

"Machine learning to risk stratify chest pain patients with non-diagnostic electrocardiogram in an Asian emergency department": Correspondence

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Dear Editor,

I read with great interest the recent article by Lin et al. on machine learning-based risk stratification of chest pain patients with non-diagnostic electrocardiograms in an Asian emergency department (ED).¹ The implementation of the myocardial-ischaemic-injury-index (MI³) algorithm offers significant potential to improve early triage and disposition decisions in busy ED environments.

The reported sensitivity (98.9%) and negative predictive value (99.8%) of MI³ for excluding type 1 myocardial infarction (MI) at 30 days are highly promising, particularly in resource-limited and overcrowded emergency settings.² When compared to conventional strategies such as the 99th percentile troponin cut-off or the European Society of Cardiology 0/2-hour algorithm, MI³ either matched or outperformed these benchmarks, highlighting its potential to reduce unnecessary admissions and improve patient flow.

However, several aspects merit further reflection. The model's performance with only baseline troponin data showed excellent accuracy but was limited in its ability to identify low-risk patients, classifying only 8.5% as such. In real-world practice, reliance on single troponin measurements is often unavoidable due to delayed presentations and ED congestion.^{2,3} Enhancing the model's discriminatory capacity in this context would increase its clinical applicability.

A noteworthy limitation is the algorithm's dependency on the Abbott ARCHITECT STAT high-sensitivity troponin I assay. Many institutions, including mine, use alternative platforms such as high-sensitivity troponin T. Cross-platform validation of MI³ or development of platform-agnostic models, is essential before widespread adoption can occur.⁴ The inconsistency in performance metrics across different assays underscores this need.

Clinician trust and interpretability remain central issues. Although MI³ requires only age, sex and troponin levels—making it more objective than tools like HEART—it remains a "black-box" system for many users.⁵ Improving model transparency and integrating

explainable artificial intelligence (AI) methods could enhance clinician acceptance, especially in non-academic and high-turnover environments.⁶

Lin et al. raise an important point about the financial burden of unnecessary admissions. The potential for cost savings by identifying low-risk patients early is significant. Nevertheless, this remains speculative without formal cost-effectiveness analysis.¹ Future research should explore the economic implications of MI³ implementation using real-world data from diverse healthcare systems.⁷

Additionally, the generalisability of MI³ to multi-ethnic populations needs further investigation. Although the authors note the underrepresentation of Asian populations in prior studies, subgroup analyses by ethnicity could reveal performance discrepancies. This is especially relevant in regions like Singapore with diverse demographics.⁸ Such analyses may inform whether model recalibration is needed for specific subpopulations.

I concur with the authors that AI tools should not replace clinical judgement. However, structured training and integration with clinical decision support systems could standardise use and mitigate the risk of overreliance or inappropriate application.⁹ Electronic medical record-based integration would also facilitate seamless adoption and adherence to protocolised care.

In summary, Lin et al. contribute valuable evidence supporting machine learning integration in acute cardiovascular care. To realise the full potential of tools like MI³, efforts should focus on improving single-sample performance, expanding cross-platform compatibility, enhancing interpretability and generating local economic data. I look forward to future implementation studies that address these real-world challenges.

Ethics statement

Not applicable. This manuscript is a commentary on a previously published study and does not involve original research on human subjects; therefore, Institutional Review Board approval was not required.

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