Rapid placement of transpyloric feeding tubes: a comparison of pH-assisted and standard insertion techniques in children

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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
The use of pH-assisted transpyloric feeding tubes for the enteral nutrition of critically ill children.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Critically ill children under 4 years of age and requiring enteral nutrition were included in the study. The average age of children in the intervention group was 9.5 months compared with 10.4 months in the control group. Of all patients, 62% were male. The paediatric risk of mortality (PRISM) score was 8.2 for the intervention group and 9.1 for the control group. 51.5% patients were suffering from respiratory failure. 16.1% had cardiac disease and the same percentage had obstruction of the airway. The remaining patients were suffering from sepsis, neurological problems or hepatic failure.

Setting
The practice settings were paediatric intensive care units at two children's hospitals. The trial and economic study were carried out in Cincinnati, Ohio and Washington DC, USA.

Dates to which data relate
The dates to which data relate were not given.

Source of effectiveness data
Evidence for final outcomes was derived from a single study.

Link between effectiveness and cost data
Costing was undertaken prospectively on the same patient sample as that used in the effectiveness study.

Study sample
Critically ill children under 4 years' of age, who had been admitted to one of two paediatric intensive care units and who were to begin enteral nutrition were eligible for enrolment. Parental consent was sought and the patients were then randomly assigned to the intervention or control methods of tube placement using the sealed envelope method. The authors justified their choice of patient sample with reference to the absence of prospective comparisons of the two methods of feeding tube placement in children. A power calculation was used to determine the sample size. There were
68 patients in total, 34 in the intervention group and 34 in the control group. The percentage of subjects whose parents refused consent and the percentage of subjects excluded from the study are not stated.

**Study design**
The study was a randomised controlled two-centred trial. The treatment cohort was followed up for four days. Loss to follow up was 13.2% overall with no loss in the treatment group and 26.4% in the control group.

**Analysis of effectiveness**
The analysis of the clinical study was based on intention to treat. The primary health outcomes used in the analysis were the number of attempts until placement success, the average number of radiographs required, time to feeding and the rate of complications. At analysis, groups were shown to be comparable in demographic and clinical characteristics.

**Effectiveness results**
Transpyloric feeding tubes were successfully placed in the first attempts in 97% of the intervention group and in 53% of the control group (p< 0.001). Second-attempt placement success was achieved in 100% of the intervention group and in 78% (25/32) of the control group (p= 0.004). Patients in the intervention group required 1.0 radiograph on average, compared with 1.6 in the control group (p< 0.001). The average time to feeding was 6.4 hours for the intervention group and 9.9 hours for the control group (p=0.08). Complications were reported in 11.8% of the intervention group and in 8.8% of the control group (p=0.5). Confidence intervals were not reported.

**Clinical conclusions**
Bedside transpyloric placement of pH-assisted feeding tubes can be accomplished more rapidly and with a higher success rate than by standard insertion techniques. In addition, significantly fewer radiographs are required to ensure correct placement of the tube. There is no significant difference in the rate of complications, or in the achievement of nutrition goals.

**Measure of benefits used in the economic analysis**
Clinical effectiveness was not converted into health benefit, in terms of quality of life and of mortality risk.

**Direct costs**
Costs were not discounted. Costs and quantities were not reported separately and no dates were given. Costs were measured from the perspective of the hospital and included the cost of the feeding tubes, the cost of routine radiography and the cost of fluoroscopy. Overheads and costs of nursing, technologist and administrative time were incorporated in these cost categories. Although pH-assisted feeding tubes were used for both the control and intervention groups, the control group feeding tubes were costed at the price of those used in standard practice.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was performed.

**Estimated benefits used in the economic analysis**
Clinical effectiveness was not converted into health benefit, in terms of quality of life and of mortality risk. Side effects were not significantly different in the two groups and were not considered in the economic analysis. The duration of the costing period was not reported.
Cost results
The total average cost per patient was $114 for the treatment group and $135 for the control group. The statistical significance of this result was not given.

Synthesis of costs and benefits
Health benefit was not calculated. The study treatment appeared to be better in terms of clinical outcomes and had lower costs, and therefore no synthesis of costs and benefits was performed.

Authors' conclusions
The bedside transpyloric placement of feeding tubes for critically ill children requiring enteral nutrition can be achieved more rapidly, with fewer radiographs and at a lower cost compared with a standard placement technique.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparator used, namely that by choosing the standard insertion technique as a comparator, the effect of adding information from a pH meter can be measured. You should consider whether the comparator is a widely used health technology in your own setting.

Validity of estimate of measure of benefit
Certain clinical effectiveness data were measured, but these were not formally converted to a generic health benefit. It was found that, with the assistance of the pH meter, fewer attempts were required to achieve successful placement of the tube. However, this effect did not result in an earlier attainment of nutrition goals and it is unclear how the children's morbidity and risk of mortality might have been affected. Differences in the level of operator skill were not measured in the analysis. The authors refer to special techniques ('corkscrew manoeuvres') that can assist tube placement. It is unclear whether these could have been taught to the operators.

Validity of estimate of costs
Resource use data were not reported separately from prices and few details of the method of quantity and cost estimation were given. It would appear that all direct costs relating to the intervention technique were estimated. The cost savings calculated were a direct result of the reduction in the number of radiographs required. However, given the inadequacy of detail on the costs, it is impossible to know if these cost savings represent real resource savings.

Other issues
The authors did not address the issue of the generalisability of the findings to other settings or countries, but did make appropriate comparisons with other studies. The reporting of cost results was inadequate and the validity of the cost estimates was unclear. The study was not powered to test whether the pH assisted technique could achieve an earlier optimal caloric intake than did the comparator. A study with a larger sample size, or a systematic review of the literature, could give an indication of the health benefits, in terms of quality of life and of mortality risk, to critically ill children of achieving more rapid placement of the feeding tube.

Source of funding
None stated.

Bibliographic details
PubMedID
8692625

Indexing Status
Subject indexing assigned by NLM

MeSH
Child, Preschool; Cost-Benefit Analysis; Energy Intake; Enteral Nutrition /economics /instrumentation; Female; Hospital Costs; Humans; Hydrogen-Ion Concentration; Infant; Intensive Care Units, Pediatric; Intubation, Gastrointestinal /economics /methods; Male; Prospective Studies; Pylorus /radiography; Time Factors

AccessionNumber
21996000812

Date bibliographic record published
31/12/1998

Date abstract record published
31/12/1998