HIGH DESERT HEALTH SYSTEM
AMBULATORY SURGICAL CENTER

SUBJECT: VIII-104 MALIGNANT HYPERTHERMIA RECOGNITION AND TREATMENT	**POLICY #**: 1261
	VERSION: 1
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DATE APPROVED: 06/27/2016	

PURPOSE:

To provide guidelines for how to:

1. Identify Malignant Hyperthermia (MH)-susceptible and potentially MH-susceptible patients who are not candidates for ambulatory surgery procedures.
2. Identify signs and symptoms of MH and institute a predetermined treatment plan.
3. Initiate Dantrolene administration and transfer of patient to an acute care facility.

POLICY:

Preparedness is essential to prevent death from malignant hyperthermia. The following procedures will assist the Ambulatory Surgery Center (ASC) anesthesia providers in the management of patients who have an episode of MH while undergoing general anesthesia.

PROCEDURE:

PREOPERATIVE ASSESSMENT AND PREPARATION

1. Any patient known to be MH – susceptible or having a family history of MH will not be scheduled for an ambulatory surgical procedure.

2. All preoperative interviews will include questions that might identify patients at risk for MH, such as, “Have you or anyone in your family ever had a high temperature during anesthesia?” “Do you have any muscle problems?”

3. All patients having general anesthesia will have a body temperature and End-Tidal CO_2 ($ETCO_2$) measured continuously. MH will be suspected when there is an unexplained temperature rise of 1-2 degrees celcius every 5 minutes, if there is an unexplained rise in $ETCO_2$ or any other sign of MH.

4. Masster spasm after succinylcholine is presumptive evidence of MH. The surgery must be stopped, if possible, transferred to an acute care facility for observation, and the patient referred for an MH evaluation.

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5. Non-depolarizing muscle relaxants are preferred in pediatric patients (<12 years of age), to decrease the incidence of masseter spasm.

6. Any patient suspected of being MH – susceptible will be properly informed about the nature of the syndrome, its course and possible symptoms. A recommendation for further evaluation will be made.

7. There will be an ASC database on MH patients.

TREATMENT:

1. Recognize Possible MH:

    a. Unexplained rise in $ETCO_2$ (2-3x normal); most sensitive and may be an early sign.
    b. Unexplained temperature rise (1-2 degrees C, every 5 minutes); often a late sign.
    c. Trunk or total body rigidity
    d. Ventricular dysrhythmias
    e. Severe muscle spasm/rigidity after administering succinylcholine may be an early sign of MH susceptibility.

2. Make the Diagnosis:

    a. Check temperature with another calibrated setup.
    b. Check for another cause of hyperthermia, tachycardia or elevated $ETCO_2$.
    c. Draw arterial blood sample for gases (ABG).
    d. Consult with MHAUS Hotline at 800-644-9737 (800-MH-HYPER)

3. If MH Confirmed:

    a. DECLARE AN MH EMERGENCY

        i. Notify the surgeons and nurses, and terminate surgery as soon as possible.
        ii. Call for help.
        iii. Call for MH cart.
        iv. Call 911 for an ambulance to transport patient to Antelope Valley Hospital Emergency Department

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b. TURN OFF VOLATILE ANESTHETIC AND N_2O, ADMINISTER 100%, O_2, INCREASE FRESH GAS FLOW

i. Discontinue volatile agents and succinylcholine. If necessary to continue operation, use non-triggering anesthetic technique.

ii. Hyperventilate with 100% oxygen at flows of 10L/min or more.

iii. Change the circle system and CO_2 absorbent if time permits

c. ADMINSTER DANTROLENE:

i. Dissolve 20 mg of Dantrolene, contained in each vial, with 60 ml sterile, preservative-free water for injection.

ii. Administer 2.5 mg/kg IV rapidly, through large-bore IV, if possible.

iii. Repeat **administration of Dantrolene** until signs of MH are reversed. **Doses up to 10 mg/kg may be necessary**.

d. START COOLING IF TEMPTERATURE GREATER THAN 39 DEGREES C.

i. Place core temperature probe (esophageal, rectal).

ii. Surface cooling with ice and/or cold water.

iii. Administer cold IV solution.

iv. Nasogastric, bladder, or rectal lavage and would irrigation with cold solution.

v. Decrease ambient temperature.

e. ADMINISTER SODIUM BICARBONATE

i. In the absence of ABG, initially 1-2 mEq/kg IV.

ii. Additional doses as indicated by ABG data.
Adult: $NaHCO_3$ (mEq) = 0.2 x weight (kg) x base deficit (mEq/L)
Ped: $NaHCO_3$ (mEq) = 0.3 x weight (kg) x base deficit (mEq/L)

iii. Maintain hyperventilation.

f. CORRECT HYPERKALEMIA

i. Hyperventilation.

ii. Replace all potassium-containing IV fluids (e.g., Lactated Ringer's) with Normal Saline.

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iii. Insulin 10 units and 50 ml 50% glucose IV; pediatric dose: insulin 0.1 unit/kg and 1 mg/kg 50% glucose.

iv. $CaC1_2$ 10 mg/kg or calcium gluconate 10-50 mg/kg for life-threatening kyperkalemia.

v. Check glucose levels hourly.

g. GAIN ADDITIONAL IV ACCESS AND LAB WORK

i. Draw blood samples for: ABG, CK, electrolytes, hemoglobin and hematocrit and clotting studies (platelet count, PT, PTT).

h. PLACE FOLEY CATHETER AND MAINTAIN URINE OUTPUT.

i. Furosemide IV, 5-20 mg.

ii. Increase IV fluid infusion rate (Reminder: each bottle of Dantrolene has 3 grams of mannitol)

i. TREAT DYSRHYTHMIAS

i. Correct metabolic abnormalities – usually will correct the arrhythmias.

ii. Lidocaine IV, 1-1.5 mg/kg. (*ACLS protocols are to be followed when treating all cardiac derangements*).

iii. Do not use calcium channel blockers, which may cause hyperkalemia or cardiac arrest in the presence of dantrolene.

j. IF SUDDEN UNEXPECTED CARDIAC ARREST OCCURS IN YOUNG PATIENTS, PRESUME HYPERKALEMIA

i. Initiate treatment.

ii. Consider **calcium administration**.

iii. Usually due to occult myopathy (i.e. muscular dystrophy).

iv. Resuscitation may be difficult and prolonged.

MANAGEMENT AFTER CRISIS

1. PATIENT MUST BE TRANSFERRED TO AN ACUTE CARE HOSPITAL FOR FOLLOW UP TREATMENT. (See transfer policy/procedure)

The transfer should preferably take place once the patient is showing signs of stability:

a. $ETCO_2$ is declining.

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b. Heart rate is stable or decreasing with no ominous dysrhythmias

c. Dantrolene administration has begun.

d. Temperature is normal or declining.

e. If present, generalized muscle rigidity is resolving.

2. **THE PATIENT AND FAMILY MUST RECEIVE COUNSELING REGARDING MH** Refer the patient to the Malignant Hyperthermia Association of the United States for Medic Alert bracelet and counseling.

3. Document the event on the Safety Intelligence.

CONTENTS OF MH CART

The ASC will have a clearly marked cart dedicated to the treatment of MH. The cart will be maintained by anesthesia personnel and will be inspected once a month for inventory and expired drugs and supplies.

MEDICATIONS	**QUANITITY**
DANTROLENE, 20 MG VIALS	36
DEXTROSE 50%, 50 ML SYRINGE	2
SODIUM BICARBONATE 8.4%, 50 ML VIAL	5
FUROSEMIDE 10 MG/ML, 2 ML VIAL	4
CALCIUM CHLORIDE 10%, 10ML SYRINGE	2
LIDOCAINE 2%, 100 MG SYRINGE	4
STERILE WATER, PRESERVATIVE FREE, FOR INJECTION-1000 ML BAG	2
REFRIGERATED MEDICATIONS	
REGULAR INSULIN 100 UNITS/ML, 10 ML/VIAL	1
NaCl 0.9% 1000 ML/IV BAG	3

SUPPLIES:

1. Needles and syringes
2. Angiocaths for IV access
3. IV sets (10 drops per ml x 2)
4. ABG kits
5. Multiple lumen Central Venous Catheter

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6. Vacutainers for blood specimens
7. Foley catheter and continuous bladder irrigation set
8. Urine specimen container
9. Nasogastric tubes
10. Irrigation tray with piston syringe and Toomy syringe
11. Enema set up
12. Esophageal or other core temperature probes
13. Containers and plastic bags for ice

The MH Policy, Transfer Policy, inventory logbook, and Malignant Hyperthermia: Ambulatory Surgery Center Procedure Manual are maintained in the MH cart.

ATTACHMENT:

MHAUS Emergency therapy for Malignant Hyperthermia

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