

Statewide Incubator Care Guideline

1. Overview / Description

Clinical management of babies requiring an incubator for inter-hospital transfer in Victoria (without a PIPER Neonatal escort).

In 2014, sixteen portable transport incubators funded by the Victorian Department of Health and Human Services (DHHS, then Department of Health), were deployed in selected 'host' health services throughout Victoria (**Appendix 1**). The incubators were provided as resources for use within these health services as well as within and between regions. For consistency, a single brand and model (V808) portable transport incubator was deployed.

The Paediatric Infant Perinatal Emergency Retrieval (PIPER) service in collaboration with Ambulance Victoria (AV) and DHHS, have developed these clinical and operational guidelines to ensure standardisation and competency in the management and utilisation of the portable transport incubators.

2. Related Documents

N/A

3. Definition of Terms

AV:	Ambulance Victoria
DHHS:	Department of Health and Human Services
NICU:	Neonatal Intensive Care Unit
PIPER:	Paediatric Infant Perinatal Emergency Retrieval
NTE:	Neutral Thermal Environment is an environment in which a baby with a normal body temperature has a minimal metabolic rate and therefore minimal oxygen consumption
SCN:	Special Care Nursery
Incubator:	An enclosed transparent cot used for maintaining an infant in a controlled thermal environment
Neonate:	A newborn under 28 days of age

4. Responsibility

All PIPER Neonatal Medical and Nursing staff.

5. Procedure

5.1 Transport Options

The choice of platform for inter-hospital transport of babies who require an incubator depends on the baby's illness acuity, age, weight, and effective use of resources. The options for the inter-hospital transfer of small babies (less than 5 months corrected age) are summarised in Table 1.

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Table 1

Inter hospital transfer option (Babies < 5 months corrected age)	Indications	Examples
PIPER Neonatal team with their infant transport system	<ul style="list-style-type: none"> Clinically unwell baby or where risk of deterioration in transit is moderate – high. 	Babies requiring respiratory support beyond low flow oxygen.
Transport incubator secured to an ambulance stretcher. Note: The need for a health service nurse/midwife or doctor to accompany the baby should be a rare event and only when agreed by the PIPER Neonatal Consultant, referring staff and Ambulance Victoria staff*.	<ul style="list-style-type: none"> Transfer of low acuity babies from a maternity service without a newborn service to a maternity hospital with a level 3 to level 5 newborn service#¹. Stable babies who require rapid transfer to a level 6b newborn service. This system will enable a much faster response and transfer time compared to using a PIPER neonatal transfer. Relatively well babies who require back transfer from a newborn service or between services. 	For example Ararat to Ballarat, or Portland to Warrnambool. Bile stained vomiting in a “well” baby. Ballarat to Ararat.

*This may include Non-Emergency Patient Transport services.

#All levels of newborn care referred to in this document align with *Defining levels of newborn care for Victorian health services* (2015)¹

5.2 Governance

- Suitability to transfer a baby without a PIPER Neonatal team is determined after consultation between referring hospital clinical staff, the PIPER Neonatal Consultant and Ambulance Victoria while taking into account clinical, logistic and other factors.
- Host services and paramedics within each region have been provided with training opportunities including education on the use of incubators, in-service training and online tools. Parker Health will provide ongoing education and training during their regular site visits to “host” services.
- It is the responsibility of the host service to ensure that clinical staff develop and maintain knowledge with regard to using the incubator, using the harness to secure a baby to the incubator, and accessing online tools^{2,3}. A checklist that details equipment items required when the incubator is dispatched and returned has been developed to ensure the incubator remains in a “ready to use” condition⁴.
- It is the responsibility of Ambulance Victoria to ensure that paramedics are aware of online educational tools and are educated and supported to use the incubators to ensure they are comfortable with their operation including the procedure for securing the incubator to a Stryker stretcher⁵.
- Host services are responsible for the ongoing care and maintenance of the incubators and are expected to develop local policies that govern their use including:
 - How hospitals in the region will access and manage the use of the incubator
 - Procedures for the return of the incubator to the “host” service at the completion of the transfer. Please note that this is the joint responsibility of the host and other health services involved in the use of the incubator.

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- Responsibility for costs incurred (e.g. taxi costs associated with relocation) when using the incubator for inter-hospital transfer.

5.3 Appropriate use of statewide incubators

The transport incubators are appropriate for use in transporting small babies (less than five months corrected age) that are not ill enough to need a PIPER Neonatal escort, but require transfer in an incubator for clinical or restraint purposes. The transport incubators:

- May be used for transport by road or air.
- Are suitable for babies weighing <5kg.
- Have an infant restraint harness that meets the Ambulance standard for inter-hospital transfer.
- Have an inbuilt pulse oximeter to enable appropriate monitoring of a baby's oxygenation.
- Have an inbuilt oxygen analyser to enable titration of supplemental oxygen if required.
- Can be used for inter or intra hospital transfers.

In most instances, after the incubator has been secured to an ambulance stretcher a paramedic will accompany the baby to the receiving health service. The need to send a referring health service nurse/midwife/doctor to escort the baby to the receiving service should be a rare event and should reflect a consensus between the PIPER neonatal consultant, health service staff and Ambulance Victoria staff.

The V808 transport incubators should not be used as the choice of transport platform when:

1. The baby requiring transport is clinically unwell or where there is a significant risk of deterioration in transit. These babies must be transferred using a PIPER Neonatal team with their infant transport system.
2. Using an infant car seat type restraint system secured to an ambulance stretcher. V808 incubators are not appropriate for use using this type of restraint system.

Clinical criteria for inter-hospital transfer without a PIPER Neonatal escort

1. Baby is > 34 weeks and 2000g.
2. Baby is haemodynamically stable and at low/no risk of deterioration during transport.
3. Baby requires no more than 30% oxygen or 2 Lpm sub nasal oxygen to maintain oxygen saturations 91-95%.
4. The baby is not anticipated to require respiratory support (including nasal CPAP or high flow sub nasal blended oxygen) during transport.
5. IV fluids are not essential during the transfer.
6. The baby's blood glucose is >2.5 (or if mild hypoglycaemia is present it is being effectively managed).
7. Baby is not at risk of requiring exchange transfusion or other neonatal ICU type interventions.

Organising a transfer using the V808 incubator

(See Flow chart - Appendix 2)

- Requests for inter-hospital transfer of babies should be directed to the PIPER emergency line (Phone: 1300 137 650). "Return" transfers can be arranged between the referring and receiving unit directly or via PIPER if preferred.
- For acute transfers the PIPER Neonatal Consultant triages the requests and the level of receiving hospital is agreed with the referring clinician.
- If the baby is suitable to be cared for in a level 3 to level 5 newborn service then the Paediatrician for the suggested receiving hospital will be invited to join the conference call to ensure the clinical

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condition of the baby is appropriate for their special care nursery. Bed availability will be assessed at this time.

- Suitability to transfer the baby without a PIPER Neonatal team is determined, taking into account clinical, logistic and other factors.
- Transfer using an incubator is subject to the availability of appropriate resources (e.g. incubator, referring hospital nurse or midwife, ambulance, or aircraft) to achieve safe transport to a health service with an appropriate level of care. An alternative plan must be formulated if there are insufficient resources available (e.g. PIPER Neonatal might do the retrieval).
- The default position is that once the baby is secured in the incubator by nursing/midwifery staff, the basic functions of the incubator likely to be required during transfer (e.g. pulse oximeter and temperature control) should be communicated to the paramedics. The transfer can then proceed in most cases with a paramedic. This decision will be made after consultation between the PIPER Neonatal consultant, referring hospital staff and ambulance staff.
- Public health services that have been allocated a transport incubator are responsible for developing policies that govern the use of the incubator within their region. A list of questions detailing the scope of material that should be addressed by health services when developing local policy and procedures has been developed (**Appendix 3**).

5.4 Procedure for caring for a baby in an incubator

5.4.1 Nursing management of the neonate in an incubator

- Start and test the incubator as per V808 operation video².
- Incubator air control: Set the desired internal temperature as per V808 operation video.
 - Determine what air temperature to set the incubator by referring to the temperature ranges for NTE^{6, 7} (**Appendix 4**).
 - If a baby has been nursed in a nursery incubator for some time prior to transfer, and the baby's axillary temperature is within normal range, set the incubator at the same temperature.
 - In babies the normal temperature range is 36.5 – 37.5°C. Do not wean air temperature any faster than 0.5°C per 30 minutes or 1°C per hour.
 - Note the transport incubator **should be plugged into a power source and turned on at all times to provide a stable standby "admission" temperature**. When preparing to place a baby into the incubator wait until the air temperature reads the same as the set temperature before placing the baby into the incubator.
 - The incubator should be kept away from drafts, direct sunlight and cool or warm windows that may affect the incubator temperature. If outside the hospital the incubator will need a cover to reduce the effects of external weather influences.
 - Both High and Low alarms for the set temperature will go to default values.
 - Avoid keeping portholes open except for examination or care. Cluster care so the opening of portholes is kept to a minimum.

Note: Do not turn the incubator off. The fan does not work with the incubator off so there is no air movement within the canopy and carbon dioxide may accumulate.

5.4.2 Place the baby into the incubator

- Place the baby supine into the incubator as per V808 operating video². Position the baby in the centre of the mattress the head to the left and feet to the right.
- Ensure the front admittance panel is closed and the knobs repositioned to lock the panel.

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- Secure the baby using the DHS 590 infant baby harness. *See Fitting instructions: Atom V808 strapping of patient harness on the Stryker stretcher³.*
- Apart from an environmental cover where required do not place anything on top of the incubator or talk over the incubator as noise is amplified in the incubator⁶.

5.4.3 **Skin temperature monitoring**

- Clean the site of the probe with luke-warm water and dry. Attach yellow skin probe, silver side down and cover with reflective temperature probe cover e.g. Neosmile.
- Attach the skin temperature probe to the baby and the other end to the left side panel of the main body of the incubator.
- Position the skin temperature probe to the upper abdomen e.g. in the midline above the umbilicus, avoid bony prominences. Do not position the temperature probe under the axilla⁷.

5.4.4 **Monitoring of incubator oxygen**

- Calibrate oxygen monitoring unit as per V808 operating video².
- Set upper and lower alarm limits 5% above and below the required amount of oxygen required by the baby. Adjust flow to increase or decrease the oxygen percentage to that prescribed.
- Keep portholes closed at all times when not requiring direct access to the baby. Opening the portholes affects the oxygen concentration being administered into the incubator canopy.

5.4.5 **Pulse oximetry**

- Position sensor on baby's right hand or wrist⁸.
- Set High and Low alarm limits for saturations:
 - if the baby has an oxygen requirement: Low limit 89%, High limit 95%
 - if the baby does not have an oxygen requirement: Low limit 89%, High limit 100%.
- Set High and Low alarm limits for heart rate:
 - Low limit 100bpm
 - High limit 180bpm
- If the baby is otherwise well and has a sleeping heart rate less than 100bpm it may be appropriate, following discussion with the PIPER Neonatal Consultant, to set the Low limit to 90bpm.

5.4.6 **Frequency of observations: Option to use observation charts from referring hospital**

Document hourly:

- Axillary temperature unless febrile or hypothermic whereby the temperature should be recorded more frequently.
- If axillary temperature is below 36.5°C increase the incubator by 0.5°C, checking the temperature half an hour later.
- If axillary temperature is greater than 37.5°C the incubator temperature is decreased by 0.5°C checking the temperature half an hour later.
- Document **half hourly:**
 - Skin temperature, heart rate, respiratory rate, SpO₂, colour, oxygen concentration or flow rate of sub nasal oxygen and baby's activity.

5.5 **Other Considerations**

Operation should align with accreditation requirements, particularly those relating to the following

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National Safety and Quality Health Service (NSQHS) standards⁹:

- Standard 1. Clinical Governance
- Standard 2. Partnering with Consumers
- Standard 3. Preventing and Controlling Healthcare-Associated Infection
- Standard 5. Comprehensive Care
- Standard 6. Communicating for Safety
- Standard 8: Recognising and Responding to Acute Deterioration

5.5.1 **Training:**

It is important that all staff are given appropriate training and opportunity to familiarize themselves with the harnesses and incubator settings.

5.5.2 **Resuscitation:**

Ensure self-inflating bag (240mL) and appropriate size mask accompanies the baby. AV may have this in their vehicle.

5.5.3 **Suction:**

All AV vehicles have suction if required. Paramedics may need to source Fg 8-10 suction catheters from the referring hospital.

5.5.4 **Securing incubator to AV stretcher**

Ambulance Victoria Work Instruction: *Securing the ATOM V808 Transport Capsule Incubator to a Stryker Stretcher*⁵. A video of the procedure can be found here <https://vimeo.com/198932740/6b238d3c92>.

5.6 **Cleaning**

- Clean incubator as per Parker Healthcare instructions¹⁰.
- Do not use an alcohol based solution or acetone on the incubator.
- Clean the DHS 590 baby harness and DHS 585 incubator harness as per procedure³.
- The responsibility for cleaning should be documented within locally developed policies and procedures.

5.7 **Caring for the Incubator Battery**

It is recommended that host services check the working order of the incubator on a weekly basis.

5.7.1 **Battery Maintenance**

To ensure the battery is fully charged and in correct working order for when transfer is required, it is important to ensure that the Atom V808 Transport Incubator is **plugged into a power source and turned on at all times** so it is providing a moderately warm temperature inside the incubator. No damage will occur to the incubator by having it plugged in and turned on at all times.

Having the incubator plugged into a power source and turned on at all times to provide a stable admission temperature ensures that, in the event of a transfer, the incubator is at a stable temperature which will prolong the battery running time. Please note that the **incubator cannot run in battery mode if the unit has not been pre-heated.**

As part of your weekly check you should ensure that the Atom V808 Incubator is:

Plugged into a power source and turned on with a stable admission temperature set.

The Battery 1 power indicator located on the front of the V808 transport incubator is illuminated

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indicating that the incubator is fully charged. If the Battery 1 power indicator is not fully illuminated and the incubator has been plugged in for a minimum of 8 hours, please contact the Parker Healthcare service department on 03 9872 0222 for further assistance.

6. References

1. Defining levels of care for Victorian newborn service (2015).
<https://www2.health.vic.gov.au/hospitals-and-health-services/patient-care/perinatal-reproductive/maternity-newborn-services/newborn-care-in-victoria>
2. Parker Healthcare. 2014. [Atom V808 Incubator Basic Use Video](#). Melbourne. Internal publication.
3. *Fitting Instructions: Atom V808 strapping of patient harness on the Stryker stretcher*. PIPER 2017
4. *Checklist for Atom V808 Incubator*. PIPER 2017.
5. Ambulance Victoria Work Instruction: Securing the Atom V808 Transport Capsule Incubator to a Stryker stretcher. Version 2.0 3 February 2017. (Video: <https://vimeo.com/198932740/6b238d3c92>).
6. Royal Children's Hospital. 2017. [Isolette use in the paediatric wards](#). Policies and Procedures. Melbourne: Internal publication.
7. Gardner SL., Carter BS, Enzman- Hines M. and Hernandez JA. 2016. *Merenstein & Gardner's Handbook of Neonatal Intensive Care*. 8th Ed. St Louis: Elsevier
8. Australian and New Zealand Committee on Resuscitation. 2016. Guideline 13.1. [Introduction to resuscitation of the newborn infant](#). P4. Melbourne: Internal publication.
9. Australian Commission on Safety and Quality in Health Care. 2017. [National Safety and Quality Health Service Standards](#).
10. Parker Healthcare. 2014. [Atom V-808 Cleaning instructions](#). Melbourne: Internal publication.

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7. Appendices

Appendix 1

Statewide V808 incubator:

“Host” Health Services

1. Echuca Regional Health
2. Portland District Health
3. Western District Health Service (Hamilton)
4. Barwon Health (Geelong)
5. Ballarat Health Service
6. Albury Wodonga Health
7. Northeast Health Wangaratta
8. Wimmera Health Care Group (Horsham)
9. Swan Hill District Health
10. Bendigo Health
11. Goulburn Valley Health (Shepparton)
12. Peninsula Health (Frankston)
13. Monash Health (Casey)
14. Northern Health
15. Gippsland Southern Health Service (Leongatha)
16. Latrobe Regional Health (Traralgon)

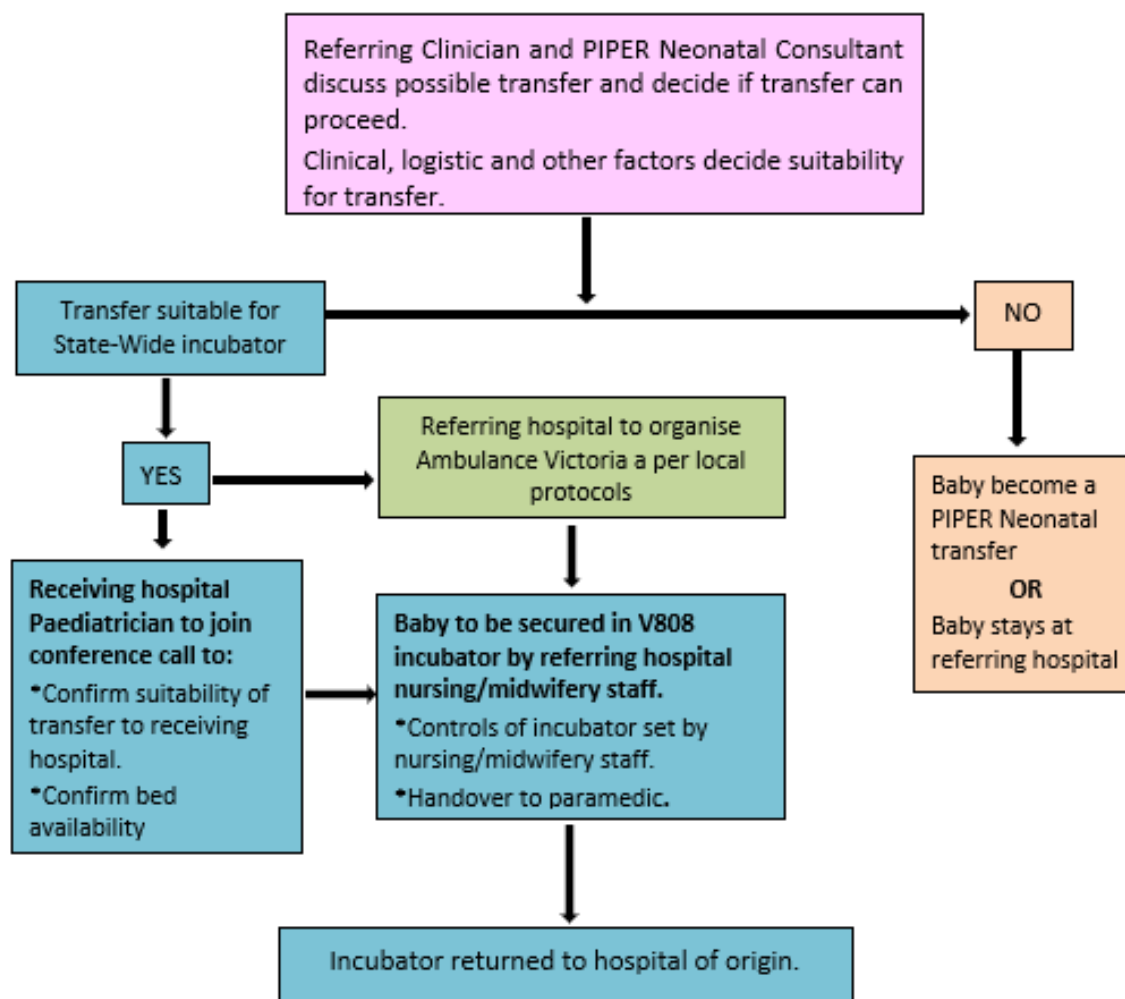
Note: *Bairnsdale Regional Health Service have a transport incubator available for transport of infants by Ambulance Victoria.*

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Appendix 2

State Wide Incubator Inter hospital transfer without PIPER Neonatal Escort

See Clinical Criteria Guideline



The decision to transfer (with or without referring hospital escort) will be made after consultation between:

- *Referring hospital staff,
- *PIPER Neonatal staff,
- *Ambulance Victoria staff.

Referral is documented on PIPER Neonatal referral sheet at present.
Data collection tool being developed.
Clinical Coordinator to document time and vital signs of baby on arrival at receiving hospital.

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Appendix 3

Local policy and procedure development: questions for consideration by health services when 'hosting' a V808 statewide incubator

Public health services (host services) that have been allocated V808 transport incubators are responsible for their ongoing care and maintenance. Host services are also expected to develop local policies that govern the use of the incubators within their region including:

- How hospitals in the region will access and manage the use of the incubator
- Procedures for the return of the incubator to the "host" service at the completion of the transfer
- Responsibility for costs incurred (e.g. taxi costs associated with relocation) when using the incubator for inter-hospital transfer.

The following questions are presented as a means of detailing the scope of material that should be addressed by health services in developing local policy and procedures for the management and operation of Statewide V808 incubators:

1. Which maternity hospitals in our area could conceivably use the incubator?
2. Who are the key contact people?
3. How are our own clinical staff and those of surrounding hospitals made aware of the incubator and its potential use?
4. How do clinical staff develop and maintain knowledge with regard to using the incubator and using the harness to secure the baby in the incubator?
5. Have the various educational resources (links to videos, power points, operational manuals, guidelines for use etc.) been propagated to clinical staff?
6. How does the incubator get to a referring hospital in your area? Will the local ambulance take it (sometimes, always, never)?
7. How has the ambulance service in the region been engaged so that they are aware of the circumstances in which the incubator may be used in the region?
8. How will the empty incubator get back to the host hospital after (a) the baby has been transferred from the host hospital to somewhere else or (b) after a baby has been moved between hospitals other than the host hospital?
9. In relocating incubators can it be moved by taxi? What are the manual handling issues involved in this? Does it require a wagon or maxi? Who pays?
10. Who bears the cost incurred when relocating the incubator?
11. How do we manage the situation if we feel a staff member should travel with the baby?
12. How does the staff member get back to their hospital if the ambulance is not returning to that hospital? Is there a mechanism to pay for a return taxi fare?
13. The trolley supplied to the host hospital does not go with the incubator during a transfer. How is this managed at the non-hosting referring hospital and receiving hospital?
14. How is the location of the cot monitored so that its whereabouts is known?
15. Is a checklist required to ensure all components of the cot are present and in working order and are dispatched and returned when the cot has been used for transfer? Suggested checklist can be found here: Checklist for Atom V808 Incubator. PIPER 2017.

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Appendix 4

Neutral Thermal Environment Temperatures

[Adapted from: Gardner SL., Carter BS, Enzman-Hines M. and Hernandez JA. 2016]

Age and weight	Starting Temp (°C)	Range of Temp (°C)
0-6 hr 1501-2500g Over 2500g and >36 wk	33.5 33.0	33.0-34.0 32.0-34.0
>6-12 hr 1501-2500g Over 2500g and >36 wk	33.0 33.0	32.0-34.0 31.5-34.0
>12-24 hr 1501-2500g Over 2500g and >36 wk	33.0 32.5	32.0-34.0 31.0-33.5
>24-36 hr 1501-2500g Over 2500g and >36 wk	32.5 32.0	31.5-33.5 30.5-33.5
>36-48 hr 1501-2500g Over 2500g and >36 wk	32.5 32.0	31.5-33.5 30.5-33.5
>48-72 hr 1501-2500g Over 2500g and >36 wk	32.5 31.5	31.0-33.5 30.0-33.0
>72-96 hr 1501-2500g Over 2500g and >36 wk	32.0 31.5	31.0-33.0 30.0-33.0
>4-12 days 1501-2500g Over 2500g and >36 wk	32.0	31.0-33.0
4-5 days	31.0	29.5-32.5
5-6 days	31.0	29.5-32.0
6-8 days	30.5	29.0-32.0
8-10 days	30.5	29.0-32.0
10-12 days	30	29.0-31.5
>12-14 days 1501-2500g	32.0	31.0-33.0
>2-3wk 1501-2500g	31.5	30.5-33.0
>3-4wk 1501-2500g	31.5	30.0-32.5
>4-5wk 1501-2500g	31.0	29.5-32.0
>5-6wk 1501-2500g	30.5	29.0-32.0

Note: for this table, Scopes and Ahmed had the wall of the incubator 1 to 2° C warmer than the ambient air temperatures. Generally, the smaller infants in each weight group require a temperature in the higher portion of the temperature range. Within each time range, the younger the infant, the higher the temperature required.

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8. Disclaimer

The Paediatric, Infant Perinatal Emergency Retrieval (PIPER) Neonatal and Paediatric guidelines were developed by PIPER clinicians for the sole use within the PIPER service at The Royal Children's Hospital Melbourne.

The authors of these guidelines have made considerable effort to ensure the information upon which they are based is accurate and up to date. Users of these guidelines are strongly recommended to confirm that the information contained within them especially drug doses is correct by way of independent resources. The authors accept no responsibility for any inaccuracies or information perceived as misleading.

9. End of Document
