



WOODSTOCK HOSPITAL

Department/Category	Nursing – RN, RPN (Perioperative Services, CCU, Maternal Child Women's Health, Inpatient Surgery, Emergency Department) Respiratory Therapists			
Policy Name/ Unit Number	Malignant Hyperthermia (MH) – Unit 2			
Location	Clinical Practice Manual			
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Background:

Malignant Hyperthermia (MH) is a pharmacogenetic disorder, not an allergy. It is dangerous, unpredictable and an inherited syndrome precipitated by commonly used anesthetic agents. Although the basic defect in MH is at the level of the skeletal muscle cell, the consequences of the reaction may affect vital organs and their function. MH may occur during or immediately following general anesthesia with certain inhaled anesthetic agents or the administration of the paralyzing agent succinylcholine. It has been identified in almost every country and most often occurs in older children and young adults but may occur in infants. MH occurs in either sex. It has lethal consequences if not diagnosed and treated promptly so is important for all staff to recognize and respond efficiently. Successful previous general anesthesia does not rule out MH or MH susceptibility (MHS). MH like syndromes can also be triggered by non-anesthetic means such as over exertion with physical activity or over heating when exposed to extreme temperatures, and may benefit from MH specific treatment.

Policy:

All nurses in perioperative services, RTs, and RNs in the ED, Surgical Inpatient unit (2500), CCU and MCWH will complete the malignant hyperthermia e-learning and associating quiz, review the policy and specific equipment used in the care of a patient in a MH crisis:

- a) As part of the orientation program for new hires and transfers into Perioperative services, ED, CCU Surgical Inpatient Unit, MCWH and RT's



WOODSTOCK HOSPITAL

Malignant Hyperthermia

b) On an annual basis

Procedure:

Anticipated MH Cases

Where a patient has been previously identified as having a risk for MH either through formal testing, a previously documented event or immediate family history of MH the OR team prepares for this case by being familiar with the signs, symptoms, treatment and equipment required in the event the patient has a reaction during the procedure. RT's will follow the 5-minute flush checklist found in Appendix A. The Circulating nurse will follow their internal processes and checklist found in Appendix C

Unanticipated Anesthetic Related MH

Once Malignant Hyperthermia is suspected the Most Responsible Physician (MRP) takes charge of the emergency providing instruction to the team.

In the Operating Room (OR) the anesthetist takes charge of the operating room, announcing the impending MH crisis and instructing the surgeon to close the wound as expeditiously as possible. All members of the team should remain in the OR to assist in managing the crisis. The Circulating Nurse will follow the checklist in Appendix D. RT will follow the checklist in Appendix B-Unanticipated MH.

1. **PACU** - If the MH crisis occurs in PACU, the primary care nurse will contact the recruits seeking help from PACU nurses and the PACU charge nurse
2. **CCU and MCWH** - If a MH crisis is identified post-operatively outside of the OR or PACU setting, the primary Nurse will activate their Emergency response system (Code Blue) and contact the MRP

3. Emergency Department (ED) -Succinylcholine Related MH

If a patient is given succinylcholine and develops symptoms of MH the primary nurse will:

- a) Immediately report findings to the ED Physician and Charge Nurse
- b) Ensure a minimum of 2 large bore IVs are in place
- c) Request assistance for preparing Dantrolene, equipment and supplies

The Charge Nurse will:

- a) Contact the RT to assist with retrieval of MH supplies from the anesthetist office
- b) Contact Pharmacy (if onsite and available) or another member of the ED team to assist with preparation of the Dantrolene
- c) Request CCU bring the cooling blanket to ED and assist with set up



WOODSTOCK HOSPITAL

Malignant Hyperthermia

MH like syndrome in Heat Related Illness in the Emergency Department

MH like syndrome may be considered as a differential diagnosis in patients presenting to the ED with Exertional Heat Stroke (EHS) or exertional rhabdomyolysis.

If the clinician is concerned of the possibility of MH in this patient population Dantrolene administration may be considered.

For All Areas:

As people arrive to assist with the Emergency, they will be assigned tasks by the Code Leader (refer to checklist in appendix E for anticipated duties)

The Malignant Hyperthermia Association of the United States (MHAUS) is the North American MH Registry. MHAUS should be notified of the crisis, either for assistance during the crisis or after for follow-up with the patient. The charge nurse is responsible for placing the call to the 24-hour hotline for assistance during a crisis at 1-800-644-9737.

Once the crisis is over, the Charge Nurse is to ensure that pharmacy is notified of the need to restock the Dantrolene supply as soon as possible to ensure that the full complement of Dantrolene is available as per MHAUS recommendations.

Once stabilized, the patient should be transferred to CCU where a ventilator is available. The patient should be monitored in the CCU for 36-48 hours for continuous cardiac monitoring for dysrhythmias, with continuous temperature monitoring and appropriate cooling procedures and ventilator care. Dantrolene may be ordered to be administered at reduced rate of 1mg/kg every 4-6 hours, titrated to the signs of MH, for at least 24 hours. For situations where an intermittent infusion is recommended, nursing staff should seek direction from the MHAUS hotline staff on recommended rescue line solution. Nursing staff should anticipate the need for regular monitoring of laboratory values including blood gases (arterial or venous), lactate levels, coagulation, electrolytes, and blood glucose in addition to monitoring accurate output to ensure diuresis of greater than 1ml/kg/hr. Refer to the Malignant Hyperthermia Association of the United States (MHAUS) website for additional recommendations or call the registry for direction in management post operatively in CCU if required.



WOODSTOCK HOSPITAL

Malignant Hyperthermia

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Reference:	<ol style="list-style-type: none"> 1) Association of Perioperative Registered Nurses. (2008). 2) AORN malignant hyperthermia guideline. <i>Perioperative Standards and Recommended Practices</i>. 3) Denver: Author Malignant Hyperthermia Association of the United States (MHAUS). (2008) <i>How to Handle a Malignant Hyperthermia Crisis</i>. MHAUS: Sherburne, NY 13460. Retrieved June 2019 from: http://www.mhaus.org/healthcare-professionals/managing-a-crisis 4) https://www.mhaus.org/blog/malignant-hyperthermia-it-s-not-just-about-anesthesia/ retrieved October 1, 2019; https://www.mhaus.org/
Cross Reference:	1) Malignant Hyperthermia Crisis Data Management Sheet Form # 20-71 (E)



WOODSTOCK HOSPITAL

Malignant Hyperthermia

Appendix A

Anticipated MH Event



Woodstock Hospital Cardiorespiratory Dept.

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Malignant Hyperthermia (MH) Protocol

Anaesthetic Gas Machine (AGM) 5 Minute Flush

- 1 Remove all vapourizers from the gas machine, and store on a cart in the anaesthesia room. Ensure they are safely stored outside of room in proper upright position.
- 2 Gather the following new and unused items : circuit, two - 2 L anaesthetic bags, gas sample line, filter, flex extension and sodalime cannister. (Found in MH container)
- 3 Remove any existing patient circuit, mask, sample line, bag and sodalime cannister.
- 4 Remove the tray from front of machine by pulling handle under the tray down to release. Pull the tray off by sliding forward, and then push the tray support (slide) into the AGM. Press the "Breathing System" release button and pull the system forward from the AGM.
- 5 Using provided Allen wrench (red handle), turn the 3 Allen screws on the ventilator module (round black plastic piece) 1/4 turn to release the breathing system from the AGM.
- 6 Lift the breathing system **up** and **off** the AGM; place on cart with the vapourizers.
- 7 Remove the upper diaphragm and replace with the **sterilized** upper diaphragm (if the Drager legend is not visible then the diaphragm is inside out). **Be sure it is seated properly.**
- 8 Install the sterile breathing assembly and lock it into position by tightening the 3 Allen screws 1/4 turn each.
- 9 Slide the breathing system back into the AGM until you feel it lock into place with a "click".
- 10 Ensure you have backup ventilation equipment available. Make sure it is functioning.
- 11 Connect the **new, unused** patient circuit, **new** 2 L anaesthetic bag (on breathing arm), **new** sample line and **new** Clik Sodalime cannister.
- 12 Occlude the "patient end" of the circuit on the **mount** and turn the machine and monitors **ON**.
- 13 Check cylinder and pipeline pressures.
- 14 **Bypass** the 5 minute Safety Check by pressing "**Cancel Test**". Perform a "**leak test**". After a successful leak test, exit, remove circuit from the occluding mount, and place the 2nd 2L bag on patient end of circuit.
- 15 Put the machine into **Vol. Mode**, with **100% O₂**, and **10 Lpm Flow** - Press "**confirm**" **twice** (once for the changes, and then once for the mode change)
- 16 The system is now "**Flushing**". Start the on screen timer so you know when 5 minutes passes
- 17 After the **5 minute flush**, place the machine in **Standby**.
- 18 Get a new circuit. Remove circuit and both 2 Litre anaesthetic bags. Install the new patient circuit including new 2 L bag on breathing arm. Reattach patient end to mount.
- 19 Turn machine power off, and then on again once count down finished. Perform the system check to ensure new block is working properly.
- 20 Check the other monitoring systems, suction, O₂ flush and safety oxygen.
- 21 When the System Self test is completed and passed, label the AGM with this checklist indicating that the MH Flushing Protocol is Completed.

Respiratory Therapist: _____ Date: _____

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WOODSTOCK HOSPITAL

Malignant Hyperthermia

Appendix B

Unanticipated MH Event

Woodstock Hospital Cardiorespiratory Dept.

Malignant Hyperthermia (MH) Protocol

Vapor-Clean MH Filters

- 1 Remove all vapourizers from the gas machine, and store on a cart in the anaesthesia room. Ensure they are safely stored outside of room in proper upright position.
 - 2 Gather the following new and unused items : circuit, gas sample line, filter, flex extension and sodalime cannister. (Found in MH container)
 - 3 Remove any existing patient circuit, mask, sample line, bag and sodalime cannister.
 - 4 Ensure you have backup ventilation equipment available. Make sure it is functioning.
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- 5 Put the machine into **Vol. Mode**, with **100% O₂**, and **10 Lpm Flow** - Press "**confirm**"**twice** (once for the changes, and then once for the mode change)
 - 6 The system is now "**Flushing**". Depress the O₂ flush button and start timer for 90 seconds. You will feel the flow from the expiratory limb of circuit mount.
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- After the 90 **second flush**,
- 7 Place one of the Vapor-Clean canisters on the inspired port of the anesthesia machine and the other canister on the expired port of the anesthesia machine.
 - 8 Get a new circuit.
 - 9 Replace the breathing bag and connect a new breathing circuit between the patient and the Vapor-Clean canisters. **Maintain fresh gas flow at > 3L/min.**
 - 10 Once the above steps are completed, label the AGM with this checklist indicating that the MH Flushing Protocol is Completed.

Respiratory Therapist: _____ Date: _____

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WOODSTOCK HOSPITAL

Malignant Hyperthermia

Appendix C Anticipated

OR-Circulation Nurse Responsibilities

- a. Call the Charge Nurse and or Ward Clerk during daytime hours to recruit help
- b. Call the hospital coordinator and MCWH unit if the MH crisis occurs outside of regular working hours for the OR
- c. Call MCWH and CCU if the MH crisis occurs on weekends during hours when the hospital coordinator is unavailable
- d. Pharmacy staff are recruited when available

Appendix D Unanticipated Event

The Circulating Nurse will simultaneously assign a member of the team to retrieve the MH Emergency Tote and box located in the Anesthetist Office along with necessary equipment and supplies.

Appendix E

For all areas

The Team Lead or Charge Nurse on the unit will assign duties to members as they arrive to assist in the Emergency

- a. 1 staff as timekeeper
- b. 1 staff to retrieve the MH emergency tote and box from the Anesthetist office in the OR along with the required equipment to manage the crisis as follows:
 - i. Crash Cart
 - ii. Regular Insulin
 - iii. Furosemide
 - iv. Thermometer preferable method using internal temperature probe in care areas that have this capability (OR, CCU and ED) to allow for continuous monitoring
- c. 2 staff (1 RN with either 1 RN or 1 pharmacy technician) to mix Dantrolene using preservative free sterile water, and prepare to administer at an initial dose of 2.5mg/kg according to physician order. Weight must be confirmed with Physician, and can be found documented in the patients' electronic health record
- d. 1 staff to obtain cooled 0.9% NaCl 1 litre bags from refrigerator and, or cold packs in anesthetist office or place room temperature 0.9% NaCl 1 litre bags in a pail of ice to cool prior to administration intravenously, or via gastric, peritoneal or bladder lavage



WOODSTOCK HOSPITAL

Malignant Hyperthermia

- e. 1 staff to request cooling blanket from CCU (CCU to set up and apply to patient) or obtain bags of ice or cold gel packs to place in the patient's axilla and groin to help speed body cooling (Note: Active cooling measures should be stopped once the core temperature has decreased below 38 degrees Celcius)
- f. 1 staff to insert urinary catheter with physician order, and monitor urinary output with urometer
- g. In cases where an anesthetic agent was involved, the anesthetist will require the nurse to obtain the Malignant Hyperthermia Crisis Data Management Sheet (Form 20-71 (E)) in order to document required information for reporting purposes. Additional documentation will be completed according to organizational and unit specific documentation standards