Implementation of early goal-directed therapy for severe sepsis and septic shock: a decision analysis

Huang D T, Clermont G, Dremsizov T T, Angus D C

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.

CRD summary
The authors aimed to evaluate the cost-effectiveness of early goal-directed therapy (EGDT) for the management of severe sepsis and septic shock. They concluded that EGDT, despite its higher implementation costs, can be cost-saving to the hospital and cost-effective over a lifetime. The quality of the study was satisfactory. Despite some limitations to the clinical data, the authors presented a reasonably transparent analysis and it is likely that the results reflected the available evidence.

Type of economic evaluation
Cost-effectiveness analysis, cost-utility analysis

Study objective
The authors aimed to evaluate the cost-effectiveness of early goal-directed therapy (EGDT) for the management of severe sepsis and septic shock.

Interventions
EGDT implemented in three ways was compared with usual care. The three strategies were: an Emergency Department (ED) strategy in which ED personnel provided both screening and the EGDT; a mobile strategy in which ED staff screened for patients and alerted the Intensive Care Unit (ICU) personnel who administered EGDT in the ED; and an ICU strategy in which ED staff screened for patients and transferred them to the ICU where EGDT was administered by ICU personnel.

Location/setting
USA/secondary and tertiary care.

Methods
Analytical approach:
The authors constructed a decision analytic model (decision tree) to compare the cost-effectiveness of the strategies. The patients’ hospital stay and patients’ lifetime were the time horizons. The authors stated that the perspective was that of the hospital, but they also conducted the analysis from the perspective of society (reference case).

Effectiveness data:
The effectiveness data were obtained from published literature, which included a single centre clinical trial. The main clinical parameters were the effectiveness of EGDT on mortality in the hospital and at 60 days, and sepsis life expectancy penalty.

Monetary benefit and utility valuations:
The utility values were derived from published sources. The methods used to evaluate the utilities were not reported.

Measure of benefit:
The measure of benefit was quality-adjusted life-years (QALYs), for the reference case. Future health benefits were discounted at an annual rate of 3%.

Cost data:
For the hospital case the costs of implementation of EGDT included start-up (equipment acquisition and training) and delivery costs (additional personnel time and screening). These were derived from the Henry Ford Health Systems corporate data stores and weighted by the Medicare Cost Report hospital and department-specific cost-to-charge ratios. For the reference case, the authors estimated post-hospital lifetime health care costs from the 1987 National Medical Expenditure Survey projected to the year 2000. The costs were expressed in US dollars ($) and were appropriately adjusted for inflation to reflect 2005 prices and discounted at an annual rate of 3%.

Analysis of uncertainty:
Parameter uncertainty was investigated using various one-way and two-way sensitivity analyses. The parameters explored, the ranges used, and the rationale for these ranges were reported in full. Additionally, a probabilistic analysis was conducted using second-order Monte Carlo simulations. All the distributions assigned to the model parameters were fully reported.

Results
An incremental analysis was performed.

EGDT implementation had a 99.4% to 99.8% probability of being dominant (more effective and less costly) from the hospital perspective, and it cost from $2,749 (ICU strategy) to $7,019 (ED Strategy) per QALY with 96.7% to 97.7% probability of being under $20,000 per QALY from the societal perspective.

The ICU strategy was the least expensive, because of lower start-up costs, but also least effective, because of implementation delay. All three strategies had similar cost-effectiveness ratios.

The sensitivity analyses showed that these estimates were particularly sensitive to the EGDT’s effect on mortality and ICU length of stay, but insensitive to other variables.

Authors' conclusions
The authors concluded that EGDT, despite its higher implementation costs, can be cost-saving to the hospital and cost-effective over a lifetime.

CRD commentary
Interventions:
The interventions were clearly reported. The study appears to have been thorough in its coverage of alternative interventions, including current practice.

Effectiveness/benefits:
The effectiveness data were derived from published studies, but no systematic search of the literature was reported. Although the sources of the literature were given neither the methods used to identify primary studies nor the inclusion criteria were reported. Therefore, it is difficult to ascertain if the best available evidence was used.
The utility values and their sources were clearly reported, but no details were provided on the methods of utility measurement. An assessment of the validity of these values is therefore not possible without recourse to the referenced studies.

Costs:
: From the hospital perspective, it appears that all appropriate costs were included. However, there was no attempt to include productivity losses in order to adequately reflect the societal perspective. The unit costs, resource use, discounting adjustments for inflation, the price year, and all costing assumptions were clearly reported.

Analysis and results:
The model structure was presented graphically along with all the relevant details and modelling assumptions. The authors conducted an incremental analysis and the results were presented in sufficient detail. The methodology and the results of the sensitivity analyses were well presented, thus enhancing the generalisability of the findings. The authors provided a full discussion around the limitations of their study.
Concluding remarks:
The quality of the study was satisfactory. Despite some limitations to the clinical data, the authors presented a reasonably transparent analysis and it is likely that the results reflected the available evidence.

Funding
Supported by grants from the National Institutes of Health, USA.

Bibliographic details

PubMedID
17855823

Indexing Status
Subject indexing assigned by NLM

MeSH
Cost-Benefit Analysis; Decision Support Techniques; Humans; Models, Theoretical; Sensitivity and Specificity; Sepsis /therapy; Shock, Septic /therapy; United States

AccessionNumber
22007001900

Date bibliographic record published
03/11/2008

Date abstract record published
31/03/2009