Rule-Out Algorithm for Diagnosis of NSTEMI

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- 55 yrs old, diabetic, Hypertensive, Smoker
- Presented to ED by epigastric pain & vomiting after heavy meal
- ECG: Normal
- Troponin: -ve
- US: gaseous distension
- IV fluids, antacids
- Pain relieved, Pt sent for home

55 yrs old, diabetic, Hypertensive, Smoker

Presented to ED by epigastric pain & vomiting after heavy meal

ECG: Normal

Troponin: -ve

This Pt have been wrongly ruled out For Diagnosis of NSTEMI

Epidemiology

Patients with symptoms suggesting AMI account for approximately 10% of all ED consultations.

-ECG

-cTn assay

-Clinical assessment

Form the diagnostic cornerstones.

Troponin Limitation

- Former-generation cTn assays
- Delayed increase of circulating levels for 3-4 hrs
- Often require serial sampling for 6-12 hrs.

Impact of Diagnosis Delay

Delays in diagnosing disease (“rule-in”):

Holds use of evidence-based therapies;

Anti-PLT (ASA, Ticagrelol).

Delays in excluding disease (“rule-out”)

-Interferes with evaluation of alternative diagnoses

-contributes to expensive overcrowding in the ED.

High Sensitive Cardiac troponin (hs-cTn)

Enabled measurement of cTn concentrations not reliably detected with prior generations of tests.

Improve the diagnostic accuracy in the early diagnosis of AMI, with rapid rule-in and rule-out of AMI .

On other hand, improvements in assay sensitivity, have significantly increased the number of +ve hs-cTn test resulting in various conditions with cardiac involvement other than AMI.

High Sensitive Cardiac troponin (hs-cTn)

As a consequence, the PPV of hs-cTn level decreased and many physicians treating pts with symptoms suggestive of AMI have been confused.

How to best take advantage of the novel hs-cTn tests in clinical practice?

Accordingly, there is an ongoing debate whether and to what extent a shortening of the time interval to the second sample is feasible and safe.

We are hoping therefore to develop and validate an algorithm for rapid rule-in and rule-out of AMI using (hs-cTnT) baseline levels and absolute changes within 1 hour.

Reichlin et al. Validated diagnostic algorithm

-hs-cTnT sampling at ED presentation & 1 h later

-Safely rules- out and rules-in AMI during the index visit.

This algorithm received a Class I recommendation in the latest ESC guidelines for NSTE-ACS.

Troponin algorithm Limitation

The likelihood of ACS and short-term MACE (rather than only index visit AMI) that is decisive for further management.

The algorithm also has not been evaluated by external groups or in EDs with an ACS prevalence <25%-30% .

Furthermore, the algorithm uses **hs-cTnT alone** to decide pt disposition; in routine care, management decisions in pts with CP are based on the **entire clinical picture**, including cTn results, pt history, and ECGs.

Troponin algorithm Limitation

Accordingly, the ESC guidelines and Reichlin et al. state that the algorithm should always be used together with an assessment of patient history and ECG.

The diagnostic performance of this combination, however, has not been studied thus far.

We are aiming to evaluate the diagnostic accuracy of

1-h algorithm supplemented with **pt history** and **ECG** for predicting:

MACE within 30 days and to compare it with the algorithm based on hs- cTnT testing alone

JACC Journals

A 1-h Combination Algorithm Allows Fast Rule-Out and Rule-In of Major Adverse Cardiac Events

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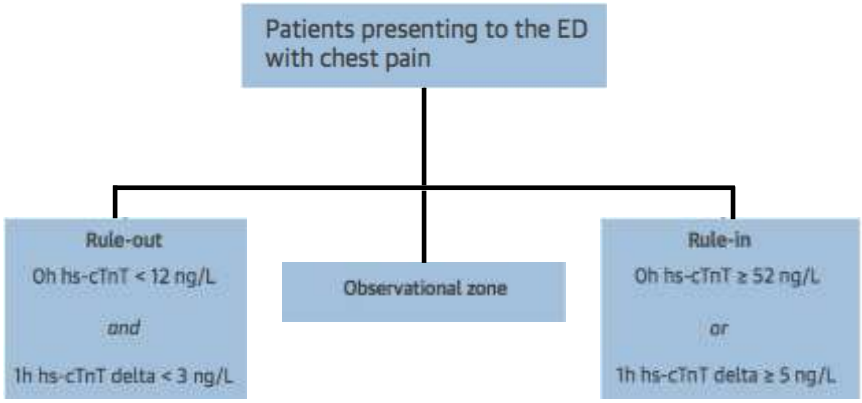
ABSTRACT

BACKGROUND A 1-h algorithm based on high-sensitivity cardiac troponin T (hs-cTnT) testing at presentation and again 1 h thereafter has been shown to accurately rule out acute myocardial infarction.

OBJECTIVES The goal of the study was to evaluate the diagnostic accuracy of the 1-h algorithm when supplemented with patient history and an electrocardiogram (ECG) (the extended algorithm) for predicting 30-day major adverse cardiac events (MACE) and to compare it with the algorithm using hs-cTnT alone (the troponin algorithm).

METHODS This prospective observational study enrolled consecutive patients presenting to the emergency department (ED) with chest pain, for whom hs-cTnT testing was ordered at presentation. Hs-cTnT results at 1 h and the ED physician's assessments of patient history and ECG were collected. The primary outcome was an adjudicated diagnosis of 30-day MACE defined as acute myocardial infarction, unstable angina, cardiogenic shock, ventricular arrhythmia,

Troponin Algorithm



This algorithm used only hs-cTnT at presentation (0 h) and 1 h for rule-out and rule-in of ED patients presenting with CP.

Extended Algorithm

Patients presenting to ED with chest pain

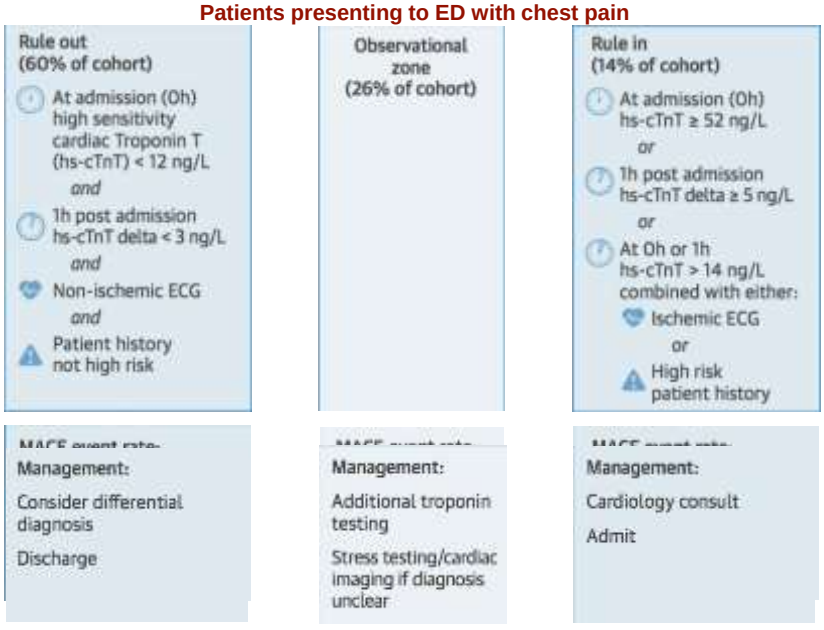


TABLE 2 30-Day MACE

	All Patients (N = 1,038)	Extended Algorithm: Rule-Out (n = 625)	Extended Algorithm: Observational Zone (n = 267)	Extended Algorithm: Rule-In (n = 146)
30-day MACE*	121 (11.7)	3 (0.5)	27 (10.1)	91 (62.3)
AMI during index visit	78 (7.5)	0	5 (1.9)	73 (50.0)
AMI during follow-up†	3 (0.3)	0	1 (0.4)	2 (1.4)
UA	39 (3.8)	3 (0.5)	21 (7.9)	15 (10.3)
Cardiogenic shock	0	0	0	0
Cardiac arrest	1 (0.1)	0	0	1 (0.7)
Ventricular arrhythmia‡	0	0	0	0
High-grade AV block‡	1 (0.1)	0	1 (0.4)	0
Cardiac death	4 (0.4)	0	1 (0.4)	3 (2.1)
Death of unknown cause	0	0	0	0
30-day MACE without UA	84 (8.1)	0	7 (2.6)	77 (52.7)

Values are n (%). *Patients could experience >1 event but were only counted once. †No AMI during index visit. ‡Requiring intervention.

AV = atrioventricular; MACE = major adverse cardiac event; UA = unstable angina; other abbreviation as in Table 1.

TABLE 3 Algorithmic Diagnostic Accuracy for 30-Day MACE

	Troponin Algorithm % (95% CI)	Extended Algorithm % (95% CI)	p Value
Rule-out	n = 682	n = 625	
Sensitivity	87.6 (80.4-92.9)	97.5 (92.9-99.5)	<0.001
Specificity	72.7 (69.7-75.6)	67.8 (64.7-70.9)	<0.001
NPV	97.8 (96.4-98.8)	99.5 (98.6-99.9)	
LR	0.17 (0.11-0.27)	0.04 (0.01-0.11)	
Rule-in	n = 101	n = 146	
Sensitivity	56.2 (46.9-65.2)	75.2 (66.5-82.6)	<0.001
Specificity	96.4 (95.0-97.5)	94.0 (92.3-95.5)	<0.001
PPV	67.3 (57.3-76.3)	62.3 (53.9-70.2)	
LR	15.6 (10.8-22.6)	12.5 (9.5-16.5)	
Observational zone	n = 255	n = 267	
PPV	14.9 (10.8-19.9)	10.1 (6.8-14.4)	
LR	1.3 (1.0-1.8)	0.9 (0.6-1.2)	

CI = confidence interval; LR = likelihood ratio; MACE = major adverse cardiac event; NPV = negative predictive value; PPV = positive predictive value.

TABLE 4 Algorithmic Diagnostic Accuracy for 30-Day MACE Without UA

	Troponin Algorithm % (95% CI)	Extended Algorithm % (95% CI)	p Value
Rule-out	n = 682	n = 625	
Sensitivity	98.8 (93.5-100.0)	100.0 (95.7-100.0)	1.00
Specificity	71.4 (68.4-74.2)	65.5 (62.4-68.5)	<0.001
NPV	99.9 (99.2-100.0)	100.0 (99.4-100.0)	
LR	0.02 (0.00-0.12)	0.00 (0.00-0.07)	
Rule-in	n = 101	n = 146	
Sensitivity	78.6 (68.3-86.8)	91.7 (83.6-96.6)	0.001
Specificity	96.3 (94.9-97.4)	92.8 (90.9-94.3)	<0.001
PPV	65.4 (55.2-74.5)	52.7 (44.3-61.1)	
LR	21.4 (15.2-30.2)	12.7 (10.0-16.1)	
Observational zone	n = 255	n = 267	
PPV	6.7 (3.9-10.5)	2.6 (1.1-5.3)	
LR	0.8 (0.5-1.3)	0.3 (0.2-0.6)	

Abbreviations as in Tables 2 and 3.

Conclusion

A 1-h combination algorithm allowed fast rule-out and rule-in of 30-day MACE in a majority of ED patients with CP

It performed better than the 1-h algorithm based on hs-cTnT level alone.

Thank You