Centre for Clinical Effectiveness

Evidence Request

Single or double checking of medications prior to administration

Date: 14 November 2006

Author: Kelly Allen

Requestors: Elizabeth Gillespie
Director of Nursing, Cranbourne Integrated Care Centre
Sterilisation and Infection Control Coordinator, Southern Health.

Paul Ferrier
Paediatric Bed Access Manager
Women and Children's Program
Southern Health.

Abstract

Background: The administration of medication to a patient is the final result of a series of steps including prescribing and dispensing of medications. All steps in this process are potentially exposed to errors. Checking immediately prior to administration is the last chance to ensure that the patient receives the correct medication.

The purpose of this review is to look at the administration phase and determine whether 'double checking' has a lower incidence of medication errors than 'single checking'. Single checking requires the clinician administering the medication to review the drug, formulation, dose, route, time, etc before giving it to the patient. Double checking is the same process conducted by two clinicians independently.

Clinical Question: In hospital patients, does a double checking procedure prior to medication administration, as compared to a single checking procedure, reduce errors?

Methods: We included all trials published in English.

We searched The Cochrane Library, including The Cochrane Database of Systematic Reviews, DARE, CENTRAL and HTA in September 2006. We also searched Medline and CINAHL.

Studies were selected and appraised by one reviewer in consultation with colleagues, using inclusion, exclusion and appraisal criteria established a priori.

Results: A recent (2006) systematic review was found that examined strategies to reduce medication error with specific reference to older adults.[1] This review contained a section on single and double checking of medication before administration by nurses. Due to limited research in this area, this review included studies that were directed at the general patient population not just older adults. Two studies, both conducted in Australia were included in this section.

The authors concluded that there is some evidence from a single cross-over controlled trial in a geriatric assessment and rehabilitation unit to suggest that double checking of medication before administration can reduce incidence of medication error. However, the authors of the review also recommend that further research is needed in this area and that in general evidence for the effectiveness of strategies to reduce medication errors is weak and further high quality trials are needed.

Conclusions: There is some limited evidence to suggest that having two nurses check medication orders before dispensing the medication may significantly reduce the incidence of medical errors, however the generalisability of this evidence to a Southern Health population is unclear. The two studies included in this systematic review were based in adult hospital patients. No studies were found that examined this practice in the paediatric hospital population.

Background

The administration of medication to a patient is the final result of a series of steps including prescribing and dispensing of medications. All steps in this process are potentially exposed to errors. Checking immediately prior to administration is the last chance to ensure that the patient receives the correct medication.

The purpose of this review is to look at the administration phase and determine whether 'double checking' has a lower incidence of medication errors than 'single checking'. Single checking requires the clinician administering the medication to review the drug, formulation, dose, route, time, etc before giving it to the patient. Double checking is the same process conducted by two clinicians independently.

Clinical Question

In hospital patients does a double checking procedure prior to medication administration, as compared to a single-checking procedure, reduce errors?

Methods

Study Selection Criteria

Patient	All hospital patients				
Intervention	Double checking procedures prior to medication administration				
Comparison	Single checking procedures prior to medication administration				
Outcomes	Incidence of medication administration errors				
Study Type	Any comparative study	**Publication Date**	Any	**Language**	English

Search Strategy

Evidence Source	**Date of Search or Issue searched**
All EBM (Ovid) *	3 September 2006 (Issue 3, 2006)
Medline (Ovid)	4 September 2006
CINAHL (Ovid)	5 September 2006

*(including The Cochrane Database of Systematic Reviews, DARE, CENTRAL and ACP Journal Club)

Search Terms in Medline

Patient	-
Intervention	$check$.mp. and (multiple or double or cross or repeat$).mp.
Comparison	-
Outcomes	error$.mp. or exp Medication Errors/ or (adverse and (event$ or effect$ or reaction$)).mp. or (dispens$ and error$).mp. or exp Medication Systems, Hospital/ or exp Quality Assurance, Health Care/ or exp Safety Management /or exp Medication Systems/

Data Collection & Analysis

Studies were selected and appraised by one reviewer in consultation with colleagues using study selection and appraisal criteria established a priori.

An initial search returned very few results so this was broadened to the search described above. This returned over 900 articles which were reviewed by title and abstract. When a decision could not be made based on abstract alone, full text was retrieved. Over 60 full text articles were retrieved for review and three articles met the inclusion and exclusion criteria.

Results

Three relevant studies were identified and met study selection criteria. One of these was a systematic review[1] which includes the second and third articles[2,3] therefore only the systematic review is included in this report. No relevant studies published after the search date of the systematic review were identified. A number of studies which included double checking as a part of a systems change were identified but these have been excluded as it is not possible to separate the effect of the double checking procedure from that of the wider system change.

A critical appraisal of the quality of this systematic review is presented in Appendix A at the end of this report.

Both studies on single or double checking of medication prior to administration included in the systematic review were Australian studies and both were conducted in adult populations.

The first study was a cross-over controlled trial in three wards of a geriatric assessment and rehabilitation unit in NSW (NHMRC evidence designation: III-1). This study found that the use of two nurses to administer medication orders resulted in 30% lower odds of a medication error (OR 0.7, 95% CI 0.5, 0.9).

The second study was based in adult inpatient units of Geelong Hospital, Australia. This was a before and after trial (NHMRC evidence designation: III-3). Reported medication error rates were derived from medications incident records. The standard practice of double-checking medications was replaced with single-checking for nurses who were assessed as competent for single-checking of medications. In the seven month period of double checking five medication incidents were reported compared to four incidents reported during the seven month period of single checking. No denominator data is presented. The authors claim that there was no significant difference between error rates in the two periods of measurement suggesting that single checking was as safe as double checking. It is unclear, however, if there really is no difference or if the study was under-powered to detect such a difference.

Discussion

The majority of medication incidents occurring in hospitals have been shown to be omissions of dose (>25%), overdoses (20%) and incorrect medicines (10%) with discrepancies in drugs of addiction, incorrect labelling and adverse drug reactions accounting for <5% each. Administration errors are higher when medicines are given from a common ward supply than when individual patients supplies are provided.[4]

Administration of medications to patients is one step in the pathway from prescribing through to dispensing and administering. In the systematic review presented in this report Hodgkinson et al (2006) provide a description of this pathway and the many points at which errors can occur.[1]

Applicability of the results of the identified studies to the Southern Health setting is unclear. These studies were based in an adult geriatric assessment and rehabilitation unit in NSW and adult inpatient wards of Geelong hospital. There were no comparative studies found that assessed single or double checking of medications prior to administration in a paediatric population.

The area of medication incidents is considered complex and no single factor is responsible. The approach to reducing medication errors, both in Australia and worldwide, currently appears to be a systems approach involving a range of strategies.[4]

Conclusions

With specific reference to the practice of single or double checking of medications before administration to the patient a recent systematic review found only two relevant articles and concluded that there is some evidence to suggest that having two nurses check medication orders before dispensing the medication significantly reduces the incidence of medical errors. The two studies included in this systematic review were based in adult populations. No studies were found that examined this practice in the paediatric hospital population.

References

1. Hodgkinson B, Koch S, Nay R and Nichols K. (2006) Strategies to reduce medication errors with reference to older adults. Int J Evid Based Healthc, 4: 2-41.

2. Jarman H, Jacobs E and Zielinski V. (2002) Medication study supports registered nurses' competence for single checking. Int J Nurs Pract, 8: 330-335.

3. Kruse H, Johnson A, O'Connell D and Clarke T. (1992) Administering non-restricted medications in hospital: The implications and cost of using two nurses. Aust Clin Rev, 12: 77-83.

4. Australian Council for Safety and Quality in Health Care. Second National Report on Patient Safety: Improving Medication Safety. Canberra: Australian Council for Safety and Quality in Health Care, 2002.

Disclaimer

The information in this report is a summary of that available and is primarily designed to give readers a starting point to consider currently available research evidence. Whilst appreciable care has been taken in the preparation of the materials included in this publication, the authors and Southern Health do not warrant the accuracy of this document and deny any representation, implied or expressed, concerning the efficacy, appropriateness or suitability of any treatment or product. In view of the possibility of human error or advances of medical knowledge the authors and Southern Health cannot and do not warrant that the information contained in these pages is in every aspect accurate or complete. Accordingly, they are not and will not be held responsible or liable for any errors of omissions that may be found in this publication. You are therefore encouraged to consult other sources in order to confirm the information contained in this publication and, in the event that medical treatment is required, to take professional expert advice from a legally qualified and appropriately experienced medical practitioner.

Appendix A - Appraisal of included study:

Study: Hodgkinson B, Koch S, Nay R and Nichols K. (2006) Strategies to reduce medication errors with reference to older adults. *Int J Evid Based Healthc*, **4**: 2-41.

Description of study

Patients — Patients in acute, subacute and residential care settings with particular reference to those aged 65 years and over.

Intervention — Strategies used to prevent medication errors associated with prescribing, dispensing and administering medications.

The intervention of interest for this evidence review is that of double checking of medications before administration.

Comparisons — Single checking of medications before administration.

Outcomes — The primary outcome measurement was medication error though in the absence of this measure surrogate measures such as test scores and numbers of distractions were used.

Inclusion Criteria

- This review initially searched for systematic reviews and RCTs that evaluated methods for reducing medication error. However, in the absence of these levels of evidence other methods such as controlled clinical trials, longitudinal studies, cohort studies, case control studies and descriptive studies were used. Only English language studies were included.
- Medication refers to medication prescribed by a medical practitioner.
- Participants were those involved in prescribing, dispensing or administering medications to people aged 65 years and over, including registered nurses, enrolled nurses, pharmacists, medical practitioners, personal care attendants or ancillary staff.
- In the absence of articles/studies relating to the 65 and over population, studies in a broader aged population were included.
- All interventions aimed at reducing medication incidents or errors were included.

Exclusion Criteria — Any studies involving over the counter, herbal or vitamin preparations. Qualitative studies, grounded theory and ethnographic studies.

Study Validity

Focused research question	Yes	The specific question is "What strategies/interventions are most effective in reducing the incidence of medication incidents (errors) in the acute, subacute and residential care settings?"
Specified inclusion/ exclusion criteria	Yes	As above
Explicit and comprehensive search strategy	Yes	Detailed search strategy is given as well as a list of bibliographic databases searched.
Validity of included trials appraised	Yes	Included studies and reviews were assessed using appraisal checklists developed by the National Health Service Centre for Reviews and Dissemination and by the Johanna Briggs Institute for Evidence Based Nursing and Midwifery. Checklists were included in the appendices of the review.
Homogeneity between studies assessed	Unclear	No information given
Summary of main results presented	Yes	Summaries were presented for each of the intervention types in the results section as well as summaries of each included study individually in the appendices.

Strengths and limitations of included studies discussed	Some	There is some general discussion on the overall quality of studies in the area. ie low levels of evidence, small sample sizes and poor or inconclusive reporting of some results.

Results

Two studies were identified that addressed the effectiveness of single or double checking of medications before administration to patients. Both were Australian studies and both were conducted in adult populations.

The first study was a cross-over controlled trial in three wards of a geriatric assessment and rehabilitation unit in NSW (NHMRC evidence designation: III-1). This study found that the use of two nurses to administer medication orders resulted in 30% lower odds of a medication error (OR 0.7, 95% CI 0.5, 0.9).

The second study was based in adult inpatient units of Geelong Hospital, Australia. This was a before and after trial (NHMRC evidence designation: III-3). Reported medication error rates were derived from medications incident records. The standard practice of double-checking medications was replaced with single-checking for nurses who were assessed as competent for single-checking of medications. In the seven month period of double checking five medication incidents were reported compared to four incidents reported during the seven month period of single checking. No denominator data is presented. The authors claim that there was no significant difference between error rates in the two periods of measurement suggesting that single checking was as safe as double checking. It is unclear, however, if there really is no difference or if the study was under-powered to detect such a difference.

Author's Conclusions

Regarding single and double checking of medications by two nurses before administration to the patient, the authors concluded that "There is some evidence to suggest that having two nurses check medication orders before dispensing medication significantly reduces the incidence of medication errors".

In the implications for practice section the authors recommend double checking of medications before administration but also recommend that further research is needed to determine if double checking can reduce the incidence of medical errors.

Our comments

In the area of single or double checking medication before administration to patients the authors of this review suggest that double checking of medications before administration may reduce medication error, however they also recommend more research to determine if this intervention is effective in reducing the incidence of medication errors. This is a reasonable conclusion given that the available evidence is based on only two studies, one which showed a reduction in medication administration errors with double checking and one which did not show such a reduction. Ideally a large, appropriately powered randomised controlled trial would give a definitive answer to this question.

This review also examines a range of other areas of intervention including computerised physician ordering entry, automated dispensing, bedside terminal systems (for individual's records), bar coding, individual patient medical supplies, education and training, pharmacist interventions and dedicated medication nurses.

This is a thorough, well designed and conducted systematic review; however, the levels of evidence of the interventions in this area are generally weak.