



**GMHA**

**NURSING SERVICES DEPARTMENT**

**Guidelines for Care:**

**Management of**

**Patients with Malignant**

**Hyperthermia**

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## OBJECTIVES:

1. Define Malignant Hyperthermia (MH).
2. Recall quick facts about Malignant Hyperthermia.
3. Discuss the Management of Malignant Hyperthermia.
4. Recall drug information on Dantrolene.
5. Recall Nursing staff responsibilities for patient care.
6. Review GMHA guidelines for the care of MH patients.
7. List the two locations of the MH Carts as per policy.
8. Discuss the contents of the MH Cart.
9. Understand the Team Role in Malignant Hyperthermia.
10. Understand the importance of a Mock MH Crisis.



## WHAT IS MALIGNANT HYPERTHERMIA (MH)?

- A potentially lethal hypermetabolic complication of a rare inherited skeletal muscle disorder
- Caused by either increased myoplasmic calcium release or decreased calcium uptake with muscle contraction.
- A severe reaction that occurs with anesthetic medications, and muscle relaxants, such as succinylcholine
- Abnormal handling of intracellular calcium levels
- Triggered by pharmacological agents, possibly by heat/exercise



## QUICK FACTS

- The incidence of an anesthetic-related episode is MH is between 1 in 15,000 children, 1 in 50,000 adults.
- 1 out of 2,000 people have the genetic predisposition to MH.
- In 2015 greater than 1,600 vials of succinylcholine were used in the patient care setting.
- MH is a true medical emergency. Approximately 5% of those who develop MH do not survive.
- The 24-Hour MH Hotline (for emergencies):
  - 1-800-644-9737 and the website is [www.mhaus.org](http://www.mhaus.org)!



## WHERE CAN A MH CRISIS HAPPEN?

- Anywhere in the hospital
- A MH Crisis can possibly happen in any unit wherein the drug inducing agent may be administered.



# TRIGGERING AGENTS

- Succinylcholine
- Potent Volatile Anesthetics
  - Isoflurane
  - Sevoflurane
  - Desflurane
  - Halothane
  - Enflurane
- The following are Safe Medications for MH Patients:
  - Nitrous Oxide
  - Propofol, Etomidate, Ketamine
  - Barbituates, Opioids and Local Anesthetics



## PATIENTS MAY EXPERIENCE:

- Unexplained muscle rigidity
- Tachycardia or cardiac arrhythmias
- Tachypnea
- Changes in skin colors from flush to mottling to cyanosis
- Acidosis (Respiratory/Metabolic)
- Hyperkalemia
- A late symptom is fever with elevated temperatures as high as 108 F (45.5 C)



## SPECIFIC SYMPTOMS

- Muscle Rigidity
- Increased CO<sub>2</sub> Production
- Rhabdomyolysis- release of myoglobin as muscle breaks down
- Marked Temperature Elevation





## WHAT CAUSES THE ELEVATED TEMP

- During a MH Crisis, elevated temperature is a result of prolonged and increased muscle contractions.
- When intracellular calcium levels rise it produces sustained, uncoordinated muscle contractions, which in turn increase muscle work, oxygen consumption, and lactic acid production.
- As a result acidosis develops and the body temperature may rise 1C (1.8F) every 5 mins.



## IN THE OPERATING ROOM

- Stop all anesthesia once MH is suspected.
- The surgeon shall close the surgical wound, if possible. If not the surgeon should pack the wound with saline-soaked surgical towels and laparotomy sponges. The circulating nurse will document in the Intraoperative nurses' notes the number of towels/lap sponges used to pack the wound.
- Change all rubber devices on the anesthesia machine. Anesthesia agents are absorbed into the rubber and will exude these agents, providing a continuous trigger mechanism to compound management difficulties



## INITIAL ACTIONS CONTINUED:

- Hyperventilate with 100% oxygen in an attempt to meet the requirements of the body during a crisis period
- Dantrium (Dantrolene Sodium) will be available in the Recovery Room Malignant Hyperthermia cart, and the Pharmacy Department. If the recovery room is not available, notify the pharmacy department of the malignant hyperthermia event. Pharmacy will have a ready available Malignant hyperthermia box containing 36 Dantrium (Dantrolene Sodium) vials.



# COLD

- To help remember initial actions use the acronym:
- COLD...
  
- C- Cancel Anesthesia, STOP the agent!
- O- Oxygenate the patient
- L- Liquids- hydrate and give Dantrolene (MH Cart)
- D- Dysrhythmias- Treat Dysrhythmias



## DANTROLENE (DANTRIUM®)

- Is used for a MH Crisis, is a skeletal muscle relaxant
- Inhibits calcium release from the sarcoplasmic reticulum and is used to reverse effects of MH
- Initial dose is 2.5 mg/kg
- Stored in 20mg vials at room temp
- 36 vials are stored in the MH Carts in PACU & ER
- 60mls of preservative free sterile water is needed to reconstitute the drug



## DANTROLENE (DANTRIUM®)

- Dosing:
- Initial dose is 2.5mg/kg RAPID IV Push and repeat continuously until symptoms subside or a cumulative dose of 10mg/kg is reached.
- Dose is not adjusted for hepatic or renal patients.
- Post MH Crisis:
- Administer Dantrolene 1mg/kg IV every 6 hours for 24-48 hours
- Then Dantrolene 1mg/kg every 6 hours for 24 hours orally as necessary



## DANTROLENE PREPARATION:

- Reconstitute by adding 60ml of preservative free sterile water
- DO NOT USE bacteriostatic water for injection, D5W and NS.
- Continue to vigorously shake the vial until solution is clear
- Protect mixed solution from light
- Must be used within 6 hours of reconstitution



# MH CARTS IN GMHA

- Stored in 2 areas
  - PACU
  - ER
- Cart items include such things as:
  - Dantrolene 20mg vials- 36 vials with reconstitution instructions
  - Preservative Free Sterile Water
  - Syringes of various sizes
  - Needles
  - Supplies for cooling measures
  - Three-way stopcocks, Connectors
  - Foley Catheter
  - Drugs necessary for the treatment of complications





## COOLING THE PATIENT:

- Infusion of iced saline solutions as fast as one (1) liter per 10 minutes for 30 minutes may be required. This results in kidney diuresis and temperature reduction. Do not use lactated ringer's solution- may contribute to acidosis.
- Surface cooling, utilizing automatic cooling blankets and/or ice packs to the neck, groin and axilla.
- Lavage of the stomach, bladder and rectum is possible using large quantities of cold saline. If in the operating room while the peritoneal or thoracic cavity is open, cold solution can be introduced into the body.
- Cooling procedures will be discontinued once the patient's temperature reaches 100.4 degrees F (38 degrees C).



# COMPLICATIONS OF MH

- Hyperkalemia
- Arrhythmias
- Metabolic Acidosis
- Myoglobinaemia
- Disseminated Intravascular Coagulation



## NURSING CARE OF THE MH PATIENT:

- **Do not treat dysrhythmias with calcium channel blocking agents.** (May cause hyperkalemia or cardiac arrest in the presence of Dantrolene.) Treat dysrhythmias with procainamide (Pronestyl). The recommended loading dose is 15 mg/ kg IV. Procainamide can be used until the syndrome stops and there is an improvement in blood gases and temperature.
- Correct acidosis, using serial blood gases as a guide to determine bicarbonate dosages. Additionally continue to hyperventilate the patient with 100% oxygen. Severe respiratory and metabolic acidosis is to be expected during the crisis.

## NURSING CARE OF THE MH PATIENT:

- Patient would need continuous monitoring in the Intensive Care Unit. An arterial line is recommended for obtaining frequent arterial blood gases. Vital signs to include core and peripheral temperatures, blood pressure, heart rate, respiratory rate; End Tidal CO<sub>2</sub> monitoring, and oxygen saturation.
- Insert a bladder catheter (3-way irrigation) to monitor urinary output and renal function. Maintaining fluid balance is critical, as cardiac and renal malfunctions are constant threats. Mannitol and Lasix are recommended to ensure diuresis and to protect the kidneys.

## NURSING CARE OF THE MH PATIENT:

- Administration of 50% Dextrose and 10 units regular insulin may be ordered to provide glucose for metabolism and reduce hyperkalemia by driving potassium back into the cells. Administration of calcium chloride may be ordered to treat hyperkalemia.
- If signs of DIC is present, consider transfusion of fresh frozen plasma, cryoprecipitate, and platelets.



## PATIENT & FAMILY EDUCATION

- About MH, emphasizing on a genetic predisposition, and the importance of informing healthcare providers of such condition.
- About the side effects of Dantrium which may include nausea, diarrhea, double vision, lightheadedness and muscle weakness.
- Provide information on MH via the Malignant Hyperthermia Association of the United States, <http://www.mhaus.org>



# NURSING CARE OF THE MH PATIENT:

- MHAUS Acronym
- M- Monitor Electrolytes
- H- Hyperkalemia- Administer Insulin & Dextrose
- A- Acidosis- Administer Sodium Bicarb
- U- Urine- Monitor hourly output
- S- Significant Other- MHAUS Counseling/teaching



# THE ABCS OF MH RESPONSE

BY MARGARET THOMAS, MSN, BS, RN, CNOR

- Assess symptoms of MH
- Ask for help
- Anesthetic Gases-stop it
- Breathing- 100% O<sub>2</sub>
- Body Temperature check
- Body Rigidity signs
- Color for perfusion
- Circulation lab checks
- Cool with ice packs or lavage
- Call the MHAUS Hotline
- Dantrolene 2.5mg/kg
- Dysrhythmias- admin Pronestyl
- DIC watch for signs
- Electrolytes check for abnormalities





# NURSING STAFF RESPONSIBILITIES

- Monitoring vital signs and assessing the patient
- Mixing and Administering Dantrolene
- Cooling the patient with Ice Packs
- Monitoring, care and management the patient post MH Crisis
- Working as a team to provide care for the patient in a MH Crisis



# NON-LICENSED NURSING STAFF ROLES

- Assisting with getting the cart and supplies
- Clearing the room/space
- Calling for additional help if needed
- Assisting with cooling measures for the patient



## THE WAY AHEAD

- Mock MH Codes will be conducted in and throughout the hospital
- This will ensure that staff know and understand the policy on how to manage a MH patient
- This will also test response times and see where improvements in the processes need to be made
- As staff your role is to be ready and prepared at any moment to care for patients who may experience a MH Crisis



## 5 KEY TAKE AWAY POINTS

- MH is a rare but serious Medical Emergency!
- A major trigger is succinylcholine.
- Initial nursing actions is **COLD!** (**C**ancel anesthesia, **O**xygenate, **L**iquids (& **D**antrolene), **D**ysrhythmia treatment
- Educate Patient & Family on MH, treatment and side effects.
- Staff must be educated and prepared to participate in a MH Mock Code.



## REFERENCES:

- Association of perOperative Registered Nurses (AORN) Standards, Recommended Practices and Guidelines, 2006 Edition.
- Drug package insert: Dantrium Intravenous. JHP Pharmaceuticals, LLC.
- GMHA Policy: Management of Patient with Malignant Hyperthermia
- Lexicomp Drug Information Handbook 22<sup>nd</sup> edition. American Pharmacists Association. 2013.
- Malignant Hyperthermia Assosiation of the United States. Website: <http://www.mhaus.org/>.
- McCance K.L. & Huether, S.E. (2015). *Pathophysiology: The biological basis for disease in adults and children 7<sup>th</sup> Edition*. (pp. 500-501).



# THANK YOU!

- To ensure comprehension of this online course please complete the online examination on our GMHA Portal:
  - GMHA Malignant Hyperthermia Exam
- Your quiz is available at: [testmoz.com/1595652](https://testmoz.com/1595652)
- Please follow instructions on the next page in order to login
- A score of 80% or greater is necessary to pass the exam. If you do not pass the exam, please re-take the exam until a passing score is achieved. Exams are timed and any questionable submissions will be reported to your Supervisors.

## USER NAME & PASSWORD:

- In ALL CAPS, Please Indicate your Unit as one of the following:
- ADMN, ADMNNL (for non-licensed), SSD, RAD, ER, ICU, HEMO, LR, MSW, NICU, OBW, OR, PEDS, SNU,SW, TELE
- followed by your first initial, full last name and employee ID number (found on your ID badge) with NO SPACES in between.

For Example:

- ADMNRAPURON123456
- Student Quiz Passcode: **GMHA**

