

DETROIT ULTRASOUND WILDERNESS ADVENTURE RACE

Field Guide 2025



Welcome to the 5th Annual Detroit SonoW.A.R.!

This isn't your typical ultrasound course—and it's not meant to be. Today isn't about reviewing the basics. It's about shaking up what you thought you knew, exploring the edges of ultrasound application, and sparking innovative thinking in emergency medicine.

Today you will be faced with creative challenges that reflect how point-of-care ultrasound (POCUS) is revolutionizing clinical decision-making across disciplines. Expect to encounter uses of ultrasound you've never imagined—and that's exactly the point. The problems you'll face in your medical career won't come with easy answers, so why should your training?

This is your chance to stretch, rethink, and reshape the possibilities. Step outside your comfort zone and help shape the future of medicine.

We're honored to welcome an extraordinary lineup of faculty from across the country who bring passion, expertise, and a shared belief in pushing the boundaries of what's possible.

By the end of today, we hope your legs are tired, your brain is buzzing, and your curiosity is reignited—with new ideas in both Wilderness and Advanced Emergency Medicine Ultrasound.



Let's get to work!



Rules: 10 x 10 x10

- 1. There are 10 stations scattered around the island
- **2.** Each station is worth 10 points and combines elements of Detroit/Michigan history, Advanced Emergency Medicine Ultrasound, and Wilderness Medicine
- 3. Each station will have a 10 minute time limit
 - a. The stations are open book use your navigation time between stations wisely to arrive prepared!
- 4. <u>Scatter Start</u>: Each team will be assigned a random Station to start (to avoid clumping)
 - a. You must use strategy, teamwork, and navigational skills to decide from there
 - b. You are not expected to do the stations in numerical order you are the captain of your own ship! Forge your own path to victory!
- 5. All stations will open precisely at 9am
 - a. You may want to be waiting at the station come 9am so you have as much time for all stations as possible!

Additional Details:

- 6. The event will end at 12 noon sharp and scores will be tallied and announced at 1p
- 7. If a residency has multiple teams, their scores will be combined and averaged
- 8. One station involves brief use of kayaks for simulated water rescue. Up to 4 members of any team can be on the kayaks, but anyone going on the water must have a digitally signed waiver:



Simple Adventures Waiver: https://waiver.smartwaiver.com/w/57099330abbbb/web

9. Most importantly, HAVE FUN! Gentle smack talk is allowed, but remember we are all on the front lines together. EM is a tight-nit family... so if a competitor dies of exhaustion, *consider* stopping to help. See you at the finish line!





Interactive Google Earth Map:



Let us take a moment to remember a fallen hero, Detroit Fire Sgt. Sivad Johnson, who died in 2020 while helping save 3 girls from drowning at Belle Isle. Per The Detroit News,

"The 26-year veteran of the department and his daughter were walking near the Yacht Club when they heard three young girls screaming for help from the water, Fornell told The Detroit News.

"He's a firefighter, he saw the girls in distress and jumped in. He's done that his entire career," Fornell said. "Something happened, and it's unfortunate to have lost one of our own that way." ...

"It is believed [Johnson] may have been dragged underwater by the rip-current and no one noticed," Michigan State Police said."¹

"Johnson was a 26-year veteran of the Detroit Fire Department's Fire Engine 59 and a recipient of the 2017



Medal of Valor. "He was my idol," said Jamal Johnson, Sgt. Sivad Johnson's brother. "He was always a hero to me." Sgt. Johnson always wanted to help others and he died doing just that."²

References

Detroit News, Aug 21 2020 https://www.detroitnews.com/story/news/local/detroitcity/2020/08/21/search-underway-man-reported-missing-detroits-belle-isle/3417039001/



References to ruminate on, en-route to this station

1. Cohen, A. Femoral artery Doppler ultrasound is more accurate than manual palpation for pulse detection in cardiac arrest. Resuscitation, 2022.



- Rolston, D. Time is running out for manual pulse checks as ultrasound races past. Resuscitation, 2022. <u>https://www.resuscitationjournal.com/article/S0300-</u> <u>9572(22)00622-0/fulltext</u>
- 3. Rabjohns, J et al. *Pesudo-pulseless electrical activity in the emergency department, an evidence based approach*. The American Journal of Emergency Medicine, 2020. https://www.sciencedirect.com/science/article/abs/pii/S0735675719306527?via% 3Dihub
- 4. Koch, M et al. Carotid Artery Ultrasound in the (peri-) Arrest Setting A Prospective *Pilot Study.* Journal of Clinical Medicine, 2022.
- 5. Adedipe, A et al. Carotid Doppler blood flow measurement during cardiopulmonary resuscitation is feasible: a first in man study. Resuscitation 2015.
- 6. Catena, E et al. Association between left ventricular outflow tract opening and successful resuscitation after cardiac arrest. Resuscitation, 2019.



(5-10mins) Board the Detroit Fire Boat and discuss a day in the life of the crew of the *Sivad Johnson*. If we get a patient from them, what have they had to do to get that patient to us in the hospital?

- 1 Point Please describe to faculty at least <u>three</u> (3) things you learned from the crew of the *Sivad Johnson* about the Detroit Fire Boat and their challenges facing emergency scenarios on the water and pre-hospital patient care
- 1 Point Faculty will select the two teams that asked the *best* questions to get this extra point. What are the "best" questions? The ones deemed most insightful, provocative, or thoughtful; or the ones that generate interesting/unique answers from the crew

(<10 mins) On shore, engage with faculty regarding POCUS guided resuscitation:

- 1 Point How accurate is a manual pulse check for determining pulselessness?
- 1 Point What is the difference between PEA and "pseudo"-PEA?
- 1 Point How can you tell the difference without ultrasound?
- 1 Point List at least 3 ways you can use POCUS to assist in differentiating whether there is true pulselessness at a pulse check (i.e. how do you get better information than just your finger)

Carotid doppler blood flow measurement is currently being researched as a means of guiding adequate CPR^{4,5}. In particular, the carotid **End Diastolic Velocity** (EDV) is proposed to be an important indicator, since adequate <u>diastolic</u> flow is required to ensure steady cerebral perfusion.⁴

1 Point What is a normal physiological EDV? (High quality CPR should try and match this!)

1 Point Measure the carotid End Diastolic Velocity on your teammate

Maybe there's cardiac activity, but is there enough blood pressure? **Peak Systolic Velocity** (PSV) of the femoral artery has been shown to correlate with blood pressure in cardiac arrest. Specifically, a $PSV \ge 20$ cm/s was more accurate than palpation to detect systolic blood pressure ≥ 60 mmHg.

1 Point Measure the femoral artery PSV on a teammate (for SonoW.A.R. purposes please measure the femoral artery at the mid-thigh level for modesty and also because it's more of a challenge!)
1 Point Complete this station within 10 minutes (time on Fire Boat does not count)



During <u>World War II</u>, the US military used Belle Isle Park for amphibious assault training. They also staged a re-enactment of the invasion of a Pacific Island invasion by the Navy and Marine Corps.¹

Your team witnesses a mass casualty event during one of these training scenarios. A tank slips off the ramp from the Tank Landing Craft and crushes several personnel. You are armed with your ultraportable PoCUS device and must rapidly triage who requires the most urgent surgical intervention.



By comparing novice and expert EM residents, it has been shown that EM residents' FAST exam skills can be *objectively measured* by differences in their probe motion efficiency, scanning time, and probe path length.²



References and neat articles to consider perusing en-route to this station:

- 1. Rodriguez, Michael; Featherstone, Thomas (2003). Detroit's Belle Isle Island Park Gem. Arcadia Publishing. p. 85.
- 2. Bell, C et al. Sonographic Accuracy as a Novel Tool for Point-of-care Ultrasound Competency Assessment. SAEM AEM Education and Training, 2017.
- 3. Lobo, V et al. Caudal Edge of the Liver in the RUQ View is the Most Sensitive Area for Free Fluid on the FAST exam. Western Journal of Emergency Medicine, 2017.
- 4. Prats, M. The Most Sensitive View of the FAST. Ultrasound G.E.L. 2017 https://www.ultrasoundgel.org/posts/LwcLMSANIyDYtgr2Y1I22g
- 5. FAST Exam, WikEM. Accessed 2021. https://wikem.org/wiki/FAST_exam
- 6. *Thoracic Trauma*, STATPearls. Accessed 2021. https://www.statpearls.com/ArticleLibrary/viewarticle/30078



1 Point	What part of the abdomen – specifically – is the most sensitive area for free fluid on the FAST exam?
1 Point	What is the lowest amount of free fluid in the abdomen that can be reliably seen on FAST exam?
1 Point	List three types of patients that may have a false-positive FAST exam
1 Point	If the patient is just going to the CT scanner anyways, what's the point of the FAST exam anymore?

First-touch accuracy: Choose your teammate to perform a FAST exam on. You <u>do not get to slide</u> your probe once it touches the skin! (Rocking, tilting, and fanning *are* allowed)

1 Point	Identify all three RUQ areas of significance without sliding your probe on the skin
1 Point	Identify all three LUQ areas of significance without sliding your probe on the skin
1 Point	Identify three areas of fluid collection in the pelvis without sliding probe on skin
1 Point	Be able to identify presence or absence of pericardial fluid on first skin contact
1 Point	On a different teammate, perform an entire FAST exam (with satisfactory imaging of ALL views above) in less than 45 seconds.
1 Point	Complete this entire station within 10 minutes



During the 2009 Detroit Free Press / Flagstar Marathon, three men (ages 26, 36 and 65) died within minutes of each other near or at the finish line.

As the Detroit Free Press reported the next day:

"It had been a chilly, but buoyant morning. And then tragedy hit at 9:02 a.m.

That's when Daniel Langdon, 36, of Laingsburg collapsed on Michigan Avenue between the 11- and 12-mile markers ...

Fifteen minutes later, at 9:17 a.m, 65-year-old Rick Brown of Marietta, Ohio, collapsed near where Langdon went down...

And then Jon Fenlon, 26, of Waterford collapsed at about 9:18 a.m., just after finishing the half-marathon in 1:53:37.

Marathon doctors and race officials said rapid, state-of-the- art resuscitation was provided. There were 14 doctors on the team of more than 60 health workers, directed by an emergency physician from Detroit Receiving Hospital."



https://www.youtube.com/watch?v=Wi-b-AKUhPY



You find yourself as part of the team tasked with preparing medical care for this year's Detroit Marathon, which takes place Saturday Oct 18^h 2025.



References and illuminating articles to consider taking a peek at en-route to this station:

- 1. Dayer, M et al. *Mortality during marathons: a narrative review of the literature*. British Medical Journal Open Sport and Exercise Medicine, 2019.
- 2. Bennett, B et al. *Wilderness Medical Society Clinical Practice Guidelines for the Management of Exercise-Associated Hyponatremia: 2019 Update.* Wilderness and Environmental Medicine, 2019.
- 3. Malbrain, M et al. *Everything you need to know about deresuscitation*. Intensive Care Medicine, 2022.
- 4. Zavorsky, G et al. *Pulmonary Edema is frequently triggered by marathon running*. European Respiratory Journal, 2012.
- Hanson, M. The Most Bizarre Marathon in Olympic History. Outside Magazine. Website, accessed May 2023. <u>The</u> <u>https://www.outsideonline.com/health/running/culture-running/history/strange-running-history-the-1904-olympic-marathon/</u>
- 6. Beaubien-Souljiny W, et al. *Quantifying systemic congestion with Point-Of-Care ultrasound: development of the venous excess ultrasound grading system.* Ultrasound Journal, 2020
- 7. The VExUS Score: Fluid Status, Reconsidered. Florida College of Emergency Physicians. https://fcep.org/the-vexus-score-fluid-statusreconsidered/?utm_source=rss&utm_medium=rss&utm_campaign=the-vexusscore-fluid-status-reconsidered





1 Point Medical resources are finite and generally limited at a large event such as a marathon. During which stage of a marathon do most deaths occur?

One author notes "Marathon running is linked to an increased risk of pulmonary edema, and it seems that women are at higher risk than men regardless of marathon finishing time."³

- 1 Point The most common cause of death in marathon runners in due to intrinsic heart disease, predominantly in men over 40.¹ What is a more common cause of death in younger marathon runners?
- 1 Point The Wilderness Medical Society recommends avoidance of overhydration. How much should you drink during endurance exercise?
- 1 Point You encounter a marathon runner that is displaying moderate respiratory distress and altered mental status. How can you use POCUS to differentiate between dehydration, cardiogenic pulmonary edema (such as MI), and noncardiogenic pulmonary edema (such as from exercise induced hyponatremia)?

The term **"deresuscitation"** was coined in 2014 and defined as active fluid removal in patients with fluid overload.³ It has become recognized that both fluid administration and fluid removal have potential for both harm and benefit.

1 Point The VEXUS score uses POCUS to assess if there is vascular congestion (volume overload). What is the most common reason in critical care for an elevated VEXUS score?

Measure your teammate's VEXUS score using POCUS

- 1 Point Assess IVC
- 1 Point Assess Hepatic Vein
- 1 Point Assess Portal Vein
- 1 Point Assess Renal Vein

1 Point Complete this entire station within 10 minutes



On the morning of June 11, 1805, you are suddenly awoken by the smell of smoke blowing through your Detroit home's window. You immediately gather your belongings and head outside only to find a nearby barn set ablaze. A bystander is watching in awe, with ashes from his pipe falling onto the ground. As you watch flames from the barn spread to nearby wooden structures, you are worried about the other 600 residents in the city and take immediate action as there was no professional fire department in the area at this time. You organize fellow civilians to form a 'bucket brigade', a line of people transporting buckets of water from the Detroit River to burning portions of the city.



The official Flag of the City of Detroit commemorates the great fire of 1805 which destroyed the city. Two women stand in the foreground while on the left, the city burns in the background and a woman weeps over the destruction. The woman on the right consoles her by gesturing to a new city that will rise in its place. Two Latin mottos read "Speramus Meliora" ("We hope for better things) and "Resurget Cineribus" ("It will rise from the ashes")⁷.

Wildfire Incineration Station Teaching Point Guide (for Residents)

- Kameda, T et al. Point-of-care ultrasound detection of tracheal wall thickening caused by smoke inhalation. Crit Ultrasound J. 2014 Jul 9;6(1):11. doi: 10.1186/2036-7902-6-11. PMID: 25097745; PMCID: PMC4105106.
- 2. Zheng, L et al. Escharotomy. StatPearls, August 2023. https://www.ncbi.nlm.nih.gov/books/NBK482120/, accessed 2024.
- NYSORA, Erector Spinae Plane Nerve Block. NYSORA website, https://www.nysora.com/erector-spinae-plane-block/, accessed 2024
- 4. Peck, M. Escharotomy Indications. Arizona Burn Center. Escharotomy Procedures for Burn Patients. May 26, 2015.
- 5. Guidelines for burn transfer referral American Burn Association https://ameriburn.org/resources/burnreferral/
- 6. US Forest Service. Wildfire Management. Huron-Manistee National Forests website, accessed 2024
- 7. Great Detroit Fire of 1805 <u>https://detroithistorical.org/learn/encyclopedia-of-detroit/great-fire-1805</u>
- 8. Detroit Historical Society, <u>https://www.detroithistorical.org/learn/online-research/encyclopedia-of-detroit/flag-detroit</u>









1 point	The background of the Flag of the City of Detroit is comprised of four different designs, one in each corner. What do they represent?
1 point	What is the first and most critical initial step in responding to wilderness emergencies and mass casualties?
1 point	A victim is found in the middle of a nearby smoldering building. What should be done before assessing this patient's medical status?
1 point	Once this is done, you notice that the victim is in respiratory distress. You recall that smoke inhalation is the leading cause of death in fires and can result in rapid airway swelling.
	Pick a teammate to be your burn victim. Demonstrate how to assess for tracheal wall thickening using POCUS
1 point	The patient is clearly having difficulty in breathing secondary to their circumferential trunk burns. Describe how to perform a truncal escharotomy.
1 point	Identify key landmarks on your victim for an ultrasound-guided Erector Spinae block to facilitate your escharotomy
1 point	Demonstrate how to perform an ultrasound-guided Erector Spinae block on the phantom, including choice of medication and dose
1 point	Perform an escharotomy on your teammate using your "scalpel" (skin marker) identifying where you would make your incisions for a truncal escharotomy
1 point	What are at least 3 criteria that warrant immediate consultation and consideration for transfer to a tertiary burn center?
1 point	Complete this station within 10 minutes



True Story. Recently a local man was mowing some new weeds in his lawn and ended up on a ventilator and hospitalized for 109 days¹. It was initially mistaken for COVID but further investigation determined he had been mowing poison hemlock and the aerosolized toxins caused paralysis and alveolar hemorrhage². In recent years, poison hemlock has begun spreading both locally and across the Untied States³.

Additionally, there are multiple medical case reports of people ingesting poison hemlock after mistaking it for lookalikes such as parsley, chervil, or wild carrot (Queen Ann's Lace).



You are hiking today's trails for the SonoW.A.R. and notice one of your teammates showing off their toxicology skills by identifying and snacking on some wild plants they found growing here along the banks of Belle Isle. They then become ill.



References and thought-provoking articles to consider while en-route to this station:

- 2. Barbuto, A et al. *Potentially toxic plant ingestions in children: Clinical manifestations and evaluation*. <u>www.Uptodate.com</u>, 2022.
- 3. Schep, Leo et al. *Poisoning due to water hemlock*. Clinical Toxicology (2009) 47, 270–278
- 4. US Department of Agriculture Research Service. *Poisonous Plant Research, Poison Hemlock (Conium Maculatum)*. Accessed 2022. <u>https://www.ars.usda.gov/pacific-west-area/logan-ut/poisonous-plant-research/docs/poison-hemlock-conium-maculatum/</u>
- 5. Santana, P et al. *Diaphragmatic ultrasound: a review of its methodological aspects and clinical uses.* Jornal Brasileiro de Pneumologia, 2020.
- D'Andrea, A et al. Transcranial Doppler Ultrasound: Physical Principles and Principle Applications in Neurocritical Care Unit. Journal of Cardiovascular Echocardiography, 2016. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5224659/

References and frightening articles from the title page:

- 1. *Lethal Poison Hemlock Plant Can Cause Respiratory Failure*. New York Post, 2022. https://nypost.com/2022/03/31/lethal-hemlock-plant-can-cause-respiratory-fa/
- The Highly Poisonous Plant That Could Be Hiding In Your Backyard. Good Housekeeping, 2022. https://www.goodhousekeeping.com/home/gardening/a39562625/ poisonhemlock-dangers-ohio-man-hospitalized/
- 3. *Invasive Poison Hemlock Takes Root in Macomb County*. Warren Weekly, 2020. https://www.candgnews.com/news/invasive-poison-hemlock-takes-root-inmacomb-county-117912
- 4. West, P et al. *Poison Hemlock-Induced Respiratory Failure in a Toddler*. Pediatric Emergency Care, 2009

Station 5: Toxic Ingestion Station

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1 Point	Name a historical figure who famously died from drinking poison hemlock.
1 Point	What parts of the poison hemlock plant are dangerous?
1 Point	What toxidrome does poison hemlock (Conium Maculatum) produce?
1 Point	What is the hallmark and <i>most dangerous</i> feature of poison hemlock (<i>Conium Maculatum</i>) toxicity and how is it treated?
1 Point	You suspect your teammate is developing respiratory paralysis from poison hemlock toxicity. What does paradoxical motion of the diaphragm on m-mode indicate during a voluntary sniffing maneuver?
1 Point	Assess your teammate's diaphragmatic mobility during quiet breathing, deep breathing, and voluntary sniffing.
1 Point	<u>Water</u> hemlock (<i>Cicuta</i> and <i>Oenanthe</i> spp.) looks similar to <u>poison</u> hemlock (<i>Conium spp.</i>) and is also frequently mistaken for edible wild plants. It is the most deadly native plant in North America (but via a different mechanism of action). Identify which of the plants on the table is potentially poisonous vs safe

Your teammate eats water hemlock and goes into status epilepticus, and begins to show signs of a subarachnoid hemorrhage. Many ICU's use transcranial doppler ultrasonography to identify cerebral hemodynamic changes, diagnosing vasospasm before appearance of clinical neurological deficits, and can suggest earlier intervention³.

1 Point A transcranial doppler cutoff of >200cm/s can predict the presence of MCA vasospasm and <120cm/s can predict the absence of MCA vasospasm. Measure the MCA transcranial doppler peak velocity on your teammate.

A wise toxicologist once said, "If you find yourself in the wilderness, be a carnivore catch your food... If you try to forage for edible plants you will poison yourself and die."

1 Point For one point demonstrate how to build a snare trap using survival paracord

1 Point Complete this station in 10 minutes



For almost 2 million years, the Great Lakes area of Michigan was intermittently covered by glaciers during a period called the Ice Age. Sea level dropped as much as 492 feet as water was locked in glacial ice and continental ice sheets covered as much as 30 percent of the earth's land surface. Nearly all of the landforms, hills, lakes, and rivers of southeast Michigan were formed during the retreat of the last continental glacier.



You and your team suddenly find yourselves at the top of one of these glaciers, towering thousands of feet above what would eventually become the top of the Detroit Renaissance Center. Some of you feel short of breath. Some have headaches.



References to ponder en-route to this station

- 1. Gifts of the Glaciers www.oaklandcountyblog.com
- 2. Auerbach, P. <u>Field Guide to Wilderness Medicine</u>, 4th Ed. Chapter 1, High Altitude Medicine. Elsevier. 2013
- 3. Wipplinger, F, et al. *Point-of-Care Ultrasound Diagnosis of Acute High Altitude Illness: A Case Report.* Wilderness & Environmental Medicine, 2021
- 4. Yang W, et al. *Lung Ultrasound Is Accurate for the Diagnosis of High-Altitude Pulmonary Edema: A Prospective Study.* Canadian Respiratory Journal, 2018
- 5. Raffiz, M. Optic nerve sheath diameter measurement: a means of detecting raised *ICP in adult traumatic and non-traumatic neurosurgical patients*. Am J Emer Med, 2017
- 6. Copetti R and Cattarossi L. *Optic nerve ultrasound: artifacts and real images*. Intensive Care Medicine, 2009

Station 6: Elevation Station



1 Point	Navigate to this station and take a selfie
1 Point	As you ascended the glacier, you noticed one of your teammates developing symptoms concerning for acute mountain sickness. Name 5 of the symptoms that are part of the Lake Louise Score for the diagnosis of AMS.
1 Point	What medication(s) could have been taken to prevent their headache?
1 Point	What feature(s) distinguish acute mountain sickness from HACE? What is the definitive treatment for both?
1 Point	Identify and demonstrate proper technique for assessing elevated intracranial pressure on POCUS
1 Point	What is the most common pitfall when performing an ultrasound measurement for elevated intracranial pressure? How can one assure they are measuring the correct structure?
1 Point	What other eye emergencies commonly occur at very high altitude?

Hypoxia triggers hypoxic pulmonary vasoconstriction, which leads to marked increase in

pulmonary artery pressures (pulm HTN), leakage of fluid into alveoli, and non-cardiogenic pulmonary edema.

- 1 Point What echocardiography findings would you expect to see with HAPE? (Demonstrate on your teammate how you would assess with TAPSE)
 1 Point What artifact does non-cardiogenic pulmonary edema create on lung ultrasound? If you see this artifact, what other life threatening pulmonary complication is *ruled out*?
- 1 Point How do you treat HAPE?



Your family is exploring the parks and wetlands around metro Detroit when your child screams out after feeling a sharp pain in their ankle just above the boot, and you see a snake slither away into the brush. They start to feel lightheaded. You take a picture of the snake.

You become concerned because you recall a fatal 2018 incident in Detroit where a 26yo male was bitten by a pet cobra and died, despite a multistate effort to scramble and administer 8 vials of antivenom.²

You were additionally concerned by a news story from 2019 where two Michigan residents were bitten by rattlesnakes in one month.³ Although neither died, one patient required a week of hospitalization and required use of a cane to walk for a prolonged time afterwards.



"All I felt was....my ankle was on fire," Bowen said. "It was just immediate. I took a couple steps and set down the stuff, and I turned around and it was a huge snake.

I kind of took a couple steps towards it and it rattled. But I wasn't sure because I'd never seen a rattlesnake before." ³

References

- 1. Michigan Department of Natural Resources <u>www.michigan.gov/dnr</u>
- 2. Zaniewski, A. *Bite from exotic snake sparks multistate scramble for antivenom*. Detroit Free Press, 2018.
- Afana, D. Two Michigan residents bitten by rare rattlesnake in one month. M Live, 2019. https://www.mlive.com/news/annarbor/2018/09/pinckney_woman_bitten_by_rattl.html



Recommended readings and ideas to discuss en route to this station:

- 1. Crotalidae Envenomation StatPearls, 2021. https://www.ncbi.nlm.nih.gov/ books/NBK551615/
- 2. Zhou A, et al. Interobserver Agreement of Inferior Vena Cava Ultrasound Collapse Duration and Correlated Outcomes in Children with Dehydration. Pediatric Emergency Care, 2022. https://pubmed.ncbi.nlm.nih.gov/32530838/
- 3. Leviter, J et al. *"Full Stomach" Despite the Wait: Point-of-Care Gastric Ultrasound at the Time of Procedural Sedation in the Pediatric Emergency Department*. Academic Emergency Medicine, 2019. https://pubmed.ncbi.nlm.nih.gov/30372569/

Station 7: Pediatric Envenomation Station

1 Point	Navigate to this location
1 Point	What is the only venomous snake native to Michigan?
1 Point	Identify it on the picture provided of snakes native to Michigan
1 Point	Which of the following are recommended for immediate management of snakebites: Tourniquet to the limb; Sucking out venom; Cutting the wound to remove venom; Immobilizing the limb to prevent lymphatic spread; Catching the snake / killing it to bring it in for identification.
1 Point	What are the main/significant differences between pit vipers, rattlesnakes, cottonmouths, and connerbeads?

Emergency management of shock and bleeding, followed by timely antivenom administration to patients with progressive tissue swelling or systemic toxicity after Crotalinae envenomation, are the most common actions needed when stabilizing patients with Crotalinae snakebites.

1 Point But when should you administer antivenom?? I.e., which physical exam findings or laboratory values should alert you to "pull the trigger" to receive antivenom?

Hypovolemia from hemorrhage, fluid shift into the bitten limb, and/or direct venom effects with vasodilation may cause shock with hypotension.

Interesting recent studies have shown that in the pediatric ED population, eyeball assessment of the IVC collapse *time* may accurately reflect degrees of hypovolemia or dehydration.

1 Point The super cool volunteer child in front of you was bitten by a snake and you are assessing for hypovolemia and vasodilation. What is their IVC collapse time? Based on this would you administer IV fluids, PO fluids, or none?

Some populations of these snakes possess a neurotoxin that can produce weakness and respiratory failure. When there is time to consider airway options other than emergent RSI, a new and growing trend in anesthesia literature is the use of gastric POCUS to assess a patient's aspiration risk.

- 1 Point EMS arrives to transport the child and decides to place an advanced airway. Should you use mild sedation and an LMA or jump to RSI? The parents report last meal was pancakes about 6 hours ago. According to ACEP, what is the association between fasting time and aspiration?
 1 Point What are the four categories you should be looking for with Gastric POCUS?
- 1 Point Assess and stratify this patient's gastric contents using point of care ultrasound

Station 7: Pediatric Envenomation Station



Snakes in Michigan



In this scenario, your team is kayaking on some of Michigan's numerous rivers and waterways and encounter a mass casualty drowning accident, with no immediate road access nearby for EMS/rescue services to reach you.



You must split your team up to best address the needs of these victims





Water Extrication Station: Study Guide Hints Page 1 of 2

Consider Reviewing these articles / resources:

• Szpilman, D et al. *Drowning*, New England Journal of Medicine, 2012.



https://www.nejm.org/doi/full/10.1056/NEJMra1013317





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Station 8: Water Extrication Station

Water Extrication Station: Study Guide Hints Page 2 of 2

- The United States Army. Reach, Throw, Row Don't Go!, website, 2011 •
- T-shirts, life jackets, or parkas can be used with tree branches to fashion an improvised ٠ litter for evaucation. Per the Field Guide to Wilderness Medicine, 5th Ed:







Station 8: Water Extrication Station



1 Point	Navigate to this station and complete it in 10 minutes
1 Point	You do not have the advanced training in rescue that Fire Sgt Johnson had. For laypersons, The American Red Cross and the US Army Corps of Engineers advocate the "Reach Throw Row – Don't Go" ^{4,5} policy to help someone in distress in the water. What are at least three options you have to assist a potential drowning victim?
1 Point	"The principles of lung ultrasound used in other respiratory emergencies seem to be applicable in the evaluation of drowning and near-drowning victims." ³
	Auscultating for rales is stupid. What findings would you expect to find on lung ultrasound for a near drowning patient that are much more specific for pulmonary edema than "rales"?
1 Point	How many lung fields should be assessed with lung POCUS to count as "assessing all pulmonary fields"?
1 Point	Drowning victims may have more than one pathology (polytrauma). Other than lung sliding, what artifact on lung POCUS also <i>rules-out</i> pneumothorax?
1 Point	Have Group Delta successfully demonstrate the "Reach Throw Row – Don't Go" technique to rescue two drowning victims and bring them to the shore for the rest of the team to assess
1 Point	Have Group Alpha successfully demonstrate how to create a makeshift litter using only the materials available
1 Point	Using POCUS, identify which of your two victims has a significantly worse prognosis and has a higher likelihood of requiring intubation and ICU admission (vs discharge from the emergency department)
1 Point	Have one of your teammates assume the role of the drowning victim you have identified as needing the most emergent care. Now carry them on the litter to the extraction point where emergency vehicles can reach you!
1 Point	Many of the most dramatic and physiologically unexpected recoveries from cardiac arrest have been in young patients after cold-water drowning. ¹ If there is any uncertainty, resuscitation attempts should continue until patient is rewarmed to what temperature?



Your party is exploring the historic Detroit Salt Mines. In 1895, a large vein of rock salt was discovered in the Detroit area that was deposited 400 million years ago, as ancient bodies of water in the Michigan Basin were separated from the ocean and then evaporated. In 1910, the Detroit Salt Company completed a 1,060-foot shaft that was one of the most impressive engineering accomplishments of its time.¹

While exploring this mine, you become separated from your group and your arm gets stuck under a large boulder of Detroit salt. You have no choice but to cut your own arm off in a desperate bid for freedom.



Photo credit: https://www.digitaltrends.com/movies/127-hours-review/

References

1. Detroit Salt Mine – History of the Detroit Salt Mine <u>www.detroitsalt.com/history</u>



Identify with ultrasound on a teammate:

1 Point	Where you would block the three forearm nerves
1 Point	Where you would block the three roots of an Interscalene block
1 Point	Where you would block the three cords for a RAPTIR block
1 Point	(Must match all 3 right) Which nerve block would you perform for:
	a. Midshaft humerus fracture (or humerus pinned by a salt boulder)
	b. Mid-forearm fracture (or forearm pinned by a salt boulder)
	c. Compound metatarsal fracture (or hand pinned by a salt boulder)
1 Point	(Must get all 3 right) What is a safe and effective medication and dose (ie volume) for each of the above blocks?
1 Point	If you could only carry one needle into the wilderness, which would it be?
	Every block at this station can be easily completed with what type of needle found in every emergency department?
	iounu in every emergency department?

Your teammates find you and are able to help extricate you from the boulder. However, you find that pain in your leg is keeping you from being able to ambulate out of the mine. Damn sciatica!

Did you know that some physicians are using *sugar water*, not lidocaine, to treat compressive radiculopathies like carpal tunnel? Or even sciatica in the ED?

1 Point	What is the rationale for using D5W instead of local amide anesthetics?
1 Point	What volume of D5W has been described as effective at treating radicular sciatic pain in the ED?
1 Point	Identify the sciatic nerve from a transgluteal approach and any key anatomic landmarks

1 Point Complete this station within 10 minutes

Station 10: Penetration Station



A pivotal battle of the War of 1812 took place in these waters. Detroit was under bombardment and was faring poorly, and the entire Northwest Territory was surrendered to the British. However, in 1813 the cannons near this objective were used aboard ships in the Battle of Lake Erie, which paved the way for the capture of an entire British fleet and was a key turning point in the war.

These cannons include a 24-pound gun that was deadly at distances up to a quarter mile, and a 32-pound carronade which was more effective at close range.

You and your team find yourself caring for wounded sailors from the Battle of Lake Erie, armed with modern ultrasound equipment. There are a variety of penetrating trauma injuries before you.



References

- 1. The War of 1812 Cannons, Dossin Great Lakes Museum signage
- The War of 1812: Bombs over Detroit, by The Detroit News (http://blogs.detroitnews.com/history/2012/08/05/the-war-of-1812-bombs-overdetroit/)



References to kick around en-route to this station:

- 1. Taylor, et al. *Ultrasound-guided thoracostomy site identification in healthy volunteers*. Critical Ultrasound Journal, 2018
- 2. ATLS 10th Edition
- 3. *Thoracic Trauma*, STATPearls. Accessed 2021. https://www.statpearls.com/ArticleLibrary/viewarticle/30078
- 4. Inaba, K. *Radiologic evaluation of alternative sites for needle decompression of tension pneumothorax*. The Archives of Surgery, JAMA, 2012.

Station 10: Penetration Station



1 Point	Describe three ways to assess for tension pneumothorax in the field using only	
	physical exam and the equipment in your bag	

- 1 Point A 2012 study suggests that needle decompression through the 5th intercostal space in the anterior axillary line correlates with a lower chance of failure (16.7%) due to body habitus compared to 2nd intercostal space midclavicular line placement (42.5% failure).^{3,4} On a teammate, measure the depth from skin to pleura at these locations to compare which requires a shorter needle path
- 1 Point Recent publications have endorsed using ultrasound to identify the diaphragm and count rib spaces prior to tube thoracostomy insertion rather than rely on blind/landmark techniques.¹ Identify on a teammate where you would insert a chest tube via blind technique.
- 1 Point Identify on a teammate where the diaphragmatic border is via ultrasound. How close was your blind mark to the diaphragm?
- 1 Point How much initial blood output from the chest tube would convince you to convert to an open thoracotomy?
- 1 Point You suspect one of your patients has developed pericardial tamponade. What is the *earliest* indication on ultrasound of tamponade (ie. what is the ultrasound equivalent of pulsus paradoxus)?
- 1 Point Measure / assess this on PoCUS
- 1 Point You suspect your teammate's RV is showing collapse consistent with tamponade. Demonstrate on your teammate how you can tell if the collapse is systolic (i.e. normal) vs diastolic (i.e. tamponade)
- 1 Point Perform an emergency parasternal pericardiocentesis on your teammate (phantom)

1 Point Complete this station within 10 minutes

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