Malignant Hyperthermia

STANDARD

Updated: July 2012
Approval Date: January 2012
Originating Committee: Non-Hospital Medical and Surgical Facilities Program Committee
Preamble

This document is intended for Class 1 non-hospital surgical facilities to ensure that best practices are incorporated into facility written policy and procedure in the event of a malignant hyperthermia (MH) crisis which would include initial evaluation, treatment, stabilization and emergency patient transfer. Information in this document is consistent with hospital practice and in accordance with the Malignant Hyperthermia Association of the United States (MHAUS) recommendations and the Canadian Anesthesiologists’ Society Guidelines.

College’s Position

The College’s guidance of non-hospital facilities is to ensure safety, quality and consistency of patient care and is not intended to replace the professional judgment of physicians and other health-care professionals. The intent of the College is for facilities to incorporate current evidence-based or consensus-based clinical information into a reasonable and acceptable framework that promotes the best possible patient outcomes. By design non-hospital facilities have more limited resources and capabilities than hospitals and this necessitates careful planning for unexpected or life-threatening events that may occur and require transfer of patients to a hospital for advanced treatment.

The MH standard is intended for all Class 1 facilities whenever MH triggering agents are administered. Triggering agents include commonly used volatile anesthetics (halothane, enflurane, isoflurane, desflurane, sevoflurane, methoxyflurane and/or the depolarizing muscle relaxant, succinylcholine*).

* Please note if no triggering agents are used in the facility, dantrolene sodium is not required to be on hand. Succinylcholine is required for a Class 1 facility only and is not a required emergency medication for a Class 2 or 3 facility. However, if a Class 2 facility has an anesthesiologist(s) present who wishes to keep succinylcholine on site then dantrolene sodium (36 vials) is required.

Equipment, Supplies and Medications

All equipment, supplies and medications must be assembled in a clearly marked and easily accessible MH kit or cart. A notice on the MH cart must clearly state where other required MH supplies/medications are stored e.g. refrigerator, freezer or warmer. Facility health-care professionals should be familiar with the location and contents of the MH cart, the treatment protocol and attend annual in-service education.
**Medications**

1. **Dantrolene sodium:** **minimum 36 vials on-site** 2.5 mg/kg needed to treat and stabilize a 70 kg patient
   
   Dantrolene sodium is now available in a rapid mix formula, Dantrium® IV. The rapidly mixing product reconstitutes in approximately 20 seconds, approximately four times faster than previous formulas.

2. **Sterile water** for injection (without a bacteriostatic agent): minimum of 2,200 ml required to reconstitute 36 vials of dantrolene sodium
   
   Each vial of dantrolene should be reconstituted by adding 60 ml of sterile water for injection USP (without a bacteriostatic agent) and the vial shaken until the solution is clear.

   The sterile water (without bacteriostatic agent) may be provided using either vials or bags. If sterile water bags are used they must be clearly labeled **NOT FOR IV ADMINISTRATION** and stored away from any other bags intended for IV use. Sterile water should be at room temperature or may be pre-warmed in a warming device intended for medical use (a microwave is **not** acceptable) to body temperature (38-39°C or 98-99°F).

3. **Sodium bicarbonate (8.4%)** - 50 ml x 5 (250 ml)
4. **Furosemide** - 40 mg/amp x 4 ampoules (total 160 mg)
5. **Dextrose 50%** - 50 ml vials x 2
6. **Calcium chloride (10%)** - 10 ml vial x 2
7. **Regular insulin** - 100 units/ml x 1 (refrigerated)
8. **Lidocaine*** for injection - 100 mg/5 ml poly ampoules or 100 mg/10 ml in preloaded syringes (3)
9. **Amiodarone** - 150 mg/3 ml vial x 6 (900 mg)

   * Amiodarone is also acceptable. ACLS protocols, as prescribed by the American Heart Association, would be followed when treating all cardiac derangements caused by MH. Lidocaine or procainamide should not be given if a wide-QRS complex arrhythmia is likely due to hyperkalemia; this may result in asystole.
General Equipment

1. Syringes (60 ml x 5) to dilute dantrolene
2. Mini-Spike® IV additive pins x 2 and Multi-Ad fluid transfer sets x 2 or an equivalent in sterile access/transfer sets to reconstitute dantrolene; facilities may call MHAUS for ordering information
3. Intravenous catheters 16G, 18G, 20G, 2-inch; 22G, 1-inch; 24G ¾-inch (4 each) (for IV access and arterial line)
4. NG tubes (sizes appropriate for patient population)
5. Toomy irrigation syringes (60 ml x 2) with adapter for NG irrigation

Monitoring Equipment

1. Temperature probes (e.g. nasopharyngeal, tympanic membrane, rectal)

Nursing Supplies

1. A minimum of 3,000 ml of refrigerated cold saline solution for IV cooling
2. Large sterile Steri-Drape™ (for rapid drape of wound)
3. 3-way foley catheter x 1
4. Urine meter x 1
5. Irrigation tray with 60 ml piston irrigation syringe
6. Large clear plastic bags for ice x 4
7. Small plastic bags for ice x 4
8. Adequate supply of ice in the freezer and the ability to crush it
9. Bucket for ice
10. Test strips for urine analysis
Laboratory Testing Supplies*

In some circumstances, the collection and monitoring of laboratory studies may be indicated. The specific laboratory studies ordered are determined by the treating physician and may include, but are not limited to: electrolytes; renal function; thyroid function; glucose; markers for rhabdomyolysis; complete blood count (CBC); coagulation; arterial blood gases; blood cultures; and urine tests.

The MH kit or cart must include the following laboratory testing supplies:

1. Syringes (3 ml) for blood gas analysis or ABG kits x 6
2. Two tubes of each type:
   a. SST (gold top) tube
   b. Fluoride (grey top) tube
   c. Citrate (blue top) tube
   d. EDTA (mauve/purple top) tube
   e. Blood cultures

Pediatric tubes are required if the facility provides pediatric services.

3. Urine collection container

* The time it takes to stabilize and transfer a patient is unpredictable therefore facilities must be prepared to begin optimal evaluation and stabilization, and timely and appropriate transport care. Testing supplies should be on hand for any ongoing or anticipated acute care needs of the patient.

Training and Education

Every Class 1 facility must include MH training in the orientation plan for new surgical and recovery room staff and any other staff who may be involved in responding to an MH crisis. MH standard review should be performed annually and mock MH drills should be conducted bi-annually to improve staff efficiency in treating patients during an MH crisis. Facility policy should identify specific tasks assigned to each member of the team to ensure a MH crisis is effectively managed.

MHAUS suggests the expired dantrolene sodium either be used for your facility’s MH practice drills or be mailed to MHAUS (11 East State Street, PO Box 1069, Sherburne, NY 13460). Expired dantrolene received by MHAUS will be donated to simulation training centers for MH practice drills.
References


Contact, Resource and Education Materials

1. MHAUS hotline US and Canada 1-800-644-9737 (1-800-MH-HYPER)
   https://medical.mhaus.org/index.cfm/fuseaction/Hotline.Home.cfm

2. Toronto General Hospital, University Health Network
   Malignant Hyperthermia Investigation Unit
   3 Eaton North-323
   200 Elizabeth Street
   Toronto ON M5G 2C4

   Phone: 416-340-3128
   Fax: 416-340-4960
   Email: malignanthyperthermia@uhn.on.ca
   Website: http://pie.med.utoronto.ca/MH/MH_content/acuteTreatment.html

Revision History

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<tr>
<td>1.1</td>
<td>2012-07</td>
<td>• Updates to Laboratory Testing Supplies section</td>
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<td>1.0</td>
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