Barcode Medication Administration Technology to Prevent Medication Errors

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ABSTRACT

Medication errors cause harm to patients at any point along the medication administration process and can be prevented. Barcoding medication administration (BCMA) is effective as a clinical decision support system (CDSS) to avoid errors. This viewpoint proposes the implementation of BCMA to avoid potential adverse events. The opinion piece gives an overview of BCMA, reviews the current literature on its effectiveness, and sheds light on the associated challenges and how to overcome them. The objective of this article is to increase awareness regarding BCMA and how it can decrease patient morbidity and mortality, enhance safety, and lower overall hospital-associated costs by preventing medication errors.

Key Words: *Bar-code medication administration, Medication errors, Adverse drug events, Patient safety.*

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The advancements and integration of technology in clinical therapeutics have resulted in improved health outcomes for patients. Nevertheless, the risk of medication errors is still a prevalent concern and has significant implications for patient safety. Medication errors are preventable adverse events that can cause harm to patients and can occur at any step along the medication administration process, from ordering to administering medicine to a patient. The main consequences of medication errors are increased morbidity and mortality in patients; furthermore, they also significantly raise the cost of healthcare systems. Medication errors are estimated to cause harm to more than 1 million people, cost $40 billion, and lead to 7,000 - 9,000 deaths annually in the United States.[1] In Pakistan, adverse medication reactions are also prevalent. At the Punjab Institute of Cardiology (PIC), Lahore, more than 300 people died in 2011 due to severe medication reactions. According to a recent study, adverse medication events are frequent in both adult and pediatric patients from Pakistan (59.9% and 40.15%, respectively).[2] Thus, it is essential to implement an effective and reliable system that can help in preventing or lowering the likelihood of medication errors. This paper proposes the idea of implementing barcode medication administration (BCMA) as a clinical decision support system (CDSS) to avoid errors.

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BCMA is an electronic medicine ordering and scanning system that will prevent misinterpretations of physician orders and can intercept medication errors at the point of care administration. Using a handheld scanner, the healthcare worker scans the barcode on the patient's wristband to confirm that it is the right patient. After confirmation, barcodes are scanned for the barcodes on the medication package to verify that it is the right patient, the right medication, the right dose, the right time, and the right route of administration. The BCMA system is best used in conjunction with electronic Medication Administration Records (eMAR), which will serve as the communication interphase that automatically documents the administration into specialised electronic health record (EHR) technology along with pharmacy stocking and retrieval processes.[3]

It is evident from the recent literature that implementation of BCMA technology has improved patient safety by decreasing the overall rate of adverse drug events (ADEs) and the rate of transcription errors. A before-and-after study examined the effects of the implementation of BCMA and eMAR technologies on ADEs at a 400 bedded academic medical centre. This study examined 775 electronic error-reporting system reports and found that the mean severity level of administration errors significantly decreased from 4.44 to 3.23 ($p = 0.005$).[4] In another study, the rate of medication administration errors was compared before and after the implementation of BCMA technology to assess BCMA's effect on the frequency of medication administration errors in the inpatient setting. The analysis found that actual patient harm incidents decreased by 55.4% after BCMA intervention.[5]

Although BCMA innovation aims to reduce medication errors and improve patient safety, some concerns are associated with it that need to be addressed and overcome for the BCMA system

to be implemented successfully. Among all the issues, the problem regarding the safety, security, and confidentiality of patients' data continues to be the biggest challenge. The security threats include the sharing of passwords among employees, viruses, and cyberattacks or ransomware on the system.[3] A few more substantial barriers associated with the proposed informatics solution include the resistance to adoption from the staff, negative perception of technology, non-compliance, and resistance from faculty to new technology that could require the additional training of staff and further burden the project financially. The lack of available equipment or malfunctioning networked medical devices can interrupt or decrease the workflow and eventually decrease the quality of care delivered to a patient. The system can also be a source of cross-contamination and airborne infectious diseases around the hospital; moreover, the obligation to use cleaning products, with the requirement to familiarise staff with device-specific cleaning methods, is a significant burden for hospitals. Another barrier that cannot be ignored is the cost. The BCMA is an exclusive innovation that requires significant investments and adequate financial strategies to start up, establish, and continue to support the BCMA system.[3]

There is a dearth of literature on the current status of BCMA system in Pakistan. The presence and implementation of BCMA have never been systematically evaluated. However, considering the unsafe practices of drug administration that jeopardised patients' safety, the use of an electronic medication administration system appears to be an effective solution for Pakistan's healthcare facilities. As mentioned above, the cost is one of the biggest challenges that cannot be ignored. The implementation of BCMA is an expensive project that needs a huge start-up investment and ongoing financial support. The costs include expenditures toward hardware, software, additional personnel, backfill personnel, education, infrastructure, and capital expenditures.[3]

Despite being a costly project, the outcomes of its implementation outweigh the cost, including the prevention of medication errors, a reduction in dispensing errors, saving patients' lives, and a decrease in additional healthcare costs associated with medication errors. There is no doubt that implementation of BCMA will bring challenges and changes to the work routine of staff, and so it is foreseen that they will initially try to operate outside the umbrella. These deviations will reflect the staff's non-adherence to policies and procedures and will create inefficiency and non-realised value in BCMA. Therefore, the built-in feature of continuous evaluation and ongoing tweaks to the system can solve this problem. The success of this new technology can be ensured by including the user in the pre-implementation, post-implementation, and ongoing evaluation of BCMA.[3]

A BCMA is an effective and potentially cost-saving tool for preventing morbidity and mortality associated with preventable medication errors in the community healthcare setting. The implementation of BCMA requires significant modifications in the work of the staff. Therefore, the framework of planned change is critical for the successful implementation of BCMA. Recognising the barriers and focusing on the strengths will provide evidence-based information that can assist in magnifying the usability and practicability; thus facilitating the BCMA to groove the impression and rule the healthcare. This life-saving project is the definite future of drug administration in healthcare and the best way to improve patient safety and quality processes.

COMPETING INTEREST:

The author declared no competing interest.

AUTHOR'S CONTRIBUTION:

MS: Substantial contribution to the conception and design of the work; and the acquisition, analysis, and interpretation of data for the work; drafting the work and revising it critically for important intellectual content; final approval of the version to be published; agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part of the work are appropriately investigated and resolved.

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