

Evolving Cardiac Biomarkers: Precision in Cardiovascular Care

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Introduction

This article discusses the updated guidelines for using high-sensitivity cardiac troponin (hs-cTn) in diagnosing acute coronary syndromes (ACS). It highlights the benefits of hs-cTn assays for faster and more accurate rule-in and rule-out of myocardial infarction, emphasizing their role in improving patient management and reducing unnecessary hospital admissions, especially in emergency department settings. The review also touches on considerations for interpreting hs-cTn levels in various clinical scenarios[1].

This review explores the expanded role of natriuretic peptides (NPs) in heart failure (HF) management, moving beyond their established diagnostic and prognostic value. It delves into their utility for guiding treatment strategies, monitoring disease progression, and identifying patients at higher risk for adverse events. The article emphasizes the importance of serial NP measurements and their integration with other clinical parameters for comprehensive patient care[2].

This paper examines the clinical relevance of soluble ST2 (sST2) as a biomarker in both acute and chronic heart failure. It highlights sST2's value in risk stratification, prognostication, and guiding therapy decisions, often complementing traditional biomarkers like natriuretic peptides. The authors discuss how sST2, reflecting myocardial fibrosis and inflammation, provides incremental information for more personalized patient management in HF[3].

This review offers a comprehensive overview of various biomarkers used in myocarditis, covering their utility from initial diagnosis to prognostic assessment. It explores established markers like cardiac troponins and inflammatory markers, as well as emerging biomarkers that could improve the detection and risk stratification of this complex condition. The paper emphasizes the need for a multi-biomarker approach to enhance diagnostic accuracy and predict outcomes[4].

This review provides a focused look at the practical application of high-sensitivity cardiac troponins (hs-cTn) in routine clinical care. It addresses common questions about interpretation, particularly regarding their use in non-acute settings and for risk stratification in various patient populations. The article highlights the increased precision and earlier detection capabilities of hs-cTn, while also cautioning about the importance of clinical context for accurate diagnosis and management[5].

This article provides an update on the evolving role of biomarkers in cardio-oncology, focusing on their utility in detecting, monitoring, and predicting cardiotoxicity induced by cancer therapies. It discusses established markers like troponins and natriuretic peptides, alongside emerging biomarkers that could help

personalize cardiac surveillance strategies for cancer patients, aiming to prevent or mitigate adverse cardiovascular events without compromising oncological treatment[6].

This comprehensive review reassesses the role of high-sensitivity C-reactive protein (hs-CRP) in the primary and secondary prevention of cardiovascular disease. It consolidates evidence supporting hs-CRP as a valuable marker of inflammation that offers prognostic information independent of lipid levels. The authors advocate for its continued use in risk stratification and for guiding anti-inflammatory therapies in high-risk individuals[7].

This article explores the synergistic relationship between cardiac biomarkers and imaging modalities in the diagnosis and management of ischemic heart disease. It discusses how biomarkers can help identify patients who would benefit most from specific imaging tests, improving diagnostic yield and resource utilization. The authors highlight how integrating biomarker data with imaging findings leads to more precise risk assessment and tailored treatment plans[8].

This update focuses on the advancements and clinical utility of point-of-care testing (POCT) for cardiac biomarkers. It discusses how rapid and accessible POCT devices can facilitate quicker diagnosis and decision-making, particularly in emergency and remote settings. The article also addresses the challenges and future prospects of POCT, emphasizing the need for robust quality control and integration into existing clinical pathways[9].

This systematic review and meta-analysis investigates the potential of circulating microRNAs (miRNAs) as novel biomarkers for myocardial infarction (MI). It consolidates evidence on various miRNAs that show promise for early diagnosis, risk stratification, and even predicting MI outcomes, often surpassing conventional markers. The study highlights the need for further research to validate these findings and translate them into clinical practice[10].

Description

High-sensitivity cardiac troponins (hs-cTn) are vital for the modern diagnosis of acute coronary syndromes (ACS). These advanced assays enable faster and more accurate decisions for ruling in or ruling out myocardial infarction, which significantly improves patient care and helps reduce unnecessary hospital admissions, especially in emergency departments [1]. Their utility extends beyond acute scenarios, offering value in non-acute settings and for general risk stratification. Careful interpretation within the specific clinical context is crucial for their effective application [5]. The precision and earlier detection capabilities of hs-cTn are notable,

making them indispensable in contemporary cardiology practice.

Natriuretic peptides (NPs) have an expanded role in heart failure (HF) management, going beyond their traditional diagnostic and prognostic uses. They are increasingly used to guide treatment strategies, monitor disease progression, and identify patients at higher risk for adverse events. Regular, serial measurements of NPs, integrated with other clinical parameters, are important for providing comprehensive care to HF patients [2]. Complementing NPs, soluble ST2 (sST2) serves as another significant biomarker in both acute and chronic heart failure. sST2 is valuable for risk stratification, prognostication, and guiding therapy decisions, offering incremental information about myocardial fibrosis and inflammation that supports more personalized patient management [3].

A multi-biomarker approach is crucial for conditions like myocarditis, where established markers such as cardiac troponins and inflammatory markers, along with emerging biomarkers, work together to improve diagnostic accuracy and predict outcomes [4]. In cardio-oncology, biomarkers are gaining importance for detecting, monitoring, and predicting cardiotoxicity stemming from cancer therapies. Established markers like troponins and natriuretic peptides, alongside newer ones, contribute to personalized cardiac surveillance strategies, aiming to prevent or mitigate adverse cardiovascular events without disrupting cancer treatment [6]. Furthermore, high-sensitivity C-reactive protein (hs-CRP) is a recognized marker in both primary and secondary prevention of cardiovascular disease. It provides significant prognostic information independently of lipid levels, guiding risk stratification and anti-inflammatory therapies in high-risk individuals [7]. The integration of cardiac biomarkers with imaging modalities also plays a synergistic role in diagnosing and managing ischemic heart disease, leading to more precise risk assessment and tailored treatment plans by identifying patients who would most benefit from specific imaging tests [8].

Innovations in biomarker testing include the advancements in point-of-care testing (POCT) for cardiac biomarkers. Rapid and accessible POCT devices facilitate quicker diagnosis and decision-making, especially critical in emergency and remote healthcare settings. The continued development of robust quality control and integration into existing clinical pathways will determine the future success of POCT [9]. Looking ahead, circulating microRNAs (miRNAs) represent a promising area of research as novel biomarkers for myocardial infarction (MI). Systematic reviews highlight their potential for early diagnosis, risk stratification, and predicting MI outcomes, often showing superiority over conventional markers. Continued research is essential to validate these findings and successfully translate them into routine clinical practice [10].

Conclusion

The field of cardiac biomarkers is rapidly evolving, offering advanced tools for diagnosing, monitoring, and managing various cardiovascular conditions. High-sensitivity cardiac troponins (hs-cTn) are fundamental for acute coronary syndromes (ACS), enabling faster and more accurate myocardial infarction assessment, reducing hospital stays, and guiding patient care [1, 5]. Natriuretic peptides (NPs) have an expanded role in heart failure (HF), extending beyond diagnosis to inform treatment strategies and monitor disease progression [2]. Soluble ST2 (sST2) further refines HF management by providing insights into myocardial fibrosis and inflammation for personalized care [3].

For complex conditions like myocarditis, a comprehensive multi-biomarker strategy, including both established and emerging markers, is critical for precise diagnosis and prognostic assessment [4]. In cardio-oncology, biomarkers are vital for early detection and monitoring of cardiotoxicity induced by cancer treatments, allowing for tailored cardiac surveillance [6]. High-sensitivity C-reactive protein (hs-

CRP) remains a key inflammation marker for cardiovascular disease prevention, offering prognostic value independent of lipid profiles and informing therapeutic decisions [7].

Beyond individual markers, the synergy between cardiac biomarkers and imaging modalities significantly improves the diagnosis and management of ischemic heart disease, leading to more precise risk assessment and treatment plans [8]. Point-of-care testing (POCT) for cardiac biomarkers is enhancing rapid diagnostics in critical and remote settings, while the discovery of novel biomarkers like circulating microRNAs (miRNAs) holds immense potential for advanced myocardial infarction diagnosis and stratification, underscoring a dynamic future for cardiac diagnostics [9, 10].

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Conflict of Interest

None.

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