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Hack-Proof Health: Strengthening Cybersecurity in ECG Monitoring Systems through Anomaly Detection and Threat Modelling

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Abstract: *Devices for electrocardiograms (ECGs) are essential medical instruments for tracking cardiac activity and identifying heart-related disorders. ECG equipment is becoming more and more integrated with cloud platforms, wireless networks, and Internet of Medical Things (IoMT) infrastructure as healthcare institutions embrace digital transformation. Although these developments facilitate real-time monitoring and increase accessibility, they also expose ECG systems to a variety of cybersecurity risks. Signal spoofing, ransomware attacks, data manipulation, and unauthorized access can jeopardize patient lives by compromising not just the confidentiality of private health information but also the precision and dependability of diagnosis.*

This study offers a thorough examination of the cybersecurity issues pertaining to ECG devices, along with attack models and real-world case studies. It draws attention to flaws that adversaries frequently take advantage of in firmware, communication protocols, and hospital network infrastructure. The study also suggests a multi-layered protection approach that includes blockchain-based data integrity solutions, firmware validation, device authentication, encryption, and artificial intelligence-based anomaly detection. Along with outlining best practices for hospitals, healthcare providers, and manufacturers, the study also looks at pertinent regulatory frameworks. To sum up, protecting ECG systems is an essential part of contemporary healthcare cybersecurity and calls for proactive design, ongoing observation, and interdisciplinary cooperation.

Keywords: Devices for electrocardiograms

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