Guideline 13.9 – After the Resuscitation of a Newborn

Summary

Guidelines 13.1-13.10 and the Newborn Life Support algorithm are provided to assist in the resuscitation of newborn infants. Differences from the adult and paediatric guidelines reflect differences in the anatomy and physiology and the causes of cardiorespiratory arrest for newborns, older infants, children and adults. These guidelines draw from Neonatal Life Support 2020 and 2015 International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations (CoSTR) [1, 2]the development of which included representation from ANZCOR. The 2020 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Care [3] and local practices have also been taken into account.

To whom do these guidelines apply?

The term 'newborn' or 'newborn infant' refers to the infant in the first minutes to hours following birth. In contrast, the neonatal period is defined as the first 28 days of life. Infancy includes the neonatal period and extends through the first 12 months of life.

ANZCOR Guidelines 13.1 to 13.10 and the Newborn Life Support algorithm are mainly for the care of newborns. The exact age at which paediatric techniques and in particular, compression-ventilation ratios, should replace the techniques recommended for newborns is unknown, especially in the case of very small preterm infants. For term infants beyond the first minutes to hours following birth, and particularly in those with known or suspected cardiac aetiology of their arrest, paediatric techniques may be used (refer to Paediatric Advanced Life Support Guidelines 12.1 to 12.7).

Who is the audience for these guidelines?

ANZCOR Guidelines 13.1 to 13.10 and the Newborn Life Support algorithm are for health professionals and those who provide healthcare in environments where equipment and drugs are available (such as a hospital). When parents are taught CPR for their infants who are being discharged from birth hospitals, the information in Basic Life Support Guidelines (ANZCOR

Guidelines 2 to 8) is appropriate.

Recommendations

The Australian and New Zealand Committee on Resuscitation (ANZCOR) makes the following recommendations:

1. For clinical and medicolegal reasons, the observations, interventions and times during newborn resuscitation must be fully documented. [Good Practice Statement]
2. Apgar scores quantify and summarise the response of the newborn over the first few minutes of life. The Apgar score is assessed and recorded based on observations made at 1 and 5 minutes after birth and then sequentially every 5 minutes from birth until the heart rate and breathing are normal. Interventions for depressed newborns should not await Apgar scoring. [Good Practice Statements]
3. Once adequate ventilation and circulation have been established, the infant who has required resuscitation remains at risk and is likely to need ongoing assessment in an intensive or special care nursery where monitoring, appropriate evaluation and care can be provided. Fluid balance and nutrition should be monitored carefully for the first few days. [Good Practice Statements]
4. Maintaining normothermia (36.5 to 37.5°C) remains important after resuscitation. If a newborn develops hypothermia unintentionally during resuscitation, limited evidence suggests no disadvantage of rapid rewarming at >0.5°C per hour compared to slow rewarming at <0.5°C per hour. [Good Practice Statements]
5. Usually, any infant who has been intubated and ventilated for resuscitation should not be extubated until the infant has been carefully assessed and the risk of the need for re-intubation has been assessed as being low. Preterm infants and selected others may benefit from surfactant administration. The assessment of infants who have required assisted ventilation should include oxygen saturation, heart rate, respiratory rate and effort. Blood pressure and blood gas analysis are also often indicated. [Good Practice Statements]
6. Blood glucose level should be checked soon after resuscitation. Newborns who require resuscitation are more likely to develop hypoglycaemia. Although no exact threshold level at which outcomes worsen has been identified, maintaining a blood glucose level above 2.5 mmol/L for newborns who have required resuscitation is unlikely to cause harm. A glucose infusion of 4 to 6 mg/kg/min will usually be sufficient. Large bolus doses of glucose (> 200 mg/kg, equivalent to > 2 mL/kg of glucose 10%) should be avoided. [Good Practice Statements]
7. Very soon after resuscitation, consideration should be given to the need for relevant investigations (such as a full blood count and blood culture) and antibiotic treatment. [Good Practice Statement]
8. Inducing hypothermia in infants with evolving moderate to severe hypoxic ischaemic encephalopathy will reduce the degree of brain injury in some. [5] [Good practice statement, LOE I]. Local guidelines should be developed to identify term and near-term newborns (gestation ≥ 35 weeks) who meet any of the following criteria, that resemble those used in clinical trials of induced hypothermia; need for prolonged resuscitation, e.g., need for assisted

ventilation with or without chest compressions at 10 min, Apgar score at 10 minutes ≤5 or acidosis as determined by cord blood gas or sample taken from the infant soon after birth, e.g., pH <7.0 or base excess worse than -12 mmol/L. [Good Practice Statement]

9. Newborns who are at risk should have their neurological status assessed over the first few hours after birth. Those who develop signs of moderate or severe encephalopathy should have induced hypothermia commenced within 6 hours. [Good Practice Statement]
10. Any newborn who is considered a candidate for therapeutic hypothermia should be discussed promptly with a neonatologist, and plans should be made for admission to a neonatal intensive care unit. [Good Practice Statement] Therapeutic hypothermia should be conducted under carefully defined protocols, consistent with those used in the randomised, controlled trials, i.e., commence within 6 hours after birth, cool to 33 to 34°C, continue for 72 hours and re-warm gradually over at least 4 hours, monitor for known adverse effects of cooling, and plan long term follow-up for all treated newborns. [Good Practice Statement]. ANZCOR suggests if necessary, therapeutic hypothermia can be initiated without specialised equipment. [CoSTR 2015 and 2020, weak recommendation, low certainty of evidence]
11. It is well established that wherever possible, newborns who are likely to require neonatal special or intensive care should be born at a centre that can provide an appropriate level of care. Those born elsewhere who require intensive or special care should be transferred to an appropriate centre. Early consultation should be undertaken to discuss management and arrange transport or retrieval. [Good Practice Statements]
12. Regardless of the outcome, witnessing the resuscitation of their newborn is distressing for parents. Every opportunity should be taken to prepare parents for the possibility of a resuscitative effort when it is anticipated and to keep them informed as much as possible during and certainly after the resuscitation. Whenever possible, discussions with parents should be held with a senior clinician. Early contact between parents and their newborn is important. [Good Practice Statements]
13. Difficult resuscitations are also stressful for the staff involved, regardless of seniority, and efforts should be made to debrief after such events. Well-conducted debriefing also represents an opportunity to improve skills. [Good Practice Statements]

Abbreviations

Abbreviation	**Meaning/Phrase**
ANZCOR	Australian and New Zealand Committee on Resuscitation
CoSTR	International Consensus on Cardiopulmonary Resuscitation and Emergency Cardiovascular Care Science with Treatment Recommendations
CPR	Cardiopulmonary resuscitation
LOE	Level of Evidence
NHMRC	National Health and Medical Research Council

1.0 | Documentation of Resuscitation

For clinical and medicolegal reasons, the observations, interventions and times during newborn resuscitation must be fully documented. [Good Practice Statement]

Apgar scores quantify and summarise the response of the newborn over the first few minutes of life.[4, 5] The Apgar score is assessed and recorded based on observations made at 1 and 5 minutes after birth and then sequentially every 5 minutes from birth until the heart rate and breathing are normal. Interventions for depressed newborns should not await Apgar scoring. [Good Practice Statements]

2.0 | Continuing Care of the Newborn after Resuscitation

Once adequate ventilation and circulation have been established, the infant who has required resuscitation remains at risk and is likely to need ongoing assessment in an intensive or special care nursery where monitoring, appropriate evaluation and care can be provided.[6, 7] An infant who has experienced perinatal compromise or has ongoing respiratory distress may have dysfunction or delayed perinatal adaptation of brain, heart, gastrointestinal tract, kidneys or other organs. Fluid balance and nutrition should be monitored carefully for the first few days. [Good Practice Statements]

2.1 | Temperature management

Maintaining normothermia (36.5 to 37.5°C [8]) remains important after resuscitation. If a newborn develops hypothermia unintentionally during resuscitation, limited evidence suggests no disadvantage of rapid rewarming at >0.5°C per hour compared to slow rewarming at <0.5°C per hour. [9, 10] [Good Practice Statements]

2.2 | Cardiorespiratory management

Usually, any infant who has been intubated and ventilated for resuscitation should not be extubated until the infant has been carefully assessed and the risk of the need for re-intubation has been assessed as being low. Preterm infants and selected others may benefit from surfactant administration. The assessment of infants who have required assisted ventilation should include oxygen saturation, heart rate, respiratory rate and effort. Blood pressure and blood gas analysis are also often indicated. [Good Practice Statements]

2.3 | Blood glucose management

Blood glucose level should be checked soon after resuscitation. [6, 7] Newborns who require resuscitation are more likely to develop hypoglycaemia. Although no exact threshold level at which outcomes worsen has been identified, maintaining a blood glucose level above 2.5 mmol/L for newborns who have required resuscitation is unlikely to cause harm. A glucose infusion of 4 to 6 mg/kg/min will usually be sufficient. Large bolus doses of glucose (> 200 mg/kg, equivalent to > 2 mL/kg of glucose 10%) should be avoided. [11] [Good Practice Statements]

2.4 | Antibiotics

The need for resuscitation can be a consequence of the onset of sepsis. Very soon after resuscitation, consideration should be given to the need for relevant investigations (such as a full blood count and blood culture) and antibiotic treatment. [Good Practice Statement]

2.5 | Induced Hypothermia for Hypoxic Ischaemic Encephalopathy (HIE)

Inducing hypothermia in infants with evolving moderate to severe hypoxic ischaemic encephalopathy will reduce the degree of brain injury in some. [5] [Good practice statement, NHMRC LOE I] Local guidelines should be developed to identify term and near-term newborns (gestation ≥ 35 weeks) who meet any of the following criteria, that resemble those used in clinical trials of induced hypothermia;

- Need for prolonged resuscitation, e.g., need for assisted ventilation with or without chest compressions at 10 min
- Apgar score at 10 minutes ≤5
- Acidosis as determined by cord blood gas or sample taken from the infant soon after birth, e.g., pH <7.0 or base excess worse than -12 mmol/L.

[Good Practice Statement]

Many but not all such newborns will have experienced an intrapartum sentinel event such as cord prolapse, severe abruption, or severe dystocia. The absence of such a recognised event does not preclude the possibility that the newborns will benefit from induced hypothermia.

Newborns who are at risk should have their neurological status assessed over the first few hours after birth. Those who develop signs of moderate or severe encephalopathy should have induced hypothermia commenced within 6 hours. [Good Practice Statement]

Any newborn who is considered a candidate for therapeutic hypothermia should be discussed promptly with a neonatologist, and plans should be made for admission to a neonatal intensive care unit. [Good Practice Statement] Therapeutic hypothermia should be conducted under carefully defined protocols, consistent with those used in the randomised, controlled trials, i.e., commence within 6 hours after birth, cool to 33 to 34˚C, continue for 72 hours and re-warm gradually over at least 4 hours, monitor for known adverse effects of cooling, and plan long term follow-up for all treated newborns. [Good Practice Statement]. ANZCOR suggests if necessary, therapeutic hypothermia can be initiated without specialised equipment. [1, 2, 12] [CoSTR 2015 and 2020, weak recommendation, low certainty of evidence]

2.6 | Stabilisation and Transfer

It is well established that wherever possible, newborns who are likely to require neonatal special or intensive care should be born at a centre that can provide an appropriate level of care. Those born elsewhere who require intensive or special care should be transferred to an appropriate centre. Early consultation should be undertaken to discuss management and arrange transport or retrieval. [Good Practice Statements]

3.0 | Continuing Care of the Family

Regardless of the outcome, witnessing the resuscitation of their newborn is distressing for parents. Every opportunity should be taken to prepare parents for the possibility of a resuscitative effort when it is anticipated and to keep them informed as much as possible during and certainly after the resuscitation. Whenever possible, discussions with parents should be held with a senior clinician. Early contact between parents and their newborn is important. [Good Practice Statements]

Difficult resuscitations are also stressful for the staff involved, regardless of seniority, and efforts should be made to debrief after such events. Well-conducted debriefing also represents an opportunity to improve skills. [Good Practice Statements]

References

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About this Guideline

Search date/s	ILCOR literature search details and dates are available on the CoSTR page of the ILCOR website (https://costr.ilcor.org) and the relevant CoSTR documents. [1, 2]
Questions/PICOs:	Are described in the CoSTR documents (https://costr.ilcor.org)
Method:	Mixed methods including ARC NHMRC methodology before 2017 and ILCOR GRADE methodology described in ILCOR publications since 2017.
Principal reviewers:	Helen Liley, Lindsay Mildenhall, Marta Thio and Callum Gately

Main changes	Inclusion of WHO definitions of cold stress, hypothermia and hyperthermia in newborns. Inclusion of evidence for rate of rewarming in unintentional hypothermia. Updating of review evidence, references, and terminology to increase consistency with GRADE terminology.
Approved:	April 2021

Referencing this guideline

When citing the ANZCOR Guidelines we recommend:

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