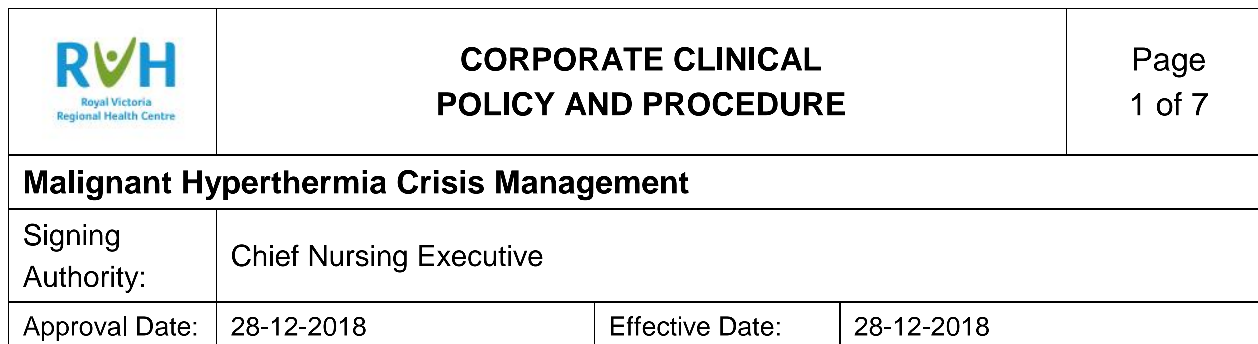

RVH Royal Victoria Regional Health Centre	CORPORATE CLINICAL POLICY AND PROCEDURE		Page 1 of 7
Malignant Hyperthermia Crisis Management			
Signing Authority:	Chief Nursing Executive		
Approval Date:	28-12-2018	Effective Date:	28-12-2018

SCOPE:
This policy and procedure applies to all nurses, Registered Respiratory Therapists (RRT), Anesthesia Assistants (AA), and physicians who shall be involved in caring for a patient experiencing Malignant Hyperthermia (MH) crisis at the Royal Victoria Regional Health Centre (RVH).

POLICY STATEMENT:
Treatment of an MH crisis requires the participation of all members of the health care team to prevent the potentially lethal consequences of MH. It is the policy of RVH that members of the health care team shall be able to recognize early and late signs and symptoms of an MH crisis, be familiar with the treatment protocol and with the location and contents of the MH carts.

1. An MH reaction can occur unexpectedly. The key to successful management of a MH reaction is early recognition and immediate treatment with dantrolene. Consider MH if, during or after an anesthetic, there is:
   a. unexplained, unexpected increase in end-tidal CO_2 together with
   b. unexplained, unexpected tachycardia and
   c. unexplained, unexpected increase in oxygen consumption
2. Patients who have a MH crisis shall be continuously monitored and treated in Intensive Care Unit (ICU) for a minimum of 24 hours following cessation of signs of MH.
3. In the event of a MH crisis in a pediatric patient:
   a. The patient shall be cared for in the Post Anesthetic Care Unit (PACU) for monitoring and treatment by the PACU nurse under the direction of the anesthesiologist until transfer to an appropriate facility with pediatric intensive care.
   b. Should the patient require mechanical ventilation, a RRT shall be in attendance for the duration of the stay in PACU.
4. A physician's order is required to administer dantrolene
5. A minimum supply of 36 vials of dantrolene shall be available at RVH.
6. All elective surgery shall be placed on hold if 36 vials of dantrolene are not present at RVH.
7. The following units shall each maintain an MH cart: Operating Room (OR), Surgery Recovery, Surgery 3 and Birthing Unit (BU) Operating Rooms.
   a. OR: Anesthesia Equipment Room (2575a)
   b. BU Operating Rooms: Patient Recovery Area (4173)
   c. Surgery Preparation: Med Room (2303A)
   d. Surgery 3: Med Room (4384)

8. The MH Carts located in the OR and in BU Operating Room shall not leave the department. If an MH Cart is required in an in-patient unit, the MH Carts from either Surgery 3 or Surgery Preparation should be used. Note: Should the MH Cart in Surgery Preparation Med Room be required after hours, contact the Hospital Service Leader (HSL) or Security to access the locked room.
9. MH Carts shall not be left unattended in public areas.
10. Nursing staff who provide post-operative care for MH susceptible patients or patients having an MH crisis shall receive annual education pertaining to the management of MH.

DEFINITIONS:

Malignant Hyperthermia (MH): is a potentially fatal, rare genetic, autosomal disorder of the skeletal muscle. It is characterized by a hypermetabolic state which can be triggered by the following:

a. A depolarizing neuromuscular blocking agent, i.e. succinylcholine
b. All potent inhalation agents, i.e. isoflurane, desflurane, sevoflurane, halothane or enflurane
c. Psychologic/physiologic stimuli, i.e. extensive skeletal muscle injury, pain, shivering, hypoxia, infection, emotional crisis, hot and humid weather, strenuous and prolonged exercise.

Malignant Hyperthermia Crisis: An MH crisis is the result of a massive release of calcium from the sarcoplasmic reticulum into the skeletal muscle. This can be triggered by volatile anesthetics, succinylcholine and sometimes stress. This hypermetabolic state is characterized by:

1. rising end tidal carbon dioxide
2. muscle stiffness/rigidity
3. unexplained sinus tachycardia
4. tachypnea
5. hypoxemia
6. unstable elevated blood pressure
7. cardiac dysrhythmias
8. peripheral mottling, cyanosis or sweating
9. hyperkalemia
10. fever
11. evidence of rhabdomyolysis (syndrome characterized by muscle necrosis and the release of intracellular constituents into the circulation) with elevated serum creatinine kinase and myoglobinuria (cola-colored urine).

Specialist Coordinator OR Utilization Team (SCOUT): The SCOUT is a physician role that is endorsed by the Hospital Administration and is supported by the interprofessional

program team. The function of the SCOUT is the daily coordination of the Surgery Program resources. This includes balancing the availability of beds, resources and staffing, directing the order of non-elective cases to maximize the use of program resources in accordance with existing program policies and guidelines, authorization for provision of second OR teams when indicated.

Recrudescence: The recurrence of symptoms or a new outbreak after a period of remission.

PROCEDURE:

EQUIPMENT:

1. MH cart
2. Bag valve mask
3. Ice – large amounts
4. Cooling blanket [Criticool® machine, located in Intensive Care Unit (ICU), if required]
5. Cold intravenous (IV) fluids (minimum 3000 mL)
6. Propofol syringe driver and tubing.
7. Cold normal saline for irrigation – 4 litres
8. Rectal tube
9. Nasogastric (NG) tube
10. MH hotline 1-800-644-9737

MH Crisis in the OR and BU Operating Room: Intraoperative

1. If an MH crisis has been identified, the circulating nurse shall call OR/BU Resource Nurse/Team Leader for help (extra assistance, a second anesthesiologist, AA, RRT, and nurses).
2. Obtain the MH cart. Obtain a second MH cart if more than 18 vials of dantrolene is required.
3. The primary anesthesiologist shall be responsible for managing the crisis.
4. When the MH protocol has been initiated, the circulating nurse shall take on the role of documentation and recording of details of patient treatment.
5. Nurses, RRT, and AA in the OR shall be prepared to do the following (on direction of the primary anesthesiologist):
   a. At least two staff members shall begin mixing the dantrolene sodium.
   b. Prepare invasive monitoring as directed, i.e. arterial line, central line with central venous pressure transducer, etc.
   c. Assist anesthesiologist with drawing of blood samples, i.e. arterial blood gases, electrolytes, coagulation studies, creatine kinase, CBC. Enter blood

samples into MEDITECH and obtain specimen labels. Ensure proper labeling of specimens before sending to laboratory.

d. Arrange for transportation of urgent blood samples to laboratory and repeat as ordered.
e. Ensure that the Code Blue crash cart is readily available. Prepare to cool the patient. Apply ice to external areas, cooling blanket (obtain from ICU), rectal lavage, nasogastric (NG) lavage and abdominal cavity lavage.
f. Continuous monitoring of core temperature.
g. Insert urinary catheter with urometer as ordered.
h. Notify ICU physician and ICU charge nurse of MH crisis and need for ICU bed.
i. Administer dantrolene as ordered by anesthesiologist.

6. The Resource Nurse/Team Leader shall notify OR/BU manager, Medical Director, anesthesiologist on call, OR SCOUT, and Pharmacy of the crisis situation. The team shall determine immediate dantrolene supply and availability in order to determine continuation of further elective surgeries.
7. The scrub nurse shall be responsible to maintain sterility of equipment for the surgical procedure. The surgeon, in collaboration with the anesthesiologist, shall determine if the surgical procedure shall be completed or aborted.
8. Transfer patient to ICU and continue treatment. Patient must be monitored in ICU for at least 24 hours following cessation of signs of MH. Monitor patient for recrudescence.

MH Crisis Outside of the OR and BU Operating Room:

1. In the event of a MH crisis outside of the surgical suites, notify the Most Responsible Provider (MRP) and the anesthesiologist on call immediately.
2. Notify Anesthesiologist if any of the following signs and symptoms are present:
   a. unexplained tachycardia, tachypnea, difficulty in maintaining oxygen saturation
   b. unexplained muscle rigidity (especially masseter muscle) or muscle pain
   c. increase in temperature greater than 0.5°Celsius every ten minutes
   d. dark brown urine
3. Depending on patient acuity, it may be appropriate to notify Critical Care Outreach Team (CCOT) or initiate a Code Blue for immediate assistance.
4. If patient is located in the Post Anesthetic Care Unit (PACU), notify the primary anesthesiologist responsible for the care of that patient.
5. In-patient units shall obtain an MH cart from either Surgery 3, Surgery Recovery or BU Operating Room. PACU may obtain the MH cart from the OR, if it is not in use with a patient.
6. If the MH protocol is initiated, notify the manager or Hospital Service Leader (HSL), depending on the time of the crisis, for additional assistance.

7. The primary anesthesiologist shall be responsible for managing the crisis.
8. The primary nurse shall take on the role of documentation and recording of details of patient treatment.
9. At least two staff members shall begin mixing the dantrolene.
10. Transfer patient to ICU when stabilized and continue treatment. The patient must be monitored in ICU for at least 24 hours following cessation of signs of MH.
11. When MH carts are removed from their assigned area, the Resource Nurse/delegate shall be made aware of the location of the MH cart.

Dantrolene Reconstitution Protocol:

1. 20 mg vial of dantrolene shall be reconstituted by adding 60 mL of sterile water for injection USP providing a final concentration of 0.33 mg/mL.
2. Open the semi-automatic Cornwall® syringe. Spike the 1000 mL bag of sterile water for injection with the syringe tubing.
3. Purge the tubing and allow the syringe to fill with water (10 mL).
4. Attach a vented 16 gauge needle to the tip of the Cornwall® syringe (the vented needle allows air to escape from the vial without withdrawing the needle).
5. Semi-automatic syringe will refill independently on release of the hand piece.
6. Allow the Cornwall® syringe to refill five more times for a total of six times (60 mL).
7. Withdraw the needle and shake the vial until the solution is clear.
8. Using a 60 mL luer lock syringe and an 18 gauge blunt needle, withdraw the dantrolene from the vial and administer.
9. Dantrolene must be used within six hours after reconstitution.

MH Reporting and Discharge:

1. The patient/family shall be made aware of an MH reaction by the anesthesiologist.
2. The anesthesiologist managing the MH crisis shall be responsible for referral to an MH diagnostic center for consultation and further investigation.

   Malignant Hyperthermia Association of the United States (MHAUS) Hotline
   (US and Canada) 1-800-644-9737
   (24 hour availability Physician to physician consults).

   Malignant Hyperthermia Investigation Unit, Toronto General Hospital, University Health Network, Toronto, ON. 1-416-340-3128
3. The anesthesiologist shall submit forms to the national/international registry of Malignant Hyperthermia Association of the United States. www.mhreg.org.

4. The patient/family shall be provided with MH discharge instructions on the signs and symptoms of an MH reaction. (Refer to RVH-4051 “Your Care after Surgery Malignant Hyperthermia Susceptible Patients”).
5. The discharge nurse shall instruct the patient /family on the signs and symptoms of an MH reaction and the importance of reporting immediately to an Emergency Department if these occur.

CROSS REFERENCES:

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