Universal cervical-length screening to prevent preterm birth: a cost-effectiveness 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
This study assessed the cost-effectiveness of the routine measurement of second-trimester cervical length by transvaginal ultrasound in low-risk singleton pregnancies to avoid preterm birth. The authors concluded that universal screening, with progesterone treatment, was cost-effective for the health care system. The cost-effectiveness methods were valid, which should ensure that the authors' conclusions are robust.

Type of economic evaluation
Cost-utility analysis

Study objective
This study assessed the cost-effectiveness of the routine measurement of second-trimester cervical length by transvaginal ultrasound in low-risk singleton pregnancies to avoid preterm birth.

Interventions
Two strategies were considered: no routine cervical length screening versus one routine transvaginal cervical length measurement at 18 to 24 weeks of gestation. In the screening strategy, women who were found to be at increased risk of preterm birth (with a cervical length of less than 1.5cm) were offered daily vaginal progesterone supplementation.

Location/setting
USA/primary and secondary care.

Methods
Analytical approach:
The analysis was based on a decision model, with a lifetime horizon. The authors stated that the perspective of society was adopted.

Effectiveness data:
A literature search was carried out in the PubMed database to identify the clinical inputs. Priority was given to randomised trials and prospective studies. Retrospective cohorts or reviews were used where no other sources were available. National statistics were used for some inputs. The key input was the effectiveness of progesterone in preventing preterm delivery. This estimate was from the only clinical trial on the efficacy of cervical length screening and progesterone, which included 24,620 asymptomatic women, of whom 24,189 had singleton pregnancies. Of these, 413 women had a cervical length of less than 1.5cm and 250 were randomised to receive progesterone or placebo.

Monetary benefit and utility valuations:
The utility values, assigned to three neonatal outcomes (death, severe neurologic disability, and health), were from a published study.

Measure of benefit:
Quality-adjusted life-years (QALYs) were the summary benefit measure and they were discounted at an annual rate of 3%.

Cost data:
The economic analysis included the costs of cervical-length ultrasound scan, vaginal progesterone supplementation, in-patient stay for short cervix (including corticosteroids), maternal and neonatal care (and other health care resources
depending on the week of delivery), and the management of severe disability. The cost of the cervical-length ultrasound scan was from Medicare, the cost of progesterone was from drug tariffs, and the other costs were from published literature. All costs were in US dollars ($) and the price year was 2010. A 3% annual discount rate was applied.

**Analysis of uncertainty:**

One-way sensitivity analyses were carried out to examine the impact of variations in the key inputs, including the total cost of each strategy, the total QALYs per strategy, the incidence of preterm birth, and the incidence of adverse neonatal outcomes. Plausible ranges of values were considered. All inputs were varied simultaneously in a Monte Carlo simulation.

**Results**

In a cohort of 100,000 women, the expected costs were $1,314,520,247 and the QALYs were 2,954,795 with usual care and the costs were $1,302,400,300 and the QALYs were 2,955,218 with screening. Screening saved costs and added QALYs and was therefore dominant. It was estimated that screening would prevent 248 births before 34 weeks of gestation and 22 neonatal deaths or neonates with long-term neurologic deficits, per 100,000 deliveries.

These results were generally robust, but were sensitive, as expected, to changes in the cost of the ultrasound scan, the effectiveness of progesterone in preventing preterm delivery, the predictive value of a shortened cervix, and the prevalence of a shortened cervix. Screening remained cost-effective or cost saving in all cases.

The screening strategy was cost-effective in 99.4% of the 100,000 Monte Carlo simulations, and was cost-saving in 68% of simulations.

**Authors’ conclusions**

The authors concluded that universal transvaginal cervical-length ultrasound screening, with progesterone treatment, was cost-effective for the health care system.

**CRD commentary**

**Interventions:**

The authors justified their selection of the comparators. No screening was the clinical recommendation of the American College of Obstetricians and Gynecologists, and screening was supported by a recent clinical trial.

**Effectiveness/benefits:**

The clinical data were identified through a review of the literature. The treatment effect was from a randomised placebo-controlled trial that is likely to have been a valid source for the relative risk data. Priority was given to clinical trials for other model inputs, but the authors had to rely on observational studies in many cases given a lack of randomised studies. Extensive sensitivity analysis was conducted on all uncertain inputs. QALYs were an appropriate measure for capturing all the benefits of reducing preterm birth on the health of newborns. Clear information on the sources of the utility values was provided, but the methods used to elicit the preferences were not explicitly reported.

**Costs:**

The authors stated that a societal perspective was adopted, but productivity costs were not included. They stated that the inclusion of these costs would have favoured screening. The costs were presented as category totals, with the unit costs for some items. Little information on data sources was provided, reducing the transparency of the analysis. US sources were always used and the estimates should be representative of the authors’ context. The price year and discounting were clearly reported. The impact of variations in the cost estimates was tested in the sensitivity analyses.

**Analysis and results:**

The results were clearly presented. An incremental approach was used to synthesise the costs and benefits of the two strategies. Valid approaches were used to investigate uncertainty and the results were extensively reported and discussed. The authors compared their results with those of other published studies that generally found screening to be cost-effective. The results appear to be specific to the authors’ context and might be difficult to transfer to other settings, given the lack of information on some economic data.
Concluding remarks:
The cost-effectiveness methods were valid, which should ensure that the authors’ conclusions are robust.

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