

Thermoregulation Guideline *for* Premature Infants



Overview

Thermal regulation is important in the care of the premature infant with the goal of maintaining the infant in a neutral thermal environment. Well known variables that predispose the premature infant to cold stress may include low caloric intake, reduced insulation secondary to smaller amounts of fat, underdeveloped stores of brown fat responsible for non-shivering thermogenesis and a high ratio of skin surface area to weight. Within a narrow range, the infant maintains body temperature with minimal oxygen consumption and avoids significant impact on metabolism and respiratory control, thus maintaining a neutral thermal environment. Overhead radiant warmers and double-walled convective isolettes are commonly used for this purpose until the infant is able to maintain body temperature in an open crib with desired weight gain and minimal impact on metabolic activities.

Goal

A systematic approach to weaning a preterm infant from an enclosed or overhead heat source into

a well-controlled NICU environment should be utilized to facilitate discharge from the hospital. The infant prior to weaning, should be feeding well with acceptable weight gain, respiratory control and thermoregulation, maintaining a minimum axillary temperature of 36.5°C (97.7°F). Although cold stress with its sequelae may occur if the infant is not ready to be transferred to a crib, delaying safe transfer on the basis of only a weight criterion may prolong hospitalization and increase the cost of care.

Criteria for Weaning from an Isolette

The ambient temperature in the NICU or nursery environment should remain stable and be maintained at an appropriate setting. An air temperature range from 72°F - 78°F, preferably with relative humidity from 30% to 60%, is desirable. Fluctuating temperatures or cool environments often result in failure to successfully transfer an infant to an open crib. This may also result in poor weight gain, reduced feeding ability and apnea. Furthermore, drafts from air vent registers and returns should be

avoided to minimize convective heat loss, as should proximity to outside windows to which body heat may be radiated.

Weaning from a heat source should be considered after a postmenstrual age of 32 weeks and/or when the infant weighs approximately 1500 grams. The appropriateness of size for gestational age may influence this transition. The more mature small-for-gestational age infant may be ready for a trial in a crib at a lower weight than the AGA extremely low birth weight infant.

Most infants are candidates for weaning to a crib after they have achieved several days of weight gain (approximately 15 gm-30 gm/day), metabolic homeostasis, cardiopulmonary stability, minimal apnea or bradycardia and feeding tolerance with oral feedings. Exclusive nipple feedings however may not be necessary to wean to an open crib. In preparation for weaning, the infant should be swaddled, have adequate weight gain and be able to tolerate either gavage or nipple feedings.



Weaning Process

Preterm infants who are initially managed under radiant warmers during the acute phase of their illnesses are commonly transferred to closed isolettes for most of their hospitalization prior to weaning to cribs. Infants in an isolette under servo control may be switched to air mode for manual weaning or weaned to a crib directly from servo control.

Transfer to a crib from air mode should occur when the infant's temperature remains stable ($\geq 36.5^{\circ}\text{C}/97.7^{\circ}\text{F}$) in an ambient temperature of 28°C or less in an isolette for at least 12-24 hours. Infants weaned in this mode benefit from blankets and head coverings. This may be achieved by gradual reduction of the ambient temperature in the isolette in 0.5°C increments several times per day while monitoring the axillary temperature. Infants with a temperature of $> 98.6^{\circ}\text{F}$ or larger infants may tolerate faster weaning rates. Reference tables are available for review from many sources that list the starting point and ranges of neutral thermal environmental temperatures for infants of various birth weights and chronological ages.

Servo controlled systems can result in hypothermia or hyperthermia if the skin probe becomes dislodged. However, weaning from this mode may occur by undressing the infant or by clothing him/her with a lighter outfit. A secure skin probe is required in addition to monitoring of the infant's axillary temperature and isolette ambient temperature. The skin set point is 36.5°C . When the isolette ambient temperature has been reduced to 28°C for 12-24 hours, the infant may transfer to a crib wearing an appropriate outfit with blanket coverings and/or a hat.

Weaning from the isolette to a crib may be accomplished as outlined below:

- Switch isolette to manual control and dress the baby in a shirt and blanket.
- Start weaning 0.5°C below the average isolette temperature over the previous 24 hours. If infant's temperature is $\geq 36.5^{\circ}\text{C}$ reduce temperature by 0.5°C at each assessment until the isolette temperature is 28°C. Every 12-24 hours the temperature of the isolette may be reduced by 1-2 degrees centigrade in increments of 0.5°C.



- Monitor the infant's temperature every two hours for stability during weaning. Add a shirt, hat and blankets as the temperature is progressively decreased until the

temperature is at the lowest setting, weight gain is steady and axillary temperature is stable. The infant can then be moved to an open crib if the temperature is stable with acceptable weight gain.

- When in a crib, the infant's outfit and coverings should vary according to the environmental temperature.
- If the infant's temperature is low or unstable in a crib, return the infant to the isolette as needed. When the infant's temperature stabilizes, the weaning process may continue.

If the axillary temperature declines to less than 36.5°C during the weaning process prior to crib entry, the following guidelines may be followed:

- Increase isolette temperature by 0.5°C every 30 minutes until axillary temperature is greater than 36.5°C.
- Assess axillary temperature every 15 minutes until axillary temperature is greater than 36.5°C for one hour.
- Resume the weaning process.

Skin-skin contact with a parent or guardian may continue throughout the weaning process. Kangaroo care may facilitate the weaning process to an open crib and promotes bonding and parental interaction.

Failure to Wean or Maintain Temperature in an Open Crib

If hypothermia or signs of cold stress develop despite the application of a hat and additional blankets when the infant is in a crib, he/she should return to an isolette. Weaning may be resumed after 24 - 48 hours if the infant's temperature has stabilized. When rewarming

a hypothermic infant, set the isolette temperature 1°C -1.5°C above the infant's temperature. Adjust the temperature every thirty minutes until the infant is warmed.

Infants who return to an isolette for phototherapy without the need for heat support, except for that provided by the phototherapy device, may return to a crib after completion of treatment.

Hospital Discharge

Infants who have been successfully weaned to a crib and have maintained stable temperatures of at least 36.5°C for 1-2 days with acceptable weight management and oral feedings may be ready for discharge provided that they meet discharge criteria.(Please refer to ProgenyHealth Guideline: Discharge Guidelines for NICU Patients.)

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