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Editorial

AI-Based Automated Echocardiographic Analysis is Expected to Revolutionize Clinical Practice

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The integration of artificial intelligence (AI) in the medical field is one of the most significant technological advancements of our time.[1)] In particular, the fields of cardiology and echocardiography have seen rapid development in AI applications, enabling more accurate, efficient, and standardized analyses.[2)3)] The use of AI in medical imaging has the potential to transform how diagnoses are made and patient care is delivered.[4)] In echocardiography, which heavily relies on precise measurements and expert interpretation, the implementation of AI-driven tools promises to reduce variability, improve accuracy, and streamline workflows.[5)6)] This innovation is not merely a theoretical possibility; it is becoming a reality as AI systems demonstrate their ability to match, and in some cases exceed, the performance of human experts.[7-9)] The question arises, however, whether these AI advancements can truly bring about a meaningful change in clinical practice, particularly in the context of automated echocardiographic analysis.

In the current issue, Jang et al.[10)] explored the potential of an AI-based system to automate echocardiographic analysis in patients with revascularized ST-segment elevation myocardial infarction (**Figure 1**). The AI-based system demonstrated an impressive accuracy in view classification, achieving a success rate of 98.5% in identifying appropriate echocardiographic views. This high accuracy is crucial because correct view classification is fundamental for accurate measurement of cardiac parameters. Additionally, the AI-based measurements showed strong correlations with conventional manual measurements across key cardiac parameters, including left ventricular ejection fraction (LVEF), left ventricular global longitudinal strain (LVGLS), left atrial volume index (LAVI), and left atrial reservoir strain (LARS). Specifically, the Pearson correlation coefficients ranged from 0.81 to 0.92, indicating a high degree of agreement between the AI-based and manual methods. Furthermore, the intraclass correlation coefficients ranged from 0.74 to 0.90, underscoring the consistency and reliability of the AI-generated measurements.

This study stands out in that it directly compared the time required for AI-based automated measurement with that of manual measurement. In a subset of 20 cases, the study revealed that the AI system dramatically reduced the time needed for echocardiographic analysis.

Data Availability Statement

The data generated in this study are available from the corresponding author upon reasonable request.

The contents of the report are the author's own views and do not necessarily reflect the views of the *Korean Circulation Journal*.

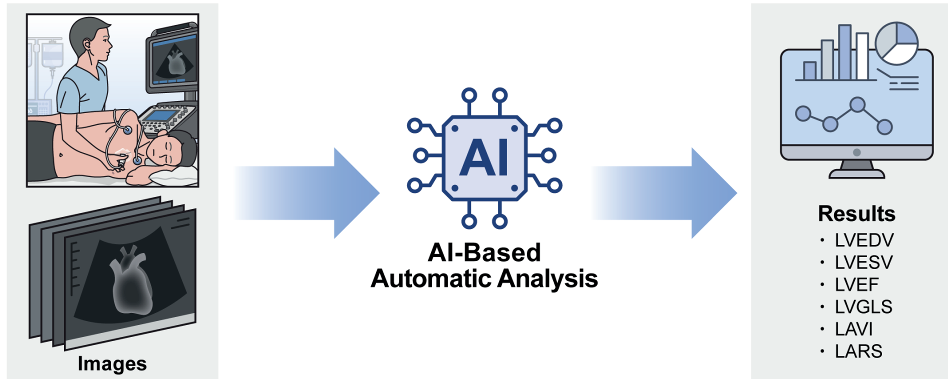

Figure 1. AI-based automated echocardiographic analysis workflow. The figure shows the process of AI-based automated echocardiographic analysis. Echocardiographic images (left) are processed by an AI-based automated tool (center) to generate key cardiac measurements (right).
AI = artificial intelligence; LARS = left atrial reservoir strain; LAVI = left atrial volume index; LVEDV = left ventricular end-diastolic volume; LVEF = left ventricular ejection fraction; LVESV = left ventricular end-systolic volume; LVGLS = left ventricular global longitudinal strain.

For example, the AI system completed LVGLS measurements in only 6.8±1.8 seconds, compared to 48.7±4.9 seconds for manual measurement. Similarly, LARS measurements took only 2.4±0.6 seconds with the AI system, versus 27.2±6.3 seconds manually. This time efficiency is particularly valuable in clinical settings, where time is often limited, and highlights the potential of the AI system to significantly alleviate the workload on clinicians and technicians. Hence, the AI system not only enhances efficiency but also allows for faster decision-making and potentially, earlier interventions.

Furthermore, the study demonstrated that AI-derived measurements are not only fast but also clinically meaningful. The predictive value of the AI-based measurements for clinical outcomes was comparable to that of the conventional method. This was particularly evident in predicting a composite of adverse outcomes, including all-cause death, rehospitalization because of heart failure, ventricular arrhythmias, and recurrent myocardial infarction. The ability of the AI system to provide prognostic information on par with the manual method is significant as it suggests that the system can be reliably used in clinical practice to inform patient management and treatment decisions. Moreover, the consistency of the AI system across various patient subgroups, including those with different disease stages, and across images with varying degrees of quality further underscores its robustness and applicability in diverse clinical settings.

The implications of these findings extend beyond simply the efficiency of the system. By providing consistent, accurate measurements regardless of the operator, the AI system can reduce the variability arising from human errors in manual echocardiographic analysis. This standardization is crucial in ensuring that all patients receive the same level of high-quality care, regardless of where or by whom their echocardiogram is performed. Additionally, the shortened analysis time can free up valuable resources in echocardiography units, allowing for more patients to be evaluated and reducing waiting times for critical diagnostic procedures. Given that the demands on clinicians are continuously increasing, the improved efficiency can lead to better patient outcomes and a more sustainable healthcare system overall.

In conclusion, this study provides strong evidence that AI-based automated echocardiographic analysis can be a paradigm shifter in clinical practice. The system's demonstrated accuracy, efficiency, and ability to standardize measurements across patients suggest that it can significantly improve clinical workflows. By reducing the time and effort required for echocardiographic analysis, while maintaining or even improving accuracy, AI has the potential to transform clinical practice, making it more efficient and reliable. As healthcare continues to evolve, AI-driven tools like the one presented by Jang et al.[10] will likely play a crucial role in shaping the future of patient care.

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