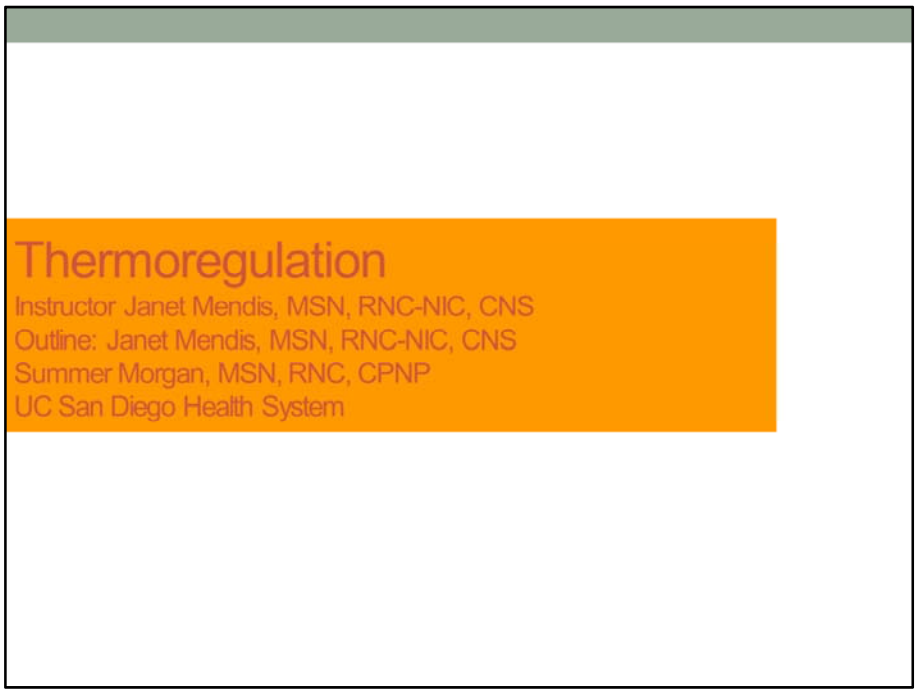

Thermoregulation
Instructor Janet Mendis, MSN, RNC-NIC, CNS
Outline: Janet Mendis, MSN, RNC-NIC, CNS
Summer Morgan, MSN, RNC, CPNP
UC San Diego Health System

Notes

Objectives

- Differentiate between methods of heat loss in the neonatal environment
- Identify infants at risk for hypothermia and hyperthermia
- Explain the difference in managing infants with hypothermia and hyperthermia

Notes

Thermoregulation

- Neutral Thermal Environment (NTE):
  - Environment in which heat production & oxygen consumption is minimal, but core neonatal temperature is maintained
- Thermoregulation influenced by:
  - Internal physiologic process
  - External environmental factors

Notes

Why are newborns are at greater risk for temperature instability?

- Greater surface area to body weight ratio
- Increased surface area of the head
- Inability to shiver
- Diminished brown fat stores
- Decreased subcutaneous fat

Notes

Non-Shivering Thermogenesis & Muscle Activity

- Non-shivering thermogenesis:
  - Brown fat metabolism heat production & transfer
  - Preterm infants have insufficient brown fat stores
- Voluntary neonatal muscle activity:
  - Minimal source of heat production
  - Flexing newborn's extremities helps conserve heat

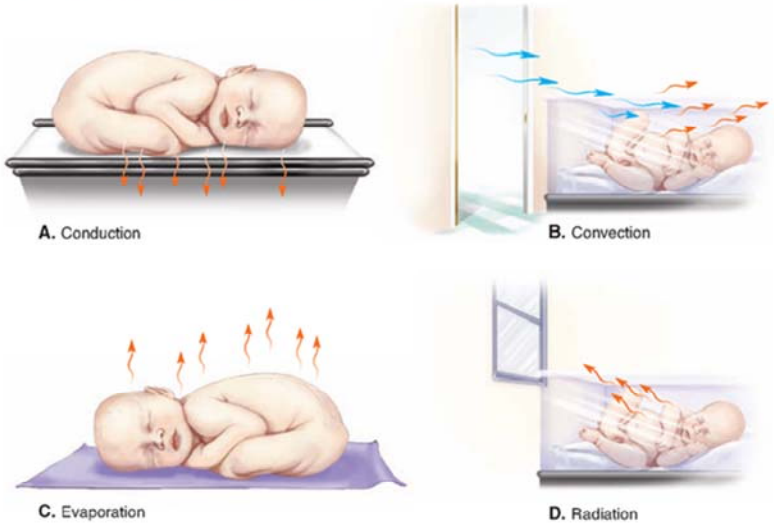
Notes

Sources of Heat Loss

- Neonatal heat loss occurs when heat is transferred from the body to the environment
- Examples of sources of heat transfer:
  - Evaporation
  - Convection
  - Conduction
  - Radiation

Notes

Sources of Heat Loss



Notes

Evaporation

- Evaporation heat loss due to conversion of fluid on skin to air vapor
- Occurs when neonate's skin is wet:
  - At birth
  - During bathing
  - Cool prep solutions

Notes

Convection

- Heat transfer from newborns body to the surrounding air
- Influenced by:
  - Amount of skin exposed to the air
  - The air temperature
  - Speed or turbulence of air movement
- Convection heat loss reduced by maintaining a warm environment

Notes

Conduction

- Heat loss generated by contact between cool surfaces in contact with newborn's body
- Conduction heat loss can be reduced by:
  - Pre-heating radiant warmers
  - Using warm blankets for drying
  - Covering scales & x-ray plates with warm blankets
  - Providing skin to skin contact whenever possible

Notes

Radiation

- Heat loss transferred from solid objects not in direct contact with the neonate
- Radiation heat loss is not influenced by ambient air temperature or air speed
- Radiation heat loss can be reduced by:
  - Use of radiant warmers after birth
  - Moving cribs and isolettes away from cooler, exterior walls
  - Use of heat shields inside incubators

Notes

Hypothermia

- Definition:
  - Rectal or axillary temperature less than 97.70 F (36.50 C)
- Rectal temperature reflects core temperature but:
  - Measurement varies with depth of probe
  - Associated with rectal mucosal irritation & perforation
- Axillary or skin temperature measurement preferred

Notes

Infants at Risk for Hypothermia

- Premature & small for gestational age (SGA) infants
- Stressed or compromised infants
- Infants with neurologic disorders
- Infants with congenital anomalies e.g., spina bifida, meningomyelocele, omphalocele, gastroschisis

Notes

Manifestations of Hypothermia

- Lethargy
- Irritabilibilty
- Tachypnea
- Poor perfusion
- Acrocyanosis
- Cool extremities
- Apnea
- Bradycardia
- Hypoglycemia
- Metabolic/respiratory acidosis

Notes

Management of Hypothermia

- Reduce sources of heat loss & provide environment conducive to intrinsic neonatal heat production
- Management approach:
  - Warm & humidify incubator air over infant
  - Use heat shield
  - Monitor air near newborn
  - Monitor newborn temperature

Notes

Hyperthermia

- Definition:
  - Rectal or axillary temperature > 99. 50 F (37.50 C)
- Possible causes:
  - Overheating
  - Maternal fever
  - Sepsis
  - CNS, cardiac disorders
  - Dehydration

Notes

Management of Hyperthermia

- Treat underlying causes & effects such as sepsis, dehydration, hypoxia, acidosis
- Change the thermal environment:
  - Modify external heat sources (e.g., room temperature)
  - Check & modify incubator or radiant warmer temperature (use servocontrols)
  - Remove excess bundling or swaddling clothing
- Monitor and document temperature

Notes

Prevention of Thermal Instability

- Delivery Room
  - Dry baby completely with pre-warmed linen
  - Pre-warm room and warmer
  - Remove wet linen
  - Skin to skin contact with mother
  - Monitor temperature
  - Use servo-control on warmer

Notes

Prevention of Thermal Instability

- Nursery
  - Assess on radiant warmer, servo-controlled
  - Ensure temperature probe attached
  - Delay bath until temperature stable
  - Re-warm neonate in warmer after bath until hair is dry and temperature is within normal range
  - Use caution with neonates at risk

Notes

Equipment to help with Thermoregulation

- Radiant Warmers
  - Use on servo-control with audible alarm
  - Attach skin probe carefully
  - Set temperature to 36.5 °C
  - Keep sides up to prevent cooling drafts
  - VLBW
    - cover with heat shield or plastic wrap
    - monitor for increased insensible water loss

Notes

Equipment to help with Thermoregulation

- Incubators/Isolette- document ambiant/isolette and infant temperature per hospital protocol
  - Servo-control
    - Ensure probe attached to skin
      - over abdomen
      - reflective cover
  - Manual Control
    - Use NTE chart
    - Monitor temperature frequently until stable

Notes

Equipment to help with Thermoregulation

- Open Crib
  - Use for term neonate after temperature stable
  - Neonates should be fully dressed, adequate blankets and hat
  - Monitor temperature frequently until stable
  - Return to incubator or warmer if temperature unstable

Notes