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NIPT in Europe: cost-saving screening for pregnant women

Background

Prior to 2011, prenatal aneuploidy screening options for trisomy 21 included measurement of serum markers and/or sonographic evaluation of the fetus.[1,2] These tests could also report a risk for trisomy 18.[1] The introduction of cell-free DNA (cfDNA)-based noninvasive prenatal testing (NIPT) created a new screening option and facilitated screening for a greater range of fetal aneuploidies (trisomies 21, 18, 13, and sex chromosome aneuploidies).[3] NIPT is now endorsed as a screening option for all pregnant women.[1,4-6] Although NIPT is more expensive than serum screening, it is cost saving, as shown below.

Finding the most cost-saving solution

While NIPT is an endorsed screening option,[1,4-6] professional societies recommend that diagnostic testing be done following any positive or failed screening test for confirmation.[6-8] Although these invasive diagnostic tests are necessary to confirm results, they're expensive.[9-11] Therefore, false positive rates (FPR), technical failure rates, and the costs associated with invasive confirmatory procedures need to be considered in cost modeling. Compared with a trisomy 21 FPR of around 5% with conventional screening approaches,[12-14] NIPT has a FPR of around 0.1%.[15] In Europe, NIPT is currently utilized primarily as a contingent screen, with NIPT offered to women with a serum screening determined risk over a certain threshold.

Studies found that utilizing NIPT as a second-line screen for trisomy 21 is cost saving at a price of €305–460.[10,11*]
As a first-line screen, one study found NIPT is cost-effective at a price of €254.[9]

0.1% FPR with NIPT

Reduction in need for confirmatory invasive procedures

Is cost saving at a price of €305–460

The verifi® Prenatal Test. Maximize cost savings with the lowest failure rate.

Of all the NIPTs, the verifi Prenatal Test offers the lowest reported technical failure rate,[16-20] substantially reducing additional costs associated with technical failures.[21] The failure rate of 0.1% is 10-fold less than that of other NIPTs on the market.

	100,000 samples 1:500 incidence T21	200 pregnancies with T21†	False-positive rate and failure rate of first-line screen (top 2 rows) or second-line screen (bottom 4 rows)	Potential number of unaffected invasive procedures	Potential costs of invasive procedures on unaffected pregnancies
First Tier Screening		verifi Prenatal Test[16]  > 199 detected	< 0.1% false positive + 0.1% assay failure →	 200 invasive	€175.7K
		Serum screen[12,14,22]  > 188 detected	~5% false positive + 0% assay failure →	 4990 invasive	€4395.3K
Second Tier Screening	5178 serum screen positive samples undergo contingent screening with NIPT 	Contingent verifi Prenatal Test[16]  > 188 detected	< 0.1% false positive + 0.1% assay failure →	10 invasive	€8.8K
		Contingent MaterniT21 PLUS[18]  > 185 detected	< 0.1% false positive + 1.3% assay failure →	 70 invasive	€61.5K
		Contingent Harmony Prenatal Test[20]  > 182 detected	< 0.1% false positive + 3.0% assay failure →	 155 invasive	€136.1K
		Contingent Panorama Prenatal Screen[19]  > 181 detected	< 0.1% false positive + 3.8% assay failure →	 194 invasive	€171.3K

NIPT and serum screening: Impact of false positive rates and test failures on the number and cost of invasive procedures for unaffected pregnancies. Theoretical example of the number of invasive procedures, and the associated total cost, for serum screening and for commonly used commercial NIPTs. Based on published cost estimates for invasive testing[9-11] and published failure rates.[16-20‡]

NIPT is cost saving for use in the general pregnancy population

Contingent NIPT proves to be cost saving in Europe—making it a viable prenatal screening option. Ultimately, in order to maximize cost-effectiveness in the general pregnancy population, the verifi Prenatal Test is the NIPT of choice.

Noninvasive prenatal testing (NIPT) based on cell-free DNA analysis from maternal blood is a screening test; it is not diagnostic. Test results must not be used as the sole basis for diagnosis. Further confirmatory testing is necessary prior to making any irreversible pregnancy decision.

* These studies modeled a pregnancy population undergoing prenatal screening, and determined at what NIPT price point first-line or second-line screening by NIPT was cost saving compared to traditional screening (measurement of serum markers with or without sonographic evaluation of the fetus). Modeling took into consideration: the risk-cutoff for offering NIPT (for second-line screening); the detection rates and false positive rates of the two screening options; costs of screening and diagnostic testing, current clinical practices in terms of screening uptake and termination rates. The per-patient, cost-saving price of NIPT reflects the total costs incurred by payers for the screening population divided by the number of patients being screened.[9-11]

† Affected pregnancies with a screening test failure were excluded from the number of detected T21.

‡ Assay failure rate for the Harmony test is based on next-generation sequencing studies and may not be consistent with actual test results achieved using the array-based Harmony test currently in use (published clinical experience data not available).

The verifi® Prenatal Test was developed by, and its performance characteristics were determined by Verinata Health, Inc. (VHI), a wholly owned subsidiary of Illumina, Inc. The VHI laboratory is CAP-accredited and certified under the Clinical Laboratory Improvement Amendments (CLIA) as qualified to perform high complexity clinical laboratory testing. It has not been cleared or approved by the U.S. Food and Drug Administration.

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