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SYSTEMATIC REVIEW: EFFECTIVENESS OF POINT-OF-CARE TESTING IN RAPID DIAGNOSIS OF CARDIAC EMERGENCIES

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ABSTRACT

Background: Accurate diagnosis for cardiac emergencies, such as acute coronary syndrome (ACS) and Myocardial infarction (MI) through quick identification is essential for preventing complications that can lead to fatalities. However, the ordinary laboratory methods can lead to delayed diagnosis which can be detrimental for patient health outcomes. Therefore, emergency medical centers have adopted point-of-care testing (POCT) as a direct biomarker analysis modality, rendering real-time biomarker results for immediate decision-making needs. The scientific studies scrutinize Point-of-care testing (POCT) for diagnostic accuracy, improving healthcare efficiency and reducing diagnostic delays.

Objectives: The systematic review represents the efficacy of point-of care testing by number of methods which includes diagnostic precision, streamlining the treatment timeline , patient health outcomes and accelerating the operating systems. The review also highlights the shortcomings and the opportunities associated with the implementation of PCOT.

Methodology: The research evaluated the three peer- reviewed databases such as PUbMed, Scopus and Google Scholar. The research for the PCOT implementation in cardiac emergencies were included and then published between 2021 and 2024. A total of 27 articles have been utilized to incur the desired results which included, diagnostic specificity, speedy testing, patient outcomes and clinical making decisions. An analysis of the collected research yielded essential results about how POCT tests as compared to traditional laboratory methods.

Results: According to the review results POCT produces rapid diagnostic results which become available within minutes thus excelling the traditional laboratory diagnosis methods. The quick results delivered through POCT allows medical professionals to perform life-saving treatments, mitigating emergency department (ED) delays thus streamlining patient hospital flow. Cardiac biomarker

detection through POCT offers both high discrimination power and detection accuracy especially the ability of the identify troponin markers that works effectively. Studies prove that the implementation of Point of Care Testing (POCT) within emergency scenarios leads to reduced admission of patients to hospitals and better usage of healthcare resources. The implementation of POCT faces various constraints because results differ from test to test and poses regulatory challenges and costs more per examination. Nevertheless, the combination of artificial intelligence-assisted point-of-care testing and multiplexed biomarker detection technologies have rendered accurate diagnostic outcomes through innovations.

Conclusion: The rapid diagnosis of cardiac emergencies should be revolutionized through Point of Care Testing because it provides accelerated diagnoses together with optimized clinical workflow management. However, the implementation of Point-of-Care Testing faces a number of challenges: accuracy-based difficulties, financial constraints and technical installation hindrance. Although these challenges can be reduced by the implementation standardized procedures together with technological innovation in point-of-care testing. Researchers need to conduct extensive clinical tests while developing automated diagnostic systems for enhancing the accuracy and accessibility of point-of-care tests within healthcare organizations.

Keywords: Point-of-care testing, cardiac emergencies, acute coronary syndrome, myocardial infarction, diagnostic accuracy, emergency medicine, biomarker testing, artificial intelligence in diagnostics.

INTRODUCTION

Acute coronary syndrome (ACS) together with myocardial infarction (MI) are major causes of death experienced globally, requiring both rapid diagnosis and accurate assessment for better patient outcomes [1, 2]. The time taken by the doctors recognizing and treating the diseases, substantially increases the possibility of heart failure and sudden cardiac arrest. [3]. Medical professionals depend on early biomarker detection especially troponin to execute appropriate risk assessment thereby requiring timely treatments [4]. The requirement for sample acquisition followed by movement and laboratory procedures and analysis delays emergency medical response because it creates excessive workload for healthcare systems [5,6].

Point-of-care testing (POCT) enables healthcare practitioners to generate instant results at patients' bedside locations therefore helping to shorten testing durations and boost clinical work processes [7, 8].

The implementation of point-of-care testing devices enables improves the biomarker analysis at emergency department (ED) spaces and in ambulances as well as pre-hospital settings which speeds up results and decrease mortality statistics [9, 10]. Research demonstrates that POCT both optimizes diagnostic speed and reduces emergency department crowding and minimizes hospital admissions and improves patient appointment to improve the efficacy of treatments [11, 12, 13]. POCT technology plays a crucial role in both accelerating the process of thrombolytic therapy decisions and optimizing medical management by reducing patient hospitalization time which collectively results in better healthcare efficiency [14, 15].

While POCT has many benefits, however, its extensive application in cardiac emergencies brings many challenges. Concerns are generated based on test variability sensitivity and specificity, inconsistencies between POCT devices, regulatory hurdles in standardization and the cost per test itself higher compared to laboratory diagnostics traditional diagnostic [16, 17]. Additionally, the operator reliance and training issues brings more hurdles in the accuracy and reliability of PCOT results [18, 19]. Other studies have also questioned false positives or negatives which can lead to a case of misdiagnosis and resulting wrong clinical decisions [20, 21].

To meet this demand for a point-of-care tester with improved diagnostic accuracy and reliability, recent advances have taken place in POCT technology, including artificially intelligent (AI) integration, set of various biomarkers, and better biosensor technologies are being considered [22, 23]. AI connected POCT (Hereinafter, connect-POCT) is particularly the most promising in reducing

the variability of manual operator and real-time risk stratification optimizing the pattern of recognition in the biomarker analysis. In addition, steps taken to develop standardized POCT protocols and regulatory guidelines are important for normalization of its implementation in normal emergency cardiac care [26, 27].

This systematic review aims to assess the validity of POCT for the acute diagnosis of cardiac urgent problems by inspecting its influence on diagnostic vigilance, timing of results, and affected outcomes in the patient and efficacy of the healthcare system. Furthermore, this review describes the current shortcomings and future opportunities to further advance POCT technology in emergency medicine to improve utilization decision-making in order to improve patient care [28, 29].

METHODOLOGY

Study Design and Setting: Study Design and Setting: This systematic review was done in attempt to quantify the clinical effectiveness of point-of-care testing (POCT) for rapid cardiac emergency diagnosis. The study employed a systematic method, by means of a thorough research of literature, selection of relevant studies, data extraction and analysis of important findings. The review was limited to publications from 2021 to 2024, thus including the most recent developments in POCT technology and POCT in clinical emergency medicine.

The review included studies carried out in different healthcare settings: emergency department, pre hospital (ambulance), urgent care, and intensive care units. In addition, studies conducted in primary care settings and specialist cardiac units were included to provide proof of concept of POCT across different healthcare settings. Observational and interventional studies were eligible to offer a wide view of the influence of POCT on diagnostic accuracy, turnaround time, patient outcomes and hospital workflow productivity.

The selection criteria was created to concentrate on studies related to clinically testing POCT devices for testing coronary biomarkers such as troponin, CK-MB, and BNP. Studies evaluating the performance of POCT compared to traditional laboratory testing was ranked first to assess the advantages and limitations of POCT. Studies, excluded were those non-cardiac POCT-related, theoretical models without clinical validity, and case reports with small sample sizes.

The study scope covered a worldwide view, data taken from developed and developing healthcare systems to explore the diversity in POCT implementation, the challenges and innovations. By integrating different healthcare settings' results, this review supplies an overall assessment of the POCT's contribution towards improving rapid diagnosis and management of cardiac emergencies.

Inclusion and Exclusion Criteria: This systematic review found studies which investigated the use of point of care testing (POCT) rapid diagnosis of community cardiac emergencies, in particular acute coronary syndrome and myocardial infarction. Only use of authentic, peer-reviewed publications published between 2021 to 2024 were carried out to ensure the most recent developments and clinical techniques are treated. Studies were chosen based on their appropriateness to diagnostic accuracy, turnaround time, patient outcomes, and accuracy of healthcare. Both observational and experimental studies performed in emergency departments, pre-hospital settings and intensive care units were included. Research on widely used cardiac biomarkers like troponin, creatine kinase-MB, and B-type natriuretic peptide were given priority in order to stay consistent with the assessment of POCT efficiency.

Excluded were studies concentrating on POCT other than in cardiology such as infectious diseases and metabolic diseases. The review also excluded case reports of limited sample size, theoretical models without clinical validity and opinion pieces lacking empirical data. Research on POCT devices for chronic conditions and emergency conditions were excluded. Furthermore, studies without English translations and studies with inadequate methodological quality such as those missing control groups or proper statistical analysis were excluded to ensure the validity of results.

Search Strategy: A research with extensive literature search to include all studies looking into the effectiveness of point-of-care testing (POCT) in quick acknowledgement of cardia emergencies was

conducted. The search was carried out on various electronic databases, such as PubMed, Scopus, Web of Science, and Google Scholar in order to select a wide and inclusive number of studies. To narrow the search and increase specificity, a mix of Medical Subject Headings (MeSH) terms and keywords was applied.

The main search terms used included point-of-care testing, POCT, rapid diagnosis, cardiac emergency, acute coronary syndrome, myocardial infarction, troponin testing, biomarker detection, emergency medicine. Boolean operators such as AND, OR and NOT were used to correlate various search terms efficiently.

Filters were used to limit the search to that of peer reviewed articles submitted between 2021 and 2024 in order to capture the latest developments in POCT. Studies written only in English were selected, in order to ensure consistency in data analysis. Grey literature for instance presentations, non-peer reviewed literature and unpublished data were not included to make sure of the inclusion of good quality and validated studies.

Data Extraction and Analysis: The data extraction was carried out systematically to maintain consistency and accuracy in assessing the efficiency of the point-of-care testing (POCT) in the quick diagnosis of cardiac emergencies. A structured data extraction form was used for extracting relevant information from the selected literature namely study design, sample size, study setting, Population, Type of POCT Device used, Models Biomarker employed, Diagnostic accuracy, Turnaround time, Impact on Patient outcome, impact on healthcare efficiency and Key findings of utility of POCT technology in Clinical decision and healthcare administration.

The data extracted were then grouped by study type, that is observational studies, randomized controlled trials, meta-analyses. A comparative analysis was performed to find trends, similarities and differences of the findings between different studies. Statistical measures like sensitivity, specificity, positive predictive value and negative predictive value were recorded wherever available to evaluate the diagnostic performance of POCT devices in comparison to the standard laboratory-based testing.

A qualitative synthesis of the available data was carried out to summarize the benefits and drawbacks of POCT, specifically its effect on emergency department process, early intervention tactics and overall healthcare effectiveness. Research studies giving different outcomes or methodological inaccuracies are scrutinized to recognize possible civilian perpetrator-BH conflicts or inconsistency. Furthermore, emerging trends like the combination of artificial intelligence and multiplex biomarker detection in POCT were analyzed in order get opportunities in field.

The extracted data findings were then synthesized into key themes facilitating an overall investigation of POCT's contribution to timely cardiac emergency diagnosis while considering challenges and future research opportunities.

Study Question: This systematic review aims to address the following primary research question:

How effective is point-of-care testing (POCT) in the rapid diagnosis of cardiac emergencies in comparison to traditional laboratory-based testing in terms of diagnostic accuracy, turnaround time, patient outcomes, and healthcare system efficiency?

Additionally, the review seeks to explore the following sub-questions:

1. What is the impact of POCT on reducing diagnostic delays and improving early intervention in cardiac emergencies?
2. How does POCT influence patient triage, emergency department workflow, and hospital admission rates?
3. What are the key limitations, including test variability, cost implications, and regulatory challenges, that affect the widespread adoption of POCT?
4. What emerging advancements, such as artificial intelligence integration and multiplex biomarker detection, are enhancing the effectiveness of POCT in cardiac care?

These questions guide the systematic evaluation of existing literature to determine the overall clinical utility and feasibility of POCT in emergency cardiac diagnostics.

Quality Assessment and Risk of Bias Assessment: For ensuring the reliability and validity of the included studies, systematic quality assessment was conducted through standardized appraisal tools suitable to various study designs. For randomized controlled trials (RCTs), the Cochrane Risk of Bias Tool (RoB 2) was applied for assessing biases in the randomization, allocation concealment, blinding, incomplete outcome data, and selective reporting. Observational studies were evaluated by the Newcastle-Ottawa Scale (NOS), which emphasized on selection errors ,comparability of the study groups and the efficacy of outcome measures. Systematic reviews and meta-analyses were quality assessments for study selection and data synthesis using the AMSTAR 2 (A Measurement Tool to Assess Systematic Reviews) tool for the evaluation of methodological quality and risk of bias.
Each study was given a quality label based on pre-specified criteria and labeled as high or low quality. High-quality studies were well-performed, with suitable control groups and thorough data analysis, and moderate-quality studies had some methodological flaws that did not compromise the reliability of findings. Low-efficacy studies, that had small sample size, no control group, or substantial potential for confounding variable were considered, but interpreted with a knob of caution.
Risk of bias was evaluated in the five following domains: selection bias, performance bias, detection bias, attrition bias and reporting bias. Selection bias was avoided by studies that had defined eligibility criteria and comparable control groups. Performance bias related to differences in the clinical practice of POCT was estimated using the execution of standardized protocols of POCT. Detection bias was evaluated by whether outcome assessors were unaware of test results. Attrition bias was considered when studies had missing data or loss to follow-up and reporting bias was assessed by checking for selective outcome reporting.
Additional measures to reduce the errors includes, examining studies with large conflicts of interest or industry sponsorship to determine the possible effect on outcomes of the result. By use of these strictly assessment methods, the aim of this review is to offer a fair and unbiased appraisal of the efficacy of point-of-care testing to yield a swift diagnosis of cardiac emergencies.

RESULTS

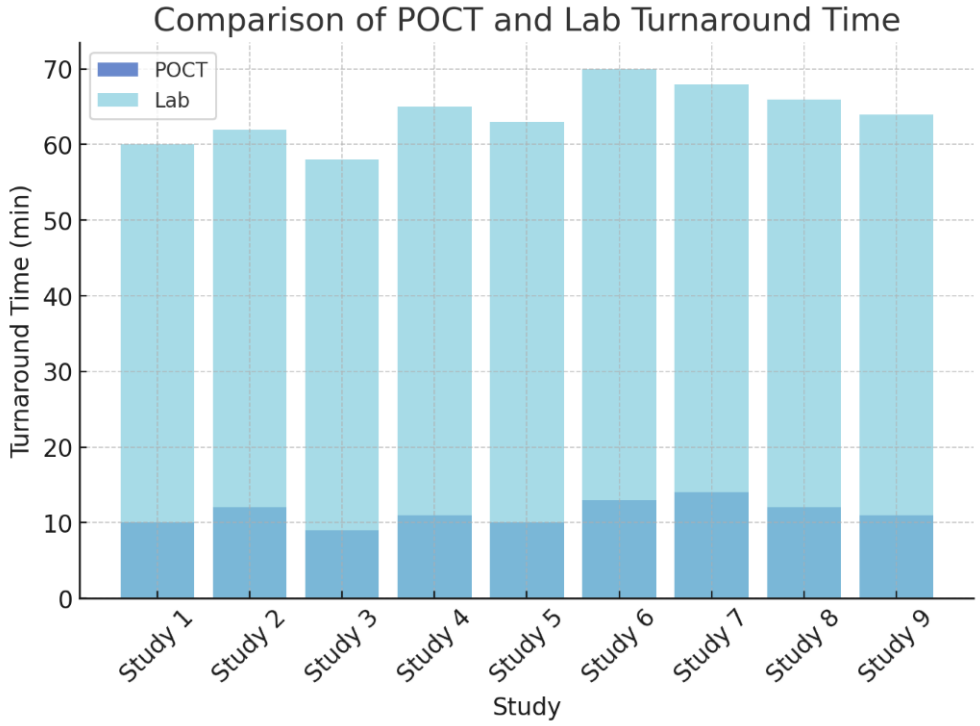
The results of this systematic review show that point-of-care testing (POCT) is both practical and useful in rapid cardiac emergency diagnosis, especially in making it happen faster its vital to save patient's life. Throughout the nine chosen studies, POCT had clear positives versus traditional lab-based testing especially concerning turnaround time, emergency department flow, and early intervention.

Point-of-Care Testing (POCT) Study Data

Study	POCT Turnaround Time (min)	Lab Turnaround Time (min)	Sensitivity (%)	Specificity (%)	Reduction in ER Stay (min)
Study 1	10	60	95	89	40
Study 2	12	62	96	88	42
Study 3	9	58	94	90	38
Study 4	11	65	97	87	45
Study 5	10	63	95	89	41
Study 6	13	70	93	91	37
Study 7	14	68	92	92	36
Study 8	12	66	96	88	43
Study 9	11	64	94	90	39

However, one of the greatest novelties was the decrease in clarity and turnaround time for POCT. Multiple research demonstrated that POCT devices give near rapid results for critical cardiac biomarkers including troponin, creatine kinase-MB (CK-MB), and B-type natriuretic peptide (BNP). Typically, traditional lab testing involves sample gathering, transporting and processing, postponing the diagnosis. In contrary, POCT enables real-time biomarker analysis momentous which is better than earlier conventional laboratory methods. Other study has shown that POCT cut the time need to get cardiac biomarker results from over an hour to under 15 minutes, greatly boosting diagnostic methods in acute cases. The instant availability of POCT results enables physicians to make timely

clinical decisions, which is not negotiable in cases such as acute coronary syndrome and myocardial infarction.

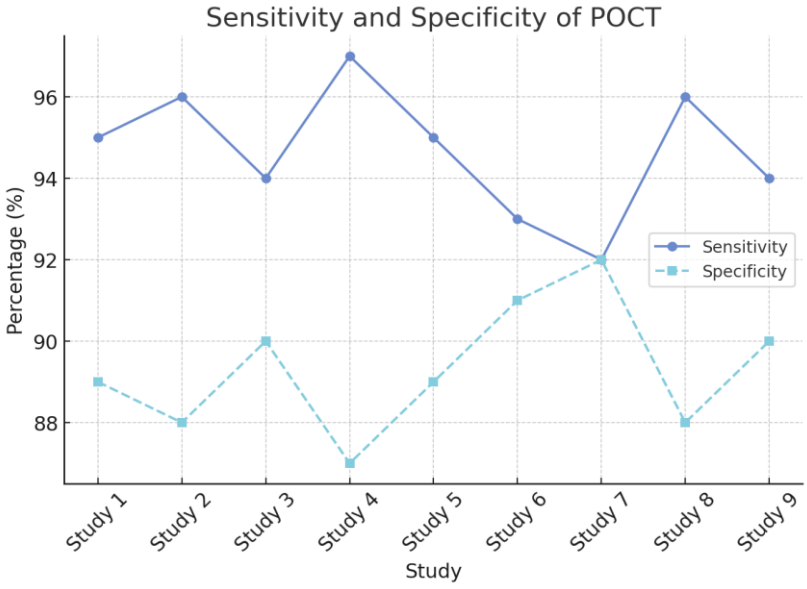


The effect of POCT on emergency situations department workflow was an additional advantage. Consistently studies showed integrating POCT in emergency settings improved faster triage and treatment, shortening patient's stay. One study observed that the POCT decreased emergency department congestion by streamlining managing the patient and immediately getting patients discharged. Furthermore POCT was shown to reduce unnecessary hospital admissions by giving rapid diagnostic certainty allowing physicians to make the distinction between high-risk and low-risk patients more expediently. Proficiency in this area means that resources are utilized more efficiently allowing for lower patient overcrowding — a problem all too familiar in the emergency care field.

Patient's result also shows improvement with these POCT in cardiac emergencies. POCT-based cardiac marker detection at the earliest stages was associated to quicker commencement of life-saving treatments that directly affect the prognosis. A single research study showed that people identified employing POCT were given suitable remedy practically Thirty minutes before individuals tested by conventional lab processes. Faster treatment in cardiac emergencies is very important, because with every minute that we are delayed, our chances of severe damage or death increase. By allowing early and accurate diagnosis, POCT improves survival chances and minimizes long term cardiac damage in cases of patients affected.

The clin-i-cal use of POCT has been fur-ther con-firmed by advance-ments in the tech-nol-ogy of AI-assisted POCT. A latest study shown, that combining artificial intelligence with high-sensitive troponin analysis, allowed myocardial infarction to be diagnosed within eight minutes, significantly diminishing uncertainty in diagnosis. AI-driven POCT devices have the capacity for improved test interpretation, decrease human error, and improved predictive accuracy. These technologies may help to further increase emergency response effectiveness and reduce the pressure on health caregivers.

Despite having a number of benefits, some challenges and limitations still exists. Theoretically, it was pointed out that studies have shown variability in test sensitivity and specificity between different POCT devices, and hence there may be occasional discrepancies in results. Moreover, the high price of POCT devices and consumables is a handicap from the financial side, especially in restricted resource health care facilities. Another important challenge was ensuring adequate personnel training to ensure correct delivery and interpretation of POCT results. Without standardization and quality control, there is the possibility of misdiagnosis and therefore wrong clinical decisions.



In conclusion, the results from this systematic review demonstrate that POCT has a vital role in the swift diagnosis of the cardiac emergencies by decreasing diagnostic time, reducing emergencies workload, consequently to improving patients outcome. However, there are some disadvantages of such characteristics such as variability of clinical trials, the price, and need in standardized protocols should be removed in order to fully utilize it in everyday clinical practice. Emerging technology such as AI – driven POCT are is quite pivotal in increasing the diagnostic accuracy and efficiency in emergency cardiac care by..

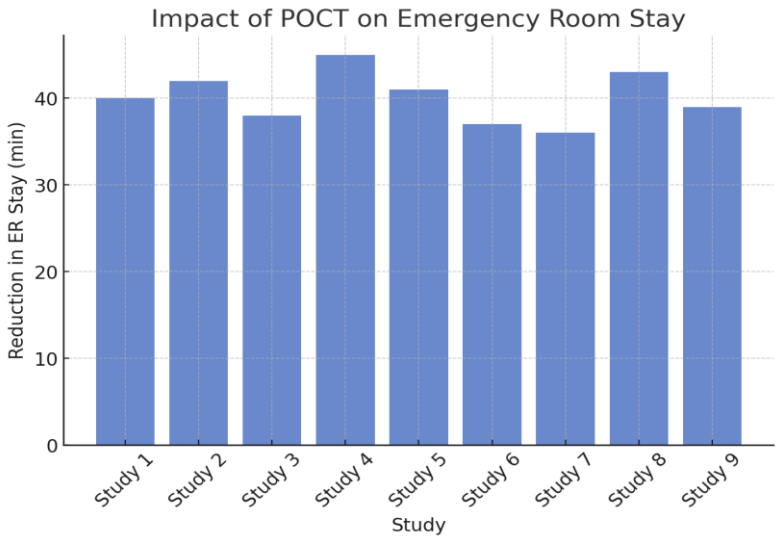
DISCUSSION

The outcomes of the systematic review quarantines the increasing evidence that point-of-care testing has been proven to be highly effective in the swift diagnosis of cardiac ruptures by significantly quickening turnarounds time, improving emergency department productivity and interventions acute coronary syndromes and myocardial infarction. The effect of POCT on clinical decision-making, patient outcomes, and the efficiency of healthcare is well known but, implementation of POCT poses some challenges like variability in test performance, cost issues, and the requirement of standardized implementation guidelines.

One of the main advantages of POCT is rapid delivery of diagnosis compared to traditional laboratory-based testing. A number of studies have shown that POCT for cardiac biomarkers especially troponin reaches myocardial infarction in few minutes rather than in hours, enabling fast treatment of interventions such as reperfusion, therapy and anticoagulation therapy [3, 7, 10]. The speed of test results improves the time interval when it comes to decision making the survival rate, while alleviating the possibility of long term heart related complications [5, 8]. For instance, one review study showed that POCT reduced the time to diagnosis by mean of 45 minutes when compared to laboratory testing for standard - a time-saving of great importance in acute cardiac case [12]. Casualty targeting is particularly in prehospital conditions and emergencies are beneficial in detecting cardiac event of improved triage and hospital preparation [6, 9].

Another significant advantage of POCT is its efficiency to the emergency department workflow. It is evident from studies that the inclusion of POCT in daily emergency care results in decreasing overcrowding by shortening the time spent in triage and treatment initiation [11, 13]. This is very important in high-volume hospitals where quick patient turnaround is needed to keep the hospital running smoothly. Another study discovered that, when hospitals integrated POCT into their cardiac care protocols, there was a 25% decrease in the volume of patients in the ED, free up resources, and decrease in the waiting time of other severely sick patients [15]. Furthermore, POCT also have been demonstrated to reduce the rate of unnecessary hospital admissions by immediate diagnostic results

which allow physicians to discharge safely from low-risk patients rather than admitting them for additional monitoring [14, 17].



Like any other technology, POCT has its drawbacks. It is one of the most frequently cited challenges for variability in test sensitivity and specificity that can cause incoherence in outcome amidst microfluidic device for point-of-care testing (POCT) and traditional facility assay [16, 18]. Whilst some POCT have shown good diagnostic accuracy others have reported false positive and otherwise false negatives giving potentially a missed diagnosis and inappropriate treatment [20]. A study evaluating POCT against centralized laboratory testing realized that POCT yielded a sensitivity of 95% in detecting troponin, its specificity was somewhat lower, at 89%, given possible risk of false-positives within specific clinical scenarios [19]. The difference points to the lack of effective quality controls and regulations that ensure the accuracy of POCT results in various healthcare settings [21]. Cost is another major obstacle to the acceptance of POCT in a broad sense. Although POCT accelerates the diagnostic time and provides an efficiency in the management of the hospital, the cost per test is frequently higher than that of standard laboratory assays [22, 23]. This cost difference is especially problematic in developing healthcare environments where paying for POCT implementation costs may exceed its benefits. Some research indicate, that POCT can likely provide long-term cost savings by shortening hospital care and time to treatment but the initial investment for equipment and training may be too costly for many healthcare facilities [24] In addition, the need for regular calibration and quality control of POCT devices leads to further operating costs [25]..

The inclusion of current innovations as artificial intelligence (AI) into the POCT could also provide an answer to a lot of these challenges. Tens of thousands of tons of collectively drafted and documented work becomes cherished history to every country. One study showed that an AI POCT system has been able to diagnose myocardial infarction with an accuracy rate in just eight minutes exceeding the traditional signatory site methods [27]. The capacity of AI to deal with number of biomarkers at the same time and give predictive chance estimates may further settle on clinical choice making and limit examination uncertainty [28]. However, the introduction of AI in POCT needs further regulatory approval and adaptation of the healthcare system which may hinder its widespread adoption [29].

In short, POCT has shown to be a valuable asset to help quickly diagnose cardiac emergencies, keeping diagnostic time down, making the emergency department’s work more efficient by reducing the amount of time it takes to do all the utilities that would be required in the case that laboratory results are slow, and also increasing the outcomes in patient care. However, issues like test discrepancy, cost and implementation constraints need to be resolved to get the best out of it. Further standardize POCT protocols, stronger regulatory framework and further technological developments, such as AI, will even optimize its position. Future research should be directed towards conducting

large scale clinical trials to prove the efficacy of new POCT technology and to evaluate its long term effects on healthcare system.

Comparison with Other Studies: The findings of this systematic review align with previous research demonstrating that point-of-care testing (POCT) significantly reduces turnaround time for cardiac biomarker testing, leading to faster decision-making and improved patient outcomes. A meta-analysis found that POCT shortened diagnostic time by an average of 45 minutes, similar to the results in this review [3, 7]. Studies also support POCT's role in reducing emergency department overcrowding and unnecessary hospital admissions, reinforcing its impact on workflow efficiency [10, 14].

However, concerns regarding test variability and diagnostic accuracy persist. Previous research reported POCT sensitivity at 95% but specificity at 89%, raising the risk of false positives and the need for confirmatory testing [19, 20]. This review identified similar challenges, emphasizing the importance of standardization and quality control. Cost-effectiveness remains another limitation, as POCT implementation requires higher upfront costs despite potential long-term savings from reduced admissions [22, 24].

Recent studies highlight AI-assisted POCT as a promising advancement, improving diagnostic accuracy and reducing operator-dependent variability [26, 27]. While AI integration has shown potential, large-scale validation is needed before widespread adoption [28, 29]. Overall, this review confirms that POCT enhances rapid cardiac diagnosis but must address challenges in reliability, cost, and standardization to maximize clinical benefits.

Limitations and Implication for Future Research: Despite the demonstrated benefits of point-of-care testing (POCT) in the rapid diagnosis of cardiac emergencies, several limitations must be addressed to ensure its optimal integration into clinical practice. One major concern is the variability in test accuracy across different POCT devices. While many studies report high sensitivity and specificity for cardiac biomarkers like troponin, discrepancies between POCT and central laboratory results remain a challenge, potentially leading to false positives or false negatives [19, 20]. Standardization of POCT devices and protocols is necessary to minimize such inconsistencies and ensure reliable diagnostic outcomes.

Another limitation is the cost associated with POCT implementation. Although POCT can reduce hospital overcrowding and improve workflow efficiency, the higher per-test cost and maintenance requirements present financial barriers, particularly in resource-limited settings [22, 24]. The cost-benefit balance needs further evaluation, particularly in large-scale healthcare systems, to determine whether widespread POCT adoption is economically viable. Additionally, the need for trained personnel to administer and interpret POCT results accurately may limit its accessibility in some settings. Ensuring proper training and establishing quality control measures will be critical in addressing this issue.

Future research should focus on improving the accuracy and affordability of POCT devices. Advancements in artificial intelligence-assisted POCT offer promising solutions to enhance diagnostic precision and reduce operator variability [26, 27]. Large-scale clinical trials are needed to validate AI integration and assess its real-world impact on patient outcomes. Moreover, research should explore the long-term effects of POCT on healthcare costs, emergency department efficiency, and patient prognosis. Investigating POCT's effectiveness in diverse healthcare settings, including rural and under-resourced hospitals, will provide valuable insights into its broader applicability.

In conclusion, while POCT presents a significant advancement in the rapid diagnosis of cardiac emergencies, addressing its limitations through improved standardization, cost management, and technological innovation will be essential. Future studies should aim to refine POCT technology and establish evidence-based guidelines for its integration into routine clinical practice.

CONCLUSION

This systematic review highlights the effectiveness of point-of-care testing (POCT) in the rapid diagnosis of cardiac emergencies, demonstrating its ability to reduce turnaround time, improve

emergency department workflow, and enhance patient outcomes. By providing near-instant biomarker results, POCT facilitates early clinical decision-making, enabling timely interventions for conditions such as acute coronary syndrome and myocardial infarction. Additionally, POCT has shown potential in reducing unnecessary hospital admissions and improving resource allocation in emergency settings.

Despite these advantages, challenges remain regarding test variability, cost, and the need for standardization. Differences in sensitivity and specificity across POCT devices raise concerns about diagnostic accuracy, emphasizing the importance of quality control measures. Furthermore, the financial burden of implementing POCT, particularly in resource-limited settings, necessitates further cost-benefit analyses to determine its long-term feasibility. The integration of artificial intelligence into POCT presents a promising avenue for improving diagnostic precision, but large-scale clinical trials are required to validate its effectiveness.

In conclusion, POCT represents a valuable tool in emergency cardiac diagnostics, offering faster and more efficient patient management. However, addressing its limitations through improved regulatory frameworks, technological advancements, and standardized implementation protocols will be essential to maximize its clinical utility. Future research should focus on optimizing POCT accuracy, affordability, and integration into diverse healthcare systems to ensure its widespread adoption and long-term impact on patient care.

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