Magnesium sulfate therapy for the prevention of cerebral palsy in preterm infants: a decision-analytic and economic 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.

CRD summary
The objective was to assess the cost-effectiveness of magnesium treatment, for pregnant women at high risk of delivery before 32 weeks gestation, for the prevention of cerebral palsy in pre-term infants. Based on the evidence available, magnesium was cost-effective, compared with no therapy. The methods were good and the results were reported in detail. For a societal perspective, the costs could be underestimated, but the conclusions appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess whether magnesium treatment, for pregnant women at risk of pre-term delivery, was cost-effective for the prevention of cerebral palsy in pre-term infants.

Interventions
Magnesium treatment for women at risk of pre-term (less than 32 weeks gestation) delivery was initiated on arrival at hospital. It was given as a 6g bolus followed by an infusion of 2g per hour for 12 hours or until delivery. This was compared with no magnesium treatment.

Location/setting
USA/in-patient secondary care.

Methods
Analytical approach:
A decision tree was used to assess the costs and outcomes of the two interventions, by combining data from published studies. The time horizon was 75 years. The authors stated that the perspective was societal.

Effectiveness data:
The effectiveness data were from a literature review in PubMed. This review identified studies in English, using several key terms. Studies without a control group and reviews were excluded. Each model parameter was the mean of selected studies, weighted by sample size, and its range was the lowest and highest reported values. The main estimate of effectiveness was the relative risk of cerebral palsy and death with versus without treatment with magnesium. This was derived from four published trials, in which magnesium was primarily given for the prevention of cerebral palsy.

Monetary benefit and utility valuations:
The utility estimates were from two published studies.

Measure of benefit:
The benefit measure was quality-adjusted life-years (QALYs) which were discounted at an annual rate of 3%.

Cost data:
The direct costs included magnesium treatment, magnesium reactions, cerebral palsy, neonatal death, and neonatal survival. These estimates were from the published literature or Medicare reimbursement rates. Charges were multiplied by a cost-to-charge ratio of 0.6. The costs were discounted using an annual rate of 3% and reported in US $.
Analysis of uncertainty:
One-way and multiway sensitivity analyses were performed to assess how variations in the model parameters changed the results. A probabilistic sensitivity analysis was undertaken, by sampling the point estimates from distributions around the model parameters, using Monte Carlo simulation. Two scenario analyses were performed. In one, magnesium was only offered to women with pre-term premature rupture of the membranes. In the other, it was offered only to women at risk of delivery at a gestational age of less than 28 weeks.

Results
The average cost per patient was $1,739 with magnesium treatment, compared with $1,917 without magnesium. The average QALYs gained were 56.6836 with magnesium and 56.6784 without it.

Magnesium treatment was dominant, as it was more effective and less costly than no magnesium. It was also dominant when offered to women with pre-term premature rupture of membranes, and to women at risk of delivery at a gestational age of less than 28 weeks.

The sensitivity analyses found that the results were robust to variations in most of the model inputs; they were sensitive to changes in the estimates of the effect of magnesium on the risk of moderate or severe cerebral palsy and neonatal death. At a willingness-to-pay threshold of $100,000 per QALY gained, magnesium was cost-effective in 86.7% of simulations and it was dominant in 63.4%.

Authors’ conclusions
The authors concluded that, based on the evidence available, magnesium was cost-effective, compared with no therapy, for women at high risk of pre-term birth before 32 weeks gestation.

CRD commentary
Interventions:
The interventions were reported clearly and in detail.

Effectiveness/benefits:
The effectiveness data were from published studies identified by a review in PubMed, which was described, including the inclusion and exclusion criteria and the key search terms. Only one bibliographic database was searched, but it appears that all the major relevant evidence was identified. The included studies were not described, but their references were given and these papers should be consulted to assess their quality and validity. The benefit measure appears to have been appropriate; QALYs capture both morbidity and mortality. The studies that supplied the utility estimates were not described and should be assessed for quality and validity.

Costs:
The perspective was stated to be societal, but no productivity costs were included, indicating that a health care system perspective was adopted. Omitting productivity costs could underestimate the total costs for a societal perspective. The sources for the costs were reported and appear to have been appropriate. The price year was not reported, which will hamper future inflationary exercises. The time horizon, discount rate, and currency were reported.

Analysis and results:
The costs and outcome information were synthesised in a decision tree. The model structure and a diagram were provided. The results were clearly reported. The model uncertainty was assessed in one- and two-way sensitivity analyses, as well as a probabilistic sensitivity analysis. As the main limitation to their study, the authors reported that the results were limited by the available published literature and the simplifying assumptions needed for the model.

Concluding remarks:
The methods were good and the results were reported in detail. For a societal perspective, the costs may have been underestimated as productivity losses were not included, but the authors’ conclusions appear to be appropriate.

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