Comparison of beractant and calfactant in a neonatal intensive care unit

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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
Beractant was compared with calfactant for the prevention and treatment of respiratory distress syndrome (RDS) in a neonatal intensive care unit (NICU).

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population included all NICU inpatients with an estimated gestational age (EGA) of less than or equal to 29 weeks. Neonates with an EGA of more than 29 weeks who required surfactant treatment because of RDS were also enrolled. Neonates with an EGA of more than 29 weeks who were given surfactant treatment but not diagnosed with RDS, such as those with meconium aspiration, pulmonary hypertension and congenital heart disease with cyanosis, were excluded. Also excluded were neonates who did not survive for 72 hours after birth, neonates who died before reaching a fraction of inspired oxygen (FiO2) of 30%, and those who received both surfactants.

The prophylaxis group included all neonates with an EGA of less than or equal to 29 weeks who received a prophylactic dose of surfactant within one hour of birth. The rescue group included neonates who did not receive a prophylactic dose of surfactant, who demonstrated radiographic and clinical signs of RDS, and who were given a rescue dose of surfactant.

Setting
The setting was tertiary care (a 760 bed private not-for-profit teaching hospital). The economic study was carried out in Florida, USA.

Dates to which data relate
The effectiveness evidence and resource use data related to 2001. 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 conducted retrospectively on the same patient sample as that used in the effectiveness study.
Study sample
The study sample included those patients admitted to the NICU from January to November, 2001. The use of power calculations was not reported. Of the 139 patients reviewed, 107 (77%) were included in the study. Of those excluded, 12 (9%) died before reaching the initial end point of 72 hours. An additional 6 patients (4%) died without ever reaching an FiO2 of 30%. Six patients (4%) were excluded because they had been given surfactant for the treatment of meconium aspiration, 4 (3%) because they received both surfactants, and 4 (3%) because they were transferred to another facility at less than 72 hours and were thus lost to follow-up. There were 52 patients in the prophylaxis group, of which 28 received beractant and 24 received calfactant. There were 55 patients in the rescue group, of which 22 received beractant and 33 received calfactant.

Study design
The study was a single-centre retrospective cohort that included those patients admitted to the NICU.

Analysis of effectiveness
The primary health outcomes used were:

the FiO2 at 72 hours after receipt of the first dose of surfactant;

the time from administration of the first dose to an FiO2 of 30%; and

complications of pneumothorax and pulmonary haemorrhage that were attributable to the surfactant.

Statistical tests were performed to analyse differences in demographic characteristics and respiratory status.

Effectiveness results
In the prophylaxis group, the mean (+/- standard deviation, SD) FiO2 at 72 hours was 0.36 (+/- 0.11) for beractant recipients and 0.34 (+/- 0.13) for calfactant recipients. The corresponding values in the rescue group were 0.30 (+/- 0.16) (beractant recipients) and 0.32 (+/- 0.13) (calfactant recipients), respectively.

In the prophylaxis group, the mean (+/- SD) time to 30% FiO2 was 24.14 (+/- 27.69) for beractant recipients and 13.77 (+/- 11.83) for calfactant recipients. The corresponding values in the rescue group were 12.5 (+/- 14.40) (beractant recipients) and 19.73 (+/- 26.70) (calfactant recipients), respectively.

None of the differences in clinical outcomes, or complications, between the two surfactant groups were significant.

There were no significant differences in demographic and clinical characteristics between the groups at baseline.

Clinical conclusions
No significant difference between the two surfactants was found within either group in terms of the mean FiO2 at 72 hours, the time to 30% FiO2, and the total number of doses per patient. There was also no significant difference in complications.

Measure of benefits used in the economic analysis
No summary measure of benefit was used in the economic evaluation. In effect, a cost-consequences analysis was performed.

Direct costs
The only direct cost used was the drug cost at group purchasing organisation prices. The authors reported that the purchasing cost was the same for equivalent doses of the two surfactants, but these values were not stated. The only resource use, number of doses, was obtained from patient data from the institution. Discounting was not carried out.
since the costs were incurred during one year. The quantities and the costs were reported separately. Both the
quantities and costs were estimated using actual data. The price year was not reported.

**Statistical analysis of costs**

Differences between beractant and calfactant, in terms of the cost and total number of doses used within each group,
were analysed using the Mann-Whitney U-test. Because of the very small number of infants requiring three doses of
surfactant in the prophylaxis and rescue groups, Fisher's exact test was used to compare the data for that variable.

**Indirect Costs**
The indirect costs were not included.

**Currency**
US dollars ($).

**Sensitivity analysis**
No sensitivity analysis was reported.

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

**Cost results**
In the prophylaxis group, the mean (+/- SD) total drug cost per patient was $379.39 (+/- 218.11) for beractant
recipients and $512.72 (+/- 167.30) for calfactant recipients. The corresponding values in the rescue group were
$689.56 (+/- 480.23) (beractant recipients) and $772.40 (+/- 439.88) (calfactant recipients), respectively.

Although the mean cost of the drug administered per patient was similar, differences were observed in the cost of drug
wastage per patient.

In the prophylaxis group, the excess, total drug cost for calfactant was $134, (p=0.0016).

Differences in the rescue group were not significant.

**Synthesis of costs and benefits**
Not relevant.

**Authors' conclusions**
Beractant and calfactant were similar in terms of their efficacy, safety and the total number of doses per patient.
However, calfactant was significantly more costly than beractant, owing to greater product waste.

**CRD COMMENTARY - Selection of comparators**
A justification was given for the comparator used. It reflected standard practice in the authors' setting. In addition, the
use of surfactants for the prevention and treatment of RDS in preterm neonates is standard care in many institutions.
You should decide if this represents a widely used technology in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a retrospective analysis. This may be prone to bias and may limit the validity of the comparison between groups. As it was a negative study, and no significant clinical differences were detected, concerns about the sample size and power necessary to detect clinically significant differences are important, as the authors adequately stated. The study referred to neonate inpatients, but it was unclear whether the study sample was representative of the study population because of the selection method. However, the patient groups were compared with those in other studies of RDS (Bloom et al., see Other Publications of Related Interest). Statistical analyses to take for potential biases and confounding factors were undertaken, but the details were not reported. No power calculations were reported.

Validity of estimate of measure of benefit
No summary measure of benefit was derived. As the authors stated that the two drugs were equally effective, only the costs were assessed further.

Validity of estimate of costs
The analysis of costs was performed from the perspective of a single provider. Although it was not stated, some relevant costs were omitted from the analysis (e.g. length of stay or other NICU costs). If clinical effects and side effects were similar between the groups, their omission was unlikely to have affected the authors' conclusions. The costs and the quantities were reported separately but the price year was not reported. This will hinder any future reflation exercises.

The cost data were taken from the authors' setting and a statistical analysis of the costs was performed. The costs were treated stochastically, but no sensitivity analysis of the prices was conducted. Discounting was unnecessary since all the costs were incurred during one year.

Other issues
The authors compared their findings with those from other studies that, in general, showed the findings to be in agreement (Bloom et al., see Other Publications of Related Interest). The issue of the generalisability of the results to other settings was not directly addressed. The authors do not appear to have presented their results selectively, although they did not always report results from the statistical tests performed. The authors' conclusions reflected the scope of the analysis, although they reported one limitation relating to sample size. They stated that it was possible that the small sample size could be the reason for a lack of an observable difference between the two surfactants in the number of doses required in either group.

Implications of the study
The authors recommended stocking only beractant in the labour and delivery unit, as that is where the first prophylactic dose of surfactant is given. However, the concerns surrounding the validity of the evidence used in the economic evaluation, as discussed already, should be borne in mind when considering this recommendation.

Source of funding
None stated.

Bibliographic details

PubMedID
14986555

Other publications of related interest

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Administration, Inhalation; Biological Products /administration & dosage /economics /therapeutic use; Humans; Infant, Newborn; Intensive Care Units, Neonatal; Male; Retrospective Studies; Treatment Outcome

**AccessionNumber**
22004000361

**Date bibliographic record published**
31/12/2004

**Date abstract record published**
31/12/2004