Cost savings from the use of antenatal steroids to prevent respiratory distress syndrome and related conditions in premature infants

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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
Antenatal corticosteroid (ANS) treatment for fetal maturation and the prevention of respiratory distress syndrome (RDS).

Type of intervention
Secondary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Premature babies weighing 2kg or less.

Setting
Secondary care sector. The economic study was conducted in North Carolina, USA.

Dates to which data relate
Effectiveness analysis data were collected from 1991-1993. Resource use data were collected from the years 1992-1993 and the prices relate to 1992.

Source of effectiveness data
Evidence for final outcomes was based on a synthesis of previously completed studies.

Modelling
A model was used based on a decision tree approach. The outcomes and costs for 100 infants were estimated given ANS, no ANS and surfactant availability as required. Results were extrapolated to predict potential national impacts of the use of ANS.

Outcomes assessed in the review
Within the model possible outcomes were grouped into three categories: no index disease and discharged alive, index disease and discharged alive or discharged dead. The term index diseases includes respiratory distress syndrome (RDS) and potentially there may be comorbidities of bronchopulmonary dysplasia (BPD), intraventricular hemorrhage (IVH), necrotizing enterocolitis (NEC) or patent ductus arteriosus (PDA).
Study designs and other criteria for inclusion in the review
Data were collected from two main sources: data from all Maryland hospital discharges for low birth weight neonates plus data from 12 National Institute of Child Health and Human Development Neonatal Research Network Centres (NICHD-NICU). The former involved a meta-analysis by Crowley and most included studies involved the random assignment of relatively large infants. In the latter case, treatment was not randomly assigned to infants. The premature babies weighed 2kg or less.

Sources searched to identify primary studies
Not stated.

Criteria used to ensure the validity of primary studies
Not stated.

Methods used to judge relevance and validity, and for extracting data
Not stated.

Number of primary studies included
Two primary studies were included in the review, one being a meta-analysis and the other a data set.

Methods of combining primary studies
The meta-analysis based on the Maryland Hospital data provided estimates on mortality and index disease and the data from the NICHD-NICU provided morbidity and length of stay estimates. Information from these two sources was synthesised in a narrative fashion.

Investigation of differences between primary studies
The authors investigated, in narrative fashion, the differences between the primary studies in terms of the weight of the babies and whether the babies were randomised prior to the availability of surfactant.

Results of the review
A 50% reduction in odds of RDS and a 40% reduction in the odds of death were reported.

Measure of benefits used in the economic analysis
Effectiveness relates to the clinical outcomes of the analysis, that is no index disease, index disease or died. A decision analytic model was used to estimate the impact of ANS or no ANS during the initial hospitalisation after a premature birth.

Direct costs
Quantities and costs were reported separately. Cost estimates per baby per day of stay by index diagnosis were calculated by estimating daily average charges for a similar population (birth weight, index disease and mortality) from records of low weight babies receiving neonatal intensive care (NICU) in Maryland in 1992. The cost boundary adopted was the hospital. The estimation of quantities and costs was based on actual data. The quantity data were derived from the two primary studies and the cost data were obtained from uniform budget charges (UB92), charge to cost ratios (and professional fees) from a NICU study. Price data refer to 1992, using the Department of Labor Statistics consumer price index for medical care when required.
Statistical analysis of costs
Not reported.

Indirect Costs
Not reported.

Currency

Sensitivity analysis
The cost and effect assumptions were subjected to simple multi-way sensitivity analysis. On the cost-side, savings continued to be achieved when maternal costs were added, physician costs were charged or removed and length of stay was reduced by 20%. Treatment impact, in terms of effects (odds of index disease or death), was also varied.

Estimated benefits used in the economic analysis
In the ANS group, for a sample of 100 infants less than 2kg, it was predicted there would be 7 deaths and 25 cases of index diseases whereas for the no ANS group the predictions were 12 deaths and 37 cases of index disease. Benefits were obtained until hospital discharge.

Cost results
For the 100 infants receiving ANS, the total cost of the initial hospitalisation was estimated as $1.72 million whereas for the no ANS group it was $2.05 million using the Crowley effectiveness rates applied to Maryland data. A minimum of $326,000 (hospital and physician costs) or $197,000 (hospital costs) per 100 treated infants would be saved. The 12 NICHD-NICU centre data applied to the model show that $500,000 in hospital costs would be saved for the treatment of 100 infants aged under 28 weeks treated with ANS compared to 100 infants not treated.

Synthesis of costs and benefits
The ANS group would have 17 fewer deaths, 9 fewer index cases and 7 additional survivors without index disease for every 100 ANS treated infants. The economic impact of treating more mature infants is less evident (Table III in the paper). Extrapolated to the whole USA it was estimated that ANS use would prevent 2,119 deaths and 5,826 cases of index disease with a total saving of $157 million per year. The cost and effect data were presented in disaggregated format.

Authors' conclusions
Given the high effectiveness of ANS and the very high costs of treatment of both sick infants and survivors, the model shows that ANS yields both cost savings and a better outcome, especially for babies weighing less than 2 kg at birth. As ANS prevents co-morbidity, the extra costs of survivors are recouped by the saving of not treating babies with RDS and co-morbid (index) conditions. As only about 15% of eligible infants are treated in the USA, extension of ANS treatment to the whole USA would result in sizeable economies.

CRD Commentary
The measure of benefit in the study was the clinical outcome that was primarily based on Crowley's meta-analysis of randomised, controlled trials and multi-site observed differences. It is likely that such data has internal validity. Resource quantities were reported separately from prices and adequate detail was provided. An attempt was made to explore the generalisability of results. For example, the representativeness of the charges taken from the Maryland data was compared to a representative sample of US hospitals. The authors report a list of caveats to their conclusions, including absence of indirect cost estimation. This is a good evaluation, which confirms previous UK studies by...
Mugford in Oxford. As the authors suggested, a longer duration of follow-up is required to observe the impact of ANS on chronic morbidity for the population sample.

**Implications of the study**
Extension of coverage of ANS treatment to mothers in premature labour (especially before 28 weeks) will result in cost savings for the health service and enhancement of health status for the newborn.

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**Other publications of related interest**

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