

Malignant Hyperthermia Cheat Sheet!

PREOPERATIVE

- A** Ask about personal and family past history of Malignant Hyperthermia or **A**dverse **A**nesthesia reactions (unexplained fever or death during anesthesia). Be **A**ware of clinical signs of MH.
- B** Body temperature monitoring for all patients undergoing general anesthesia for other than brief procedures.
- C** Capnographic monitoring for all patients undergoing general anesthesia.
- D** Dantrolene: have dantrolene available wherever MH trigger anesthetics are used.

INTRAOPERATIVE

Primary Survey / Clinical Signs

- A** Awareness: are you suspecting an MH Crisis? **A**irway: severe masseter spasm (difficult to open the mouth).
- B** Breathing: difficult to ventilate and/or intubate due to masseter spasm or severe **B**ody rigidity after succinylcholine. **B**ody temperature high (late sign).
- C** Capnography: elevation of end tidal CO₂ despite proper ventilation & adequate fresh gas flows with properly functioning anesthesia ventilating apparatus. **C**irculation: cardiac arrhythmias, tachy/bradycardia, hyper/hypotension.
- D** Drugs: are you using triggering agents (succinylcholine, potent halogens)?
- E** Exposure/ **E**xamine the patient: skin color, perfusion, temperature, urine color, extremities, muscle tone.

Emergency Treatment

- A** Ask for Help/Ask for the MH cart and for dantrolene. **A**gents/**A**nesthesia: Stop anesthesia triggering agents and the surgery.
- B** Breathing: hyperventilate with 100% oxygen.
- C** Cooling, if the patient is hot: insert large intravenous bore catheters. Give **C**old intravenous fluids 15 cc/ kg IV 3 times. Irrigate the wound, stomach and bladder with cold saline. **Call MH Hotline: 1-800-644-9737 or 1-315-464-7079**
- D** **DANTROLENE**: give dantrolene IV, 2.5 mg/kg, and repeat the dose until the signs are controlled.
- E** Check **E**lectrolytes, especially potassium.

Secondary Steps

- A** Acidosis? Assess initial and subsequent arterial or venous blood gases. Is there mixed metabolic and respiratory acidosis?
- B** Bicarbonate? 1-2 mEq/kg guided by pH, Base deficit.
- C** Circulation/monitoring: consider arterial line, central venous catheter, laboratories: arterial/venous blood gases, **CBC**, **Coagulation tests**, **CK**, myoglobin levels.
- D** Dysrhythmias: generally subside with resolution of the hypermetabolic phase of MH. Arrhythmias can be treated with amiodarone, lidocaine, procainamide, adenosine, or other drugs indicated according to the ACLS protocol. Remember impact of hyperkalemia. **D**iuresis: assure diuresis greater than 1 ml/kg/h.
- E** Electrolytes: if hyperkalemic, treat with bicarbonate, glucose/insulin, calcium.
- F** Follow up: **A**: Arterial and venous blood gases. **B**: Body temperature (core) avoid hyper/hypothermia. **C**: end-tidal CO₂, **CK**, **Coagulation tests**. **D**: **D**iuresis (urine output and color). **E**: **E**lectrolytes.

POST-OPERATIVE

Post-Crisis Problems

- A** Alkalinize urine & diurese, monitor for **ARF** (*acute myoglobinuric renal failure*).
- B** Beware hypothermic, hyperkalemic, hypokalemic, hypervolemic overshoot— serial monitoring of filling pressures, fluid balance, electrolytes, temp, K, Ca, coags., and Hct may require recorrection.
- C** Creatine Kinase (**CK**) levels track severity of *rhabdomyolysis*: if present, beware of renal failure, which may follow marked rhabdomyolysis. *Compartment Syndrome* is rare, but requires serial monitoring of extremities and abdominal girth or bladder pressures after severe insults.
- D** **DIC** with *coagulopathy, thrombocytopenia, hemolysis, and abnormal bleeding* may follow major crises with severe shock and/or severe hyperthermia.
- E** Elevated liver functions are often observed 12-36 hours post-MH crisis.
- F** Follow CNS function serially after MH Crisis: magnitude of crisis may or may not correlate with CNS insult.
- G** Good communication and follow-up is essential among medical specialists in the post-resuscitation and monitoring phase of the MH crisis for prevention of secondary crisis-related organ insults. Care may be transferred from an anesthesia care provider to a pediatric or adult medical or surgical intensivist, provided good information about the MH crisis and post-resuscitation management is maintained

Post-Acute Phase

- A** Aware of recrudescence signs. **A**sk the relatives about anesthesia problems/neuromuscular disorders.
- B** Biopsy: Send the patient to a biopsy center for evaluation.
- C** Contact MHAUS for further information/referral of patient.
- D** Dantrolene 1 mg/kg IV q 4-6h and continued for 24-48h after an episode of Malignant Hyperthermia. **D**ocumentation: submit forms to the national/international North American MH Registry of MHAUS: www.mhreg.org

ANESTHESIA FOR MH-SUSCEPTIBLE PATIENT

- A** Anesthesia machine preparation: change circuits, disable or remove the vaporizers, flush the machine at a rate of 10 L/min for 20 min. **A**nesthesia: Use local or regional anesthesia but general anesthesia with non-triggering agents is acceptable. Safe drugs include: barbiturates, benzodiazepines, opioids, nondepolarizing neuromuscular blockers and their reversal drugs, and nitrous oxide.
- B** Body temperature monitoring.
- C** **C**apnography: Close monitoring for early signs of MH.
- D** Dantrolene available. **D**ischarge, if no problems, after 2.5 hours.