Cost-benefit analysis of newborn screening for galactosemia in the Philippines


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
The screening of newborns for galactosemia (GAL) using the Beutler test was studied.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
All newborns for whom consent was obtained were screened for GAL after 24 hours of life.

Setting
The setting was secondary care (24 hospitals in Metro Manila, the Philippines, which were participating in the Philippine Newborn Screening Project, PNSP). The economic study was carried out in the Philippines.

Dates to which data relate
The effectiveness evidence and resource use data related to newborns screened between June 1996 and December 2000. The price year appears to have been 2001.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was carried out retrospectively on the same sample of patients as that used in the effectiveness analysis.

Study sample
The study sample comprised all 143,185 newborns screened at the Metro Manila study sites for the duration of the PNSP up to the time of reporting (June 1996 to December 2000). The initial study sample was therefore appropriate for the clinical study question, assuming that the incidence of GAL did not vary in different parts of the country. There was no information about newborns for whom screening consent was not obtained.

Study design
This was a multi-centred cohort study (24 metropolitan hospitals). Follow-up was limited to obtaining test results for those testing negative for GAL; for those testing positive for GAL at the screening test, follow-up continued up to
Diagnosis confirmation.

**Analysis of effectiveness**
The study represented a report of observational investigation. All of the patients included in the study were accounted for in the analysis. The primary health outcome recorded was the crude and weighted incidence of GAL in the screened population. The crude incidence rate was calculated by dividing the number of confirmed cases by the total number of cases screened. The weighted incidence was computed based on the proportion of the sample size from each participating hospital. Screening was conducted on blood samples using the Beutler test. For diagnosis confirmation, blood spot confirmatory tests by enzyme assay were carried out in Australia alongside a clinical review.

**Effectiveness results**
Eight newborns had positive screening results for GAL and 2 cases were confirmed.

It was reported that the crude incidence of GAL was 1 in 71,592, while the weighted incidence was 1:106,006 (95% confidence interval: 1:44,218 to 1:266,796).

**Clinical conclusions**
The authors concluded that there would be no missed cases among screened newborns given the low incidence and high sensitivity rate of the screening test. They noted that the incidence of 1:106,006 was low relative to rates reported in the literature (1:10,000 to 1:30,000) “in countries where GAL screening has been in place for decades”. This was attributed to the small sample size used in the study.

**Measure of benefits used in the economic analysis**
The outcome measure used was the savings of resources, that is, the costs avoided through preventing the complications of GAL (developmental delay, speech problems, motor problems, cataracts and productivity losses). These are negative incremental costs and are therefore described under the direct and indirect costs headings below. Projected cost benefits were calculated by applying the weighted incidence rate of GAL to the annual birth rate in the Philippines in 1998 (1.5 million newborns/year). The benefits were discounted at a rate of 7% during the follow-up years.

**Direct costs**
The costs were estimated and projected using a population of 1.5 million newborns, which was the annual birth rate. Discounting was carried out at a rate of 7% during follow-up years. The costs of the screening programme included the following:

- the costs of the screening proper (cost of blood collection, machine use, reagents and other materials, expected labour input and laboratory testing);
- the costs of recall (cost of contacting patients);
- the costs of confirmatory visits (enzyme assay confirmatory tests, transportation, professional fee); and
- the costs of treatment and monitoring of screened patients (metabolic evaluations, dietary consultations, development assessment, ocular reviews, specialist visits, allied medical services, habilitation and special education).

The benefits of the screening programme were represented by costs avoided by preventing the complications of GAL. The cost of management of developmental delay included allied medical services, special education, and laboratory and professional fees. The cost of care for cataracts included surgical, laboratory and professional fees.

The unit quantities and the costs were described separately for many cost components. Estimates of quantities were derived using a mixture of actual data from PNSP, results from the literature, authors’ assumptions and expert opinion. The cost data were not attributed to a source, except for the minimum wage (national law).
Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The costs were estimated and projected using a population of 1.5 million newborns, which was the annual birth rate. Discounting was carried out at a rate of 7% during follow-up years. The costs of the screening programme included productivity losses for patient accompaniers during recalls and productivity losses for patient and carer during treatment and monitoring. The benefits of the screening programme similarly included productivity losses avoided through preventing the complications of GAL. Productivity loss of the patient was computed at year 2000 minimum wage per day for 45 years, assuming the patient started work at age 20 and retired at 65. Productivity loss of the carer was projected at half that of the patient. Income tax was included separately. The quantities and the unit costs were described separately. The price year was likely to have been 2001. Total costs, but not total quantities, were reported.

Currency
Philippines pesos (PHP). The conversion rate to US dollars ($) was $1 = PHP 50 (April 2001).

Sensitivity analysis
A sensitivity analysis was carried out on the incidence rate of GAL, using the incidences 1:106,006 (baseline), 1:75,000 (crude rate), 1:30,000 and 1:10,000 (results from the literature). The discount rate was also varied (3% and 12%) in a two-way analysis.

Estimated benefits used in the economic analysis
The proportions of GAL patients suffering developmental delay (45%), speech problems (56%), motor problems (18%) and cataract complications (30%) were estimated from the literature (Elsas 1999, see Other Publications of Related Interest- below for bibliographic details).

Cost results
The total cost of the screening programme was $1,120,500. The authors reported the total (cost) benefits of the screening programme at $217,900 over a cohort's lifetime.

Synthesis of costs and benefits
The net cost of the screening programme was $898,900 (costs discounted at 7% per annum). Hence, at an incidence of 1:106,006, a newborn screening of GAL was not cost-beneficial. This result was true for all discount rates at this incidence rate.

For an incidence rate as high as 1:10,000, potential net benefits of up to $2.8 million were seen. However, the authors noted that the incidence rates used in the sensitivity analysis were not reflective of the true incidence of GAL in the Philippines.

Authors' conclusions
The cost-benefit analysis demonstrated that the costs of the Philippine Newborn Screening Project (PNSP) outweighed the benefits with respect to galactosemia (GAL). Therefore, newborn screening for GAL was not cost-beneficial.

CRD COMMENTARY - Selection of comparators
The choice of the comparator (no screening, or a "do-nothing" alternative) was justified as standard practice in the Philippines. You should decide whether this comparator represents common practice in your own setting.

**Validity of estimate of measure of effectiveness**
The analysis was based on a cohort study of newborns attending hospitals in a large metropolitan area. It was assumed, without investigation, that the measure of effectiveness found in the study sample was representative of the study population, but this may not have been the case, especially given the mainly rural location of the majority of the population. Statistical analyses were not undertaken to take potential biases or confounding in the data into consideration. It was also confusing that the reported number of patients screened differed between the abstract and the main body of the text (it was assumed that the correct figures were those reported in the main body of the report).

**Validity of estimate of measure of benefit**
The estimation of benefit was modelled. The authors reported that they used a cost-benefit model. In fact, the study was not a cost-benefit analysis since the savings of resources were considered as benefits (outcomes). Therefore, the analysis should be defined as a cost-effectiveness analysis with the effectiveness outcomes being the number of GAL complications prevented. Finally, a cost-utility analysis would have been more informative and more inclusive of the full health benefits (quantity and quality of life rather than the costs of resources used in treatment).

**Validity of estimate of costs**
All the categories of cost relevant to the perspective adopted were included in the analysis. Relevant cost components were included. The costs and the quantities were reported separately to a variable extent, some in full and some not at all. This would make it difficult to replicate the calculations or to gauge the accuracy of the estimation of quantities. This depended on a wide variety of sources (data, literature, expert opinion and assumption), the weight of each in the results being unclear. No sensitivity analysis of the costs or quantities was performed. Neither the source nor the date of the cost data was given. Currency conversions and discounting were performed appropriately. In summary, the analysis of the costs and quantities appeared detailed, but the lack of transparency in reporting made the results less credible and reduced the opportunity to apply the methods to other settings. The authors did not acknowledge the uncertain reliability of their conclusions.

**Other issues**
The authors reported the results of some relevant studies but did not draw appropriate comparisons. Instead, they appear to have used them to support recommendations unwarranted by the results of their own study (i.e. to show that net benefits could accrue to the screening programme if the true incidence of GAL was much higher, and to point out that lower costs could be achieved if screening was performed in tandem for other congenital diseases). The issue of the generalisability of the results to other settings was not addressed. The authors did not present their results selectively. However, they placed more emphasis on the results of favourable sensitivity analyses than on those shown in the base-case (aligned to real data collected in the study). Within these caveats, the authors' conclusions reflected the scope of the study. The authors did not report further limitations to their study.

**Implications of the study**
The authors recommended that the coverage of screening be increased to include all newborns, in order to determine the true incidence of GAL in the Philippine population, as this could substantially affect the conclusion of the cost-benefit analysis. They also suggested that, in order to lessen costs, screening for GAL should be conducted in tandem with screening for other disorders such as congenital hypothyroidism.

**Source of funding**
None stated.
Bibliographic details

PubMedID
15906739

Other publications of related interest
http://www.geneclinics.org/profiles/galactosemia/details.html

Indexing Status
Subject indexing assigned by NLM

MeSH
Cost-Benefit Analysis; Galactosemias /diagnosis /epidemiology; Humans; Incidence; Infant, Newborn; Neonatal Screening /economics; Philippines /epidemiology; Program Development

AccessionNumber
22005006322

Date bibliographic record published
30/06/2006

Date abstract record published
30/06/2006