



NMNEC Concept: **Thermoregulation**

Mega Concept: Health and Illness

Category: Homeostasis & Regulation

Concept Name: Thermoregulation

Concept Definition:

Processes that balance heat production and heat loss to maintain the body's temperature. Body surface temperature fluctuates according to external environment and is unreliable.

Regulatory processes are measured in degrees and are best reflective true core temperature.

Scope and Categories:

- **Scope:** Thermoregulation ranges from above normal to optimal to below normal.
- **Categories:**
 - Intrinsic
 - Metabolic
 - Hormonal
 - Extrinsic
 - Injury/trauma
 - Environmental

Risk Factors:

Individuals of all ages, gender, race or socioeconomic status may develop problems associated with thermoregulation.

Populations at Risk:

- Very young (e.g., preterm newborns or small for gestational age [SGA] newborns)
- Older adults
- Homeless
- Those who reside in very cold or hot climates
- Males
- Physiological impairment

Individual risk factors:

- Impaired cognition
- Genetics
- Recreational or occupational exposures



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- Immobility
- Surgery
- Alcohol
- Substance abuse

Physiological Processes and Consequences:

Thermoregulation is a complex process controlled by the hypothalamus involving compensatory and regulatory actions to maintain core temperature.

- Heat production and conservation
- Heat loss
- Temperature control
- Hyperthermia
- Hypothermia

Assessment/Attributes:

Subjective:

- Baseline history
- Thirst
- Dizziness
- Cramps
- Personality change
- Nausea, vomiting, or anorexia
- Fatigue
- Problem-based history
 - Malignant hyperthermia
 - Environmental exposure
 - Recent injury

Objective:

- Examination findings
 - Presenting symptoms of hypo- or hyperthermia
 - Vasoconstriction or vasodilation
 - Alterations in vital signs (tachycardia, blood pressure, cardiac output)
 - Muscle rigidity
 - Flushed skin without diaphoresis



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Clinical Management - Interdisciplinary: To maintain temperature within optimal range to promote well-being

Primary: Prevention

- Environmental control & shelter
- Appropriate clothing
- Physical activity
- Exercise

Secondary: Screening

Does not apply to this concept.

Tertiary: Treatment

- Hyperthermia
 - Identify underlying cause
 - Minimize cardiovascular and neurologic complications
 - Maintain or improve hydration
 - Provide cooling methods
 - Administer medications as needed
 - Antipyretics
 - Aspirin in adults
 - Dantrolene sodium
- Hypothermia
 - Remove from wet/cold environment
 - Provide passive and/or active rewarming methods

Interrelated Concepts:

- Perfusion
- Fluid & Electrolyte Balance
- Comfort
- Intracranial Regulation
- Tissue Integrity

Exemplars:

New Mexico Nursing Education Consortium (NMNEC) Required Exemplars:



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- Hyperthermia: 38°C-41°C or 100.4°F-106°F (Environmental vs. Disease Process)
- Hypothermia: 35°C-34°C or 95°F-93.2°F (Exposure)

Optional Exemplars:

- **Hyperthermia**
 - Brain Injury
 - Febrile seizures
 - Fever
 - Heat Exhaustion
 - Heat Stroke
 - Hyperthyroidism
 - Infection: Bacterial/Viral
 - Malignant Hyperthermia
 - Thyroid Storm
- **Hypothermia**
 - Brain Injury
 - Environmental Exposure
 - Frostbite
 - Preterm Infant
 - Submersion
 - Therapeutic hypothermia



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Resources:

Center for Disease Control and Prevention (CDC). (n.d.). *Heat-Related Illness Picture of America: Heat-Related Illness Fact Sheet*. Retrieved from

https://www.cdc.gov/pictureofamerica/pdfs/Picture_of_America_Heat-Related_Illness.pdf

Center for Disease Control and Prevention (CDC). (2016). *Natural Disasters and Severe Weather*. Retrieved from <https://www.cdc.gov/disasters/winter/staysafe/hypothermia.html>

Hildebrandt, B., Wust, P., Ahlers, O. (2002). The cellular and molecular basis of hyperthermia. *Crit Rev Oncol/Hematol* 43, 33-56.

Lewis, S., Dirksen, S., Heitkemper, M., Bucher, L., & Camera, I.M. (2017). *Medical surgical nursing* (10th ed.). St. Louis, MO: Mosby.

Pearson Education. (2019). Thermoregulation. *Nursing: A concept-based approach to learning, Volume I* (3rd ed.) (pp 1537-1564). New York: Pearson Education, Inc.