Clinical and economic outcomes of infants receiving breast milk in the NICU

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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 breastfeeding of preterm and low birth-weight infants was examined.

Type of intervention
Other: feeding methods for infants.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised preterm and low birth-weight infants that were in the NICU.

Setting
The setting was tertiary care. The study was carried out in Pittsburgh (PA), USA.

Dates to which data relate
The effectiveness and resource use data were collected between October 1995 and January 1996. The unit costs might have related to the same period. The price year was not reported.

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

Link between effectiveness and cost data
The costing was performed retrospectively on the same sample population as that used for the effectiveness analysis.

Study sample
No power calculations, to assure a certain power, were reported in the planning phase of the study. The medical records of the hospital were reviewed in order to identify preterm and low birth-weight infants born at the hospital where the study was performed, who were discharged to home from the hospital, and were exclusively fed either with breast milk or formula during the study period. Formula-fed infants were randomly selected from these charts to match the breastfeeding group. After excluding those with duplicate records, with missing data, or who were fed with breast milk and formula at the same time, the final study sample comprised 80 infants. There were 39 infants within the breastfeeding group and 41 formula-fed infants. The authors did not report evidence that the study sample was representative of the study population, but this was likely to have been the case.
Study design
This was a retrospective cohort study, with a matched control group, which was performed at a single centre. The infants were followed up during their stay in the NICU, from their birth until they were discharged. The outcomes do not appear to have been assessed in a blinded manner.

Analysis of effectiveness
Infants with missing data in their medical records were excluded from the effectiveness analysis. The primary outcomes assessed were: the mean weight gain during hospitalisation, the mean length of hospital stay, and the average number of days the infants received parenteral nutrition. The two groups were shown to be comparable at analysis in terms of gestational age, (p=0.53), admission weight, (p=0.43), use of resources, (measured by a resource demand scale rate; p=0.99), and expected mortality, (calculated within the hospital's information system; p=0.3).

Effectiveness results
The mean weight gain during hospitalisation was 592.6 g (standard deviation, SD=765.8) for breastfed infants and 455.6 g (SD=691.2) for formula-fed infants (t-test -0.82; p>0.05).

The length of hospital stay was 38.9 days (SD=32.3) for breastfed infants and 28.9 days (SD=31.4) for formula-fed infants (t-test -1.40; p>0.05).

Infants in the breastfeeding group received parenteral nutrition for an average of 14.9 days (SD=17.6), while formula-fed infants received it for an average of 14.3 days (SD=20.0; t-test -0.13; p>0.89).

Clinical conclusions
There were no statistically significant differences between breastfeeding infants and formula-fed infants in terms of the outcomes considered at analysis (i.e. weight gain, length of hospitalisation, and days with parenteral nutrition).

Measure of benefits used in the economic analysis
No summary measure of benefit was used in the economic analysis. The study was therefore categorised as a cost-consequences analysis.

Direct costs
The direct costs considered in the economic evaluation appear to have been those of the hospital. The authors did not describe all the categories of costs included and, consequently, the resource quantities were not reported separately from the costs. The costs appear to have been estimated from hospital data. The authors reported that they used patient charges for supplies and equipment during hospitalisation to estimate costs. Therefore, the costing seemed to have been based on actual data. Discounting was not performed, but it was not relevant since the follow-up period was shorter than 2 years. The price year considered at analysis was not reported. Patient charges appear to have been used but no adjustments, to reflect the actual costs associated with the feeding strategies, seem to have been performed. The costs reported were the average costs per infant. Moreover, the authors estimated the net revenue as the difference between reimbursement received from third-party payers and patient charges.

Statistical analysis of costs
The costs were treated stochastically. The mean and SDs of the average costs per infant were reported. In additionally, t-tests were used to compare the average costs of both feeding strategies.

Indirect Costs
The indirect costs were not estimated.
Currency
US dollars ($).

Sensitivity analysis
No sensitivity analysis was reported.

Estimated benefits used in the economic analysis
See the 'Effectiveness Results' section.

Cost results
The average costs per infant were $15,179 (SD=14,001) within the breastfeeding group and $11,813 (SD=18,893) within the formula-feeding group, (p=0.37).

The mean net revenue was $46,161 (SD=40,820) in the breastfeeding group and $35,365 (SD=42,154) in the formula-feeding group, (p=0.25).

Synthesis of costs and benefits
The estimated benefits and costs were not combined because of the cost-consequences approach undertaken.

Authors' conclusions
No significant differences between breastfed and formula-fed infants were found in terms of days of parenteral nutrition, weight gain, length of stay, or costs. The clinical and cost results were therefore comparable between the groups.

CRD COMMENTARY - Selection of comparators
The formula-feeding strategy appears to have been used as the comparator because it was one of the current practices in the authors' setting for the feeding of preterm and low birth-weight infants. Another alternative strategy could have been considered, which was the combination of breastfeeding and formula feeding. The authors did not justify their exclusion of this strategy. You should consider which strategies for the feeding of preterm and low birth-weight infants in the NICU are most widely used in your own setting.

Validity of estimate of measure of effectiveness
This was a retrospective cohort study with a matched control group. As such, there were several caveats that limited its validity. Since it was retrospective, and based on medical records, the results were very dependent on the accuracy of the reporting. Moreover, some confounding factors, which were not reflected in the records (such as infant morbidity, and mothers' socioeconomic and health characteristics), might have affected the outcomes. In addition, only those infants who were discharged from the hospital to their homes were considered in the study, therefore infant mortality was excluded from the clinical analysis. The authors also did not report any evidence that the study sample was representative of the study population. These facts may affect the external validity of the study. The authors stated a further limitation to their study. The lack of statistically significant differences in the effectiveness outcomes between the study groups might have been due to the small sample size and, therefore, the results should be interpreted with caution.

Validity of estimate of measure of benefit
The authors did not derive a summary measure of health benefit. The analysis was therefore categorised as a cost-consequences analysis.
Validity of estimate of costs
The perspective adopted was rather limited, as only the direct costs related to hospitalisations were considered at analysis. Moreover, there was not a clear description of the categories of costs included in the economic evaluation. Consequently, it could not be inferred whether all the costs relevant to the hospital perspective were included. The resource quantities and the costs were not reported separately, which will hinder reflation exercises to other settings. The price year was not given. In addition, it appears that charges instead of costs have been considered at analysis, and no adjustments were made. Therefore, the estimation of the costs might not reflect the true opportunity costs of the strategies considered at analysis.

Other issues
The authors performed appropriate comparisons of their findings with those obtained by other studies, showing some degree of disagreement across studies. The issue of the generalisability of the results was not addressed.

Implications of the study
The authors suggested further research on the topic. More specifically, long-term prospective studies to determine other outcomes, such as the prevalence of illness, repeat hospitalisations, long-term growth patterns, developmental milestone attainment, and psychosocial adjustment. These studies should include infants who receive some breast milk in addition to formula.

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Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
Cost Savings; Direct Service Costs /statistics & numerical data; Humans; Infant Food /economics /standards; Infant Mortality; Infant Nutritional Physiological Phenomena; Infant, Low Birth Weight /growth & development; Infant, Newborn; Infant, Premature /growth & development; Intensive Care, Neonatal /economics /methods; Length of Stay /statistics & numerical data; Milk, Human; Neonatal Nursing /economics /methods; Nurse Clinicians /economics /standards; Nursing Evaluation Research; Retrospective Studies; Treatment Outcome; Weight Gain

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