NICE National Institute for Health and Care Excellence

Putting NICE guidance into practice

Resource impact report:
High-throughput non-invasive prenatal testing for fetal *RHD* genotype (DG25)

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Summary

The guidance states that the case for adopting high-throughput non-invasive prenatal testing for fetal *RHD* genotype is supported by the evidence.

It is estimated that every year in England, 95,000 women who are rhesus D (D) negative and pregnant, and are not known to be sensitised to the rhesus D antigen, are eligible for testing with high-throughput non-invasive prenatal testing (NIPT). It is estimated that around 90,200 women will have NIPT from year 3 onwards.

The estimated annual saving of implementing this guidance for the population of England based on the uptake in the resource impact assumptions is shown in table 1.

Table 1 Estimated annual cost in England of implementing the guidance

	2016/17	2017/18	2018/19	2019/20	2020/21
Population having high-throughput non-invasive prenatal testing (NIPT) each year	3,800	47,500	90,200	90,200	90,200
Cost impact each year for NIPT (£000/−£000)	91	1,140	2,166	2,166	2,166
Saving impact each year for avoided routine antenatal anti-D prophylaxis (£000/−£000)	−71	−883	−1,678	-1,678	-1,678
Saving impact each year for avoided testing and treatment for potentially sensitising events during pregnancy (£000/−£000)	−36	−452	−859	−859	−859
Overall saving impact each year for implementing guidance (£000/−£000)	−16	−195	−371	−371	−371

This report is supported by a resource impact template which may be used to calculate the resource impact of implementing the guidance by amending the variables.

This technology is commissioned by clinical commissioning groups. Providers are NHS hospital trusts. Implementation of the guidance will result in savings to providers.

1 Introduction

1.1 This report looks at the resource impact of implementing the NICE guidance on high-throughput non-invasive prenatal testing (NIPT) for fetal *RHD* genotype in England.

1.2 The guidance states that:

- NIPT for fetal *RHD* genotype is recommended as a cost-effective option to guide antenatal prophylaxis with anti-D immunoglobulin, provided that the overall cost of testing is £24 or less. This will help reduce unnecessary use of a blood product in pregnant women, and conserve supplies by only using anti-D immunoglobulin for those in whom it is necessary.
- Cost savings associated with NIPT for fetal *RHD* genotype are sensitive to the unit cost of the test, additional pathway costs and implementation costs. Trusts adopting NIPT should collect and monitor the costs and resource use associated with implementing testing to ensure that cost savings are achieved.

1.3 This report is supported by a resource impact template. The template aims to help organisations in England, Wales and Northern Ireland plan for the financial implications of implementing the NICE guidance by amending the variables.

1.4 This technology is commissioned by clinical commissioning groups (CCGs). Providers are NHS hospital trusts. Implementation of the guidance will result in savings to providers.

2 Background and epidemiology of rhesus D sensitisation

2.1 During pregnancy, small amounts of fetal blood can enter the maternal circulation (an event called fetomaternal haemorrhage). The presence of fetal D-positive cells in the maternal circulation after fetomaternal haemorrhage can cause a mother who is

rhesus-D (D)-negative to produce antibodies against the D antigen on the fetal blood cells (anti-D) – a process called sensitisation. Sensitisation can happen at any time during pregnancy, but is most common during the third trimester and delivery.

2.2 The process of sensitisation has no adverse health effects for the mother and usually does not affect the pregnancy during which it occurs. However, if the mother is exposed to the D antigen from a D-positive fetus during a later pregnancy, the immune response is quicker and much greater. The anti-D produced by the mother can cross the placenta and cause haemolytic disease of the fetus and newborn. This can cause severe fetal anaemia, leading to fetal heart failure, fluid retention and swelling (hydrops), and intrauterine death.

2.3 The risk of sensitisation can be reduced if D-negative pregnant women have anti-D immunoglobulin prophylactically during pregnancy, after potentially sensitising events, and after birth.

2.4 In England, there were around 637,000 births from April 2014 to March 2015 (NHS maternity statistics - England, 2014-15), of which about 15% (95,500 births) were to D-negative women (diagnostics assessment report, derived from 2013/14 hospital episode statistics data). The NICE guideline on routine antenatal anti-D prophylaxis for women who are rhesus D negative states that in England, an estimated 500 pregnant RhD-negative women are known to be sensitised to the RhD antigen each year. Therefore, we estimated that about 95,000 D-negative women who are not known to be sensitised to the D antigen give birth each year.

2.5 About 38% of these women (around 36,000 per year) carry a D-negative fetus and so do not need to have anti-D immunoglobulin (Chitty LA, Finning K, Wade A, et al. 2014).

Table 2 Number of people eligible for testing in England

Population	Proportion	Number of people
Total population	-	53,865,817
Number of births	1.18%	636,600
Number of births to women who are rhesus-D (D)-negative	15.00%	95,500
Number of births to women who are D-negative and are not known to be sensitised	99.47%	95,000
Total number of women eligible for testing with high-throughput non-invasive prenatal testing (NIPT)	100.00%	95,000
Total number of people estimated to have NIPT each year from year 3	95.00%	90,200

2.6 Therefore, we estimate that about 95,000 women are eligible for testing with high-throughput non-invasive prenatal testing (NIPT) each year.

2.7 From year 3, we estimate that 90,200 women will have NIPT each year, once uptake has reached 95% (see table 2).

3 Assumptions made

3.1 The resource impact template makes the following assumptions:

- The prevalent population remains the same over time.
- The number of births to rhesus-D (D)-negative women is 15% of the total number of births.
- Around 500 births per year are to D-negative women who are known to be sensitised to the D antigen.
- Uptake of routine antenatal anti-D prophylaxis (RAADP), in both current practice and after a positive high-throughput non-invasive prenatal testing (NIPT) result, is 99% (2013 audit of anti-D prophylaxis).
- All D-negative women who have a D-negative fetus identified by NIPT will not have RAADP).

- Women who are not treated with RAADP are assumed to incur no further costs.
- The result of NIPT testing does not change post-partum testing and all women continue to receive cord blood typing.
- The percentage of potentially sensitising events during pregnancy is estimated at 14.8% (2013 audit of anti-D prophylaxis).
- All D-negative women who have a D-positive fetus, and those not having NIPT, have testing and treatment after a potentially sensitisting event during pregnancy.
- All D-negative women who have a D-negative fetus identified by NIPT will not have testing and treatment after a potentially sensitising event during pregnancy.
- Uptake of the technology is based on the clinical expert and test provider opinion and increases from 4% in year 1 to 95% in year 3.
- NIPT has been modelled at a test cost of £24, representing the highest level that is still cost effective as in the recommendations.
- The cost of anti-D treatment is weighted based on 94% of sites using the single-dose regime (2013 audit of anti-D prophylaxis).
- RAADP costs are assumed to be the drug costs only, because treatment is given at standard maternity appointments.
- The cost of antenatal feto-maternal haemorrhage testing is assumed to be £128 per test.

4 Resource impact

4.1 The annual saving associated with implementing the guidance for the population of England is shown in table 3 below. The cost saving from year 3 once steady state reached is equivalent to around £689 per 100,000 population.

Table 3 Resource impact of implementing the guidance for the population of England using NICE assumptions

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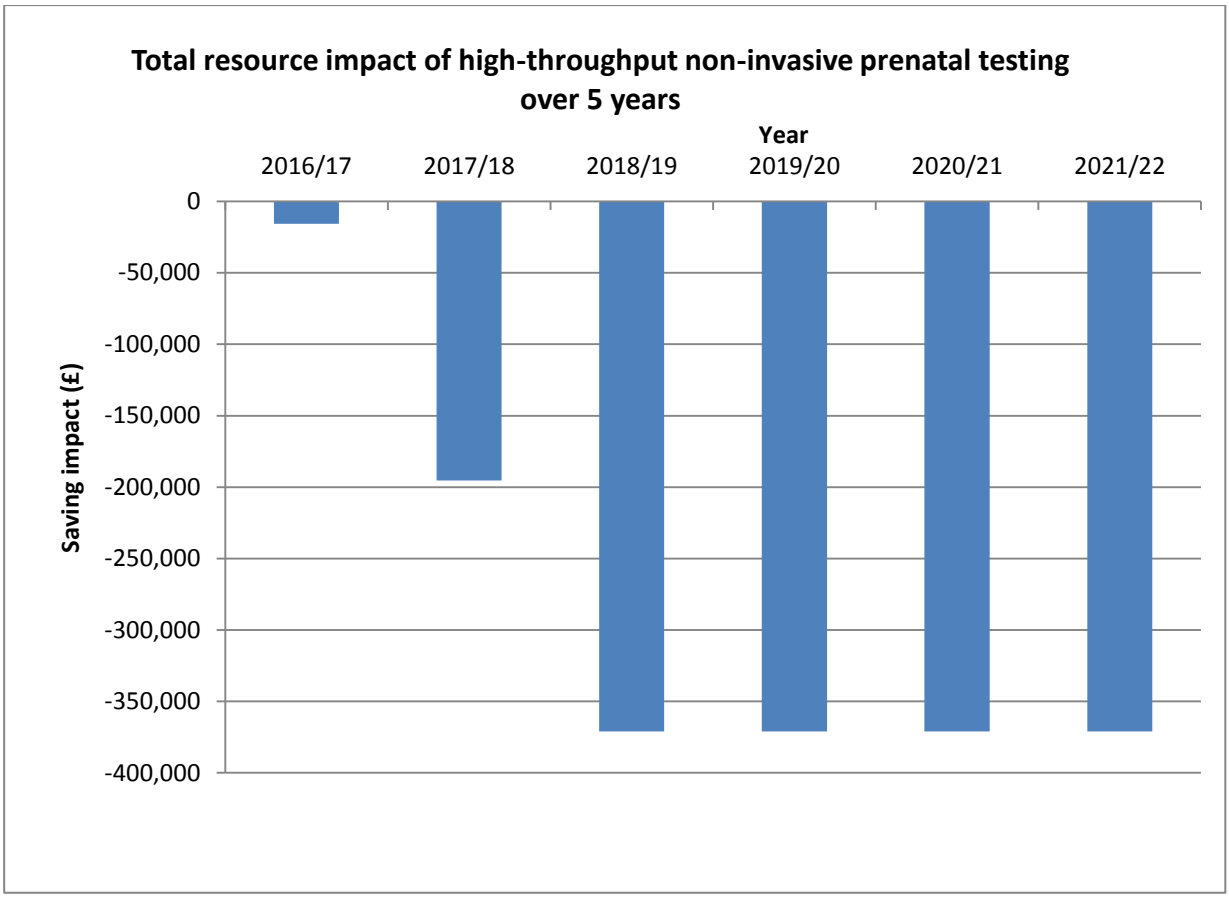

5 Savings and benefits

5.1 Anti-D immunoglobulin is produced from the pooled plasma donated by large numbers of D-negative people, who have had a transfusion of D-positive red cells to stimulate the production of D antibodies. It is a finite resource, and because there have been shortages in the past, it needs to be used carefully to maintain stocks.

5.2 Anti-D immunoglobulin is a blood product and may also carry the risks common to all blood products, including physiological reactions, processing errors and the potential risk of unknown blood-borne viral or prion diseases.

5.3 Implementing the guidance may help with optimal use of blood stocks and enable people from rare blood groups to continue to donate blood.

6 Sensitivity analysis

6.1 Several key assumptions have been varied to explore which has the greatest effect on the overall resource impact for this guidance. The full analysis can be found in the 'sensitivity analysis' section of the resource impact template.

6.2 The baseline price of the high-throughput non-invasive prenatal testing in the modelling is £24 per test. This leads to a resource impact saving of £0.4 million from year 3 onwards in England. We estimated that, if the price is reduced to £16 per test, the resulting resource impact savings will be £1.1 million from year 3 onwards.

7 Implications for commissioners

7.1 Implementation of the guidance may lead to a reduction in drug and test costs for the provider. The weighted average cost of anti-D prophylaxis is around £41 per treatment, and we estimated that 34,300 women would not need the treatment. The cost of testing

and treatment for a potentially sensitising event is around £162 per event. The model estimates that this intervention may no longer be needed for around 5,100 events per year.

7.2 Implementation will not result in any change for the commissioner. The standard antenatal maternity tariff (£1,057) will be paid for women who have not previously had rhesus isoimmunisation at the time of booking (2016/17 National tariff payment system).

7.3 High-throughput non-invasive prenatal testing for fetal RHD genotype falls within the programme budgeting category 18X maternal and reproductive health.