Cost-effectiveness analysis of medical documentation alternatives  

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  
An automated medical documentation system incorporating speech-recognition technology and electronic signatures was examined.

Type of intervention  
Other: Medical documentation system.

Economic study type  
Cost-effectiveness analysis.

Study population  
The study population comprised the patients' hospital charts.

Setting  
The setting was a hospital. The economic study was carried out in Canada.

Dates to which data relate  
The effectiveness and resource use data were gathered from March 2000 to June 2001. The price year was 2003.

Source of effectiveness data  
The effectiveness evidence was derived from a single study (current system) and experts' opinions (automated system).

Link between effectiveness and cost data  
The costing was carried out prospectively on the same sample of patients as that used in the effectiveness study.

Study sample  
No statistical analyses were carried out to justify the size of the sample. All records of discharge notes identified during the study period were considered. Overall, 16,295 records were included in the analysis.

Study design  
The evidence came from a case series, which was used to identify all discharge notes at the study hospital. Data were obtaining by interviewing staff in the Centre for Applied Health Informatics (CAHI).

Analysis of effectiveness
The outcome measure was the mean delay time (time required to complete the medical documentation). All available discharge notes were considered.

**Effectiveness results**
The mean delay time for the current medical documentation system was 70 days.

**Clinical conclusions**
The analysis showed that completion of the medical documentation took a long time when using the standard system.

**Methods used to derive estimates of effectiveness**
The mean delay time for the automated medical documentation system was estimated on the basis of interviews with the manufacturer.

**Estimates of effectiveness and key assumptions**
The software manufacturer estimated that 50% of physicians would be able to use the technology effectively. The mean delay time for the automated medical documentation system was estimated at 14 days (10 days for physician time and 4 days for transcription).

**Measure of benefits used in the economic analysis**
The summary benefit measure was the mean delay time. This was derived from hospital charts (for the current medical documentation system) and from manufacturer's assumptions (for the automated medical documentation system).

**Direct costs**
A time horizon of 4 years (2003 to 2006) was assumed. Thus, the annual costs were discounted at a rate of 3%. Similarly, the annual note volume was discounted at the same rate. The health services included in the economic evaluation were:

- maintenance (on-going hardware, service contracts, and Information Technology personnel), transcription wages, notification and distribution (postage, photocopying, and printing) for the current system; and
- hardware, licensing, maintenance, infrastructure, and residual distribution and transcription for the automated system.

No training costs were considered. The cost/resource boundary of the hospital was adopted. Both the resource use and costs were estimated from hospital data, although the use of resources in the automated medical documentation system was also based on assumptions since the implementation of the new system was hypothetical. The costs were expressed in 2003 values.

**Statistical analysis of costs**
The costs were treated deterministically.

**Indirect Costs**
The indirect costs were not considered in the economic evaluation.

**Currency**
Canadian dollars (Can$).
Sensitivity analysis
Univariate sensitivity analyses were carried out to test the robustness of the results of the analysis to variations in the discount rate (from 0 to 5%), annual discharge note volume (+/- 3% per year), percentage of physicians using the voice recognition system (from 25 to 75%), percentage of notes requiring postage (from 0 to 50%), and the length of study (from 2 to 6 years). The ranges of variations were based on authors’ opinions.

Estimated benefits used in the economic analysis
The mean delay time was 70 days for the current medical documentation system and 14 days for the automated medical documentation system. The difference was 56 days.

Cost results
The discounted total costs were Can$4,794,671 with the current medical documentation system and Can$5,631,669 with the automated medical documentation system. The cost-difference was Can$1,174,503.

The higher acquisition costs for the automated system (licensing, hardware and infrastructure) were only partially offset by the lower costs associated with transcription wages, postage and notification.

Synthesis of costs and benefits
An incremental cost-effectiveness ratio (ICER), that is, the cost per day of delay avoided per discharge, was calculated to combine the costs and benefits of the alternative documentation systems. The ICER for the automated system compared with the traditional medical documentation system was Can$0.331.

The results of the sensitivity analysis revealed that the ICER varied from:
- Can$0.313 to Can$0.343 when varying the discount rate;
- Can$0.322 to Can$0.341 when varying the annual discharge note volume;
- Can$0.588 to Can$0.075 when varying the percentage of physicians using the voice recognition system;
- Can$0.322 to Can$0.340 when varying the percentage of notes requiring postage; and
- from Can$1.236 to Can$0.034 when varying the length of study.

Thus, the base-case results were particularly sensitive to the useful length of the documentation system and to the proportion of physicians able to use voice recognition technology.

Authors’ conclusions
The automated medical documentation system was more expensive, but also more effective, than the current medical documentation system. If the hospital managers were willing to spend Can$0.331 per discharge, then the average time of note completion per discharge would be decreased, on average, by one day.

CRD COMMENTARY - Selection of comparators
The selection of the comparator was appropriate as it reflected the standard approach at the authors’ setting. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The analysis of the effectiveness was based on evidence derived from a case series (for the comparator) and from opinions (for the new system). This approach was used because the implementation of the new system was hypothetical. Such a design is usually associated with several drawbacks, which limits the validity of the analysis. However, the issue
of the robustness of the effectiveness estimates was explored in the sensitivity analysis. The authors stated that a systematic review of the literature had been undertaken, but the purpose of such search was unclear.

**Validity of estimate of measure of benefit**
The summary benefit measure was specific to the interventions considered in the study and was not comparable with the benefits of other health care interventions. The authors stated that the benefit measure used in the analysis represents a useful measure for decision-makers to make comparisons with other capital investments with a “cost per patient per day” criterion.

**Validity of estimate of costs**
The authors stated explicitly which perspective was adopted in the study. As such, all the relevant categories of costs were reported. A breakdown of the cost items was provided, but information on the unit costs and quantities of resources used was not given. This reduces the possibility of replicating the analysis. Discounting was relevant and was appropriately performed. The source of the data was the hospital and the cost estimates were specific to the study setting. In fact, no variations in the costs were investigated in the sensitivity analysis. However, some resource use data were varied. The price year was reported, which enhances the possibility of performing reflation exercises in other settings. No statistical analyses of the costs were performed.

**Other issues**
The authors did not compare their findings with those from published studies. The issue of the generalisability of the study results to other settings was addressed, and the authors stated that the results could be of interest in similar health care organisations. However, some institution-specific factors (e.g. clinical practice, relative costs, and patient population) could reduce the generalisability of the results of the analysis. The use of sensitivity analyses enhanced the external validity of the study. The authors noted that possible wage increases were not considered, which could represent a limitation of the analysis. It was also highlighted that the analysis did not capture some benefits of the new system, which could make it even more attractive from an effectiveness perspective.

**Implications of the study**
The study results supported the implementation of the new automated medical documentation system, especially for private hospitals, which could have greater incentives for faster documentation turn-around times for billing purposes.

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**Other publications of related interest**


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