Clinical benefits, costs, and cost-effectiveness of neonatal intensive care in Mexico

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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 examine the clinical outcomes, lifetime costs, and cost-effectiveness of neonatal intensive care in Mexico. The authors concluded that their results implied that neonatal intensive care was very high value for money. The methods were good, and they and the results were reported comprehensively. Given the scope of the analysis, the authors' conclusions appear to be appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to examine the clinical outcomes, lifetime costs, and cost-effectiveness of neonatal intensive care in Mexico.

Interventions
Neonatal intensive care was compared with no neonatal intensive care for pre-term babies.

Location/setting
Mexico/tertiary in-patient care.

Methods
Analytical approach:
A decision-tree model was used to simulate the costs and outcomes in a birth cohort of around two million infants. The authors analysed three categories of gestational age at birth: 24 to 26 weeks, 27 to 29 weeks, and 30 to 33 weeks. The time horizon was the lifetime of the baby. The authors stated that a societal perspective was adopted.

Effectiveness data:
The clinical and effectiveness data were derived from Mexican vital registration datasets, hospital discharge datasets, published studies, meta-analyses, and systematic reviews, and authors' assumptions. The main effectiveness parameters, over the short term, were neonatal mortality, survival to 28 days with no disability, and survival with major or minor disability. These estimates were from hospital discharge datasets and published studies. Long-term morbidity and mortality were based on published data from industrialised countries, including the USA.

Monetary benefit and utility valuations:
Average disability weights were derived from a published study that elicited standard gamble utility values (Carroll, et al. 2009, see 'Other Publications of Related Interest' below for bibliographic details).

Measure of benefit:
Life expectancy, disability-free life expectancy and disability-adjusted life-years (DALYs) were the measures of benefit. DALYs were discounted at an annual rate of 3% per annum.

Cost data:
The direct health care costs included those for initial hospitalisation (general and those of neonatal procedures and complications), the short-term costs of rehospitalisation, and the long-term costs of health care for neurodevelopmental impairments. The resource use was derived from published studies and registry data. The unit costs were from sources including the World Health Organization's CHOICE database. All costs were updated to 2005 prices, using the gross
domestic product deflator. They were reported in US dollars ($) and future costs were discounted at an annual rate of 3%.

Analysis of uncertainty:
One-way sensitivity analyses were performed and the results were presented in a tornado diagram. A Monte-Carlo probabilistic sensitivity analysis was undertaken to assess the joint effect of uncertainty around all the input model parameters and the results were presented as a cost-effectiveness acceptability curve. Additional scenarios that were designed to bias against neonatal intensive care were analysed, using high mortality, morbidity, and costs for neonatal intensive care.

Results
Compared with no neonatal intensive care, the average gain in life-years with intensive care, for each gestational age group, was 28 for gestational age 24 to 26 weeks, 43 for age 27 to 29 weeks, and 34 for age 30 to 33 weeks. The average DALYs averted were nine for age 24 to 26 weeks, 15 for age 27 to 29 weeks, and 12 for age 30 to 33 weeks.

The incremental mean costs incurred with intensive care were $11,400 for age 24 to 26 weeks, $9,500 for age 27 to 29 weeks, and $3,000 for age 30 to 33 weeks.

The incremental costs per DALY averted were $1,200 for age 24 to 26 weeks, $650 for age 27 to 29 weeks, and $240 for age 30 to 33 weeks.

One-way sensitivity analysis showed that none of the analyses produced cost-utility ratios exceeding $1,800 for any of the three gestational ages.

The probabilistic sensitivity analysis showed that at a willingness-to-pay threshold of the average per capita income of Mexico ($8,200 in 2005) per DALY averted there was essentially no uncertainty in the conclusion that neonatal intensive care was cost-effective for all gestational age groups.

Authors’ conclusions
The authors concluded that their results implied that neonatal intensive care was very high value for money.

CRD commentary
Interventions:
The interventions were reported clearly. The comparator appears to have been appropriate.

Effectiveness/benefits:
The authors reported neither how the clinical and effectiveness data sources were identified, nor whether a systematic review of the literature was undertaken. This makes it unclear whether the best available evidence was used. The authors provided additional details on the sources used and the derivation of all the individual parameters in their model. Further information on the effectiveness and clinical data was reported in appendices. The authors reported three measures of long-term effectiveness; only the DALYs were appropriately discounted.

Costs:
The authors stated that a societal perspective was adopted, but only the direct health care costs were analysed and no work-related productivity losses nor informal care costs were assessed. From a health care system perspective it appears that all the major relevant costs were included. Details of the sources of resource use and unit costs were reported clearly. Some data were from other countries (such as long-term annual disability costs from a published US study), which may limit the generalisability of the results. Unit costs were presented separately from resource use, which allows the replication of the cost assessment to other settings. The price year was reported and the costs were appropriately discounted.

Analysis and results:
The decision analytic model was appropriate, the assumptions were described, and a diagram was provided. Extensive one-way, probabilistic, and scenario sensitivity analyses were appropriately undertaken to assess the overall parameter
uncertainty and robustness of the model results. The methods and results were reported in detail. The authors provided a balanced discussion on the limitations of their study. They acknowledged that the main limitation was that many model probabilities were from studies conducted in high-income countries, thus there remained a considerable amount of uncertainty surrounding several model inputs. The authors compared their results with those of comparable published economic evaluations.

Concluding remarks:
The methods were good, and they and the results were reported comprehensively. Given the scope of the analysis, the authors’ conclusions appear to be appropriate.

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