Preventing early-onset group B streptococcal sepsis: strategy development using decision analysis

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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
Recommended strategies for prevention of early-onset group B streptococcal infections (EOGBS) in neonates.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
Pregnant women and infants.

Setting
Hospital setting. The study was carried out in the USA.

Dates to which data relate
Effectiveness and resource use data were collected from studies published between 1982 and 1999. Cost data were collected from the authors’ institution and from a 1994 source. The price year was not reported.

Source of effectiveness data
Effectiveness data were derived from a review of the literature.

Modelling
A decision analytic model using Bayesian principles was used to determine the cost-effectiveness of the various prevention strategies.

Outcomes assessed in the review
The review assessed population attack rates and the effectiveness of the interventions.

Study designs and other criteria for inclusion in the review
Study designs and other criteria were not reported.

Sources searched to identify primary studies
The sources searched to identify primary studies were not reported.

Criteria used to ensure the validity of primary studies
The criteria used to ensure the validity of primary studies were not reported.

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 10 studies were used.

Methods of combining primary studies
Although reported narratively in the present study, the source studies from which estimates were derived were based on a systematic review of the literature in the derivation of risk factors associated with EOGBS and the effects of the intervention designed to prevent this disease. Studies were combined using the Mantel-Haenszel method.

Investigation of differences between primary studies
An investigation of differences between primary studies was not reported.

Results of the review
Vaginal and rectovaginal colonisation rates were 14.7% and 22.8%, respectively. The overall attack rate was 3 cases per 1,000 live births. Intrapartum prophylaxis alone or in combination with postpartum prophylaxis reduced the EOGBS attack rate by 80.2% or by 95.0%, respectively, and postpartum prophylaxis alone reduced it by 68.8%.

Measure of benefits used in the economic analysis
The number of patients treated per 1,000 births and per case prevented, and the number of EOGBS cases prevented were used as the measures of benefit.

Direct costs
Direct costs were not discounted given the short time frame of the study (less than 1 year). Quantities and costs were reported separately. Direct costs covered the costs of maternal prophylaxis, costs of treating maternal complications, the cost of neonatal antibiotic prophylaxis, and the costs of screening tests. The quantity/cost boundary adopted was that of the hospital. The estimation of quantities and costs was based on actual data. Costs of screening tests were based on the costs of performing these tests at Lucile Packard Children's Hospital. The price year was not reported.

Statistical analysis of costs
A statistical analysis of costs was not reported.

Indirect Costs
Indirect costs were not included.

Currency
US dollars ($).
Sensitivity analysis
Sensitivity analyses were conducted on the population attack rate, effectiveness of interventions, and cost estimates across the range of possible values.

Estimated benefits used in the economic analysis
The number of patients treated per 1,000 births was 37 under the AAP strategy, 171 under the ACOG strategy, 307 under the CDC strategy, 323 under the Gotoff and Boyer strategy, and 1,000 with universal intrapartum prophylaxis.

The number of patients treated per case prevented was 38 under the AAP strategy, 106 under the ACOG strategy, 136 under the CDC strategy, 142 under the Gotoff and Boyer strategy, and 415 with universal intrapartum prophylaxis.

The number of GBS cases prevented was 32.9% under the AAP strategy, 53.8% under the ACOG strategy, 75.1% under the CDC strategy, 75.6% under the Gotoff and Boyer strategy, and 80.2% with universal intrapartum prophylaxis.

Intrapartum prophylaxis prevented the majority of EOGBS cases expected to occur in nearly one-fourth of infants born to mothers with intrapartum fever or PROM before 28 weeks of gestation, but would be of little benefit for infants born to mothers without intrapartum risk factors after 34 weeks of gestation.

Cost results
The costs per case prevented amounted to $22,215 under the AAP strategy, $3,067 under the ACOG strategy, $11,925 under the CDC strategy, $9,720 under the Gotoff and Boyer strategy, and $12,049 with universal intrapartum prophylaxis.

Synthesis of costs and benefits
The risk factor strategy was less expensive than screening-based strategies for a reduction in attack rate lower than 65%, but was of comparable or greater cost for more effective strategies. Both the number of infants requiring treatment and marginal cost per case prevented increased rapidly as reductions in GBS disease rates exceeded 80%. For strategies based on intrapartum screening using the Strep B OIA, an 80% reduction in prophylaxis required prophylaxis for all risk groups in which the intervention would prevent EOGBS in at least 0.25% of infants. These results were not sensitive to changes in the population attack rate, effectiveness of interventions, and cost estimates.

Authors’ conclusions
No strategy can prevent all EOGBS cases, but the attack rate can be reduced at a cost less than $12,000 per prevented case. Supplementing intrapartum prophylaxis with postpartum ampicillin in a few infants was more cost-effective and less costly than providing intrapartum prophylaxis for more mothers. Better intrapartum screening tests offered the greatest promise for increasing efficacy.

CRD COMMENTARY - Selection of comparators
A justification was given for the comparators used, namely recommended prevention strategies. The user of this database, should decide whether these health technologies are relevant to their setting.

Validity of estimate of measure of benefit
The authors did not state whether a systematic review of the literature had been undertaken, although examination of the source literature reviews indicates that the literature reviews used were conducted in a systematic manner and used appropriate methods of combining the results. As such it is likely that effectiveness estimates were derived credibly from primary studies. Estimates of benefits were obtained directly from the effectiveness analysis.
Validity of estimate of costs
All categories of costs relevant to the perspective adopted were included in the analysis. The costs of not providing prophylaxis were not considered. Cost estimates did not include potential costs of prolonging hospital stay to permit extended observation or treatment of infants at risk. Quantities and costs were reported separately. Sensitivity analyses were conducted on costs, but not on quantities. Costs were used to proxy prices. The price year was not reported.

Other issues
The authors did make appropriate comparisons of their findings with those from other studies. The issue of generalisability to other settings was addressed. The authors do not appear to have presented their results selectively. The study enrolled women at risk of EOGBS and this was reflected in the authors' conclusions.

Implications of the study
Integrated obstetrical and neonatal regimens appropriate to the population served should be adopted by each obstetrical service. Surveillance of costs, complications, and benefits will be essential to guide continued iterative improvement of these strategies.

Source of funding
Sources of funding were not stated.

Bibliographic details

MeSH
Age of Onset; Ampicillin /economics /therapeutic use; Antibiotic Prophylaxis /economics; Cost-Benefit Analysis; Decision Support Techniques; Female; Gestational Age; Humans; Infant, Newborn; Penicillins /economics /therapeutic use; Pregnancy; Pregnancy Complications, Infectious /drug therapy; Prenatal Care; Risk Factors; Sepsis /economics /microbiology /prevention & control; Streptococcal Infections /economics /microbiology /prevention & control; Streptococcus agalactiae

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