TABLE: CHARACTERISTICS OF PATIENTS AND ED COURSE

Age (years)	4	15	84	90
Gender	Female	Female	Male	female
Bone/joint involved	Ulna	Ankle	Hip	Shoulder
Injury	Fracture	Fracture/dislocation	Dislocation	Fracture/dslocation
Narcotic used	Fentanyl	Morphine + fentanyl	Morphine	Morphine
Total Dose (mcg/kg)	1	70 + 1.2	70	70
Time before ketamine (min)	-3	68 and 6	163 and 138	120 and 97
Ketamine dose (mg/kg)	1	1.2	1	2
Reason for naloxone	pCO2 increased to 47	Unresponsive verbally	Apnea	Difficulty breathing
Other intervention	Bag valve mask		Sternal rub	
Time: ketamine to naloxone (min)	33	4	12	5
Naloxone dose (mcg/kg)	50	3	4	33
Patient disposition	Home	Admitted	Admitted	Admitted

No, authors do not have interests to disclose

15 Diagnostic Performance of the MI^3 Machine Learning Algorithm in Patients With an Initial Indeterminate Troponin

Mahler S, Snavely A, Jackson L, Stopyra J, Ashburn N, Supples M, Miller C, Murtagh G/Wake Forest School of Medicine, Winston Salem, North Carolina, US

Study Objectives: Ruling out myocardial infarction (MI) among emergency department (ED) patients with an indeterminate (detectable to mildly elevated) initial troponin measure is challenging for emergency clinicians. MI^3 is a machine learning algorithm designed to aid the diagnosis of MI, but it has yet to be studied in an ED population with indeterminate troponins. Thus, this study seeks to evaluate the diagnostic performance of MI^3 among patients presenting to the ED with chest pain who had an initial indeterminate troponin measure.

Methods: We conducted a secondary analysis of the CMR-IMPACT trial cohort, which prospectively enrolled adult patients with symptoms suggestive of acute coronary syndrome who had an initial clinical contemporary troponin of 0.006-1.0 ng/ml across four U.S. hospitals. For this analysis, patients with initial and 3-hour high-sensitivity cardiac troponin I (Abbott Laboratories) measures were included. Each patient was classified by MI^3 into low-, moderate-, and high-risk groups. The primary outcome was adjudicated MI at 30 days. The sensitivity, specificity, and negative likelihood ratio (-LR) of MI^3 for MI at 30 days was calculated and reported with 95% confidence intervals. A receiver operator characteristics curve for MI at 30 days was created and area under the curve (AUC) for MI^3 was calculated.

Results: Among 207 patients, 34.3% (71/207) were female and 33.3% (69/207) non-white, with a mean age of mean age 61±11 years. Among these patients, within 30 days, MI occurred in 43.5% (90/207). The AUC for MI^3 for the detection of MI at 30 days was 0.882 (95%CI: 0.833-0.932). MI^3 classified 34.8% (72/207) of patients as low-risk, of which 8.3% (6/72) had MI at 30 days, yielding a sensitivity of 93.3% (95%CI: 86.1-97.5%) and -LR of 0.12 (95%CI: 0.05-0.26). Among the 47.3% (98/207) classified as moderate-risk, MI at 30 days occurred in 48.0% (47/98). MI^3 classified 17.9% (37/207) as high-risk, among which 100% (37/37) had MI at 30 days, yielding a specificity of 100% (95%CI: 96.9-100%).

Conclusion: Among ED patients with an initial indeterminate troponin measure, the MI^3 machine learning algorithm had an excellent AUC and high specificity, suggesting that it may be useful as an aid in diagnosis of MI in this challenging patient population.

Yes, authors have interests to disclose
Disclosure: Abbott Laboratories
Grant Support Abbott Laboratories
Disclosure: Abbott Laboratories
Consultant/Advisor Abbott Laboratories
Disclosure: Abbott Laboratories
Employee
Abbott Laboratories
Disclosure: Abbott Laboratories
Employee
Abbott Laboratories

16 Deriviation of a Clinical Decision Aid to Rule Out Acute Aortic Syndrome in Patients Presenting to the Emergency Department With Chest Pain

Ohle R, Tavafi M, Sharma D, McIsaac S, Schneider S/Northern Ontario School of Medicine University, Health Sciences North Research Institute, Sudbury, Ontario, CA

Background and Study Objectives: Acute aortic syndrome (AAS) is a rare clinical syndrome encompassing acute aortic dissection, intramural hematoma and penetrating atherosclerotic ulcer. It has a high mortality and is often missed. There are no validated clinical decision aids that can define a low-risk group requiring no further investigation. The objective of this study was to create a clinical decision aid that can rule out AAS in patients presenting to the emergency department with chest pain.

Methods: Multi-centre historical cohort study. We recruited consecutive patients presenting to one of 68 emergency departments with non-traumatic chest pain. AAS outcomes were identified through an admission, discharge or death certificated diagnosis of acute aortic syndrome. We developed multivariate models to predict AAS. We used recursive partitioning, logistic regression and machine learning techniques. We report sensitivity, specificity, positive/negative likelihood ratio and 95% CI. We used multiple imputations by chained equations to handle missing data. We estimated a sample size of 100 outcomes to derive a decision aid with 100% sensitivity and a 95% CI of 98-100%.

Results: We recruited 148,839 patients presenting with non-traumatic chest pain(129 cases of acute aortic syndrome(0.09%)). The simplest model was through recursive partitioning. We created a 4 variable rule: Age >50, Diastolic blood pressure >100mmHg, previous AAS, Severe Pain (>7/10). The rule had a sensitivity of 99.2% (95% CI 95.6- 99.9%), specificity of 48.6%(95%CI 48.3 – 48.8%), Positive likelihood ratio of 2 (95% CI 1.9-2.1), negative predictive value of 0.03(95% CI 0.01-0.1). The most accurate model was through machine learning (10-fold Cross-Validation and random forest technique). This model included age, sex, d-dimer, HBA1C, Hemoglobin, absolute lymphocyte count, percentage lymphocyte count, absolute neutrophil count, platelets, troponin, diastolic blood pressure, systolic blood pressure, GCS, height, pain score, pulse oximetry, heart rate, respiratory rate, temperature and weight. Random Forest had high sensitivity (100%, 95%CI 97.1-100%) and specificity (98%, 95%CI 98.1-98.3%), demonstrating strong precision (0.982), F1-score (0.991), and accuracy (0.991).

Conclusion: AAS is a rare diagnosis with a prevalence of 0.09% in patients presenting to the emergency department with chest pain. We have developed a simple bedside assessment tool and a more complex but more accurate tool to rule out AAS. If they are externally validated, they have the potential to improve the diagnosis and treatment of patients with AAS.

No, authors do not have interests to disclose

17 Determinants of Guideline-Directed Anticoagulation in Emergency Department Patients Admitted With Acute Pulmonary Embolism

Stubblefield W, Helderman R, Strokes N, Greineder C, Vinson D, Westafer L/Vanderbilt University Medical Center, Nashville, Tennessee, US

Study Objectives: Despite guideline recommendations for use of low molecular weight heparins (LMWHs) or direct oral anticoagulants (DOACs) in the treatment of most patients with acute pulmonary embolism (PE), studies in the United States demonstrate an increasing use of unfractionated heparin (UFH). Our objective was to identify barriers and facilitators of guideline-directed anticoagulant use in patients being admitted with acute PE.

Methods: We conducted semi-structured interviews with a purposeful sample of emergency physicians and hospitalists. Physicians were recruited from community and academic practice settings. We used maximum variation sampling to recruit physicians with high or low use of UFH in acute PE. We developed and piloted an interview guide using the implementation science frameworks—the Consolidated Framework for Implementation Research and the Theoretical Domains Framework. Interviews were recorded, transcribed, and analyzed in an iterative process using reflexive thematic analysis.

Results: We interviewed 24 emergency physicians and 13 hospitalists. Participants were diverse with regard to practice setting, years in practice, and primary anticoagulation strategy (UFH v. LMWH). Most clinicians were agnostic to

anticoagulation choice and did not perceive significant differences between UFH and LMWH with regards to risk (eg spontaneous bleeding, delay in therapeutic anticoagulation). Participants reported that institutional culture, clinical inertia, and hassle bias played a significant role in determining anticoagulation choice. Barriers to guideline-directed use of LMWH included the perception of UFH as "quick on, quick off" therapy, fear of decompensation or bleeding, and the desire to allow freedom in treatment modification. Facilitators of guideline-directed use included institutional protocols, knowledge of the pharmacokinetics of UFH, and the burden of UFH infusion protocols on patients and nursing staff.

Conclusion: Common barriers and facilitators exist to the use of guideline-directed anticoagulation in patients, particularly with regard to knowledge, fear, and institutional culture. Implementation efforts may consider targeting these domains.

Theme (subtheme in italics)	Theoretical domain (CFIR / TDF)	Representative quote (participant ID)
Fear of decompensation	Characteristics of individuals (CFIR) / Knowledge / Emotion (TDF)	*"if there is clinical decompensation and a decision to do some sort of an intervention, the heparin can be basically stopped or reversed and stopped."* (EM22)
Agnostic to anticoagulation choice	Characteristics of Individuals / Knowledge	*"In my own practice, it almost never matters which anticoagulant I choose"* (EM12)
Clinical inertia	Characteristics of Individuals	*"I guess it's just kind of what I was taught in residency, and I've never really wavered from that kind of thing."* (EM22)
Institutional culture influences anticoagulation choice	Inner Setting (hospital)	*"If they're going to be admitted the preference is LMWH over UFH. That's been slow to change, but there is some push coming from somewhere. I'm not exactly why, just thinking it's a preferred agent in terms of possibly efficacy."* (H6)
Peer pressure	Emotion / Beliefs about consequences (TDF)	*"I once stepped on a nail because I tried to give somebody a shot of LMWH and admit them to the floor for their PE and sort of got an angry email afterwards about that. so it's it's a little different.."* (EM12)
Anticipation of what inpatient/consultants want	Inner setting (CFIR)	*"it's mostly driven by the culture of the institution that I work at… it's what the inpatient team expects [giving UFH]."* (EM23)
Understand catheter directed treatments require anticoagulation		*"the perceived benefit [to UFH] is if they require a procedure, a catheter directive therapy, then it could be stopped and that would help the interventional radiologist. But that's inaccurate, because they would continue anticoagulation regardless of whether it's UFH or LMWH to do the procedure."*
Fear of decompensation	Characteristics of individuals / Knowledge / Emotion (TDF)	*"if there is clinical decompensation and a decision to do some sort of an intervention, the heparin can be basically stopped or reversed and stopped."* (EM22)
Value "quick on, quick off" of UFH	Knowledge / Beliefs about consequences (TDF)	*"I'm mostly a nocturnist, so my job is, you know, I see it as make the right decision for the next 12 h. So my initial, my initial response, assuming that the ER you know, has said that an admission is necessary. I'll usually do a heparin drip…it's easily reversibleand most people do just fine on it and you're essentially already anticoagulated as soon as you start it. And there's minimal follow up from my perspective as a nocturnist. So it's just kind of order it fire and forget…It gives you a good bridge to to make whatever decisions are needed moving forward with there being very little potential negative to that…you're not stopping anybody else from making future decisions."* (H10)
Prioritization of reversibility over iatrogenic bleed	Characteristics of individuals / Knowledge / Emotion / Beliefs about consequences (TDF)	*"In the hospital for me, I feel like, let me start them on heparin and then…if they have other things going on I think it gives me the sense of, 'Oh, I can reverse it whenever I want to.'"* (H9)

No, authors do not have interests to disclose

18 Comparing the Accuracy of Modified HEART Scores for Risk Stratification of Low-risk Chest Pain Patients at the Emergency Department

Phillips D, Alanis N, Jose J, Milis L, Wang H/John Peter Smith Hospital, Fort Worth, Texas, US

Background: The accuracy of risk stratifying chest pain patients at the emergency department (ED) using the HEART (history, ECG, age, risk factors, and troponin level) score has been validated. However, the original HEART score was derived using conventional troponin, which has been replaced by high-sensitivity cardiac troponin (hs-cTn). Several modified HEART scores (mHEART) have been proposed based on different hs-cTn levels, but their comparative accuracies have not been assessed. This study aims to compare the performance of five mHEART scores and evaluate the role of hs-cTn in risk stratifying low-risk chest pain patients at the ED.

Methods: This retrospective single-center observational study included all ED patients with suspected acute coronary syndrome who had HEAR (history, ECG, age, and risk factors) scores calculated and at least one hs-cTnI resulted during their ED evaluation. The hs-cTnI levels measured in the ED were categorized as: 1) 99th percentile upper reference limit (URL, ie, positive, ≥53ng/l for females and ≥78ng/l for males), 2) variation zone (ie, uncertain zone 20-52ng/l for female and 20- 77ng/l for males), 3) limit of detection (LOD, ie, negative: <20ng/l), and 4) limit of quantitation (LOQ, <3ng/l). mHEART scores were calculated based on existing literature reports (see Table). Patients with a Troponin-score of 0 or an mHEART score of 0-3 were classified as low-risk chest pain patients. The 30-day Major Adverse Cardiac Event (MACE) outcomes were compared across different mHEART scores.

Results: From January 1, 2019, to December 31, 2023, a total of 10,486 patients were included, with 337 (3.21%) experiencing 30-day MACE. The 30-day MACE rates were 0.53%, 1.37%, and 2.00% for hs-cTnI cutoffs of LOQ (<3ng/l), LOD (<20ng/l), and URL (<53ng/l for females and <78ng/l for males), respectively. However, when using an mHEART score of 0-3 to define low risk, the 30-day MACE rate ranged from 0.26% to 0.62% across different mHEART scores.

Conclusion: The use of the HEART score for risk stratification of low-risk chest pain patients demonstrates superior accuracy in predicting 30-day MACE outcomes compared to using hs-cTnI alone. All mHEART scores exhibit acceptable accuracy in predicting 30-day MACE outcomes, with mHEART1 identifying the highest number of patients as low-risk chest pain patients.

Table: Different modified HEART scores

	HEART-score	T-score
mHEART1	HEAR + T1 : female<53ng/l, male<78ng/l	0
	female: 53-158ng/l, male 78-233ng/l	1
	female≥159ng/l, male≥234ng/l	2
mHEART2	HEAR + T2: <20ng/l	0
	female: 20-52ng/l, male: 20-77ng/l	1
	female: ≥53ng/l, male≥78ng/l	2
mHEART3	HEAR + T3: <20ng/l	0
	20-59ng/l	1
	≥60ng/l	2
mHEART4	HEAR + T4: <3ng/l	0
	female: 3-52ng/l, male: 3-77ng/l	1
	female: ≥53ng/l, male≥78ng/l	2
mHEART5	HEAR + T5: <3ng/l	0
	3-11ng/l	1
	≥12ng/l	2

No, authors do not have interests to disclose

19 Lack of Telehealth Capable Devices Among Patients With Heart Failure as a Barrier to Virtual Outpatient Follow-up Care

Ramirez-Castillo D, Vargas-Torres C, Blutinger E, Topaz L, Daniels B, Masterson-Creber R, Turchioe M, Merchant R/Icahn School of Medicine at Mount Sinai, New York, New York, US

Study Objectives: Over 3 million emergency department (ED) visits and 1.9 hospital admissions annually in the United States are due to heart failure. However, fewer than half of patients admitted and fewer than 25% visiting the ED with heart failure present to an outpatient clinic visit for follow up within one week after discharge. Telehealth and Mobile Integrated Health are promising alternative strategies for assisting patients who have reduced access to in-person follow-up heart failure outpatient care. However, patients without telehealth capable devices likely cannot engage in virtual only visits. Among patients admitted for heart failure, we aimed to better understand the frequency of and the contributing factors affecting lack of home access to telehealth capable devices.

Methods: This secondary analysis included participants from the PCORI-funded MIGHTY Heart study. The study enrolled adult patients (≥ 18 years old) admitted for heart failure at 11 hospitals in New York City from January 2021 to March 2024. Participants were queried during their hospitalization about their demographic characteristics, financial resources ("Do you have enough financial resources to make