Amber

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Citation	Wibring, K. et al 2023, June 20-21. Validation of the ESC 0/1 algorithm in the EMS setting [Poster presentation]. 999 EMS Research Forum, Manchester. http://hdl.handle.net/20.500.12417/1565
Download date	2025-08-02 13:30:30
Link to Item	http://hdl.handle.net/20.500.12417/1565

Validation of the ESC 0/1 algorithm in the EMS setting

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Background

Chest pain is one of the most common reasons for contacting the emergency medical services (EMS). Troponins is a corner stone in ruling out high-risk conditions at the emergency department (ED) and the interest in using Troponins in the EMS setting is increasing. European Society of Cardiology (ESC) advocate the use of the 0/1 algorithm which allows rule-out after one Troponin test. However, no study has been validating the ESC 0/1 algorithm in the EMS setting.

Aim

To examine the accuracy of the ESC 0/1 algorithm if being applied in the EMS setting using prehospital Troponin T.
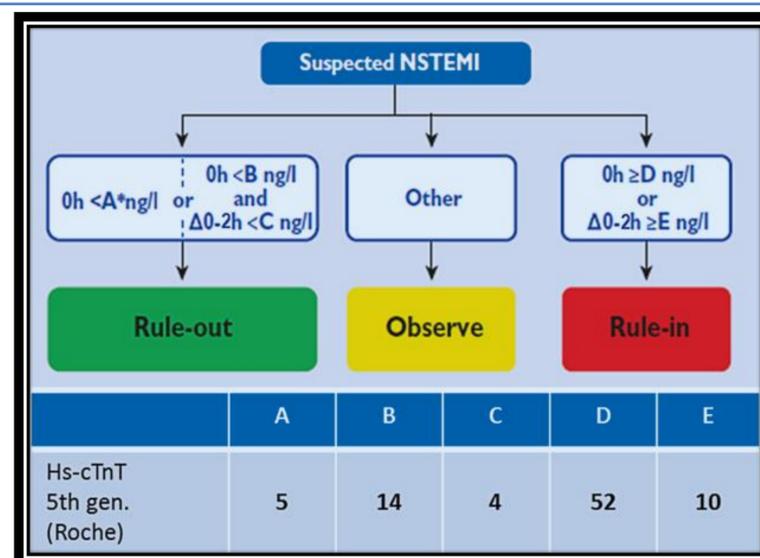
Results

For AMI identification the sensitivity was 99.4 (CI 95% 96.8-100.0), specificity 18.0 (CI 95% 19.9-20.1), PPV 13.4 (CI 95% 11.6-15.4) and NPV 99.6 (CI 95% 97.7-). Giving a rule-out rate of 16%, with <0.1% patients with AMI wrongly ruled-out.

For high-risk conditions (AMI, pulmonary embolism, aortic dissection etc.) identification the sensitivity was 98.4 (CI 95% 96.1-99.6), specificity 19.0 (CI 95% 16.1-19.1), PPV 20.0 (CI 95% 19.5-20.5) and NPV 98.3 (CI 95% 95.7-99.4), with four false negatives. Giving a rule-out rate of 16%, with <0.2% patients with high-risk conditions wrongly ruled out.

Methods

Observational cohort study including all patients with chest pain cared for by the EMS in the county of Halland, Sweden, during 2018. A blood sample was collected during the EMS mission and brought to the ED, where a high-sensitive Troponin T (hs-TnT) was analysed. The diagnosis at hospital discharge were retrieved from the hospital medical record.

In total 2 917 EMS missions were included, of which 1 501 had an EMS hs-TnT test result. The sensitivity, specificity, negative and positive predictive value (NPV, PPV) of the ESC 0/1 algorithms ability to identify acute myocardial infarction (AMI) and other high-risk diagnoses were calculated. Using a single hs-TnT test. Calculation were made twice. Once for patients with symptoms onset >3 hours ago and once regardless of time for symptom onset.

symptom onset >3 hours ago

ESC rule-out

	Total number	True positive	False positive	True negative	False negative	Sens	Spec	PPV	NPV
Debut >3 h och Tnt <5 ng/L, AMI	538	51	414	72	1	98	15	11	97
Tnt <5 ng/L, AMI	1 501	169	1 092	239	1	99	18	13	100
Debut >3 h och Tnt <5 ng/L, high-risk	538	76	389	70	3	96	15	16	96
Tnt <5 ng/L, high-risk	1 501	252	1 009	236	4	98	19	20	98

ESC rule-in

	Total number	True positive	False positive	True negative	False negative	Sens	Spec	PPV	NPV
Tnt ≥52 ng/L, high-risk	1 501	89	78	1 167	167	35	94	53	87
Tnt ≥52 ng/L, AMI	1 501	81	86	1 245	89	48	94	49	93

Conclusions and clinical implications

By introducing new technology, enabling beside hs-Troponins analyses, and applying the ESC 0/1 algorithm in the EMS setting, high-risk conditions and especially AMI can be ruled out with high accuracy using only a single hs-Troponin test. Allowing referral of low-risk patients to self-care or alternative modes of transportation or destination. High-risk patients beneficial of increased triage level or transportation to hospitals providing PCI capabilities or cardiac care units could also be identified, allowing to by-pass the nearest hospital or the emergency department.