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AI-Powered CDSS for the Interpretation of ST-Segment Elevation Myocardial Infarctions in Electrocardiograms: A Systematic Literature Review

Michael Etter[1], Dr. Bruce Lazar[2]

[1] School of Health Sciences, Southern Illinois University, Carbondale, USA
michael.etter@siu.edu
[2]School of Health Sciences, Southern Illinois University, Carbondale, USA
Bruce.lazar.edu

***Abstract**: This systematic review examines the diagnostic accuracy of artificial intelligence (AI)-powered clinical decision support system (CDSS) in the interpretation of ST-segment elevation myocardial infarctions (STEMIs) in electrocardiograms (ECGs) in adult inpatients. Hospitals today continue to struggle to meet the national standards for first-medical-contact to device-times even with strict STEMI criteria. This poor triaging of patients leads to missed device times and poor patient outcomes. Limited evidence on the use of AI-powered CDSS is published. A systematic literature review of current research is required to evaluate the diagnostic accuracy of AI-powered CDSS for interpreting STEMIs on adult inpatients. This review utilized the PRISMA 2020 guidelines to identify studies published between the years 2021-2026 using the databases Medline Ultimate, PubMed, and CINAHL. Keyword searches included ST-segment elevation myocardial infarction (STEMI), AI-assisted ECG interpretation, diagnostic accuracy, and ECG interpretation, which were combined with Boolean operators (AND/OR) and MeSH terms. Other inclusion criteria included peer-reviewed articles, articles published in English, and full-text articles. Studies that met these criteria were then screened by titles/abstract. A full-text review was then conducted for the final inclusion process. Utilizing this screening process, eighteen studies were included in the systematic review that included cohort and diagnostic accuracy studies. Primary outcomes found consistently high diagnostic accuracy for AI-powered CDSS. Secondary outcomes demonstrated improved ECG turnaround times and improved door-to-balloon times with the use of AI-powered CDSS. Evidence gaps included differing AI algorithms utilized throughout the included studies. The studies were also performed across a broad range of patient populations, which influences variability in outcomes. The overall findings demonstrated improved diagnostic accuracy of STEMI identification in ECGs along with improved ECG turnaround times and door-to-balloon times. Due to the differing algorithms, future research needs to focus on a single AI algorithm for ease of implementation into workflows.*

Keywords— (“STEMI” OR ST-Elevated Segment Myocardial Infarction” Or “Heart Attacks” Or “Acute Myocardial Infarctions”) AND (“AI” Or “Artificial Intelligence” Or “machine learning” Or “deep learning”) AND (“ECG Accuracy” or “EKG Accuracy” or “activation” or “door-to-balloon”) AND (“Clinician Interpretation” Or “Traditional ECG Interpretation”); APA Style Format

1. Introduction

Healthcare systems are currently experiencing delays in STEMI treatment even with standardized STEMI treatment criteria. A recent study by Sammour et al. found that only 50% of STEMI patients met the first-medical-contact to device time of less than 120 minutes when being transferred from an outside facility to a percutaneous coronary intervention (PCI)-capable center. The study also found that only 60% of patients who presented to a PCI-capable facility were treated in the first medical contact-to-device time of less than 90 minutes. Despite national standards set for STEMIs, facilities are still struggling to meet the goals for first-medical contact-to-device time. Sammour et al. also found that missed device times led to an increase in hospital mortality (Sammour et al., 2025).

There are limited literature reviews and meta-analyses about the use of AI for the diagnosis of STEMIs. One systematic review of literature suggests that AI has a high diagnostic accuracy for identifying STEMIs in patients with acute coronary symptoms. The review found AI to have a sensitivity comparable to, and at times exceeding, that of clinician interpretations of ECGs. However, the study highlights the need to evaluate whether AI improves times of diagnosis and patient outcomes (Fawzy et al., 2025).

Due to the recent development of AI, there is a need for research on the use of AI in diagnosing STEMIs from ECGs. The limited research provides generalized evidence of the potential of utilizing AI in the decision-making process. Therefore, a systematic literature review can provide clarity on the use of AI-powered CDSS for the diagnosis of STEMIs and improvement of first medical contact-to-device times. This systematic literature review aims to answer the question: among patients experiencing ST-segment elevation myocardial infarctions (STEMIs), how does the use of AI-assisted interpretation compared to clinician and traditional ECG interpretation methods impact ECG diagnostic accuracy, STEMI activation time, and time to coronary revascularization?

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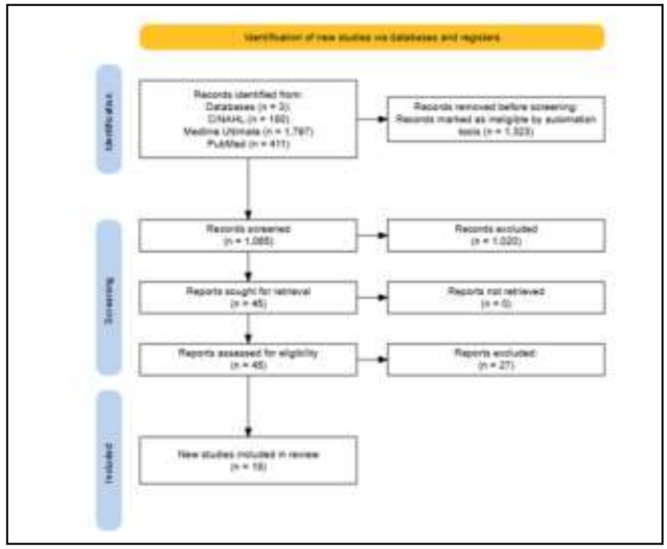
2. Methods

To assess the efficacy of utilizing AI for the use of diagnosing STEMIs in adults, the researcher performed a systematic literature review in accordance with the PRISMA 2020 guidelines. The research question was developed through the PICO (population, intervention, comparison, and outcome) framework: Among patients experiencing ST-segment elevation myocardial infarctions (STEMIs), how does the use of AI-assisted interpretation, compared to clinician and traditional ECG interpretation methods, impact ECG diagnostic accuracy, STEMI activation time, and time to coronary revascularization? This systematic review was performed in accordance with the PRISMA 2020 guidelines to assess the efficacy of utilizing AI for the use of diagnosing STEMIs. Though this review was not registered, all analytical and eligibility search methods were documented before initiating the review. By utilizing databases provided by Southern Illinois University of Carbondale's Morris Library, a comprehensive literature review was conducted through CINAHL, Medline Ultimate, and PubMed databases. All databases were searched in 2026 utilizing PICO-based keywords including ST-segment elevation myocardial infarction (STEMI), AI-assisted ECG interpretation, diagnostic accuracy, and ECG interpretation, which were combined with Boolean operators (AND/OR) and MeSH terms.

Inclusion criteria during the literature search consisted of peer-reviewed articles published in English between the dates of 2021-2026 that were available in full-text. Articles were excluded if the article was a meta-analysis, narrative review, or non-peer-reviewed; outside the published date range of 2021-2026; or articles were not available in full text or failed to meet the target population (adult inpatients with suspected or confirmed STEMI). Two independent reviewers then performed a screening process of abstracts and titles, followed by full-text reviews for study eligibility. A final review of studies was conducted by the two independent reviewers of the remaining studies. The final included studies had a Cohen's Kappa (k) agreement value of k=0.615, which indicated moderate agreement between the two independent reviewers.

Data extracted independently from each study included the country the study was conducted in, study design, population, sample size, intervention, comparison, outcomes, key findings, and study limitations. The primary interest of the data extraction was the diagnostic accuracy of AI in recognizing STEMIs in adult inpatients experiencing AMIs. The Joanna Briggs Institute (JBI) Critical Appraisals Tool was then utilized to assess bias in the studies identified to ensure only low-to moderate-risk studies were incorporated into the literature review. The PRISMA flow diagram (Figure 1) illustrates article selection transparency with adherence to PRISMA 2020 standards.

Fig. 1. *PRISMA Flow Diagram*



3. Results

The systematic review consisted of 18 studies that were broken down by characteristics including author/year, country the study was performed in, study design, population, sample size, intervention, comparison, outcome measures, and key findings (Table 3). After the characteristics were identified from each study, the reviewer was able to identify common themes throughout the studies. Narrative synthesis identified three PICO patterns, with one primary theme and two secondary themes (Table 1). The primary/dominant theme identified during the literature review was AI-powered CDSS diagnostic accuracy in interpreting STEMI in ECGs. The two common secondary themes included efficiency, which encompassed both ECG turnaround times and reduction of false positives. Using the JBI Critical Appraisal Tools, the reviewer conducted bias screening for inclusion (Table 2). Fourteen of the 18 studies were assessed as low bias risks, while four studies were assessed as having a moderate risk for bias.

The studies were performed in a wide range of countries and regions including the United States, Korea, Europe, Taiwan, India, and China. Seven of the 18 studies occurred in the United States (Karim 2025, Herman 2023, Herman 2026, Shroyer 2025, Kei Wei 2022, Sharkey 2026, and Carvalho 2026), 6 of the 18 studies occurred in Korea (Lee 2025, Kim 2024, Kyung Hoon Cho 2025, Dongsung 2022, Min Ji Park 2024, Min Seok Choi 2026) and 3 of the 18 studies either occurred across Europe or in a European country such as Sweden (Herman 2026, Cooper, 2025, Nystrom 2026).

The dominant theme was the diagnostic accuracy of AI-powered CDSS. The review of literature found AI-powered CDSS to have a higher diagnostic rate than traditional ECG interpretation methods, including clinician interpretation, STEMI criteria, and ECG machine interpretation. Across the

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included studies, diagnostic accuracy consistently improved with AI-powered CDSS, with studies by Lee 2025, Kim 2024, Karim 2025, Liu 2021, Herman 2023, Herman 2026, Shroyer 2025, Ke-Wei 2022, Kyung Hoon Cho 2025, Sharkey 2026, Carvalho 2026, Cooper 2025, Dongsung 2022, Yahzi, 2026, Nystrom 2026, Min Ji Park 2024, Praveen 2026, and Min Seok Choi 2026 reporting an overall high diagnostic accuracy while also outperforming control groups in 17 of 18 studies measured using sensitivity, specificity, and area under the curve. The study by Kim 2024 did not find improved diagnostic accuracy with AI when compared to that of cardiologists, but it was non-inferior.

The secondary themes identified during the literature review were efficiency and door-to-balloon times. Efficiency relates to the STEMI activation time portion of the PICO question by evaluating the timeliness of ECG interpretations for improvement of door-to-balloon times and reduction in false positives, which decrease cath lab activation. Consistent findings in the studies included a reduction in ECG read/interpretation turnaround times and a reduction in false positive STEMI reads, which leads to a decrease in unnecessary cath lab activations. In eight studies, findings related to efficiency were overall positive. Studies by Praveen 2026, Yahzi Lo 2026, Cooper 2025, Shroyer 2025, Herman 2023, Herman 2026, Lee 2025, and Karim 2025 reported either improved ECG turnaround times and/or reduction in false positive STEMIs. The door-to-balloon time theme demonstrated positive results, with outcomes reported across 3 studies (Dongsung 2022, Liu 2021, and Min Seok Chi 2026) showing a reduction in door-to-balloon time with the use of AI-powered CDSS.

Overall, the findings were consistent for both the primary and secondary outcomes. However, evidence gaps remain after review of studies. The primary outcome had an overall high diagnostic accuracy finding, though the variability in algorithms used throughout the studies limits the generalizability of findings. The diverse populations included across the studies provide a broad representation of patient groups; however, differences in the AI algorithms used create uncertainty regarding whether these algorithms can be effectively implemented across diverse populations. The secondary outcomes also had limited data throughout the included studies, which implies the need for future research for more accurate results.

Table 1: Evidence Synthesis Matrix

Theme	***Subtheme***	***Supporting Studies***	***Direction***
Diagnostic Accuracy	STEMI/AMI detection accuracy	Lee, Min (2025) Kim, Jongkwang (2024) Karim, Shifa (2025) Liu, Wen-Cheng (2021) Herman, Robert (2023) Herman, Robert (2026) Shroyer, Steven (2025) Ke-Wei Chen (2022) Kyung Hoon Cho (2025) Sharkey, Scott (2026) Carvalho, Pedro (2026) Cooper, Benjamin (2025) Dongsung, Kim (2022) Yazhi Lo (2026) Nystrom, Axel (2026) Min Ji Park (2024) Praveen Chandra (2026) Min Seok Choi (2026)	Positive
Efficiency	Workflow optimization	Praveen, Chandra (2026) Yahzi, Lo (2026) Cooper, Benjamin (2025) Ke-Wei Chen (2022) Shroyer, Steven (2025) Herman, Robert (2023) Herman, Robert (2026) Lee, Min (2025) Karim, Shifa (2025)	Positive

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Theme	*Subtheme*	*Supporting Studies*	*Direction*
Door-to-Balloon Time	Patient care	Dongsung, Kim (2026) Liu. Min (2021) Min Seok Choi (2026)	Positive

Table 2: JBI Critical Appraisals Tool

Author	*Tool*	*Score*	*Risk*
Lee, Min (2025)	JBI	10	Low
Kim, Jongkwang (2024)	JBI	7	Moderate
Karim, Shifa (2025)	JBI	8	Low
Liu, Wen-Cheng (2021)	JBI	8	Low
Herman, Robert (2023)	JBI	8	Low
Herman, Robert (2026)	JBI	8	Low
Shroyer, Steven (2025)	JBI	7	Moderate
Ke-Wei Chen (2022)	JBI	8	Low
Kyung Hoon Cho (2025)	JBI	8	Low
Sharkey, Scott (2026)	JBI	8	Low
Carvalho, Pedro (2026)	JBI	8	Low
Cooper, Benjamin (2025)	JBI	10	Low
Dongsung, Kim (2022)	JBI	8	Low
Yazhi Lo (2026)	JBI	10	Low
Nystrom, Axel (2026)	JBI	10	Low
Min Ji Park (2024)	JBI	7	Moderate
Praveen Chandra (2026)	JBI	7	Moderate
Min Seok Choi (2026)	JBI	10	Low

Table 3: Study Characteristics

Author	*Comparison*	*Findings*
Lee, Min (2025)	Physician	AI sensitivity 92.5% to 86.4%
Kim, Jongkwang (2024)	Cardiologist	AI sensitivity comparable to cardiologist
Karim, Shifa (2025)	STEMI criteria	AI sensitivity twice that of STEMI criteria with specificity of 97.7%. Reduced false positives from 25% to 16%
Liu, Wen Cheng (2021)	Non-AI-CDSS	AI sensitivity 93.2% with improved door-to-balloon times
Herman, Robert (2023)	STEMI criteria	AI sensitivity doubled STEMI criteria
Herman, Robert (2026)	Standard triage	AI 92% versus 71% with reduction in false positives
Shroyer, Steven (2025)	Physician	AI accuracy of 89% versus 66% with reduction in false positives
Chen, Ke-Wei (2022)	Physician	AI specificity of 99.4% and reduced ECG turnaround time

Author	*Comparison*	*Findings*
Cho, Kyung Hoon (2025)	Physician	AI AUROC 99.1%
Sharkey, Scott (2026)	No comparison	AI sesnitivitiy of 93.8%
Carvahlo, Pedro (2026)	STEMI criteria	AI AUC 0.938 versus 0.836
Cooper, Benjamin (2025)	STEMI criteria	AI sensitivitiy 89.2% versus 68.3%
Dongsung, Kim (2022)	Physician	AI accuracy 98% versus 95 and improved door-to-balloon by 11 minutes
Yahzo, Lo (2026)	STEMI Criteria	AI accuracy of 96% versus 94.5% and 93.5%
Nystrom, Axel (2026)	STEMI criteria	AI AUC 95.3% versus 62%
Min Ji Park (2024)	Physician	AI sensitivity post cardiac arrest 70.8% with improved AUC than that of phsyician
Chandra, Praveen	ECG	AI flagged 231 STEMIs versus 162 with a mean AI ECG turnaround time of 2.91 minutes
Choi, Min Seok (2026)	Physician	AI sensitivity of 96.7% versus 68.3% with a reduced door-to-balloon by 7 minutes

4. Discussions

The review of literature concluded that there was an improved diagnostic accuracy for AI-powered CDSS interpreting STEMIs on ECGs. The review also concluded that AI-powered CDSS improved ECG interpretation turnaround times while also decreasing false positive STEMIs. The review concluded that AI-powered CDSS decreased door-to-balloon times for improved coronary intervention times. The synthesis demonstrated strong evidence towards the primary theme, while weaker evidence demonstrated improvement in themes two and three. These findings were consistent with Fowzy et al that AI has the potential to improve the diagnostic ECG interpretation accuracy of STEMIs. Fowzy et al also reported the potential for early detection in comparison to this literature review, which identified an improvement in ECG turnaround time and door-to-balloon times.

Healthcare organizations could utilize AI-powered CDSS alongside clinician expertise to improve STEMI recognition, cath lab activation, and door-to-balloon times. Integrating AI into current workflows has the potential to improve patient triage during STEMIs by enhancing ECG turnaround times and ultimately improving door-to-balloon times. Future research should focus on the use of a single algorithm that could be utilized across a broad range of populations that includes patient diversity, age, and sex. Future research should also expand upon clinician usability and trust. For AI to be successful, clinicians must have buy-in to incorporate AI into daily workflows and the decision-making process.

4.1 Limitations

Using JBI Critical Appraisal Tools, the reviewer conducted bias screening for inclusion (Table 2). Fourteen of the 18 studies were assessed as having high methodological quality, with four studies assessed as having moderate methodological quality risk. Strengths of the studies include large sample sizes with clearly defined data collection methods and outcomes. Common limitations of the studies included small sample sizes, single-site studies, and a lack of population diversity. Though a wide range of populations were utilized for the eighteen studies, most studies had limited population diversity within the study itself. The studies also did not utilize the same comparison groups, as some comparisons were clinician interpretation and others included ECG machine interpretation. Population diversity was the main evidence gap presented throughout the studies. Studies reported the need for future studies to include more diversity to ensure AI-powered CDSS has reliability for all patient populations. Other possible barriers mentioned were workflow integration of AI and the ability for the hospital to accommodate AI architecture. This review was limited by potential selection bias from the inclusion criteria and reviewer interpretation of studies and data included in the literature review, which could negatively influence the results of the literature review

5. Conclusion

Overall, AI-powered CDSS has a high diagnostic accuracy for identifying STEMIs on ECGs for adult patients experiencing acute myocardial infarctions. Other findings in the literature review found that AI-powered CDSS also has the capability of improving ECG turnaround times along with improving door-to-balloon times. AI-powered CDSS should not replace clinician judgement but rather be paired with clinician expertise to enhance patient triage during acute myocardial infarctions. The effectiveness of AI-powered CDSS may vary for each hospital or healthcare facility due to the AI architecture needed, differing AI algorithms utilized in each reviewed study, and the limited data on AI and population diversity.

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