Scenario Overview

The Soldier Multi-Trauma Showcase Scenario simulates the injuries that a Combat Medic or other caregiver may encounter on the battlefield. This scenario highlights the ability of the Pulse physiology engine to simulate multiple insults occurring simultaneously. We have incorporated a tension pneumothorax with a massive hemorrhage. The tension pneumothorax is itself a combinitatory insult, affecting both the respiratory and cardiovascular systems. Combining the tension pneumothorax with the blood loss from the hemorrhage pushes and eventually exceeds the limits of the homeostatic control mechanisms.

Base Physiology	Insults and injuries	Assessments	Interventions								
		Heart Rate	Tourniquet								
A 22 year old physically fit	Trauma which causes massive	Bleeding Rate Blood Pressure	Needle Decompression								
male soldier. No known	hemorrhage and tension	Distal Pulse	Narcotics								
complicating factors.	pneumothorax.	Respiration Rate	Fluid Resuscitation Transfusion								
		Oxygen Saturation									
Segment 0	Engine initialization period.	Scenario Na	rative								
Segment 1		etonates injuring one o	ough a small village in a troubled country. As they pass a mud wall, an the soldiers. The squad medic was with the other team in another part of fter the onset of injury.								
Segment 2	other injuries. After one minut	e of assessment, the m	top the hemorrhage with direct pressure while she assesses the casualty for edic suspects a tension pneumothorax. She instructs a combat life saver to prepares to treat the tension pneumothorax.								
Segment 3			rming a needle decompression. The three inch needle is inserted utes finishing and assessing the effectiveness of the procedure.								
Segment 4	The medic notices that the combat life saver is unable to effectively control the bleeding with direct pressure. She applies a tourniquet stop the hemorrhage. The medic spends 30 seconds inspecting the tourniquet application and preparing an intravenous infusion.										
Segment 5	The medic initiates a bolus intravenous infusion of isotonic saline.										
Segment 6	The medic also administers five military person on the scene to		e intravenously to control the casualty's pain. She advises the ranking ntinues supportive care.								
References Publications:											
1	Bond, Casey, et al., eds. 68W A	dvanced Field Craft: Co	mbat Medic Skills. Jones & Bartlett Publishers, 2009. P42.								
2			mbat Medic Skills. Jones & Bartlett Publishers, 2009. P86. Ind NATHAN W. SHOCK. "Changes in cardiac output with age." Circulation								
3	12.4 (1955): 557-566.										
4	CHRISP, DELILA R. "Action Stat	: Tension pneumothora	x." Nursing2013 30.5 (2000): 33.								
5	Drummond, G. B., and B. Laffe journal of anaesthesia 104.5 (2		decreases acutely when opioids are given during anaesthesia." British								
6	Echt, Martin, et al. "Effective compliance of the total vascular bed and the intrathoracic compartment derived from change: central venous pressure induced by volume changes in man." Circulation research 34.1 (1974): 61-68. Feldschuh, Joseph, and Yale Enson, "Prediction of the normal blood volume. Relation of blood volume to body habitus."										
7	Feldschuh, Joseph, and Yale Enson. "Prediction of the normal blood volume. Relation of blood volume to body habitus." Circulation 56.4 (1977): 605-612.										
8	Grmec, Stefek, Mirjam Golub, and Alina Jelatancev. "Relationship between mean arterial pressure and end-tidal partial p of carbon dioxide during hemorrhagic shock and volume resuscitation." Signa Vitae 4.1 (2009): 24-26. Gutierrez, Guillermo, H. David Reines, and Marian E. Wulf-Gutierrez. "Clinical review: hemorrhagic shock." CRITICAL CARI										
9	8 (2004): 373-381.	Reines, and Marian E. V	Vulf-Gutierrez. "Clinical review: hemorrhagic shock." CRITICAL CARE-LUNDON-								
10		C. Guyton. Textbook of	medical physiology. Saunders, 2011. P229.								
11			medical physiology. Saunders, 2011. P469. Severe Abdominal Blood Loss Using Peripheral to Central Blood Oxygen								
12	Saturation." Advances in medi	cal sciences 53.1 (2008)	: 87-93.								
13	Implications. FA Davis, 2015. P	93	orehensive Handbook of Laboratory & Diagnostic Tests with Nursing								
14	Implications. FA Davis, 2015. P	295	orehensive Handbook of Laboratory & Diagnostic Tests with Nursing								
15	Van Leeuwen, Anne M., and M Implications. FA Davis, 2015. P		orehensive Handbook of Laboratory & Diagnostic Tests with Nursing								
16		·	:—time for a re-think?." Emergency medicine journal: EMJ 22.1 (2005): 8. ine/dextran infusion for post-traumatic hypotension. The USA Multicenter								
17	Trial." Annals of surgery 213.5		and section initiation for post-traumatic hypotension. The OSA Multicenter								
18	Morgan, G. E., and M. S. Mikai		gy." (2006). P200.								
19	Price, James W. "Novel Electro 15.4 (2006): 415-419.	cardiographic changes	associated with iatrogenic pneumothorax." American Journal of Critical Care								
20			hreatening simultaneous bilateral spontaneous tension pneumothorax-a ovascular surgery 44.3 (2011): 253-256.								
21	Satsumae, Tsuyoshi, et al. "Ma (2013): 231-235.	gnesium sulfate attenu	ates tourniquet pain in healthy volunteers." Journal of anesthesia 27.2								
22			d asymmetric chest wall dynamics in early progressing pneumothorax."								
SMEs:											
\$1 \$2	Rodney Metoyer - Former Arm Bryan Bergeron, M.DPreside		gies, Inc.								
Key											
ney	Good Agreement with data/tre	ends									
	Agreement with most trends,										
	Some major disagreements wi	ui validation data/tren	15								

Segment Number		Segment Duration (s)	Exect (to begin regiment)	Notes (End Segment Expected Physiology to right)	New Wales (EMN)	Engles HealtEate (BPM)	NearttoukeValume (mt/feat)	Engine HeadStrake Solume (mij/Seat)	Blood/Volume (e4)	Engine Bland Volume (nt.)	MeandsteridPressure (montg)	Engles MeantriedalPressure (mateg)	SydulichderialPressure (marky)	Degine DystolichterielPressure (montg)	Distributerial Pressure (marty)	Engine DiscolubrisciaPressare (moltg)	CardiasDulput (ec/min)	Engine Cardia/Output (es/ess)	NemoglobinContext (g)	Engles Hemoglobin/Content (d)	MeanControl Mesour Procure (number)	Begine MeanCentralitiesausPro source (australities	Respiration/Late (Breaths, finis)	Engine Requisionfate (Beath,(nin)	Oxygendaturation (fraction)	Engine Oxygentaturation (fraction)	Tidal Volume (mil)	Engine Tabalitatume (mil)	TotalLungValume (mL)	TotalLungValume (etc) [Measured as peak over Weasured ()
0	0	60	Initialization (Advance time I minute)	An initial period to facilitate observation of changes	60-100(11)		35.11495.1(1)	π	1900(7)	5965	70 - 105 [18]	*	100-140(18)	114	40-10(18)	71	1600 (at ext) [10] Elevated due to increased ME [11]	6622	18.2 - 17.8g/ds. Blood [15]	m	3.4(6)	4.1	12 - 30 [1]	26	0.96 - 0.99(14)	697	500[11]	600	2800 [11]	2600
1	9	40	Regin Tention FearmsChoices (art cole, closed, severy 5.75) Rejn Matthe Fearmschape (Ggld. leg., cate 250 sst, (man)	Mission bemarkage from the right leg. 30 or, into load or common femoral array variantees than use, he eight broken 2000 or for the land 2000 or for the broken for the send of this segment (Class bemarkage). Tending pre-markhair by progressed with either for 2 market.	"20% monate [10] Tachycanka [26]	200	Decision [LI]	8	5290	5290	NC or decrease [38] Compensiony Mechanisms Keep Ital Baseline Valves [12]	в.	Modecitie Decreace Audinty [12] Decrease, lock eat completely callapse [12]	4	No Charge [12]	п	Decimace (65)	1393	790	788	Increase (ki)	1.21	40[4] 16-30[6] Tailegees [23] [2] [26]	263	Decesse [4] [2] [24] [23]	6/92	78% Decrease [27]	200	"TOTA of Baseline [12]	2000
3	130	40	Non-boundput kineding control (Manual pressure reduces honorchage to 50 ms_(loco)	A pressure directing or manufacture its applied to attempt to control the bleeding. These of Model Seas of the end of the cogness (Transitioning from Class 1 to Class II he manuface). Tension pneumothers in the progressed untrested for Transition.	"25% Incorate [10] Tachycaella [26]	200	No-Change [12]	я	5300	5290	NC or decrease [36] Compensatory Mechanisms Reep East Biseline Values [12]	в.	No Change [12]	a .	No Change [12]	78	Stress indused slight elevation (ICI)	5000	798	760	Increase (4)		80 [4] 16-30 [6] Tachginea [23] [2] [39]	223	Decrease [4] [12] Materials [22]	GH?	"IN Decrease [III]	225	"TOTA of Baseline [12]	2300
	180	200	Needle Decomprocion	A needle decompression proordure scapplied on the affected side.	W-120[12]	120	morases (12)	10	4900	5028	Compensatory Mechanisms Keep IT at Baseline Yahun [12]	10	NC or thight moveme (NJ)	205	No Change [12]	77	Stores trabuted stigits elevation (N2) Storeson with the Navedile Decompression (N2)	1033	765	700	Decreasing, but not to bootine [12] NC or Night Decrease[12]	4.75	Back to Baseline [52]	2	trunese > 5.95 (20)	697	Back to Baseline (12)	400	"80% of Esseline (52)	2000
4	600	и	Townsquet Application (see-maintage completely consulted, cate to set_(less)	A Summount is applied to the hemochaging log. "Note this action only stops bleeding. There is not surveyly a humayor model in the Inguist continuency of planning the model in the Inguist continuency application process are grotted about the Continuency of the	117.9 (13) Possibly no agenticast change [19]	230	No change	10	e100	1,000	No Charge or Increase [21]		No Change or movease [21]	205	No Change or Increase [25]	77	Nu Change	1000	795	740	Ce-shape, but not to bookine [12] NC or Yagin Georgae[12]	4.75	Bick to Ricebne [32]	a.	Back to Receive (ICI)	6.97	Stack to Stateline (12)	600	"NOS of Raceline [12]	2300
	410	130	Introvenous Fluid Recordination (Saline, 302 et. atracte of 200 et./mm)	Saline is administered over 3 winutes at a rate of 200 kg/min.	Slight decrease because of partial correction of the hypositema. (LL) Stress-induced Moderate Tashysantia (LS)	110	Increase with the Increase in blood volume (10) Noward Bootine as pretaid returns to execute (11)	**	5300	5380	monate (II)		Increase [3] [37] Mack toward baseline [53]	305	morrane [12]	77	tooreste (NJ)	1720	795	798	Move toward Baseline (NI)	1.00	Nick to Receive [13]	163	Back to Raceline [52]	697	Rack to Raceline [12]	400	"80% of Baseline [52]	2300
٠	170	360	Nanodics (Morphine) Administration (5 ms of morphine IV at concentration of 1 mg/ms)	A belies of timp of morphise is administered intravenously. The rest of the time inchis segment is to allow the saline to finish and to obtains.	Decivace (SD) Decivace (SR)	90	Toward Rateline (12)		3600	5700	MNI Decresse [38]	EF	Mild Decrease [18]	300	Mild Decrease [18]	70	Mid Dearwase [12]	6000	795	700	Mid Decrease (52)	1.50	25-20% Decrease [18]	2	NC(N1) Decresor(N)	C96	Madeste Decresor(12)	80	"90% of Baseline (62)	2000

Man Restriction 1 description 2 description 2 description 2 description 3 description