ChatGPT-Assisted ECG Interpretation Can Help in the STEMI Activation Pathway: A Single-Centre Diagnostic Accuracy Study

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BACKGROUND AND AIMS

Timely identification of ST-segment elevation myocardial infarction (STEMI) and prompt activation of the catheterisation laboratory team are determinant for patient outcomes. Current guidelines recommend a first-medical-contact-to-balloon time of less than 90 minutes for primary percutaneous coronary intervention, yet real-world workflows are frequently hampered by diagnostic uncertainty and variability in ECG interpretation.[1] Between 5–10% of emergent cath lab activations represent false positives,[2] resulting in unnecessary risk and resource expenditure, while missed or delayed diagnoses carry substantial morbidity and mortality. Conventional 12-lead ECG analysis depends on operator experience and, even among cardiologists, inter-observer agreement for STEMI diagnosis is imperfect.[3]

Generative AI, and large language models in particular, have attracted growing interest in Cardiology. Prior studies evaluating earlier ChatGPT (OpenAI, San Francisco, California, USA) versions for ECG interpretation showed moderate overall accuracy, with the model performing best for normal tracings and poorly for acute ischaemic changes.[4,5] The emergence of multimodal large language models has opened the possibility for direct visual analysis of ECG images to support clinical triage.

Dedicated AI ECG platforms have demonstrated high sensitivity and specificity on coronary occlusion detection,[2] but require institutional integration and technical infrastructure. ChatGPT is accessible; however, there is few data stating it can meaningfully support the STEMI activation decision in a real-world clinical setting.

The authors' aim was to assess the diagnostic accuracy of ChatGPT version 5.0 for ECG-based detection of acute coronary occlusion in a real-world STEMI activation cohort.[6]

MATERIALS AND METHODS

This single-centre retrospective study enrolled all consecutive coronary team ('Via Verde Coronária') STEMI activations at a Portuguese tertiary centre from

January–November 2025. Available ECG images were analysed using ChatGPT version 5.0, prompted with a single standardised question: "Based on this ECG, is there an occluded coronary artery?" ChatGPT's binary prediction ('yes'/'no') was compared against the reference standard of invasive coronary angiography. Significant coronary artery disease was defined as stenosis >90% requiring urgent revascularisation.

RESULTS

A total of 220 STEMI activations were reviewed (mean age: 64±14 years; 30.9% female; comorbidities including hypertension in 63.2%, dyslipidaemia in 42.7%, and diabetes in 21.8%). ECGs were available for analysis in 176 cases (80%); the remaining 20% were unavailable due to external acquisition or technical issues. Of the 176 analysable patients, 152 (86%) had angiographically confirmed significant coronary stenosis.

ChatGPT correctly predicted significant stenosis in 126 of 152 cases (83%), with 26 missed occlusions: left anterior descending artery (n=10), left circumflex artery (n=5), right coronary artery (n=5), diagonal branch (n=2), obtuse marginal branch (n=2), and three-vessel disease (n=1). Among 24 patients without significant stenosis, 20 (83%) were correctly classified; four false positives were identified in patients with normal coronary arteries (n=2), coronary vasospasm (n=1), or undergoing repeat angiography (n=1).

Overall, diagnostic accuracy was 83.0%. Sensitivity was 82.9% and specificity 83.3%, with a positive likelihood ratio of 4.97. The positive predictive value (PPV) was high at 96.9%, compared with 84.4% for the human comparator, confirming strong rule-in capability. The negative likelihood ratio was 0.21 and the negative predictive value was 43.5%, indicating limited rule-out capability.

CONCLUSION

These results indicate a good overall performance, driven mainly by ChatGPT's rule-in ability, with a high PPV, providing practical reassurance for clinicians uncertain about activating the interventional team or even the on-duty cardiologist. The negative predictive value was low (although limited by the high disease prevalence), and ChatGPT should not be used to exclude a coronary occlusion. The high PPV suggests further investigations are necessary to explore ChatGPT's capability in similar settings, such as identifying non-STEMI patients with an acutely occluded artery.

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