

## Neonatal Thermoregulation

The normal neonatal temperature range is 36.5 °C to 37.2 °C per axilla. Hypothermia is common in neonates, particularly in the compromised patient. It is important to remember that there are significant risks associated with both hypothermia and hyperthermia. The time needed to stabilise a baby for transfer can often be reduced if the baby's temperature is maintained within the normal limits, before the arrival of the transfer team.

### 1. Challenges in transport

- Limited facility for providing humidity in transport incubators
- It is more difficult to re-warm a baby during transfer compared with in NICU
- Environmental temperature may be more difficult to control

### 2. En route to referring unit

- Ensure generator is switched on and incubator is plugged in
- Switch on ambulance heater
- Set incubator to thermo neutral range (see table below) for weight and maturity of baby, this may be in excess of 37 °C for extremely preterm infants.
- Consider whether baby will benefit from a transwarmer mattress
- Ensure is Transwarmer™ activated between 19 °C and 26 °C before activation if needed (see Transwarmer™ protocol). **Do not** activate Transwarmer™ outside this range.
- If baby is <28/40 or <1kg, put 200mls of sterile water onto humidity sponge (if using HillRom™ transport incubator)

### 3. On arrival at referring unit

- Measure baby's axilla temperature with digital thermometer
- If baby's temperature is greater than 36 °C
  - Maintain a thermo neutral environment
  - Continually monitor baby's skin temperature using probe, sited on lower abdomen
  - Ensure that the baby's temperature correlates with the skin temperature probe.
  - Ideally, do not move baby unless axilla temperature >36.5 °C
- If baby's temperature is less than 36 °C
  - Minimal handling – only perform emergency procedures until warm
  - If baby is <28/40 or <1kg, or temperature is <35 °C, wrap plastic sheet around baby (Baby's head should only to be covered if ventilated) forming an air tight seal
  - Increase incubator temperature, and consider adding humidity
  - Recheck axilla temperature with digital thermometer after 30 mins
  - If temperature remains <36 °C
  - Ensure transport incubator is prewarmed to maximum temperature
    - Fill ventilator humidity bottle and switch on (using air only) to build up humidity in ventilator circuit (only available in Stephan™ ventilator)
    - Activate Transwarmer™ mattress and allow to warm before use

### 4. When ready to transfer baby into the Transport Incubator

- Recheck axilla temperature with digital thermometer
- Ideally, baby's temperature will be above 36.5 °C before transferring (see note below)
  - If transfer is time critical (eg gastroschisis) it may be necessary to transfer before baby has been rewarmed. Optimise potential for rewarming during the journey using the methods described
- If baby is <28/40 or <1kg, or temperature is <35 °C, wrap plastic sheet around baby (Baby's head should only be covered if ventilated)
- Ensure the room is warm prior to moving baby, minimise draughts

- Move the baby into the transport incubator with minimal delay
- May need to use a 2<sup>nd</sup> transwarmer, depending on time taken to stabilise
- Ensure that air flow is not blocked by bedding

## 5. On Transferring to the ambulance

- Operate incubator within thermo neutral range (see chart below)
- If using HillRom™ incubator and temperatures in excess of 38 °C are required, it is possible to override the normal temperature range. This can be done by pressing both the up and down arrows, to reach a maximum temperature of 39.9 °C. The incubator heater will shut down when 40 °C is reached.
- Use incubator cover in cold or wet weather
- It is advisable to operate incubator at temperatures of 39 °C or below. This is so that the incubator temperature can be increased slightly before going outside. This then ensures that the heater is operating at full power. Once the incubator is in the ambulance, it should then be reduced again to a temperature below 39 °C, so that the procedure can be repeated on arrival at the destination

## 6. On arrival at Receiving Unit

- Handover all aspects of baby's care to receiving team before moving the baby, including details of temperature control / stability / instability
- Measure and document digital axilla temperature immediately prior to moving baby from incubator
- Ensure all preparations for baby's transfer are made before opening transport incubator doors, and offer assistance to unit staff with moving baby.

### Note

There may be instances such as gastroschisis or other surgical emergencies, when it may be more appropriate to move a baby before their temperature is within the desired range, as long as it is clinically safe to do so. This principle may also apply if the baby is unreasonably slow in responding to attempts to re-warm.

If this is the case, the transport consultant and the receiving unit should be advised of this decision, and all appropriate methods should be employed whilst en route, to attempt to stabilise the temperature.

Below is a chart adapted from Hey and Katz (1971) although it is important to note that it is intended as a guide for babies above 1kg. The neonate weighing less than 1kg will require higher incubator temperatures, with those smallest babies requiring incubator temperatures as high as 39 - 40 °C. The unit incubator temperature can be used as a guide. Babies weighing less than 28/40 gestation or weighing less than 1kg should have supplementary humidity added to their incubator.

Age	Birth Weight and Temperature Range			
	1000-1200 grams ±0.5 C	1201-1500 grams ±0.5 C	1501-2500 grams ±1.0 C	>2500 & >36wks. grams ±1.5 C
0-12 hrs	35.0	34.0	33.3	32.8
12-24 hrs	34.5	33.8	32.8	32.4
24-96 hrs	34.5	33.5	32.3	32.0