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| **Case Title**  | Malignant Hyperthermia (MH) |
| **Scenario Name** | Post-op Appendectomy |

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| **Learning Objectives -** [**Use action words**](http://ubccpd.ca/sites/ubccpd.ca/files/Accreditation_Learning%20Objectives_%20Verbs.pdf) |
| **Knowledge:**1. Recognize signs and symptoms of MH
2. Discuss MH Protocol and MH Cart (location and supplies)
 |
| **Skills:**1. Demonstrate utilization of MH Protocol
2. Practice mixing and administration of Dantrolene
3. Manage critically ill patient
 |
| **Attitude/Behaviours:**1. Demonstrate effective team skills
2. Demonstrate situational awareness
3. Demonstrate graded assertiveness
 |
| **Scenario Environment** |
| **Location** | PAR |
| **Monitors** | Bedside monitor |
| **Props/Equipment** |

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| * Temperatlure probe
* Pulse oximeter
* Capnograph
* Art line
* ET tube
* Laryngoscope
* Dantrolene
* Sterile water
 | * 60ml syringes
* NS
* Bicarbonate
* Glucose/insulin
* Calcium
* Defibrillator
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| **Make-up/Moulage** |  |
| **Potential Distractors** |  |

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| **Case Introduction:** |
| 27 year old male transferred to RIH from NVGH with appendicitis for a surgery consult. Presenting VS: T – 39.5, P – 115, BP 95/40, RR – 20. Pt c/o diffuse abdominal pain, nausea. Ultrasound revealed perforated appendix. To OR within 20 mins of arrival. No surgical complications - irrigation of the peritoneal cavity for purulent drainage. Required neuromuscular blocker for challenging intubation: Laryngeal view - grade 3/Mallampati Class III. Arrives in PAR intubated, sedated. |

| **Patient Parameters** | **Effective Management** | **Notes** |
| --- | --- | --- |
| **Phase 1: Arrival to PAR****Condition:** Stable. I & V.**Initial Assessment*** **Heart Rhythm:** Sinus
* **HR:**  80
* **BP:** 110/70
* **RR:** bagging by Anesthesia *(RT to be called and placed on ventilator)*
* **SP02:** 99%
* **T:** 37
* **CNS:** Sedated
* **Chest:** Clear
* **GI:** Abd dressing intact – small amount sang shadowing
* **GU:** Catheter insitu. Approx 500cc in bag
* **Weight:** 110 kg
 | 1. **Focused history** ( see Notes column)
2. **Management**
* Apply appropriate monitoring

*\*\*Procced to* ***Phase 2: Hypercabia*** *after 2 min* | 1. **Focused history**

**PMHx*** Healthy

**Meds*** Abx pre-op and introperatively

**Allergies*** NKA
 |
| **Phase 2: Hypercarbia****Condition:** Patient becomes hypercarbic and mildly tachycardic**Physical Examination*** **Heart Rhythm:**  Sinus
* **HR:** 110
* **BP:** 100/70
* **RR:** bagging or ventilator
* **SP02:** 97%
* **ETCO2:** 55
* **T:** 37
 | 1. **Patient Reassessment** (see Notes column)
2. **Management**
* Recognize hypercarbia and tachycardia
* Notify anesthesia
* Increase FiO2 to 100%
* Try to find the casue of hypercabia
	+ Check ventilator paramters, ETT, and breath sounds
* Consider areterial line placement

*\*\*Proceed to* ***Phase 3: Fever*** *after 2 min* | 1. **Patient Reassessment**

**Airway*** Managed
* ET tube placement confirmed

**Breathing** * CS clear

**Circulation*** Spontaneous
 |
| **Phase 3: Fever****Condition:** Pt becomes unstable**Physical Examination*** **Heart Rhythm:** Sinus tachycardia
* **HR:** 125
* **BP:** 85/45
* **RR:** bagging or ventilator
* **SP02:** 93
* **ETCO2:** 70
* **T:** 39
 | 1. **Patient Reassessment** (see Notes column)
2. **Management**
* Recognize MH – **Call CODE**
* Initiate IH MH Protocol – ***\*\*staff to know where to access resources and cart\*\****
	+ Stop warming *(if in process)*
	+ Increase minute ventilation, set up capnography
	+ Intubate *(if not intubated)*
	+ Assess for rigidity
	+ Insert esophageal/rectal temperature probe
	+ Apply ice packs, insert NG/three-way foley
	+ Arterial Line placement *(if not placed)*
	+ Call MHAUS hotline
	+ Administer
		- Propofol/narcotic relaxant
		- Dantrolene ***\*\*critical action\*\****
			* Initial dose – 2.5 mg/kg
			* Maintenance dose – 1 mg/kg q6 hours. Ensure dantrolene availability for 36 hours
	+ ***If*** peaked T waves on ECG, admnister Calcium 🡪 Insulin
	+ ***If*** cardiac arrhythmia ***and*** no peaked T waves, administer Bicarb
	+ Order ABG, chemistry, CK, and coagulation studies
	+ Notify lab and pharmacy of MH patient
	+ Consult ICU

**Consequences of management*** *If learners* ***do not*** *start MH treatment within 2 min proceed to* ***Phase 4A: Code***
* *If learners* ***do*** *start MH treatment within 2 min proceed to* ***Phase 4B: Resolution***
 | 1. **Patient Reassessment**

**Airway*** Managed and/or secure

**Breathing** * CS clear
* Rate per ventilator/bagging

**Circulation*** Spontaeous
 |
| **Phase 4A: Code****Condition:** Unstable, hypotensive witout palpable pulses**Physical Examination*** **Heart Rhythm:** VT
* **HR:** 151 – *no palpable pulse*
* **BP:** 60/30
* **RR:** per bagging or ventilator
* **SP02:** 62%
* **T:** 39.2
* **ABG:** 7.1/86/100/19
 | 1. **Patient Reassessment** (see Notes column)
2. **Management**
* Recognize change in VS and arrhythmia
* Attempt to palpate pulses
* Begin ACLS algorithm for pulseless VT
	+ CPR – 2 min cycles
	+ Check rhytm
	+ Defibrillation immediately
	+ Epinephrine q 3-5 min
* MH treatment

**Consequences of management*** *Continue with pulseless VT algorithm until MH treatment initiated, then proceed to* ***Phase 4B: Resolution***
 | 1. **Patient Reassessment**

**Airway*** Managed

**Breathing** * Rate per ventilation/baggin

**Circulation*** Compromised
 |
| **Phase 4B: Resolution****Condition:** Stabilizing**Physical Examination*** **Heart Rhythm:** Sinus
* **HR:** 110
* **BP:** 130/80
* **RR:** per bagging or ventilation
* **SP02:** 96%
* **ETCO2:** 48
* **T:** 37.7
 | 1. **Patient Reassessment** (see Notes column)
2. **Management**
* Verify pulse
* Verify SR
* Terminate ACLS alorithm
 | 1. **Patient Reassessment**

**Airway*** Managed and secured

**Breathing** * Rate per ventilation/baggin

**Circulation*** ROSC
 |

**Insert more lines if more phases required.**

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| **Debriefing Points** |
| * Discuss order of signs in MH
* Discuss MH Protocol
* Discuss dosage and preparation of Dantrolene
* Discuss pulseless VT alogorithm
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