National Down's Syndrome Screening Programme for England

A Handbook for Staff

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UK National Screening Committee

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Contents

Abbreviations

AFP	Alpha-fetoprotein
CPA	Clinical Pathologists Accreditation
CVS	Chorionic Villus Sampling
DR	Detection Rate (sensitivity)
FISH	Floutescent in-situ hybridisation
FPR	False-Positive Rate (specificity)
hCG	Human Chorionic Gonadotrophin
MDA	Medical Devices Agency (MHRA - Medical and Healthcare Products Regulatory Agency)
NEQAS	National External Quality Assessment Scheme
NT	Nuchal Translucency
Q-PCR	Quantitative Polymerase Chain Reaction
NICE	National Institute for Clinical Excellence

Glossary

Affected individuals
Those individuals who are affected by the disorder for which they are being screened.

Amniocentesis
An invasive procedure performed transabdominally under ultrasound guidance whereby amniotic fluid is removed and sent for analysis.

Chorionic villus sampling
An invasive procedure performed transabdominally or transvaginally whereby placental tissue is removed and sent for analysis.

Combined test
First trimester test based on combining nuchal translucency measurement with free b-hCG, pregnancy-associated plasma protein A (PAPP-A) and the woman's age.

Dedicated co-ordinator
A named individual, usually a midwife, who is responsible for running a screening service, e.g. antenatal serum screening. The role would also incorporate audit, and the training of other healthcare professionals.

Detection rate
The proportion of fetuses affected by Down's syndrome which will be identified by a screening test or combination of screening tests.

Double test
Second trimester test usually based on the measurement of alpha-fetoprotein (AFP), human chorionic gonadotrophin (hCG – either free beta-hCG or total hCG), together with the woman's age.

Down's syndrome
A disorder caused by the presence of an extra chromosome (i.e. three instead of two) of chromosome No. 21.

False-negative
A pregnancy affected by Down's syndrome that was classified as low risk/screen negative.

False-positive
A pregnancy unaffected by Down's syndrome that was classified as high risk/screen positive.

False-positive rate
The proportion of women whose screening test result describes a level of risk high enough to warrant an invasive diagnostic procedure but whose fetus does not have Down's syndrome.

Fluorescent in-situ hybridisation (FISH)
A diagnostic test in which a chromosome-specific DNA probe is used on uncultured interphase cells from chorionic villi or amniotic fluid.

Follow-on diagnostic test
A procedure by which a diagnosis can be made after screening.

Gestational age
The duration of an on-going or completed pregnancy, measured from the first day of the last menstrual period (usually about two weeks longer than that measured from conception). Gestational age is usually measured in completed weeks, e.g. a pregnancy between 16 weeks and 16 weeks 6 days counts as a 16-week pregnancy.

Integrated test
The integration of measurements performed at different times of pregnancy into a single test result. Unless otherwise qualified, "integrated test" refers to the integration of nuchal translucency measurement and PAPP-A in the first trimester with the quadruple test in the second.

Karyotyping
Microscopic analysis of the number and type of chromosomes after blood sampling, amniocentesis, or CVS.

Markers
A biochemical substance found in a pregnant woman's serum, e.g. alpha-fetoprotein (AFP). Also known as analytes.

Multiple of the Median (MOM)
The serum marker concentration for a pregnant woman divided by the median concentration value for unaffected pregnancies of the same gestational age.

Nuchal translucency (NT) Measurement
An early ultrasound scan used to measure the thickness of fluid at the nape of the fetal neck. An increased amount of fluid may indicate that the fetus has Down's syndrome or another chromosomal, structural, or genetic anomaly.

Polymerase chain reaction (PCR)
A rapid diagnostic test for the most common chromosome abnormalities. Using a small sample of amniotic fluid, PCR amplifies and enables specific regions of the DNA molecule to be quantified from uncultured amniocytes providing a definitive diagnosis of Down's syndrome within 48 hours.

Prenatal diagnosis
A variety of invasive tests (biopsies) used in pregnancy to determine the chromosomal or genetic constitution of the fetus, e.g. amniocentesis.

Quadruple test
Second trimester test based on the measurement of AFP, uE3, free b-hCG (or total hCG), and inhibin-A together with the woman's age.

Termination of pregnancy (TOP)
The medical expulsion or extraction from the uterus of a fetus in the first, second, or third trimester of pregnancy due to a fetal chromosomal, genetic, or structural abnormality.

Threshold
The value of a screening variable that distinguishes screen negative/low risk from screen positive/high risk usually set at 1:250.

Triple test
Second trimester test usually based on the measurement of AFP, unconjugated oestriol (uE3), and hCG (either total hCG or free b-hCG) together with the woman's age.

Ultrasound probe
A hand-held device that is placed on the pregnant woman's abdomen when performing ultrasound.

Uptake rate
The proportion of women from the pregnant population that undergo screening.

Preface

Following the policy stated in the Model of Best Practice document issued from the Department of Health in November 2003 the second iteration of this handbook has been written for those who will need to develop their services to meet the requirements for the Down's syndrome screening programme of offering a screening test for all pregnant women. For those running an established programme this handbook can be used to check whether any improvements or changes could be made.

As the Down's syndrome screening programme develops, further iterations of the handbook will be produced, and include any future standards recommended by the UK National Screening Committee.

1.0 Background to Screening Programmes in the UK

1.1 The UK National Screening Committee

The UK National Screening Committee (UK NSC) was established in 1996 to advise Ministers of England, Northern Ireland, Wales and Scotland on screening issues. [1,2]

The work of the UK NSC is complementary with that of the National Institute for Clinical Excellence (NICE), the professional Colleges, and the Health Technology Assessment (HTA) panel.

The Antenatal Screening Sub-Group of the UK NSC reviews the evidence for the implementation or cessation of antenatal screening programmes. The conclusions are forwarded to the UK NSC for ratification. Both committees meet quarterly.

1.2 Management of screening programmes

In recent years, there has been a trend towards the active management of screening programmes at all levels in the NHS. For several screening programmes, there is now a Programme Director in post at central level to co-ordinate implementation in the NHS, and to oversee quality, e.g. as for the breast and cervical screening programmes. Management of the screening programmes is co-ordinated by the UK NSC and the Department of Health.

The management structure of UK national screening programmes is shown in Figure 1.1

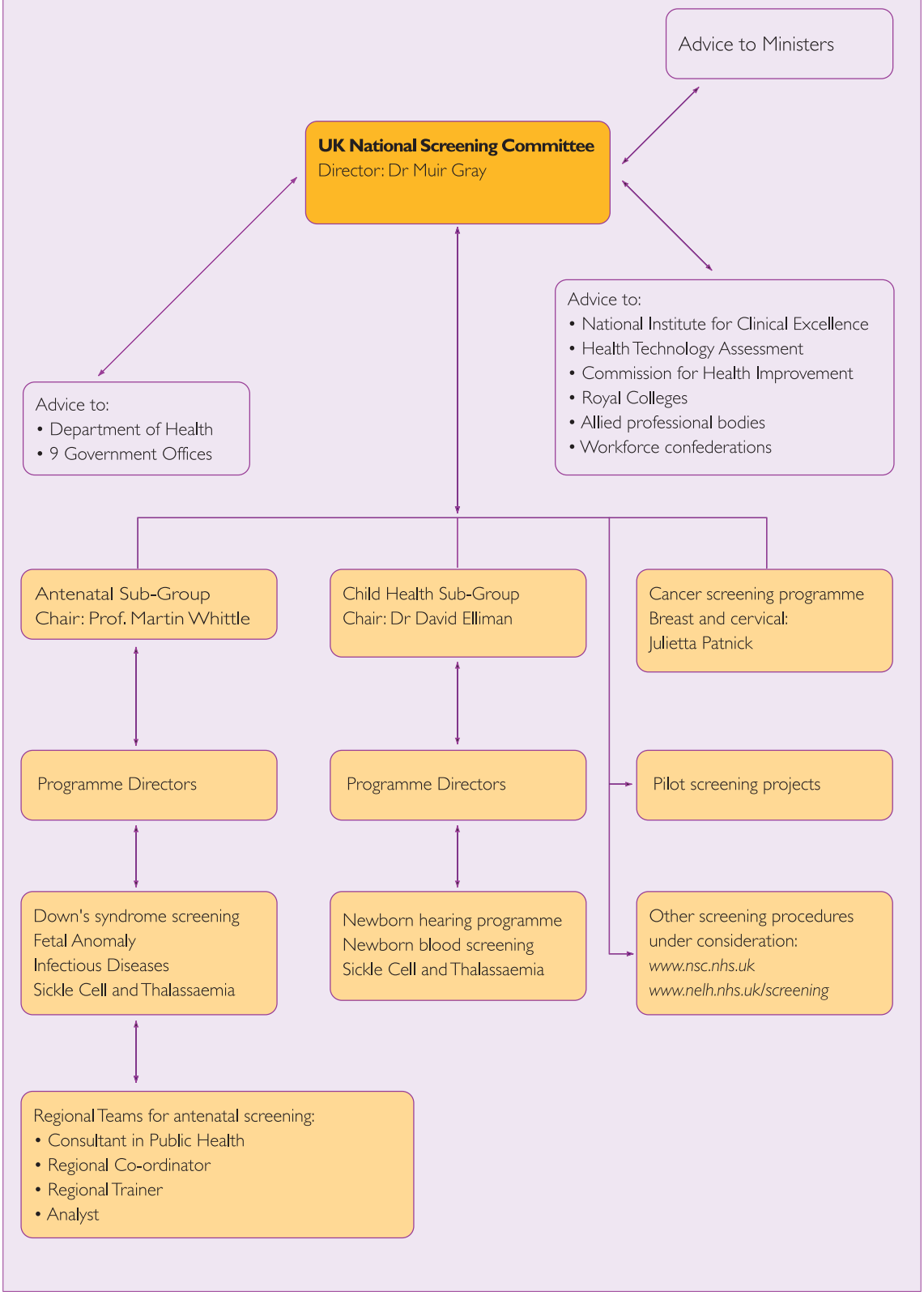
At present, in England, there are 9 regional antenatal screening teams comprising a co-ordinator, a trainer, and an analyst who work with the public health consultant assigned responsibility for leading on screening.

The role of the regional teams is:

- to ensure that information is communicated to staff working at the service level;
- to support the development of a programme that is equitable and of uniformly good quality.
- to disseminate and encourage good practice;
- to work with appropriate agencies to monitor and audit the quality of screening programmes.

For further information about the regional teams and what is happening in your area, contact your regional antenatal screening co-ordinator. (Appendix1)

Fig 1.1: The management structure of the UK national screening programmes



2.0 What is Screening

2.1 Definition

Screening is a public health service in which members of a defined population, who do not necessarily perceive they are at risk of, or are already affected by a disease or its complications, are asked a question or offered a test to identify those individuals who are more likely to be helped than harmed by further tests or treatment to reduce the risk of disease or its complications.

2.2 The risks and limitations of screening

There are important ethical differences between screening and clinical practice. In clinical practice, the person undergoing testing and treatment has sought help for a health problem knowing that testing and treatment may have side-effects and may not confer benefit. However, during screening, the health service targets apparently healthy people, only a small proportion of whom will benefit, with the aim of helping some individuals make better informed choices about their health. Although some screening programmes have the potential to save lives or to improve a person's quality of life through early diagnosis of serious conditions, in any screening programme, there is an irreducible minimum of false-positive results (people are diagnosed as having the condition when they do not) and false-negative results (people are diagnosed as not having the condition when they do). Thus, there is the potential to cause harm during screening, for example, a false-positive result can cause unnecessary anxiety. Therefore, it is important that the public have realistic expectations of the outcomes of participating in any screening programme.

2.3 The Antenatal and Newborn Screening Programme

Screening for Down's syndrome is one part of the Antenatal and Newborn Screening Programme which has three elements:

- fetal assessment;
- maternal assessment;
- assessment of the newborn.

3.0 Screening Policy

3.1 History

Maternal serum screening for Down's syndrome has been undertaken in the UK since the late 1980s following the publication of markers for Down's syndrome in 1984.[3] The results of the first demonstration project were published in 1992.[4]

3.2 Availability of screening for Down's syndrome

In 1998, the UK NSC mapped the provision of services relating to screening for Down's syndrome, and the infrastructure relating to antenatal screening in the UK. The results of this mapping exercise suggested that there were several areas of service provision that would benefit from improvement including:

- the equity of provision;
- accessibility to a quality screening programme;
- the need to introduce performance standards;
- the implementation of an infrastructure necessary to support the introduction of screening on a nationwide basis.

In 2000, the UK NSC commissioned a survey of services for Down's syndrome screening:[5]

- to identify the infrastructure available and that which would be necessary to deliver a co-ordinated screening programme;
- to identify and address any concerns within the NHS about such a programme.

The results have been used to develop a comprehensive co-ordinated service that conforms to performance management standards and is linked to a quality assurance programme.

The UK NSC have made recommendations for the introduction of a screening programme for Down's syndrome which was clarified in the Chief Executive Bulletin No. 84. This followed a press release from the Minster for Public Health in April 2001 stating that all women should be offered screening for Down's syndrome. Further guidance has been issued in the Genetics White Paper 'Our inheritance, our future' June 2003,[6] the NICE Antenatal Care Clinical Guideline October 2003 [7], and the Model of Best Practice document from the Department of Health, November 2003. Further guidance is expected in the forthcoming National Services Framework.

3.3 Evidence-based policy-making

The policy made in 2001 was known to be a basic policy founded mainly on experience. In anticipation of the publication of an HTA report on screening, a meeting was organised at the Royal College of Obstetricians and Gynaecologists on 2nd December 2002. In part because the SURUSS report had not been published by the time of that meeting, a paper was prepared based on the draft of the SURUSS report and other research which went through numerous iterations before being presented to both the Antenatal Screening Sub-Group of the National Screening Committee and the National Screening Committee itself in September 2003 (Appendix 2).

The paper presented was adapted in the light of comments and submitted to the Chief Medical Officer. On the basis of this paper a new policy – the Model of Best Practice – was produced (Appendix 3).

The key recommendations are listed on the next page (Box 3.1)

Box 3.1: Model of Best Practice for Providing Down's Syndrome Screening Services

Programme outcomes

- A detection rate of at least 60% with a false positive rate of 5% or less
  (Benchmark timeframe: By 2004/05)

- A detection rate of greater than 75% with a false positive rate of less than 3%
  (Benchmark timeframe : By April 2007)

Screening tests

The current evidence suggests that the following tests are acceptable, meet the above outcomes, and they are recommended (subject to paragraphs 3 to 5 below).

- The quadruple test for women who attend for screening in the second trimester. A second trimester test will always be required to accommodate women who present after the first trimester.
  (Benchmark timeframe: By 1 April 2005)

- The serum integrated test which is potentially the best test if nuchal translucency (NT) measurement is not available.
  (Benchmark timeframe: By 1 April 2005)

- The combined test, NT measurement by ultrasound screening plus serum tests, for women who request screening in the first trimester and understand the implications of doing so.
  (Benchmark timeframe: By 1 April 2007)

- The integrated test which provides better performance than the combined test if good quality NT measurement is available and the woman is prepared to wait until the second trimester for the results.
  (Benchmark timeframe: 1 April 2007)

Performance measures

To ensure that the measurement of performance, quality assurance and decision-making are consistent nationally, all performance measures should be age-related and based on a cut-off of 1 in 250 at term.

4.0 The Screening Programme

4.1 Developing screening programmes

A screening programme is a set of services which are co-ordinated and offered to defined populations. The defined population has to be established locally and is usually based on one or more than one obstetric unit. Steps are being taken to ensure that all programmes have clearly defined populations. An antenatal and newborn screening programme may serve one, or more than one, primary care trust. Conversely the primary care trust may have its population covered by one or more than one programme.

The overall aim of the programme is to offer all pregnant women choices in their care and management of the pregnancy. Support should be given for all decisions that women make within this screening programme, with time allocated to ensure they can make a fully informed decision.

4.2 Objectives, criteria and standards

Like all screening programmes, the Down's Syndrome Screening Programme has an aim to offer women and their partners choice; it also has a set of objectives, criteria to measure progress towards those objectives, and standards.

Standards have been developed to guide the service in reaching a quality assured programme. These will be reviewed on an annual basis and developed as the service changes. These should be referred to when developing and operating a service. Standards have to cover both the management and performance of the programme (Appendices 4 and 5).

4.3 Management standards

As well as assessing the programme itself, it is also appropriate to assess the infrastructure on which both Down's syndrome screening and antenatal screening as a whole is based, and a set of standards, approved by the Antenatal Screening Sub-Group of the National Screening Committee, is also set out in Appendix 6.

5.0 Down's Syndrome Screening Services

5.1 Identifying, inviting and informing women

The first step in the process is to identify pregnant women and all antenatal care is better the earlier the confirmation of pregnancy and contact with the midwife takes place. Steps are being taken within the Antenatal Screening Programme as a whole to increase the proportion of women identified.

In the development of the Down's Syndrome Screening Programme, a leaflet was developed to present options to women in a balanced way. This leaflet has been sent to all units.

The National Programme is also developing training material for professionals. This is already available as a stand-alone programme but it will also be integrated with other training resources for midwives, primary care professionals, and obstetricians.

5.2 Screening procedures

There are two methods of initial screening for Down's syndrome:

1. serum screening, the most common method being biochemical;
2. ultrasound screening.

For both methods, it is necessary to use software to estimate the risk of a woman having a Down's syndrome pregnancy from the results.

5.2.1 Biochemical screening

Different methods of serum screening have been developed. The most common method of serum screening is biochemical. A blood sample is taken from the pregnant woman between 10 and 20 weeks' gestation and tested for various proteins and hormones, usually in combination. The most common combination used in the second trimester is alphafetoprotein (AFP) and free beta-human chorionic gonadotrophin (beta-hCG); a combination used less frequently is that of unconjugated eostriol (UE3) and Inhibin A. The National Screening Committee is awaiting the outcome of a feasibility study before fully recommending the use of Inhibin A. It is expected that this will report at the end of 2004.

Biochemical screening can also be undertaken during the first trimester of pregnancy between 10 and 14 weeks' gestation, when the combination used is free beta-hCG and placenta associated plasma protein A (PAPP-A).[8]

5.2.2 Ultrasound

There have been significant developments in using ultrasound techniques as a screening tool for Down's syndrome. During the first trimester of the majority of pregnancies, it is possible to measure the size of the fluid area at the back of the fetus's neck, known as the nuchal translucency (NT). The increasing size of the NT indicates a greater risk of the fetus having Down's syndrome.[9]

Both biochemical and ultrasound screening methods can be combined to give a better detection rate. This is the suggested way forward for screening in England where sufficient resources have been identified.

NT is the only marker that should be used. Measurement of other markers, including the nasal bone, should be done only in the context of an ethically approved research project.

5.3 Interpretation of results from initial screening procedures

The results of one or both initial screening procedures are entered into a software programme which calculates the risk for a woman of having a child with Down's syndrome at her present age. This risk is calculated in relation to that of the population covered by the programme. The levels of risk associated with having a Down's syndrome pregnancy in relation to a woman's age are shown in Table 5.1.

Table 5.1: Levels of risk of having a Down's syndrome pregnancy in relation to a woman's age

Woman's age (years)	Risk as a ratio	% risk
20	1:1500	0.066
30	1:800	0.125
35	1:270	0.37
40	1:100	1.0
45 and over	1:50 and greater	2.0

If the risk is greater than 1 in 250, it is judged to be within the higher risk category. In such cases, it is necessary to offer the woman a further procedure to establish the diagnosis.

About 5% of all pregnant women undergoing screening will have a high-risk result, and need to be offered a follow-on diagnostic procedure such as amniocentesis or chorionic villus sampling. However, the percentage of women who undergo such procedures is slightly lower than 5% because not all women who have a high-risk result want to be subjected to an invasive procedure. It is one of the aims of the programme to lower the number of women who are offered an invasive diagnostic test by improving the specificity of the screening tests.

To ensure that interpretation of the results from the initial screening procedures is as accurate as possible, it is essential to establish the date of the pregnancy. This need for accuracy underlines the importance of women having an early ultrasound scan to date the pregnancy.

5.4 Follow-on diagnostic procedures

If the pregnancy is beyond 15 weeks' gestation, the follow-on diagnostic procedure is amniocentesis; if the pregnancy is of less than 13 weeks' gestation, the follow-on diagnostic procedure is chorionic villus sampling (CVS).

The sample from amniocentesis or CVS is sent to a cytogenetics laboratory to be cultured. Karyotyping of the sample can also reveal other chromosomal aberrations that were not anticipated. It can take up to 3 weeks before the results of the follow-on diagnostic procedure are available. Both of these diagnostic procedures carry a risk of miscarriage, quoted as 2% for CVS and 1% for amniocentesis by most hospitals.[10] Quantitative fluorescent polymerase chain reaction (QFPCR) and fluorescent in situ hybridisation (FISH) are techniques which allow rapid diagnosis of the sample, usually within 48 hours.
The contribution that PCR testing has to make will be decided by the NSC early in 2004.

5.4.1 Detection rate

The detection rate for Down's syndrome pregnancies varies depending on the combination of tests used. Following the Model of Best Practice Document it is anticipated that more than 75% of women in the screening programme who have affected fetuses will be identified by 2007.

5.4.2 Termination of pregnancy

From the results of published studies, it would appear that 90% of women who have a definitive diagnosis of Down's syndrome in their fetus choose to terminate their pregnancy. Termination can occur late in the pregnancy (at 24 weeks' gestation) if the initial screening procedure was undertaken at about 20 weeks' gestation. [11]

However, whenever possible women would be encouraged to undergo screening and diagnosis as early as possible to avoid late decision-making.

5.5 Pathways through the screening process

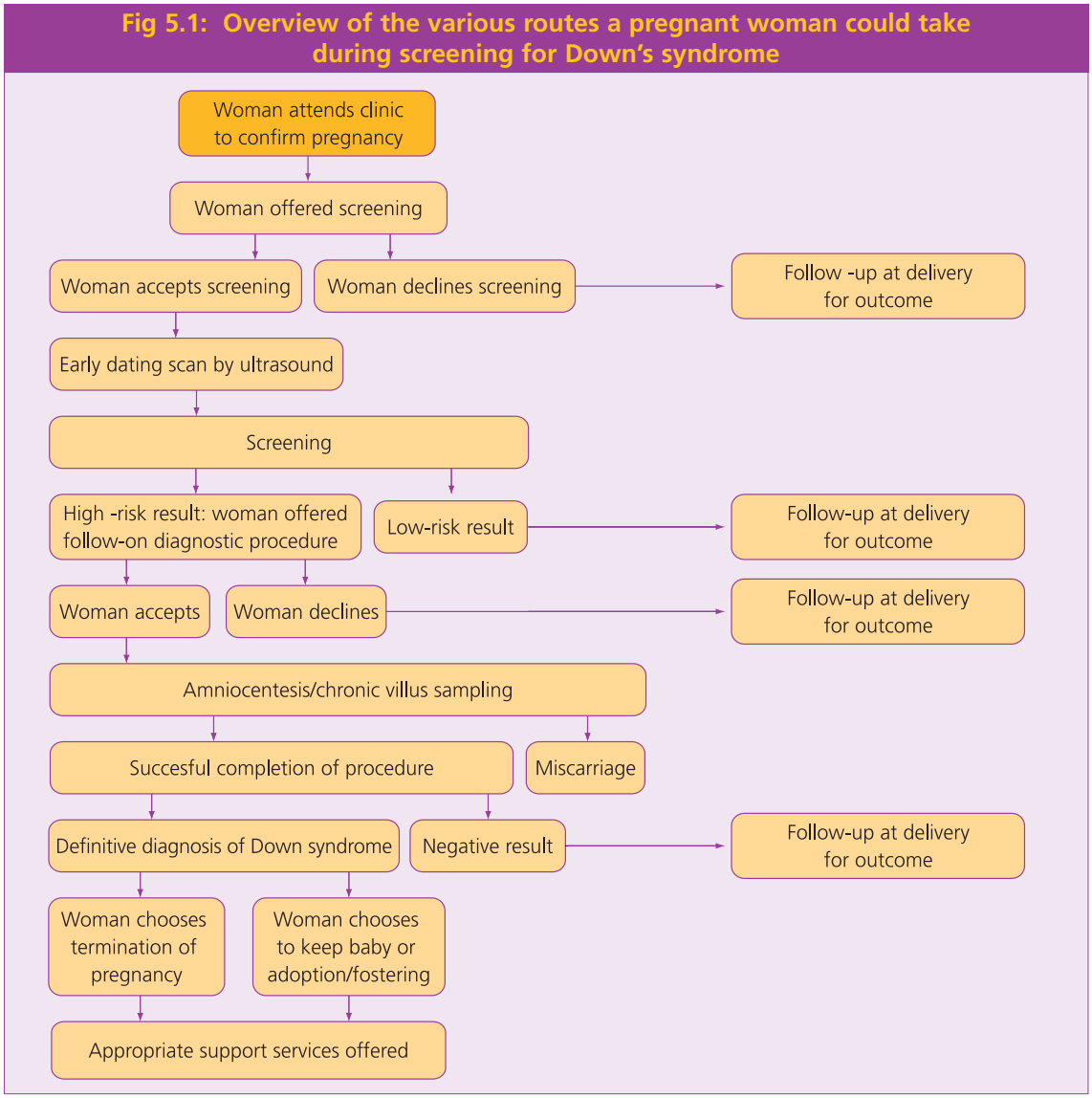
The main pathways that a pregnant woman could take through a Down's syndrome screening programme are outlined in Figures 5.1 to 5.5. However, these diagrams are only a guide; practice may vary from hospital to hospital due to differences in policies and protocols.

In Figure 5.1, an overview of the various routes a pregnant woman could take through the screening process is shown. In Matrix 5.1, the various sectors and services involved in the Down's syndrome screening programme are shown in relation to the main roles they perform. This matrix highlights the large number of people that a pregnant women undergoing screening will see within a relatively short space of time.

Figure 5.1 and Matrix 5.1 are followed by a series of flowcharts, Figures 5.2 to 5.5. Each flowchart is focused on a particular part of the screening process, and outlines prompts for action by staff involved in the programme, and any key standards that need to be achieved in relation to these actions.

In Figure 5.2, we show the events leading up to and immediately following the offer of an initial screening procedure for Down's syndrome. In Figure 5.3, we show the events following the report of a high-risk result. In Figure 5.4, we show the events following the decision by a woman to accept a follow-on diagnostic procedure. In Figure 5.5, we show the events following a definitive diagnosis of Down's syndrome.

Fig 5.1: Overview of the various routes a pregnant woman could take during screening for Down's syndrome



Matrix 5.1	Woman attends to confirm pregnancy: offered screening	NT/Early dating scan/biochemical screening booked	High-risk result	Amniocentesis/ CVS	Termination	Keep baby	Fostering/ adoption
Primary care	√	√	√		√	√	√
Secondary care		√	√	√	√	√	
Tertiary care					√	√	
Regional cytogenetics				√			
Social services						√	√
External support agencies/ organisations			√		√	√	√

Figure 5.2: For women who accept screening, the ultrasound dating, nuchal translucency and biochemical screening pathway

Event	Prompt	Standard
Woman attends clinic (GP/midwife) to confirm pregnancy before 20 weeks' gestation	• Provide leaflet and verbal information on screening tests available • Arrange ultrasound dating scan/NT • Complete blood test form and scan form • Document whether form given	• Sufficient time allowed for woman to read leaflet and seek further information if necessary
Woman attends for ultrasound dating scan/NT	• Insert ultrasound dates and NT measurements of pregnancy in obstetric notes • Keep a record in ultrasound department • Give the woman date for biochemical screening test	• All women to have a dating scan prior to undergoing screening test
Woman offered biochemical screening test	• Document whether screening test accepted or declined • If accepted, send blood sample to laboratory • Keep a record of blood taken in antenatal clinic for audit trail	• Conform to local phlebotomy policy arrangements
Results of screening test	**Result shows low risk** • Return report to requester • Document result in obsteric notes • Inform woman of result **Result shows high risk** • Laboratory returns result to requester • Laboratory notifies screening co-ordinator or deputy	• Within 7 days of test • As soon as possible • At next antenatal clicic or sooner • Within 7 days of test • Within 3 working days

Figure 5.3: Pathway after a high-risk result from the initial screening procedure

Event	Prompt	Standard
Resluts show high risk		
Co-ordinator takes responsibility in agreement with clinician	• Document action of taking responsibility • Check ultrasound scan dates correct • Make appointment for woman and partner to attend consultant clinic session for further information • Inform GP and community midwife of result and appointment with consultant	• Appointment to be within 7 days of receipt of result by the coordinator
Midwife contacts woman	• Give woman the result • Give date for attendance at consultant clinic • Give woman contact telephone number in case of further questions	• All women should be given telephone number of community midwife or screening co-ordinator; if number of community midwife given, midwife to have access to immediate specialist support if needed
Woman and partner attend clinic	• Discuss result of test • Document outcomes of discussion • Offer follow-on diagnostic procedure • Document woman's decision • Inform GP and community midwife	• All women should be able to discuss result with consultant or screening co-ordinator • Sufficient information must be provided to empower woman and partner

Figure 5.4: Pathway after a woman accepts a follow-on diagnostic procedure

Event	Prompt	Standard
Woman accepts follow-on diagnostic procedure	• Arrange appointment for follow-on diagnostic procedure	• Within 7 days of woman's acceptance of the offer
Woman attends for follow-on diagnostic procedure	• Perform diagnostic procedure • Document procedure in obstetric notes • Agree with woman when and in what way she will receive the result	• Procedure to comply with guidance from RCOG and under ultrasound guidance

Figure 5.5: Pathway for women who have a definitive diagnosis of Down's syndrome

Event	Prompt	Standard
Definitive diagnosis received by specialist co-ordinator and clinician	• Report diagnosis to consultant obstetrician • Make an appointment for woman to see consultant	• As soon as possible
Definitive diagnosis communicated to woman	• Communicate diagnosis to woman by method agreed at clinic • Inform GP and community midwife of positive diagnosis • Give woman date for consultant appointment	• All women receive result according to method agreed previously. Consider option of informing woman at home
Woman and partner attend consultant appointment	• Discuss options available, including follow-on support • Document decisions	• Sufficient time given for woman and partner to make decision

6.0 Governance of the Programme

6.1 Governance arrangements

These have to be clearly established within each programme, namely everyone who has a responsibility needs to ensure that they are aware of the other individuals who carry complementary responsibilities:

- the responsibility for the quality of a service rests with the service manager;
- the responsibility for the quality of a programme rests with the person defined as being the programme manager, who will usually be one of the service managers;
- for quality assurance, namely for preventing errors, for dealing with errors when they occur, and for continuous performance improvement, rests with the programme and service managers;
- the responsibility for managing quality assurance systems currently rests with Regional Directors of Public Health which they discharge through the antenatal screening co-ordinators;
- the responsibility of a Director of Public Health for a Primary Care Trust is to ensure that their population is covered by a programme or programmes of adequate quality;
- the responsibility of a Medical Director for a Strategic Health Authority is to ensure that these arrangements are in place and that specialise commissioning is undertaken where appropriate;
- the responsibility of a Regional Director of Public Health is to ensure that quality assurance systems are well managed.

Following the ministerial announcement that Down's syndrome screening is to be made available to all women by 2004, it is vital to ensure that clear lines of accountability for the screening programme are established at all levels in the NHS. At a local level, the need for accountability will apply not only to services for Down's syndrome screening that are already established but also to those that need to be developed to meet the requirement that all women are offered at least a double test as specified in the Model of Best Practice Document.

6.2 Clinical governance

Government policy to improve quality and accountability in the NHS is set out in the clinical governance framework, available at:
www.doh.nhsweb.nhs.uk/nhs/clingov.htm

The key strategies for quality improvement are:

- establishing clear lines of accountability for the overall quality of clinical care;
- developing a comprehensive programme of quality improvement initiatives;
- developing clear policies aimed at managing risk;
- establishing procedures to enable all professional groups to identify and remedy poor performance.

The principles of clinical governance can be applied to the introduction and development of a Down's syndrome screening programme.

6.3 Setting up a clinical governance board

One of the mechanisms by which it is possible to assure the quality of any service or programme at a local level is to establish a clinical governance board, comprising representatives of all stakeholders. Establishing a clinical governance board to oversee antenatal screening should be the first priority for those planning and implementing a screening programme for Down's syndrome. When setting up a clinical governance board, it is necessary to consult with the relevant Trust(s) about the screening programme, and the implications for service provision.

The clinical governance board should be accountable for all the managerial and operational aspects of the antenatal screening programme. Quality assurance of the programme should also be part of the board's remit (Box 6.1).

Box 6.1: Remit of a Clinical Governance Board

- To ensure equality of access to antenatal screening for all women as suggested by the guidance from the Department of Health and the UK National Screening Committee.
- To develop local policies and protocols in conjunction with published recommendations.
- To produce an annual report for the hospital Trust board and Strategic Health Authority on antenatal screening services, in particular those screening programmes which are part of present directives from the Department of Health. The report should include uptake rates for the programme, sensitivity and specificity of the tests offered, and an assessment of women's views.
- To be able to change-manage effectively any aspects of the programme to improve quality.

The chair of the board should preferably be a lead clinician, supported by a programme manager. Key stakeholders are:

- GP;
- midwife – hospital and community;
- consultant obstetrician;
- biochemistry department;
- ultrasound department;
- user group representative;
- fetal maternal medicine, if applicable;
- Chaplaincy department;
- screening midwife, specialist midwife/co-ordinator;
- PCT or PCTs' representative.;
- Programme Manager.

The remit of the programme manager is to take appropriate decisions on a daily basis and report any operational problems to the board for decision-making about remedial action. The role of the programme manager is set out on the next page (Box 6.2).

Box 6.2: Suggested job description for programme manager

Title:	Antenatal screening co-ordinator/programme manager
Grade:	Specialist midwife/nurse level
Qualifications:	
Minumum:	Registered Midwife/Nurse 3 years post-registration experience
Desirable:	A qualification in basic counselling A qualification in basic teaching A qualification in basic genetic counselling management Level 1
Reports to:	Clinical lead for antenatal screening programmes.
Accountable to:	Clinical Governance Board for antenatal screening.
Professionally accountable to:	Head of Midwifery services.

Summary of role

To ensure the provision and continued effectiveness of a user-centred antenatal screening and diagnosis programme for the hospital Trust by enacting the decisions made by the Clinical Governance Board, and acting as a co-ordinator between those involved in providing the programme and those receiving the programme.

Function and responsibilities

- To act as a specialist in the field of antenatal screening and diagnosis, assisting and advising other healthcare professionals in the care of women undergoing testing.
- To provide a counselling/information service to women undergoing such eating.
- To liase with appropriate departments and external support agencies to ensure a rapid and co-ordinated response following prenatal testing and diagnosis congruent with the wishes of the woman and her partner.
- To monitor, audit and maintain registeres as appropriate for the antenatal screening services.
- To assist in developing the programme in the light of new research and guidance.
- To ensure that the programme meets locally agreed policies and protocols as well as nationally set standards and guidance.
- To report any possible risks or critical adverse incidents arising from the screening programme to the clinical governance board and to act to manage them accordingly.
- To develop and participate in the education and training needs of all health professionals involved in the programme.
- To develop and maintain appropriate documentation systems for the programme.
- To produce an annual report about the screening programme for the clinical governance board, and hospital trust board, including information on the uptake of tests, sensitivity and specificity, and women's views on the programme.

The programme manager may have a dual role as the screening co-ordinator. The UK NSC recommends that a person be appointed to co-ordinate the Down's syndrome screening programme at a local level, who will have daily responsibility for assuring quality according to the operational standards set by the clinical governance board. Secretarial support is integral to the capacity not only to deliver the screening programme, but also to monitor, audit, and feed back results on performance.

Lines of accountability and support for the Down's syndrome screening programme at all levels of the NHS. The Strategic Health Authorities (StHAs) are responsible for monitoring the performance of NHS Trusts, and this responsibility should include quality assurance of the screening programme at Trust level.

This general mechanism of accountability for the Down's syndrome screening programme can also be used as a model for other antenatal screening programmes as they are implemented.

7.0 Commissioning for the Development and Implementation of the Screening Programme

The key events and timescales involved in the development and implementation of a Down's syndrome screening programme, are shown in Figure 7.1.

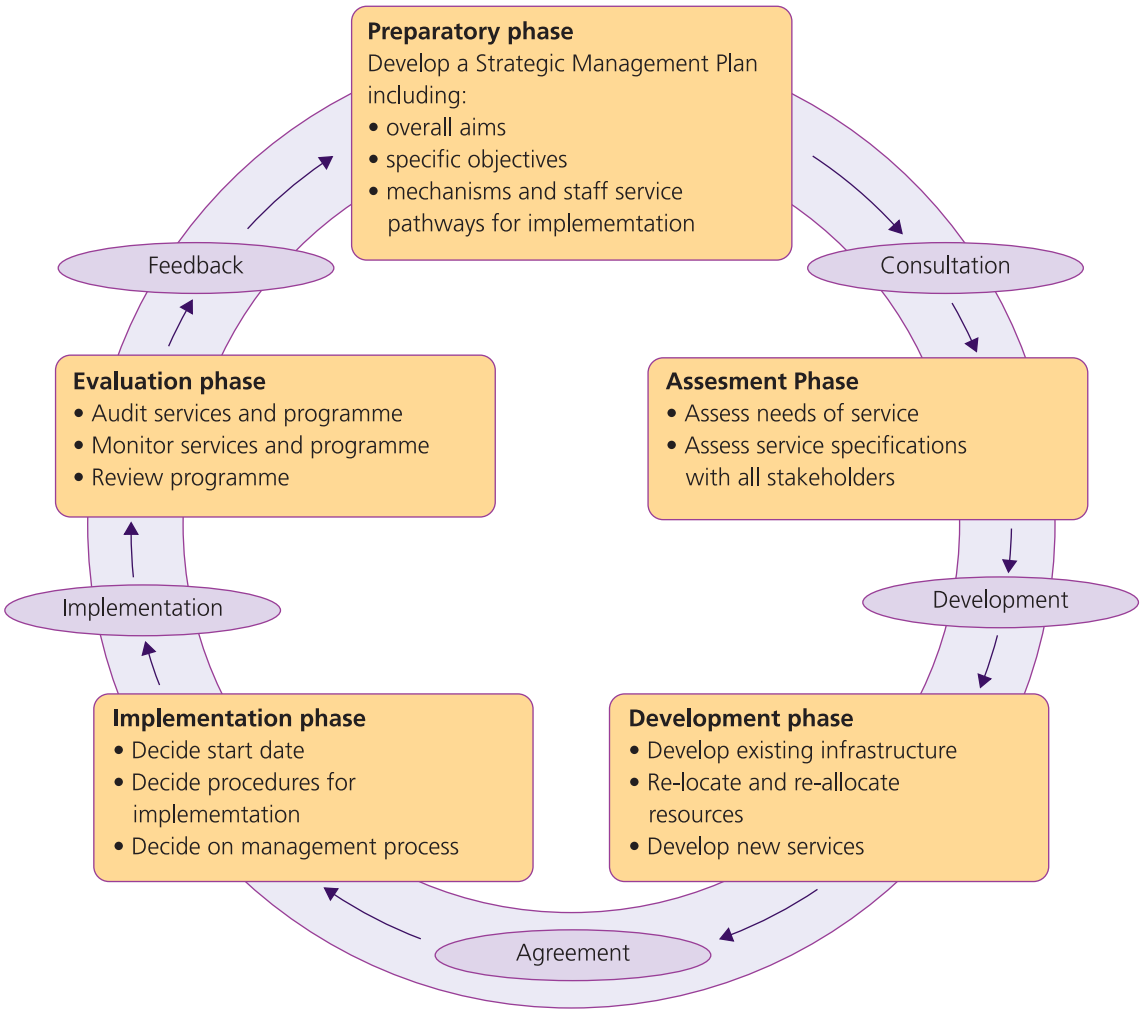
Figure 7.1: Time sequence for the development and implementation of a Down's syndrome screening programme

	Month											
Action	1	2	3	4	5	6	7	8	9	10	11	12
Setting up a Clinical Governance Board												
Consultation of stakeholders												
Assessment of current infrastructure												
Identification of new, and re-allocation of, resources												
Staff training												
Implementation of screening programme												

The process involved in commissioning any service or programme is shown in Figure 7.2. This process is applicable to the introduction and development of a Down's syndrome screening programme. There are five main phases in commissioning:

- preparatory phase;
- assessment phase;
- development phase;
- implementation phase;
- evaluation phase.

Figure 7.2: Cycle of commissioning



7.1 Preparatory phase

The development of a plan is fundamental to the preparatory phase.
In this plan, it is important to identify:

- the overall aim of the programme;
- the specific objectives to be reached;
- the pathways to achieve the aims and objectives;
- the standards which need to be reached.

The plan should also include:

- the way in which the programme is to be delivered;
- what services are to be involved, or need to be developed;
- mechanisms to ensure that service providers can deliver to the service specifications;
- which resources need to be re-located and which need to be re-allocated to support the delivery of the programme;
- tools for monitoring and audit;
- a process for change management and the implementation of improvements to the programme.

7.2 Assessment phase

The delivery of any antenatal screening programme, including one for Down's syndrome, is dependent on the effective collaboration of all sectors in the NHS - primary, secondary, and tertiary – and of many stakeholders (see Box 7.1).

Box 7.1: Stakeholders involved in an antenatal screening programme

- **Primary care:**
  - midwives;
  - GPs;
  - practice nurses;
  - patient representatives.
- **Secondary care:**
  - clinicians;
  - hospital midwives;
  - laboratory departments;
  - ultrasound;
  - cytogenetics;
  - labour/gynaecology ward.
- **Tertiary care:**
  - regional fetal medicine centre;
  - regional cytogenetics centre.
- **External support agencies and social services**
- **Primary Care Trusts**
- **Strategic Health Authorities**
- **Regional Offices**
- **National Programme Centre**

During the assessment phase, it is vital:

- to identify the infrastructure and services already in place;
- to conduct a gap analysis of current service provision.

This task should be a joint initiative among all stakeholders, under the auspices of the clinical governance board, the results of which should be made available.

In assessing the requirements for implementing a screening programme for Down's syndrome, the development needs of all stakeholders should be taken into account because the development of one sector/service is likely to have significant implications for the workload in another. Failure to take an holistic view of the development needs for the whole programme could result in some sectors/departments not being able deliver a service according to specification.

To ensure that a comprehensive and effective screening programme is implemented, it is necessary to write a commissioning strategy in which the services and resources that are already available are identified as well as those that need to be developed are outlined. If new services are required, a cost analysis should be undertaken for the commissioning strategy.

During the assessment phase, services in the following sectors need to be considered:

- inviting, informing and involving women (Section 7.2.1);
- screening tests (Section 7.2.2);
- diagnostic services (Section 7.2.3);
- external support agencies or organisations (Section 7.2.4).

7.2.1 Inviting, informing and involving women

The services and facilities in primary care it is necessary to assess are:

- arrangements for the dissemination of information to all GPs and midwives through various communication routes, including verbal, written, and audio; the National Programme produces a validated leaflet for women;
- access to phlebotomy;
- portering services to laboratories for serology testing;
- an IT system for the documentation of the offer of an initial screening procedure and the decision made by the woman;
- audit IT facility and connectivity to the hospital maternity system including laboratories.
- arrangements for rapid reporting of results to the women being screened;
- access to appropriate diagnostic services at the relevant stage of the pregnancy.

7.2.2 Screening tests

It is necessary to assess the following services and facilities in secondary care:

- laboratory facilities for undertaking biochemical screening for Down's syndrome (see Box 7.2);

Box 7.2: Important factors to assess in relation to laboratory services

- A consultant biochemist should be identified for accountability.
- The staffing level of Medical Laboratory Scientific Officers (MLSOs) in relation to the number of biochemical screening tests that will be performed.
- The amount of analysing equipment that will be required, including capital and revenue costs. The need for interpretative software which is CE marked.
- Adherence to standards set by the National Screening Committee and Colleges.

- arrangements for the rapid return of results from the initial screening procedure;
- ultrasound facilities for undertaking dating of pregnancies and nuchal translucency screening. (see Box 7.3);
- access to a specialised midwife to support patients and staff;
- clerical staff to support the programme;
- IT support facilities for audit purposes.

Box 7.3: Important factors to assess in relation to ultrasound services

- Appropriate staffing levels, particularly those qualified to undertake ultrasound
- Training for undertaking nuchal translucency measurement
- The equipment and facilities required
- The capital and revenue costs of any new equipment and facilities
- The capacity of staff to produce, distribute, and archive the results
- Adherence to the standards set by the National Screening Committee and Colleges.

7.2.3 Diagnostic services

In diagnostic services it is necessary to assess the following services and facilities:

- access to an obstetrician for follow-on diagnostic procedures within 7 days of obtaining a high-risk result from the initial screening procedure;
- support and counselling for women and their partners who receive high-risk results;
- arrangements for the safe and rapid transport of diagnostic specimens to the appropriate laboratory;
- monitoring of the diagnostic programme, including detection rates, false-positive rates, and uptake rates;
- training and education of all health professionals;
- access to facilities for the termination of pregnancies, and for follow-on support for the women involved;
- access to agencies that can support women who decide to continue their pregnancy after a definitive diagnosis of Down's syndrome;
- a system of reporting to the clinical governance board, the hospital Trust board, and the Strategic Health Authority on the quality of the programme;
- a quality assurance system designed to meet national guidance and any standards that might be developed.

In genetic diagnostic laboratory services, the facilities to be assessed in tertiary care are;

- access to a regional molecular cytogenetic department able to undertake karyotyping and, if required, QFPCR or FISH;
- ability to refer to a regional fetal medicine centre and a regional genetics centre in cases of differential diagnosis;
- arrangements for the rapid return of test results to the requester, and to the woman concerned;
- an audit process to monitor the time taken to report the test results to the requester, and to the woman concerned;
- IT facilities to support audit;
- linking with the National Down's Syndrome Cytogenetic Register to facilitate national audit.

7.2.4 External support agencies or organisations

Support from agencies or organisations external to the NHS may be available in your area. Their views should be sought as to their capacity to support a Down's syndrome screening programme locally. Discussions should be held to determine whether these organisations can support parents through various stages of the screening programme. For a list of external support organisations, see Box 7.4.

Box 7.4: External support agencies or organisations

- local and national parent support groups
- Spiritual and pastoral care services
- Social services and, in particular, community paediatric support
- Miscarriage support groups
- National support agencies such as Antenatal Results and Choices (ARC)
- The Down's Syndrome Association
- Local disability groups

7.3 Development phase

Once the strategic aims for the programme have been set, and an assessment of current service provision has been made, it is necessary to consider the services and systems that need to be developed before the programme can be implemented.

During the development phase, it is necessary to appoint a lead person as screening co-ordinator/programme manager (who will probably be a midwife or specialist nurse):

- to undertake counselling of women who have received a high-risk test result;
- to be responsible for the training and education of health professionals involved in the screening programme.

It is likely that this lead person will also be responsible for co-ordinating the Down's syndrome screening programme in smaller maternity units.

Contingency plans should be made for full provision of these functions during:

- absences of the lead person due to sickness or annual leave;
- changes in personnel.

Another important function for the lead person to undertake during the development phase is to establish mechanisms and develop tools for monitoring and evaluation of the Down's syndrome screening programme. This will include ascertaining parents' views on the quality of the local programme.

7.3.1 Midwifery services and primary care

In a Down's syndrome screening programme, one of the main demands on midwifery services/primary care will be the need to counsel women and their partners. Therefore, the education and training needs of GPs and community midwives requires careful consideration during the development phase to ensure that, following implementation, time for counselling is utilised to its fullest, and accurate, good-quality information is given to women and their partners.

To this end, all staff should have access to information aids in various formats to give to women in order to supplement that communicated verbally, for example, leaflets, books, videos, and audio aids. The nature and content of these information aids should be considered during the development phase. It is also important to consider producing information aids in languages other than English depending on the proportion of women from different ethnic minority groups in the local population. A national leaflet is available for Trusts to use and is provided free of charge.

In terms of workload, the amount of time to counsel women undergoing screening for a Down's syndrome pregnancy should not be underestimated. It usually takes about 20-30 minutes per session.

7.3.2 Laboratory services

It will be necessary to develop laboratory services in accordance with the findings from the assessment phase.

During the development phase, it is important to ensure that:

- staff have been given the appropriate training to undertake biochemical screening;
- the equipment used, and its location, comply with European and national regulations;
- the equipment and facilities available are sufficient to deliver the service to specification;
- interpretation software complies with the EU directive of CE marking.

In addition, the laboratories involved need to demonstrate that they:

- participate in an external quality assurance scheme, such as a NEQAS scheme, for Down's syndrome screening;
- are accredited under the Clinical Pathology Accreditation Ltd. (CPA) scheme.

Before the implementation of the screening programme, it is necessary to establish median levels for the analytes chosen for the biochemical screening service using samples from the local population, against which the results from individual women will be interpreted once the screening programme has been implemented. The time necessary to establish these median levels must be taken into account during the development phase. However, it is also important to discuss the method of establishing the medians, including any ethical issues involved (i.e. the need to obtain consent), and have a policy agreed with all stakeholders before the process is undertaken. At present laboratories should handle a minimum of 5,000 specimens annually to meet the NSC standard. This is being reviewed. Overall audit of the programme would be set at around 25,000 pregnancies.

7.3.3 Ultrasound services

The requirement to undertake an early ultrasound scan to establish the date of pregnancies will have implications for the workload of ultrasound services. Therefore, it will be necessary to develop the service in accordance with the findings of the assessment phase.

It is essential to ensure that sufficient time is allowed during the development phase:

- for staff to familiarise themselves with operational practices and requirements;
- to develop a quality assurance mechanism for dating pregnancies.

If a nuchal translucency screening service is to be introduced, it is necessary:

- to allocate adequate time for staff training;
- to develop a quality assurance mechanism;
- ensure the service adheres to the appropriate standards set by the NSC and Colleges.

7.3.4 Diagnostic services

During the development phase, it is necessary to estimate the number of consultant and of registrar sessions that will be required for women to receive counselling and follow-on diagnostic procedures.

The potential demand for clinical services can be calculated from the false-positive rate (intervention rate), which is usually taken as 5% of the number of women undergoing screening if the screening programme offers at least a double test to all women. In practice, the figure will be slightly less because not all women decide to undergo the follow-on diagnostic procedure.

Consideration needs to be given to the availability of ultrasound facilities as recommended by the Royal College Obstetricians and Gynaecologists' guidelines on invasive diagnostic procedures *(www.rcog.org.uk).*

It is vital to develop a telephone helpline facility for women and their partners, which should be publicised on any information aids being produced (see Section 7.3.5.1).

7.3.5 Information about the screening programme

7.3.5.1 For women and their partners

A leaflet for women and their partners should be designed and printed in readiness for the implementation phase. Examples of leaflets are available at: *www.nhs.nelh.uk/screening*

In fact, the collation of an information pack for women and their partners to take home would be useful because it allows them time to assimilate the contents and consider fully the implications of any decision they might reach. It would be helpful if this pack included various website addresses.

However, printed matter should not be the only method of providing information. As a priority, consideration should be given to developing a website, featuring the screening programme for the hospital. The website address should be publicised widely to women and their partners. If possible, incorporate a comments box on the website in order to obtain feedback about the programme.

7.3.5.2 For staff

The information needs of all staff involved in the Down's syndrome screening programme should be clarified at an early stage of the development phase and at least 1-2 months before implementation.

To ensure that the implementation of the programme is as smooth as possible, operational mechanisms and staff service pathways should be defined during the development phase and made available to all staff in the form of leaflets or information packs.

7.3.6 e-mail facility

During the development phase, it is useful to set up an e-mail database of contacts, and block e-mail facilities, as an effective way of distributing information to all staff (by means of an update bulletin board).

7.3.7 Policies and protocols

During the development phase, it is necessary to write and agree policies and protocols prior to implementation so that staff will have time to familiarise themselves not only with what is being offered within the programme but also what their individual roles are.

These policies and protocols need to be distributed to all departments and sectors involved in the screening programme, including the GPs and community midwives who will be the first contact with patients.

Departments providing services, such as biochemistry and ultrasound, should devise complementary operational policies to ensure good practice in their discipline.

7.3.8 Quality assurance

The need for quality assurance mechanisms is highlighted in the clinical governance framework. During the development phase, all departments providing services and all sectors involved in the Down's syndrome screening programme should set up quality assurance mechanisms to ensure the programme is operating at its optimum.

In particular, it is important to work towards the following aims:

- to assess and, if necessary, readjust the initial screening and follow-on diagnostic procedures when variations from other services have been identified;
- to reduce the miscarriage loss rate due to invasive diagnostic procedures by obtaining the best possible sensitivity and specificity rates;
- to develop a good-quality programme that is acceptable to women and their partners.

7.4 Implementation phase

A date for implementation should be set and publicised to all staff, and to all departments providing services within the Down's syndrome screening programme. Clarity about implementation will lessen confusion, and reduce the possibility of adverse events occurring due to lack of communication or other factors, such as downtime of ultrasonography machines.

It is the role of the screening co-ordinator/programme manager:

- to inform all staff of the start date;
- to be readily available during the first six months of implementation to identify any problems in the system, and the services/sectors that may need more support. It is vital to have a clear strategy for identifying and addressing risks at the service level quickly from the outset.

Women and their partners also need to be made aware of the implementation of a Down's syndrome screening programme, and to understand their rights and responsibilities within it. Various mechanisms can be used to publicise the programme, including the local media, and posters or loop videos in antenatal clinics.

7.4.1. Support for staff

The number of staff involved in a Down's syndrome screening programme will be large. It is essential that each one is informed of their role and responsibilities, and are clear about where to obtain further information and support when trying to respond to the questions of women and their partners. This is particularly important for GPs and community midwives. Newsletters and updates for frontline staff can be a useful means of communication, and ensure regular contact and support. The information provided could also include new developments in the Down's syndrome screening programme and any changes to operational policies.

It is also helpful for staff if:

- a crib sheet of commonly asked questions is produced;
- regular update sessions are arranged.

Throughout implementation, the screening co-ordinator/programme manager should be readily available to give information and support to staff as needed.

7.4.2 Support for women and their partners

Women and their partners will require support through each stage of the screening process.

Their main sources of support will be the:

- community midwife;
- GP;
- hospital consultant;
- screening co-ordinator.

Other sources of support, particularly for women who have a definitive diagnosis of Down's syndrome, will include agencies both within and external to the NHS (see Box 7.4), including reiligous bodies and hospital chaplaincy departments. This type of support should be offered to women and their partners early on in the screening process.

To help inform their decision-making, a range of expertise and experience should be made available to women and their partners, such as that provided by a paediatrician on the medical condition to that provided by a community team leader who works with children with disabilities. Information from support groups such as the Down's Syndrome Association could also be supplied. Indeed, it is useful if a rapport has been established with the local parent support groups because they may be prepared to discuss some of the issues with women and their partners and to give their perspective.

7.5 Evaluation phase

Evaluation is central to clinical governance and quality improvement.

All aspects of the Down's syndrome screening programme in all sectors/services should be monitored and evaluated regularly to identify and manage any adverse risks. However, it is possible that during the initial stages of implementation audit and review will need to be performed more frequently to determine whether any changes are required urgently.

A key person, such as the screening co-ordinator/programme manager, should have responsibility for developing and overseeing monitoring and evaluation of the screening programme. Basic information data (i.e. detection rate, the false-positive rate, and uptake rates) and data on potential adverse risks within the programme should be submitted to the clinical governance board, and to the hospital Trust board. Data concerning adverse risks should be supplemented by information on quality assurance, and any recommendations for risk management and improvements to the service.

Information for the Trust board on the screening programme could be submitted in the form of an annual report. A set of information data which should form the basis of an annual report is given in appendix 5.

7.5.1 Mechanisms for monitoring and audit

Mechanisms to monitor, evaluate, and feed back on performance are essential for the development of the Down's syndrome screening programme, and fundamental to improving standards. For example, the use of audit trails will enable the identification of problems at source.

All women should be aware of and asked to agree to the use of data for continuous improvement of the service. It should be made clear that all staff are bound by the Data Protection Act and confidentiality agreements.

7.5.2 Documentation of offers and decisions

Throughout the process of screening, it is imperative that staff carefully document:

- the offer of a screening procedure;
- acceptance or refusal of the test by the woman;
- the decisions made by a woman and her partner, for example, following the offer of an initial screening procedure or a follow-on diagnostic procedure.

For the purposes of evaluation, it is particularly important to monitor documentation relating to women who are receiving counselling because they are at high risk of a Down's syndrome pregnancy. The record should include:

- information given to the woman and her partner;
- a detailed account of the session;
- the decision made by the woman and her partner.

The record should be kept in the woman's hospital notes, and, in case of loss, a copy should be sent to the screening co-ordinator/programme manager.

7.5.3 Monitoring outcomes

All high-risk pregnancies should be followed up to ascertain outcome.

There should also be a system in place for the notification of the birth of babies who have Down's syndrome and were missed during screening, or whose mothers were not screened. This information can usually be obtained through close collaboration with the molecular cytogenetics department.

National figures can also be obtained from the National Down's Syndrome Cytogenetic Register web site: *http://www.mds.qmw.ac.uk/wolfson/ndscr/*

7.5.4 Women's perceptions of the screening programme

Women's perceptions of the screening programme should be explored in terms of both their experience and their level of satisfaction so that improvements can be made. A confidential survey of a small but representative cohort should be conducted at least once a year.

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Appendix 1

Contact details of Regional Co-ordinators and Education and Training Facilitators

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Appendix 2

National Screening Committee
Antenatal Screening for Down's Syndrome - Policy and Quality Issues

Paper presented to the National Screening Committee on 4 Jult 2003

Executive summary

- This report is based on a report from the NHS Health Technology Assessment Programme (1), other research, a review of Down's syndrome screening in England (2), and the experience of those professionals who have been involved in the consultation process.
- National action is necessary and urgent to offer all pregnant women screening with a good standard of effectiveness, safety and quality.
- Minimum acceptable standards will also be defined, and programmes that can achieve higher standards should be encouraged to do so.
- Currently, the minimum acceptable standard is that all women should be offered screening by tests that produce a 60% detection rate and a 5% false positive rate by the 1 April 2004.
- Good standard screening requires all women who present in the first trimester to be offered screening that will achieve a 75% detection rate and less than 3% false positive rate by 1 April 2007. The rate of progress will be determined principally by the rate at which good quality nuchal translucency screening can be developed. Early booking should be encouraged and facilitated, and different ways of arranging ultrasound screening and the blood test will be explored to optimise the tests and minimise the inconvenience for women.
- This policy will also provide cost-effective screening for trisomy 18 and trisomy 13; there is no national policy to screen for sex chromosome abnormalities.
- Good standard screening requires all women who present in the second trimester to be offered triple screening by 1 April 2005, and quadruple screening at a date to be determined when the Inhibin-A pilot study has been completed.
- The integrated test and the serum integrated test should be piloted in a programme, or programmes, in addition to that programme in which it has been developed. The serum integrated test will be of particular importance to populations whose services have difficulty in developing ultrasound of adequate quality.
- A comprehensive quality assurance programme should be supported.
- There should be continuing investment in research and development.
- The programme should take into account the diverse needs and preferences of women.
- All these measures should be implemented and managed as part of a national Down's Syndrome Screening Programme which should report annually.
- The ethical implications of all screening programmes are important. These implications are particularly important in antenatal screening and the need to respect the values and beliefs of different groups and individuals is of highest importance.

These recommendations have cost implications which will be offset in part by reductions in the cost of invasive testing and diagnosis.

1.0 The imperative for change

The variations in policy and practice, and in quality and safety of Down's syndrome screening programmes make the present situation untenable. Change is necessary to offer all women a programme of acceptable quality and safety.

Action is necessary and urgent to tackle the main problems and the need to solve major problems quickly requires action that will bring all programmes up to an acceptable standard and offer all women screening in both the first and second trimesters. Some programmes will be able to offer services of a higher standard and the long-term aim would be to bring all programmes up to this standard. The difficulty in achieving this should not divert attention from the need to achieve an acceptable standard.

2.0 Variations in practice and quality

The National Screening Committee turned its attention to Down's syndrome screening because of reports that there were worrying variations in policy, practice and service quality. These reports were substantiated by the national survey of Down's syndrome screening carried out by the Down's Syndrome Screening Development Team, which was set up to improve the quality of screening (see Table 1 below).

Table 1: The gap between current service provision and the best available situation (5)

Type of test	Number of programmes
No test offered	11
Nuchal translucency (NT) only	29
NT and hCG	26
Double test – AFP, hCG	107
Triple test – AFP, hCG, uE3	31
Quadruple test – as above including Inhibin A	1
Inhibin A as part of the triple test	2
Total	**207**

Top priority for the National Screening Committee was to tackle the variations in quality, because whatever the screening policy adopted in one part of the country or another, the impact on the population served by that service was determined by the quality of service offered. Obviously there was a need to work towards a common policy for the country as a whole, but when the NSC started its work on Down's syndrome screening, it did so knowing that the Health Technology Assessment Programme had commissioned work specifically to advise on policy options in 1995.

3.0 Evidence-based screening

The National Screening Committee and its officers are part of the national public health service. It is not a Research and Development Committee and has neither the remit, competence nor resources to commission research. The National Screening Committee and its officers base their decisions on the evidence produced by research workers, principally on the Health Technology Assessment reports produced by the R&D Programme of the English Department of Health. Some decisions are based on MRC trials and research sponsored by other funders, but the main evidence base for the National Screening Committee is the Health Technology Assessment Programme. The committee has made use of all of the reports on screening produced by the HTA Programme, about twenty in number.

Thus the National Screening committee started to work on variations in practice and quality, seeking to increase the detection rate and improve safety, but did not go into the details of policy-making while awaiting the results of the HTA study. One policy issue that was tackled by the National Screening Committee, however, was the issue of equity, and in 2001 guidance was issued that all women who were pregnant should be offered Down's syndrome screening using any method that would achieve a 60% detection rate and a 5% false positive rate. Both ultra-sound screening and serum screening can achieve this standard which, although considered mod-est by a number of people, represented a significant increase in coverage for the population as a whole because in many parts of the country screening was offered only to women over a certain age, and the age threshold itself varied from one part of the country to another.

The HTA report, First and second trimester antenatal screening for Down's syndrome: the results of the Serum, Urine and Ultrasound Screening Study, known as the SURUSS report, was eventually published in April 2003, although drafts of the report had circulated for some time before this and had been considered at a major workshop held on 2 December 2002.

The NSC paper is, like other National Screening Committee papers, based primarily on the study that was commissioned by the Department of Health. The comments on the draft of this report, which was made widely available in May 2003, inevitably related not only to the draft of the report itself but also to the HTA report. Of the 46 comments made on the draft of this paper which was widely distributed and made available on the National electronic Library for Screening, only one of them, from the Laboratory Sub-Committee of the Down's Syndrome Screening Management Group of the National Screening Committee, separated comments on the SURUSS report from those on the NSC report. The other respondents merged their comments on the HTA report and the NSC report.

3.1 The evidence base – June 2003

Respondents to the paper, who also took the opportunity to make specific comments about SURUSS, highlighted three issues about the SURUSS methodology and governance:

1. the failure of the SURUSS report to cite a number of studies in its references (Appendix 2);

2. the relatively small number of Down's syndrome pregnancies included in the SURUSS report and the modelling assumptions based on this number;

3. the perception that the conclusions would not be seen as unbiased because of the declaration of interest made by one of the authors of the report.

The last of these is perhaps the easiest to deal with in the short term, although the problem of the perception of conflict of interest may remain; neither the principal author of the HTA report, who declared his interest clearly, nor any of the other authors, will be involved in the final decision-taking. The first two comments will be referred to the HTA Programme, which seeks comments on published reports. All these issues were raised in the five referees' reports and dealt with by the authors and by the HTA editors over a period of six months, but a difference of opinion still persists, and it is difficult to see how this can be resolved either without a correspondence column debate, as would be the case if the SURUSS report had been published in a conventional journal, or with a definitive meta-analysis of all the studies that were deemed to be of adequate rigour.

The potential conflict of interest has been addressed by the explicit declaration of interest and by the exclusion of those who declared an interest from the final decision-taking process. It is customary to involve suppliers of goods and services in decision-making because of their technical expertise, but to exclude them from the final decision-taking, and this has been the process in these deliberations.

3.2 The SURUSS report results and conclusions

The main results from SURUSS are set out below (Table 2).

Table 2: The main results from the SURUSS Report

Test (all include maternal age)	Measurements	FPR for 85% detection rate	95% confidence intervals
Integrated test	NT and PAPP-A at 10 weeks and AFP, uE3, free b-hCG and Inhibin-A at 14-20 weeks	1.2% (1.3%*)	1.0-1.4 (1.2-1.4*)
Serum Integrated test	Integrated test without NT. PAPP-A at 10 weeks	2.7% (4.9*)	2.4-3.0 (4.4-5.4*)
Combined test	NT, free b-hCG and PAPP-A at 10 weeks	6.1% (6.0*)	5.6-6.5 (5.5-6.5*)
Quadruple test	AFP, uE3, free b-hCG, Inhibin-A at 14-20 weeks	6.2%	5.8-6.6
Triple test	AFP, uE3, free b-hCG at 14-20 weeks	9.3%	8.8-9.8
Double test	AFP and free b-hCG at 14-20 weeks	13.1%	12.5-13.7
NT	Nuchal translucency at 12-13 weeks	20.0%	18.6-21.4

FPR = false positive rate; DR = detection rate
*NT and /or serum measurement at 12 weeks

An important feature of the SURUSS report is that these different tests are compared using the same risk cut-off. The risk cut-off is 1 in 250 mid-term; this is not to imply that this is the cut-off point that would be used in practice. The cut-off used in practice is recommended as being 1 in 250 at term, but for the purpose of appraising and comparing tests or programmes, a standard cut-off is needed that allows tests used in the first trimester to be compared with tests used in the second trimester, and for this reason 1 in 250 at mid-term is the cut-off used in the SURUSS report.

Results from several published studies of the effectiveness of first trimester screening combined NT and biochemistry testing have shown better detection rates and better false positive rates than quoted in the SURUSS report, with detection rates of over 90% and false positive rates of around 5%. These have usually been achieved in centres with rigorous management of the quality of the NT measurement. However, direct comparison of detection rates and false positive rates between publications is complicated because of assumptions that may be made about fetal loss rates and the age profile of the women being screened.

The main conclusions of the SURUSS report are set out below.

> "Our results showed that overall, on the basis of efficacy, safety, and cost, the integrated test is the test of choice. Adding other markers provided little benefit. The integrated test yielded an 85% detection rate for a false-positive rate of 1.2% or a satisfactory NT measurement was obtained for all or nearly all pregnancies and PAPP-A was measured at 10 complete weeks.

If an NT measurement was not available, the serum integrated test (using the same serum markers) would be the next best screening method (85% detection rate for a 2.7% false-positive rate), materially better than any first or second trimester serum screening test.

The benefits of integrating markers across the two trimesters is greater than might intuitively be expected; it decreases the false-positive rate substantially, compared with screening in either trimester alone. It therefore has a large impact in reducing the number of women requiring an invasive diagnostic procedure and hence reducing the loss of unaffected pregnancies.

For women who present for the first time in the second trimester of pregnancy, the SURUSS results suggest that the quadruple test is the test of choice, confirming the results from other studies. For women who request a screening result and a diagnosis and a diagnosis made before 14 completed weeks of pregnancy, the combined test was found to be the best option, though women would need to be informed that the efficacy and safety of this screening and diagnostic regimen is inferior to the use of the integrated test.

The SURUSS results show that in antenatal screening for Down's syndrome it is now possible to obtain a high level of detection (detecting 8 or 9 out or every 10 affected pregnancies) with a false-positive rate (1-2%) that is substantially lower than in the past, so achieving a significantly higher level of safety by reducing the number of women who need an invasive diagnostic test such as amniocentesis."

Certain of the conclusions receive a broad level of support from respondents, notably that:

- screening in the first trimester with a combination of nuchal translucency (NT) and biochemical testing provides acceptable detection and false positive rates, with one respondent proposing that NT alone would achieve adequate quality if it was well done;
- acceptable levels of detection and false positive rates can be obtained by the use of the serum screening test for women who present in the second trimester;
- no feature other than nuchal translucency thickness can be used in ultrasound screening at present; all other markers should be used only in the context of a peer reviewed and ethically approved research project.

The main criticism of the SURUSS report conclusions, as distinct from the criticisms of research method and governance listed above, were:

1. the recommendation that Inhibin-A be introduced immediately to the NHS as a whole to create the quadruple test was not supported without further work;

2. the performance of nuchal translucency screening was said to achieve higher detection and false positive rates than reported in the SURUSS report, provided the screeners had been properly trained; however, although criticising this aspect of the SURUSS report, only one responder suggested that nuchal translucency alone provided an adequate screening test in the first trimester;

3. the integrated test and the serum integrated tests posed too many practical problems to be introduced nationally at present, even if all parts of the country had the combined test for the first trimester and the quadruple test for the second trimester; among the concerns raised about the implementation of the integrated test were:

- that in any population that was socially transient and sought care from more than one provider, the problems of integrating the two test results were not to be underestimated;
- that the ethical issues associated with holding data from the first trimester test had not been clearly described, and the way in which the options inherent in the integrated test could be put to women had not been described and tested in an ordinary service setting;
- that the feasibility of translating savings from reductions in referral for diagnostic testing to laboratory services was felt to be more difficult in practice than in theory.

3.3 Implications for safety of different tests and strategies

The choice of tests is based on the characteristics of the tests, expressed as their detection rate and their false positive rate, equivalent to the terms "sensitivity" and "1-specificity" which are more commonly used in screening technology appraisal. In Down's syndrome screening, however, these rates also vary depending on the "risk cut-off" chosen as a threshold for defining results deemed to be "positive" or"higher risk", and therefore determining the number of women offered a diagnostic test, chorionic villus sampling, or amniocentesis.

Table 3 shows the number of Down's syndrome pregnancies and the number of unaffected pregnancies lost from amniocentesis or chorionic villus sampling (CVS) at two detection rates (75% and 85%). At an 85% detection rate the four tests recommended by the SURUSS authors achieve a ratio of 4 or greater in the number of Down's syndrome pregnancies detected to the number of procedure-related unaffected fetal losses (Table 3).

Table 3: Outcome in100,000 women screened (1) (derived from Table 20 in the SURUSS report)

Tests	Unaffected women referred for CVS or amnio	No. of Down's syndrome diagnosed	No. of unaffected fetuses lost*	No. of Down's syndrome diagnosed per unaffected fetuses lost
75% detection rate				
Double	6,500	152	47	3.2
Triple	4,200	152	30	5.1
Quadruple	2,500	152	18	8.5
Combined	2,300	152	17	9.0
Serum integrated	800	152	6	25.4
Integrated	300	152	2	76.3
85% detection rate				
Double	13,100	173	94	1.8
Triple	9,300	173	67	2.6
Quadruple	6,200	173	45	3.8
Combined	6,100	173	44	3.9
Serum integrated	2,700	173	19	9.1
Integrated	1,200	173	9	19.2

* Assuming an 80% acceptance rate of amniocentesis or chorionic villus sampling and 0.9% loss rate.

The detection rate and the benefit:hazard ratio are the two key criteria in specifying how the four tests should be interpreted in a systematic and rational way. A mid-trimester risk cut-off of 1 in 250 will achieve a ratio of four or greater with all four tests and exceed a detection rate of 80% (see Table 4).

Table 4: Detection rate and false-positive rate using a 1 in 250 mid-trimester risk cut-off level according to test (derived from Tables 30 & 31 in the SURUSS report)			
Test	**Detection rate (%)**	**False-positive rate (%)**	**DSD:UFL**
Integrated test	90	2.8	9.0
Serum Integrated test	88	4.0	6.2
Combined test	83	5.0	4.7
Quadruple test	84	5.7	4.2
Triple test	81	6.9	3.3

DSD = Number of Down's syndrome pregnancies diagnosed
UFL = Number of unaffected fetal losses
* = First trimester markers measured at 10 weeks

3.4 Cost-effectiveness

Because of the reduction in referrals, the cost of shifting from double to triple testing is estimated as being offset by the reduction in diagnostic costs, as shown in Table 5.

Table 5: The cost of shifting from double to triple testing, offset by the reduction in diagnostic costs (derived from costs cited in SURUSS report)			
Nationally *		**For an average PCT**	
Reagent costs	Diagnostic services costs	Reagent costs	Diagnostic services costs
£560,000	£3,240,000	£2,000	£11,700
(Increase)	(Decrease)	(Increase)	(Decrease)

* Assuming: 1) one-sixth of women are already being offered triple test;
2) 80% acceptance of offer.

The addition of uE3 to the double test to create the triple test is not likely to require additional laboratory equipment in a large proportion of laboratories. The costs of moving from triple to quadruple testing are of the same magnitude with respect to the costs of reagents, but there will be a capital cost associated with this; this is being studied by the Laboratory Sub-Group of the development project.

The Laboratory Screening Sub-Group of the Down's Syndrome Screening Management Group was unanimous in advising that Inhibin-A could not be recommended for national introduction at present, and on the basis of this advice, the pilot study of the use of Inhibin-A and its costs and service implications should be conducted. This will take place in Glasgow and the west of Scotland.

The additional costs of introducing the combined test relate both to the cost of offering PAPP-A as a serum test and the cost of the high quality ultrasound service that is required. This issue will be further explored by the National Screening Committee during 2003 as part of the Antenatal Sub-Group's review of fetal anomaly screening and ultrasound services.

It is also important to emphasise that anxiety is associated with a referral for diagnosis; this has not been costed in financial terms but its impact, both short-term and long-term, should not be underestimated.

3.5 The integrated test

The SURUSS results demonstrate the potential value of integrating tests in the first and second trimester. However, experience with the integrated test is relatively limited. At the workshop on 2 December 2002 it was reported that the integrated test was being used and was acceptable to a proportion of women in Maine, Ontario, and in north London. More information is being gathered about the actual use of the integrated test and about the way in which choices are put to women who need to understand that they could either make a decision after the first trimester test or, at the cost of some weeks of anxiety, have a higher detection rate and a lower false positive rate by combining their first trimester results with the results of serum tests in the second trimester.

Of the 24 responses that were received, three respondents were in favour of introducing the integrated test without piloting, and two of these respondents were authors of the SURUSS report. It is therefore proposed that the integrated test be piloted and evaluated in a programme in which there is both first trimester combined testing and second trimester serum testing of adequate quality.

4.0 Policy recommendations

On the basis of the evidence that is available, the following recommendations are made:

- The development of first trimester screening using the combined test, namely ultrasound screening of nuchal translucency combined with free ?-hCG and PAPP-A, should be undertaken; to minimise the resource consequences nuchal translucency testing should be combined with the dating scan. A training and quality assurance programme needs to be developed to ensure that the nuchal translucency screening performed as part of dating is of adequate quality. The only marker to be used in ultrasound screening is nuchal translucency; all other markers should be measured in the context of ethically approved and peer reviewed research projects. The detection rate and false positive rate of using serum markers alone is unclear, and serum screening without ultrasound in the first trimester is not recommended.
- For all women who present in the second trimester of pregnancy, serum screening should be made available. Women should be offered the triple test in the second trimester.
- The feasibility of using Inhibin-A nationally should be evaluated in a pilot service so that the laboratory and financial implications can be examined.
- When satisfactory screening is in place in the first and second trimester, a pilot of integrated screening should be organised in a routine NHS setting. The attitudes and experience of women both about the choice and about the effect of waiting should be the principal outcomes, although other factors relating to the feasibility of the test, particularly in inner city populations, also need evaluation.
- The serum integrated test should also be piloted.
- The comments made about the methodology of SURUSS should be fed back to the HTA Programme and the authors of SURUSS. This should include the references to studies not cited in the HTA report, with the recommendation that they consider commissioning an ongoing meta-analysis of the data.

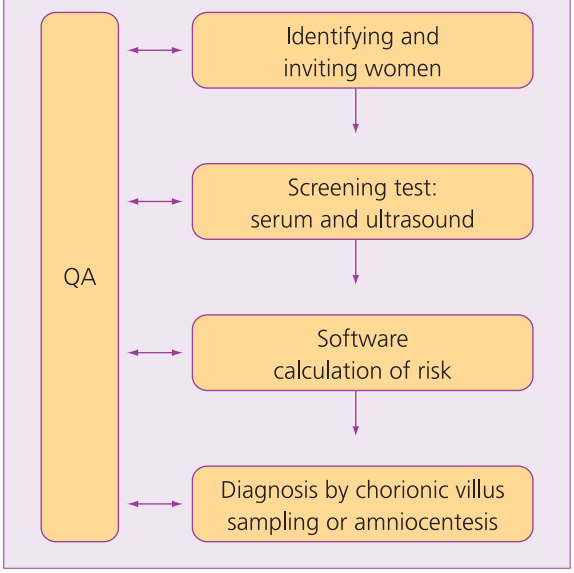
5.0 Quality assurance and improvement

Whatever screening policy is in place, it is essential to measure performance, compare it with standards, and seek to achieve improved performance year on year – a process of quality assurance and improvement. This process maximises the probability of benefit and minimises the probability of harm.

The National Screening Programme has been working on measures to improve the quality of Down's syndrome screening for the last two years through a series of measures linked to, but distinct from, policy-making.

Screening is a programme, not a test, and the stages and components of the Down's Syndrome Screening Programme are set out in the diagram (Figure 1).

Fig 1: Stages and components of the Down's Syndrome Screening Programme



Each of these stages needs quality assurance and improvement.

5.1 Identifying and inviting women

The outcome of screening is choice. The aim of the Down's Syndrome Screening Programme is to offer those women who might wish to make a choice the opportunity to do so. This requires not only that the woman is clear about the possible consequences of testing before she accepts the offer of testing, but also that she receives the information, advice and support needed to make a decision at each stage in the process.

There is also a need to ensure that professionals have a good understanding of the principles and practice of Down's syndrome screening and that they are able to discuss the issues with the woman seeking support.

5.1.1 Action

The National Screening Committee is:

- developing and evaluating an information source for women, with the involvement of the Down's Syndrome Association, to ensure that a balanced picture is presented;
- negotiating with NHS Direct Online, and other providers of public information, to ensure that the information presented on Down's syndrome screening has the same standards of clarity and comprehensiveness;
- piloting a test to measure the NHS Advisory Centre on Patient Surveys' experience of women offered antenatal screening that could be used in surveys of women using antenatal services;

- developing training programmes for clinicians and co-ordinators;
- commissioning a database of the experience of individuals from the charity DIPEX – the Database of Individual Patient Experience – which would allow a woman to reflect on the experiences of other women who have faced similar choices;
- commissioning research to study the potential adverse impact on health inequalities of increasing the complexity of the information offered;
- developing a race equality scheme under the Race Relations Amendment Act to ensure that the Down's Syndrome Screening Programme takes into account ethnic and cultural diversity.

5.2 Serum testing

Like many other biochemical tests, inter-laboratory variation can be observed when Down's syndrome screening tests are carried out in more than one laboratory. The development of National External Quality Assessment Schemes (NEQAS) and Clinical Pathology Accreditation (CPA) offer the opportunity of reducing inter-laboratory variation by improving the quality of the service, and all laboratories have to participate in external quality assurance and be accredited. What has also emerged are the problems that laboratories with small throughputs face in evaluating their performance because they may undertake too few tests to measure the detection rate reliably.

A necessary pre-requisite of quality is, therefore, not only participation in external quality assessment but the throughput of the laboratory. The development of near patient testing, as part of "one-stop screening", also needs to be costed and evaluated and a project will be set up to do this.

5.2.1 Action

The Down's Syndrome Screening Programme will:

- work with the NEQAS and CPA schemes to ensure that all laboratories are covered by these schemes for CVS diagnostic procedures;
- encourage laboratories to work more closely together and increase volume where that is appropriate;
- ensure that the serum markers used for screening are licensed for use;
- explore the possibility of national procurement of markers and equipment;
- plan the introduction of PAPP-A and uE3 to minimise quality problems when these are introduced;
- pilot the use of Inhibin-A.

5.3 Nuchal translucency testing

A number of markers are associated with an increased probability of a fetus being affected by Down's syndrome. Several other markers are currently being examined in both first and second trimesters, notably absence of the nasal bone in the first trimester, but nuchal translucency measurement in the first trimester is at present the only risk marker identifiable by ultrasound screening which should be used in screening.

Ultrasound screening is an essential component of first trimester screening, if combined with serum markers, for example the measurement of PAPP-A and free ?hCG, and of the integrated test. To develop and maintain adequate quality it is essential for the person who is going to carry out the ultrasound test to have had adequate training, and to participate in a quality assurance programme.

5.3.1 Action

The National Screening Committee is;

- planning to commission, in association with relevant professional bodies, training and quality assurance;
- discussing with those responsible for training in ultrasonographic skills how appropriate training can be incorporated in all training programmes;
- standardising the definitions used in NT screening to minimise interobserver variability.

5.4 The quality of the risk calculation software

The recent review of laboratories carried out by the National External Quality Assessment System, in partnership with the National Screening Committee project team, demonstrated that even when consistent results are obtained for biochemical testing, significant differences occur in the risk estimate given to the woman when identical data are fed into the different software packages. The feasibility of offering a personalised risk estimate will be explored.

5.4.1 Action

The National Screening Committee is:

- preparing a specification for the risk calculation software, based on the Scottish specification, as a basis for national procurement of a limited number of software packages.

5.5 The quality of the diagnostic services – amniocentesis and chorionic villus sampling

There is a risk to the normal fetus whilst in the process of diagnosis. The case for carrying out these tests in centres which are able to undertake a large number of tests annually is strong and programmes should take steps to ensure that the number of such tests carried out in centres meet minimum standards.

The use of molecular diagnostic techniques to supplement or replace karyotyping has been reviewed in a workshop on PCR/FISH testing organised in June 2003 to consider the implications of this technology.

To minimise the time women have to wait, diagnosis should be by QF-PCT; karyotyping may be indicated for clinical reasons but for screening QF-PCR is the technique of choice.

5.5.1 Action

The National Screening Committee is:

- supporting the development of evidence-based guidelines by the Royal College of Obstetrics and Gynaecology;
- to cost and plan QF-PCR testing services.

5.6 Programme management

Screening is a programme, not a test, and someone has to have designated responsibility for the organisation and delivery of the Down's Syndrome Screening Programme.

The main task of the Director of Public Health is not to manage screening programmes but to ensure that his or her population is covered by a screening programme of adequate quality. Responsibility for the quality of the programme rests with the individual identified as being

responsible for its co-ordination and management, with each specific service within the programme, for example, the biochemical laboratories, having responsibility for their service which forms part of the programme. A service manager may also be the programme manager but the two roles are distinct.

To manage the programme properly it is also necessary to have numbers of sufficient size to observe trends and discern variations from the standards set. It is therefore appropriate to aim for a programme of between 20,000 and 30,000 births per year. It may be that more than one laboratory will be present within a programme, bearing in mind the fact that laboratories, like programmes, often benefit from a higher throughput, but Down's syndrome screening programmes themselves need a significantly larger population base than is currently the case. Regional Directors of Public Health will be asked to review the pattern of programmes in their Regions and take appropriate action to create larger programmes.

5.6.1 Action

The National Screening Committee is:

- supporting the Register of Down's syndrome births to ensure that process measures of quality are complemented by outcome measures;
- working with Regional Directors of Public Health, Medical Directors of Strategic Health Authorities and the relevant professional groups to discuss the creation of larger population-based programmes and the possible implications for laboratory and other investigative services;
- making available software that can be used for programme review.

5.7 Private screening and testing

The National Screening Committee aims to protect the health of the population, not simply to advise the NHS. Although screening policy and quality in the private sector is more difficult to regulate than in the NHS, the NSC has a duty to consider it. Public health professionals have to use the resources available to them to ensure that members of the public are neither misled by the claims of people providing private screening nor exposed to screening of poor or unknown quality.

There has been a rapid growth of testing for risk factors in the private sector in recent years, due in part to the lack of clarity in NHS policy. The screening has been introduced by large-scale and well-organised providers, but we have also seen a growth of small-scale testing, where individual clinicians purchase the necessary equipment and carry out part of the screening programme. However, screening is a programme and not a test, and simply providing, for example, ultrasound screening without participation in an adequate quality assurance programme and without providing CVS or amniocentesis, is not providing a screening programme and should be discouraged. If private providers wish to provide screening, they should provide not only serum screening and ultrasound measurement of the nuchal translucency, but also ensure that there is sufficient provision to offer amniocentesis or CVS of adequate quality to people deemed at high risk by their programme. Furthermore, everyone involved in the provision of ultrasound screening in the private sector should be part of a recognised quality assurance programme and should produce an annual report which would allow their performance to be assessed against explicit standards. It also needs to be recognised that there is a possible conflict of interest in the advice that may be given by clinicians to the local providers or commissioners, if those clinicians are providers of screening in the private sector.

Part of the impetus for this development has been due to the lack of clarity about NHS policy. The clear commitment to provide support to the NHS services that have the capacity to develop nuchal translucency screening will reduce this uncertainty and thus reduce the motivation to develop screening outside general antenatal services.

5.7.1 Action

The National Screening Committee is:

- developing clear standards for ultrasound screening;
- creating programme standards which will require anyone who is providing a single part of the programme to participate in quality assurance and to relate the outcomes of their work to the next stage in the screening process so that the quality of their work can be measured and improved; this work will be done in partnership with the Commission for Health Care Audit and Inspection and the relevant professional Colleges and Societies.

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ANNEX 1 Comments on the first draft of this paper were received from the following persons

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Dr David Aitken; Institute for Medical Genetics, York Hill NHS Trust, Laboratory Sub-Group, Down's Syndrome Screening Programme.

Dr Valerie Armstrong: Regional Antenatal Co-ordinator, National Screening Programme.

Dr Loom Bin: Hinchingbrooke Hospital, East of England Region.

Dr Patricia Boyd: Oxford Down's Syndrome Screening Clinical Governance Board.

Dr Jennie Carpenter: Department of Health Screening Policy Team.

Dr Jean Chapple and colleagues: NHS Antenatal Screening Programmes, London Region.

Dr Lyn Chitty: Consultant Geneticist, University College, London.

Dr Jenny Crossley: Institute for Medical Genetics, York Hill NHS Trust.

Professor Howard Cuckle: Professor of Reproductive Epidemiology, Leeds.

Dr Frances Flinter: Senior Lecturer in Clinical Genetics, Guy's Hospital, London.

Dr Michael France: CM & MC Manchester.

Dr Sue Gordon: Northumberland Care Trust.

Dr Sue Halliday: Antenatal Regional Screening Co-ordinator, East of England Region.

Sheila Harris, Superintendant Sonographer, London Region

Dr Gayle Harrison: Principal Biochemist, Southmead Hospital, Bristol.

Dr Victoria Heath: Fetal Medicine Foundation.

Dr Nicholas Hicks: Director of Public Health, Milton Keynes Primary Care Trust

Mr David Howe: Consultant in Fetomaternal Medicine, Princess Anne Hospital, Southampton.

Dr Andrew Iverson: Brighton & Sussex Hospitals NHS Trust.

Dr David James: Consultant Chemical Pathologist, Taunton & Somerset NHS Trust

Dr Bronwyn Kerr: Consultant Clinical Geneticist, Central Manchester & Manchester Children's Hospitals University NHS Trust.

Dr Pat Lewis: Consultant Obstetrician, Wigan.

Mr G S McCune, Consultant Obstetrician, Milton Keynes General NHS Trust

Dr Gwynn McCreanor: Clinical Director, Department of Pathology, Kettering.

Professor Tim Reynolds: Department of Clinical Chemistry, Queen's Hospital, Burton-on-Trent

Ms Janice Robinson: Local Screening Co-ordinator, London Region.

Professor S C Robson: University of Newcastle.

Professor Charles Rodeck: Department of Obstetrics & Gynaecology, Royal Free & UCL Medical School

Dr Mark Sellinger: Lead Clinician Feto-Maternal Medicine, Royal Berkshire & Battle NHS Trust

Dr Brian Senior: Department of Clinical Chemistry, Royal Bolton Hospital.

Dr Isabel Shirley: Ultrasound Group, Down's Syndrome Screening Programme.

Dr Rosalind Skinner: Principal Medical Officer, Scottish Executive.

Professor Peter Soothill: Professor of Maternal and Fetal Medicine, University of Bristol.

Dr Kevin Spencer: Department of Clinical Biochemistry, Barking Havering & Redbridge Hospitals NHS Trust

Dr Allison Streetly, National Co-ordinator, NHS Haemoglobinopathy Screening Programme.

Dr Anthony Sudell: Acting Director of Public Health, Blackpool PCT.

Ms Diane Swindlehurst: on behalf of Senior Midwives in Bolton.

Mr Anas Turabi: Medical Student, University of Oxford.

Professor Nicholas Wald: Wolfson Institute of Preventive Medicine, London.

Dr Steve Walkinshaw: Consultant in Fetal and Maternal Medicine, Liverpool.

Dr Brenda Walton: Ashford & St Peter's Hospital, Chertsey.

Mrs Pat Ward: National Co-ordinator for Down's Syndrome Screening.

Professor Martin Whittle: Department of Fetal Medicine, University of Birmingham.

Ms Llywela Wilson: Screening Midwife, Llandough Hospital, Cardiff.

Dr David Worthington: Laboratory Advisory Group, Down's Syndrome Screening Programme (two separate reports).

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Professor Howard Cuckle also submitted his draft chapter for Milunski's textbook which contained 261 references.

Appendix 3

Screening for Down's Syndrome - Model of Best Practice

Issued by the Department of Health on 17 November 2003, based on the National Screening Committee's endorsement of the recommendations in the Programme Director's report considered by the Committee on 4 July 2003

1. The Priorities and Planning Framework (PPF) has a capacity assumption, under Health Inequalities, of improving access to services for disadvantaged groups and areas, particularly antenatal and child health screening services. The Local Delivery Plan (LDP) supporting guidance indicated that LDPs should make clear what procedures will be put into place locally to ensure that all women, irrespective of age, are offered Down's Syndrome screening.

2. The publication of the Health Technology Assessment (HTA) Programme report "First and Second trimester antenatal screening for Down's Syndrome: the results of the Serum, Urine and Ultrasound Screening Study" (SURUSS)[1] showed that when more recent, sensitive screening tests are used, fewer diagnostic tests are needed leading to better outcomes and safety.

3. NHS trusts and PCTs can use the attached model of best practice to help deliver the PPF and LDP requirements. The model complements, and supports NHS implementation of the recently published Clinical Guidelines on Antenatal Care from the National Institute for Clinical Excellence (www.nice.org.uk).

4. The Government is fully committed to ensuring that appropriate services are provided to children and adults with disabilities, including those who may be born with Down's Syndrome, to enable them to live fulfilled lives and make a valuable contribution to their communities.

Programme Outcomes

A detection rate of at least 60% with a false positive rate of 5% or less
(Benchmark timeframe: By 2004/05)

A detection rate of greater than 75% with a false positive rate of less than 3%
(Benchmark timeframe : By April 2007)

Screening Tests

The current evidence suggests that the following tests are acceptable, meet the above outcomes, and they are recommended (subject to paragraphs 3 to 5 below).

- The quadruple test for women who attend for screening in the second trimester.
  A second trimester test will always be required to accommodate women who present after the first trimester.
  (Benchmark timeframe: By 1 April 2005)

- The serum integrated test which is potentially the best test if nuchal translucency (NT) measurement is not available.
  (Benchmark timeframe: By 1 April 2005)

- The combined test, NT measurement by ultrasound screening plus serum tests, for women who request screening in the first trimester and understand the implications of doing so. **(Benchmark timeframe: By 1 April 2007)**

- The integrated test which provides better performance than the combined test if good quality NT measurement is available and the woman is prepared to wait until the second trimester for the results.
  (Benchmark timeframe: 1 April 2007)

Performance Measures

To ensure that the measurement of performance, quality assurance and decision-making are consistent nationally, all performance measures should be age-related and based on a cut-off of 1 in 250 at term.

Background to the model of best practice

1. The aim of antenatal screening for Down's Syndrome is to offer women, during pregnancy, a screening test which can identify those women at higher risk of having a child with Down's Syndrome. The group at increased risk is then offered diagnostic tests. With high quality counselling, parents can then make an informed choice about what to do. The national support programme (see Annex C for details) is intended to ensure that women across the country receive a high standard of antenatal screening and care.

2. The UK National Screening Committee (NSC), after consultation, recommends that the revised benchmarks be adopted because of the evidence from the SURUSS report that the rate of loss of unaffected fetuses can be greatly reduced with improved testing strategies. The proposed new quality benchmark is that the detection rate should be greater than 75% and the false positive rate should be less than 3% by April 2007. Table 1 below shows estimates of the number of Down's Syndrome pregnancies diagnosed and the number of unaffected pregnancies lost from diagnostic interventions following different screening tests. There are some provisos.

Testing in the second trimester of pregnancy

3. If testing is done in the second trimester, improved results can be achieved by the introduction of a third serum marker to the test, to create the "triple test". When tests for the Inhibin serum marker have been shown to be reliable in the ordinary service setting, adding this test to create the quadruple test with four serum markers would achieve even better outcomes. A pilot of inhibin testing will be undertaken by the NSC. All programmes could achieve the use of the triple test by 1 April 2005 and if the NSC and the pilot report to target, the quadruple test could also be implemented nation-wide by 1 April 2005.

Testing in the first trimester of pregnancy

4. To carry out tests in the first trimester requires the use of ultrasound screening to measure nuchal translucency thickness, combined with serum testing. The evidence is that many women wish testing to start in the first trimester. The national roll-out of laboratory testing for serum markers in the first trimester is relatively straightforward but would have some costs and training implications. However, it is recognised that a significant development task is required to ensure that ultrasound screening of adequate quality is available throughout the NHS. It is anticipated that it would take until 1 April 2007 for complete national roll-out of ultrasound screening of adequate quality to be universal.

Testing in both first and second trimesters

5. If a programme has both first and second trimester screening, it is able to offer the integrated screening test which provides the best results in terms of detection rates and false positive rates. The NSC is considering the need to test the feasibility and acceptability of the integrated and serum integrated approach in the UK.

Table 1: Modelled Outcome in 100,000 women screened (derived from Table 20 in the SURUSS report)

75% detection rate				
Tests	Unaffected women referred for CVS or amnio	No. of Down's syndrome diagnosed	No. of unaffected fetuses lost*	No. of Down's syndrome diagnosed per unaffected fetuses lost
Double	6,500	152	47	3.2
Triple	4,200	152	30	5.1
Quadruple	2,500	152	18	8.5
Combined	2,300	152	17	9.0
Serum integrated	800	152	6	25.4
Integrated	300	152	2	76.3

* Assuming an 80% acceptance rate of amniocentesis or chorionic villus sampling and 0.9% loss rate.

Reference

1. Wald NJ, Rodeck C, Hackshaw AK, Walters J, Chitty L, Mackinson AM. First and second trimester antenatal screening for Down's syndrome: the results of the Serum, Urine and Ultrasound Screening Study (SURUSS). Health Technol Assess 2003; 7(11):1-77

ANNEX B Programme Background

Existing commitments

1. The NHS Plan made a commitment for effective and appropriate screening programmes for women and children by 2004. The National Capacity Assumption in the Priorities and Planning Framework (PPF) for Reducing Health Inequalities was for improved access to services for disadvantaged groups and areas, particularly antenatal and child health screening services. The guidance on Local Delivery Plans (LDPs) asked for it to be made clear in plans what procedures would be put in place locally to ensure that all women, irrespective of age, are offered Down's Syndrome screening. In the recent Genetics White Paper it stated that a programme expected to be fully implemented in England by 2004/5, would ensure that all pregnant women were offered antenatal screening for Down's Syndrome and then counselled by midwives to help them make an informed choice. Counselling and support should also be available to those who decide not to have screening.

2. In 2001 an interim standard was issued that all women should be offered a test which detected at least 60% of cases for a false positive rate of 5% or less. This was agreed in the knowledge that the work of the support programme and new research in the pipeline, funded by the HTA programme, would enable these standards to be updated this year. The research is now available. There has been wide consultation with stakeholders and the standards attached are the product of the evidence review and discussion.

Quality of the test and safety issues

3. The research shows that when the more recent screening tests are used, fewer diagnostic procedures are needed, because there are fewer false positive screening test results. This has important consequences for improved outcomes and better patient safety. For every diagnostic intervention, there is a small, but significant, risk of loss of the pregnancy through miscarriage associated with the procedure. Reducing false positive screening results will reduce the overall number of pregnancies lost as a result of interventions to confirm the diagnosis.

Resource consequences

4. If the costs of testing and diagnostic interventions are taken together, introducing the more sensitive screening tests reduces the overall cost of the programme. The more expensive options in terms of the cost of testing are, on average, the less costly ones when diagnostic tests are taken into account.

5. Extra resource is likely to be needed to implement the most effective tests, which include ultrasound scan measurement in the first trimester. However, most maternity services are moving to first trimester dating scans and some services have rearranged their ultrasound capacity to incorporate the tests without extra resource. There are training and QA implications for including NT measurements, which will take time to address. This change is likely to happen over time.

Ultrasound Screening Issues

6. To carry out tests in the first trimester requires the use of ultrasound screening to measure nuchal translucency thickness, combined with serum testing. The evidence is that many women wish testing to start in the first trimester. The national roll-out of laboratory testing in the first trimester is relatively straightforward but would have some costs. However, it is recognised that a significant development task is required to ensure that ultrasound screening of adequate quality is available throughout the NHS. It is anticipated that it would take until 1 April 2007 for complete national roll-out of ultrasound screening of adequate quality to be universal.

Additional work undertaken across the programme

7. The NSC has been working on measures to improve the quality of Down's Syndrome screening. It has been developing and evaluating an information source for women with the involvement of the Down's Syndrome Association to ensure that a balanced picture is presented. It has also commissioned a database of the experience of individuals from the charity DIPEX to allow a woman to reflect on the experiences of other women who have faced similar choices. It has been developing complementary training programmes for clinicians and co-ordinators.

8. Links have been made with the National External Quality Assessment Schemes (NEQAS) and Clinical Pathology Accreditation (CPA) to ensure that all laboratories are accredited to reduce inter-laboratory variation and improve the quality of the service, especially where laboratories have too small a throughput. Additional work is being undertaken to examine software pack ages to eliminate the significant differences in estimating risk.

9. For the use of ultrasound the NSC is commissioning, with the relevant professional bodies, training and quality assurance measures to reduce inter-observer variability.

10. The use of molecular diagnostic techniques to supplement or replace karyotyping is being considered.

Appendix 4

Programme Management Standards

1.0 Generic standards

1.1 Policy

- There is a Regionally and locally agreed written policy for antenatal screening programmes.
- The Regionally and locally agreed policy sets out the aim and standards for the local programme.
- All antenatal screening policies should follow national recommendations and guidance.
- There is a minimum size for a 'local area' which should be as large as possible e.g. Strategic Health Authority.
- Every pregnant woman is offered all appropriate antenatal NHS funded screening tests which are provided within a programme that meets national standards where they are in place.
- When setting regional or local antenatal screening policy, all significant stakeholders must be involved in developing the policy. This may involve:- NHS Trusts, Primary Care Trusts or other commissioning groups, Strategic Health Authorities or their equivalent and other relevant laboratories and user groups
- There is a dedicated antenatal screening co-ordinator in each local area or Trust responsible for:
  - assisting in the implementation of standards;
  - ensuring there are arrangements in place for the education of local professional staff providing NHS screening services;
  - assisting in the development of care pathways;
  - ensuring there are arrangements in place for audit and monitoring;
  - linking with a regionally agreed quality assurance mechanism.
- The Regionally or locally agreed antenatal screening policy is disseminated widely to all professionals involved in antenatal screening provision and is easily available to pregnant women or others who wish to read it.
- All antenatal screening policies adhere to recommendations made by the National Screening Committee.

1.2 Clinical arrangements for antenatal screening programmes.

- A dedicated screening co-ordinator should be identified to oversee the running of the local antenatal screening programme provided by NHS Trusts, supported by a deputy, both of whom have this role included in their job description.
- Each maternity unit/NHS Trust has a multidisciplinary clinical steering group for the antenatal screening programmes which meet regularly to examine audit reports and oversee the management and quality of the programmes. The group should be accountable and report to the Chief Executive of the Trust.
- There is auditable documented evidence of which antenatal screening tests the woman has consented to have and which antenatal screening tests have been performed.
- Each Maternity unit /NHS Trust has a clearly defined antenatal screening policy for informing patients of their risk results.
- When women have an antenatal screening test they must be given clear information regarding how and when they will receive their result.
- All women having an antenatal screening test must be informed of their screening test result, (including screen negative / low risk results).

- Women who receive a screen positive result/high risk must have access to an appropriately trained health professional in antenatal screening to discuss her result and her options for further management.

1.3 Education and training for staff

- All those directly involved in the provision of antenatal screening information or services should participate in an induction course and undertake an annual updating session.
- All professionals providing antenatal screening information and services should have received the appropriate education for their roles and responsibilities and any specific tasks required. This would include midwives, medical staff, general practitioners, primary care teams, ultrasonographers and laboratory staff.
- The appropriate training and education will be defined by National and Regionally agreed policies, which take into account professional development requirements, and guidance from appropriate Royal Colleges and N.S.C.
- A record of those completing locally arranged education sessions must be maintained by the locally identified screening midwife or other agreed administrative arrangement.
- An ongoing multidisciplinary antenatal screening education programme is provided in all Trusts, co-ordinated by the screening midwife.
- The job description of the screening midwife should include the responsibility for antenatal screening, education, assessment and evaluation with ultimate accountability to the clinical governance board.
- Local multidisciplinary antenatal screening education programmes are audited and reviewed regularly.
- Training requirements relating to antenatal screening issues should be discussed as part of staff appraisals.

1.4 Information and support for women and their partners

- All women and their partners are enabled to make informed choices about the screening tests which they wish to accept.
- All women and their partners should receive information about antenatal screening as early as possible in pregnancy before they are asked to make any screening decisions.
- All women and their partners are given an opportunity to discuss the decisions they have made for antenatal screening with a professional who is appropriately trained and informed about the condition.
- Other patient information materials are available for women and their partners with specific needs, such as audio tapes, videos and other visual information.
- Supplementary written information is available to all women who have a screen positive test result.
- All women receive information about the result of antenatal screening tests within 2 weeks of the tests being done, and this is followed up by a written report.
- All women and their partners are offered further information and access to support from other sources, both clinical and non-clinical within and outside the NHS.
- Health professionals should work collaboratively with appropriate agencies such as social services, voluntary sector support groups, religious bodies and funeral directors to provide a comprehensive support network based on a women's individual needs and requests.

1.5 Generic ultrasound screening standards.

- There is a regionally or locally agreed written policy and protocol which adheres to national standards and defines the purpose of the early dating scan including the possibility of detecting an abnormality.
- Written information must be given and discussed with all pregnant women prior to the screening procedure, to enable then to make an informed choice.
- Gestational age assessment is by measurement of Crown Rump Length (CRL) before 13 weeks and Head Circumference (HC) or Biparietal Diameter (BPD) after 13 weeks.
- Techniques and biometric charts used for fetal measurements must meet nationally agreed standards:-
    a. CRL, HC, BPD as advised by BMUS
    b. Nuchal Translucency – undergoing consultation.
- All health professionals undertaking an ultrasound scan must have an accredited certificate in obstetric ultrasound or equivalent.
- Equipment standards must be in place for the specification, maintenance schedule and upgrading of scanning equipment.
- There is continuous assessment and monitoring of the quality of the ultrasound screening programme performance which includes operator performance and patient satisfaction with the service.
- There is an identified professional lead in each maternity ultrasound or radiology unit who is accountable for service quality and responsible for local processes of dealing with poor performance and system failures.
- Measurements and results of ultrasound scans are recorded in the woman's pregnancy health record and in the ultrasound clinical information system or written record.
- All health professionals performing ultrasound scans should attend an appropriate communication/counselling course.

1.6 Audit and monitoring processes.

- Overall audit and monitoring of the antenatal screening programmes should be performance managed at Strategic Health Authority (StHA) or Regional level and overseen by a multi professional advisory group.
- The multi professional advisory group of each Trust should provide a report to the Regional Director of Public Health , StHA and service commissioners (PCT).

The following standards relate specifically to the Down's syndrome screening programme.

2.0 Down's syndrome screening management standards

2.1 Audit and monitoring standards for Down's syndrome screening

- Arrangements are in place for each NHS Trust to provide an annual audit report of the Down's syndrome screening programme to the PCT, StHA and Regional Co-ordinator.
- The multi professional advisory group of each Trust are provided with an annual report of the Down's syndrome screening programme in their hospital which is co-ordinated by a named individual.

- Each maternity unit, laboratory and ultrasound department has the appropriate Information Technology arrangement to support the audit process.
- The contents of the report should include the basic minimum information as stated by National guidance.

2.2 Laboratory Standards for Down's Syndrome Serum Screening

- The laboratory must be accredited by an appropriate body e.g. Clinical Pathology Accreditation UK (Ltd)
- The laboratory participates in an accredited External Quality Assessment Scheme (EQAS), e.g. NEQAS, and must be able to able to demonstrate satisfactory performance.
- There is a senior member of the laboratory staff at consultant level responsible for the Down's screening service, with defined lines of accountability for all laboratory aspects of the service.
- There is a documented risk management policy for the Down's syndrome screening service.
- Appropriate internal quality assurance procedures are undertaken and documented, e.g. weekly or monthly screen positive rates, results of internal QC specimens, median MoM values.
- The laboratory participates in multidisciplinary audit of the screening service at local and regional level.
- The laboratory must have a workload of at least 1000 Down's syndrome screening specimens per annum. If the annual workload is between 1000 and 5000 specimens, the laboratory must be part of a network of screening laboratories using the same screening package, i.e. computer software, measuring the same serum markers and using the same correction factors, so that the combined workload is greater than 5000 specimens per year. If Down's syndrome screening specimens exceed 5000 per annum, the laboratory can function independently, but will still be required to participate in multidisciplinary audit at local and regional level.
- 95% of Down's syndrome serum screening reports must be issued within 3 working days of receipt of the specimen at the laboratory.
- The cut-off level used to define the population at increased risk of a Down's syndrome affected pregnancy should be 1 in 250 at term.
- Laboratories undertaking Down's syndrome serum screening must use a combination of at least two biochemical markers, and achieve at least a 60% detection rate for a 5% screen positive rate. (Account will need to be taken of the age profile of the screened population in these figures).

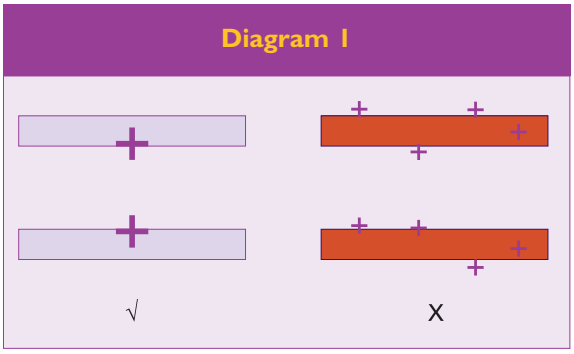
2.3 Draft standards for fetal nuchal translucency measurement for Down's syndrome screening

- There is an agreed policy and protocol defining the purpose of screening for Down's syndrome by measurement of nuchal translucency, including the potential for detecting other abnormalities at the time of the scan.
- All sonographers performing nuchal translucency measurements must be appropriately trained and accredited and their results subjected to rigorous valid audit and performance management. To assure continuing satisfactory performance each ultrasonographer must perform a minimum of 50 nuchal translucency measurements per year.
- The ultrasound equipment must be of good quality, it should have a cineloop function and the callipers should have a precision to one decimal point, i.e. 0.1 mm. Harmonic imaging could be helpful to optimise the image and procure the right section but should be turned

off when making a measurement. All equipment should display TI (Thermal Index) and MI (Mechanical Index) in accordance with the online display standard. 1,2,3

- Ultrasound scanning equipment must meet the European Council Directive, enforced by the Medicines and Healthcare Regulatory Agency, to ensure that it is safe and effective to use. Equipment should, ideally, be no more than five years old with appropriate up to date software. The repair and maintenance of the scanners should be undertaken in a consistent way throughout England to ensure quality control.
- The ideal fetal crown rump length should be 45 mm-84 mm, corresponding to a gestational age of 110 – 140 weeks. The measured image must be retained for the patient record.
- Nuchal translucency can be measured successfully by transabdominal ultrasound examination in about 95% of cases; in others it may be helpful to perform transvaginal sonography if this is available. It may be appropriate to recall the woman for a second scan. However, if there is failure to obtain a nuchal translucency measurement then the woman must be offered a second trimester biochemical screen.
- A midline sagittal section of the whole fetus should be obtained with the fetus horizontal on the screen. The NT should be measured with the fetus in the neutral position with the head in line with the spine, neither hyper-extended nor flexed. The magnification should be as large as possible before the image is frozen so that only the fetal head and shoulders are visible on screen. Small movement of the callipers should produce only a 0.1 mm change in the measurement.
- Care must be taken to distinguish between fetal skin and amnion because, at this stage in gestation, both structures appear as thin membranes. This is achieved by waiting for spontaneous fetal movement away from the amniotic membrane; alternatively, the fetus is moved off the amnion by asking the mother to cough and\or by tapping the maternal abdomen.
- The maximum thickness of the subcutaneous translucency between the skin and the soft tissue overlying the cervical spine should be measured occiput to shoulder.
- Measurements should be taken with the horizontal lines of the callipers placed 'on' the lines that define the nuchal translucency thickness, not in the line and not in the translucency (see diagram 1). The callipers selected should be a vertical cross.

Diagram 1



- An approved risk calculation software package must be used and each centre must take part in an approved internal and external quality assurance programme to demonstrate satisfactory performance.

References

The Online Display Standard can be found at:-

1. O'Brien, WD, Szabo, T, Abbott, J, Carson, PL, et al.
Acoustic Output Measurement and Labelling Standard for Diagnostic Ultrasound Equipment.
American Institute of Ultrasound in Medicine, Laurel, MD, 1992, 122 pp.

2. NEMA. Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment.
NEMA UD-2-1981992, National Electrical Manufacturers Association, Washington, 1992, 158 pp.

3. AIUM/ NEMA (Merritt CR, O'Brien WD, Sweeney T, Carson PL, et al.
Standard for Real Time Display of Thermal and Mechanical Indices of Diagnostic
Ultrasound Equipment,
(Approved New Orleans, Spring, 1991). Amer. Inst. Ultrasound Med., Laurel, MD, 1992, 63 pp

Appendix 5

Agreed objectives, criteria and performance standards

Overall aim of the programme

To ensure all pregnant women have access to a Down's Syndrome screening programme which is uniform, equitable and adheres to national guidance. The primary aim being to allow parents to make informed choices concerning their pregnancy outcome.

Agreed objectives, criteria and performance standards				
		Standards		
Objective	Criteria	Minimum acceptable	Achievable	Excellent
To offer screening to all pregnant women at the appropriate gestational age.	Pregnant women attending for antenatal care prior to 20 weeks gestation are offered screening for Down's syndrome. This is by an agreed method in place at the local Trust which meets national guidance.			100% of women presenting before 20 weeks gestation are offered screening for Down's syndrome.
To ensure that all pregnant women receive written information, supplemented as appropriate, before they enter the screening programme.	All pregnant women presenting before 20 weeks gestation are given written and supplementary information about Down's syndrome screening. This should preferably be at the first antenatal booking visit, and prior to any screening procedure being undertaken.			100% of women are given written information prior to the screening procedure.
To maximise the detection rate and minimise the false positive rate of the test, and ensure that these rates conform to National Standards.	The detection (sensitivity) rate and the false positive (specificity) rate of the programme are monitored and a report provided to all stakeholders. It should demonstrate that the standard is reaching nationally agreed levels.	100% of Trusts provide an annual report to their stakeholders which demonstrates that the programme reaches the minimum standards set by national guidance.	100% of Trusts provide an annual report to their stakeholders which demonstrates that the programme reaches the achievable standards set by national guidance.	100% of Trusts provide an annual report to their stakeholders which demonstrates that the programme reaches the maximum standards set by national guidance.
To minimise harm associated with the screening programme.	The Trust's overall miscarriage rate following invasive diagnostic procedures should be audited. It should be available for all stakeholders in a report format. The number of invasive procedures undertaken by each clinician should be recorded.			All clinicians undertaking this procedure should undertake a minimum of 30 procedures in one year. The reported miscarriage loss rate should include all miscarriages and fetal losses.
To ensure that all results are made available to all screened women on a timescale conforming to National Standards.	All screening results of the Down's Syndrome Screening Programme are available to women and communicated to them by the agreed method discussed at their previous antenatal visit.	90% of negative/low risk results are available within 7 working days of being interpreted and validated, and 95% of positive/high risk results within 3 working days of being interpreted and validated.	95% of negative/low risk results are available within 7 working days of being interpreted and validated, and 97% of positive/high risk results within 3 working days of being interpreted and validated.	100% of negative/low risk results are available within 7 working days of being interpreted and validated, and 100% of positive/high risk results within 3 working days of being interpreted and validated.

Agreed objectives, criteria and performance standards				
		Standards		
Objective	Criteria	Minimum acceptable	Achievable	Excellent
To ensure that women who screen positive/high risk are given appropriate information and support to make the decision whether or not to have a diagnostic test, and that appropriate services are made available without delay.	All women who receive a positive/high risk result are offered a diagnostic test and are given verbal and written information to assist them in making that decision.	95% are offered a diagnostic test within 3 working days of receipt of the test result.	97% are offered a diagnostic test within 3 working days of receipt of the test result	100% are offered a diagnostic test within 3 working days of receipt of the test result
To minimise harm and anxiety following a diagnosis of a Down's syndrome fetus and manage the pregnancy according to the wishes of the parents.	Following a diagnosis of an affected pregnancy, parents are supported in their decision, and once a decision has been made appropriate management and services are made available without delay, adhering to national guidance.	95% of diagnostic results are available to women within 14 calendar days of receipt of specimens in the laboratory, and all information and services are available in support of any decision.	97% of diagnostic results are available to women within 14 calendar days of receipt of specimens in the laboratory, and all information and services are available in support of any decision	100% of diagnostic results are available to women within 14 calendar days of receipt of specimens in the laboratory, and all information and services are available in support of any decision
To ensure that all relevant health professionals involved in the screening programme have attained the necessary level of knowledge and skill.	All relevant health professionals are able to demonstrate a period of study relevant to the screening and diagnostic process. Clarification of this standard is awaited from the Education and training Group.	50% of all health professionals involved in screening have attended a minimum of four hours' study on screening within the past year	75% of all health professionals involved in screening have attended a minimum of four hours' study on screening within the past year	100% of all health professionals involved in screening have attended a minimum of four hours' study on screening within the past year
To provide regular feedback of the effectiveness and quality of the service of the population screened to clinicians, managers and those who commission services	A report on the effectiveness and quality of the screening programme is produced for the Trust and stakeholders with benchmarks against set national guidance.	An annual report is produced to the Trust and stakeholders setting out the quality and effectiveness of the programme against set minimum standards.	An annual report is produced to the Trust and stakeholders setting out the quality, effectiveness and future improvements against set national achievable standards	An annual report is produced to the Trust and stakeholders setting out the quality, effectiveness and future improvements against set national maximum standards
To improve all aspects of the programme by a process of continuous quality assurance	A written report is available demonstrating a quality assessment, assurance and improvement process. This incorporates audit, monitoring and feedback processes, as well as improvement plans for each financial year	An annual plan is provided to the Trust and stakeholders of the audit and monitoring process	An annual plan is provided to the Trust and stakeholders of the audit and monitoring processes, including improvement plans necessary to meet all achievable standards set by national guidance	An annual plan is provided to the Trust and stakeholders of the audit and monitoring processes, including improvement plans necessary to meet all maximum standards set by national guidance. The improvement plans also demonstrate financial and professional support obtained to meet those maximum standards

Appendix 6

Proforma for the Audit and Monitoring of the National Down's Syndrome Screening Programme

Initial specifications

- The preferred method of screening adopted by your Trust.
- The cut-off/threshold level used for your programme.
- The Trust and Strategic Health Authority involved.
- The number of women delivered within the maternity unit(s) under the jurisdiction of the Trust, to include home confinements – the total number of women actually delivering within the jurisdiction of the Trust and its maternity facilities. Figures to relate to annual totals within the financial year.

Basic requirements and criteria

1. The number of women booked for antenatal care before 20 weeks of pregnancy

Criteria
The total number of women seeing a midwife/GP for an antenatal booking history/visit regardless of the intended place of delivery. Figures to relate to annual totals within the financial year. This group is termed the eligible population.

2. The number of women offered screening for Down's syndrome regardless of the technique employed. e.g. by serum screening, nuchal translucency, or combined/integrated testing, before 20 weeks of pregnancy. This should not include fetal anomaly ultrasound screening.

Criteria
The total number of women booked to deliver under the jurisdiction of the Trust who are made aware of the option of screening for Down's syndrome and receive appropriate information leading up to a decision to accept or decline the test, i.e. the informed offer. Statistics relating to the informed offer to be collated as soon as possible after the informed offer has been made and by 20 weeks of pregnancy for accuracy, rather than after the delivery. Figures to relate to annual totals within the financial year and expressed as a percentage (1).

3. The number of women accepting the informed offer of screening for Down's syndrome by (a) the Trust's own method and (b) other methods, i.e. the screening uptake rates.

Criteria
(a) The total number of women having a specific screening test by the Trust's chosen method.
(b) The total number of women having a specific screening test by an alternative method.

Figures relate to annual totals within the financial year and expressed as a percentage of this.
The following questions relate to the Trust's own screening method unless stated otherwise.

4. The number of women undergoing risk assessment by serum screening alone who have had a dating scan carried out prior to sampling.

Criteria
The total number of women undergoing serum screening alone in whom the risk assessment has been based on the accuracy of an early dating scan. Screening methods which inherently involve early scanning (in particular nuchal translucency) are excluded from this requirement.

5. The number of women accepting screening in the context of the Trust's own method who receive a low risk result, i.e. the screen negative rate

Criteria
The total number of eligible women accepting the offer of the Trust's own screening method who are allocated as being at low risk of Down's syndrome. Figures relate to the annual totals within the financial year.

6. The number of women accepting screening in the context of the Trust's own method who receive a high risk result, i.e. screen positive rate

Criteria
The total number of eligible women accepting the offer of the Trust's own method who are allocated as being at high risk for Down's syndrome. Figures relate to annual totals within the financial year.

7. The number of women defined as high risk as a result of the Trust's own screening method who are offered a diagnostic test

Criteria
The number of women classified as screen positive using the Trust's own method who are followed up and offered a diagnostic test. This does not include diagnostic offer rates for other available screening methods.

8. The number of women accepting the offer of a diagnostic procedure

(a) after a high risk result using the Trust's own method, i.e. the diagnostic uptake rate, or
(b) as a consequence of other screening methods employed or as a result of other indications, e.g. past history, age alone, late ultrasound indications.

The total figures for each to be subdivided into
(i) amniocentesis, and
(ii) chorionic villus sampling.

Criteria
The total number of eligible women proceeding with an invasive diagnostic test, firstly on the basis of the Trust's high risk screening results and, secondly, as a consequence of other factors. Figures relate to annual totals within the financial year. Total figures to be subdivided into amniocentesis or chorionic villus sampling groups.

9. The overall pregnancy loss rate following invasive diagnostic procedures for Down's syndrome screening

Criteria
The total miscarriage and pregnancy loss rate at any stage of pregnancy following invasive diagnostic procedures for Down's syndrome, to include method of testing and individual practitioner's pregnancy loss rate.

10. The total number of identified Down's syndrome cases in the total pregnant population

Criteria
The total number of all cases of Down's syndrome identified in all women receiving antenatal care under the jurisdiction of the Trust within a financial year.

11. The total number of identified Down's syndrome cases in the eligible population

Criteria
The total number of cases of Down's syndrome identified in women who book for antenatal care under 20 weeks of pregnancy.

12. The total number of identified Down's syndrome cases in the ineligible population

Criteria
The total number of pregnancies affected by Down's syndrome in women who book for antenatal care after 20 weeks within a financial year.

13. The total number of identified Down's syndrome pregnancies in the eligible population screened using the Trust's screening method, subdivided into those designated as high and low risk

Criteria
The total number of women in the eligible population screened in a financial year using the Trust's own method who are diagnosed as having a pregnancy affected by Down's syndrome divided into:
(a) those classified as high risk, and
(b) those classified as low risk.

14. The total number of Down's syndrome affected pregnancies in the eligible population who were not offered screening

Criteria
The total number of affected pregnancies diagnosed in the eligible population where screening was not offered. The gestational age at which diagnosis was made and the diagnostic method employed to be documented.

15. The total number of Down's syndrome affected pregnancies in the eligible population who were offered but declined screening

Criteria

The total number of affected pregnancies in the eligible population offered screening using the Trust's chosen method but where this was declined.

16. The total number of identified Down's syndrome pregnancies in the eligible population not using the Trust's own screening method

Criteria

The total number of women in the eligible population not screened in a financial year using the Trust's own method who are diagnosed as having a pregnancy affected by Down's syndrome. The gestational age at which diagnosis was made, reasons for not screening, and the method whereby the diagnosis was made to be documented.

17. The total number of identified Down's syndrome pregnancies in the eligible group diagnosed as a result of late interventions such as fetal anomaly scanning after 20 weeks of pregnancy

Criteria

The total number of affected pregnancies diagnosed in the eligible population within a financial year where the screening/diagnostic method was employed after 20 weeks gestation, regardless of the method of screening/diagnosis. This would also include fetal anomaly ultrasouand screening. The gestational age at which diagnosis was made and the diagnostic method employed to be documented.

18. The total number of cases of Down's syndrome diagnosed prenatally by whichever method employed as a percentage of the total identified Down's syndrome cases in the relevant pregnant population

Criteria

The actual detection rate of Down's syndrome for the Trust, regardless of the mechanism of the screening or diagnosis employed, i.e. the overall detection rate.

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