Chapter 2
AI in Patient Monitoring

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ABSTRACT

The chapter underscores the significance of enhanced decision support tools which helps medical professionals to make more informed and quicker and better clinical judgements, ultimately improving patient care. It also highlights the potential for AI to reduce healthcare costs through early detection of health issues and prevention of complications, leading to fewer hospital readmissions and more efficient use of healthcare resources. The chapter also touches on the importance of building patient trust and acceptance of AI technologies through transparent communication about their benefits, limitations, and ethical use. By addressing these critical aspects, the chapter provides a comprehensive overview of how AI is poised to revolutionize medicine, improving patient outcomes, enhancing healthcare delivery, and shaping the future of medical practice.

1 INTRODUCTION

Patient monitoring is an essential part of healthcare nowadays, it allows for contineous observation of patients' vital signs and health metrics to ensure timely

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intervention and improved outcomes. Patient monitoring has changed dramatically with the introduction of autonomous systems and artificial intelligence (AI). This chapter explores the revolutionary impact of AI on patient monitoring, detailing its evolution, current applications, challenges, and future directions.

1.1 The Evolution of Patient Monitoring

1.1.a Historical Perspective

Webster (2009) and Singh (2021) explain that the history of patient monitoring dates back to ancient times, where basic methods such as manual pulse taking and temperature measurement were used. The advent of modern medicine brought about more sophisticated tools, such as the stethoscope in the early 19th century and the electrocardiogram (ECG) in the early 20th century. These innovations marked significant milestones in the ability to monitor patient health more accurately and efficiently. In the mid-20th century, the development of electronic monitoring devices, such as the first bedside monitors, used for regular observation of vital signs like heart rate, BP (blood pressure), and respiratory rate. The introduction of computerized systems in the 1970s and 1980s further enhanced monitoring capabilities, enabling the integration of multiple parameters and the generation of alarms for critical conditions. Despite these advancements, traditional patient monitoring systems had limitations. They often required manual interpretation of data, were prone to human error, and lacked the ability to predict adverse events proactively. The need for more advanced, intelligent systems became evident as healthcare demands increased and technology evolved.

1.1.b Transition to AI-Driven Monitoring

The transition to AI-driven patient monitoring represents a paradigm shift in healthcare. AI's latest state of art, have enabled the development of systems that to create systems that can instantly evaluate enormous volumes of data, spot trends, and produce highly accurate predictions. One of the key drivers of this transition is the exponential growth in healthcare data. Electronic health records (EHRs), wearable devices, and other digital health tools generate massive volumes of data that can be harnessed for AI-driven insights. AI algorithms can process and analyze this data more efficiently than traditional methods, providing clinicians with actionable information to improve patient care. AI-driven monitoring systems offer several advantages over traditional methods. They can continuously analyze patient data, detecting subtle changes that may indicate the onset of a critical event. This capability enables early intervention, potentially preventing complications and im-