ESC European Society of Cardiology

European Heart Journal: Acute Cardiovascular Care (2024) **00**, 1–4
https://doi.org/10.1093/ehjacc/zuae143

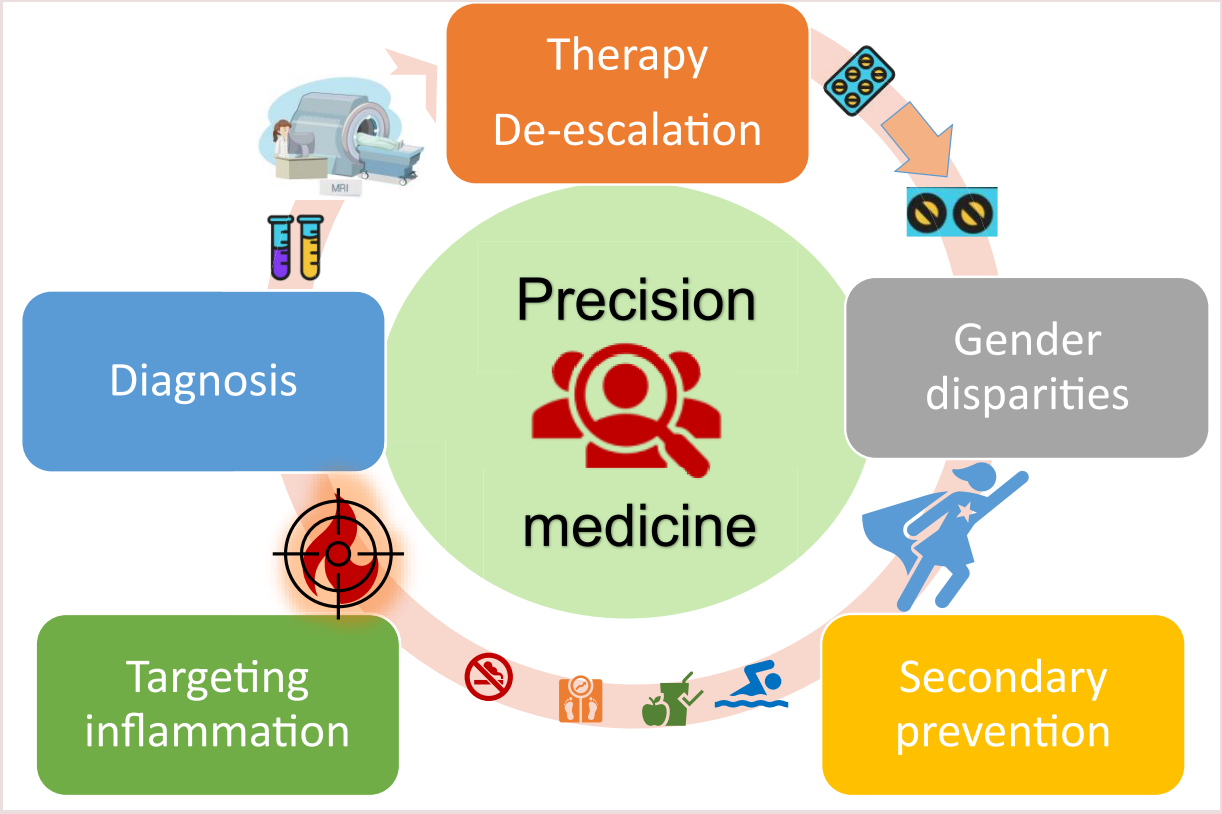
EDITORIAL
Educational papers

Shaping the future of acute coronary syndrome management: a look back at 2024

Pascal Vranckx[1,2]*, Marco Valgimigli[3], and Milica Aleksic [4]

[1]Department of Cardiology and Critical Care Medicine, Jessa Ziekenhuis, Stadsomvaart 11, 3500 Hasselt, Belgium; [2]Faculty of Medicine and Life Sciences, University of Hasselt, Martelarenlaan 42, 3500 Hasselt, Belgium; [3]Cardiocentro Ticino Institute and Università della Svizzera Italiana (USI), Lugano, Switzerland; and [4]Internal medicine specialist, Cardiology Fellow, University Hospital Medical Center Bezanijska kosa, Belgrade, Serbia

Graphical Abstract



As the calendar turns to 2025, we reflect on 2024 as a year marked by significant progress in acute coronary syndromes (ACS) research and management, captured in this special edition of the *European Heart Journal: Acute Cardiovascular Care*. Inspired by the Olympic spirit of breaking barriers and striving for excellence, this edition celebrates a transformative year in ACS management. Building on the 2023 ESC guidelines, which combined approaches for ST-elevation (STE-ACS) and non-ST-elevation ACS (NSTE-ACS), the advancements of 2024 offer a glimpse into the future of precision medicine. These include refinements to dual antiplatelet therapy (DAPT), a greater focus on

The views and opinions expressed in this article are those of the authors; they do not necessarily reflect the views of the Editors.

* Corresponding author. Tel: +32 11309579, Email: pascal.vranckx@jessazh.be

cardiovascular drug de-prescription, and insights into the evolving ESC chronic coronary syndrome guidelines—all of which prioritize personalized care as a key strategy for better outcomes.

The 2023 European Society of Cardiology (ESC) guidelines for acute coronary syndromes (ACS) integrated recommendations for ST-segment elevation (STE-ACS) and non-ST-segment elevation (NSTE-ACS) into a cohesive framework that emphasizes a unified approach to management, with a focus on antithrombotic optimization and personalized care.[1] This consolidation highlights the importance of consistent principles across the ACS spectrum and introduces 37 new recommendations while revising 9, with particular attention to patient-centered care, shared decision-making, and addressing regional outcome disparities.[1] Compared to the American College of Cardiology (ACC) and American Heart Association (AHA) guidelines, the ESC guidelines have some notable differences in treatment preferences.[2] For example, the ESC prefers prasugrel over ticagrelor for patients undergoing percutaneous coronary intervention (PCI) when there are no contraindications, while the ACC/AHA guidelines do not specify a preference.[2] The ESC has also updated its recommendations for pre-treatment in STE-ACS patients, reflecting the latest evidence and clinical practices. Regional differences in the management of ischaemic heart disease (IHD) are apparent, with regions like Central Asia and Eastern Europe facing higher mortality rates and requiring tailored treatments. In contrast, high-income Asia Pacific regions often use lower doses of statins and glucose-lowering therapies for conditions like heart failure and chronic kidney disease.[3]

One key guideline recommendation is the use of 12-month dual antiplatelet therapy (DAPT) following ACS or drug-eluting stent (DES) implantation.[1] However, emerging data from randomized clinical trials (RCTs) and meta-analyses support early de-escalation to P2Y12 inhibitor monotherapy after 1–3 months of DAPT, demonstrating comparable ischaemic outcomes with reduced bleeding risks.[4–7] The evolving evidence challenges the conventional 12-month DAPT approach, promoting a more individualized strategy that balances ischaemic and bleeding risks, using validated assessment tools.[8] This transition towards personalized care is reinforced in the 2024 ESC guidelines for chronic coronary syndrome, which prioritize bleeding prevention while advocating for evidence-based, individualized strategies that enhance ischaemic protection without increasing bleeding risk (ACC-D-24-00621).

The 2023 ESC Guidelines also caution against routine pre-treatment with oral P2Y12 inhibitors or GP IIb/IIIa antagonists, emphasizing the importance of balancing bleeding risk and individualized treatment.[1] Recent analyses of the On-TIME 2 trial, published in the European Heart Journal Acute Cardiovascular Care, show that prehospital tirofiban improves angiographic outcomes and increases the rate of disrupted myocardial infarction, a marker of optimal reperfusion.[8,9] These findings prompt a re-evaluation of early antiplatelet strategies, while emerging therapies such as subcutaneous GP IIb/IIIa inhibitors and P2Y12 antagonists might become new treatment options for prehospital care.[10,11]

Another standout achievement of 2024 was the refinement of diagnostic tools for ACS. Advances in diagnostic strategies for acute coronary syndromes (ACS) marked a major achievement in 2024, reflecting a deeper understanding of myocardial infarction and its complexities.[12] High-sensitivity cardiac troponin (hs-cTn) assays have transformed emergency care, enabling the exclusion of myocardial infarction with a single test at presentation.[13–15] However, their ability to detect even minor elevations in troponin has introduced challenges, particularly in patients with chronic kidney disease (CKD), where non-ischaemic elevations are common.[16] Refining diagnostic thresholds in CKD may enhance specificity without sacrificing sensitivity, addressing a critical gap in ACS diagnosis.[16] Traditionally, elevated hs-cTn levels have been associated with larger infarcts and better responses to guideline-directed therapies. Yet recent findings, including data from the SWEDEHEART registry, suggest that patients with elevated hs-cTn may not always benefit from a given therapy, challenging assumptions about troponin's role in guiding treatment. This highlights the need to consider context and patient-specific factors when interpreting biomarker data.[17] Imaging techniques complement biomarkers but also have limitations. Late gadolinium enhancement (LGE) cardiac MRI (CMR) is a cornerstone for identifying myocardial scars, yet approximately 10% of myocardial infarction cases lack detectable LGE despite significant hs-cTn elevations.[18,19] This phenomenon may result from subthreshold infarction, transient ischaemia, or spontaneous reperfusion. Emerging technologies like dark-blood LGE offer promising improvements in detecting subtle myocardial injury, potentially bridging gaps in diagnostic sensitivity.[20] Together, these advances underscore the importance of integrating refined biomarker thresholds with innovative imaging modalities. A multimodal approach will be essential to improve diagnostic precision and optimize care for ACS patients.

Cardiogenic shock (CS) is a life-threatening condition characterized by critical circulatory failure, leading to end-organ hypoperfusion and high mortality rates, especially in patients with acute myocardial infarction (AMI) or decompensated heart failure (HF).[21,22] Despite advances in early reperfusion therapies, CS remains prevalent, complicating up to 10% of AMI cases, particularly in ST-elevation myocardial infarction (STEMI). Early recognition is essential, as delayed intervention exacerbates multiorgan dysfunction and worsens outcomes.[23] Machine learning (ML) has shown promise in predicting late-onset CS. A study by Hu et al., leveraging the MIMIC-III database, developed an ML model, 'CShock,' using time-series data from 1500 patients. The model demonstrated robust predictive performance, with an area under the curve (AUC) of 0.82, identifying CS onset 36 h prior to clinical presentation.[24] In AMI complicated by CS, the CULPRIT-SHOCK trial provided pivotal insights into revascularization strategies.[22] Among patients with multivessel disease (MVD), culprit-lesion-only PCI reduced the composite of death or severe renal failure compared to immediate multivessel PCI (hazard ratio 0.84; 95% CI, 0.72–0.99). The residual SYNTAX score (rSS) further stratifies risk in patients with CS supported by veno arterial extracorporeal membrane oxygenation (VA-ECMO), correlating higher rSS with worse outcomes.[25] While complete revascularization improves ECMO weaning, its role remains nuanced, emphasizing individualized treatment strategies to optimize outcomes in this high-risk population. A dedicated 'Best of 2024' manuscript in our series will provide further insights into cardiogenic shock and its therapies (ref Sean).

Secondary prevention remains pivotal in reducing the long-term burden of ACS. The European Society of Cardiology (ESC) emphasizes comprehensive secondary prevention after AMI to mitigate long-term cardiovascular risks.[1] This involves pharmacological interventions—aspirin, P2Y12 inhibitors, statins, beta-blockers, and RAAS inhibitors—alongside lifestyle modifications, including smoking cessation, exercise, and dietary changes. Despite initial adherence during hospitalization and rehabilitation, long-term adherence remains suboptimal.[26] Only 50% of patients in the GULLIVE-R study received all five recommended medications, and just one-third participated in regular physical activity, highlighting significant gaps in adherence.[27] Patient education on risk factors and target values is critical but often declines over time. In the GULLIVE-R study, only 37.9% of patients correctly identified blood pressure targets, and 8.2% knew their LDL-C goals. Structured follow-up programmes and risk communication strategies may enhance adherence. The residual risk persists despite advances in lipid-lowering and antithrombotic therapies. In the realm of novel therapeutics, the AEGIS-II trial explored CSL112, a plasma-derived apolipoprotein A-I, to reduce residual cardiovascular risk. Despite promising preclinical data, the trial did not achieve significant improvements.[28,29] This underscores the challenges of advancing therapies in an era where standard care is highly optimized.

Inflammation has become a focal point in understanding outcomes in acute coronary syndromes (ACS), particularly in ST-segment elevation myocardial infarction (STEMI), where an intense inflammatory response drives adverse cardiac re-modeling and heart failure (HF).

A recent study using the TriNetX Research Network analysed eosinophil (EOS) levels in 47 669 STEMI patients treated between 2012 and 2022, stratifying patients into high ($\geq 0.2 \times 10^3/\mu L$) and low ($<0.2 \times 10^3/\mu L$) EOS groups.[30] Propensity score matching balanced baseline characteristics (15 877 patients per group), revealing that low EOS levels were associated with significantly higher rates of all-cause death or new-onset HF (17.0% vs. 13.3%; HR 1.35, 95% CI, 1.28–1.43, $P < 0.001$). These findings underscore the importance of post-STEMI inflammation resolution, with EOS levels emerging as a potential biomarker for risk stratification.

Therapies targeting inflammation have seen mixed success, underscoring the complexity of this approach. Unlike earlier trials such as COLCOT, LoDoCo-2, and CANTOS—which demonstrated significant reductions in cardiovascular events with low-dose colchicine and canakinumab—CLEAR-SYNERGY reported no benefit of colchicine on its primary composite outcome (HR 0.99, 95% CI, 0.85–1.16, $P = 0.93$) or spironolactone on its co-primary endpoints (HR 0.91, 95% CI, 0.69–1.21, $P = 0.51$).[31–35] Furthermore, the trial's observed reduction in high-sensitivity C-reactive protein (hs-CRP) at 3 months (3.0 mg/L vs. 4.3 mg/L) failed to achieve the <2.0 mg/L threshold associated with cardiovascular event reductions in prior studies. The CLEAR-SYNERGY trial, conducted during the COVID-19 pandemic, faced several challenges that complicate its interpretation.[35] These included under-reporting of nonfatal events, an atypical myocardial infarction-to-death ratio (0.62 in CLEAR-SYNERGY vs. 1.52 in COMPLETE), and pandemic-related disruptions that have similarly affected other trials, such as GUIDE-HF and IRONMAN. Notably, the lack of benefit from spironolactone stands in contrast to survival gains reported in earlier landmark trials, including EPHESUS and RALES.[36,37] These findings underscore the complexity of targeting inflammation in ACS and the influence of external factors, such as the pandemic, on trial outcomes. Future studies, including the COL BE PCI study, may provide additional clarity on the role of colchicine in broader populations. For now, CLEAR-SYNERGY highlights the need for careful trial design and interpretation, particularly when external influences may affect data reliability.

The use of beta-blockers in patients with heart failure and reduced ejection fraction (HFrEF) is a well-established Class I indication. The discontinuation of beta-blockers after AMI in patients with preserved left ventricular ejection fraction (LVEF) is emerging as a critical aspect of cardiovascular drug de-prescription. Historically, beta-blockers were foundational in post-AMI care, with early studies demonstrating significant mortality reductions.[38] However, these trials predated the era of modern reperfusion strategies and comprehensive secondary prevention therapies such as statins, angiotensin-converting enzyme inhibitors, and dual antiplatelet therapy.[2] The evolving therapeutic landscape and improved AMI outcomes have prompted a re-evaluation of beta-blocker use, particularly in patients with preserved LVEF, for whom benefits are less clear. Furthermore, the use of beta-blockers may impact quality of life.[39]

Recent evidence has highlighted the limited efficacy of beta-blockers in this population. The REDUCE-AMI trial, involving 5020 patients, found no significant reduction in all-cause mortality or recurrent AMI among beta-blocker users compared to non-users (7.9% vs. 8.3%, $P = 0.64$).[40] Similarly, the AβYSS trial, which examined beta-blocker discontinuation in stabilized post-AMI patients, demonstrated a higher rate of cardiovascular hospitalization without quality-of-life improvements in the discontinuation group.[41] These findings challenge the routine continuation of beta-blockers in well-managed patients with preserved LVEF, underscoring the importance of individualized treatment decisions. Nevertheless, uncertainties persist. The risk of increased cardiovascular events upon discontinuation, as suggested by the AβYSS trial, necessitates a nuanced approach.[41] In variance, the REDUCE-AMI trial found that beta-blocker therapy modestly increased depressive symptoms without significantly affecting anxiety, underscoring the need to weigh psychological impacts in patients with preserved LVEF post-MI (https://doi.org/10.1093/ehjacc/zuae112). Until further data from ongoing trials become available, shared decision-making remains essential, balancing the potential benefits of discontinuation against the risks of adverse outcomes.

Finally, Gender disparities in cardiology, particularly in acute coronary syndrome (ACS), reflect significant differences in presentation, management, and outcomes. Women admitted for their first ACS event are, on average, 7 years older than men and have a higher comorbidity burden, leading to worse short- and long-term outcomes, including higher in-hospital mortality (10% vs. 7%), 30-day mortality (16% vs. 12%), and 2-year death or cardiovascular readmission (44% vs. 34%).[42] Younger women (<65 years) face disproportionately high risks, often influenced by complex interactions of age, comorbidities, ethnicity, and socioeconomic factors. Tailored clinical strategies are needed to mitigate these risks. Non-ST-segment elevation myocardial infarction (NSTEMI) presents unique challenges in women, who frequently exhibit conditions like myocardial infarction with non-obstructive coronary artery disease (MINOCA) and spontaneous coronary artery dissection (SCAD), conditions associated with severe complications and comparable mortality to obstructive coronary disease.[43,44] Despite higher ischaemic risks, women often receive less guideline-directed care, including invasive angiography.[1] Efforts to close these gaps, particularly through secondary prevention measures like smoking cessation and rehabilitation, show promise. Continued research into sex-specific differences, particularly in underrepresented groups such as postpartum SCAD, is critical. Standardized, equitable, and targeted approaches are essential to optimize cardiovascular care for women.

As we bid farewell to 2024, the achievements of this transformative year reaffirm the importance of integrating evidence-based practices with innovative, patient-centered approaches. The advancements in diagnostic precision, therapy refinement, and understanding of inflammation's role in ACS reflect a field on the cusp of major breakthroughs. By continuing this momentum, 2025 promises to build on these foundations, advancing the frontier of acute coronary syndrome management towards a future defined by personalized care and improved outcomes.

Funding

No external funding.

Conflict of interest: none declared.

Data availability

No new data were generated or analysed in support of this research.

References

1. Byrne RA, Rossello X, Coughlan JJ, Barbato E, Berry C, Chieffo A, *et al.* 2023 ESC guidelines for the management of acute coronary syndromes. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:55–161.
2. Ortega-Paz L, Mehran R, Angiolillo DJ. North American perspective on the 2023 European Society of Cardiology guidelines for the management of acute coronary syndromes. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:165–172.
3. Torii S, Chiang C-E, Hong SJ, Goto S, Huang W-C, Chan MY-Y, *et al.* Asian perspective on the recently published practice guideline for acute coronary syndrome by ESC. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:162–164.
4. Vranckx P, Valgimigli M, Jüni P, Hamm C, Steg PG, Heg D, *et al.* Ticagrelor plus aspirin for 1 month, followed by ticagrelor monotherapy for 23 months vs aspirin plus clopidogrel or ticagrelor for 12 months, followed by aspirin monotherapy for 12 months after implantation of a drug-eluting stent: a multicentre, open-label, randomised superiority trial. *Lancet* 2018;**392**:940–949.
5. Gragnano F, Mehran R, Branca M, Franzone A, Baber U, Jang Y, *et al.* P2y(12) inhibitor monotherapy or dual antiplatelet therapy after Complex percutaneous coronary interventions. *J Am Coll Cardiol* 2023;**81**:537–552.
6. Valgimigli M, Hong S-J, Gragnano F, Chalkou K, Franzone A, da Costa BR, *et al.* De-escalation to ticagrelor monotherapy versus 12 months of dual antiplatelet therapy in patients with and without acute coronary syndromes: a systematic

review and individual patient-level meta-analysis of randomised trials. *Lancet* 2024; **404**:937–948.
7. Landi A, Aboyans V, Angiolillo DJ, Atar D, Capodanno D, Fox KAA, *et al.* Antithrombotic therapy in patients with acute coronary syndrome: similarities and differences between a European expert consensus document and the 2023 European Society of Cardiology guidelines. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:173–180.
8. Van't Hof AW, Ten Berg J, Heestermans T, Dill T, Funck RC, van Werkum W, *et al.* Prehospital initiation of tirofiban in patients with ST-elevation myocardial infarction undergoing primary angioplasty (on-TIME 2): a multicentre, double-blind, randomised controlled trial. *Lancet* 2008;**372**:537–546.
9. Siasos G, Oikonomou E, Tousoulis D. Alirocumab and evolocumab: an indirect comparison of cardiovascular benefits. *Eur Heart J Cardiovasc Pharmacother* 2021;**7**:236–237.
10. Sinnaeve P, Fahrni G, Schelfaut D, Spirito A, Mueller C, Frenoux J-M, *et al.* Subcutaneous selatogrel inhibits platelet aggregation in patients with acute myocardial infarction. *J Am Coll Cardiol* 2020;**75**:2588–2597.
11. Rikken SAOF, Bor WL, Selvarajah A, heng KL, Hack AP, Gibson CM, *et al.* Prepercutaneous coronary intervention zalunfiban dose-response relationship to target vessel blood flow at initial angiogram in st-elevation myocardial infarction—a post hoc analysis of the cel-02 phase IIa study. *Am Heart J* 2023;**262**:75–82.
12. Mingels AM, Mills NL, Mueller C. Cardiac troponin T and I: back to basics. *Eur Heart J Acute Cardiovasc Care* 2023;**12**:631–632.
13. de Barros E Silva PGM, Ferreira AA, Malafaia F, Tavares Reis AFM, Sznejder H, Lopes Junior ACDA, *et al.* Potential performance of a 0 h/1 h algorithm and a single cut-off measure of high-sensitivity troponin T in a diverse population: main results of the IN-HOPE study. *Eur Heart J Acute Cardiovasc Care* 2023;**12**:755–764.
14. Apple FS, Mills NL, Mueller C. The origin and future of cardiac troponin testing. *Eur Heart J Acute Cardiovasc Care* 2022;**11**:e1–e2.
15. Lehmacher J, Sörensen NA, Twerenbold R, Goßling A, Haller PM, Hartikainen TS, *et al.* Diagnostic and prognostic value of the sex-specific 99th percentile of four high-sensitivity cardiac troponin assays in patients with suspected myocardial infarction. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:3–12.
16. Knott JD, Ola O, De Michieli L, Akula A, Mehta RA, Dworak M, *et al.* Diagnosis of acute myocardial infarction in patients with renal failure using high-sensitivity cardiac troponin T. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:546–558.
17. Eggers KM, Lindhagen L, Lindahl B. Cardiovascular medications, high-sensitivity cardiac troponin T concentrations, and long-term outcome in non-ST segment elevation acute coronary syndrome. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:559–562.
18. McAlindon E, Pufulete M, Lawton C, Angelini GD, Bucciarelli-Ducci C. Quantification of infarct size and myocardium at risk: evaluation of different techniques and its implications. *Eur Heart J Cardiovasc Imaging* 2015;**16**:738–746.
19. Salatzki J, Giannitsis E, Hegenbarth A, Mueller-Hennessen M, André F, Frey N, *et al.* Absence of visible infarction on cardiac magnetic resonance imaging despite the established diagnosis of myocardial infarction by 4th universal definition of myocardial infarction. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:24–35.
20. Salatzki J, Giannitsis E, Hegenbarth A, Mueller-Hennessen M, André F, Katus HA, *et al.* Correlation of serial high-sensitivity cardiac troponin T values to infarct mass determined by cardiac magnetic resonance imaging: a validation study. *Eur Heart J Acute Cardiovasc Care* 2022;**11**:826–833.
21. Tavazzi G, Rossello X, Grand J, Gierlotka M, Sionis A, Ahrens I, *et al.* Epidemiology, monitoring, and treatment strategy in cardiogenic shock. A multinational cross-sectional survey of ESC-acute cardiovascular care association research section. *Eur Heart J Acute Cardiovasc Care* 2022;**11**:706–711.
22. Jung C, Wernly B, Masyuk M, Kelm M, Freund A, Pöss J, *et al.* A Bayesian reanalysis of the CULPRIT-SHOCK trial. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:701–708.
23. Correction to: prognostic significance of haemodynamic parameters in patients with cardiogenic shock. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:589.
24. Hu Y, Lui A, Goldstein M, Sudarshan M, Tinsay A, Tsui C, *et al.* Development and external validation of a dynamic risk score for early prediction of cardiogenic shock in cardiac intensive care units using machine learning. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:472–480.
25. Hong D, Choi KH, Ahn C-M, Yu CW, Park IH, Jang WJ, *et al.* Clinical significance of residual ischaemia in acute myocardial infarction complicated by cardiogenic shock undergoing venoarterial-extracorporeal membrane oxygenation. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:525–534.
26. Valgimigli M, Garcia-Garcia HM, Vrijens B, Vranckx P, McFadden EP, Costa F, *et al.* Standardized classification and framework for reporting, interpreting, and analysing medication non-adherence in cardiovascular clinical trials: a consensus report from the non-adherence academic research consortium (NARC). *Eur Heart J* 2019;**40**: 2070–2085.
27. Zeymer U, Goss F, Kunadt M, Oldenburg S, Hochadel M, Thiele H, *et al.* Patient knowledge about risk factors, achievement of target values, and guideline-adherent secondary prevention therapies 12 months after acute myocardial infarction. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:537–545.
28. Gibson CM, Duffy D, Korjian S, Bahit MC, Chi G, Alexander JH, *et al.* Apolipoprotein A1 infusions and cardiovascular outcomes after acute myocardial infarction. *N Engl J Med* 2024;**390**:1560–1571.
29. Verbrugge FH, Krychtiuk KA. In perspective: CSL112 (apolipoprotein A-I) infusions and cardiovascular outcomes in patients with acute myocardial infarction: the ApoA-I event reducing in ischemic syndromes II (AEGIS-II) trial. *Eur Heart J Acute Cardiovasc Care* 2024; **13**:362–364.
30. Golino M, Corna G, De Ponti R, Abbate A, Van Tassell B. One-year outcomes of patients with ST-segment elevation myocardial infarction according to eosinophil blood count. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:429–432.
31. Tardif J-C, Kouz S, Waters DD, Bertrand OF, Diaz R, Maggioni AP, *et al.* Efficacy and safety of low-dose colchicine after myocardial infarction. *N Engl J Med* 2019;**381**:2497–2505.
32. Nidorf SM, Fiolet ATL, Mosterd A, Eikelboom JW, Schut A, Opstal TSJ, *et al.* Colchicine in patients with chronic coronary disease. *N Engl J Med* 2020;**383**:1838–1847.
33. Ridker PM, MacFadyen JG, Everett BM, Libby P, Thuren T, Glynn RJ. Relationship of C-reactive protein reduction to cardiovascular event reduction following treatment with canakinumab: a secondary analysis from the CANTOS randomised controlled trial. *Lancet* 2018;**391**:319–328.
34. Jolly SS, d'Entremont M-A, Lee SF, Mian R, Tyrwhitt J, Kedev S, *et al.* Colchicine in acute myocardial infarction. *N Engl J Med* 2024; doi:10.1056/NEJMoa2405922. Published online ahead of print 17 November 2024.
35. Tardif JC, Kouz S. Efficacy and safety of colchicine and spironolactone after myocardial infarction: the CLEAR-SYNERGY trial in perspective. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:zuae13512.
36. Pitt B, Remme W, Zannad F, Neaton J, Martinez F, Roniker B, *et al.* Eplerenone, a selective aldosterone blocker, in patients with left ventricular dysfunction after myocardial infarction. *N Engl J Med* 2003;**348**:1309–1321.
37. Pitt B, Zannad F, Remme WJ, Cody R, Castaigne A, Perez A, *et al.* The effect of spironolactone on morbidity and mortality in patients with severe heart failure. Randomized aldactone evaluation study investigators. *N Engl J Med* 1999;**341**:709–717.
38. Norwegian Multicenter Study Group. Timolol-induced reduction in mortality and reinfarction in patients surviving acute myocardial infarction. *N Engl J Med* 1981;**304**: 801–807.
39. Humphries S, Wallert J, Mars K, Held C, Hofmann R, Olsson EMG. Association between β-blocker dose and quality of life after myocardial infarction: a real-world Swedish register-linked study. *Eur Heart J Acute Cardiovasc Care* 2022;**11**:491–500.
40. van Diepen S, Halvorsen S, Menon V. The REDUCE-AMI trial: an important step in cardiovascular drug de-prescription. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:370–372.
41. Platz E, Morrow DA. AβYSS trial in perspective: beta-blockers following myocardial infarction among patients with preserved ejection fraction. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:674–676.
42. Earle NJ, Doughty RN, Devlin G, White H, Riddell C, Choi Y, *et al.* Sex differences in outcomes after acute coronary syndrome vary with age: a New Zealand national study. *Eur Heart J Acute Cardiovasc Care* 2024;**13**:284–292.
43. Nishiguchi T, Tanaka A, Ozaki Y, Taruya A, Fukuda S, Taguchi H, *et al.* Prevalence of spontaneous coronary artery dissection in patients with acute coronary syndrome. *Eur Heart J Acute Cardiovasc Care* 2016;**5**:263–270.
44. Vogel B, Acevedo M, Appelman Y, Bairey Merz CN, Chieffo A, Figtree GA, *et al.* The lancet women and cardiovascular disease commission: reducing the global burden by 2030. *Lancet* 2021;**397**:2385–2438.