ALTERED BODY TEMPERATURE

PRESENTED BY:

LISA CHADHA

M.SC (NSG) 1ST YR

BVCON

Objectives

- Discuss thermoregulation and factors affecting thermoregulation.
- Enlist types of temperature.
- Explain hyperthermia , causes, pathophysiology and diagnostic finding , management.
- Describe fever of unknown origin, types, causes, diagnostic findings and management.

5. Explain Hypothermia Types,causes, Diagnostic Findings And Management.

6. Explain Hyperthermia Types, Causes, Diagnostic Findings And Management.

7.Explain Thermoregulation Mechanism.

8.Define Frostbite, Causes, Types, Diagnostic Findings, Management.

9. Review Recent Research Articles.

INTRODUCTION

- **Homeothermic- Humans capable of maintaining their body temperatures within narrow limits.**
- **Biochemical reactions do not fluctuate due to the constant & high temperatures.**
- **41^0 C (106^0F) – 43^oC convulsions are seen**
- **Nerve malfunction & protein denaturation seen with higher temperature.**



GENERAL CONSIDERATIONS



Temperature can be expressed as ^0C or ^0F.

$C = (F - 32) \times 5/9$ and $F = (C \times 9/5) + 32$

Normal is 37^0C or 98.6^0F

- Measured under tongue, axilla or rectum
- Oral temp is 0.5^0C less than core body temperature (rectal temp).
- Internal temp varies with activity pattern and changes in ext temp.
- Circadian fluctuation of about 1^0C - lowest at night and highest during the day.
- Women show higher temp during second half of menstrual cycle



DEFINITION



- Body temperature is the degree of hotness or coldness of a body or environment.
- It is the somatic sensation of heat or cold. It is the degree of or intensity of heat of a body in relation to external environment.
- The body temperature is the difference between the amount of heat produced by body processes & the amount of heat lost to the external environment

Temperature Regulation

- Body Temperature =Thermogenesis– Heat Loss



TYPES OF TEMPERATURE

Core temperature-

it is the temperature of internal body tissues below the skin & subcutaneous tissues. The sites of measurement are rectum, tympanic membrane, esophagus, pulmonary artery & urinary bladder.







Surface body temperature-

it refers to the body temperature of external body tissues at the surface that is of the skin & subcutaneous tissues

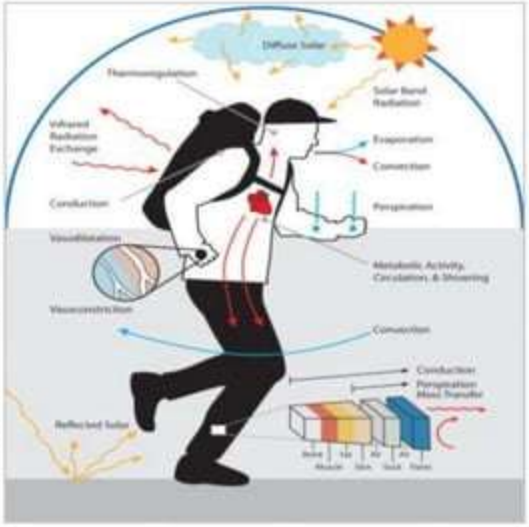




PHYSIOLOGY OF THERMOREGULATION

It is precisely regulated by physiological & behavioral mechanisms in number of ways:-

- **Neural control**
- **Vascular control**
- **Skin in temperature regulation**
- **Behavioral control**



FACTORS AFFECTING BODY TEMPERATURE



AGE



EXERCISE



HORMONAL LEVEL



STRESS

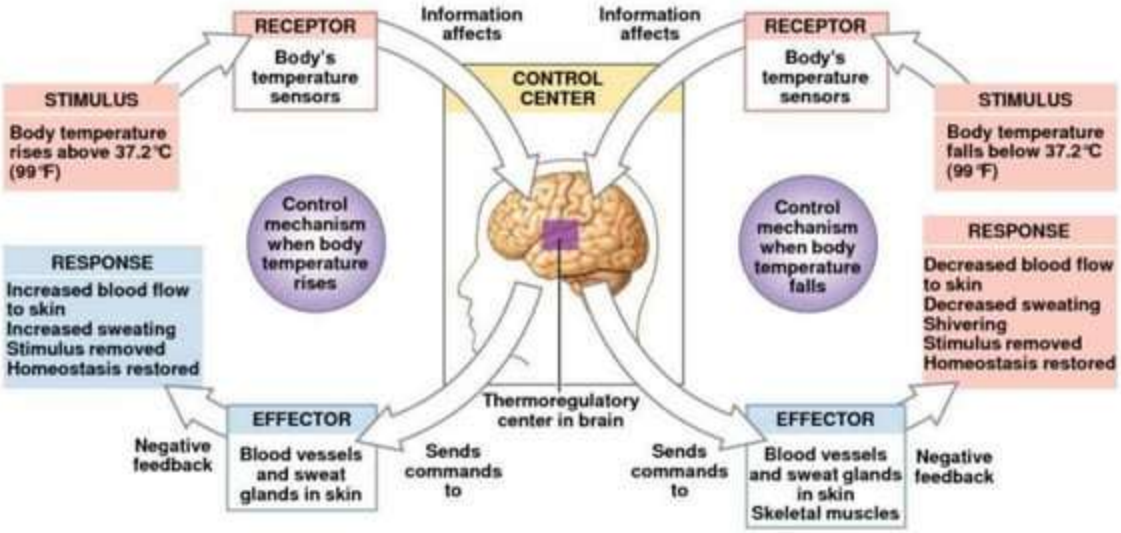


CIRCARDIAN RHYTHM



ENVIRONMENT

THERMOREGULATION MECHANISM



Copyright © 2007 Pearson Education, Inc., publishing as Benjamin Cummings

FEVER

- Fever is an elevation of body temperature that exceeds normally daily variation and occurs in conjunction with an increase in the hypothalamic set point for e.g. 37^0C-39^0C.



CLASSIFICATION OR PATTERNS OF FEVER:

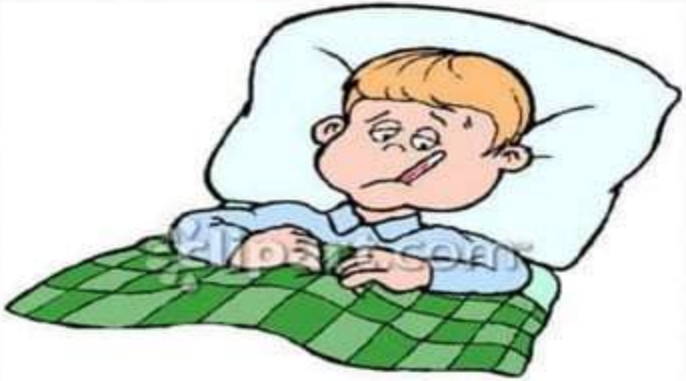
1. **Intermittent fever**: Temperature returns to acceptable value at least once in 24 hours. The temperature curve returns to normal during the day and reaches its peak in the evening. E.g.- in septicemia.

2. **Remittent fever**: fever spikes & falls without a return to the normal temperature levels. The temperature fluctuates but does not return to normal. E.g.- TB, viral diseases, bacterial infections



3.Sustained fever: the temperature remains continuously elevated above 38 degree Celsius & demonstrates little fluctuation.

4. Relapsing fever: periods of febrile periods interspersed with acceptable temperature values i.e. periods of fever are interspersed with periods of normal temperature.



FEVER OF UNKNOWN ORIGIN:

- ✓ Fever of Unknown Origin(FUO) was defined by Peterson & Benson in 1961 as having following features-
- ✓ temperature of > 38.3 degree Celsius (>101 degree Fahrenheit) in several occasions.
- ✓ A duration of fever of > 3 weeks.
- ✓ Failure to reach a diagnosis despite one week of inpatient investigation.

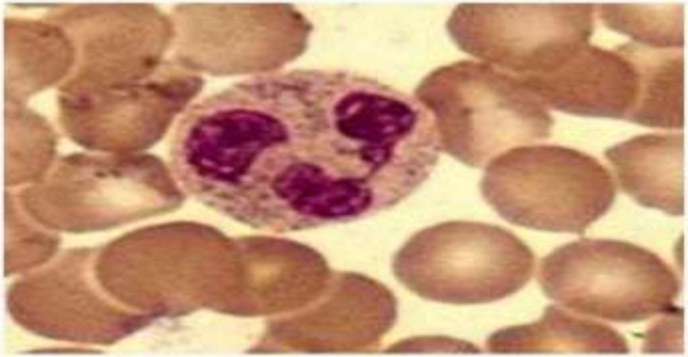
CLASSIFICATION OF FUO:

Derrick and Street have purposed a new system for classification of FUO:-

- **Classic FUO:** E.g. infections, malignancy, inflammatory diseases, drug fever.

- **Nosocomial FUO:** a temperature of >= 38.3 C (>=101 F) develops on several occasions in a hospitalized patients who are receiving acute care and in whom infection was not present at time of admission. For e.g. septic thrombophlebitis, sinusitis, drug fever.

- **Neutropenic FUO**: a temperature of >= 38.3 C (>=101 F) develops on several occasions in a patient whose neutrophil count is < 500/micro litre.



CAUSES OF FUO:

- Infections
- Neoplasm's
- Collagen vascular/ Hypersensitivity diseases
- Miscellaneous conditions
- Inherited and metabolic diseases
- Thermoregulatory Disorders



TREATMENT:

- Continuous observation and examination.
- Do not start with immediate Antibiotic Therapy as it can delineate the cause of FUO.
- The debilitating symptoms are treated by NSAIDS and glucocorticoids.

- If neutropenia and vital sign instability are present then empirical therapy with fluroquinolone and piperacillin is given.

- When no underlying source of infection is found even after 6 months the prognosis is generally good.



HYPERTHERMIA

- It is elevated body temperature due to failed thermoregulation that occurs when a body produces or absorbs more heat than it dissipates. Temperature ranges - >37.5-38.3degree Celsius (99.5- 100.9 degree Fahrenheit).



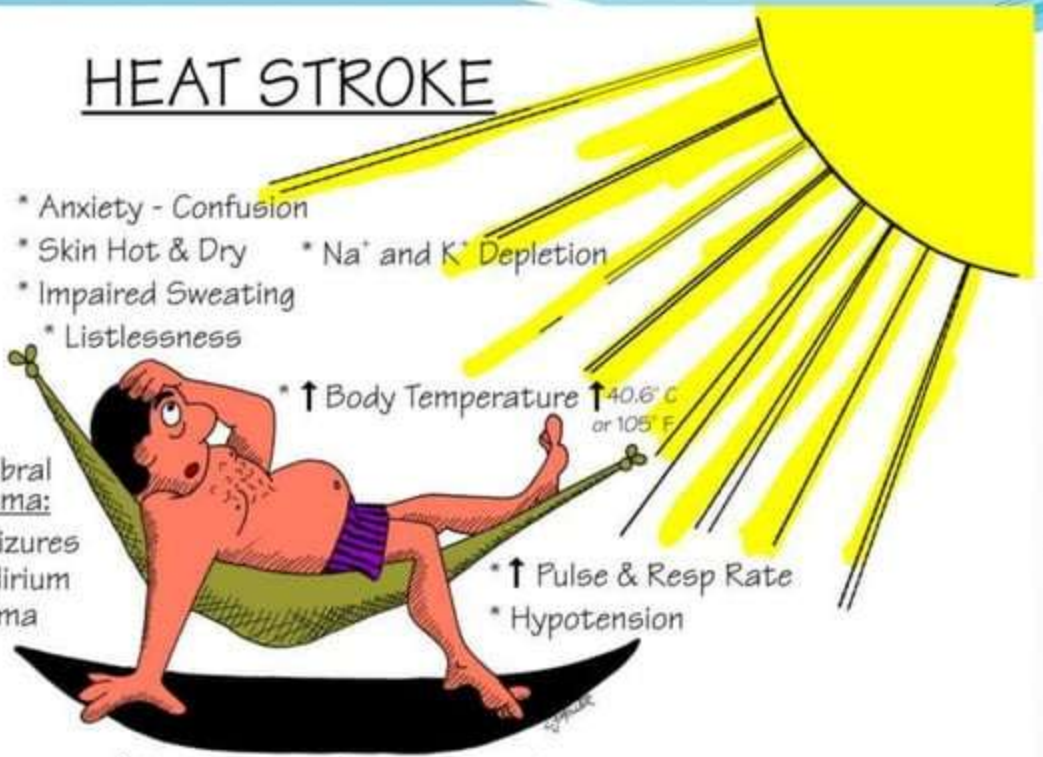
CAUSES OF HYPERTHERMIA

1.HEAT STROKE

Prolonged exposure to sun or high environmental temperatures. These condition causes heat stroke A dangerous heat emergency with a high mortality rate.



HEAT STROKE



* Anxiety - Confusion
* Skin Hot & Dry
* Impaired Sweating
* Listlessness
* Na⁺ and K⁺ Depletion
* ↑ Body Temperature ↑ 40.6° C or 105° F

Cerebral Edema:
* Seizures
* Delirium
* Coma

* ↑ Pulse & Resp Rate
* Hypotension

(Management - Cooling, Rest, Fluid & Electrolyte Support.)

©2007 Nursing Education Consultants, Inc.

2.DRUG INDUCED HYPERTHERMIA

- DIH syndromes are a rare and often overlooked cause of body temperature.
- Elevation and can be fatal if not recognized promptly and managed appropriately.

- There are five major DIH syndromes:

(1) neuroleptic malignant syndrome,
(2)serotonin syndrome,
(3) Anticholinergic poisoning,
(4) sympathomimetic poisoning,
(5) malignant hyperthermia



MALIGNANT HYPERTHERMIA

It is a rare reaction to common anesthetic agents (such as halothane) or a reaction to the paralytic agent succinylcholine.

- Malignant hyperthermia is a ge

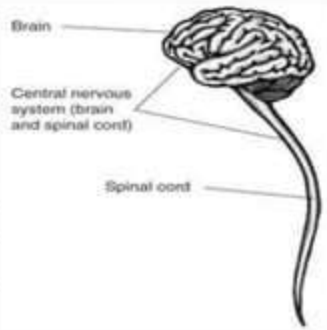


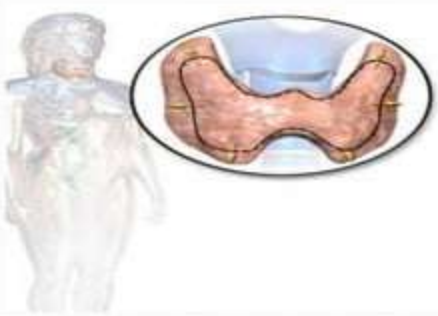
3. ENDOCRINOPATHY

Thyrotoxicosis and pheochromocytoma can lead to increased thermogenesis

4.CENTRAL NERVOUS SYSTEM DAMAGE

Cerebral hemorrhage, status epileptics, hypothalamic injury can cause hyperthermia





DIAGNOSIS

- ✓ History taking
- ✓ Physical examination
- ✓ Laboratory tests

i. Clinical pathology
ii. Biochemistry
iii. Microbiology





MEDICAL MANAGEMENT:

- Acetaminophen: adult: 325-650 mg PO q 4-6 hrs. Children: 10-15mg/kg body weight q4-6 hrs.
- Ibuprofen (NSAID) - dosage: adult-200-400mg PO q6hrs; children: 5mg/kg body wt for temp. <102.5F; 10 mg/kg body wt. for temp 102.5F (not to exceed 40 mg/kg/day).
- Indomethacin and naproxen (NSAID).

NURSING MANAGEMENT OF FEVER AND HYPERTHERMIA:



ASSESSMENT-

- Monitor vital signs.
- Assess skin color and temperatur
- Monitor white blood cell count, hematocrit value, and other pertinent laboratory reports for indication of infection or dehydration.

NURSING DIAGNOSIS:

1) During chill phase: Risk for altered body temperature as evidenced by shivering and feeling cold

2) During fever phase: Hyperthermia as evidenced body temperature >38.5C, irritability, increased respiratory rate and dry skin

3)Altered comfort as evidenced by restlessness

4) Altered nutrition related to fever as evidenced by anorexia and lack of food intake

5) During Flush phase- Altered fluid & electrolyte balance related to excessive sweating

NURSING MANAGEMENT OF FEVER AND HYPERTHERMIA:

- Provide adequate nutrition and fluids to meet the increased metabolic demands and prevent dehydration.
- Reduce physical activity to limit heat production especially during the flush stage.
- Provide a tepid sponge bath to increase heat loss through conduction.
- Provide dry clothing and bed linens.

NURSING MANAGEMENT OF FEVER AND HYPERTHERMIA

- Remove excess blankets when the client feels warm, but provide extra warmth when the client feels chilled.
- Monitor intake and output.
- Administer antibiotics as ordered.
- Provide oral hygiene to keep the mucous membranes moist.

CURRENT TRENDS



Internal cooling techniques -such as ice water gastric or rectal lavage, extracorporeal blood cooling, and peritoneal or thoracic lavage are effective but they are also difficult to manage and associated with complications.

External cooling techniques are usually easier to implement, well tolerated and effective.
Conductive cooling techniques include direct application of sources such as hypothermic blanket, ice bath, or ice packs to neck, axillae and groin

Convective techniques include removal of clothing and use of fans and air conditioning.
Evaporative cooling can be accelerated by removing clothing and using a fan in conjunction with misting the skin with tepid water or applying a single layer wet sheet to bare skin.

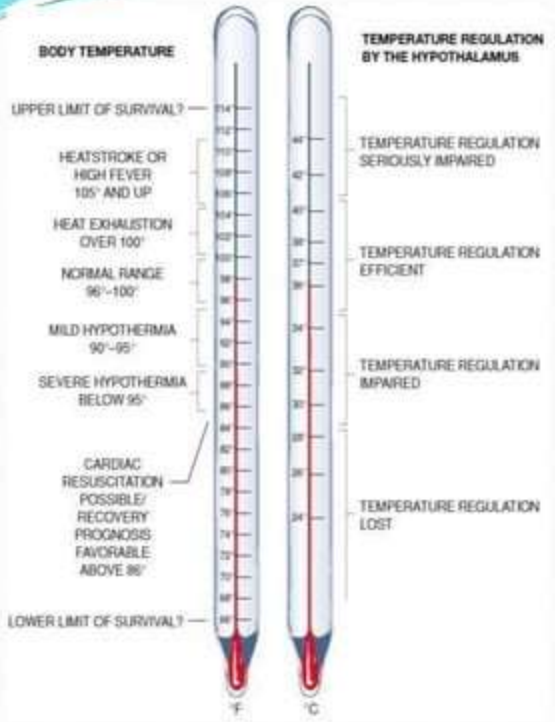
PREVENTION

- Drink 2 to 3 quarts of water daily.
- Avoid exertion or exercise, especially during the hottest part of the day.
- If traveling, allow 2 to 3 weeks in an unusually hot climate before attempting any type of exertion.
- When outside, wear a hat and loose clothing; when indoors, remove as much clothing as needed to be comfortable.
- Take a tepid bath or shower.
- Use cold wet towels or dampen clothing with tepid water when the heat is extreme.
- Avoid hot, heavy meals.
- Avoid alcohol.
- Determine if the person is taking any medications that increase hyperthermia risk; if so, consult with the patient's physician.

HYPOTHERMIA:

- Hypothermia is a state in which the core body temperature is lower than 35 degree Celsius and 95 degree Fahrenheit. At this temperature many of the compensatory mechanism to conserve heat begin to fall.





- **Normal Range:**
  - 96-100º F
- **Mild Hypothermia:**
  - 90-95º F
- **SevereHypothermia**
  - < 90º F

CAUSES:

- Exposure to cold environment in winter months and colder climates.
- Occupational exposure or hobbies that entail extensive exposure to cold for e.g. hunters, skiers, sailors and climbers.
- Endocrine dysfunction: hypothyroidism, adrenal insufficiency , hypoglycemia

- Medications like ethanol, phenothiazines, barbiturates, benzodiazepines, cyclic antidepressants, anesthetics.
- Neurologic injury from trauma, Cerebral vascular accident, Subarachnoid hemorrhage.
- Sepsis

RISK FACTORS FOR HYPOTHERMIA:



- Age extremes: elderly, neonates.
- Outdoor exposure: occupational, sports-related, inadequate clothing.
- Drugs and intoxicants: ethanol, phenothiazine's, barbiturates, anesthetics, neuromuscular blockers and others.
- Endocrine related: hypoglycemia, hypothyroidism, adrenal insufficiency, and hypopituitarism.

- Neurologic related: stroke, hypothalamic disorders, Parkinson's disease, spinal cord injury.
- Multisystem: malnutrition, sepsis, shock, hepatic or renal failure.
- Burns and exfoliative dermatologic disorders.
- Immobility



Signs and Symptoms



MILD Hypothermia:

- Lethargy
- Shivering
- Lack of Coordination
- Pale, cold, dry skin
- Early rise in heart rate, and respiratory rates.

Signs and Symptoms

- **SEVERE Hypothermia:**
  - No shivering
  - Heart rhythm problems
  - Cardiac arrest
  - Loss of voluntary muscle control
  - Low blood pressure
  - Undetectable pulse and respirations



DIAGNOSIS:

- Measuring the core temperature at two sites- rectum & esophagus with the help of rectal probe & esophageal probe.



MANAGEMENT:

- continuous monitoring
- Rewarding
- supportive care.



REWARMING:

- PASSIVE: involves the use of blankets to cover body and head to trap heat being lost.
- ACTIVE: the application of outside heat to raise body temperature
- External – heat blanket/forced hot air system
  - Internal – introduction of warm fluids into the body
    - Warm IVF, body cavity lavage, extracorporeal

REWARMING:

- **Active Rewarming of MILD Hypothermia:**
  - **Active external methods:**
    - **Warm blankets**
    - **Heat packs**
    - **Warm water immersion (with caution)**
  - **Active internal methods:**
    - **Warmed IV fluids**

REWARMING:

- Active Rewarming of
- SEVERE Hypothermia:
  - Active external methods:
    - Warm blankets
    - Heat packs
    - Warm water immersion (with caution)
  - Active internal methods:
    - Warmed IV fluids
    - Warmed, humidified oxygen

NURSING MANAGEMENT OF HYPOTHERMIA:

- Provide extra covering and monitor temperature.
- Cover head properly.
- Use heat retaining blankets.
- Keep patient's linen dry.



NURSING MANAGEMENT OF HYPOTHERMIA:

- Control environmental temperature.
- Provide extra heat source (heat lamp, radiant warmer, pads, and blankets).
- Carefully assess for hyperthermia or burn.
- Regulate heat source according to physical response.

FROST BITE:

- Frost bite is the condition in which the tissue temperature drops below o degree Celsius. It results in cellular and vascular damage. Body parts more frequently affected by frostbite include the digits of feet and hands, tip of nose, and earlobes.

PREDISPOSING FACTORS:

- Contact with thermal conductors such as metal or volatile solutions
- immobility
- careless application of cold packs
- vaso constrictive medications

CLASSIFICATION OF FROST BITE:

- **First degree frost bite**: Just affects the epidermis.



❖**Second degree frost bite:**

May affect the epidermis and part of the dermis.



- **Third degree frost bite:**

Affect the dermis, epidermis and fatty tissue beneath the dermis.



Fourth degree frost bite:

Affects the full thickness of the skin, the tissue that lie underneath the skin and also deeper structures such as muscles, tendons and bone



SYMPTOMS:



- The injured area is white or mottled blue white, waxy and firm to the touch.
- There is tingling and redness followed by pallor and numbness of the affected area.
- There are three degrees: transitory hyperemia following numbness, formation of vesicles and gangrene.
- The affected area is insensitive to touch.

MANAGEMENT OF FROST BITE:

- **Before thawing:**

remove client from cold environment, stabilize core temperature, treat hypothermia, protect the frozen part and do not apply friction or massage.



MANAGEMENT OF FROST BITE:

- **During thawing:**

provide parental analgesia e.g. keratolac & Provide ibuprofen 40 mg PO. Immerse part in 37-40 C circulating water containing an antiseptic soap for 10-45 minutes. Encourage patient to gently move the part



After thawing:

i) gently dry and elevate it.

ii) Apply pledges between toes; if macerated.

iii) If clear vesicles are intact aspirate the fluid or the fluid will reabsorb in days; if broken then debride and dress with antibiotic



After thawing: Cond....

iv) Continue analgesics Ibuprofen 400mg 8-12 hourly. Provide tetanus prophylaxis and hydrotherapy at 37C.

v) The patient should be stimulated with orally administered hot fluids such as tea and coffee.

vi) The patient should not be allowed to smoke.

vii)Artificial respiration should be administered if the patient is unconscious

RECENT RESEARCH ARTICLES

1. **Management of malignant hyperthermia: diagnosis and treatment**

Therapeutics and Clinical Risk Management
11-Sep-2016

MH crises, patient survival depends on early recognition of symptoms of MH and prompt action on the part of the attending anesthesiologist. In clinics that use known MH-triggering agents for induction and maintenance of general anesthesia, dantrolene must be available for immediate treatment and to reduce the risk of serious harm to the patient in the event of an episode of MH. After a suspected MH event, the patient should be referred to an MH center for further counseling.

2. Diagnosis and treatment of drug-induced hyperthermia

American Society of Health-System Pharmacists
Jan 1 2013

DIH is a hypermetabolic state caused by medications and other agents that alter neurotransmitter levels

In patients with known susceptibility to malignant hyperthermia, there are many potential alternative agents that can be used to provide anesthesia or therapeutic paralysis, such as nitrous oxide, propofol, nondepolarizing neuromuscular blockers, and benzodiazepines

BIBLIOGRAPHY:

- Basheer. P. Shabeer, Khan Yaseen S. A Concise Textbook of Advanced Nursing Practice. " Psychosocial Pathology". Emmess Medical Publishers. 2013.Page No. 241- 255.
- Basvanthappa BT. Textbook of Fundamentals of Nursing. " Vital Signs". Jaypee Medical Publisher.Page No. 125-165.
- Nancy Sr. Fundamentals Of Nursing. Jaypee Medical Publishers. 1st Volume. 2006.Page No. 245-269.
- Potter A Patrica, Anne Griffin Perry's —Fundamental Of Nursing‖, Edition 6th; Published By: Elsevier India Private Limited, Page No. 619-637.
- www.emedicine.medspace.com
- www.google.com
- www.healthcentral.com
- www.medicinenet.com
- www.nia.nih.gov
- www.princeton.gov
- www.wikipedia.com




Thank
You!