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The Emerging Role of Artificial Intelligence in Monitoring Insulin Levels: Current Progress and Future Directions

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ABSTRACT

Precise monitoring of both blood glucose and, by proxy, insulin levels is essential in the process of management of diabetes mellitus. The traditional insulin testing techniques, mostly enzyme-linked immunosorbent assays (ELISA) and radioimmunoassay (RIA), are intrusive, laborious, and not suitable for real-time and continuous monitoring. This literature review examines how artificial intelligence (AI) can be used to address these constraints in a transformative way. Continuous glucose monitoring (CGM) systems and non-invasive sensors are being incorporated with AI algorithms, specifically machine learning (ML) and deep learning (DL) models, to predict insulin needs and identify abnormal patterns, and optimize diabetes care. Through the exploration of large, multi-variable datasets, AI can deduce insulin dynamics on a real-time basis, providing a proactive way of glycemic control. In this paper, the significance of insulin monitoring is discussed, AI opportunities, the substantial benefits of AI over traditional methods, the existing data privacy, model interpretability, and clinical validation issues. The future outlook is the creation of fully autonomous, closed loop insulin delivery, which will usher in an era of personalized and predictive diabetology.

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