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Strategies to reduce mdication errors with reference to older adults.
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Best Practice
Evidence based information sheets for health professionals

Strategies to reduce medication errors with reference to older adults

Recommendations

- Computerised physician order entry (CPOE) can reduce the risk of misreading medication errors in prescriptions. **(Grade A)**
- The use of medical administration records (MAR), or the use of computer adverse drug events/ effects (ADE) detection and alerts can reduce medication error at the prescription stage. **(Grade B)**
- The nurses' use of bar codes at the point of care information system may reduce medication errors in prescribing. However, sufficient time allocation and staff education are required for continuous successful use. **(Grade B)**
- Despite strong evidence to support the use of individual medication supply systems/individually packed doses of medications, there is a great risk of simply shifting medication errors from the ward/ hospital floor to the pharmacy. **(Grade C)**
- Where possible, pharmacists should be made available for double checking medication orders and for consultation. **(Grade B)**
- Double checking medication orders by two nurses prior to administration reduces the number of medication errors. **(Grade B)**
- No strong evidence was found to recommend the use of designated nurses, medication administration review and safety committee (MARS), and education for nurses concerning specific medication use, or in reducing medication errors. **(Grade C)**

Information Source

This Best Practice Information Sheet, which updates and supersedes the JBI information sheet of the same title published in 2005,[2] has been derived from six systematic reviews published in 2006-2008.[3-8] Of 6 included systematic reviews, 4 reviews[3,5-7] address only Computerised Physician Ordering Entry system (CPOE) and/or Clinical Decision Support Systems (CDSS) and no updated evidence was available for other types of interventions. One review only addressed the incidence and characteristics of preventable adverse drug events.[4] Therefore, most of the previous Best Practice Information Sheet could not be updated.

Background

Medication error is a significant problem in health care in many countries. In a report from the United States of America (USA), medication errors represent 20% of medical errors despite recent efforts to reduce them.[5] In Australia, the older population have higher reported rates of medication incidents due to higher levels of medication intake and increased likelihood of being admitted to hospital (hospital statistics being the main source of medication incident reporting) than other age groups. The financial burden is staggering with one estimate putting the cost of preventable medication errors in the USA alone between $17 and $29 billion per year.[9] In Australia, the cost has been estimated at over $350 million annually.[10] As medication errors can occur at all stages in the medication delivery process, from prescription by physicians to delivery of medication to the patient by nurses, and in any site in the health system, it is essential that interventions be targeted at all aspects of medication delivery.[8]

Medication Errors and Adverse Drug Events/Effects

A large number of adverse drug events/ effects (ADE) in long-term care settings are caused by preventable errors. A case-control study assessed the incidence of and risk factors for ADE in long-term care settings in the USA. The results indicated that 42% of identified ADE were judged preventable.[6]

Grades of Recommendation

These Grades of Recommendation have been based on the JBI-developed *2006 Grades of Effectiveness*[1]

Grade A Strong support that merits application

Grade B Moderate support that warrants consideration of application

Grade C Not Supported

Type of Errors

A USA study of 11 medical and surgical units followed over a six month period found the most common types of errors were wrong dose (28%), prescribing wrong choice of medication (9%), administering wrong medication (9%), known allergy (8%), or a missed dose (7%), at the wrong time (6%) or frequency (6%).[2] This can be compared with data from the Australian Incident Monitoring System showing that most medication incidents occurring in hospital were categorised as omissions (>25%), overdoses (20%), wrong medicines (10%), drug of addiction discrepancy/drug misappropriation (<5%), incorrect labelling (<5%) or an adverse drug reaction (<5%).[8]

Type of Drugs

A systematic review containing 29 studies also revealed that drugs commonly associated with ADE included cardiovascular drugs, analgesics, and hypoglycaemic agents.[4] Other common medication errors associated with preventable ADEs include failure to prescribe prophylaxis for patients continuously taking nonsteroidals anti-inflammatory drugs, or anti-platelet drugs to prevent gastrointestinal toxicity, lack of monitoring of diuretic or hypoglycaemic, and anticoagulant use cause over-or under-diuresis, hyper- or hypoglycaemia, and bleeding.[4]

Cause of Errors

In a USA study the most common cause of medication error (22%) was lack of knowledge of the drug, (eg. lack of awareness of medication interactions, incorrect dosages, incorrect mixing, and overly rapid infusions.) The second most frequent cause was the lack of information about the patient (14%), (eg. inappropriate medication for that patient.)[8] There is limited Australian data on the causes of these errors in a hospital setting, however for prescription errors, approximately 2% of all prescriptions have the potential to cause an adverse event with the most common causes being the inappropriate or unclear dose, missing dose, or the directions for use were unclear or absent.[8]

Errors in Dispensing

The most common types of dispensing errors reported by pharmacists are the selection of the incorrect strength (concentration), incorrect product or misinterpretation of a prescription. The major reason for selecting the incorrect strength or product has been described as the result of 'look alike' or 'sound alike' error. Other major factors cited for contributing to dispensing errors were high prescription volume, overwork, fatigue, and interruptions.[8]

Other Factors

Other factors that have been suggested as contributing to medication errors are inadequate continuity of care between the hospital and the community after discharge of a patient, multiple health care providers where medications can be prescribed by more than one doctor (polypharmacy), keeping unnecessary medications, generic names/trade names and misunderstanding the label instructions. However, the effect of these factors on medication error and adverse drug events has not been studied.[8]

Definitions

For the purposes of this information sheet the following definitions were used:

Medication errors are preventable incidents where patients are given the wrong medications, the wrong form of medications, the wrong dosage or at the wrong time due to an error in the process of prescribing, dispensing and administration.

Objectives

This information presents the best available evidence related to management of medication incidents (errors) associated with the prescribing, dispensing and administration of medications in the acute, subacute and residential care settings with particular emphasis where possible to persons aged 65 years and over. As little research has been performed strictly within the ≥65 years population, it was considered appropriate to include studies from all clinical environments.

Types of intervention

Interventions that have been examined for effectiveness in reducing medication errors and/or adverse drug events could be placed into one of the five following categories:

- Computerised systems
- Individual patient medical supplies
- Education and training
- Use of pharmacists
- Nursing care models

Quality of Research

Overall, authors of the systematic reviews reported that the quality of the existing research is low as many of the studies had small sample size, inadequate randomisation, or the results were poorly reported or inconclusive.

Findings

Computerised Systems

Computerised Physician Ordering Entry system (CPOE) combined with Clinical Decision Support Systems (CDSS)

CPOE is described as a computer based system whereby the physician writes all orders online. CDSS provides computerised advice on drugs doses, routes and frequencies. CDSS can also perform drug allergy and drug-drug interaction checks as well as prompt for corollary orders (such as glucose levels after insulin has been ordered).

Good evidence suggests that CPOE alone is effective in reducing medication errors in a general hospital population.[8] In contrast, little evidence was found to support the use of CPOE combined with CDSS in reducing medication errors and ADEs.[3,5,7,8] A recent systematic review of 10 studies revealed that most included studies (80%) showed that the use of CDSS modestly improved prescription, as measured by minimising drugs to avoid, optimising drug dosage, or more generally improved prescribing choices in older adults.[7] However, no study examined clinical outcomes such as medication errors or adverse drug effects.[7] Another recent systematic review found some evidence to support the use of CPOE with CDSS but no studies were high quality.[6]

Computer Alert System

One study found that in 44% of cases where the system alerted the physician to a potential risk of an adverse drug event related injury, the physician was unaware of the risk. However, the system consisted of only 37 drug specific adverse drug events and therefore would need to be expanded and updated to encompass a greater variety of risk.[8]

Medical Administration Records (MAR)

Medical administration records (MAR) are initially generated by order entry in the pharmacy. There was lower level evidence for their effectiveness in a single report where medication errors decreased from one year to the next by 18%. A positive aspect of new computerised MAR was their readability over handwritten documents.[8]

Bedside Terminal Systems

There was no evidence to suggest that the use of bedside terminal systems reduce medication error incidence.[8]

Bar coding

Research found that nurse use of bar codes in a point of care information system decreased the medication error rate in hospital from 0.17% before the system was instituted to 0.05% after. (Grade B) However, the use of the bar coding device was "easily and frequently circumvented" possibly due to:[8]

- Nurse confusion over automated removal of medications by the bar code medication administration system
- Degraded coordination between the nursing staff and the physicians
- Nurses dropping activities to reduce workload during busy periods
- Increased prioritisation of monitored activities during busy periods
- Decreased ability to deviate from routine sequences

Automated Dispensing

The available, generally poor quality evidence did not support the use of automated dispensing systems to improve safety outcomes, but did significantly reduce the rate of error in filling of dosage carts by technicians.[8]

Individual Patient Medication Supply

Individual medication supply systems have been shown to reduce medication error rates compared with other dispensing systems such as ward stock/stock bottle approaches. However, it has been suggested that the use of these systems shifts the chances for error from the nursing ward into the pharmacy, where distractions are also common and errors may occur.[8]

Education and Training

From limited studies, written medication examinations and education on medication calculation could not improve nurse competence to prevent errors beyond the skills they had already accrued.[8]

Use of Pharmacists

The use of a pharmacist for consultation and patient education during medication rounds and at discharge resulted in significantly fewer medication errors. Evidence in the outpatient setting is inconclusive.[8]

Nursing care models

Double Checking

There is evidence that suggests that having two nurses check medication orders prior to dispensing medication significantly reduces the incidence of medication errors.[8] Weaker evidence suggested that single checking could be as safe as double checking, but was reliant on the number of medication errors reported in the medication incident records and may be a conservative estimate of the number of medication errors that actually occurred. It has been demonstrated that actual error rates could be 33% higher than reported rates.[8]

Dedicated Nurses

There is no conclusive evidence to suggest that providing designated nurses to dispense medication can reduce the incidence of medication errors.[8]

Medication Administration Review and Safety (MARS) committee

MARS involved the introduction of an interdisciplinary committee of staff to review all reported errors and attempted to identify potential causes. If necessary, medication administration policies were revised. This information was then shared with staff through a publication called a "Hot Spots" brief. There is limited evidence to suggest that introducing a MARS committee can significantly reduce the incidence of medication administration documentation errors. Introduction of MARS may heighten the awareness of medication error prevention and reporting but there is no conclusive evidence of reduced incidence of medication administration documentation errors.[8]

Partner in Patient Care (PIPC)

The PIPC nursing practice model was instituted in an attempt to reduce workload on registered nurses by delegating less clinical tasks to a multi-skilled technician; however, there is limited evidence to suggest that introducing the PIPC model significantly reduces the incidence of medication errors.[8]

Process Change

As an example of the implementation of process change to improve the delivery of a specific drug and reduce the likelihood of an adverse event, diabetes education to nurses and the installation of blood glucose testing units in all wards was assessed. Limited evidence was found to suggest that providing education on diabetes management to nurses and the provision of bedside blood glucose monitors significantly reduce the time between blood glucose measurement and insulin administration.[8]

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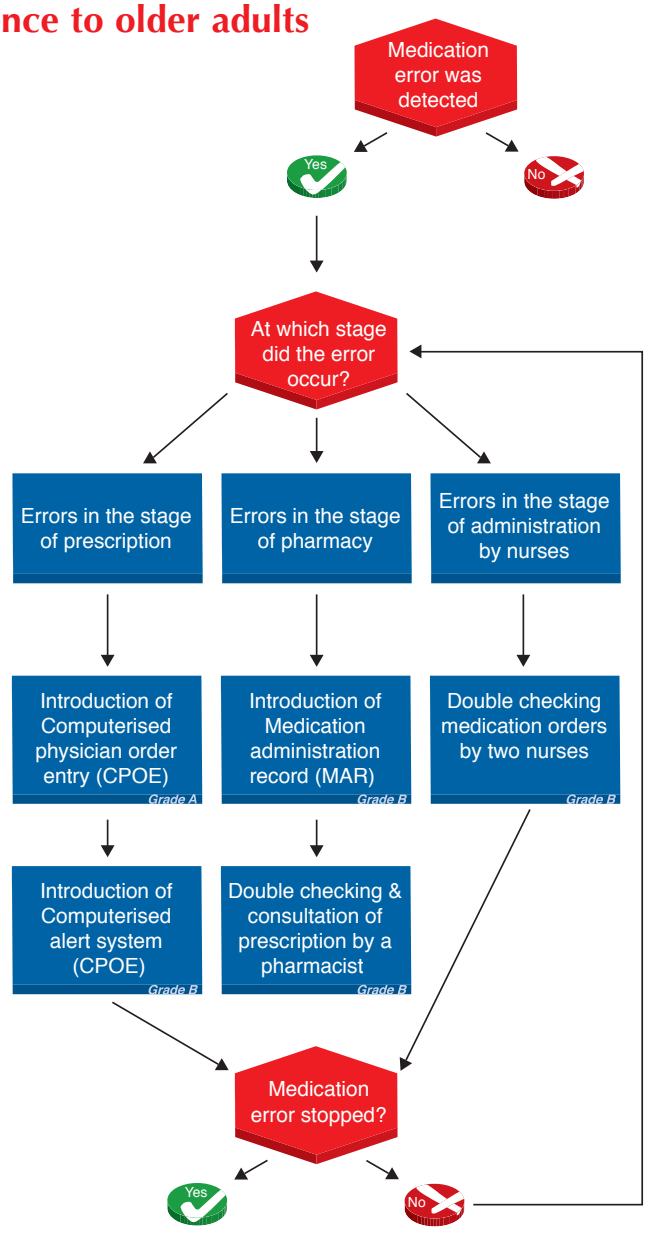

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Evidence-based Practice evidence, context, client preference judgement

This *Best Practice* information sheet presents the best available evidence on this topic. Implications for practice are made with an expectation that health professionals will utilise this evidence with consideration of their context, their client's preference and their clinical judgement.[11]

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