

LAC+USC MEDICAL CENTER POLICY

Subject: MANAGEMENT OF MALIGNANT HYPERTHERMIA (MH)		Original Issue Date: 7/12/11	Policy # 922
		Supersedes: 1/11/19	Effective Date: 1/18/23
Departments Consulted: Department of Anesthesiology Department of Pharmacy Department of Nursing	Reviewed & Approved by: Attending Staff Association Executive Committee Senior Executive Council Pharmacy and Therapeutics Committee	Approved by: (Signature on File) Chief Medical Officer	
		(Signature on File) Chief Executive Officer	

PURPOSE

The purpose of this policy is to ensure that a patient receiving volatile anesthetic agents and/or succinylcholine is assessed for signs of **Malignant Hyperthermia (MH)** and receives appropriate and immediate treatment if indicated.

SCOPE

Hospital-Wide

POLICY

The LAC+USC Medical Center ensures provision of consistent and comparable recognition and treatment of MH for all patients by:

- Training staff in all areas where volatile anesthetic agents and/or succinylcholine is used on signs and symptoms and treatment of MH
- Providing the equipment necessary to treat patients experiencing MH
- Reviewing patient outcomes in an organized, systematic fashion and providing feedback to care providers

DEFINITION

MH is a *rare* inherited hypermetabolic syndrome that is characterized by muscle rigidity, hyperthermia, metabolic and respiratory acidosis, electrolyte imbalance (hyperkalemia), and rhabdomyolysis. If not recognized and treated early it has an estimated 80% mortality. However, if recognized and treated early, mortality is reduced to less than 5%. **Dantrolene is the only known treatment for MH.**

The **only triggers** for malignant hyperthermia are anesthetic volatile agents (halothane, isoflurane, sevoflurane, and desflurane) and **succinylcholine**. The incidence with succinylcholine is 1:50,000 to 1: 100,000.

All other anesthetics, sedatives/hypnotics, local anesthetics, and muscle relaxants are safe to use even in patients known to be malignant hyperthermia susceptible and should not be avoided.

Classic Signs and Symptoms of MH Crisis:

- Tachycardia
- Tachypnea

Subject:
MANAGEMENT OF MALIGNANT HYPERTHERMIA (MH)

Effective Date:
 1/18/23

Chief Executive Officer's Initials:
 (Initials on File)

- Muscle or limb rigidity (during and after succinylcholine administration)
- Metabolic acidosis
- Respiratory acidosis
- Elevated end-tidal CO₂ / Elevated PaCO₂
- Electrolyte imbalance (esp. hyperkalemia)
- Fever (note this is often a late sign)
- Rhabdomyolysis with no known cause

Other causes for any of the above signs and symptoms should be ruled out before contemplating treating for MH.

PROCEDURE

Acute Phase Treatment of MH:

- **Call for Help and retrieve the MH Cart and refrigerated MH medications from the nearest location.**
 - Note: Refrigerated Malignant Hyperthermia Medications will be located in the closest medication refrigerator to the MH cart **in a sealed Ziplock Bag** labeled "For Malignant Hyperthermia Use Only.")
 - The MH Cart must be available within ten (10) minutes.

CART LOCATION AREA	ARCHITECTURAL ROOM NUMBER
DEM RESUSCITATION MEDICATION ROOM	1F118
CCU 4 TH FLOOR IPT CRITICAL CARE UNIT (4D)	4K413
SICU 5 TH FLOOR IPT SURGICAL INTENSIVE CARE UNIT (5B2)	5P119
OR D&T 5 TH FLOOR ANESTHESIA WORKROOM	5C418
L&D 3 RD FLOOR IPT ANESTHESIA WORKROOM	3P118

- **STOP** the use of succinylcholine or volatile agents.
- Administer 100% oxygen.
- **Administer dantrolene (Ryanodex).** Start with a dose of 2.5 mg/kg IV.
- Dissolve each 250 mg vial with 5 ml of sterile water and administer as a rapid intravenous push. One vial of Dantrolene (Ryanodex) is enough to load a patient weighing up to 100 kg.
- Note that each 250 mg vial also contains 125 mg of Mannitol versus the 3 grams in each 20 mg vial of dantrolene (Dantrium). This quantity of Mannitol is not sufficient to maintain diuresis.
- Continue dantrolene until signs of MH (hyperthermia, muscle rigidity, hypercarbia) are reversed. **Dantrolene up to 10 mg/kg may have to be administered.**
- Monitor blood gases frequently and treat metabolic and respiratory acidosis appropriately as needed with bicarbonate or hyperventilation.
- Cool the patient if temperature reaches >39°C. Apply ice to body surfaces. Infuse cold saline intravenously.
- Treat dysrhythmias with standard drug therapy.
- **AVOID Calcium Channel blockers. Calcium channel blockers in the presence of dantrolene may cause hyperkalemia and/or cardiac arrest.**

		Page 3	Of 4
Subject: MANAGEMENT OF MALIGNANT HYPERTHERMIA (MH)	Effective Date:	1/18/23	
	Policy #		922
Chief Executive Officer's Initials: (Initials on File)			

- Treat hyperkalemia with hyperventilation, bicarbonate, glucose/insulin, and/or calcium.
- Look for myoglobinuria and treat appropriately with diuretics and hydration.
- **Contact MH Hotline** for 24-hour expert advice: **1-800-644-9737**

Post-Acute Phase Treatment of MH:

- Patient suspected of MH should be transferred to and observed in the ICU for at least 24 to 48 hours.
- Dantrolene must be continued for at least 24 hours. Dantrolene 1 mg/kg q 4-6 hours or 0.25 mg/kg/hr. should be continued.
- Watch for recrudescence (a new outbreak after a period of abatement). Recrudescence occurs in about 25% of MH cases.
- Ensure adequate urine output by hydration and diuretics since myoglobinuria is common.
- Follow coagulation profile since DIC may occur.
- Measure creatinine kinase (CK) every 6 hours until falling.
- All suspected cases should be reported to the QI manager of the department.
- A Safety Intelligence (SI) event report should be submitted.
- Provide patient and family educational information. Refer them to MHAUS (www.MHAUS.org) for information regarding MH.
- Refer patient for muscle biopsy for definitive diagnosis.

Malignant Hyperthermia “Cart”:

The Department of Pharmacy Services is responsible to maintain and monitor the MH Cart in each area. The carts containing dantrolene are located in areas shown above and listed in Attachment B.

Each cart has 2 vials of dantrolene and in addition other medications that may be used for treatment during an MH crisis (See Attachment A). Report any use of dantrolene to pharmacy so that supplies can be replenished.

If an MH cart is opened, please contact pharmacy (ext. 97641) to restock and reseal the MH cart.

OTHER RELATED INFORMATION

Testing for Suspected MH Susceptibility:

The halothane-caffeine contracture test (CHCT), a test performed on biopsied muscle is the “gold standard” for diagnosis of MH. CHCT is the most sensitive and specific diagnostic test for MH. Unfortunately, only a handful of centers are available in the US that provides this testing (see below).

Experts from the Malignant Hyperthermia Association of the United States (MHAUS) welcome consultation to assist in determining which patients are at significant risk and should be considered for diagnostic testing (see testing center below).

Presently there are no alternatives to the CHCT for MH which are sufficiently specific to allow for a reliable diagnosis. While genetic testing is available, CHCT should be conducted first due to its better specificity and sensitivity.

Subject: MANAGEMENT OF MALIGNANT HYPERTHERMIA (MH)	Effective Date: 1/18/23	Page 4	Of 4
		Policy # 922	
	Chief Executive Officer's Initials: (Initials on File)		

Where is the Halothane-Caffeine Contracture Test Conducted?

The CHCT diagnostic test for MH can be performed at one of the following center in the state of California.

UC Davis MH Biopsy Testing Center, Sacramento CA; Timothy Tautz, MD, tjtautz@ucdavis.edu, (916) 734-2432

RESPONSIBILITY

- Department of Anesthesiology
- Department of Nursing Services
- Department of Emergency Medicine
- Department of Pharmacy Services

PROCEDURE DOCUMENTATION

Documentation should meet Facility/Area/Department Policy and Procedure Manuals

REFERENCE

Malignant Hyperthermia Association of the United States - www.MHAUS.org

Ronald S Litman, DO, Malignant Hyperthermia: Clinical Diagnosis and Management of Acute Crisis, up-to-date, February 2018

Dantrolene: Drug Information, Lexicomp, July 2018

ATTACHMENTS

- Malignant Hyperthermia Cart Drug Contents (Attachment A)
- Malignant Hyperthermia Cart Locations (Attachment B)

REVISION DATES

July 11, 2014; July 8, 2014; June 17, 2016; July 30, 2018; January 11, 2019, January 18, 2023