A tiered approach is more cost effective than traditional pharmacist-based review for classifying computer-detected signals as adverse drug events


Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
Two methods of identifying drug-related problems in outpatient settings, to determine which problems were adverse drug events (ADEs) and which were due to medical errors (MEs), were compared. The two identification methods were a review process conducted by pharmacists, and a review process conducted by tiers or layers of personnel with different expertise.

Type of intervention
Other: Classification method of drug-related problems detected by a computerised system.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised adult patients who made outpatient visits at ambulatory care clinics.

Setting
The setting was primary care (ambulatory clinics). The economic study was carried out in the USA.

Dates to which data relate
The effectiveness data were collected between 15 January and 31 May 2001. The cost data were retrieved from electronic sources, which were assessed in 2003, and were reported for the price year 2003.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was undertaken prospectively on the same patient sample as that used in the effectiveness analysis.

Study sample
The sample size was not determined in the planning phase of the study. In addition, power calculations were not performed retrospectively. Details of adult patients, (over 18 years old) who had made an outpatient visit to ambulatory care clinics during the study period were retrieved from the electronic medical records from the Wishard Health Services (n=19,426) in Indianapolis, and from the Brigham and Women's Medical Centre (n=33,202) in Boston. The number of pharmacists, data analysts, nurses and physicians included in the study was not reported.
Study design
This was a retrospective cohort study that was conducted in 33 ambulatory clinics (22 in Indianapolis and 11 in Boston). Data on the patients were retrieved from electronic medical records during a 4-month period. A computer program was used to exclude duplicate conditions from the same patient and cases or signals resulting from the same drug or drug date, or laboratory test and laboratory test date. In addition, if one clinical evaluation resulted in more than one signal (drug-related problem), the program removed all but one problem.

Analysis of effectiveness
The primary outcome used in the analysis was the sensitivity of the two review methods in identifying computer-generated signals as ADEs or MEs. The sensitivity was evaluated by comparing positive predictive values (PPVs) for ADEs and MEs between the two review methods using the chi-squared test. The patient groups appear to have been comparable in terms of most baseline characteristics. They differed only in the proportion of Afro-Americans, but no adjustments were carried out for possible confounding.

Effectiveness results
The PPV of a case (signal) for ADEs was 10.2 at the Boston site (pharmacist review method) and 9.6% at the Indianapolis site (tiered review method). The difference was not statistically significant, (p=0.36).

The PPV of a case (signal) for MEs was 4.4% at the Boston site and 10.0% at the Indianapolis site. The difference was statistically significant, (p<0.001).

Clinical conclusions
The authors concluded that the tiered review method was at least as sensitive as the pharmacist review method in identifying ADEs and MEs.

Measure of benefits used in the economic analysis
The measure of benefit used was the number of ADEs identified using each of the review methods. This was derived from the effectiveness analysis.

Direct costs
The costs to the health service were included in the analysis. These covered training, oversight and reporting costs for data analysts occupied in the tiered review method, and the salaries of licensed nurses, data analysts and pharmacists. The unit costs were reported and were based on actual data (national salary rates). The quantities were derived from the effectiveness analysis. Overhead costs were omitted, but the authors felt that this omission would not have affected the comparative analysis. All the costs appear to have been reported for the year 2003. Discounting was not relevant as the costs were incurred during a short period of time.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs were not included in the analysis.

Currency
US dollars ($).
Sensitivity analysis
No sensitivity analysis was carried out.

Estimated benefits used in the economic analysis
The number of ADEs identified was 242 at the Boston site (pharmacist review method) and 535 at the Indianapolis site (tiered review method). The numbers of MEs identified were 104 (Boston) and 562 (Indianapolis), respectively.

Cost results
The total cost was $22,606 for the tiered review method and $44,580 for the pharmacist review method.

Synthesis of costs and benefits
The cost per ADE classified was $68.70 under the pharmacist review method and $42.40 under the tiered review method.

Authors’ conclusions
The tiered review method was more cost-effective than the pharmacist review method in identifying adverse drug events (ADEs) and medical errors (MEs).

CRD COMMENTARY - Selection of comparators
The authors gave a justification for their choice of the comparator. You should decide if this is a widely used health technology in your own setting.

Validity of estimate of measure of effectiveness
The analysis was based on a retrospective cohort study. Given the size of the sample, it is likely to have been representative of the study population. The patient groups appear to have been comparable in terms of all but one baseline characteristic, but no adjustments for potential confounding were made. The retrospective nature of the study represents a limitation to the internal validity since, for example, different recording methods might have been used at the two sites. Therefore, although a statistical analysis was used to compare the results, the authors could not ascertain whether the differences obtained were only attributable to the different review methods used.

Validity of estimate of measure of benefit
The number of ADEs classified by each method was obtained directly from the effectiveness analysis.

Validity of estimate of costs
The authors did not explicitly state the perspective adopted, but it was not societal since the indirect costs were not included. The costs and the quantities were not analysed separately. The quantities were derived from the effectiveness analysis, but no statistical analysis of the quantities was performed. In addition there was no sensitivity analysis of either the costs or the quantities, which may limit the interpretation of the study findings.

Other issues
The authors did not compare their findings with other published results. However, this may have been because of a lack of published literature in this specific area. The issue of generalisability of the results to other settings was not discussed. The authors do not appear to have presented their results selectively. The study considered adult patients who visited ambulatory care clinics and this was reflected in the authors’ conclusions. The authors reported a number of limitations to their study. For example, they included the training time for data analysts in their calculations, which resulted in an underestimation of the average time to process an adverse effect. Second, they mentioned that they had
employed imprecise methods for time estimations, but stated that this would not have affected the results owing to the
great number of adverse effects reviewed. More importantly, the authors acknowledged that the results might have been
confounded since the two methods were implemented for different populations, and electronic medical records might
have been modulated in different ways at the two sites.

Implications of the study
The authors did not make any explicit recommendations for changes in policy or practice, acknowledging the fact that
even the more cost-effective tiered approach is probably unaffordable for many organisations. No further research was
explicitly identified.

Source of funding
Supported by the Agency for Healthcare Research and Quality (grant U18 HS11169).

Bibliographic details
more cost effective than traditional pharmacist-based review for classifying computer-detected signals as adverse drug

PubMedID
14552850

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Adult; Adverse Drug Reaction Reporting Systems /economics; Aged; Algorithms; Ambulatory Care
/economics /methods; Cost-Benefit Analysis /methods; Database Management Systems; Expert Systems; Female;
Humans; Information Storage and Retrieval /methods; Male; Medication Errors /classification /economics /prevention
& control; Middle Aged; Patient Care Team; Pharmaceutical Services /economics; Reproducibility of Results;
Sensitivity and Specificity

AccessionNumber
22003009890

Date bibliographic record published
30/06/2005

Date abstract record published
30/06/2005