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ESC GUIDELINES

2023 ESC Guidelines for the management of acute coronary syndromes Supplementary data

Developed by the task force on the management of acute coronary syndromes of the European Society of Cardiology (ESC)

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ESC subspecialty communities having participated in the development of this document:

Associations: Association of Cardiovascular Nursing & Allied Professions (ACNAP), Association for Acute CardioVascular Care (ACVC), European Association of Cardiovascular Imaging (EACVI), European Association of Preventive Cardiology (EAPC), European Association of Percutaneous Cardiovascular Interventions (EAPCI), European Heart Rhythm Association (EHRA), and Heart Failure Association (HFA).

Working Groups: Cardiovascular Pharmacotherapy, Cardiovascular Surgery, E-Cardiology, Myocardial and Pericardial Diseases, Thrombosis.

3.3.2. Rapid 'rule-in' and 'rule-out' algorithms

3.3.2.1. European Society of Cardiology 0 h/1 h and European Society of Cardiology 0 h/2 h algorithms

NSTEMI can be ruled out at presentation if the 0 h hs-cTn concentration is very low and the chest pain onset was >3 h prior to the 0 h hs-cTn measurement. NSTEMI can also be ruled out by the combination of low baseline levels of hs-cTn and the lack of a relevant increase within 1 h (no 1 hΔ). Patients have a high likelihood for NSTEMI if the hs-cTn concentration at presentation is at least moderately elevated or shows a clear rise within the first hour (1 hΔ).[4,6–8,89–96] Cut-offs are assay-specific (see *Table S4*) and derived to meet pre-defined criteria for sensitivity and specificity for NSTEMI.

Recently, specific cut-offs for the patients assigned to the 'observe zone' using the hs-cTn T assay (combination of a 3 h hs-cTn T concentration <15 ng/L and a 0 h/3 h absolute change <4 ng/L) have been derived and validated as having acceptable safety and efficacy for further decision-making.[97] Specific cut-offs for other hs-cTn I assays in the observe zone are currently being developed.

3.3.2.2. Caveats of using rapid algorithms

When using any algorithm, six main caveats apply:

(i) Algorithms should only be used in conjunction with all available clinical information, including detailed assessment of chest pain characteristics and ECGs, and should be applied only following exclusion of STEMI or other life-threatening conditions. Patients with a clear pattern of crescendo or UA should undergo further investigation.

(ii) The rapid algorithms should be used only in patients presenting with suspected ACS and should not be applied in an unselected ED population (i.e. in patients with stroke or sepsis).

(iii) The European Society of Cardiology (ESC) 0 h/1 h and 0 h/2 h algorithms apply to all patients irrespective of chest pain onset. This approach is very safe (negative predictive value [NPV] and sensitivity >99%), including in the subgroup of patients presenting very early (e.g. <2 h).[71] However, due to the time dependency of cTn release and the moderate number of patients presenting <1 h after chest pain onset in previous studies, obtaining an additional cTn concentration at 3 h in early presenters triaged towards rule-out should be considered.

(iv) As late increases in cTn have been described in ~1% of patients, serial cTn testing should also be pursued if clinical suspicion remains high or if the patient develops recurrent chest pain.[30,31,68,71–74]

(v) Time to decision = time of blood draw + turnaround time. The use of the ESC 0 h/1 h algorithms is irrespective of the local turnaround time (time from blood draw to blood results); 0 h and 1 h refer to the time points at which blood is taken. The second blood draw may need to be taken before the result from the first one is available (although the results should be available in most cases within 60 min of blood sampling), but this does not affect the interpretation of the algorithms. The clinical and economic benefit of the ESC 0 h/1 h algorithm compared with other algorithms where the second blood draw is later than 1 h is therefore independent of the local turnaround time.[98]

(vi) The ESC 0 h/1 h and 0 h/2 h algorithms are assay specific and can be used only for the suggested assays for which the algorithms have been validated. If none of these assays are available, an alternative strategy needs to be considered.

Table S4 Assay specific cut-off levels in ng/L within the 0 h/1 h and 0 h/2 h algorithms

0 h/1 h algorithm	Very low	Low	No 1 hΔ	High	1 hΔ
hs-cTnT (Elecsys; Roche)	<5	<12	<3	≥52	≥5
hs-cTnI (Architect; Abbott)	<4	<5	<2	≥64	≥6
hs-cTnI (Centaur; Siemens)	<3	<6	<3	≥120	≥12
hs-cTnI (Access; Beckman Coulter)	<4	<5	<4	≥50	≥15
hs-cTnI (Clarity; Singulex)	<1	<2	<1	≥30	≥6
hs-cTnI (Vitros; Clinical Diagnostics)	<1	<2	<1	≥40	≥4
hs-cTnI (Pathfast; LSI Medience)	<3	<4	<3	≥90	≥20
hs-cTnI (TriageTrue; Quidel)	<4	<5	<3	≥60	≥8
hs-cTnI (Dimension EXL; Siemens)	<9	<9	<5	≥160	≥100
0 h/2 h algorithm	**Very low**	**Low**	**No 2 hΔ**	**High**	**2 hΔ**
hs-cTnT (Elecsys; Roche)	<5	<14	<4	≥52	≥10
hs-cTnI (Architect; Abbott)	<4	<6	<2	≥64	≥15
hs-cTnI (Centaur; Siemens)	<3	<8	<7	≥120	≥20
hs-cTnI (Access; Beckman Coulter)	<4	<5	<5	≥50	≥20
hs-cTnI (Clarity; Singulex)	<1	TBD	TBD	≥30	TBD
hs-cTnI (Vitros; Clinical Diagnostics)	<1	TBD	TBD	≥40	TBD
hs-cTnI (Pathfast; LSI Medience)	<3	TBD	TBD	≥90	TBD
hs-cTnI (TriageTrue; Quidel)	<4	TBD	TBD	≥60	TBD

The cut-offs apply irrespective of age, sex, and renal function. Optimized cut-offs for patients above 75 years of age and patients with renal dysfunction have been evaluated, but not consistently shown to provide better balance between safety and efficacy as compared with these universal cut-offs.[30,31] The algorithms for additional assays are in development: hs-cTn T on Elecsys (Roche), hs-cTn I on Architect (Abbott), hs-cTn I on Centaur (Siemens), hs-cTn I on Access (Beckman Coulter), hs-cTn I on Clarity (Singulex), hs-cTn I on Vitros (Clinical Diagnostics), hs-cTn I on Pathfast (LSI Medience), and hs-cTn I on TriageTrue (Quidel).
hs-cTn, high-sensitivity cardiac troponin; TBD, to be determined.[30,31,67–88]

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