ALTERATIONS IN BODY TEMPERATURE (vital signs)

- Body temperature may be within the normal range for one's age or it may be increased or decreased from the normal range.
- These changes can be related to excess heat production, excessive heat loss, minimal heat production, minimal heat loss or any combination of these alterations.
- The nature of the change affects the type of clinical problems a client experiences. A body temperature above the usual range is called fever. It occurs because heat loss mechanisms are unable to keep pace with excess heat production, resulting in an abnormal rise in body temperature.

Fever

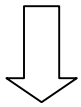
A body temperature above the usual range is called fever. A person with an increased body temperature is said to be febrile. It results from a response to bacterial or viral infections.

Phases of Fever

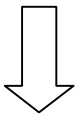
1. **Invasive or onset**: It is the phase of starting of rising temperature. It may be sudden or gradual.
2. **Fastigium or stadium**: In this phase, fever reaches its maximum degree and remains constant at high level
3. **Decline**: In this phase, the high temperature comes back to normal. It may be **sudden or gradual.**
4. **Crisis**: It means a sudden decrease in temperature. It may take few hours or a day. In true crisis there will be improvement in the patient's condition. In false crisis, there is no improvement in the patient's condition.
5. **Lysis:** It means a gradual decrease in temperature. It may take two or three days.

Pathophysiology of Fever

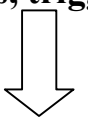
Infection, microbial toxins, enters the body



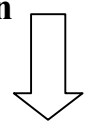
Immune reactions



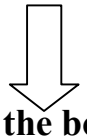
Pyrogens acts as antigens, triggering, the immune system.



Monocytes/macrophgages, endothelial cells circulation in the body to promote the body's defense against infection



Trigger the hypothalamus to elevate thermoregulatory set point



To meet the new higher set point, the body produces and conserves heat

Fever

Types of Abnormal Temperatures

1. **Hypopyrexia or subnormal temperature**: The temperature falls below 97°F or 37°C.

2. **Low pyrexia:** Temperature ranges between 99-101F

3. **Moderate pyrexia:** Temperature ranges between 10 103F.

4. **High pyrexia:** Temperature ranges between 103-105°F

5. **Hyper pyrexia**: temperature goes above 105°F

6. **Constant fever:** Body temperature remains almost same with slight variation of 1 to 2 degrees.

7. **Remittent fever**: There is variation of more than 2 degrees in morning and evening temperature but temperature never falls to normal.

8. **Intermittent fever:** There is a great variation in the temperature. Temperature rises very high and may fall at regular intervals. This type of fever is seen in malaria cases.

9. **A relapsing fever** is one in which there are brief febrile periods followed by one or two days of normal temperature.

10. During a **constant fever,** the body temperature fluctuates minimally but always remains above normal. This can occur with typhoid fever.

11. **Inverse fever:** In this, the highest range of temperature is recorded in the morning hours and lowest in the evening hours which are contrary to that found in the normal course of fever.

12. **Rigor:** It is a sudden severe attack of shivering in which the body temperature rises rapidly to the state of hyper- pyrexia as seen in malaria.

13. **Irregular fever:** When the fever is entirely irregular in its course and it cannot be classified under any of the fevers described above.

14. **Crisis:** Crisis is a sudden return to normal temperature from a very high temperature within a few hours or days.

a. **True crisis:** The temperature falls suddenly within few hours and touches normal, accompanied by marked improvement in the patient's condition.

b. **False crisis:** A sudden fall in temperature not accompanied by an improvement in the general condition.

15. **Lysis:** The temperature falls in a zig-zag manner for two or three days or a week before reaching normal, during which time the other symptoms also gradually disappear.

Clinical Manifestations of Fever

1. **Respiratory system:** Shallow and rapid breathing.
2. **Circulatory system:** Increased pulse rate and palpitation
3. **Alimentary system:** Dry mouth, coated tongue, loss of appetite, indigestion, nausea, vomiting, constipation or diarrhea.
4. **Urinary system:** Diminished urinary output, burning maturation, dark colored urine.
5. **Nervous system:** Headache, restlessness, irritability, insomnia, convulsions, delirium.
6. **Musculoskeletal system:** Malaise, fatigue, body pain, joint pain.
7. **Integumentary system:** Heavy sweating, hot flushes, gooseflesh, shivering or rigors.

Assessment of the Patient with Fever

1. **History:**

a. Medical history including any chronic or immune compromising disorders, recent hospitalizations or surgeries and medications.

b. Occupational history.

c. Exposure to infectious agents, febrile or infected in- dividuals in the home and workplace.

d. Use of tobacco, IV drugs, trauma, animal bites, immunization.

e. Family history of TB, arthritis, infectious disease, anemia.

2**. Physical examination**: Check vital signs, skin, lymph nodes, eyes, nail beds, CVS, chest, abdomen, musculoskeletal system, nervous system should be carefully examined. Pelvic examination for PID.

Auscultation: Change in cardiac murmurs indicate endocarditis, pneumonia, pericarditis or pleuritis.

Palpation of abdomen: Hepatomegaly, splenomegaly, abscess or mass. Musculoskeletal: Arthritis and osteomyelitis.

Neurologic: Meningitis or fecal deficits.

3. **Laboratory tests:** If a patient reveals more than a simple viral illness or pharyngitis then lab testing is done. Clinical pathology includes CBC, Blood smear examination for pathogens and ESR.

4. **Radiology:** Chest X-ray is done for significant febrile illness.

Pharmacological Management

Acetaminophen: Adult: 325-650 mg PO q4-6 hrs. Children: 10-15 mg/kg body weight q 4-6 hrs.

Indomethacine and naproxen (NSAID), Aspirin: Adult 325-650 mg POq6 hrs; Children 10-20 mg q 6 hrs.,

Corticosteroid: potent anti-pyretic inhibit PGE2 synthesis.

Nursing Management of Fever:

- Promote heat loss and lower the temperature. Limit physical activity to decrease heat production, reduce external covering on client's body to promote heat loss through radiation and conduction.
- If fever continues, physical therapies can be used to lower the temperature, such as applying ice packs to axilla and groin areas. Frequently assess the temperature and record the readings.
- Observe the pattern, the extent and the course of fever. Observe client's respiration, pulse, blood pressure, shivering and diaphoresis when taking client's temperature. Assess for contributing factors such as dehydration, infection or environmental temperature.
- Observe intake/output of patient. Contact physician promptly in case of abnormal conditions.
- Provide nutrients to meet increased energy need. Pro Vide measures to stimulate appetite and offer well balanced diet.
- Provide fluids at least 3000 ml per day for client with normal cardiac and renal function to replace fluid loss through insensible water loss and sweating.

- Provide oral hygiene and keep oral moist to prevent oral infection. Keep clothing and bed sheet dry to increase comfort and heat loss through conduction and Convection
- Provide psychological care. Promote comfort and pre vent complications.

Rigor

Rigor is a sudden feeling of cold with shivering accompanied by a rise in temperature, sweating, especially at the onset of a fever. It is characterized by three stages.

- **First stage (Cold stage):** In this the patient feels chill, shivering and temperature rises.
- **Second stage (Hot stage):** In this stage patient feels hot and thirsty.
- **Third stage (Sweating stage):** Temperature falls down due to profuse sweating.

Nursing Care in Rigor

Cold Stage

The patient experiences cold and may shiver. Skin becomes pale and cool. The face is pinched, pulse is feeble and rapid.

Interventions:

1. Monitor vital signs.

2. Restrict activity.

3. Monitor skin color and temperature.

4. Apply extra blankets.

5. Provide hot drinks to the patient.

6. Supply O_2 if client has pre-existing cardiac or respiratory problem.

Hot Stage

It occurs when fever reaches the new higher set point. The skin is hot and dry. The patient may experience thirst and complains of aching muscles. General malaise and weakness can be there due to increased protein catabolism. Client may be drowsy or restless. An uncontrolled fever can make the patient delirious and to suffer from convulsions due to cerebral nerve cell irritation.

Interventions:

- Remove excess clothing.
- Cover with light warm clothing to avoid chilling.
- Monitor temperature
- Encourage cold fluids
- Start tepid sponging (Don't use cold water)
- Adjust cooling measures on the basis of temperature
- Apply lubricant to dry lips and nasal mucosa.
- Monitor for decreasing level of consciousness
- Promote rest and restrict activity.
- Take safety precautions if patient is delirious
- Administer antipyretics as prescribed.

Sweating Stage: During this phase the patient experiences profuse diaphoresis, decreased shivering and possible fluid volume deficit.

Interventions:

- Change the clothes that are wet with sweat.
- Put on clean dry clothes and cover the patient with light cotton blanket.
- Monitor intake and output.
- Monitor electrolyte levels.
- Replace fluids and electrolytes loss through sweating
- Monitor temperature.
- Provide rest and comfort to the patient.

Hyperthermia:

Hyperthermia is elevated body temperature (temperature range 105°F) due to failed thermoregulation that occurs when a body produces or absorbs more heat than it dissipates. It is characterized by an unchanged (normothermic) setting of the thermoregulatory center in conjunction with an uncontrolled increase in the body temperature that exceeds the body's ability to lose heat. Exogenous and endogenous heat productions are two mechanisms by which hyperthermia can result in dangerously high internal temperature.

- **Heat Cramps** These painful muscle cramps occur most commonly in the legs following vigorous exercise in the hot weather. There is no elevation of core temperature.

  The mechanism is considered to be extracellular sodium depletion following electrolyte loss as a result of persistent sweating with replacement of water but no salt.

  The syndrome is also encountered in miners undertaking heavy physical work in hot conditions with very limited ventilation, which impairs the effect of evaporative heat loss from sweating. Symptoms usually respond to salt replacement.
- **Heat Exhaustion**:temperature between 37-40°C and is usually seen when the individual is undertaking vigorous physical working a hot environment. A high work rate, extreme ambient temperature, heat loss due to high humidity or inappropriate clothing may all combine to overcome thermoregulatory control.

  Diagnosis is based on the findings of an elevated core temperature associated with hyperventilation and symptoms of tiredness or fatigue, muscular weakness, dizziness and collapse. The blood analysis may show evidence of dehydration with mild elevation of blood urea, sodium concentration and hematocrit.

  Treatment involves removal of patient from the heat, active cooling using cold sponging and fluid replacement. This may be achieved by oral rehydration mixtures containing both salt and water or intravenous isotonic saline. Adult patients may require 5 liters or more positive fluid balance in the first 24 hours. Frequent monitoring of blood electrolytes is important, especially in patients receiving I.V. replacement therapy.

- **Heat Stroke:** Heat stroke occur when the core body temperature rises above 40°C and is a severe and life threatening condition above provoked by failure of heat regulatory mechanisms.

  Symptoms of heat exhaustion include headache, nausea and vomiting. Neurological manifestations include a coarse muscle tremor and contusion, which may progress to loss of consciousness.

  The patient's skin feels very hot and sweating is often absent due to failure of thermoregulatory mechanisms. The condition may progress from heat exhaustion or present acutely in a patient who has become progressively dehydrated without symptoms.

  Treatment includes rapid cooling using ice packs, careful fluid replacement and appropriate intravascular monitoring.

  Investigations reflect the complications and include coagulation studies and muscle enzymes in addition to routine hematology and biochemistry.

  Management of Hyperthermia:

  Physical cooling with sponging, cooling blankets, cooling mattress or even ice bags should be initiated immediately in Conjunction with appropriate pharmacological agents and intravenous fluids. Internal cooling can be achieved by gastric or peritoneal lavage by iced saline.

  In extreme circumstances, hemodialysis may be performed.

Hypothermia

Hypothermia is a state in which the core body temperature is lower than 35°C and 95°F.

At this temperature, many of the compensatory mechanisms are used to conserve heat begin to fall.

It is usually caused by prolonged exposure to cold temperatures. In severe hypothermia, core body temperature drops to 86 degrees or lower.

Cold Exposure Cause Hypothermia

During exposure to cold temperatures up to 90% of heat loss takes place through skin; the rest is, exhaled from lungs. Heat loss through the skin happens primarily through radiation and speeds up when skin is exposed to wind or moisture. The hypothalamus, the brain's temperature-control center, works to raise body

temperature by triggering processes that warm and cold the body. During cold temperature exposure, shivering is a protective response to produce heat through muscle activity. In another heat-preserving response called vasoconstriction, the blood vessels are temporarily narrow.

Normally, the activity of the heart and liver produce most of heat in body. But as core body temperature cools, these organs produce less heat, in essence causing a protective "shut down" to preserve heat and protect the brain. Low body temperature can slow brain activity, breathing and heart rate.

Causes of Hypothermia:

Age extremes:

a. Elderly

b. Neonates

Outdoor exposure:

a. Occupational

b. Sports related

C. Inadequate clothing

Drugs and intoxicants:

a. Ethanol

b. Barbiturates

c. Neuromuscular blockers

Endocrine disorders:

a. Hypoglycemia

b. Hypothyroidism

C. Adrenal insufficiency

Neurological disorders:

a. Stroke

b. Hypothalamic disorders

C. Spinal cord injury

Multisystem disorders:

a. Malnutrition

b. Shock

C. Hepatic or renal failure

d. Burns and exfoliative dermatological disorders

e. Immobility

Nursing Interventions in Hypothermia: The priority treatment for hypothermia is to prevent a further decrease in body temperature:

1. **Monitoring:** The basic life support is the priority. The patient's vital signs, urine output, arterial blood gas levels, blood chemistry determinations (BUN, creatinine, glucose, electrolytes)and chest X-Rays are evaluated frequently.

2. Clients are monitored closely for cardiac irregularities and electrolyte imbalances. Continuous ECG monitoring is performed because cold induced myocardial irritability leads to conduction disturbances, especially ventricular fibrillation. An arterial line is inserted and maintained to record BP and facilitate blood sampling.

3. Elevate body temperature: Add clothes, wrap the client in blankets and give heating blankets or hot packs to prevent heat loss. Provide hot liquids such as soup to a conscious client.

4. Rewarming: Rewarming methods include active core (internal) rewarming, active external rewarming and passive or spontaneous rewarming. Core rewarming method includes warm intravenous fluid administration and warm humidified oxygen by ventilator or warm peritoneal lavage. Passive external rewarming includes use of warm blankets or use of over the bed heaters to maintain the body temperature.

5. Observe the vital signs, take temperature once at least per hour until the temperature returns normal and stabilize.