Heart Foundation | CSANZ Cardiac Society of Australia and New Zealand

Australian clinical guideline for diagnosing and managing acute coronary syndromes 2025

Supplementary material B

Suggested citation: Brieger D, Cullen L, Briffa T et al. National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Comprehensive Australian clinical guideline for diagnosing and managing acute coronary syndromes 2025. 2025. www.heartfoundation.org.au/for-professionals/acs-guideline

This article was published in Heart, Lung and Circulation, 34(4), Brieger D, Cullen L, Briffa T et al., National Heart Foundation of Australia & Cardiac Society of Australia and New Zealand: Australian clinical guideline for diagnosing and managing acute coronary syndromes 2025, 309-397, Copyright Elsevier (2025). https://doi.org/10.1016/j.hlc.2025.02.102

Corresponding author at: National Heart Foundation of Australia, Level 9, 565 Bourke Street Melbourne, VIC, 3000; Email: clinicalevidence@heartfoundation.org.au

Funding

The guideline was jointly funded by the Heart Foundation and CSANZ. Funding was also received from trusts managed by Perpetual for the guideline development in 2020 and 2021.

Endorsements

For a full list of the organisations that have endorsed this guideline, refer to the Heart Foundation website. www.heartfoundation.org.au/for-professionals/acs-guideline

HH-PRISK-065.1.0225

Acknowledgement of Country

We acknowledge the Traditional Owners and Custodians of country throughout Australia and their continuing connection to land, waters and community. We pay our respects to them and their cultures, and Elders past, present and future.

First Nations peoples is the term used throughout this guideline. However, the Heart Foundation recognises that the preferred term(s) when writing for, and about, First Nations peoples can differ between communities and individuals. No disrespect is intended to First Nations peoples who may identify with an alternative term.

Disclaimer

This guideline has been developed by the National Heart Foundation of Australia ABN 98 008 419 761 (**Heart Foundation**) in collaboration with the Cardiac Society of Australia and New Zealand ABN 23 006 63505 (**CSANZ**) to support healthcare professionals in making informed clinical decisions. The content of this guideline is general advice only and provided for informational purposes only. It is not intended to serve as health, medical, or treatment advice. It is based on the best available evidence and expert consensus as at the time of publication. The recommendations are intended to support, not replace, the clinical judgment and shared decision-making process between qualified healthcare professionals and the people they care for, considering an individual's circumstances and the availability of resources.

Intended use

This guideline is expressly intended for use by appropriately qualified healthcare professionals within Australia. It is intended as a reference tool and is not designed for use by individuals without proper medical training except under the supervision of a qualified healthcare professional. Any reliance on the content by unqualified individuals is at their own risk. The Heart Foundation does not warrant that the content in this guideline is suitable for your needs or any specific purpose. Users are responsible for assessing whether the information is accurate, reliable, up-to-date, authentic, relevant, or complete, and where appropriate, should seek independent professional advice.

Liability limitation

The Heart Foundation, including its employees, officers, collaborators, and associated institutions, disclaims and excludes, to the maximum extent permitted by law, all responsibility and liability (including liability in negligence) for any direct, special, indirect, incidental, consequential, punitive, exemplary, or other loss, damage, cost, or expense arising out of, or in connection with, the use or reliance on this guideline or any information contained within it, including any inaccuracies or omissions. This guideline is not exhaustive and may not apply to all clinical situations.

Third-party references

Any reference to third-party organisations, products, or services within this guideline does not constitute an endorsement or recommendation by the Heart Foundation. The inclusion of such references is for informational purposes only, and the Heart Foundation is not responsible for the content, accuracy, or actions taken based on information from external sources.

Copyright and permissions

Clinical judgment and decision-making

This guideline should not override the responsibility of healthcare professionals to make appropriate decisions based on the specific circumstances of each person, including consideration of applicable local regulations and the person's values and preferences. Healthcare professionals are also responsible for verifying current regulations and recommendations before applying any treatments or interventions referred to in this guideline.

Updates and revisions

Medical knowledge is continually evolving, and guidelines may be updated as new information becomes available. Users are encouraged to consult the latest version of the guideline and to consider any new evidence that may have emerged.

Jurisdictional application

This guideline has been developed in accordance with Australian regulatory and clinical standards and may not be suitable for use in other jurisdictions without appropriate adaptation.

Disclosures

For a full list of disclosures/conflicts of interest, refer to Supplementary material A2.

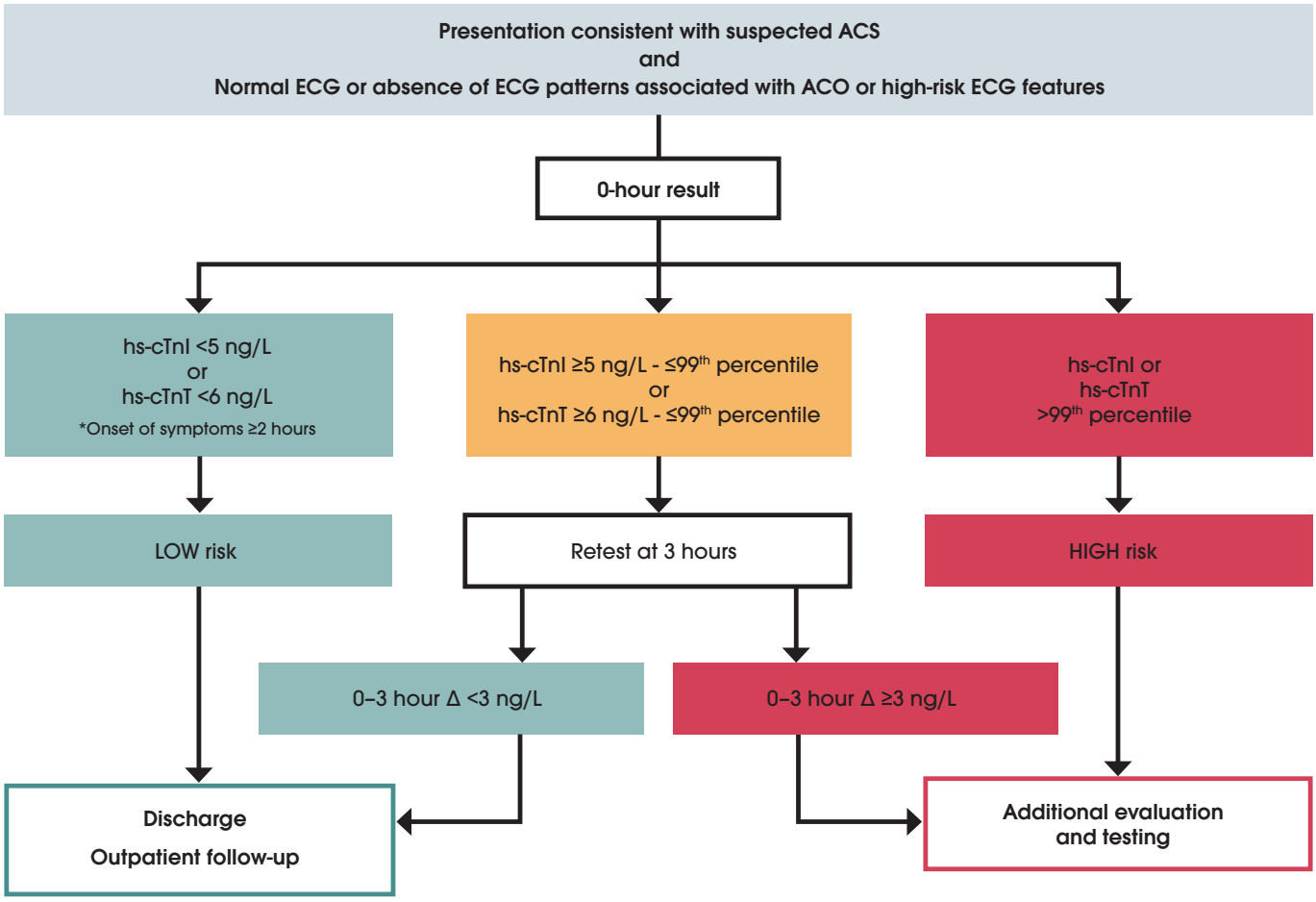
Contents

Supplementary material B1

High-sensitivity troponin in the evaluation of patients with acute coronary syndrome (High-STEACS) algorithm

If the first high-sensitivity cardiac troponin (hs-cTn) value is <5 ng/L, MI is low risk. If the value is ≥5 ng/L but less than or equal to the sex-specific 99th percentile upper range limit (URL), a second high-sensitivity cardiac troponin I (hs-cTnI) measurement is performed three hours from the time of presentation. If the change from the first measurement is <3 ng/L and the value remains below the sex-specific 99th percentile URL, MI is low risk.

Early presenters are defined as those presenting within two hours of chest pain onset and such people require serial testing. This strategy was evaluated in a step-wedge randomised implementation trial reporting from seven hospitals and 31,492 people.[1] Implementation was associated with an increase in the proportion of people discharged from the ED (50–71%), and a reduced length of stay (10.1 to 6.8 hours) without an increase in adverse events at 30 days.



Supplementary figure 2 High-STEACS algorithm.[1–5] Note: The 99th sex-specific percentile is assay-specific. Hs-cTnI assay metrics for risk evaluation have been evaluated on selected assays. Abbreviations: ACO, acute coronary occlusion; ACS, acute coronary syndromes; ECG, electrocardiogram; hs-cTnI, high-sensitivity cardiac troponin I; hs-cTnT, high-sensitivity cardiac troponin T.

Supplementary material B2

Additional validated risk assessment tools

Emergency department assessment of chest pain score (EDACS)

EDACS is a scoring system derived from Australia and New Zealand studies, incorporating readily available clinical information. It requires the person to have a non-ischaemic ECG and serial contemporary cardiac troponin (cTn) values ≤99th percentile over two hours (**Supplementary table 2**).[6] Validation studies and a systematic review show those people classified as low-risk by the EDACS pathway (~30% of people) have a 30-day MACE rate of <1%.[7–11]

History, electrocardiogram, age, risk factors, and troponin (HEART) score

The HEART score uses the clinician's interpretation of the history with other readily available clinical data to risk-stratify people with good prognostic accuracy and it may be used to define a cohort not requiring additional cardiac testing (**Supplementary table 2**).[12-16] In a US implementation study of the HEART pathway, a HEART score <3 combined with a non-ischaemic ECG and 0- and 3-hour cTn <99th percentile identified 30.7% of people as low risk and eligible for early discharge, with a 30-day rate of death from MI of 0.4%.[17] As sex-specific considerations are not included in the HEART scoring system, its effectiveness in men and women may not be equal.[18, 19] Although the HEART score correlates with patient outcomes, in First Nation peoples, those with low HEART scores of 0–3 were three times more likely to have 30-day MACE than non-indigenous Australians.[20]

Supplementary table 2 EDACS and HEART scores.

EDACS low risk 0–15 points; non-low risk ≥16 points		HEART score low risk 0–3 points; non-low risk ≥4 points	
Age, years		**History**	
18–45	2	High suspicion	2
46–50	4	Moderate suspicion	1
51–55	6	Low suspicion	0
56–60	8	**ECG**	
61–65	10	ST-segment deviation	2
66–70	12	Paced, LBBB, RBBB, LVH	1
71–75	14	Normal or nonspecific changes	0
76–80	16	**Age, years**	
81–85	18	>65	2
86+	20	45–65	1
Male sex	6	<45	0
Age 18–65 and either ≥3 risk factors or known CAD	4	**Risk factors**	
Diaphoresis	3	≥3 or known CAD	2
Pain radiating to arm or shoulder	5	1–2	1
Pain worsened with inspiration	-4	0	0
Pain reproducible by palpation	-6	**Troponin**	
		>3x normal limit	2
		1–3x normal limit	1
		≤ normal limit	0

Abbreviations: CAD, coronary artery disease; ECG, electrocardiogram; EDACS, Emergency department assessment of chest pain score; HEART, History, electrocardiogram, age, risk factors, troponin; LBBB, left bundle branch block; LVH, left ventricular hypertrophy; RBBB, right bundle branch block.

Other scores

The *Improved assessment of chest pain trial* (ImpACT) protocol is another strategy that supports accelerated assessment of people using contemporary troponin assay results over two hours with selective exercise stress testing in people at intermediate risk. The protocol has been shown to safely reduce ED/hospital length of stay.[21] For all First Nations peoples, an inpatient cardiac testing protocol is recommended.[22]

The *No objective testing* (NOT) rule identifies people who are at low risk of ACS and could be discharged without further cardiac testing (**Supplementary table 3**).[23] It was specifically developed to be applied after MI had been ruled out using ECG and troponin results (either high-sensitivity or contemporary assays) and safely identifies low-risk people as those aged <50 years with <3 risk factors and no prior coronary artery disease (CAD) or MI.[24]

The *Two-hour accelerated diagnostic protocol to assess patients with chest pain symptoms using contemporary troponins as the only biomarker* (ADAPT) pathway combines a TIMI score of 0, a non-ischaemic ECG, and 0- and 2-hour cTn concentrations <99th percentile to identify people at low-risk (30-day MACE risk <1%), but does so with less efficacy than the HEART and EDACS pathways (**Supplementary table 4**).[25–27]

The GRACE and TIMI scores were initially developed for risk stratification for managing NSTEACS but have also been studied for evaluating people with acute chest pain. However, they have inferior sensitivity and negative predictive value to the HEART score and EDACS, and are not recommended for risk stratification of people with suspected ACS.[28]

Supplementary table 3 NOT rule and TIMI.

NOT rule **Low risk = 0**		**TIMI score** **In ADAPT – Low risk score = 0** **In m-ADAPT – Low risk score = 0 or 1**	
Age ≥50 years	1	**Age >65 years**	1
≥3 risk factors	1	**≥3 cardiovascular risk factors**	1
Hypertension		Hypertension	
Current smoker		Current smoker	
Hypercholesterolaemia		Hypercholesterolaemia	
Diabetes		Diabetes	
Family history of cardiovascular disease		Family history of cardiovascular disease	
Prior history of CAD	1	**≥2 angina episodes in the last 24 hours**	1
Prior history of MI	1	**Elevated cardiac biomarkers**	1
		ST-segment deviation on an ECG	1
		Use of aspirin within the last seven days	1
		Known CAD	1

Abbreviations: ADAPT, Two-hour accelerated diagnostic protocol to assess patients with chest pain symptoms using contemporary troponins as the only biomarker; CAD, coronary artery disease; mADAPT, Modified two-hour accelerated diagnostic protocol to assess patients with chest pain symptoms using high-sensitivity troponins as the only biomarker; MI, myocardial infarction; NOT, no objective testing; TIMI, Thrombolysis in myocardial infarction.

Supplementary table 4 Summary of low-risk features.

Low risk (<1% 30-day risk for death or MACE)	
hs-cTn based	
T-0	T-0 hs-cTn below the assay limit of detection or 'very low' concentration if symptoms present for at least two hours
T-0 and 1- or 2-hour delta	T-0 hs-cTn and 1- or 2-hour delta are both below the assay 'low' thresholds (>99th % NPV for 30-day MACE)
High-STEACS	T-0 <5 ng/L hs-cTnI or <6 ng/L hs-cTnT or T-0 5 ng/L to 99th % hs-cTnI or T-0 6 ng/L hs-cTnT and T-3 change ≤3 ng/L
Clinical decision pathway based	
HEART pathway	HEART score ≤3 and 0/3 cTn/hs-cTn < assay 99th percentile
EDACS	EDACS score ≤16 and 0/2 cTn/hs-cTn < assay 99th percentile
ADAPT	TIMI score 0 and 0/2 cTn/hs-cTn < assay 99th percentile
mADAPT	TIMI score 0/1 and 0/2 cTn/hs-cTn < assay 99th percentile
NOT rule	0 factors

Abbreviations: ADAPT, Two-hour accelerated diagnostic protocol to assess patients with chest pain symptoms using contemporary troponins as the only biomarker; cTn, cardiac troponin; EDACS, Emergency department assessment of chest pain score; HEART, History, electrocardiogram, age, risk factors, troponin; hs-cTn, high-sensitivity cardiac troponin; MACE, major adverse cardiovascular events; mADAPT, Modified two-hour accelerated diagnostic protocol to assess patients with chest pain symptoms using high-sensitivity troponins as the only biomarker; NOT, no objective testing; NPV, negative predictive value; STEACS, ST-segment elevation acute coronary syndromes; TIMI, Thrombolysis in myocardial infarction.

Sites using clinical score-based clinical decision pathway and hs-cTn assays

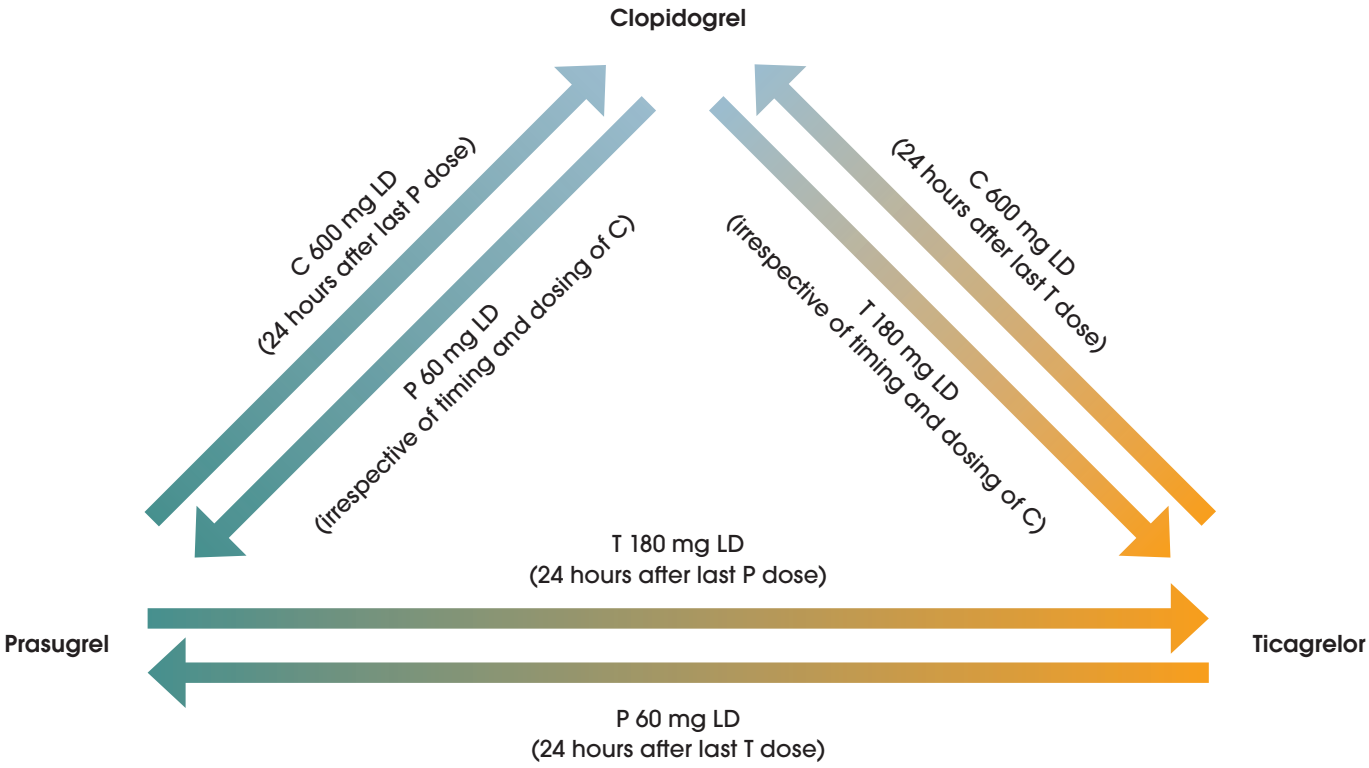
For sites with access to hs-cTn assays, use of a high-sensitivity troponin-based clinical decision pathway (CDP) is recommended. Adaption of the performance of some clinical score-based strategies with hs-cTn assay results has been reported.[8, 25] A variation of the EDACS pathway using a single measurement of troponin with a hs-cTn assay may identify 30% of people as low risk.[8] The modified ADAPT score, using hs-cTn and a TIMI risk score of 0 or 1 identifies ~40% of people as low risk.[25]

Supplementary material B3

Platelet $P2Y_{12}$ inhibitor therapy

Supplementary table 5 Dosing table for $P2Y_{12}$ inhibitors.

Drug	Dose type	Dosing	Comment
Clopidogrel	Loading dose	300–600 mg orally	300 mg dose noted for people post fibrinolysis.
	Maintenance	75 mg orally daily	
Prasugrel	Loading dose	60 mg orally	
	Maintenance	10 mg orally daily	5 mg if <60 kg, 5 mg if >75 years of age, if deemed necessary.
Ticagrelor	Loading dose	180 mg orally	
	Maintenance	90 mg orally twice daily	



Supplementary figure 3 Dosing strategies when switching between $P2Y_{12}$ inhibitors. Adapted with permission from Angiolillo et al.[29] Abbreviations: C, clopidogrel; LD, loading dose; P, prasugrel; T, ticagrelor.

References

1 Anand A, Lee KK, Chapman AR, et al. High-sensitivity cardiac troponin on presentation to rule out myocardial infarction: a stepped-wedge cluster randomized controlled trial. *Circulation*. 2021; 143:2214–24.

2 Chapman AR, Anand A, Boeddinghaus J, et al. Comparison of the efficacy and safety of early rule-out pathways for acute myocardial infarction. *Circulation*. 2017;135:1586–96.

3 Chapman AR, Lee KK, McAllister DA, et al. Association of high-sensitivity cardiac troponin I concentration with cardiac outcomes in patients with suspected acute coronary syndrome. *JAMA*. 2017;318:1913–24.

4 Chapman AR, Fujisawa T, Lee KK, et al. Novel high-sensitivity cardiac troponin I assay in patients with suspected acute coronary syndrome. *Heart.* 2019;105:616–22.

5 Chapman AR, Sandeman D, Ferry AV, et al. Risk stratification using high-sensitivity cardiac troponin T in patients with suspected acute coronary syndrome. *J Am Coll Cardiol*. 2020;75:985–87.

6 Than M, Flaws D, Sanders S, et al. Development and validation of the Emergency Department Assessment of Chest pain Score and 2 h accelerated diagnostic protocol. *Emerg Med Australas*. 2014;26:34–44.

7 Mark DG, Huang J, Chettipally U, et al. Performance of coronary risk scores among patients with chest pain in the emergency department. *J Am Coll Cardiol*. 2018;71:606–16.

8 Pickering JW, Flaws D, Smith SW, et al. A risk assessment score and initial high-sensitivity troponin combine to identify low risk of acute myocardial infarction in the emergency department. *Acad Emerg Med*. 2018;25:434–43.

9 Boyle RSJ, Body R. The diagnostic accuracy of the Emergency Department Assessment of Chest Pain (EDACS) Score: a systematic review and meta-analysis. *Ann Emerg Med*. 2021;77:433–41.

10 Body R, Morris N, Reynard C, et al. Comparison of four decision aids for the early diagnosis of acute coronary syndromes in the emergency department. *Emerg Med J*. 2020;37:8–13.

11 Stopyra J, Snavely AC, Hiestand B, et al. Comparison of accelerated diagnostic pathways for acute chest pain risk stratification. *Heart*. 2020;106:977–84.

12 Laureano-Phillips J, Robinson RD, Aryal S, et al. HEART score risk stratification of low-risk chest pain patients in the emergency department: a systematic review and meta-analysis. *Ann Emerg Med*. 2019;74:187–203.

13 Fernando SM, Tran A, Cheng W, et al. Prognostic accuracy of the HEART score for prediction of major adverse cardiac events in patients presenting with chest pain: a systematic review and meta-analysis. *Acad Emerg Med.* 2019;26:140–51.

14 Mahler SA, Riley RF, Hiestand BC, et al. The HEART pathway randomized trial. *Circ Cardiovasc Qual Outcomes*. 2015;8:195–203.

15 Mahler SA, Hiestand BC, Goff DC, Jr., et al. Can the HEART score safely reduce stress testing and cardiac imaging in patients at low risk for major adverse cardiac events? *Crit Pathw Cardiol*. 2011;10:128–33.

16 Six AJ, Cullen L, Backus BE, et al. The HEART score for the assessment of patients with chest pain in the emergency department: a multinational validation study. *Crit Pathw Cardiol*. 2013;12:121–6.

17 Mahler SA, Lenoir KM, Wells BJ, et al. Safely identifying emergency department patients with acute chest pain for early discharge. *Circulation*. 2018;138:2456–68.

18 Bank IEM, de Hoog VC, de Kleijn DPV, et al. Sex-based differences in the performance of the HEART Score in patients presenting to the emergency department with acute chest pain. *J Am Heart Assoc.* 2017;6:e005373.

19 Ola O, Akula A, De Michieli L, et al. Use of the HEAR Score for 30-day risk-stratification in emergency department patients. *Am J Med*. 2023;136:918–26.e5.

20 Bodapati SN, Gunnarsson R, McBride WJ, et al. Chest pain risk assessment in Indigenous and non-Indigenous Australians using HEART Score. *Emerg Med Australas*. 2016;28:138–44.

21 Cullen L, Greenslade JH, Hawkins T, et al. Improved Assessment of Chest pain Trial (IMPACT): assessing patients with possible acute coronary syndromes. *Med J Aust.* 2017;207:195–200.

22 Cullen L, Stephensen L, Greenslade J, et al. Emergency department assessment of suspected acute coronary syndrome using the IMPACT Pathway in Aboriginal and Torres Strait Islander People. *Heart Lung Circ.* 2022;31:1029–36.

23 Greenslade JH, Parsonage W, Than M, et al. A clinical decision rule to identify emergency department patients at low risk for acute coronary syndrome who do not need objective coronary artery disease testing: the No Objective Testing Rule. *Ann Emerg Med.* 2016;67:478–89.e2.

24 Stopyra JP, Miller CD, Hiestand BC, et al. Validation of the No Objective Testing Rule and comparison to the HEART Pathway. *Acad Emerg Med*. 2017;24:1165–68.

25 Cullen L, Mueller C, Parsonage WA, et al. Validation of high-sensitivity troponin I in a 2-hour diagnostic strategy to assess 30-day outcomes in emergency department patients with possible acute coronary syndrome. *J Am Coll Cardiol.* 2013;62:1242–49.

26 Than M, Cullen L, Aldous S, et al. 2-Hour accelerated diagnostic protocol to assess patients with chest pain symptoms using contemporary troponins as the only biomarker: the ADAPT trial. *J Am Coll Cardiol.* 2012;59:2091–98.

27 Than MP, Pickering JW, Aldous SJ, et al. Effectiveness of EDACS versus ADAPT Accelerated Diagnostic Pathways for Chest Pain: a pragmatic randomized controlled trial embedded within practice. *Ann Emerg Med.* 2016;68:93–102.e1.

28 Reaney PDW, Elliott HI, Noman A, et al. Risk stratifying chest pain patients in the emergency department using HEART, GRACE and TIMI scores, with a single contemporary troponin result, to predict major adverse cardiac events. *Emerg Med J.* 2018;35:420–27.

29 Angiolillo DJ, Rollini F, Storey RF, et al. International expert consensus on switching platelet $P2Y_{12}$ receptor-inhibiting therapies. *Circulation.* 2017;136:1955–75.