CALIFORNIA SIMULATION ALLIANCE

CSA

Simulation Scenario Template

Introduction:

The Bay Area Simulation Collaborative (BASC) is comprised of representatives from schools of nursing and hospitals in the ten Bay Area counties. The CINHC provides leadership for the BASC. This project, which is the third component of the Bay Area Nursing Resource Center, involves faculty development for nursing faculty and hospital educators in the Bay Area.

Scenario development is the second component of the BASC project. The BASC team is spearheading this new approach to education through developing simulation scenarios and curriculum. The BASC will facilitate training educators to write scenarios in the BASC developed template; validate, test and ultimately, make scenarios available to the BASC community.

Utilization of simulation in schools, hospitals and regional centers will ultimately increase the quality of nursing education and practice. The overall goal is the enhancement of patient safety.

TABLE OF CONTENTS

SECTION I SCENARIO OVERVIEW

- **A.**

SECTION II CURRICULUM INTEGRATION

- **A. Learning Objectives**
  1. **Primary**
  2. **Secondary**
  3. **Critical Elements**
- **B. Pre-scenario Learner Activities**

SECTION III SCENARIO SCRIPT

- **A. Case Summary**
- **B. Key Contextual Details**
- **C. Scenario Cast**
- **D. Patient/Client Profile**
- **E. Baseline patient/client simulator state**
- **F. Environment / equipment / essential props**
- **G. Case flow /triggers / scenario development**

SECTION IV APPENDICES

- **A. PHYSICIAN ORDERS**

SECTION I: SCENARIO OVERVIEW

Scenario Title:	Perioperative Malignant Hyperthermia (MH) during ORIF left ankle					
Original Scenario Developers:	Jenny Mendenhall, Monique Mabey, Debbie Dunfield Ramona Domen, CRNA (1/20/2011)					
Date - original scenario	10/13/06					
Validation date:		Draft	x	Pilot		Approved
Revision Dates:	Transferred to BASC template 10/31/10					

Estimated Scenario Time: 15-20 minutes
Debriefing time: 30-40 minutes

Target group: Inter-professional perioperative team: surgeon, anesthesia provider, physician assistant, OR RN, surgical technologist

Core case: Perioperative hyperthermia

Brief Summary: 16 y.o. healthy male undergoing a general anesthetic for an Open Reduction Internal Fixation of his left ankle after a skateboarding injury. During surgical preparation of the lower extremity, the OR RN remarks the patient's leg muscles seem tight and the anesthesia provider notices an acute increase in heart rate and exhaled CO2.

The scenario is designed to help learners recognize and treat malignant hyperthermia as a collaborative team effort. It provides guidelines for assessment and team effort in the treatment of the condition, and gathering supplies for placement of invasive monitoring. His medical history includes only rare use of an albuteral MDI. He has never been to the ED or admitted for treatment of the condition.

B. EVIDENCE BASE

(List all references include complete citation, following APA guidelines)

Anderson-Pompa, K. A. et al. (2008). Genetics and susceptibility to Malignant Hyperthermia, *Critical Care Nurse* 28(6), 32-6.

Malignant Hyperthermia Association of the United States (MHAUS). (2008). Retrieved from http://medical.mhaus.org/PubData/PDFs/treatmentposter.pdf

Nettina, S. Lippincott Manual of Nursing Practice (2009). 9TH ed. Wolters Kluwer, Lippincott Williams and Wilkins, Philadelphia, PA.

(or agency specific protocols)

SECTION II: CURRICULUM INTEGRATION

A. SCENARIO LEARNING OBJECTIVES
1. Learning Outcomes (Global)
1. Interpret data and recognize signs and symptoms of an acute hyperdynamic state (MH)
2. Communicate effectively as inter-professional team members to treat the crises
3. Identify treatments and institute measures to support hemodynamic stability
4. Evaluate effectiveness of treatment measures
2. Specific Learning Objectives
1. Identify factors in the situation leading to increased hypermetabolic state (expired CO2, tachycardia, hypertension, diaphoresis, arrhythmias, muscle rigidity)
2. Recognizes significance of arrthymias and increasing temperature (assessment data) and seeks cause for patient instability 3. Team leader (surgeon or anesthesia provider) activates emergency team actions after making diagnosis 4. Demonstrates ability to safely administer medication (dantrolene)
5. Includes therapeutic communication and patient teaching
3. Critical Elements (Key points to observe to determine if scenario objectives are met)
1. Performs focused assessment following onset of hyperdynamic state
2. Function as a team to support and correct hemodynamic function
3. Institutes appropriate independent nursing actions (mix, administer IV meds safely, starts IV, draws blood)
4. Calls for help / recognizes need for simultaneous treatments and actions 5. Prioritizes and delegates responsibilities as appropriate 6. Communicates to other team members effectively using SBAR
7. Reassesses following interventions

B. PRE-SCENARIO LEARNER ACTITIVIES	
Prerequisite Knowledge Required prior to participating in the scenario	
Psychomotor Competencies	Cognitive competencies:
❑ Systems assessment (Cardiovascular, respiratory, muscular, skin)	❑ Pathophysiology of malignant hyperthermia
❑ Administration of medications, cooling measures	❑ Pharmacology of medications involved in treatment
❑ IV placement, blood draw, set up for invasive monitoring (A-line, CVP)	❑ SBAR communication with inter-professional team
❑ EKG interpretation	❑ Team dynamics (effective communication, performance of appropriate skills)
❑ Lab interpretation	❑

SECTION III: SCENARIO SCRIPT

A. Case summary

16 y.o. healthy male undergoes a general anesthetic for an ORIF of his left ankle after a skateboarding injury. After going to the ED, he presents to the pre-operative area with his mother.

The patient has no surgical history, rarely uses his albuteral MDI, has no prescribed drugs, does not smoke, has no drug allergies and has no family anesthetic concerns in the past. He ate 3 hours prior to injury making him a candidate for a rapid sequence intubation with propofol and succinylcholine.

He received pain medication, morphine 4mg IV, 60minutes ago in the ED prior to arriving in the pre-op area. He has a R 18g hand IV and a soft splint to his right ankle. Pre-op Ancef 1g is ordered per usual routine.

After a non-eventful rapid sequence induction, the patient is placed on the ventilator with oxygen, air and desflurane for anesthetic maintenance. The OR RN is ready to start the surgical scrub and the surgeon is examining the extremity.

There is an acute increase in heart rate, exhaled CO2 and the patient's operative leg seems rigid.

A team leader (surgeon or anesthesia provider) will make the diagnosis and run the resuscitation scenario. Team members should be able to perform skills consistent with their training. Recognize MH, call for help from members outside the room, obtain the MH cart, start mixing the IV Dantrolene, start additional IVs, draw labs, cool the patient, prepare for invasive monitors (A-line and CVP), prepare for a code and prepare to transfer patient to ICU.

ABG (prior to dantrolene): Ph 7.10, PaCO2 86, (100% FiO2), PaO2 80, SaO2 84%, HCO3 18, Potassium 7.6, Sodium 170, Calcium 16.

B. Key contextual details

The patient enters the OR; anesthesia induction is uneventful. The surgical technician is setting up instruments; the OR RN is ready to start the surgical scrub and the surgeon is examining the extremity. The PA is standing nearby; the surgical tech is at the back-table.

Hyperdynamic state starts and as several patient VS monitors' alarm, the surgeon comments the patient's leg feels rigid. Upon inspection, the patient is diaphoretic and muscles are rigid.

C. Scenario Cast		
Patient/ Client	❑ Human Patient Simulator (SimMan®, SimBaby®, ECS®, HPS®)	
	❑ Standardized Patient	
	❑ Low-mid fidelity manikin	
	❑ Hybrid (Blended simulator)	
Role	**Brief Descriptor (Optional)**	**Confederate (C) or Learner (L)**
Anesthesia	Anesthesia resident or student nurse anesthetist	Learner
Surgeon		Confederate
Physician assistant	PA	Learner
Circulator	OR RN	Learner
Scrub technician	Surgical Tech	Learner
Help assistant	OR charge	Confederate / Actor

D. Patient/Client Profile				
Last name:	Patrick		First name:	Damian
Gender: Male	Age: 16	Ht: 68 inches	Wt: 160 pounds	BMI: 24.3
Ethnicity: Caucasian		Religion: Protestant		
1. History of present illness				
16 y.o. healthy male undergoing a general anesthetic for an Open Reduction Internal Fixation of his left ankle after a skateboarding injury. No prior surgical history. Medical Hx: rare use of albuteral MDI, no prescribed drugs, does not smoke, no drug allergies. He received morphine 4mg IV for pain 60minutes prior to arriving in the pre-op area. He has an 18 gauge IV in right hand and a soft splint to his right ankle.				
Primary Medical Diagnosis	Fractured malleolus requiring ORIF Rt. ankle.			

2. Review of Systems	
CNS	Alert and oriented
Cardiovascular	S1, S2
Pulmonary	Lungs clear. Non-smoker
Renal/Hepatic	Wnl
Endocrine	Wnl
Heme/Coag	Wnl
Musculoskeletal	Moves all extremities (R ankle restricted in soft cast)
Integument	Wnl
Developmental Hx	Normal for age
Psych History	None known
Social History	Lives with parents, one sibling
Alternative/ Complementary Medicine History	None reported

Medication allergies:	No known drug allergies	Reaction:	
Food/other allergies:	No known food allergies	Reaction:	

3. Current medication	Drug	Dose	Route	Frequency
	Albuterol MDI	90mcg/spray	Inhaled	1-2 puffs Q 4-6 hours PRN

4. Laboratory, Diagnostic Study Results (None pre-op)
After one dose of Dantrolene
(Prior to dantrolene): Ph 7.10, PCO2 126, PO2 88, (100% FiO2) PaO2 98, SaO2 84%, HCO3 18, Potassium 7.6, Sodium 170, Calcium 16.

Na: 158	K: 5.5	Cl: 121	HCO3:	BUN: 36
Cr: 3.1	BS: 98	HgA1C: NA		
Hgb: 18	Hct: 45	Plt: 320	WBC:4	
PT: 13	PTT: 25	INR: 1.0		
ABG-pH:7.30	paO2:75	paCO2:52	HCO3/BE:16/-4	SaO2:92%
Ca: 14	Mg:3	ABO Blood Type:NA		
LFTs:	Albumin: 2.0	SGOT: 40	SGPT:40	AlkPhos:140
VDRL:	GBS:	Herpes:	HIV:	Herpes:
CXR: Diffuse interstitial edema		ECG: Sinus tachycardia		
CT:		MRI:		

E. Baseline Patient/Client Simulator State

This may vary from the baseline data provided to learners

1. Manikin physical appearance - Mark X next to item and/or describe

Gender:	Male; Caucasian
Attire:	Hospital gown

X	ID band present, accurate information		ID band present, inaccurate information		ID band absent or not applicable
	Allergy band present, accurate information		Allergy band present, inaccurate information	x	Allergy band absent or not applicable

Alterations in appearance (moulage): R hand IV; R ankle splint

2. Initial Vital Signs Monitor display in simulation action room:
(Should be appropriate for the scenario setting)

	No monitor display		Monitor on, but no data displayed	x	Monitor on, standard display		

BP: 120/60	HR: 80	RR: 16	T: 36.0 C	SpO2: 98%
CVP:	PAS:	PAD:	PCWP:	CO:
AIRWAY:	Clear			
FHR:				
Lungs: Sounds/mechanics	Left: CTA		Right: CTA	
Heart:	Sounds:	S1, S2		
	ECG rhythm:	Sinus rhythm		
	Other:			
Bowel sounds:	Wnl		Other:	

3. Intravenous lines - INITIAL manikin set up									
	Saline lock #1	Site:							IV patent (Y/N)
	IV #1	Site: R hand		Fluid type:	LR	Initial rate:	150 ml/hr		IV patent (Y/N) Yes
x	Main								
	Piggyback								
	IV #2	Site:		Fluid type:		Initial rate:			IV patent (Y/N)
	Main								
	Piggyback								

4. Non-invasive monitors – INITIAL manikin set up					
x	NIBP	x	ECG First lead: Lead II		ECG Second lead:
x	Pulse oximeter	x	Temp monitor/type Skin		

5. Hemodynamic monitors- INITIAL manikin set up					
	A-line Site: R radial		Catheter/tubing Patency (Y/N)	CVP Site:	PAC Site:

6. Other monitors/devices					
	Foley catheter	Amount in drainage bag:		Appearance of urine:	
	Epidural catheter		Infusion pump Pump settings:		
	Fetal Heart rate monitor/tocometer		Internal		External

7. Digital images of initial manikin appearance	
Insert digital photo of initial manikin appearance here	**Insert digital photo of initial manikin appearance here**

F. Environment, Equipment, Essential props

Standardized set ups for equipment/supplies for each commonly simulated environment is recommended

1. Scenario setting

	Medical-Surgical Unit Patient Room
	Pediatric Unit Patient Room
	Perinatal Unit Room
	ICU Patient Room
	PICU Patient Room
	NICU Patient Room
	ED Bay
	Trauma Bay (ED)
	Labor & Delivery Room
	Labor & Delivery Operating Room
X	Operating Room
	Home Health
	Out-patient clinic
	Pre-Hospital
	Other:

2. Confederate placement - INITIAL scenario set up

Role	▪ General instructions (Initial placement and disposition) ▪ Key actions to implement triggers for learner
OR Charge Nurse	Available when called
Mother	Answers pre-operative medical questions with patient
Surgeon	Examines and manipulates R LE immediately after intubation. Assists with diagnosis; team leader *only* if anesthesia provider not primary learner; otherwise consultant with anesthesia provider leader

3. Equipment, supplies, monitors

(In simulation action room or available in adjacent core storage rooms)

x	Intubated patient on monitors	x	Foley catheter insertion kit	x	Central line / A line set up		
x	IV Infusion pump	x	Pressure bag				
x	Malignant Hyperthermia Cart	x	Blood drawing equipment; tubes for lab				
x	Defibrillator	x	Code Cart				
x	Ice	x	ABG machine				
x	IV fluid Type: LR running	x	IV fluid Type: Cold NS to be started				

4. Respiratory therapy equipment/devices							
x	Anesthesia machine	x	Oxygen source (extra supply)				
x	BVM/Jackson Reese						
x	Wall suction apparatus (regulator/canister/tubing)						

5. Essential props/special effects
Anesthesia machine w/capability of end tidal CO2; Need 2nd IV & foley placed. Need to have MH cart (or substitute), need ice, need members to mix dantrolene (or any powder in 60cc bottle/bag) and administer; after Foley; release 50 ml tea colored urine.

6. Documentation and Order Forms							
x	H & P		Consult reports				
x	Anesthesia record	x	ED Vital Sign record				
x	ED Physician orders	x	ED Nurses notes / Triage forms		Code Record		
x	Laboratory results	x	OR Nurses notes (before transfer, to be written)				
x	Transfer orders (OR to ICU - to be written)		Graphic record		Standing (protocol) orders		
					Post procedure Physician orders		
					Prenatal record		
x	Actual medical record binder, constructed per institutional guidelines				Other Describe:		

7. Medications (to be available in sim action room)					
X	Dantrolene 20mg / bottle (or bag)	X	Fentanyl		
X	Sterile water (60 cc diluent per dantrolene bottle)	X	Propofol		
X	Sodium bicarbonate (box)	x	Succinylcholine		
x	Calcium chloride or Calcium gluconate	x	Emergency anes meds		
		x	Scopalamine		

CASE FLOW / TRIGGERS/ SCENARIO DEVELOPMENT STATES

Initiation of Scenario : At bedside in preoperative holding area. Interview completed, patient taken to OR.
Anesthesia induced and patient intubated by anesthesia provider with OR RN assist for rapid sequence intubation.

The surgical technician is setting up instruments; the OR RN is ready to start the surgical scrub and the surgeon is examining the extremity. The PA is standing nearby, the surgical tech is at the back-table.

This healthy patient has no preoperative studies or labs done (the ankle was examined under fluoroscopy).

STATE	PATIENT STATUS	DESIRED LEARNER ACTIONS & TRIGGERS TO MOVE TO NEXT STATE		
1. Baseline Alert, oriented, mildly anxious 16 y.o. old	**IDLE until learner places on operating room monitors** **Skin T:** 36.0° C HR: 80/SR BP: 120/60 RR: 16 O_2 sats: 98% Lung sounds: CTA bilaterally	**Learner Actions:** ○ Attaches pt. to monitor, obtains baseline VS ○ Induces anesthesia with OR RN assisting for RSI ○ Intubates patient ○ Places on the ventilator ○ Adds anesthetic agent	**Operator:** **VS revealed as specific monitoring initiated** (Slight↑HR / ↓ BP as Propofol & intubation affects pt) **Skin T:** 36.0° C HR: 90/SR BP: 100/50 RR: 12 (ventilator) O_2 sats: 98% End tidal CO_2: 4O Lung sounds: CTA bilaterally **Triggers:** Learner actions completed within 5 min; surgeon starts exam of extremity.	**Teaching Points:** • Team communication for induction; RSI sequence • Decision making priorities (positioning, warming measures, surgical prep)

STATE	PATIENT STATUS	DESIRED ACTIONS & TRIGGERS TO MOVE TO NEXT STATE		
2. ↑ ETCO2 ↑ heart rate	Deteriorating	**Learner Actions:** ○ Start differential diagnosis ○ Give pain medication ○ ↑ anesthetic depth ○ ↑ RR or tidal volume ○ Completes focused assessment	**Operator:** EKG: SR @110 $ETCO_2$: 70 BP: 170/90 O_2 sat: 94% **Triggers:** Learner Actions completed within 3 minutes Surgeon: Mentions leg 'feels tight'	**Teaching Points:** • Rationale for actions • Anticipated results of interventions • Significance of deteriorating VS & O_2 saturation

3.
Continues to deteriorate …
Hyperdynamic parameters continue to increase
	EKG: SR @150
	BP: 170/100
	$ETCO_2$: 84
	O_2 sat: 88%
		Learner Actions:
		○ Takes off the vent, assess BS
		○ Cycles BP to monitor more frequently
		○ Consults surgeon & presents/relays suspected diagnosis
		○ Call for help
		○ Call for MH cart
		○ Discontinue anesthetic gas
		○ 100% O_2, flow at 10L
		  ○ ↑ RR/TV
		○ Cool the patient
		○ Prepare for resuscitation
		  ○ Directs A-line
			Operator:
			No change in basic parameters;
			Add esophageal temp when available: 39.5° C
			Triggers:
			Learner Actions completed within 10 minutes
				Teaching Points:
				• Team Communication
				  • Identify leader (surgeon should defer if anesthesia is primary learner)
				  • Repeat back verbal orders and when task done (i.e., start IV)
				• Performing qualified abilities (Foley, blood draw, mixing meds, assisting with procedures)

		placed (surgeon), ABG drawn ○ Directs IV placed, labs drawn (CK, myoglobin, DIC) ○ Directs Foley placed (UA sent), ○ Directs to cool the patient ○ Places esophageal stethoscope ○ Consider amnesia (IV scopolamine)		
STATE	**PATIENT STATUS**	**DESIRED ACTIONS & TRIGGERS TO MOVE TO NEXT STATE**		
4 Continues to deteriorate … Hyperdynamic parameters continue to increase until Dantrolene is administered.	EKG: SR @170 BP: 200/100 A-line: Correspond ETC O_2: 90 O_2 sat: 84% Temp: 40.0° C **After** one dose of Dantrolene, begins improvement over next 3 minutes.	**Learner Actions:** ○ Administer dantrolene ○ Delegates appropriate tasks to team members; assure being complete ○ Assures ice in and around patient ○ Verbalizes and validates assessment of improvement ○ Communicates with surgeon, team members	**Operator:** Begin improvement trends over next 3 minutes EKG: SR ↓ 120 BP: ↓ 170/80 Add A-line when avail: Correspond with NIBP ETCO2: ↓ to 60 O_2 sat: ↑ to 94% Temp: 39.0° C **Triggers** Learner Actions within 5 minutes	**Teaching Points:** • Stop offending source • Treat the condition • Rationale for medication • Rationale for cooling • Rationale for labs, ABG, Foley • Expected effects of medications with time frame • Importance of communication with team members

5 Improving… Patient starts to breathe over vent; opens eyes	Lungs: Faint / distant but clear; EKG: SR ↓ 100 with occasional PVC BP: ↓ 150/80 A-line corresponds if successful ETCO2: ↓ to 50 O_2 sat: ↑ to 96%	○ Reassess breath sounds ○ Assess urine output (50 ml dark amber urine) ○ Assess total fluids ○ Assess anesthetic requirements (amnesia, anesthetic depth, talks to pt) ○ Completes focused assessment ○ Analyzes available labs, ABG (second set improved) ○ Draws second labs from A-line ○ Assesses need for CVP (if not already ordered)	**VS revealed as specific monitoring initiated** No change in parameters	**Teaching Points:** • Assess-Intervene-Reassess • Prepare patient for transport • Consider repeat dose • Prepare to tell mother
STATE	**PATIENT STATUS**	**DESIRED ACTIONS & TRIGGERS TO MOVE TO NEXT STATE**		
6. Remains stable. Patient to be transported.	Lab Results: See lab section - second set ABG remarkably improved.	**Learner Actions** ○ Reassess patient status ○ Sedation medications ○ Transport monitors / requirements per institution (consult head anesthesiologist, etc).	**Operator** No change in parameters **Triggers:** Learner Actions completed within 5 minutes.	**Teaching Points** • Vigilance for reoccurrence prior to transport • Monitor cooling using core temp (stop <38) • Transport safety (lines, sedation, O_2, etc.)
SCENARIO END POINT: Patient is stable, sedated, O_2 and transport monitors connected. Nurse gives SBAR to receiving ICU team.				

SUGGESTIONS TO INCREASE OR DECREASE SCENARIO COMPLEXITY:

PA and OR tech may not benefit directly from scenario (assist only). Could add pre-licensure learner with Foley/IV skills. Surgeon is confederate, to run crises only if anesthesia provider not primary learner. Consider starting in the OR, versus pre-operative area. Can increase complexity by anesthesia provider start A-line (although risk being team leader).

Another scenario dealing with communication to family for anesthesia provider (surgeon stands idly) could be included.

PHYSICIAN ORDERS

Patient Name: Damian Patrick **DOB: 11/6/1994** **MR#: 123456** **Age: 16**	**Diagnosis: R ankle fracture**

x No Known Allergies
□ Allergies & Sensitivities

Date	Time	ED PHYSICIAN ORDER AND SIGNATURE
		OOB with assist
		Lactated Ringers @ 150 ml/hr
		Morphine sulfate 2 mg IV now for moderate pain; repeat x1 in 20 minutes for moderate pain PRN
		Consult ortho service - done
		Pulse oximeter
		O_2 to maintain sats above 93%
		NPO
		Ancef 1 gram IVPB on call to OR
Signature		