- Fernando, S et al. Necrotizing soft tissue infection: diagnostic accuracy of physical examination, imaging and LRINEC score: a systematic review and meta-analysis. Ann Surg. 2019 Jan;269(1):58-65.
  - A 2018 meta-analysis found pooled sensitivity of 68% and specificity of 85% using a cut-off of 6.
  - There are case reports of patients with a LRINEC score of 0 having OR-confirmed necrotizing fasciitis. Used in isolation, the score misses too many cases. However, the individual components are markers of systemic derangement and might be helpful for risk-stratification. It might help support your clinical diagnosis.
- **Imaging.** Cross-sectional CT imaging is often obtained when ruling out necrotizing soft tissue infections. If the CT scan is completely normal, it can be helpful as it is unlikely that there is infection that requires surgery. If there is a lot of edema, it can be hard to definitively determine if the edema is consistent with cellulitis or necrotizing soft tissue infection. Severe edema, gas, thickening of the fascia with tracking of the fluid is consistent with necrotizing fasciitis.
  - There isn't great data evaluating whether IV contrast is needed.
  - **Necrotizing infection is a clinical diagnosis and imaging may not be needed.**
  - **Plain x-rays are poorly sensitive for the diagnosis as they require a gas-forming organism and sufficient gas to show up on the x-ray.** Only a subset of organisms are gas-forming. X-ray is only about 50% sensitive but 94% specific. If you see gas, it can help solidify your diagnosis but a negative x-ray should not change your plan.
  - **MRI with gadolinium is considered the gold standard imaging.** The sensitivity approaches 100%. This approach is not feasible in most EDs.
  - **There may be some utility to ultrasound.** It is more accurate than x-ray. It can be performed rapidly at the bedside while talking to the patient. It can be repeated. Many of the other imaging modalities are negative early in the disease course.
    - **STAFF mnemonic.** Subcutaneous thickening, air and fascial fluid. Subcutaneous thickening refers to a thickened and irregular fascia or cobblestoning and edema near the fascial layer. Compare the affected side with the contralateral side. The dual mode feature allows side by side comparison. Air involves shadowing. It can look like clouds scattered in the tissue. 1 mm of fluid at the fascial layer is 87% sensitive but 50% specific. The specificity increases to 98% when there is 5 mm or more fluid.

Related Material

EMA 2019 May: Abstract 19: Prospective validation of the LRINEC score for the extremities

C3 - Soft Tissue Infections

Cardiology Corner: Clinical Decision Instruments

Amal Mattu, MD and Anand Swaminathan, MD

Take Home Points

- **There are new clinical decision instruments for ACS such as T-MACS and EDACS.**
- **Both T-MACS and EDACS are less subjective and have good negative predictive values and sensitivities.**
- **Comparison of the decision instruments found that T-MACS and EDACS were more sensitive than the HEART score but all three are reasonable options.**

- **There are some new scores that have recently come out such as the Troponin-only Manchester Acute Coronary Syndromes (T-MACS) and Emergency Department Assessment of Chest pain (EDACS).**
- Than, M et al. **Development and validation of the Emergency Department Assessment of Chest pain Score and 2 h accelerated diagnostic protocol.** Emerg Med Australas. 2014 Feb;26(1):34-44.

Variable	Value	Score
Age	18-45	2
	46-50	4
	51-55	6
	56-60	8
	61-65	10
	66-70	12
	71-75	14
	76-80	16
	81-85	18
	>86	20
Sex	Female	0
	Male	6
Known coronary artery disease	No	0
or >3 risk factors	Yes	4
Diaphoresis	No	0
	Yes	3
Pain radiates to arm, shoulder,	No	0
neck or jaw	Yes	5
Pain occurred or worsened	No	0
with inspiration	Yes	-4
Pain is reproduced by palpation	No	0
	Yes	-6

Low risk cohort has EDACS<16, non-ischemic EKEG and 0-hr and 2-hr troponin negative.

- Body, R et al. **Troponin-only Manchester Acute Coronary Syndromes (T-MACS) decision aid: single biomarker re-derivation and external validation in three cohorts.** Emerg Med J. 2017 Jun;34(6):349-356.

$$\text{Probability of ACS (p)} = \frac{1}{1 + e^{-(1.713E + 0.847A + 0.607R + 1.417V + 2.085S + 1.208H + 0.089T - 4.766)}}$$

E: EKG ischemia	No	0
	Yes	1
A: Worsening or crescendo angina	No	0
	Yes	1
R: Pain radiation to the right arm or shoulder	No	0
	Yes	1
V: Pain associated with vomiting	No	0
	Yes	1
S: Sweating observed	No	0
	Yes	1
H: Hypotension	No	0
	Yes	1
T: hs-cTnT concentration on arrival	Hs-cTnT value on arrival	

- **Both of these scores are validated.** They have good negative predictive values and sensitivities (98-99%). If the HEART score is 3 or less, especially with two negative troponins, you can discharge the patient knowing the likelihood of an adverse outcome is less than 1%. The EDAC and T-MACS score are similar. They likely allow discharge of more patients than the HEART score.
- Body, R et al. **Comparison of four decision aids for the early diagnosis of acute coronary syndromes in the emergency department.** Emerg Med J. 2020 Jan;37(1):8-13.
  - Patients were enrolled from 18 different centers around the UK and the HEART, EDACS, T-MACS and TIMI scores were applied looking at which score was the best at predicting major adverse cardiac events at 30 days and sensitivity for ACS.
  - They enrolled 999 patients in the study. T-MACS had a 99.2% sensitivity and was able to risk-stratify 46.5% of patients to the extremely low risk group. EDACS had 96% sensitivity with 48% of patients designated low risk. Both scores outperformed the HEART score. The HEART score had 96% sensitivity but only 35% were low risk.
  - Is there bias? This study was done in 18 different centers in the UK. There needs to be external validation.
  - The HEART score often utilizes two troponins. In this study, they only used one troponin on arrival. If they had done the HEART pathway, the HEART score may have performed better.
- **The T-MACS and EDACS scores are good.** Any of these 3 scores are reasonable. The questions in T-MACS and EDACS scores are less subjective.

Related Material

EM:RAP 2018 January: Origin of the HEART Score

Status Epilepticus

Justin Morgenstern, MD

Take Home Points

- **In trials of status epilepticus, the second-line agent failed half the time.**
- **After 15 minutes of seizure, the risk of adverse outcome increases.**
- **Current algorithms for status epilepticus allow too much time to elapse. Be aggressive in trying to control the seizure early.**
- **Anesthetic agents such as phenobarbital and propofol may be helpful in the management of status.**

- **Patients in status epilepticus have high mortality and bad neurologic outcomes.** We do not do a good job managing patients in status epilepticus. The current status epilepticus algorithms take too long and fail too often.
- **There were three large trials published last year.**
  - Dalziel, S et al. **Levitiracetam versus phenytoin for second-line treatment of convulsive status epilepticus in children (ConSEPT): an open-label, multicentre, randomised controlled trial.** Lancet. 2019 May 25;393(10186):2135-2145.
  - Lyttle, M et al. **Levetiracetam versus phenytoin for second-line treatment of paediatric convulsive status epilepticus (EcLiPSE): a multicentre, open-label, randomised trial.** Lancet. 2019 May 25;393(10186):2125-2134.
  - Kapur, J et al. **Randomized trial of three anticonvulsant medications for status epilepticus.** N Engl J Med. 2019. Nov 28;381(22)2103:2113.
- **These three trials showed that it does not matter what second-line agent you use.** However, these trials also showed something much more important. **In all of these trials, the second-line agent failed about half the time.** Even when it worked, it took a long time. Many of these patients were still seizing 45 minutes to an hour after arrival. This is a big problem. The longer a seizure lasts, the risk of bad neurologic outcome and death increases.
- **Prolonged seizures cause physiological problems like rhabdomyolysis, hypoglycemia, metabolic acidosis and airway issues.** Most people can hold their breath for two minutes but