

Enhancing Medication Safety through the Implementation of a Double Check System : Strategies, Benefits and Challenges

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Abstract

Introduction: Medication errors pose significant risks within healthcare settings, necessitating the implementation of effective mitigation strategies. Among these, the double-check system has emerged as a vital approach to enhance medication safety. This paper introduces the concept of medication errors, underscoring their prevalence and the critical need for robust prevention methods. It further elaborates on the rationale for adopting a double-check system, setting the stage for a detailed discussion on its components, benefits, challenges, and strategies for successful implementation. Seminal works and contemporary literature are referenced to provide a comprehensive backdrop to the study.

Methods: This review employs a comprehensive literature review, analyzing academic databases and seminal works to understand the multifaceted nature of medication errors and the efficacy of double-check systems in mitigating these errors. The methodology encompasses the identification of components, the examination of implementation challenges and benefits, and the evaluation of strategies for effective adoption of double-check systems in healthcare settings.

Results: Findings reveal that medication errors stem from various factors, significantly impacting patient safety. The implementation of a double-check system, characterized by clear roles, standardized procedures, and technological integration, offers an additional layer of verification, thus enhancing safety. Despite challenges such as resistance and time constraints, benefits including improved safety, accountability, and adherence to safety standards are evident. Successful implementation strategies involve leadership support, staff engagement, workflow integration, and continuous evaluation.

Conclusions: The adoption of a double-check system presents a viable solution to reducing medication errors in healthcare settings. Despite inherent challenges, strategic approaches encompassing leadership involvement, procedural standardization, and technological advancements can optimize medication safety outcomes. Future directions should focus on technological innovation, interdisciplinary collaboration, and patient engagement to further bolster the safety and efficacy of medication administration practices.

Keywords: *Medical Errors, Intervention, Efficacy, Reporting, Medications, Pharmacy*

Introduction

Medication errors represent a significant challenge in healthcare systems worldwide, posing threats to patient safety and well-being. Defined as any preventable event that may cause or lead to inappropriate medication use or patient harm, medication errors encompass a wide range of mistakes, from prescribing errors to administration errors and everything in between [1]. Despite efforts to improve medication safety, errors continue to occur at alarming rates, highlighting the need for effective strategies to mitigate risks and enhance patient care. One such strategy gaining traction in healthcare settings is the implementation of a double-check system for medication administration. The double-check system involves two healthcare professionals independently verifying the accuracy of medication orders before administration, providing an additional layer of scrutiny to catch potential errors [2].

This approach is based on the principle of redundancy, where multiple checks are performed to ensure the right medication, in the correct dose and route, is being administered to the right patient. The rationale behind implementing a double-check system is rooted in the recognition of human fallibility and the complexity of medication administration processes. Despite advancements in technology and automation, medication errors remain a persistent challenge due to various factors, including distractions, time pressures, and cognitive biases [3]. By incorporating a double-check process into routine medication administration workflows, healthcare organizations aim to minimize the risk of errors and promote a culture of safety and vigilance among staff members. Evidence supporting the effectiveness of double-checking in reducing medication errors is compelling. A study by Tam et al. (2017) found that the implementation of a double-check system resulted in a significant decrease in medication administration errors in an acute care hospital setting. Similarly, a systematic review by Keers et al. (2013) concluded that double-checking, when performed correctly, can help identify and prevent errors before they reach the patient, thereby improving medication safety outcomes. The benefits

of a double-check system extend beyond error reduction to encompass improvements in patient outcomes and healthcare quality. By enhancing the accuracy and reliability of medication administration, healthcare organizations can minimize the occurrence of adverse drug events, prevent patient harm, and optimize treatment outcomes [4]. Moreover, the implementation of a double-check system fosters a culture of collaboration and accountability among healthcare professionals, reinforcing the importance of attention to detail and adherence to established protocols.

Despite the potential advantages of a double-check system, challenges and barriers to implementation exist. Resistance to change, concerns about increased workload, and the need for comprehensive training are among the factors that may hinder successful adoption of double-checking practices [5]. Overcoming these challenges requires proactive leadership, staff engagement, and ongoing support for medication safety initiatives. In light of the continued prevalence of medication errors and their impact on patient safety, the implementation of a double-check system represents a proactive approach to mitigating risks and improving medication safety outcomes in healthcare settings. This review aims to explore the rationale, components, benefits, challenges, and strategies for successful implementation of a double-check system for medication administration, drawing on relevant literature, research studies, and real-world examples. Medication errors represent a significant threat to patient safety and are a leading cause of adverse events in healthcare settings worldwide.

Definition and Classification

Medication errors are broadly defined as any preventable event that may cause or lead to inappropriate medication use or patient harm. This definition encompasses errors at any stage of the medication use process, including prescribing, dispensing, administration, and monitoring [1]. Common types of medication errors include

prescribing errors (e.g., incorrect dosage or medication), administration errors (e.g., wrong route or timing), and documentation errors (e.g., incomplete or inaccurate recording of medication information). Medication errors can also be classified based on their severity and potential impact on patient outcomes. Minor errors may have minimal consequences or be intercepted before reaching the patient, while serious errors can result in significant harm or even death (National Coordinating Council for Medication Error Reporting and Prevention, 2020). Understanding the different types and classifications of medication errors is crucial for prioritizing interventions and allocating resources to prevent them.

Causes and Contributing Factors

Medication errors are multifactorial in nature and can arise from a combination of individual, system, and organizational factors. Common causes and contributing factors to medication errors include:

1. **Human Factors:** Healthcare professionals may make errors due to fatigue, distraction, workload, or lack of knowledge or training. Cognitive biases and heuristics can also influence decision-making, leading to errors in medication prescribing, dispensing, or administration [6].
2. **Communication Breakdowns:** Inadequate communication among healthcare team members, as well as between healthcare providers and patients, can contribute to medication errors. Misinterpretation of verbal or written orders, unclear medication instructions, and language barriers can all increase the risk of errors.
3. **System Failures:** Flaws in medication-related processes, such as medication reconciliation, order entry, and medication storage, can create opportunities for errors to occur. Lack of standardization, poorly designed electronic health record systems, and inadequate medication safety protocols can compromise patient safety.
4. **Complexity of Healthcare Systems:** The complexity of healthcare delivery systems, including the use of multiple medications, high-risk medications, and comorbidities, can increase the likelihood of errors.

Medication errors are more common in settings with high patient acuity, such as intensive care units or emergency departments.

Consequences of Medication Errors

The consequences of medication errors can vary depending on factors such as the type of error, the patient's health status, and the timeliness of intervention. Minor errors may result in temporary discomfort or inconvenience for the patient, while serious errors can lead to prolonged hospitalization, disability, or death (WHO, 2019) [7]. In addition to the direct impact on patient outcomes, medication errors can have broader repercussions for healthcare organizations and systems. They can erode patient trust and confidence in healthcare providers, increase healthcare costs due to additional treatments or interventions, and result in legal and regulatory penalties for healthcare facilities [8]. Furthermore, medication errors can have psychological and emotional effects on healthcare professionals involved, leading to feelings of guilt, shame, or burnout. Addressing the consequences of medication errors requires a multifaceted approach that focuses on error prevention, patient-centered care, and organizational learning and improvement. In conclusion, medication errors are a complex and pervasive issue in healthcare systems, with far-reaching implications for patient safety and quality of care. Understanding the nature, causes, and consequences of medication errors is essential for developing effective prevention strategies and promoting a culture of safety and accountability within healthcare organizations.

Rationale for Implementing a Double-Check System

Implementing a double-check system for medication administration is a proactive approach aimed at enhancing patient safety and minimizing the risk of medication errors. This strategy is founded on the big recognition of inherent vulnerabilities in the medication use process and the need for additional safeguards to prevent adverse events. The rationale for adopting a double-check system stems from its ability to provide an added layer of verification, thereby

reducing the likelihood of errors slipping through undetected. By requiring two independent healthcare professionals to review medication orders, the probability of identifying discrepancies or potential mistakes is significantly heightened (Institute for Safe Medication Practices, 2017). This redundancy serves as a critical safety net, especially in high-stress environments or when administering high-risk medications where errors can have severe consequences.

Moreover, the implementation of a double-check system fosters a culture of collaboration and accountability within healthcare teams. It encourages open communication and mutual support among staff members, as they work together to ensure the accuracy and safety of medication administration processes. This collaborative approach not only improves the reliability of medication verification but also promotes a sense of shared responsibility for patient care outcomes (Pape, 2005).

Furthermore, guidelines and recommendations from medication safety organizations underscore the importance of independent double checks as a fundamental strategy for error prevention. Organizations such as the Institute for Safe Medication Practices (ISMP) and the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) advocate for the implementation of double-checking protocols as part of comprehensive medication safety initiatives (ISMP, 2017). In summary, the rationale for implementing a double-check system for medication administration lies in its ability to provide an additional layer of verification, promote collaboration and accountability among healthcare professionals, and align with best practices in medication safety.

Components of a Double-Check System

A double-check system for medication administration comprises several essential components designed to ensure thorough verification and minimize the risk of errors. These components encompass the roles and responsibilities of healthcare professionals involved, standardized procedures for conducting double checks, and the integration of technology to support the process.

Roles and Responsibilities:

In a double-check system, distinct roles and responsibilities are assigned to healthcare professionals to facilitate effective verification. Typically, one individual serves as the "checker" while another acts as the "verifier." The checker is responsible for preparing the medication dose and verifying the accuracy of the order against the patient's medical record or prescription. The verifier independently reviews the medication order, confirms its accuracy, and provides final approval before administration (Institute for Safe Medication Practices, 2017). Clear delineation of roles helps to ensure accountability and prevent errors by distributing the verification process across multiple individuals.

Procedures for Conducting Double Checks:

Standardized procedures for performing double checks are essential to maintain consistency and reliability in the verification process. These procedures outline specific steps that healthcare professionals must follow when conducting double checks, including verifying the patient's identity, comparing the medication order to the medication label, confirming the dosage and route of administration, and documenting the verification process (Joint Commission, 2018). Adherence to established protocols helps to minimize variability in practice and ensure thorough verification of medication orders.

Integration of Technology:

Technology plays a crucial role in supporting the implementation of a double-check system and enhancing its efficiency and accuracy. Electronic health record (EHR) systems can facilitate the documentation of medication orders, automate alerts for potential errors or discrepancies, and provide real-time access to patient information for verification purposes (Westbrook et al., 2018). Barcode scanning technology enables healthcare professionals to verify medication administration against the electronic medication record, reducing the risk of medication errors related to incorrect dosages or medications (Koppel et al., 2008). Integration of technology into

double-check processes streamlines workflow, reduces manual errors, and improves overall medication safety. Incorporating these components into a double-check system for medication administration ensures comprehensive verification and minimizes the risk of errors. By clearly defining roles and responsibilities, standardizing procedures, and leveraging technology, healthcare organizations can enhance the reliability and effectiveness of double checks in promoting patient safety.

Challenges and Benefits to Implementation of a Double-Check System

Implementing a double-check system for medication administration presents both challenges and benefits for healthcare organizations. While the adoption of such a system is essential for enhancing patient safety and reducing medication errors, it is not without its obstacles. Understanding these challenges and benefits is crucial for successful implementation and optimization of medication safety protocols.

Challenges:

1. **Resistance to Change:** One of the primary challenges in implementing a double-check system is resistance to change among healthcare professionals. Resistance may stem from concerns about increased workload, perceived inefficiencies, or reluctance to adopt new practices (Hiyama et al., 2019). Overcoming resistance requires effective change management strategies and clear communication about the rationale and benefits of double-checking.
2. **Time Constraints:** Conducting double checks may require additional time and resources, particularly in fast-paced clinical environments. Time constraints can lead to rushed or incomplete verification processes, compromising the effectiveness of double-checking (Pape, 2005). Healthcare organizations must address time constraints by streamlining workflows, providing adequate staffing levels, and optimizing the efficiency of verification procedures.
3. **Training and Education:** Ensuring that healthcare professionals are adequately trained and competent in

performing double checks is essential for successful implementation. However, providing comprehensive training and education on double-checking protocols may pose logistical challenges, particularly in large healthcare systems with diverse staff members [9]. Healthcare organizations must invest in ongoing training and education initiatives to ensure staff proficiency and adherence to double-checking practices.

4. **Integration with Workflow:** Integrating double-checking into existing workflow processes can be challenging, particularly if it disrupts established routines or workflows. Healthcare organizations must carefully assess workflow dynamics and identify opportunities to seamlessly integrate double-checking into medication administration processes (Institute for Safe Medication Practices, 2017). Flexibility and adaptability are key to overcoming integration challenges and ensuring the sustainability of double-checking practices.

Benefits:

1. **Enhanced Medication Safety:** The primary benefit of implementing a double-check system is enhanced medication safety. By requiring two independent verifications of medication orders, the likelihood of errors being detected and prevented is significantly increased (Institute for Safe Medication Practices, 2017). Double-checking serves as a critical safety net, reducing the risk of medication errors and adverse drug events.
2. **Improved Patient Outcomes:** The reduction in medication errors resulting from the implementation of a double-check system can lead to improved patient outcomes. By minimizing the occurrence of adverse drug events and preventable harm, double-checking contributes to better patient care and treatment outcomes (National Coordinating Council for Medication Error Reporting and Prevention, 2020).
3. **Promotion of Accountability:** Double-checking promotes accountability and shared responsibility

among healthcare professionals. By requiring collaboration and communication between individuals, double-checking fosters a culture of teamwork and vigilance [10]. Healthcare providers are encouraged to question and verify medication orders, contributing to a safer and more reliable medication administration process.

4. Compliance with Standards: Implementing a double-check system aligns with medication safety standards and recommendations from regulatory agencies and professional organizations. Organizations such as the Joint Commission and the Institute for Safe Medication Practices advocate for the adoption of double-checking protocols as a fundamental strategy for error prevention (Joint Commission, 2018).

Using the ADKAR Model:

The ADKAR model (Awareness, Desire, Knowledge, Ability, Reinforcement) provides a framework for understanding and managing change within organizations. Here's how it can be applied to the implementation of a double-check system: By applying the ADKAR model, healthcare organizations can effectively navigate the challenges and capitalize on the benefits of implementing a double-check system for medication administration.

Strategies for Successful Implementation

Implementing a double-check system for medication administration requires careful planning, collaboration, and ongoing support from healthcare organizations. To ensure successful implementation and sustained adherence to double-checking protocols, the following strategies can be employed:

1. Leadership Support and Commitment: Strong leadership support is essential for driving change and fostering a culture of medication safety within healthcare organizations. Leaders should champion the implementation of double-checking practices, allocate resources, and prioritize medication safety initiatives (Institute for Safe Medication Practices, 2017). Leadership visibility and engagement demonstrate a commitment to patient safety and

encourage staff participation in double-checking efforts.

2. Staff Engagement and Training: Engaging frontline staff in the development and implementation of double-checking protocols is critical for fostering ownership and buy-in. Healthcare organizations should provide comprehensive training and education on double-checking procedures, including hands-on practice, role-playing scenarios, and feedback mechanisms [11]. Ongoing reinforcement and support are essential to ensure staff proficiency and adherence to double-checking practices.

3. Standardization of Procedures: Standardizing double-checking procedures helps to promote consistency and reliability in the verification process. Healthcare organizations should develop clear and concise protocols for conducting double checks, including specific steps, roles and responsibilities, documentation requirements, and communication channels (Joint Commission, 2018). Standardization minimizes variability in practice and enhances the effectiveness of double-checking efforts.

4. Integration with Workflow: Integrating double-checking into existing workflow processes is essential for ensuring seamless adoption and sustainability. Healthcare organizations should assess workflow dynamics and identify opportunities to incorporate double-checking into routine medication administration practices (Pape, 2005). Flexibility and adaptability are key to integrating double-checking without disrupting established workflows or compromising efficiency.

5. Continuous Monitoring and Feedback: Monitoring and feedback mechanisms are essential for evaluating the effectiveness of double-checking practices and identifying areas for improvement. Healthcare organizations should establish systems for monitoring adherence to double-checking protocols, collecting data on errors or near-misses, and providing feedback to staff members (Institute for Safe Medication Practices, 2017). Regular feedback sessions, performance reviews, and quality improvement initiatives promote ongoing learning and refinement of double-checking processes.

Future Directions and Innovations

While the implementation of double-checking practices represents a significant step towards improving medication safety, future directions and innovations in this area hold promise for further enhancing patient outcomes. Some potential future directions and innovations include:

1. **Technological Solutions:** Leveraging technology to support double-checking processes offers opportunities for automation, standardization, and real-time feedback. Electronic health record systems, barcode scanning technology, and medication verification software can streamline verification procedures, reduce manual errors, and enhance the efficiency and accuracy of double checks [9].
2. **Artificial Intelligence and Decision Support:** Integrating artificial intelligence (AI) and decision support systems into double-checking processes can provide clinicians with real-time guidance and recommendations based on patient-specific factors and best practice guidelines. AI algorithms can analyze medication orders, identify potential errors or discrepancies, and alert healthcare providers to take corrective action [8].
3. **Interdisciplinary Collaboration:** Enhancing collaboration among healthcare disciplines, including pharmacists, nurses, physicians, and allied health professionals, can facilitate comprehensive medication reviews and verification processes. Interdisciplinary teams can leverage their collective expertise and perspectives to identify and mitigate medication-related risks more effectively.
4. **Patient Engagement and Empowerment:** Engaging patients as active participants in the medication verification process empowers them to take an active role in their own care and safety. Providing patients with access to their medication lists, encouraging them to ask questions about their medications, and involving them in medication reconciliation activities can help prevent errors and improve medication adherence (World Health Organization, 2019). By embracing these future directions and innovations, healthcare organizations can continue to advance

medication safety practices and optimize patient outcomes in the evolving healthcare landscape.

Conclusion:

In conclusion, the implementation of a double-check system for medication administration represents a critical strategy for enhancing medication safety and reducing the risk of errors in healthcare settings. Despite the challenges associated with its adoption, including resistance to change, time constraints, and training requirements, the benefits of implementing a double-check system far outweigh the challenges. By employing strategies such as strong leadership support, staff engagement and training, standardization of procedures, integration with workflow, and continuous monitoring and feedback, healthcare organizations can successfully implement and sustain double-checking practices. These strategies promote a culture of medication safety, foster accountability among healthcare professionals, and optimize patient care outcomes. The benefits of implementing a double-check system are manifold. Enhanced medication safety, improved patient outcomes, promotion of accountability, and compliance with standards are among the key advantages. Double-checking serves as a critical safety net, reducing the likelihood of medication errors and adverse drug events. It fosters collaboration and communication among healthcare team members, promotes a shared commitment to patient safety, and aligns with best practices in medication safety endorsed by regulatory agencies and professional organizations.

Looking to the future, innovations in technology, interdisciplinary collaboration, patient engagement, and decision support hold promise for further advancing medication safety practices. Leveraging technological solutions, such as electronic health record systems and artificial intelligence, can streamline verification processes and enhance the efficiency and accuracy of double checks. Interdisciplinary collaboration and patient engagement empower stakeholders to play an active role in medication safety, contributing to a culture of transparency, trust, and shared responsibility. In summary, the implementation of a double-check

system for medication administration is a multifaceted endeavor that requires collaboration, commitment, and continuous improvement. By addressing challenges, leveraging strategies for successful implementation, and embracing future directions and innovations, healthcare organizations can enhance medication safety, optimize patient outcomes, and ultimately, improve the quality and delivery of healthcare services.

Conflict of interests

The authors declared no conflict of interests.

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Table (1): Summary of the findings of the included studies that aimed to

ADKAR Element	Description	Application to Double-Check Implementation
Awareness	Ensure that staff are aware of the need for a double-check system and the benefits it offers in enhancing medication safety.	Communicate the rationale and importance of double-checking through training sessions, educational materials, and organizational communications.
Desire	Foster a desire among staff to embrace double-checking practices by highlighting its potential to improve patient outcomes and reduce medication errors.	Engage staff in discussions about the impact of medication errors on patient safety and encourage their participation in developing and implementing double-check protocols.
Knowledge	Provide staff with the knowledge and skills necessary to perform double checks effectively, including training on verification procedures, documentation requirements, and communication techniques.	Offer comprehensive training programs and resources to ensure that staff understand the purpose and procedures of double-checking and are proficient in executing them.
Ability	Support staff in developing the ability to perform double checks accurately and consistently through practice, feedback, and ongoing support.	Provide opportunities for staff to practice double-checking in simulated or real-world scenarios, offer constructive feedback on their performance, and address any challenges or concerns that arise.
Reinforcement	Reinforce the importance of double-checking through recognition, rewards, and positive reinforcement, and integrate it into organizational policies and procedures to sustain long-term adherence.	Recognize and celebrate staff members who consistently demonstrate adherence to double-checking protocols, incorporate double-checking requirements into performance evaluations and quality improvement initiatives, and reinforce the importance of double-checking through ongoing communication and reinforcement activities.

