I'M STILL HERE –I'M STILL A PROBLEM!
MALIGNANT HYPERTHERMIA

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MALIGNANT HYPERTHERMIA

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MALIGNANT HYPERTHERMIA

- A hypermetabolic syndrome of unknown cause triggered in susceptible individuals by potent general anesthetics, depolarizing muscle relaxants, and possibly stress
- Only disorder "caused" by anesthetic

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MH IS TRIGGERED BY…

- Inhalation agents
  - Halothane, enflurane, isoflurane, desflurane, sevoflurane and succinylcholine

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NORMAL MUSCLE CELLS

- Calcium stored inside
- Muscle contracts
  - Calcium leaves
- Muscle relaxes
  - Calcium returns

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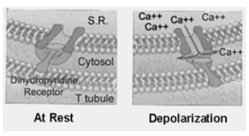
MUSCLE IN MH

- Calcium leaves muscle to produce contraction
- Calcium can not get back into muscle
- Muscle CAN NOT relax



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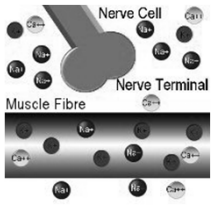
THE "CASCADE"

- Increased extra cellular calcium
- ATP production triggered then triggered again



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WHICH MEANS????

- Anaerobic metabolism and lactic acidosis
- WHICH MEANS…..build up of
  - Heat
  - Acid
  - Carbon Dioxide

  …a hypermetabolic state

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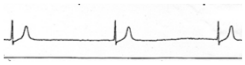
EARLY SIGNS AND SYMPTOMS

- Muscle rigidity
  - Masseter muscle spasm
- Tachycardia and Dysrhythmia
  - Often first sign
  - PVCs, Bigeminy
  - Sudden cardiac arrest from hyperkalemia



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LATE SIGNS AND SYMPTOMS

- Pyrexia
  - Temp may increase 1 degree F/3min. May go as high as 109.4F (43C)
- Coagulopathy
  - DIC, venapuncture sites bleed
- Rhabdomyloysis
  - Muscle membrane breakdown

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SEQUELEA TO CRISIS

- CNS damage
  - Coma, convulsions, paralysis, blindness
- Renal failure
- Recurrence
- Muscle edema
  - Compartment syndrome

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DIAGNOSIS/TREATMENT

- Does not usually produce only one clinically abnormal sign
- Differential Diagnosis
  - R/U other cause of fever

- STOP surgery!
- Administer 100% Oxygen by hand
- Administer Dantrolene
- Cool patient
- Maintain fluid and electrolyte balance
- Monitor cardiac output

CALL MHAUS HOTLINE 1-800-644-9737

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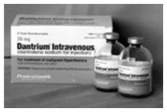
ADMINISTERING DANTROLENE

- 1 mg/kg up to total of 10mg/kg Each vial
- 20mg, powder to be reconstituted with 50ml of sterile water ONLY
- Dissolves in 2 to 3 minutes



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NEW TREATMENT…….RYANODEX

- Faster and easier than other alternatives
- Less than 1 minute for reconstitution/administration of loading dose (2.5mg/kg)
- Fewer vials required (1 vial=250mg of dantrolene)
- Over 99% less sterile water needed for injection

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COMPARE……

RYANODEX®[1]	Other treatment protocols[9,10]
1 to 3 vials	12.5 to 36 vials
5 mL to 15 mL of sterile water	750 mL to 2160 mL of sterile water
Less than 1 minute for reconstitution and administration	>15 minutes[11]
1 staff member[2]	1 to 3 staff members[2]
250 mg dantrolene sodium per vial	20 mg dantrolene sodium per vial
50 mg/mL reconstituted formulation concentration	0.33 mg/mL reconstituted formulation concentration

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HOW TO RECONSTITUTE RYANODEX ®

- Each 250 mg vial of RYANODEX® should be reconstituted by adding 5 mL of sterile water for injection USP (without a bacteriostatic agent), and the vial should be shaken to ensure an orange colored uniform suspension.

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ADMINISTERING RYANODEX®

- RYANODEX® should be administered by intravenous push. RYANODEX® can be administered either into the intravenous catheter while an intravenous infusion of 0.9% sodium chloride injection, or 5% dextrose injection is freely running; or into the indwelling catheter–after assuring its patency– without a freely running infusion. Flush the line to assure that there is no residual RYANODEX® remaining in the catheter.

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NOT SUBSTITUTE FOR SUPPORT MEASURES

- Discontinue triggering agents
- Increase oxygen
- Manage metabolic acidosis
- Cooling
- Monitor urinary output
- Monitor electrolytes
- Administer diuretics

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PACU CARE

- Continue cooling
  - Ice packs, lavage, cooling blankets
- Maintain fluid and electrolyte balance
  - Monitor CVP or PA
  - Treat Metabolic Acidosis – Bicarb per ABG
  - Monitor urine output
  - IV Fluids
  - Lasix and Mannitol for hyperkalemia
  - Glucose/Dextrose and Insulin

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PREPARING FOR SUSPECTED MH PATIENT

- Flush anesthesia machine
- Use non-causative agent
- First case of the day
- Monitor core temp
- Equipment
  - Hypothermia blanket, minimum of 3L of cold NS available, MH Kit readily available

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MH

REMEMBER

- MH still exists!
- Attention to excellent screening questions
- Be prepared – know what to do
  a. annual skills b. MH drills
- Inspection of MH carts routinely, replace expired meds

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