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Medication-Related Incidents and the Potential Impact of EPMA Systems

Medicines are crucial in healthcare, but there is increasing recognition of the need to enhance medication safety and prevent medication errors to improve patient outcomes. Medication-related adverse events arise either from adverse drug reactions (usually unavoidable) or from medication errors (usually avoidable). Medication errors, encompassing mistakes in prescribing, dispensing, administering, or monitoring medicines, are frequent and can occur regardless of whether harm results. The National Reporting and Learning System (NRLS) in England reports that medicines account for about 9% of NHS incidents, with an estimated 237 million medication errors annually, 66 million of which could be clinically significant. Approximately half of adverse drug events (ADEs) in secondary care are preventable, highlighting the need for strategies to reduce these errors.

Electronic prescribing and medicines administration (EPMA) systems, which facilitate electronic communication of prescriptions, can reduce errors inherent in paper-based systems, such as those caused by poor handwriting and data loss. EPMA systems enhance legibility, completeness, and include clinical decision support functionalities to assist clinicians in making accurate prescriptions. Research shows these systems can improve patient care quality.

Nottingham University Hospitals (NUH) NHS Trust, a large teaching hospital, has traditionally used paper-based systems but secured funding to implement the Nervecentre EPMA system. This system includes features like dose sentences, interaction and allergy checks, and barcode scanning for patient and medication identification.

The study at NUH examined medication-related incidents from their reporting system to determine the frequency and types of incidents causing harm, and to assess if EPMA could reduce these risks. This research aims to highlight how EPMA could address safety issues and identify medication safety areas beyond EPMA's scope.

Study Design, Data Sources and Selection of Records

The study was a retrospective review of 3,988 medication-related reports recorded by healthcare professionals at Nottingham University Hospitals (NUH) NHS Trust through the DATIX incident-reporting system. This system provided a framework for classifying incidents according to the requirements of the English National Reporting and Learning System (NRLS). The reports represented records of inpatients at the hospital between 1 September 2020 and 31 August 2021. The study was approved by the Clinical Effectiveness Department at the Trust and did not require ethical committee approval.

Data from DATIX included only medication-related incidents that were submitted and classified by the reporter as medication-related. Repeat entries were excluded, and data were anonymized. The incidents were classified into categories by the reporting healthcare professional, referring to the stage in the medication process where the incident occurred, including Administration, Discharge, Pharmacy, Prescribing, and Other. Each DATIX entry included the degree of harm to the patient and the category and subcategory of the incident type. The degree of harm, assessed by the reporter and confirmed by an incident investigator, followed the Trust's incident reporting policy, defining harm levels as none, low, moderate, severe, and catastrophic (death).

Before the in-depth review, outpatient incidents were excluded. Incidents rated as no harm (3,269) were also removed, leaving those with low, moderate, severe, or catastrophic harm ratings for review. This resulted in 387 incidents being reviewed in-depth, as some DATIX reports involved more than one incident per report.

Method for Assessing the Potential for EPMA to Have Prevented Incidents

Two reviewers, trained in reviewing incident reports, assessed each report by reading the original entry and additional information, including investigation results. They determined to what extent the EPMA system (Nervecentre) could have reduced the likelihood of each incident, using four possible outcomes:

- EPMA would reduce the likelihood without configuration.
- EPMA could reduce the likelihood with some configuration.
- EPMA could reduce the likelihood with development.
- EPMA could not reduce the likelihood under any circumstances.

Disagreements were discussed within the team. Incidents avoidable with EPMA were tested to ensure correct categorization and intervention triggers. Common themes tested included barcode scanning, duplicated administration, and drug-drug interaction.

DATIX reports from the specified period were downloaded and stored in Microsoft Excel, including incident categorization. All reports fitting the review scope were used. Each incident was reviewed, and the potential impact of EPMA was recorded using the four-point classification system. Data analysis involved generating frequencies for each category and subcategory and associated harm levels using pivot tables in Excel. Descriptive statistics were determined and reported.

Nearly Half of Incidents were Administration-Related

Of the 387 incidents reviewed, 55.6% (215 incidents) were related to administration, with the largest subcategory being 'non-administration/dose omitted or significantly delayed' (17.3%, 67 incidents), often due to poor communication, human error, distractions, and low staff numbers. The 'Other' category accounted for 26.4% (102 incidents) of total incidents, with new adverse drug reactions making up the majority of this category (43.1%, 44 incidents).

Most incidents were classified as low harm (83%, 321 incidents), with 16.5% (64 incidents) as moderate harm, and two incidents as severe and catastrophic, respectively. In administration incidents, 89.8% were low harm and 10.2% moderate harm. The 'Other' category included incidents across all harm levels: 65.7% low harm, 32.4% moderate harm, 1.0% severe harm, and 1.0% catastrophic harm. Of the moderate harm incidents in the 'Other' category, 72.7% were due to new adverse drug reactions or unexpected drug responses, mostly related to opioid sensitivity.

EPMA could have reduced the likelihood of 18.6% (72 incidents) of all incidents without configuration, with 18.1% (13 incidents) of these being moderate harm. The majority of these incidents (65.3%, 47 incidents) were in the administration category. An additional 7.5% (29 incidents) could have been reduced by EPMA with configuration, with 20.1% (six incidents) in the moderate or severe harm categories. Most of these were related to incorrect dosing. EPMA with further development could have reduced 11.1% (43 incidents) of all incidents, with 9.3% (four incidents) being moderate harm. Nearly half of these were administration-related, primarily due to incorrect dosing, frequency, and non-administration.

EPMA would not have been able to reduce the likelihood of 62.8% (243 incidents) of incidents with identified harm. Over half of the administration incidents (60.9%, 131 out of 215) could not have been prevented by EPMA, often due to communication issues, distractions, or staff shortages. For prescribing incidents, 45.7% (21 out of 46) could not have been prevented by EPMA, many involving 'failure to prescribe' and 'incorrect dose'. In the 'Other' category, 70.6% (72 out of 102) of incidents could not have been reduced by EPMA, including all incidents classified as new adverse drug reactions.

These findings underscore the critical role of EPMA systems in reducing medication errors, particularly in the administration category. However, it also highlights significant areas for improvement in medication safety that EPMA alone cannot address, such as issues stemming from poor communication, human error, and staff shortages. Comprehensive strategies that include but are not limited to EPMA implementation are essential to enhancing overall patient safety and reducing medication-related harm.

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