Infection risk and cost-effectiveness of commercial bags or glass bottles for total parenteral nutrition

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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
Commercial bags or glass bottles for total parenteral nutrition.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population consisted of hospitalised patients with severe digestive tract disorders and patients in medical and surgical intensive care units (ICUs).

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

Dates to which data relate
Effectiveness and resource use data were collected from studies published between 1984 and 1995. Cost data related to the period 1988-1994. The price year was not reported.

Source of effectiveness data
Effectiveness data were derived from a literature review and local information (for surgical ICU patients).

Outcomes assessed in the review
The review assessed nosocomial infections, and hospital stay.

Study designs and other criteria for inclusion in the review
Not stated.

Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Methods used to judge relevance and validity, and for extracting data
Summary statistics from individual studies were used.

Number of primary studies included
At least ten primary studies were included.

Methods of combining primary studies
The narrative method was used.

Investigation of differences between primary studies
Not stated.

Results of the review
The risk of intravenous-line sepsis during TPN was 50% for patients hospitalised in gastroenterology, 10% for patients receiving TPN for severe bowel dysfunction secondary to Crohn's disease, and 12% for patients hospitalised in a medical or surgical ICU. The extra length of hospital stay attributable to bacteremia ranged between 7 and 15 days.

Methods used to derive estimates of effectiveness
Estimates of effectiveness were also based on the authors’ assumptions.

Estimates of effectiveness and key assumptions
The authors assumed that nutritional efficiency and metabolic complications of TPN in bottles and TPN in bags were identical.

Measure of benefits used in the economic analysis
The authors performed a cost-minimisation analysis assuming that nutritional efficiency and metabolic complications of TPN in bottles and TPN in bags were identical. They also conducted a cost-effectiveness analysis based on the differences between TPN in bottles and TPN in bags in terms of IV-line infections, the measure of benefits used being the number of lives saved.

Direct costs
Direct costs were, appropriately, not discounted given a time horizon of less than one year. Quantities and costs were not reported separately. Direct costs included costs of labour, drugs, and supplies. Costs that were common across both strategies were not included. Monetary benefits were estimated from the cost of nosocomial IV-line sepsis and the likelihood of reducing its risk using TPN bags. The quantity/cost boundary adopted was that of the hospital. The estimation of quantities and costs was based on actual data. Costs and quantities were obtained from the authors’ institution and from published sources. The price year was not reported.

Statistical analysis of costs
The authors reported total costs and costs per day.

Indirect Costs
Indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
Sensitivity analyses were conducted on the cost of nosocomial infections and mortality rates.

**Estimated benefits used in the economic analysis**
The benefits were not reported separately. See synthesis of costs and benefits below.

**Cost results**
TPN in bags was cost-beneficial when the absolute reduction in the daily risk of nosocomial bacteremia reached the threshold value of 0.3%. Such a reduction could not be attained in patients with Crohn's disease, and corresponded to a 50% to 60% reduction of infection rates in ICU patients.

**Synthesis of costs and benefits**
Varying the risk of mortality attributable to IV-line-related infection from 1% to 13% resulted in a cost-effectiveness of using TPN bags ranging from $90,000 to $7,000 per life saved in ICU, assuming a two-thirds reduction in IV-line infections, and from $180,000 to $14,000 if the infection rate was reduced by one third.

**Authors' conclusions**
Based on the cost-minimisation analysis, TPN bags resulted in a net monetary loss to the hospital and should not be used. Based on the cost-effectiveness analysis, the cost per life saved may vary between $180,000 and $7,000.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparator used, namely that it was a current treatment alternative. You, as a user of the database, should decide if these health technologies are relevant to your setting.

**Validity of estimate of measure of effectiveness**
The authors undertook a literature review to derive effectiveness estimates, which seemed appropriate, although they did not state that a systematic review of the literature had been undertaken. Additional effectiveness estimates were, appropriately, based on expert opinion. The validity of the results was enhanced by sensitivity analyses to account for variability in the estimates.

**Validity of estimate of measure of benefit**
The primary analysis of benefits was based upon therapeutic equivalence of treatment alternatives. The economic analysis therefore included only costs. The secondary analysis was based on the assumption of a risk reduction of infection from the use of TPN in bags. However, the authors acknowledged that no data on this risk reduction are actually available. The conclusions may therefore need to be treated with some caution.

**Validity of estimate of costs**
Good features of the cost analysis were that all relevant direct cost categories were included and the validity of the cost results was enhanced by appropriate sensitivity analyses. However, quantities and costs were not reported separately, which limits the generalisability of the results. Also the price year was not reported which would make reflation...
exercises in other settings problematic.

Other issues
The authors made appropriate comparisons of their findings with those from other studies. The issue of generalisability to other settings was not addressed. The authors did not present their results selectively. The study enrolled hospitalised patients with severe digestive tract disorders and patients in medical and surgical ICUs, and this was reflected in the authors' conclusions. The authors assumed that two thirds of baseline infections could be averted, which they stated was over-optimistic. Hence, the cost-effectiveness ratio of TPN bags versus bottles is likely to be lower. In terms of either accepting or rejecting the intervention, the wide range of the cost-effectiveness ratios would be a hindrance to a decision maker as the extreme values are either well below or well above acceptable thresholds.

Implications of the study
Based on the cost-minimisation analysis, the authors recommended that TPN bags should not be used in the hospital. The results of the incremental cost-effectiveness analysis are conflicting for the decision maker.

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Bibliographic details
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