How Can Artificial Intelligence Assist with the Improvement of Diagnosis and Treatment Plans of Cardiovascular Diseases

Published: January 23, 2026

Source: mariresearch.com

Generated By MARI Research Team

Introduction

Artificial intelligence is better at diagnosing a challenging heart condition, wide-complex tachycardia, than general cardiologists (Chow et al., 2024). Artificial intelligence (AI) is the capability of computers to execute complex tasks that are attributed to humans, such as reasoning or learning from previous experiences (Copeland, 2025). The medical use of AI in fields such as medical imaging and cardiology is rapidly increasing (Litjens et al., 2019). It has been reported that AI outperforms existing programs in health data analysis, enabling the evaluation of electrocardiograms used for the assessment of cardiovascular health in a manner that was often overlooked by commonly used methods (Nahar et al., 2013 & Ng et al., 2022). Cardiovascular diseases are the leading cause of death worldwide (World Health Organization [WHO], 2025). Additionally, there is strong evidence indicating that sex plays a role in the prevalence, diagnosis, and treatment outcome of cardiovascular diseases, where women are more likely to be misdiagnosed and not receive the proper medical care (Peters et al., 2019). According to Dr. Beigi, mismedicine is defined as any medical act that does not adhere to regulated medical standards and could lead to challenges such as misdiagnosis and mistreatment (Blissy, 2024). Therefore, the integration of AI in the healthcare system, particularly in the field of cardiology, enhances diagnosis accuracy and timeline (Chow et al., 2024). This report aims to draw attention and highlight the benefits of integrating AI in the field of cardiology to improve and enhance the timely diagnosis, appropriate sex-specific treatment plans, and reduce mismedicine.

What are Electrocardiograms?

Electrocardiograms (ECGs) are commonly used tools by physicians that are easily accessible, simple, convenient to store, and fast (Konstantinos et al., 2021). These reports provide a summary of the heart's structure and biology, and their interpretations are standardized (Konstantinos et al., 2021). However, the ECG readings and interpretations could differ based on the healthcare provider's expertise and experiences (Konstantinos et al., 2021). Presently used data analysis tools and algorithms are trained based on pre-established patterns and criteria (Krizhevsky et al., 2017). Nonetheless, the incorporation of AI in the form of deep learning, such as convolutional neural networks (CNNs) can provide a human-like assessment of ECGs (Krizhevsky et al., 2017).

What is deep learning?

Deep learning is an area of machine learning where a function is learned from a set of inputs and outputs, and the training is adjusted until the AI identifies relationships where the outputs are extremely close to the actual data set without any human modifications, such as CNNs (Rudin, 2019). Whereas the current models are instructed to relationships and features that are selected by humans, limiting their reliability and correctness (Rudin, 2019). The recent use of CNNs has

shown enhanced analysis of the ECGs that were undetectable by humans (Krizhevsky et al., 2017).

How does sex play a role in electrocardiograms?

It has been revealed that women are more prone to misdiagnosis in cardiovascular diseases, which could be due to the present misconception among physicians that females are at decreased risk of developing cardiovascular challenges (Leifheit-Limson et al., 2015). Additionally, sex differences are clearly evident in the ECGs, but these dissimilarities are usually missed with the traditional algorithms (Moss, 2010). However, it has been shown that the AI-ECG model was able to identify a sex biomarker and recognize sex almost perfectly for both individuals with high and low cardiovascular risk factors (Sau et al., 2025).

Real-World Examples

In 2020, a CNN was established for the diagnosis of 21 heart rhythms based on over 80,000 EGCs from over 70,000 patients (Zhu et al., 2020). Compared to the reference group that consisted of cardiologists, it was reported that this CNN outperformed the ECG reading of a cardiologist with no assistance (Zhu et al., 2020).

The diagnosis of Wide-complex tachycardia (WCT) heart condition and categorizing its type from ECG readings by physicians is challenging (Chow et al., 2024). However, in 2024, a research study from the University of Ottawa Heart Institute stated that AI was able to classify and identify this heart complication with an accuracy of 93% (Chow et al., 2024). The results exceeded the correctness and speed of general cardiologists but performed to the same level as the cardiologists who specialize in the heart's electrical system, also known as electrophysiology cardiologists (Chow et al., 2024).

Limitations and Areas of Improvement

The limitations with the use of AI are not a particular instance of ECGs, but rather are about general concerns, such as data quality and patient security (Siontis et al., 2021). Although the use of AI and CNNs in the field of cardiology illustrates promising outcomes for patients, they have been tested only in some populations (Smith et al., 2019). Therefore, further evaluation and assessment in populations with various backgrounds and age range groups are an area that requires attention (Siontis et al., 2021). Some additional challenges are that AI cannot read ECGs stored as pictures, and the cost and smooth incorporation of AI in everyday clinical practices are areas of discussion (Siontis et al., 2021).

Conclusion

Strong evidence suggests that artificial intelligence could improve the quality and speed of diagnosis by providing a more extensive interpretation of electrocardiograms. This advancement could lead to the development of more personalized and sex-specific treatment options for individuals challenged with cardiovascular diseases, not only by cardiologists but also by other physicians. Furthermore, with additional testing in diverse groups, AI could show promising results to be incorporated into healthcare settings to improve the patient experience and hopefully lower the cases of death due to cardiovascular diseases.

References

Chow, B. J. W., Fayyazifar, N., Balamane, S., Saha, N., Farooqui, M., Hasan, B. A., Clarkin, O., Green, M., Maiorana, A., Golian, M., & Dwivedi, G. (2024). Interpreting wide-complex tachycardia with the use of artificial intelligence. Canadian Journal of Cardiology, 40(10), 1965-1973. https://doi.org/10.1016/j.cjca.2024.03.027

Copeland, B. (2025, December 17). Artificial Intelligence (AI) | definition, examples, types, applications, companies, & facts | britannica. Encyclopedia Britannica. https://www.britannica.com/technology/artificial-intelligence

Escalante, Ariana. [Blissy]. (2025, August 9). Why Your Skin Issue Might Be Misdiagnosed! Dr. Beigi's Insights | The Blissy Experience Ep. 10. [Video]. YouTube. https://www.youtube.com/watch?v=yA7PpiNM600.

Krizhevsky, A., Sutskever, I., & Hinton, G. E. (2017). ImageNet classification with deep convolutional Neural Networks. Communications of the ACM, 60(6), 84-90. https://doi.org/10.1145/3065386

Leifheit-Limson, E. C., D'Onofrio, G., Daneshvar, M., Geda, M., Bueno, H., Spertus, J. A., Krumholz, H. M., & Lichtman, J. H. (2015). Sex differences in cardiac risk factors, perceived risk, and health care provider discussion of risk and risk modification among young patients with acute myocardial infarction. Journal of the American College of Cardiology, 66(18), 1949-1957. https://doi.org/10.1016/j.jacc.2015.08.859

Litjens, G., Ciompi, F., Wolterink, J. M., de Vos, B. D., Leiner, T., Teuwen, J., & Isgum, I. (2019). State-of-the-art deep learning in cardiovascular image analysis. JACC: Cardiovascular Imaging, 12(8), 1549-1565. https://doi.org/10.1016/j.jcmg.2019.06.009

Moss, A. J. (2010). Gender differences in ECG parameters and their clinical implications. Annals of Noninvasive Electrocardiology, 15(1), 1-2. https://doi.org/10.1111/j.1542-474x.2009.00345.x

Nahar, J., Imam, T., Tickle, K. S., & Chen, Y.-P. P. (2013). Computational intelligence for heart disease diagnosis: A medical knowledge driven approach. Expert Systems with Applications, 40(1), 96-104. https://doi.org/10.1016/j.eswa.2012.07.032

Ng, B., Nayyar, S., & Chauhan, V. S. (2022). The role of Artificial Intelligence and machine learning in clinical cardiac electrophysiology. Canadian Journal of Cardiology, 38(2), 246-258. https://doi.org/10.1016/j.cjca.2021.07.016

Peters, S. A. E., Muntner, P., & Woodward, M. (2019). Sex differences in the prevalence of, and trends in, cardiovascular risk factors, treatment, and control in the United States, 2001 to 2016. Circulation, 139(8), 1025-1035. https://doi.org/10.1161/circulationaha.118.035550

Rudin, C. (2019). Stop explaining black box machine learning models for high stakes decisions and use interpretable models instead. Nature Machine Intelligence, 1(5), 206-215. https://doi.org/10.1038/s42256-019-0048-x

Sau, A., Sieliwonczyk, E., Patlatzoglou, K., Pastika, L., McGurk, K. A., Ribeiro, A. H., Ribeiro, A. L., Ho, J. E., Peters, N. S., Ware, J. S., Tayal, U., Kramer, D. B., Waks, J. W., & Ng, F. S. (2025). Artificial intelligence-enhanced electrocardiography for the identification of a sex-related cardiovascular risk continuum: A retrospective cohort study. The Lancet Digital Health, 7(3). https://doi.org/10.1016/j.landig.2024.12.003

Siontis, K. C., Noseworthy, P. A., Attia, Z. I., & Friedman, P. A. (2021). Artificial intelligence-enhanced electrocardiography in cardiovascular disease management. Nature Reviews Cardiology, 18(7), 465-478. https://doi.org/10.1038/s41569-020-00503-2

Smith, S. W., Walsh, B., Grauer, K., Wang, K., Rapin, J., Li, J., Fennell, W., & Taboulet, P. (2019). A deep neural network learning algorithm outperforms a conventional algorithm for emergency department Electrocardiogram Interpretation. Journal of Electrocardiology, 52, 88-95. https://doi.org/10.1016/j.jelectrocard.2018.11.013

World Health Organization. (2025). Cardiovascular diseases (cvds). World Health Organization. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)#:~:text=Key%20facts,38%25%20were%20caused%20by%20CVDs.

Zhu, H., Cheng, C., Yin, H., Li, X., Zuo, P., Ding, J., Lin, F., Wang, J., Zhou, B., Li, Y., Hu, S., Xiong, Y., Wang, B., Wan, G., Yang, X., & Yuan, Y. (2020). Automatic multilabel electrocardiogram diagnosis of heart rhythm or conduction abnormalities with deep learning: A cohort study. The Lancet Digital Health, 2(7). https://doi.org/10.1016/s2589-7500(20)30107-2

Provided and edited by the members of MARI Research, Error in Medicine Foundation and MISMEDICINE Research Institute, including Paniz Ghavimi, Charmi Patel, and Dr. Pooya Beigi MD. MSc.