The effect of computerized physician order entry with clinical decision support on the rates of adverse drug events: a systematic review

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CRD summary
This review concluded that few non-randomised studies had evaluated computerized physician order entry with clinical decisions support in terms of development of adverse events; further research was warranted. The authors’ conclusions seem reasonable, although it should be kept in mind that the search for studies was not exhaustive.

Authors’ objectives
To assess the effects of Computerized Physician Order Entry (CPOE) with Clinical Decisions Support (CDS) on the development of an adverse event.

Searching
MEDLINE was searched 1966 to March 2007 for studies published in English. Search terms were reported. Reference lists of retrieved papers were reviewed.

Study selection
Studies that evaluated the effects of CPOE with CDS on the development of an adverse event were eligible for inclusion.

The type of CPOE/CDS system was classified as home grown or commercially sold. The systems used in the included studies were mostly home grown; a small number of commercially sold systems were evaluated. CPOE systems were mostly used for all drug orders or for specific drugs (antibiotics or psychotropic drugs orders). Studies used basic or advanced clinical decision support. Basic support included drug-allergy checking, dose guidance, formulary decision support, duplicate therapy checking and drug-drug interaction checking; advanced support included adjusting for dose for renal insufficiency, guidance for medication-related laboratory testing, drug-disease contraindication checking and drug-pregnancy checking.

Studies were grouped into three categories: hospital care, ambulatory care and long-term care. Most studies were undertaken in a hospital setting and focused on older patients, paediatric patients or intensive care unit patients. There was a single study in an ambulatory setting (outpatient clinic).

The primary outcome of interest in the review was prevention of adverse drug events related to the prescribed medications. Adverse events were considered preventable if they were caused by an error or were classified as preventable using a standard approach. Data sources used to identify events in the studies included medical charts and records, and incident reports from staff. Where reported, a range of different methods were used across studies to identify events (such as computer identified, verified by nurse/pharmacist, independent review of data sources by two people and pharmacist monitoring and analysis of drug orders).

The authors did not state how many reviewers selected the studies.

Assessment of study quality
The quality of the included studies was assessed using criteria outlined by Downs. Twenty-six quality items were assessed: reporting of the study (10 items); external validity (three items); and internal validity (13 items). Maximum achievable score was 27.

Two reviewers independently assessed quality of the included studies and resolved disagreements by discussion.

Data extraction
Pre- and post-intervention incidences of adverse events were extracted for the intervention and control group and the p-
value for the difference across time or groups. Adverse events were reported per 1,000 patient days, per 100 patient
days, per 100 doses and actual number of events.

It was unclear how many reviewers performed the data extraction.

**Methods of synthesis**
The studies were summarised in a narrative synthesis, grouped by setting and patient population.

**Results of the review**
Ten studies (number of patients not reported) that evaluated the effect of CPOE with CDS on adverse events met the
inclusion criteria. The included studies were categorised as pre/post analysis, time series analysis and controlled cross-
sectional analysis. Study quality ranged from a score of 13 to 20 (mean=17).

Five of the 10 studies that assessed use of CPOE with CDS showed statistically significant decrease in adverse events
(p≤0.05) and five studies did not. The seven studies that evaluated home-grown CPOE with CDS systems demonstrated
mixed results: three studies showed statistically significant reductions in adverse events and four studies did not show
significant reductions. Two of the three studies that assessed the effect of commercial systems of CPOE with CDS
found a statistically significant decrease in adverse events and one study showed no significant reduction.

**Authors’ conclusions**
Only a few non-randomised studies had assessed CPOE with CDS on rates of adverse events; further research across
various clinical settings was warranted.

**CRD commentary**
This review addressed a well-defined question in terms of participants, interventions and outcomes, but the study design
was not clearly specified. There was a risk that relevant studies were missed as only one database was searched,
unpublished studies were not sought and only English-language studies were included. Two reviewers independently
assessed study quality. It was unclear how many reviewers selected studies and extracted data and how any
disagreements were resolved, which meant that potential for errors and bias could not be ruled out. Quality was assessed
using a standard tool.

The authors’ conclusion about the need for further research due to the absence of randomised controlled studies seem
reasonable, although it should be kept in mind that the search for studies was not exhaustive.

**Implications of the review for practice and research**

**Practice**: The authors did not explicitly state any implications for practice.

**Research**: The authors stated that further research was needed to evaluate the effectiveness of CPOE with CDS across
various clinical settings.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract
contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on
the reliability of the review and the conclusions drawn.