Medication Errors in Nursing and Prevention Strategies

An Academic Essay

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Introduction

Medication errors represent one of the most significant and preventable causes of patient harm within healthcare systems worldwide. In the United Kingdom, the scale of this problem has prompted sustained attention from national bodies, healthcare regulators, and nursing organisations alike. The National Health Service (NHS) reports tens of thousands of medication-related incidents annually, with a substantial proportion attributed to nursing practice, given that nurses administer the vast majority of medications across clinical settings (Elliott *et al.*, 2021). The consequences of such errors range from minor adverse reactions to life-threatening complications and death, placing enormous burdens on patients, families, and healthcare institutions.

Medication errors are broadly defined as any preventable event that may cause or lead to inappropriate medication use or patient harm whilst the medication is in the control of the healthcare professional (National Coordinating Council for Medication Error Reporting and Prevention [NCC MERP], 2023). This definition encompasses errors of prescription, transcription, dispensing, administration, and monitoring. For nurses, the administration stage is of particular relevance, although nursing roles in monitoring, transcription, and patient education also carry inherent risk.

This essay critically examines the nature and prevalence of medication errors in nursing practice, explores the contributory factors that increase their likelihood, and evaluates a range of evidence-based prevention strategies. The discussion draws upon contemporary literature, national guidelines, and theoretical frameworks to propose a comprehensive approach to reducing medication errors and improving patient safety across NHS settings.

Prevalence and Classification of Medication Errors

The prevalence of medication errors in nursing is difficult to quantify with precision due to significant underreporting, variability in definitions, and differences in reporting systems across NHS trusts. Nevertheless, available data provide a sobering picture. A systematic review by Keers *et al.* (2013) found that administration errors by nurses occurred in approximately 8–25% of medication administrations, with studies using direct observation consistently identifying higher rates than those relying on incident reports. More recently, the NHS Patient Safety Learning report (2022) highlighted that medication-related incidents accounted for over 40,000 reported events per year in England alone, with an unknown but likely larger number remaining unreported.

Medication errors are typically classified according to the stage at which they occur and their severity. The most common types encountered in nursing practice include wrong dose errors, wrong patient errors, wrong route of administration, omission errors, and wrong timing errors (Cloete, 2015). Wrong dose errors, in particular, are frequently cited as the most prevalent category, often arising from calculation mistakes, ambiguous prescriptions, or interruptions during preparation (Westbrook *et al.*, 2010). Omission errors — where a prescribed medication is not administered — are also highly significant as they may result in therapeutic failure, particularly in critically ill patients reliant on time-sensitive treatments.

Near-miss events, defined as errors that were detected and corrected before reaching the patient, are equally important to capture and analyse. Near misses provide valuable opportunities for systems learning without requiring patient harm as a prerequisite for investigation (Reason, 2000). Despite this, fear of blame and punitive cultures within some healthcare organisations continue to suppress reporting, undermining organisational learning and safety improvement efforts.

Contributory Factors to Medication Errors in Nursing

Medication errors are rarely attributable to a single cause; rather, they result from the complex interaction of individual, environmental, and organisational factors. James Reason's (2000) Swiss Cheese Model of accident causation remains a widely used theoretical framework in patient safety literature, positing that errors occur when multiple layers of defence fail simultaneously. Applied to medication management, this model highlights how individual nurse fatigue, unclear prescriptions, inadequate staffing, and poor ward design can each independently reduce safety margins, and together create conditions

in which errors are almost inevitable.

At the individual level, nurse-related factors include inadequate knowledge of pharmacology, poor calculation skills, fatigue, and cognitive overload. A study by Brady *et al.* (2009) found that a significant proportion of nursing students and qualified nurses lacked confidence in drug dose calculations, raising concerns about the adequacy of pre-registration education. Fatigue is a particularly pervasive concern in NHS settings, where long shifts, high patient acuity, and understaffing regularly challenge nurses' cognitive capacity. Research has demonstrated that error rates increase substantially after twelve hours of work, a finding with direct implications for the organisation of shift patterns (Rogers *et al.*, 2004).

Environmental and contextual factors also play a critical role. Interruptions and distractions during medication preparation and administration are among the strongest predictors of error. Westbrook *et al.* (2010) conducted a landmark observational study in Australian hospitals, demonstrating that each interruption during medication administration was independently associated with a 12.7% increase in procedural failures. Whilst this study was conducted outside the UK, its findings are broadly applicable to NHS ward environments characterised by high noise levels, competing demands, and frequent disruptions.

Organisational factors, including staffing levels, workload, ward culture, and communication systems, exert substantial influence on medication safety. High nurse-to-patient ratios have been consistently associated with increased error rates, burnout, and poorer patient outcomes (Aiken *et al.*, 2014). In addition, poor communication at handover, illegible or incomplete prescriptions, and the absence of standardised protocols for high-risk medications create systemic vulnerabilities that individual vigilance alone cannot overcome.

Technology-related factors also merit consideration. Whilst electronic prescribing and medicines administration (ePMA) systems have the potential to reduce certain error types, they introduce novel risks including alert fatigue, data entry errors, and over-reliance on automated checks (Mozaffari *et al.*, 2021). Healthcare organisations must therefore ensure that the implementation of digital systems is accompanied by robust training, ongoing evaluation, and a critical awareness of their limitations.

Impact of Medication Errors on Patients and the Healthcare System

The consequences of medication errors extend far beyond the immediate clinical event. For patients, errors can result in prolonged hospitalisation, permanent disability, psychological trauma, and death. The World Health Organisation (WHO, 2019) estimated that medication-related harm costs healthcare systems globally approximately USD 42 billion annually, a figure that underscores the economic as well as the human cost of preventable harm. In the UK specifically, the NHS spends an estimated £98 million per year managing the consequences of medication errors in primary care alone, with far greater costs arising in secondary and tertiary settings (Elliott *et al.*, 2021).

Vulnerable patient groups, including older adults, neonates, and those with complex multi-morbidity, face disproportionate risk from medication errors. Polypharmacy — the concurrent use of five or more medications — is particularly prevalent in older adults and is associated with increased risk of drug interactions, adverse effects, and errors during administration (Duerden *et al.*, 2013). Nurses working in care of the elderly, paediatrics, and intensive care settings must therefore exercise heightened vigilance and apply their pharmacological knowledge with particular rigour.

Beyond patient harm, medication errors have profound consequences for nursing professionals. Nurses involved in errors often experience significant psychological distress, including guilt, anxiety, and post-traumatic stress symptoms, a phenomenon sometimes referred to as the 'second victim' effect (Wu, 2000). The fear of blame and professional consequences can deter reporting, perpetuating cycles of underreporting and missed learning opportunities. Creating psychologically safe environments in which nurses feel supported to report errors without fear of disproportionate sanction is therefore essential for both workforce wellbeing and systems improvement.

Prevention Strategies

The prevention of medication errors requires a multi-layered, systems-based approach rather than a reliance on individual vigilance. The NHS Patient Safety Strategy (NHS England, 2019) explicitly promotes a learning culture, the adoption of safety science principles, and investment in infrastructure to support safer practice. Prevention strategies can be grouped into several broad categories: educational interventions, procedural and technological safeguards, organisational and cultural changes, and patient involvement.

Educational Interventions

Improving nurses' pharmacological knowledge and numeracy skills is a fundamental component of error prevention. The Nursing and Midwifery Council (NMC, 2018) standards for pre-registration nursing education require that all students demonstrate competence in medicines management and drug dose calculations prior to registration. However, evidence suggests that the quality and consistency of this preparation varies considerably across universities and practice placements (Brady *et al.*, 2009). Strengthening curricula, incorporating simulation-based learning, and ensuring regular reassessment of clinical staff competencies are therefore important priorities.

Continuing professional development (CPD) plays an equally vital role. Regular updates on high-risk medications, new drugs introduced to formularies, and changes in administration techniques help to maintain and extend nurses' knowledge over the course of their careers. Structured mentorship programmes and clinical pharmacist liaison roles within ward teams have also demonstrated effectiveness in improving nurses' confidence and competence in medicines management (Latter *et al.*, 2010).

The Five Rights and Structured Checking Procedures

The 'Five Rights' of medication administration — right patient, right drug, right dose, right route, and right time — have long been a cornerstone of nursing practice and remain widely taught in pre-registration education. Some contemporary frameworks have expanded this to nine rights, adding right documentation, right reason, right response, and right to refuse, thereby providing a more comprehensive framework for safe administration (Elliot and Liu, 2010). Whilst adherence to such frameworks does not guarantee the elimination of errors, they provide a structured cognitive prompt that can help nurses identify discrepancies before reaching the patient.

Double-checking procedures, particularly for high-alert medications such as insulin, anticoagulants, and concentrated electrolytes, are recommended by the Institute for Safe Medication Practices (ISMP, 2018) and widely adopted across NHS trusts. Independent double-checks, in which two nurses separately verify each element of the administration process without prior knowledge of the other's findings, are considered more reliable than dependent double-checks where one nurse reviews another's work (Prakash *et al.*, 2014). However, the resource implications of universal double-checking must be weighed against their evidential benefit, and trusts should apply them judiciously to genuinely high-risk

scenarios.

Reducing Interruptions During Medication Administration

Given the strong evidence linking interruptions to medication errors, strategies to protect the medication preparation and administration process from disruption are well-supported. The use of 'Do Not Disturb' vests or tabards worn by nurses during drug rounds is a simple and low-cost intervention that has been widely implemented across UK hospitals. A randomised controlled trial by Fore *et al.* (2013) found that the use of medication safety vests significantly reduced the number of interruptions experienced by nurses during administration rounds, with corresponding improvements in error rates. Designated medication preparation areas and physical environmental modifications, such as improved lighting and reduced noise, complement such measures.

Technology and Electronic Systems

Electronic prescribing and medicines administration (ePMA) systems represent a significant advance in medication safety infrastructure. By replacing handwritten prescriptions and administration records with electronic systems, ePMA reduces transcription errors, improves legibility, and enables decision-support functions such as allergy alerts and dose range checks (Mozaffari *et al.*, 2021). NHS England has prioritised ePMA implementation as part of its digital transformation agenda, and evidence from trusts with established systems suggests meaningful reductions in prescribing and administration errors (Franklin *et al.*, 2007).

Barcode medication administration (BCMA) technology offers an additional layer of safety by requiring nurses to scan both the patient's wristband and the medication before administration, thereby verifying identity and drug details electronically. A systematic review by Cochran *et al.* (2016) found that BCMA was associated with significant reductions in wrong-patient and wrong-medication errors in hospitals where it was implemented with adequate training and workflow support. As with all technologies, success depends critically on implementation quality, staff engagement, and ongoing governance.

Automated dispensing cabinets (ADCs) and unit dose dispensing systems also contribute to error reduction by ensuring that medications are available in correct doses, properly labelled, and dispensed by appropriately trained staff. These systems reduce nurse

preparation time and the associated risk of calculation and measurement errors, though they require robust governance to prevent unauthorised access and stock management failures.

Staffing, Workload, and Organisational Culture

Organisational interventions directed at staffing levels, shift design, and workplace culture are among the most consequential but also the most challenging to implement. The evidence linking unsafe nurse-to-patient ratios to increased error rates and adverse outcomes is compelling (Aiken *et al.*, 2014), yet workforce pressures within the NHS continue to challenge the maintenance of safe staffing levels. Nurse leaders and managers must advocate robustly for evidence-based staffing norms, particularly on wards with high medication complexity.

The cultivation of a safety culture — characterised by open communication, non-punitive responses to errors, and shared commitment to learning — is identified as a critical enabler of patient safety improvement (Vincent, 2010). Healthcare organisations that adopt a 'just culture' framework, distinguishing between human error, at-risk behaviour, and reckless conduct, and responding proportionately to each, foster environments in which reporting is normalised and improvement is continuous (Marx, 2001). The NHS Patient Safety Strategy (NHS England, 2019) explicitly endorses this approach, encouraging trusts to adopt safety culture surveys, establish Patient Safety Incident Response Frameworks (PSIRF), and invest in multidisciplinary safety improvement teams.

Patient Involvement and Medicines Reconciliation

Engaging patients as active partners in their own medication management is an increasingly recognised strategy for error prevention. Patients who are well-informed about their medications, including their names, purposes, doses, and potential side effects, are better positioned to identify discrepancies and alert nurses to potential errors (World Health Organisation, 2019). Nurses have a professional and ethical responsibility under the NMC Code (2018) to provide patients with clear, accurate information about their medicines and to respect their right to make informed decisions about treatment.

Medicines reconciliation — the process of ensuring that complete and accurate medication information is communicated at all care transitions — is a particularly important intervention. Discrepancies between a patient's pre-admission medications and their inpatient prescription chart are a common source of omission and duplication errors,

especially in emergency admissions (Hellström *et al.*, 2012). Structured medicines reconciliation processes, supported by clinical pharmacists and informed by community pharmacy records, have been shown to reduce medication discrepancies significantly at the point of admission and discharge.

The Role of Professional Regulation and Accountability

The NMC Code (2018) places a clear duty on registered nurses to practise safely and effectively in medicines management, to acknowledge and learn from errors, and to raise concerns when patient safety is compromised. Nurses must also maintain their competence and knowledge as an ongoing professional responsibility, seeking guidance when uncertain and escalating concerns through appropriate channels. This regulatory framework provides an important foundation for individual accountability within the broader systems context.

Healthcare organisations, in turn, bear responsibility for providing the conditions that enable safe practice: adequate staffing, appropriate training, functional equipment, and responsive governance systems. The Health and Safety at Work Act 1974 and the Health and Social Care Act 2008 (as amended) create legislative obligations for employers to manage foreseeable risks to patients and staff. Regulatory bodies such as the Care Quality Commission (CQC) inspect medicines management practices as part of their assessment of NHS trust safety and quality, and their findings have the power to drive organisational improvement.

Conclusion

Medication errors in nursing constitute a complex, multifactorial patient safety challenge that demands a sustained, coordinated response at individual, team, and organisational levels. As this essay has demonstrated, errors arise from the interaction of knowledge deficits, environmental pressures, systems vulnerabilities, and cultural factors — none of which can be addressed in isolation. Effective prevention requires the integration of robust educational preparation, structured checking procedures, technological safeguards, safer staffing, and a genuine commitment to learning culture.

The evidence base for many prevention strategies is growing, and the NHS Patient Safety Strategy provides a coherent national framework for progress. Nevertheless, sustained improvement will require ongoing investment, courageous leadership, and the active engagement of nurses at every level of practice. As the largest professional group within the

NHS and the clinicians most frequently involved in medication administration, nurses are both at the centre of the problem and central to its solution.

Ultimately, reducing medication errors is not merely a technical challenge but a moral imperative. Every preventable error represents a failure to protect a patient entrusted to professional care. By embedding the principles of patient safety science into everyday nursing practice and advocating for the systemic conditions that support safe care, nurses can make a decisive contribution to a healthcare system that is worthy of public trust.

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