach of the Code. The apology is to be provided to HDC within three weeks of the date of this report, for forwarding to Ms A.
  - b) I note that Mr B is no longer a practising paramedic; however, should he return to practice with St John, I recommend that he undertake further training on the updated St John Clinical Procedures and Guidelines and training material related to paediatric assessment, neonatal resuscitation, and the general management of obstetric emergencies.
92. I recommend that St John:
- a) Provide a written apology to Ms A for its breach of the Code. The apology is to be provided to HDC within three weeks of the date this report, for forwarding to Ms A.
  - b) Consider the recommendations made by my expert advisor, Mr Banks, in particular the provision of an explicit connection between section 7.1 of the Guidelines (special considerations in young children) and 7.3 (neonatal resuscitation), and report back to HDC on the outcome of this review within three months of the date of this report.
  - c) Provide an update on the recommendations made in case 20HDC00487, with respect to specifically equipping frontline and patient transfer services with neonatal-specific equipment, within three months of the date of this report.

## Follow-up actions

93. A copy of this report with details identifying the parties removed, except St John Ambulance Service and the expert who advised on this case, will be sent to the Australasian College of Paramedicine, the Paramedic Council, and the Health Quality & Safety Commission, and placed on the Health and Disability Commissioner website, [www.hdc.org.nz](http://www.hdc.org.nz), for educational purposes.
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## Addendum

94. Mr B failed to provide an apology to this Office for forwarding to Ms A and did not meet the recommendation outlined at paragraph 91 of this report.

## Appendix A: Independent clinical advice to Commissioner

The following expert advice was obtained from Mr Don Banks, an intensive care paramedic:

### **“Opinion on the care provided to [Ms A] and [Baby A] by St John Ambulance [in] 2018.**

I have been asked to provide an opinion to the Commissioner on case number C19HDC01293, and I have read and agree to follow the Commissioner’s Guidelines for Independent Advisors. I am a practising Intensive Care Paramedic having qualified in the role in 1987. I have practised in metropolitan, rural and remote settings. I hold a Master of Health Science degree and teach on the BHSc — Paramedic programme at Whitireia New Zealand.

I have reviewed the letters of complaint, ambulance care summary and supporting documentation supplied by St John Ambulance, [Hospital 2] and [the second district health board].

The Commissioner’s office has requested commentary on whether the care provided to [Baby A] by St John Ambulance Services was reasonable and specifically to provide commentary on:

1. Whether it was appropriate to travel to [Hospital 2] without the ‘use of lights and sirens’ and without [Ms A’s] midwife being contacted.
2. The management of both [Ms A] and [Baby A] on delivery.
3. The adequacy of observations and monitoring of [Baby A] at birth.
4. Whether the administration of oxygen via tubing held close to the face was appropriate.
5. Whether it was appropriate to discontinue oxygen administration when [Baby A] transferred from the ambulance to the maternity unit.
6. The delay in transferring [Baby A] to the maternity unit.
7. The adequacy of oxygen administration guidelines in place at the time of [Baby A’s] birth.
8. Any other matters that warrant comment.

### **Summary.**

This is a complex case where the ambulance crew were required to manage [Ms A’s] illness in addition to her labour and [Baby A’s] birth. This represents a high cognitive workload for a single crewed paramedic, and this is likely to be a contributing factor to breaches in care described below.

It is likely that the hypoxia and signs of [Baby A’s] distress noted in the delivery suite were present during the time she was in the ambulance.

Regarding [Baby A’s] care, there has been a breach in the standards of assessment and [Mr B] has not recognised the severity of [Baby A’s] condition. As a result, [Baby A] did

not receive adequate treatment for her hypoxic presentation. Ideally, [Baby A] should have received mechanical ventilation via a bag-mask device with positive expiratory end pressure and oxygen.

There are some breaches in the standards of assessment of [Ms A]. Her temperature has not been recorded nor has indications of her peripheral perfusion such as capillary refill time been noted. It is likely that the times recorded for her hypotension and intravenous fluid therapy are incorrect and that these occurred in close vicinity to [Hospital 2]. The treatments given to [Ms A] were appropriate, but the associated delays may have negatively impacted on [Baby A's] condition.

The use of lights and sirens to reduce the time to definitive care may have been an advantage. However, my colleagues would be reluctant to offer criticism of the driver as this does not always result in a beneficial reduction in transport time, and can negatively impact on the safety of all in the ambulance. Contacting the Lead Maternity Carer may also have had advantages for [Baby A]. Again, it is difficult to offer criticism as the logistics of meeting on the side of the road with limited means of communication can often result in significant delays and this would not have been appropriate. Other forms of assistance were available but requesting these required [Mr B] to have recognised the severity of [Baby A's] presentation.

The discontinuation of treatment during the delay at the delivery suite entrance was not an appropriate course of action and this has likely occurred secondary to the failure in recognising the severity of [Baby A's] symptoms.

The Clinical Guidelines and Procedures in place at the time of this case offered adequate guidance for the treatment of [Ms A] and [Baby A]. Improvement is possible should an explicit link between the requirements for assessment and neonatal resuscitation be added.

### **Background**

[Ms A] had been unwell for the 48 hours preceding her presentation at [the] Maternity Centre. She was directed to [Hospital 2] by private transport. It is unclear whether [Ms A's] Lead Maternity Carer (LMC) was advised of this or what arrangements, if any, had been made in this regard.

An ambulance response was requested due to the labour contractions [Ms A] experienced while en route to [Hospital 2] with her sister. This has led to a complex situation in which the paramedic has had to simultaneously assess and manage [Ms A's] labour, provide adequate care for [Baby A], and consider the staging and impact of [Ms A's] illness on her own and [Baby A's] health.

Relative to a Delivery Suite, my colleagues would consider an ambulance as an unstable environment for the delivery of a child. There is limited space for the patient, limited clinician space (especially if more than one provider is required), and limited control of environmental factors such as temperature. Should both mother and baby require

resuscitation these issues are compounded. Furthermore, the restraint of a neonatal patient for transport is difficult to achieve with standard ambulance equipment. My colleagues would associate the number of factors present in this case, and the fact that [Mr B] managed the early part of this case single crewed, as a high cognitive workload and thus a risk to safe and efficacious decision making.

[Mr B] was single crewed and spent 12 minutes transferring [Ms A] from the car to the ambulance. He recorded [Ms A's] pulse rate and blood pressure, placed [Ms A] in the left lateral position and commenced transport towards [Hospital 2]. After a short delay, [Mr B] called for assistance. He has then stopped to assist in the delivery of [Baby A]. [Mr B's] notes indicate an uncomplicated vaginal delivery.

### **Observations and monitoring of [Baby A] at birth**

[Mr B's] notes state that [Baby A] 'cried and moved limbs', 'was blue but pinked up within 15 minutes' and that her 'respiratory effort was slightly irregular'. This is at odds with [Ms A's] account ('never cried') and that she heard 'gasping sounds'. [Ms A's] sister also raised concerns 'several times' regarding [Baby A's] breathing. The initial 'Care Plan and Progress Notes' supplied by [Hospital 2] indicate several markers of distress (low oxygen saturations, pale/grey colour, gasping respiratory effort, poor muscle tone and meconium staining on [Baby A's] skin). It is likely that some, or all, of these symptoms preceded [Baby A's] transfer from the ambulance to the delivery suite. My colleagues would view these symptoms as serious and warranting immediate intervention. The use of oxygen in the ambulance may have reduced the severity of these symptoms making the level of [Baby A's] distress less obvious at that time.

The standards for assessment of neonatal patients at the time of this case is described in section 7.1 (Special considerations in young children) of the comprehensive edition of Clinical Procedures and Guidelines 2016–2018<sup>1</sup> (The Guidelines). Further support is given in section 7.3 (Neonatal resuscitation).

To meet the expectations for this assessment [Mr B] would have needed to assess and record the following:

- The level of physical activity or muscle tone displayed by [Baby A].
- Her heart rate and skin colour.
- Her respiratory rate and any signs of distress she displayed.

The recording of [Baby A] crying and moving all limbs indicate activity was assessed. [Mr B's] interpretation of this is likely to have been incorrect in the light of concerns raised by [Ms A], her sister and the initial findings recorded in the Delivery Suite at [Hospital 2].

There is no recording of [Baby A's] heart rate and no indication this assessment was undertaken. The physical measurement of neonatal heart rate can be challenging however the use of the cardiac monitoring equipment in the ambulance is adequate to the task. The commentary in Section 7.3 (Neonatal resuscitation) offers the advice that the '... heart rate

is best monitored via pulse oximetry or ECG leads'. He describes [Baby A] as 'cyanotic' and that this persisted for 15 minutes. The notes go on to state the use of oxygen 'improved colour'.

There is no recording of [Baby A's] respiratory rate nor any objective description of her respiratory effort. The paediatric assessment triangle contained in the guideline states that interpretation of respiratory effort should be based on respiratory rate, respiratory sounds such as grunting and signs of increased workload such as intercostal indrawing. [Mr B's] notes make no mention of the presence or absence of these signs. No pulse oximetry is recorded; however, [St John's] letter states that St John Ambulance does not equip their vehicles with oxygen saturation probes for neonatal patients. My colleagues would agree that the use of adult probes is inappropriate due to the unreliability of readings leading to inappropriate treatment.

The commentary for section 7.3 (Neonatal resuscitation) states that a 'crying and/or active baby requires no specific intervention'. It is probable that [Mr B] has failed to recognise or has misinterpreted the seriousness of [Baby A's] presentation. This has led him to follow the guideline to keep the baby warm but has done so without employing a structured approach to gather and/or analyse the information demanded by the paediatric assessment triangle. This misinterpretation may well have influenced his decision to focus on monitoring [Ms A] and thus failed to provide continual monitoring of [Baby A's] heart rate, respiratory status and level of activity.

## **OPINION**

My colleagues would consider the lack of recorded observations as a breach in standards in one of two settings.

Firstly, had [Mr B] not undertaken any structured assessment of [Baby A] following her birth and at regular intervals such a breach would be considered severe.

Secondly, had [Mr B] undertaken an assessment and misinterpreted the findings we might presume he remained focussed on [Ms A]. Without further evidence of a structured or more complete assessment of [Baby A] this is still deemed a severe breach of the standard required in assessment.

## **OTHER FACTORS**

The lack of neonatal pulse oximetry probes may have compounded this issue. Section 7.3 mentions the use of pulse oximetry to determine levels of treatment and provides a table of expected oxygen saturations, yet the probe specific to this setting is not provided. There is no guarantee that the availability of a neonatal probe would have altered [Mr B's] actions with respect to the assessments he made of [Baby A's] symptoms; however, if it had been available it may have provided objective information that would have emphasised her respiratory distress and hypoxic state.

Arguably, the direction to use these assessments is the recognition of a sick baby. The information for assessment and subsequent response is contained in two separate

sections of The Guidelines and there may be benefit if these were linked in some way. Possible solutions include

1. A written link in section 7.3 (Neonatal resuscitation) advising the use of the paediatric assessment triangle in section 7.1 or
2. The inclusion of a new section specific to the assessment of the new-born utilising APGAR scoring or equivalent with a link to section 7.3 or
3. The inclusion of the required assessment parameters in section 7.3

[Mr B] was single crewed at the time [Baby A] was born. My colleagues would consider childbirth in an ambulance to be a rare occurrence and infrequently practised. [Ms A] was unwell, and this would likely increase the cognitive loading for any paramedic in this situation.

### **RECOMMENDATIONS**

1. [Mr B] review The Guidelines and training material related to paediatric assessment, neonatal resuscitation and the general management of obstetric emergencies. It may be pertinent for [Mr B] to gain further observational experience at an appropriate maternity facility.
2. Emergency ambulance providers in New Zealand supply neonatal pulse oximetry probes to meet the decision making and treatment regimens outlined in the neonatal resuscitation section of The Guidelines.
3. The inclusion of a specific neonatal assessment tool or link to the Paediatric Assessment Triangle within the neonatal section of The Guidelines.

### **Management of [Baby A] at birth and subsequently**

Had the seriousness of [Baby A's] symptoms been recognised, the standard for management is laid out in Section 7.3 (Neonatal resuscitation) of the Guidelines. The treatment regimens are dictated firstly by circulatory status and secondly by respiratory status. The evidence supplied by [Ms A], her sister and the Delivery Suite indicate poor respiratory effort or function and to fulfil the requirements of this guideline, [Baby A] should have received mechanical ventilation via a bag-mask device with a positive expiratory end pressure (PEEP) device set to 5cm H<sub>2</sub>O [water pressure]. Failure to see signs of improvement would require the addition of oxygen and continuous monitoring to this regimen. Had the severity of [Baby A's] symptoms been recognised, deviation from or failure to provide this treatment would be considered a severe breach of this standard.

[Mr B] has not recognised the severity of [Baby A's] symptoms and has adhered to the more general advice in section 7.3.

There is no record of the time he administered the oxygen nor notes that clarify the relationship between the oxygen administration and any alteration in [Baby A's] presentation. Provision of oxygen may have ameliorated the cyanosis making it less



obvious, however, the findings at the Delivery Suite make it clear that the underlying issues remained unaddressed.

The lack of clarity around these issues is, in part, due to the notes relating to [Baby A's] birth and presentation. These are presented as an addendum to the clinical record prepared for [Ms A]. They would have been added after the clinical information for [Ms A] had been prepared and submitted. There is no time stamp on these notes and thus the length of delay between the submission of [Ms A's] record and the addition of the notes for [Baby A] is an unknown factor. Section 8.2 of The Guidelines (Other obstetric considerations) state 'Good documentation is always important' and that 'Separate PRFs [patient report forms] are required for the mother and baby'. The benefit of this advice is that the timeline of [Baby A's] presentation, treatment and response to that treatment could be more easily observed.

Section 1.15 (Oxygen administration) of The Guideline offers five options for oxygen administration devices. Given the seriousness of [Baby A's] symptoms, oxygen should have been administered via a bag-mask device (see above). In the setting that these symptoms were not recognised, the use of a mask or nasal cannula would have been appropriate. Providing oxygen using 'blow-by' is no longer advocated. There is no specific mention regarding this method in the obstetric, neonatal, paediatric or general guidelines published by St John. My opinion is that 'blow-by' may be effective; however, it requires undivided attention to ensure the oxygen flow is directed toward the mouth and nose and is held at the 'correct' distance to achieve the desired increase in the fraction of oxygen in inspired air. These features are difficult to quantify and hence the use of bag-mask, mask or cannula are the preferred options.

As discussed above, my peers would consider failure to provide oxygen via a bag-mask device whilst providing mechanical ventilation as a severe breach of the standard. If seen in the light of [Mr B's] misinterpretation and that he hadn't considered this to be an emergency intervention, then the breach in assessment (discussed above) is the more prevalent issue and the use of 'blow-by' would be considered a mild breach of standard.

## **OPINION**

The recognition of the severity of [Baby A's] symptoms would have led to a different course of treatment and a sense of urgency in her care. Had [Mr B] recognised the severity of [Baby A's] presentation, the appropriate course of action would have been to provide mechanical ventilation with the addition of oxygen via a bag-mask device. Had the severity of [Baby A's] symptoms been recognised, deviation from or failure to provide this treatment would be considered a severe breach of the standard of care.

This breach needs to be considered in the light of [Mr B's] failure to recognise the severity of the situation. The guidelines for treatment in place at the time of this case were adequate and are in line with the teaching offered in tertiary and in-service settings. The breach in management is most likely secondary to the breach in assessment and recognition and not related to the advice offered in The Guidelines.

Having failed to recognise the severity of [Baby A's] symptoms, [Mr B's] use of 'blow-by' oxygen would be considered a mild breach of the standard.

### **RECOMMENDATION**

1. [Mr B] reviews The Guidelines and training material related to paediatric management techniques, neonatal resuscitation and the general management of obstetric emergencies. It may be pertinent for [Mr B] to gain further observational experience at an appropriate maternity or neonatal facility.

#### **Use of lights and sirens en route to hospital**

The question of whether the transport of [Ms A] and [Baby A] should have occurred under 'lights and sirens' is not covered by any specific clinical guideline or Standard Operating Procedure. In the setting of normal labour, Section 8.2 (Other obstetric conditions) of The Guidelines excludes its use.

The Guidelines contain numerous cautions which address the risk of injury to unrestrained crew, difficulty maintaining safety and efficacy of interventions, increased likelihood of a collision, and increased risk of injury to all in the ambulance and other road users. Where unrestrained crew members are providing treatment, drivers are instructed not to exceed posted speed limits.

Open roads that do not have passing lanes or adequate shoulder space for other vehicles to pull into can lead to unpredictable actions by other motorists and may have the opposite effect to that desired. My colleagues use lights and sirens in some traffic situations and attempt to reduce transport times by clearing intersections, but even this comes with an increased risk of unpredictable responses and collision. Lights and sirens are as likely to be employed when calling attention to the fact an ambulance is forced to travel more slowly due to the nature of the patient's injuries or the interventions that are being carried out. Thus, the use of lights and sirens to reduce transport time should not be considered synonymous with an increase in speed and should not be automatically associated with a significant clinical benefit.

The evidence provided is insufficient to determine the benefit associated with the use of lights and sirens in this case. Had [Mr B] recognised the severity of [Baby A's] presentation it would have been appropriate for him to request the driver to utilise this method. The final decision rests with the driver who is required to balance the risks against any benefit.

### **OPINION**

I believe my colleagues would agree that this case could warrant the use of lights and sirens and that it would be a moderate breach had this not been considered.

My colleagues would be reluctant to offer criticism of the driver due to the number of variables he may have experienced and the minimal impact that the use of lights and sirens would have on time to definitive care.

**Contact of [Ms A's] midwife**

The Guidelines offer no direct imperative to have called [Ms A's] midwife.

Contacting the LMC is a common practice especially when in a more stable environment such as the client's home. In this case, [Ms A] was in the back of an ambulance on a rural road and reasonably close to a hospital with advanced obstetric and neonatal care facilities.

My colleagues would question the logistics in attempting to meet the LMC under these conditions. It would require ambulance staff to identify the LMC's contact number, establish the availability of the LMC and then organise a point to meet. This may have involved a lengthy wait on the side of the road and an increased time to reach definitive care. My colleagues would consider the ambulance crew's call to advise the Delivery Suite of their arrival to be an equal or more advantageous course of action.

Had [Mr B] recognised the severity of [Baby A's] presentation his decision to transport directly to the Delivery Suite would have been considered even more appropriate.

**OTHER FACTORS**

The revised version of The Guidelines<sup>2</sup> gives more explicit advice around contacting an LMC. In doing so it advises to seek assistance from the LMC but not at the expense of delay in transport to definitive care.

**OPINION**

Had [Mr B] recognised the severity of [Baby A's] presentation it would have been appropriate for him to have recommenced transport without contacting the LMC.

**Discontinuation of oxygen during transfer**

The Guidelines offer no direct advice on the continuation of oxygen during handover. It is common practice for ambulance staff to continue monitoring and treating clients up to the point of formal handover to clinical staff and for longer, should this be required during the physical transfer of the client to the hospital environment. The absence of clinical staff and equipment at the point of transfer should have been evidence that treatment and monitoring utilising ambulance equipment needed to be continued.

Again, the failure to recognise the severity of [Baby A's] condition appears to have influenced this decision. It seems likely [Mr B], in not recognising this severity, has calculated the transfer time without the use of oxygen did not pose a specific risk.

**OPINION**

Given the severity of [Baby A's] symptoms, my colleagues would view the failure to provide oxygen (or other forms of emergency treatment) during the transfer as a severe breach of normal practice. Again, the nature of the breach must be considered in the light of [Mr B] failing to recognise the severity of [Baby A's] symptoms and in this light, the breach would be considered mild.

### **Delays in transfer at [Hospital 2]**

The ambulance crew made a request to inform the Delivery Suite staff of their arrival. [St John's] letter (17 September) indicates this request was forwarded by the Ambulance Communication Centre. This is common practice and would be considered an appropriate course of action by my colleagues.

Based on the information provided, reasons for the subsequent delay could only be speculative.

### **Care provided to [Ms A]**

The expected standard of care in assessment is described in Section 1.18 (Treatment and referral decisions) of The Guidelines which state that the paramedic 'must fully assess the patient, including taking a history, performing a primary survey and secondary survey and measuring appropriate vital signs'. Further direction is given in sections 1.19 (Vital signs) and section 1.20 (The primary and secondary survey).

To fulfil the requirements of these guidelines [Mr B] would have had to ascertain and record the historical features leading to the call and document a set of vital signs.

He notes that [Ms A] was 'unwell' for 48 hours and has subsequently made an addendum noting 'flu like illness, lethargy, fever and vomiting'. This addendum was added after the initial submission of the PRF and it is not time stamped. It is not clear when the addendum was added and equally not clear whether the significance of these symptoms was analysed at the time of the initial examination.

[Mr B] has recorded a heart rate, respiratory rate, blood pressure and oxygen saturation percentage. To fulfil the requirements laid out in Section 1.19 of The Guidelines, [Mr B] also needed to record [Ms A's] temperature and capillary refill time but, this has not occurred. The total transport time was 53 minutes and during this time [Mr B] has recorded two incomplete sets of vital signs. It is unclear whether the second set was recorded at 11:44 or within minutes of arrival at hospital. In either case, there has been a 40–50-minute interval during which no vital signs were recorded. [Mr B] has recorded a 'Final Patient Status' of '3 — Unlikely threat to life' and section 1.19 advises vital signs to be acquired every 20–30 minutes in this setting.

The presence of [Ms A's] symptoms over 48 hours indicate an infective illness and the provisional diagnosis should include sepsis. Section 6.1 (Infection) of The Guidelines provides an example of sepsis by describing the presence of infection, systemic response, tachycardia, a temperature exceeding 38.5°C and normal perfusion). This is similar to [Ms A's] presentation, but the way in which the historical features are noted, and the absence of temperature and capillary refill recordings indicates this was not considered and/or recognised.

The speed of the transfer to the ambulance and early call for assistance indicate [Mr B] realised the imminent nature of [Ms A's] delivery. Managing this event is likely to have dominated his thinking and reduced the chance that he considered any parallel morbidities. Childbirth in an ambulance setting is a rare occurrence and results in the

paramedic having to manage two patients. The possibility for cognitive overload appears to be high in these circumstances.

With the benefit of hindsight, [Mr B] should have called for advanced assistance to assist with the workload he was encountering. It is common practice for paramedics to seek assistance from an Intensive Care Paramedic (ICP) when procedures beyond the paramedic Authority to Practice (ATP) are required. It is less common to seek such assistance in the face of complex presentations that fall within the realm of the paramedic ATP. This, the failure to recognise the seriousness of [Baby A's] symptoms and the complex issues of [Ms A's] presentation appear to have had a negative impact on seeking further assistance.

Ambulance staff are aware of the current stretching of resources and may avoid seeking assistance to avoid any further burden. Section 1.9 (Crew resource management) of The Guideline advises to call for help when necessary, to avoid delay in seeking assistance and to 'have a low threshold' for this in the face of uncertainty. This case highlights the role of seeking assistance or clinical advice in the setting of complex situations such as multiple patients or multiple diagnostic requirements.

## **OPINION**

Despite the obvious workload faced by [Mr B], it would be reasonable to expect that [Ms A's] temperature and capillary refill times were recorded. Whilst it is understandable that this may not have occurred at the initial phase due to workload it should have occurred on subsequent occasions.

In normal circumstances this would be considered a moderate breach of the assessment standards however, in the setting of [Mr B's] workload, in this case, it would be considered a minor omission.

## **RECOMMENDATIONS**

1. [Mr B] review The Guidelines and training material around Sections 1.18 through 1.20.
2. Emergency ambulance services in New Zealand provide information to reinforce the need for clinical advice or assistance in complex situations.

[Ms A] suffered a hypotensive episode in the ambulance. The PRF shows this occurring at 11:44 but [Ms A's] account and the GPS records indicate that the treatment may have commenced as late as 12:22.

Two scenarios seem likely. The first is that the times for both the blood pressure and the fluid administration were recorded incorrectly. It is common practice for ambulance staff to gather a set of vital signs when close to the receiving hospital. If this was the case it was likely that the recognition of the hypotension and subsequent treatment occurred at the later time and in close vicinity to the hospital. The second is that the

time of the blood pressure was recorded correctly but that the treatment of the hypotension occurred some 20 minutes after it was recognised.

In the setting of a retained placenta, Section 8.3 (Other obstetric considerations) of The Guidelines advises the placement of an intravenous cannula (IVC). Whilst the primary concern noted in this guideline is postpartum haemorrhage, my colleagues would be concerned that this hypotensive episode was caused by the presence of sepsis and/or the retained placenta. Their expectation would be the early placement of an IVC and the use of intravenous fluids to manage ongoing hypotension. Several guidelines address this type of shock and all recommend the delivery of 1000mls of 0.9% saline. The current teaching and common practice is to give an initial 250–500 ml bolus and then titrate the fluid administration following a reassessment of the vital signs. Once the fluid therapy has been commenced the expectation would be that initial 500mls of fluid would be administered over a 10–20-minute period. Given the delay in reaching the delivery suite, it is conceivable that 500mls could have been administered.

### **OPINION**

In the first scenario, my colleagues would accept that stopping the ambulance to place an IVC and commence intravenous fluid therapy was an appropriate course of action despite the vicinity of the hospital. They would also accept that earlier placement of the IVC would have been more appropriate.

In the second scenario, my colleagues would deem the delay in instituting treatment as a moderate breach of the standards in The Guidelines.

### **OTHER FACTORS**

While the delay in transport time to treat [Ms A] was appropriate, it may have compounded the issues faced by [Baby A]. As the severity of her symptoms had not been recognised or treated whilst in the ambulance, any stoppages made to manage [Ms A] may have had a negative impact on her.

There were options available to mitigate these issues. Had the severity of [Baby A's] symptoms been recognised and the impact of [Ms A's] illness been considered, [Mr B] should have called for an ICP to assist with their management. The logistics around organising this are reasonably straight forward as both the ambulance and the ICP are in communication with each other and the communications centre. This would have resulted in the prompt arrival of an advanced clinician and would have been likely to reduce the physical and cognitive workload for [Mr B].

### **RECOMMENDATION**

In addition to the review of his clinical practice, it may be appropriate for [Mr B] to undertake training in the reduction of cognitive bias in clinical decision making. Recognition of these biases, and strategies to mitigate them, may assist in recognising the red flags that indicated that [Baby A] was unwell.



Thank you for the opportunity to provide opinion on this case. If you require any further clarification, please feel free to contact me.

Yours sincerely,

**Don Banks**

## REFERENCES

St John Ambulance. *Clinical Procedures and Guidelines — Comprehensive Edition*. Auckland: St John Ambulance; 2016.

St John Ambulance. *Clinical Procedures and Guidelines 2019–2022 — Comprehensive Edition*. Auckland: Author; 2019.

<https://www.stjohn.org.nz/globalassets/documents/health-practitioners/clinical-procedures-and-guidelines---comprehensive-edition.pdf>. Accessed December 24, 2019.”

The following further expert advice was obtained from Mr Banks:

“Thank you for the opportunity to review this information. I have read the response and attachments sent to your office by St John, and the letter from [the DHB] regarding meeting the ambulance at the Delivery Suite entrance.

St John’s response reiterates the effect of the cognitive workload that [Mr B] experienced in caring for [Ms A] and [Baby A] and, that the departures from the standards in management were secondary to not having recognised the seriousness of [Baby A’s] condition.

This information does not alter my initial opinion regarding the assessment and care offered to [Baby A] by St John.

I cannot entirely agree with the stance that the need for the recording of [Ms A’s] capillary refill time and temperature was negated by the fact it wouldn’t have changed [Ms A’s] treatment. It could equally be said that without these assessments, a paramedic might not fully establish which treatments were required. My original opinion included comments on the high workload that [Mr B] was experiencing. In this situation, my colleagues would understand that the initial recordings may not have incorporated these assessments but would expect a review during the transfer.

The Clinical Practice Guideline that was current at the time states ‘Vital signs should not be recorded if the patient has a time critical problem and the results will not change the treatments’ (St John Ambulance, 2016 p62). The subsequent examples include factors such as being close to a hospital with a time-critical patient or having to manage multiple patients without significant injury. This case did not reflect these examples, but I would agree that [Mr B’s] workload was an influencing factor. My opinion should have reflected this by characterising the nature of the breach as minor.

The treatment of [Ms A's] hypotension was appropriate, and the only breach that may have occurred would have been a prolonged delay in instituting this.

The radio call made at 12:14 has made an explicit request for someone to meet the ambulance crew at the 'bottom of the lift'. The subsequent request used the same words and received confirmation that this would happen. I am unaware of the local procedure or routine for ambulance staff accessing the delivery suite at [Hospital 2]. However, it seems reasonable that the response from the Delivery Suite staff would make the caller from the Ambulance Call Centre confident that the request was understood and would be acted on. I cannot recall if [Mr B] accompanied [Ms A] and [Baby A] to the delivery suite. If he hadn't, I assume that it would be a result of his belief that [Baby A] was not critically unwell.

St John's newer Clinical Practice Guideline offers a more structured approach to the assessment of the neonate and includes guidance for ongoing monitoring of heart rate and oxygen saturation. It asks for this when 'breathing or activity are abnormal' (St John Ambulance, 2019 p327) and, like the previous edition, there is a tacit link between this statement and the paediatric assessment triangle described on page 305 in section 7.1 (Special considerations in young children). While the newer guidance is very beneficial, the addition of a link between these two sections could enhance it further. There are examples of this linking in other sections of the pocket and app-based editions of these guidelines. These links provide information to map the severity of presentation, refer to checklists or direct the use of a related guideline. An explicit connection between section 7.1 and 7.3 may provide similar assistance.

If I can offer further assistance, please do not hesitate to contact me.

Nāku noa, na

**Don Banks"**

The following further expert advice was obtained from Mr Banks:

"Thank you for the opportunity to review this information. I have read the correspondence from St John Ambulance and reviewed the content of the training material.

The Commissioner's office has requested whether this information would change the advice and to provide comment on the adequacy of the neonatal resuscitation training [Mr B] received in 2014.

The information provided has not altered the advice that the breaches in assessment and care were most likely secondary to [Mr B] not recognising the severity of [Baby A's] presentation and providing ongoing monitoring. These breaches may have been more likely due to the high cognitive workload associated with managing two patients and [Mr B] being the sole provider during the initial phase of this case.



Without viewing the training material, it is difficult to comment on the adequacy of the training [Mr B] received in 2014. My experience of similar training was that it was based on the Clinical Procedures and Guidelines (CPG)<sup>1</sup> in effect at that time. This CPG focussed on assessing the adequacy of breathing and circulation and provided concise mapping of oxygen saturation levels and heart rate to management strategies. Presumably, the training offered to [Mr B] would have reflected this content and provided an opportunity to practise neonatal specific resuscitation skills.

Those assessment and management strategies are comparable to the current CPG<sup>2</sup>; however, the current version's level of commentary and guidance is more substantial. What degree this was reflected (or not) in earlier training is not clear, but while the earlier training may have been adequate, the current CPG and training package offers more comprehensive and explicit advice.

Pages 10–15 of the CCE manual provided by St John Ambulance respond directly to the CPG changes that enhance the structure for the assessment and management of neonatal patients. The initial focus reiterates the importance of heart rate as the determinant for the level of intervention, and the CPG itself provides a structured approach to interventions based on this. The manual also includes information on the required level of ongoing monitoring and options to monitor the heart rate. There is also explicit direction on what level of assistance to seek and recommendations for the urgency of transport. The accompanying PowerPoint prompts a discussion around decision making for resuscitation. Most likely, this results in a review of the paediatric and neonatal assessment strategies as documented in the CPG and CCE manual.

Arguably, opportunities to practise neonatal assessment are infrequent in the emergency ambulance service. However, this training material and the increased structure and commentary within the CPG might mitigate against errors associated with this. These enhancements address the level of monitoring and the nature of assistance that would have benefited [Baby A].

My colleagues view the increased amount of double crewed emergency ambulances as an excellent improvement. While it is difficult to state categorically that this would have changed the outcomes for [Ms A] and [Baby A], it might have reduced the cognitive workload and provided an opportunity for [Mr B] to review the circumstances, assessments, and management strategies as the case unfolded.

I hope that this has been helpful. If you have any further questions, please do not hesitate to contact me.

Yours sincerely,

**Don Banks**

## References

St John Ambulance. *Clinical Procedures and Guidelines — Comprehensive Edition*. St John Ambulance; 2016.

St John Ambulance. *Clinical Procedures and Guidelines 2019–2022 — Comprehensive Edition*. Author; 2019.”

## Appendix B: Relevant standards

### St John Ambulance Service — Clinical Procedures and Guidelines Comprehensive Edition 2016–2018

The St John Ambulance Service publication “Clinical Procedures and Guidelines Comprehensive Edition 2016–2018” states the following:

#### “7.3 Neonatal resuscitation

- Always clarify who is in charge. If a lead maternity carer (LMC) is present, they are in charge of directing the treatment provided to the baby unless this responsibility is formally handed over to ambulance personnel.
- Assessment and interventions are based primarily on the baby’s heart rate, breathing and SpO<sub>2</sub>.

*If breathing is inadequate or the heart rate is less than 100/minute*

- Ventilate with a manual ventilation bag at a rate of 60/minute, using PEEP set to 5 cmH<sub>2</sub>O and without added oxygen.
- Continually monitor the heart rate.

*If the heart rate rises to greater than 100/minute*

- Stop ventilation.
- Dry the baby and keep them warm.
- Administer oxygen if the SpO<sub>2</sub> is less than expected (see below).
- Continually monitor the heart rate, breathing and SpO<sub>2</sub>.

*If the heart rate is 60–100/minute*

- Focus on providing ventilation.
- Ventilate with 10 litres/minute of oxygen if the heart rate fails to improve.

*If the heart rate falls to less than 60/minute*

- Start CPR at a ratio of 3:1.
- Continue to focus on ventilation with oxygen at 10 litres/minute.
- Place an LMA.
- Consider placing an ETT.
- Gain IV access.
- Administer adrenaline IV every four minutes:
  - a) 0.01 mg (0.1 ml of 1:10,000) for gestation less than or equal to 26 weeks.
  - b) 0.025 mg (0.25 ml of 1:10,000) for gestation 27–37 weeks.

- c) 0.05 mg (0.5 ml of 1:10,000) for gestation greater than or equal to 38 weeks.

*In addition*

- Measure the blood glucose concentration if the baby's activity is not normal, but this is not a priority if resuscitation is required. Administer glucose if the blood glucose concentration is less than 2.5 mmol/litre:
  - a) Spread glucose gel on the gums, tongue and inside of the cheeks if the baby is conscious and repeat this every 5–10 minutes.
  - b) Administer 10 ml of 10% glucose IV if the baby is unconscious or the blood glucose concentration does not rise 20 minutes after oral glucose.
  - c) Repeat the glucose measurement every 10 minutes and administer further glucose if required until the glucose concentration is greater than or equal to 2.5 mmol/litre.

*Expected SpO<sub>2</sub>*

- 60–70% at 1 minute.
- 65–85% at 2 minutes.
- 70–90% at 3 minutes.
- 75–90% at 4 minutes.
- 80–90% at 5 minutes.
- 85–90% at 10 minutes.
- 90–95% at more than 10 minutes.

*Referral*

- Transport to a hospital with neonatal facilities whenever feasible if the baby has required intervention or has abnormal vital signs.

**Additional information**

*General*

- Resuscitation of a neonate is focused primarily on supporting ventilation.
- A crying and/or active baby requires no specific intervention. Dry the baby and place skin to skin with the mother provided neither is requiring resuscitation. Place a hat on the baby if one is available, cover them both with a warm blanket and observe the baby's activity and breathing.
- It is normal for the peripheries of the baby to remain blue for several hours after birth.
- The heart rate is best monitored via pulse oximetry or ECG leads.

- Pulse oximetry should be monitored using the right hand whenever possible because a patent ductus arteriosus may produce falsely low measurements in the left hand and feet.
- Preventing heat loss is vital, particularly in a premature baby:
  - A premature baby requiring resuscitation should be immediately wrapped in plastic (leaving the face free) without being dried and placed under radiant heat as soon as possible.
  - A term baby should be dried and resuscitated in a warm environment if possible.
  - A hat should be placed on the baby if one is available.
  - The interior of the ambulance should be made as hot as possible.
- Mother and baby must be safely restrained during transport.

#### *Hypoglycaemia*

- Hypoglycaemia is uncommon in neonates in the first few hours.
- The normal blood glucose concentration is lower in a neonate than in older children and a neonate is not hypoglycaemic unless the glucose concentration is less than 2.5 mmol/litre.
- Glucose concentration should be measured via heel prick.
- If the baby is conscious, spreading glucose gel on the mucous membranes of the mouth is usually an effective treatment.

#### *Oxygen administration, suctioning and ventilation*

- Routine oxygen administration during neonatal resuscitation appears to make outcomes worse. This is why oxygen is reserved for deterioration despite initial ventilation.
- Suctioning the mouth and nose before the body is delivered is not required, even if meconium is present. If ventilation is required, this takes priority over suctioning meconium unless meconium is clearly occluding the airway.
- Ventilation via an LMA is preferred to ventilation via an ETT because intubation with an ETT has a high failure rate, unless the person performing the intubation is very experienced. However, if resuscitation is required for more than 10 minutes an ETT may be placed provided intubation is able to be easily performed.

Ventilation via a face mask or LMA can result in distension of the stomach, but an attempt to decompress the stomach should not usually occur unless instructed to do so by an LMC.

#### *Intravascular access, adrenaline and 0.9% sodium chloride*

- Gaining IV access has a lower priority than providing good CPR with a focus on ventilation.

- If the baby is very small, access may be difficult to obtain because the paediatric needle may be too long and the softness of the bones may result in the needle being easily displaced.
- Administering adrenaline IV is not a priority, but may occur provided this does not compromise the focus on providing good ventilation and CPR.
- 0.9% sodium chloride IV does not have a significant role in resuscitation, but consider administering 10 ml/kg if there are signs that the baby has bled or the baby shows signs of shock.

#### *Cutting the cord*

- There is no urgency to clamp and cut the cord provided neither the baby nor the mother is requiring resuscitation.
- In the absence of urgency, clamp and cut the cord 2–3 minutes after birth.
- Clamp and cut the umbilical cord at least 5 cm from the baby as this facilitates access to the cord vessels for later cannulation if required.

#### *Backup*

- Request early backup and support from an ICP and/or LMC if resuscitation is required.
- There is no role for requesting a hospital neonatal team to attend a scene that is not a birthing unit.

There may occasionally be a role for a hospital neonatal team to attend a birthing unit, noting that this decision will be made by a hospital neonatologist in consultation with the LMC and the team may take significant time to reach the scene.

- The decision to utilise a hospital neonatal team is usually a trade off between time and the availability of dedicated equipment during transfer:
  - If the baby is requiring ventilation or resuscitation, it will usually be faster to deliver the baby to hospital than to deliver a hospital team to the scene.
  - If the baby is not requiring ventilation or resuscitation and there is specific equipment at the scene that cannot be utilised during transfer, it may be preferable to wait at the scene for a hospital team with dedicated equipment.

#### *Starting and stopping resuscitation*

- A resuscitation attempt should always be started unless an LMC directs ambulance personnel not to.
- Resuscitation should usually occur at the scene because the quality of resuscitation is compromised during transport. However, resuscitation en route to hospital may be appropriate if transport time is less than 15 minutes and an ICP or LMC cannot reach the scene.

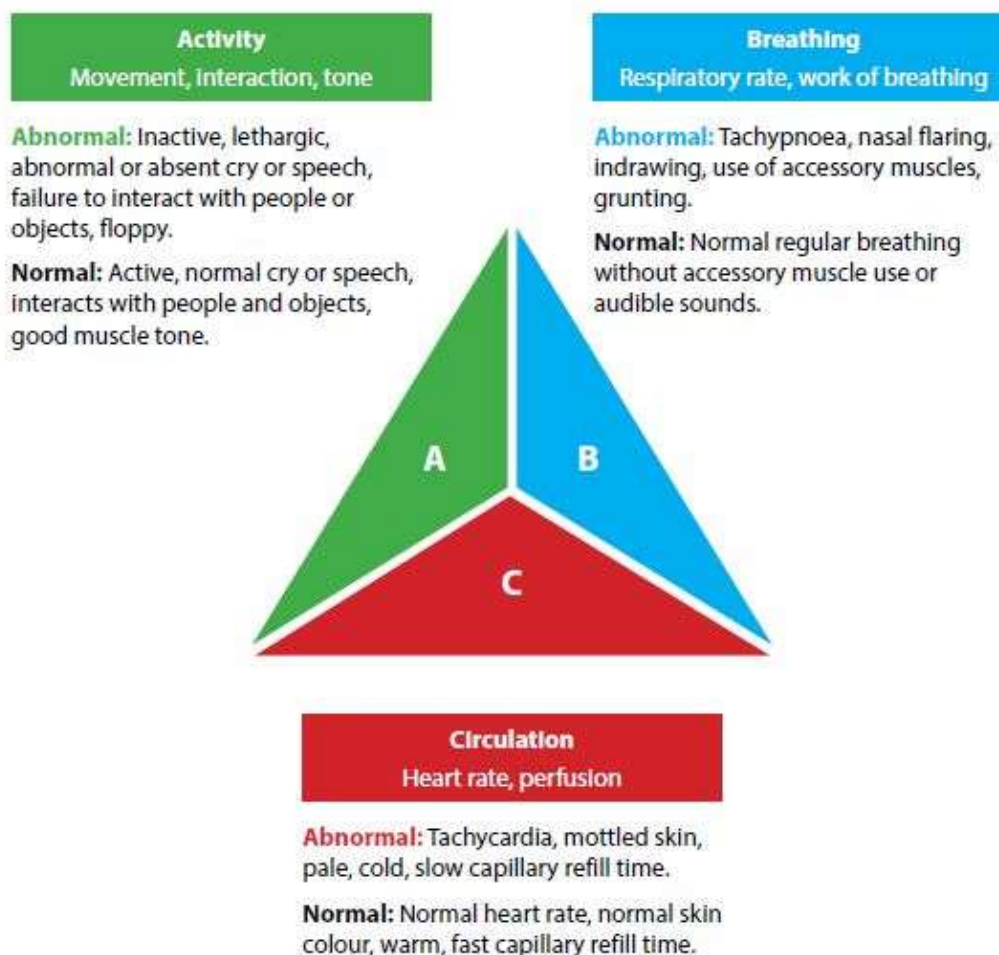
- If the LMC is not present to make the decision, resuscitation attempts should be stopped if the baby is in asystole for more than 10 minutes.
- If there is uncertainly personnel must seek clinical advice.

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## 7.1 Special considerations in young children

### Initial assessment

- A child's general appearance is an important consideration when determining how severe their illness or injury is, the need for treatment and the response to therapy.
- The paediatric assessment triangle (PAT) is a form of assessment that can be used to help determine the severity of illness or injury. The PAT involves an assessment of activity, breathing and circulation and is performed at the same time as the primary survey.
- The more abnormal the PAT is, the more severe the illness or injury is:



— If the PAT is normal, the child is unlikely to have severe illness or injury.

- If one segment of the PAT is abnormal, the child is showing signs of an important illness or injury.
- If two segments of the PAT are abnormal, the child is seriously ill or injured and is likely to be status two.
- If three segments of the PAT are abnormal, the child is severely ill or injured and is likely to be status one.
- The aspects of the PAT that are most abnormal can help determine the underlying cause. For example:
  - If activity is abnormal, but breathing and circulation are near normal, the child is likely to have a condition primarily involving the brain.
  - If breathing is abnormal (particularly work of breathing), but activity and perfusion are near normal, the child is likely to have a condition primarily involving the lung.
  - If perfusion is abnormal, but activity and breathing (particularly work of breathing) are near normal, the child is likely to have a condition primarily involving the circulation.
- Document the aspects of the PAT on the PRF, but do not refer directly to the PAT as a title. This is because most hospital personnel are familiar with the individual aspects of the PAT, but not the actual title.

#### *Communication*

- The child is likely to be frightened. This will be contributed to by the injury or illness, the feelings and discomfort associated with it and the fact that ambulance personnel will be strangers.
- The child can only communicate up to their level of vocabulary. A calm and soothing tone is important.
- Communication is more difficult if the child is distressed or in pain.
- Parents, relatives and caregivers may be acting in a manner driven by feelings of helplessness and fear. It is important to acknowledge their anxiety and to keep a calm manner, without appearing to be overly relaxed or unconcerned.
- Whenever possible do not separate the child from parents or caregivers.

#### *Interaction and activity*

- A child will have reduced interaction and activity if very unwell or badly injured.
- Signs of reduced activity include:
  - Lethargy.
  - Abnormal cry.
  - Failure to interact with people or objects.
  - Reduced tone or floppiness.



### *The respiratory system*

- Children rely heavily on the rate of breathing to compensate for respiratory difficulty. This is because they are unable to increase the depth of respiration due to the inability of the diaphragm to move farther downward against their abdominal organs.
- Tachypnoea is an early sign of respiratory distress.
- Children have narrower airways with higher resistance than adults.
- Children have a higher resting respiratory rate than adults and higher oxygen consumption.
- In children, the diaphragm is the dominant respiratory muscle. They do not move their chest wall significantly during normal breathing. Use of the diaphragm makes them more prone to fatigue.
- Children have lower functional residual capacity (FRC) than adults. This results in lower oxygen reserves and makes them more prone to hypoxia.
- Children have very compliant (elastic) ribs. This means that an increase in work of breathing will cause indrawing or retraction.
- Signs of respiratory distress include:
  - Tachypnoea.
  - Nasal flaring.
  - Grunting.
  - Weak cry.
  - Indrawing or retraction. Look for this in the supraclavicular, intercostal and substernal sites.
  - Accessory muscle use.
  - Stridor.
  - Abnormal positioning for example sitting forward, the sniffing position, the tripod position or refusing to lie down.
  - Head bobbing.
- Hypoxia in children causes tachycardia, agitation, drowsiness and pallor. Cyanosis is a late sign.
- If hypoxia is very severe the heart rate will begin to fall. This is a very late sign of imminent cardiac arrest.

### *The cardiovascular system*

- Children have a higher blood volume (80–100 ml/kg) and cardiac output relative to size, a relatively fixed stroke volume and a higher resting heart rate than adults.
- Children have a significant capacity for vasoconstriction in the setting of falling cardiac output. This ability to vasoconstrict means that a fall in blood pressure is a very late sign of shock. However, the trend of blood pressure and pulse pressure over time are useful.

- The signs of shock in children are:
  - Tachycardia.
  - Tachypnoea.
  - Vasoconstriction with prolonged capillary refill time. This will also often produce mottled skin.
  - Reduced activity and interaction.
- Although children have a higher blood volume per kilogram, they have a lower total blood volume. This means that what may seem like a small amount of blood loss may represent a significant proportion of blood volume. For example, small children can become shocked from bleeding within their skull or from their scalp.

#### *Traumatic brain injury (TBI)*

- Children have large and heavy heads relative to their bodies and are more prone to TBI than adults.
- When unconscious, the upper airway tends to get obstructed by a relatively large, flaccid tongue, or kinked because of head flexion induced by the prominent occiput.
- GCS scoring is more difficult in small children. Focus on the motor score as it is the most important component.

#### *Skeletal injury*

- Children have more pliant and flexible bones than adults and are therefore subject to fewer fractures.
- Internal organ injuries in the absence of fractures of the overlying bones are more common than in adults. For example the rib cage is very compliant, so there may be internal injuries in the absence of superficial injuries, such as rib fractures.
- When a small child requires cervical spine immobilisation, to achieve neutral alignment they may require padding under the thoracic spine to avoid neck flexion from their relatively large head.

#### *Temperature control*

- Children have a less mature thermoregulatory (temperature control) mechanism and a higher surface area to mass ratio compared to adults. This makes heat loss and hypothermia more common.
- Children are at higher risk of hypothermia when exposed to cold weather, have burns, are cooled or are undressed during examination and treatment.

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## 1.19 Vital signs

### *When vital signs must be recorded*

- Vital signs must be recorded when a single patient is being given a recommendation that transport to a medical facility is not required:
  - A set of vital signs that includes: respiratory rate, heart rate, blood pressure, capillary refill time, SpO<sub>2</sub> and GCS must be recorded.
  - In addition, a temperature must be recorded if the patient has a clinical condition that is not a traumatic injury.
  - Personnel should have a lowered threshold for recording two sets of vital signs if any of the first set were at the outer limits of normal.
- Vital signs must be recorded when they are a prerequisite to providing treatment. For example, a blood pressure must be recorded before administering GTN.
- Vital signs must be recorded following treatment that has been initiated in response to abnormal vital signs. For example, if 0.9% sodium chloride has been administered for tachycardia and a narrowed pulse pressure, these vital signs must be recorded after administration.

### *When vital signs should not be recorded*

Vital signs should not be recorded if the patient has a time critical problem and the results will not change the treatment that is provided. For example:

- Not all vital signs need to be recorded for a patient that is very close to hospital with a severe TBI, an obstructed airway and poor breathing. This is because a rapid approach to commencing transport and treating en route is expected, with a focus on maintaining airway and breathing and recording a blood pressure will not change the treatment that is provided.
- Not all vital signs need to be recorded prior to adrenaline administration if a patient has anaphylaxis that is clearly immediately life-threatening.
- Vital signs do not need to be routinely recorded if multiple patients are being assessed at the scene. Most commonly this will be a road crash scene where multiple patients appear to be uninjured. However if a patient appears to be injured, a set of vital signs must be recorded before making a recommendation that transport to a medical facility is not required.
- Clinical judgement is required if the patient is receiving end of life care. In this setting vital signs are not a prerequisite for providing treatment and it is appropriate not to take recordings or perform examinations that will cause additional unnecessary discomfort.
- When vital signs are not recorded (or are unable to be recorded), the reason for this must be documented on the PRF.

### *The frequency of vital sign recordings*

- Clinical judgement is required when determining how frequently to record vital signs:
  - Vital signs should usually be recorded every 10–15 minutes for a patient that is status one or status two, noting that vital signs are not required if the patient has a time critical problem and the result will not change the treatment that is provided.
  - Vital signs should usually be recorded every 20–30 minutes for patients that are status three.
- Some vital signs are monitored continually (for example heart rate via ECG leads) but are recorded at intervals. It is appropriate to record these if a significant change occurs, or other vital signs (such as blood pressure) are being recorded.
- It is usually inappropriate to stop a moving ambulance for the purpose of measuring and/or recording vital signs.

### *Specific vital signs*

- **Respiratory rate.** Tachypnoea is a subtle but important sign that a patient is unwell or injured. The respiratory rate must be counted and not estimated. The trend of the respiratory rate is more important than a single recording.
- **Heart rate.** Unexplained tachycardia is a subtle but important sign that a patient is unwell or injured. The trend of the heart rate is more important than a single recording.
- **Blood pressure.** Blood pressure alone is a poor indicator of the adequacy of cardiac output. Take note of the pulse pressure and the trend, noting that a narrowed pulse pressure is a sign of vasoconstriction, usually in response to reduced cardiac output. A standing and lying/sitting blood pressure should be measured if postural hypotension may have contributed to the patient's clinical condition and non-transport is being considered.
- **Capillary refill time.** In the absence of hypothermia or significant peripheral vascular disease, a prolonged capillary refill time is a sign of vasoconstriction, usually in response to reduced cardiac output. The trend of the capillary refill time is more important than a single recording.
- **GCS.** Carefully determine each component noting that the motor score is the most important component of the GCS.
- **SpO<sub>2</sub>.** This measures how much oxygen is bound to the haemoglobin in arterial blood as a percentage of maximum. It measures how well a patient is oxygenated, but does not measure how well a patient is breathing (ventilating). How well a patient is breathing is determined by clinical examination and use of ETCO<sub>2</sub>. Failure of the pulse oximeter probe to record an SpO<sub>2</sub> is often an indication that the patient is vasoconstricted and poorly perfused.

- **Blood glucose.** The blood glucose concentration does not need to be routinely recorded in all patients. It should be recorded to rule out hypoglycaemia or hyperglycaemia, taking into account the overall clinical picture. For example, a blood glucose should be recorded in all:
  - Patients with diabetes.
  - Patients with an altered level of consciousness.
  - Patients who are unwell without an obvious cause.
  - Children with significant signs of infection. In particular, children under five years of age are particularly prone to hypoglycaemia if they have severe infection.
  - Patients with poisoning where hypoglycaemic medicines may have been taken.
  - Patients with signs or symptoms of stroke.
- **Temperature.** Hyperthermia is most commonly due to infection, but normothermia does not rule out infection. There is no specific temperature that correlates well with severity of illness, however:
  - A temperature greater than 39 degrees should usually result in a patient being given a recommendation to be transported to a medical facility.
  - Hypothermia is an important clinical sign as it is often a sign of low cardiac output. A temperature below 36 degrees should usually result in a patient being given a recommendation to be transported to a medical facility.
- **End tidal CO<sub>2</sub>.** End tidal CO<sub>2</sub> (ETCO<sub>2</sub>) must be measured continually via capnography and regularly recorded if the patient has been intubated with an ETT. ETCO<sub>2</sub> may be measured via an LMA, noting that the trend is more important than individual recordings, as these are affected by any leak around the cuff. ETCO<sub>2</sub> may be measured in a spontaneously breathing patient using nasal prongs if these are available, noting that clinical examination must be used in conjunction with the waveform and the ETCO<sub>2</sub>. ETCO<sub>2</sub> should not usually be measured if the patient is being ventilated via a face mask as it is significantly affected by any leak and does not usually alter treatment.

#### *Other clinical signs*

- There are other clinical signs that are elicited by examining the patient. They are often just as important as the vital signs that are recorded and include:
  - Features of general concern such as pallor or sweating.
  - Airway noise such as stridor or grunting.
  - Lung sounds such as wheeze or crackles.
  - Signs of increased work of breathing such as indrawing and nasal flaring.
  - Interaction and activity, particularly in small children.
  - The ability to mobilise normally without assistance.”