Pulse oximetry screening for critical congenital heart defects in asymptomatic newborn babies

A meta-analysis suggests that newborn screening for life-threatening congenital heart defects using pulse oximetry, a simple, low-cost test that measures blood oxygen levels, should be adopted as part of the routine assessment of all newborns. The research raises a number of questions that are currently being considered by the UK National Screening Committee.

**Overview:** Congenital heart disease is responsible for more neonatal deaths than any other birth defect, but outcomes can be improved if defects are identified early ([Knowles et al. 2005](#)).

Previous research has reported the potential of pulse oximetry to detect significant or life-threatening heart defects that might otherwise go unnoticed in babies who appear to be well. Pulse oximetry is a quick, non-invasive test that measures the concentration of oxygen in the blood using a sensor applied to the hand or foot of a newborn. Low levels of oxygen can indicate a heart problem, infection, or other health problem that requires further investigation. However, uncertainty remains about false-positive rates and the test's accuracy.

**Current advice:** In the UK there is a newborn screening policy that comprises a clinical examination at birth and at 6-8 weeks, with specific cardiac investigations for specified high-risk children. The USA is the only country, so far, to adopt routine pulse oximetry screening.

**New evidence:** A systematic review assessed the performance of pulse oximetry as a screening method for the detection of critical congenital heart defects in asymptomatic newborn babies ([Thangaratinam et al. 2012](#)).

The researchers analysed 13 studies including data for nearly 229,421 newborn babies (doubling the numbers used in previous reviews) to assess the test's ability to detect congenital heart disease.

Results showed that pulse oximetry had high specificity (99.9%) with moderate sensitivity, detecting 76.5% cases of congenital heart defects with a low false-positive rate (0.14%).

The false-positive rates were affected by the timing of the test and were significantly lower when the screening was done at least 24 hours after birth (0.05%) than when it was done within the first 24 hours (0.50%). However, the researchers stress that this finding should be balanced against the increasing tendency to discharge babies with serious conditions deteriorating before screening has taken place. They suggest that pulse oximetry testing at home by healthcare workers could overcome some of the difficulties associated with short postnatal stay in hospitals or home births, but the cost implications of this strategy needs to be assessed.

The researchers point to an earlier economic assessment ([Ewer et al. 2011](#)) as evidence for the test's likely cost-effectiveness when used as an adjunct to UK practice, particularly if the outcomes of neonatal cardiac surgery continue to improve. They add that, because so many babies have now been tested with pulse oximetry, further research in this area is unlikely to produce substantially different findings.

**Commentary:** "This paper and the recent paper by Ewer point to the gathering evidence that pulse oximetry can identify babies whose oxygen saturations suggest a problem. This paper also points out
that the Centers for Disease Control and Prevention in the USA has recommended the implementation of pulse oximetry for the assessment of newborns. However in the USA, unlike the UK, a physical examination is not carried out and the USA may have a later discharge time which materially affects the performance of the test (as the authors suggest).

"In a UK context the research generates a number of questions. For example, can pulse oximetry replace the physical examination? Unfortunately none of the published literature has addressed a comparison directly, and if the pulse oximetry was to be done in addition to the physical examination would that be cost effective? If it is done in hospital how will that affect the test performance, and critically how many extra false positives (and therefore extended stays) would that lead to? If the test were to be done after 24 hours who would perform it and how could we ensure universal coverage? And finally how many babies with other conditions (lung or neurological) would be found, how would they be managed and would they benefit from the earlier discovery?

"The UK National Screening Committee is currently considering some of these questions and will consult on the findings towards the end of the year."

– Anne Mackie, Director of Programmes, UK National Screening Committee.

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