Cost-effectiveness of ultrasound screening for developmental dysplasia of the hip

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
Three screening strategies for developmental dysplasia of the hip (DDH) were examined:

- general ultrasound screening at the age of 3 months;
- selective ultrasound screening at the age of 3 months, when only infants with recognised risk factors (breech position or a family history of DDH in first- or second-degree relatives) or abnormal results on physical examination of the hip were screened; and
- current screening policy for DDH in the Netherlands. This was based on repeated physical examination of the infant hip and risk factors in the first months of life, and was performed as part of the child health care (CHC) programme.

Both ultrasound screening strategies used the Graf’s sonographic method.

Type of intervention
Screening.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised the general cohort of infants in their first months of life.

Setting
The setting was CHC centres (primary care). The economic study was carried out in the Netherlands.

Dates to which data relate
The dates to which the effectiveness and resource use data related were not reported. The price year was 2002.

Source of effectiveness data
The effectiveness evidence was derived from completed studies.

Modelling
A decision tree model was used to evaluate the costs and clinical outcomes of the three screening strategies. Details of the model were not reported.

Outcomes assessed in the review
The health outcomes assessed from the primary studies were the incidence of DDH in the Netherlands and the probability values for:

true cases of DDH,

missed cases,

infants treated by the CHC physician,

infants screened by ultrasound,

referral for specialist consultation, and

early treatment given a positive screening result.

Study designs and other criteria for inclusion in the review
A formal review of the literature was not carried out. The authors stated that one of the primary studies was a large prospective study (the Soundchec study) that involved 5,170 infants screened by ultrasound.

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
The effectiveness evidence came from 2 primary studies.

Methods of combining primary studies
Not stated.

Investigation of differences between primary studies
Not stated.

Results of the review
The incidence of DDH in the Netherlands was 3.7%.

The probability values were:

for true cases of DDH, 3.1% for general ultrasound screening, 2.4 for selective ultrasound screening and 2.8% for CHC screening;

for missed cases of DDH, 0.006 for general ultrasound screening, 0.013 for selective ultrasound screening and 0.009 for CHC screening;
for infants treated by the CHC physician, 0.33 for general ultrasound screening, 1 for selective ultrasound screening and 1 for CHC screening;

for infants screened by ultrasound, 1 for general ultrasound screening and 0.192 for selective ultrasound screening (NA for CHC screening);

for referral for specialist consultation, 0.045 for general ultrasound screening, 0.030 for selective ultrasound screening and 0.192 for CHC screening; and

for early treatment given a positive screening result, 0.711 for general ultrasound screening, 0.8 for selective ultrasound screening and 0.146 for CHC screening.

Measure of benefits used in the economic analysis
The summary benefit measure used in the economic evaluation was the proportion of screen-detected cases of DDH. This was obtained from the decision tree.

Direct costs
Discounting was irrelevant since the costs per patient were incurred during a short time. The unit costs were presented separately from the quantities of resources used. The health services included in the economic evaluation were ultrasound examination (personnel, training, equipment and consumables), medical costs (diagnostic imaging and treatment of DDH) and travel expenses. A breakdown of the costs was provided. The cost/resource boundary adopted in the study reflected the societal perspective. The equipment costs were calculated using a depreciation method based on annuities with a discount rate of 4.5%. It was assumed that the equipment had an economic lifetime of 5 years and the costs of maintenance were 8% of the purchase price. Most of the resource use and cost data came from the Soundcheck study and authors' and experts' assumptions. The Dutch guideline prices were also used for medical costs and travel expenses. Distances were based on prior studies. All the costs were adjusted to 2002 values using the consumer price index.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs were included in the economic evaluation to reflect the societal perspective adopted in the study. The unit costs were not reported, although the authors stated that the patients’ time was valued according to Dutch guidelines. However, the method used was not reported. The quantity of time spent for screening examination, visits and overnight hospitalisation was estimated using authors’ assumptions. The price year was likely to have been 2002.

Currency
Euro (Euro).

Sensitivity analysis
One-way sensitivity analyses were carried out. These assessed the impact of changes in the costs of ultrasound screening, CHC screening and diagnostic imaging in hospital, treatment costs of true-positive infants, patient costs, and the incidence of DDH. The authors stated that plausible changes were made.

Estimated benefits used in the economic analysis
The proportion of screen-detected cases of DDH was 2.4% for selective ultrasound screening, 2.8% for CHC screening and 3.1% for general ultrasound screening.
Cost results
The total cost per child screened was Euro 52.1 with selective ultrasound screening, Euro 82 with CHC screening and Euro 70.6 with general ultrasound screening.

Synthesis of costs and benefits
Average and incremental cost-effectiveness ratios were calculated to combine the costs and benefits of the screening strategies. The average cost per screen detected case of DDH was Euro 2,171 with selective ultrasound screening, Euro 2,929 with CHC screening and Euro 2,278 with general ultrasound screening. CHC screening was dominated by general ultrasound screening, which in turn offered a cost of Euro 2,646 per additional case of DDH detected.

The sensitivity analysis showed that the ranking of the alternative screening strategy did not change when key inputs were varied, the CHC strategy was always dominated by the general ultrasound strategy. The incremental cost-effectiveness ratio of general versus selective ultrasound screening ranged from Euro 2,388 to Euro 4,526. Only when patient costs were excluded (and a health care system perspective was adopted), was the general ultrasound screening strategy the overall dominant cost-effective option, with an average cost-effectiveness ratio of Euro 1,804 per infant detected.

Authors' conclusions
General ultrasound screening represented a cost-effective strategy for the detection of developmental dysplasia of the hip (DDH) in the Netherlands. It dominated all other alternative screening options if it were assumed that the patients were willing to pay for the additional time required to attend outpatient visits and screening procedures.

CRD COMMENTARY - Selection of comparators
The authors justified their choice of the comparators. Universal ultrasound screening was the strategy under evaluation, which had been shown to be cost-effective in other countries such as Austria, Germany and Switzerland. CHC screening represented the strategy currently implemented in the Netherlands. Selective ultrasound screening was considered as a further comparator because it was unclear from earlier analyses whether it could be more efficient than universal screening. Overall, it appears that all feasible screening alternatives have been considered in the study. You should decide whether they represent valid comparators in your own setting.

Validity of estimate of measure of effectiveness
The analysis of effectiveness used data derived from published studies, but it is unclear whether a systematic review of the literature was carried out. Details of the primary studies were not provided and it is not obvious whether the authors also made some assumptions. Therefore, since the sources of the effectiveness evidence were not reported satisfactorily, it is difficult to assess the validity and reliability of the data used in the analysis.

Validity of estimate of measure of benefit
The benefit measure used in the analysis represents a disease-specific measure that was calculated using a decision tree model. The model was not described and the structure of the tree was not depicted. Hence, the patterns of care under each strategy were unclear. The use of the number of detected cases does nothing to facilitate comparisons with the benefit measures used for other health care interventions.

Validity of estimate of costs
The perspective adopted in the study was explicitly stated. It was the most appropriate as it also included patient costs. A breakdown of the costs was provided, and both resource use and unit cost data were reported for most of the direct costs included in the economic evaluation. The indirect costs were estimated from Dutch guidelines, which were also used to estimate some other medical costs. The price year was reported, thus simplifying reflation exercises in other settings. The cost estimates were specific to the study setting, but the transferability of the results was enhanced by the
sensitivity analyses conducted on most key economic parameters. Experts’ assumptions were also used for resource use data.

Other issues
The authors did not make extensive comparisons of their findings with those from other studies. In terms of the generalisability of the study results to other settings, the authors stated that their conclusions were applicable only to countries with characteristics similar to those observed in the Netherlands. However, the CHC programme represented quite a unique system with nearly complete attendance of all infants. Sensitivity analyses were carried out to assess the robustness of the study results to variations in the parameters used. Some limitations to the validity of the study were reported. The long-term costs and effects were not considered and the authors stated that their inclusion would have favoured the general ultrasound screening strategy. The rate of participation represented a critical variable, but the authors expected near complete participation if ultrasound screening were included in the actual CHC programme.

Implications of the study
The study results suggested that general ultrasound screening for DDH represents a cost-effective strategy. Policy-makers should devote more attention to the identification of effective and efficient screening options for infants.

Source of funding
None stated.

Bibliographic details

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