

**Antenatal Congenital Heart Disease**  
*Improving detection, diagnosis and audit*

**Summary of Current Practice, Issues and Recommendations  
in the Second Trimester**

**From the RCOG/Tiny Tickers Workshop**

Wednesday July 9th 2008

**Convenors:** H. Gardiner, A. Cameron

**Hosts:** Royal College of Obstetricians and Gynaecologists and Tiny Tickers

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### Introduction

More and more people are living with congenital heart disease and the benefits of antenatal detection are now well understood. However, current practice does not always reflect this.

Tiny Tickers perceives that the time is right for a more integrated, national approach to the antenatal detection, diagnosis, audit, care and treatment of a baby with congenital heart disease.

The Workshop convened to discuss current practices, identify issues and develop recommendations. This was compiled and distributed to workshop participants for comments. From this feedback, Tiny Tickers are publishing the integrated care pathway for the second trimester. We will continue to work on the first trimester pathway and recommendations.

This document presents an integrated antenatal cardiac care pathway in order to bridge the gap in training and practice between different specialities caring for affected pregnancies.

### Fetal cardiology specialists

To support an integrated cardiac care pathway, we recommend the development of medical or technical health professionals with expertise in fetal cardiology who have received specialised training to a pre-defined level to enable them to function effectively within the care pathway. This is similar to the recommendations published by the Department of Health in consultation with the Grown Up Congenital Heart Patients Association, GUCHPA, for Specialist GUCH Consultants (1).

Training guidelines for doctors wishing to gain expertise or to become recognised as specialists in fetal cardiology have been published by the AEPC and more general guidelines for health professionals working in fetal medicine and cardiology by ISUOG. (2,3) Depending on the local setting, the training could encompass health professionals working in obstetrics, sonography, radiology, materno-fetal medicine, cardiology, paediatrics, pathology or morphology.

We recommend that a broader range of suitably trained specialists be included in decisions involving fetal cardiac screening and management, including screening committees, which have been traditionally obstetric lead, and this is likely to improve referral pathways for expert opinion.

### 5 Transverse Views

Tiny Tickers strongly supports a ***systematic training method*** for fetal heart scanning that is both ***practical and comprehensive***.

The 5 Transverse Views satisfies these criteria by viewing the whole fetal heart with a minimum of sweeps and changes in orientation. This includes establishing fetal lie, sweeping up the fetal chest tracing cardiac connections and relationships and including the important 3 Vessel and Trachea view. With training and practice, this protocol can improve screening within the time allowed and can also form the basis of a more detailed, diagnostic examination.

## **Antenatal Congenital Heart Disease – improving detection, diagnosis and audit**

### **First Trimester**

The Working Group is currently working on the pathway (Map 1) and recommendations in the following three areas:

#### **(1) Booking with primary care (General Practitioner)**

#### **(2) First trimester (11-13<sup>+6</sup> week) screening (Local Obstetric Unit)**

#### **(3) Early (14-16 week) fetal echo/anomaly scan (Fetal Medicine Unit/Service)**

#### **Link from first trimester to second trimester:**

If a major cardiac anomaly is detected following first trimester screening and the woman continues with the pregnancy, she will be offered second trimester care in a Fetal Medicine Unit or in some areas by specialists providing a fetal medicine service locally.

This links to section 5(a) in this document and Map 2 [label 5(a)] at the end of this document.

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### Second Trimester

#### (4) Fetal anomaly scan - screening and referral

Sections 4 and 5 deal with the patient pathway in the second trimester, including screening and referral followed by diagnosis, counselling and management.

See Map 2: “Recommended pathway for fetal cardiac anomaly screening (second trimester)”

Key: Each section consists of Current Practice (**CP**), Issues (**I**) and Recommendations (**R**).

#### **(4a) Screening: Training and Practice**

|           |  |
|-----------|--|
| <b>CP</b> | The fetal anomaly scan is performed at 18-20 weeks in some units and 20-22 weeks in others. The whole of the fetus is examined, often within 20 minutes.   |
| <b>I</b>  | <p><b>Detection rates:</b> In the UK, almost all women attend their fetal anomaly scan and, on average, only about 30% of babies born with major cardiac malformations, requiring surgery or intervention in the first year of life, have a prenatal diagnosis. Thus the current national screening programme has on average a false negative detection rate of 70%.</p> <p><b>Timing:</b> The National Screening Committee (FASP) recommends examination at 18-20<sup>6</sup> weeks (4), but many practitioners have expressed concern as they feel cardiac defects are more easily detected at 20-22 weeks.</p> <p><b>Time and Audit:</b> Many units do not provide enough time to perform the scan and associated paperwork and audit. Some do not have electronic systems and this places stress on the health professional and does not support effective audit.</p> <p><b>Movie/image storage:</b> Storage of movie clips, not just still images, supports good audit and feedback, yet is not widespread practice.</p> <p><b>Environment:</b> Pregnant women should be informed that this is a medical screening examination and not a social visit by the family to “see the baby”</p>   |
| <b>R</b>  | <p><b>4.1 Training:</b> Detection rates for congenital heart disease (CoHD) can be improved through standardised training and assessment (accreditation).<br/>We recommend screening the whole heart using a comprehensive and practical protocol such as the 5 Transverse Views.</p> <p><b>4.2 Scan time:</b> To allow sufficient time for a full scan and paperwork, it would be reasonable to increase the average appointment time (singleton) to 30 minutes.<br/>When training staff, more time should be allowed for the appointment.</p> <p><b>4.3 Paperwork:</b> We support the use of electronic audit and digital clip storage to improve data quality and audit.</p> <p><b>4.4 Environment:</b> We support appropriate measures for child care, so that the screening environment is calm and conducive to a proper examination and supports better communication between health professional and the pregnant woman.</p> <p><b>4.5 “High risk cases” (e.g. maternal diabetes, MCDA twins, NT &gt;95&lt;99 centile)</b> should <b>not</b> be automatically referred for a cardiac consultation as these referrals will overwhelm a tertiary centre. The risk of CoHD is slightly higher (2-3%) than baseline risk (0.8%), but most should be managed within an effective screening programme.</p> |

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### (4b) Referral following a suspected detection of CoHD in the local obstetric unit

#### (4b1) Timely referral by local gatekeepers

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| <b>CP</b> | A suspected case of CoHD from second trimester screening may be checked by a local consultant in obstetric ultrasound or radiology, or a superintendent sonographer (i.e. a local gatekeeper), before referral for specialist opinion, which may be available through a local service or tertiary centre.   |
| <b>I</b>  | Sometimes the woman is asked to return two weeks later if an abnormality is suspected at screening because “cardiac views could not be obtained”.<br><br>Delayed referral impacts on a woman’s choice before 24 weeks where there is CoHD but it is not deemed sufficient to satisfy termination under Clause E of the Abortion Act.  |
| <b>R</b>  | <p><b>4.6 Timely Referral</b> of suspected case of CoHD from second trimester screening to an appropriately trained specialist, should ideally occur within 1-2 working days.</p> <p><b>4.7 When cardiac views cannot be obtained</b> women should be reviewed locally on the same day (by a more experienced colleague) and referred to an appropriately trained specialist if a “normal” heart cannot be seen, which often indicates an anomaly.</p> <p><b>Note:</b> Anxiety created by a suspected case of CoHD means that all women would like a swift referral for diagnosis, no matter what the actual lesion is.</p> <p><b>4.8 Training and Resources</b> need to be put in place to support timely referral (e.g. more MFMs with fetal cardiology expertise).</p> <p><b>Parallel clinics</b> may assist training of paediatric cardiologists to develop fetal cardiology specialisation, by running clinics in parallel to allow peer review.</p> |

#### (4b2) Timely referral from remote regions using new technologies

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| <b>CP</b> | Some regions are remote and physical transport is lengthy and expensive, requiring better triage of cases.<br><br>Possible technical solutions include telemedicine (“live link” or “store and forward” of scan data) and/or 3-dimensional (3D) ultrasound volume datasets transmitted over the web.   |
| <b>I</b>  | Telemedicine clinics may be a cost effective method of obtaining expert second opinion from the small numbers of specialists in the UK.<br><br>Telemedicine requires training of the local sonographers and obstetricians to create high quality scans, sufficient for triage.<br><br>One barrier to the acceptance of analysis of 3D ultrasound volume datasets is the time taken for analysis and the quality of acquisition depends on the level of training of the operator. Paediatric cardiologists may feel that they are already over-stretched and not experienced in manipulating the volume sets. |
| <b>R</b>  | <p><b>4.9 Telemedicine</b> may enable triage and swifter referral of high risk cases, or cases of suspected cardiac abnormality, in remote areas. This technology is only useful when there are proper procedures in place for regular communication, appropriate and on-going training of local sonographers and obstetricians, and dedicated specialist resources.</p> <p><b>4.10 Transfer of 3D ultrasound volume datasets</b> of the heart for expert opinion is not recommended, unless proper procedures and dedicated, trained resources are in place.</p>  |

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### (5) Diagnosis following referral

#### (5a) Diagnosis and Counselling

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| <b>CP</b> | <p>Some referrals are made to the local fetal medicine team and some directly to a specialist in fetal cardiology.</p> <p>Cardiac liaison nurses and midwives are an essential part of the team and will help to co-ordinate information given to families on all medical and practical issues associated with the full diagnosis (cardiac, extra-cardiac and chromosomal issues).</p> <p>After initial scans and counselling an invasive test (amniocentesis) is usually offered to check fetal karyotype (with some exceptions, such as isolated simple TGA). Karyotyping is offered to provide information for parents regarding pregnancy choices, continuing with the pregnancy or termination, as well as for pregnancy management</p>   |
| <b>I</b>  | <p>It is difficult to counsel before the diagnosis has been confirmed and karyotype known. Inappropriate counselling can lead to considerable parental confusion and perhaps an unusual parental decision (e.g. termination of pregnancy for CoHD associated with good outcome such as Transposition of the Great Arteries).</p> <p>Parents may not be aware that certain types of surgery (e.g. Norwood) are not usually offered to babies with chromosomal malformations. Aneuploid fetuses or those with syndromes may not tolerate labour well and show fetal distress. Caesarean delivery is not always appropriate for these babies, so it is helpful to know karyotype in advance.</p>  |
| <b>R</b>  | <p><b>5.1 Multi-disciplinary Team:</b> Effective communication is vital between all professionals, who often operate across multiple sites, to deliver a high standard of care. In addition, cardiac liaison nurses have an important role in collating diverse information, discussing this with parents, and then providing feedback to the MDT.</p> <p><b>5.2 Providing information:</b> Data for counselling of the precise diagnosis, surgical results and long term outcomes for CoHD should come from a specialist in cardiology and not just from obstetricians, or other health professionals, working in isolation.</p> <p><b>5.3 Karyotype:</b> Inform parents of the value of knowing the karyotype antenatally to assist in the planning of mode of delivery, monitoring in labour and decision making in the case of fetal distress as well as postnatal management.</p> |

#### (5b) Termination of pregnancy or intra-uterine death

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| <b>CP</b> | <p>Following a diagnosis of severe congenital heart disease at screening (isolated or with extra-cardiac malformations and/or aneuploidy) intra-uterine death (IUD) occurs in approximately 6% of cases. Before 24 weeks, termination of pregnancy (TOP) will be discussed. A late termination of pregnancy &gt;24 weeks is offered where cases where substantial risk of disability is thought likely and these are managed in a fetal medicine unit.</p> <p>After 21<sup>+6</sup> weeks, RCOG recommends that ‘feticide’ is offered. There are alternative options such as ‘early induction with palliative care’ without feticide.</p> |
| <b>I</b>  | <p>Families do not readily accept post mortem (following Alder Hey), but this provides important information for recurrence risks for families and for good clinical governance.</p> <p>The shortage of suitably trained and experienced pathologists is a national issue.</p>  |
| <b>R</b>  | <p><b>5.4 Experienced personnel</b> are needed in the fetal medicine units to explain the options and process to families and guide them through this difficult time.</p> <p><b>5.5 Post mortem:</b> IUD or TOP should be accompanied by a request for a detailed post mortem (PM) of the baby including the heart. This provides vital information to professionals</p>  |

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

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|  | <p>and parents for counselling on future pregnancies.</p> <p>If consent for PM is declined, request suitable alternatives, such as consent for medical photographs (helpful for geneticists) and a total body MRI.</p> <p><b>Perinatal Pathologists / Cardiac Morphologists:</b> We recommend the heart is assessed by an appropriately trained professional with special interest in cardiac pathology or at least access to the network of highly specialised professionals such as the UK Cardiac Pathology Network to provide guidance if there is no local expertise. While there is no specific training for fetal cardiac pathology it is included in the paediatric curriculum of the Royal College of Pathologists and more advanced training is available from cardiac morphologists and the International Paediatric Pathology Association (IPPA). (5)</p> <p><b>5.6 Counselling</b> following the pregnancy should be offered to all. The timing is usually about 6 weeks later, once post mortem results are available and coinciding with a postnatal check by the obstetrician. The purpose is to discuss what happened in this pregnancy, possible reasons from PM results and recurrence risks in future pregnancies. An early fetal cardiac scan may be offered for future pregnancies (as in the case of a TOP in the First Trimester).</p> |
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### (5c) On-going monitoring

Pathway for on-going pregnancies complicated by CoHD.

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| <b>CP</b> | <p>Fetal echocardiography and growth scans are performed regularly, depending on the cardiac lesion (e.g. static or progressive), presence of extracardiac anomalies and health of the fetus and the obstetric health of the mother. Surveillance may increase towards the end of the pregnancy, particularly if there is evidence of placental insufficiency.</p> <p>Delivery plans will be formulated with the family during this period by the MDT and these may change depending on scan findings or worsening of original scan findings. Most non-duct dependent lesions are best delivered locally. The local neonatal team will be involved at this stage as should the paediatric specialists, such as the local paediatrician with expertise in cardiology (PEC).</p>  |
| <b>I</b>  | <p>Professional issues include poor communication between the various parts of the multi-disciplinary team and tertiary and local units. Sometimes families do not receive consistent information and may be unclear about the diagnosis and management plans.</p> <p>Lack of IT systems to aid effective communication</p>   |
| <b>R</b>  | <p><b>5.7 Co-location:</b> Best practice for women (although not always possible) is to have a fetal cardiology and fetal medicine obstetric assessment in the same place to minimise visits to hospital and improve communication between specialists, including referring obstetricians.</p> <p><b>5.8 Parental involvement:</b> Sufficient time should be given at every consultation to discuss management plans and new findings with the family. Offer parents a visit to the cardiac unit and NICU before delivery providing the chance to talk to the surgeon, neonatal and cardiac teams, co-ordinated by the cardiac liaison nurse.</p> <p><b>5.9 Unborn baby file:</b> In order to have a clear perinatal management plan and co-ordination between health professionals and families, in case of unexpected delivery, we recommend that there is an unborn baby file containing copies all correspondence and ultrasound scan reports. There should be a copy in all suitable locations, including in the maternal hand-held notes, in the mother's file in the local maternity hospital where a baby may be delivered, or the tertiary neonatal unit and paediatric cardiac intensive care unit at the cardiac centre where the baby will receive surgery.</p> <p><b>5.10 Appropriate IT systems</b> to support the pathway outlined in the process maps (including unborn baby file) with guidelines from professional and advisory bodies.</p> |

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### **(6) Initial and continuing education, audit and feedback (in second trimester)**

This section deals with the overall professional processes of education, audit and feedback, to improve second trimester screening, referral and diagnosis.

See Map 3: “Recommended professional process for education, audit and feedback to improve cardiac screening, referral and diagnosis (second trimester)”

#### **(6a) Screening and Referral**

|           |  |
|-----------|--|
| <b>CP</b> | Regional screening is variable.  |
| <b>I</b>  | Current regional inequalities are unacceptable   |
| <b>R</b>  | <p><b>6.1 Guidelines:</b> We support the minimum acceptable standards such as NICE (Antenatal Screening Update 2008) and FASP (4).</p> <p>However, screening 4-chambers and Outflow Tracts misses out the essential 3 Vessel and Tracheal View and a further 10% of important lesions involving the aortic arch, so we recommend a practical, comprehensive and systematic protocol such as the 5 Transverse Views that incorporate all major views of the heart.</p> <p><b>6.2 Assessment with revalidation for fetal cardiology speciality:</b> We strongly recommend practical workplace assessment and continued professional education for all health professionals involved in fetal cardiac scanning, including training, screening, referral, diagnosis and management. The aim is to improve CoHD detection rates and maintain improvement.</p> <p><b>6.3 Three-level model:</b> In a sub-speciality such as fetal cardiology where there are few specialists, the limited resources must be used efficiently. One model is the development of fetal medicine obstetricians specially trained in fetal cardiology that triage referrals from local obstetric hospitals and are supported by the congenital heart disease unit/service.</p> <p><b>6.4 Audit and Image storage:</b> Ensure adequate storage of clips for feedback and evaluation of screening and training programmes.</p> <p><b>6.5 Support for learning:</b> We recommend focus on developing a sense of responsibility and ownership, creating a learning and not a blame culture.</p> |

**(6b) Referral to Local Gatekeeper** – see recommendations 4.6 - 4.8

**(6c) Referral to Specialist** – see recommendations in section 5

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### (6d) Regional / National Audit and National Standards

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| CP | <p><b>Congenital Malformation Registers:</b> Most have high quality, appropriate and specific data, but not all geographic areas are covered. Affected pregnancies can be tracked into their local cardiac centres permitting comprehensive audit (e.g. Wessex and Welsh anomaly registers, WANDA and CARIS).</p> <p><b>CCAD:</b> the regional congenital heart disease centres contribute to the central cardiac audit database (CCAD). This collates the entries and produces reports of all postnatal congenital cardiac surgery and interventions in encoded databases. The information is available to professionals and has a public portal to enable an overview of number and type of conditions treated and the early outcomes.</p> <p>Overall, audit is poorly funded and supported. There is currently no robust method of data collection that is easy to share and that enables units to know how well they are performing.</p>  |
| I  | <p>Trust-based initiatives incurring costs to individual Trusts have proved difficult to implement, as they have low priority. NHS re-configuration is continuous. There is poor cross-linking across registries and in particular linking to CCAD.</p> <p>Many babies are transferred to the cardiac units soon after birth and before they are issued with an NHS number so they are not “linked” with their mother immediately after delivery.</p> <p><b>CMRs:</b> Sporadic: only half of England is covered, all of Wales and some of Scotland. Lack of secure funding for national coverage to support good Clinical Governance.</p> <p><b>CCAD:</b> Inadequate antenatal information, so impossible to link ante- and postnatal data to track pregnancies into cardiac surgery/catheter and evaluate local antenatal detection and postnatal morbidity and mortality.</p> <p><b>Postnatal Registries:</b> Most registries (e.g. PICANet or CCAD) do not record fetuses who are terminated or suffer intrauterine death, as they require that an individual survives long enough to be admitted to an intensive care unit and does not die before surgery.</p>   |
| R  | <p><b>6.5 National Audit:</b> Set up a properly funded, lasting system that is independent of political change, with national/regional funding rather than local.</p> <p>National audit will inform the development of the care pathway, enable practical skills and performance to be assessed and compared regionally, identify needs that should be met by the NHS or other bodies and highlight systemic problems (e.g. delays in referral by tracking screening and referral data).</p> <p><b>6.6 Central funding for CMRs</b> is essential to provide a high quality and safe service.</p> <p><b>6.7 Standardise Registers</b> to amalgamate data across different registers using standardised definitions, as published by the coding committee. A specialist group should consider the likely areas within the dataset where this may be problematic and formulate recommendations that will be useful for anyone setting up or modifying an anomaly register.</p> <p><b>6.8 Antenatal database</b> should incorporate antenatal diagnoses (confirmed by perinatal cardiologists) and postnatal maternal demographics (for tracking missed cases and informing the antenatal screeners in local hospitals). This would enable us to provide units with feedback on their detection rates at antenatal screening.</p> <p><b>6.9 National Tracking Service:</b> It is essential to make better use of the National Tracking Service which allows one to track via an NHS number. The cost for this, from one government department to another, creates an artificial barrier to greater use, which should be resolved.</p> |

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### (6e) Continuing Professional Education

|           |   |
|-----------|---|
| <b>CP</b> | Sonographers or midwives perform fetal anomaly scans and during this 20-30 minute appointment are expected to complete a checklist of normal/abnormal/unseen, to enable the detection of major malformations including those of the heart.  |
| <b>I</b>  | Basic sonographer training covers cardiac screening, but practical support for continued professional education (CPE) may fluctuate and needs to be regularly reviewed.<br><br>While recruitment into the speciality is acknowledged as difficult, there is marked postcode inequality of opportunities in the workplace and this is reflected in a wide variability in antenatal diagnosis of CoHD   |
| <b>R</b>  | <b>6.10 Vary sonographer sessions</b> to improve performance and morale.<br><b>6.11 Record details of the screening examination</b> to facilitate audit. One example is the <b>FASP menu</b> (3), and we recommend this be extended to cover the <b>5 Transverse Views</b><br><b>6.12 Create local, expert second opinion</b> available on the same day as screening whereby local individuals, with more advanced training, supervise and examine suspected cases before referral to improve education and quality.<br><b>6.13 Skills For Health</b> have proposed that other health personnel be re-trained in obstetric ultrasound screening to address recruitment and resource issues. |

## Antenatal Congenital Heart Disease – improving detection, diagnosis and audit

### REFERENCES

- (1) A commissioning guide for services for young people and grown ups with congenital heart disease, DH, May 2006
- (2) Lee W et al. ISUOG consensus statement: what constitutes a fetal echocardiogram? Ultrasound Obstet Gynecol 2008; 32: 239–242
- (3) Fetal Working Group. Recommendations from the Association for European Paediatric Cardiology for training in Fetal Cardiology. Cardiol Young 2007? **TBC**
- (4) NHS Fetal Anomaly Screening Programme, 18<sup>+0</sup>-20<sup>+6</sup> Weeks' Fetal Anomaly Screening Scan **DRAFT** (Version 5d 6<sup>th</sup> March 2009)
- (5) Practical Guidelines for Autopsy Pathology; the Perinatal and Pediatric Autopsy. Arch Path Lab Med 1997; 121: 368-376

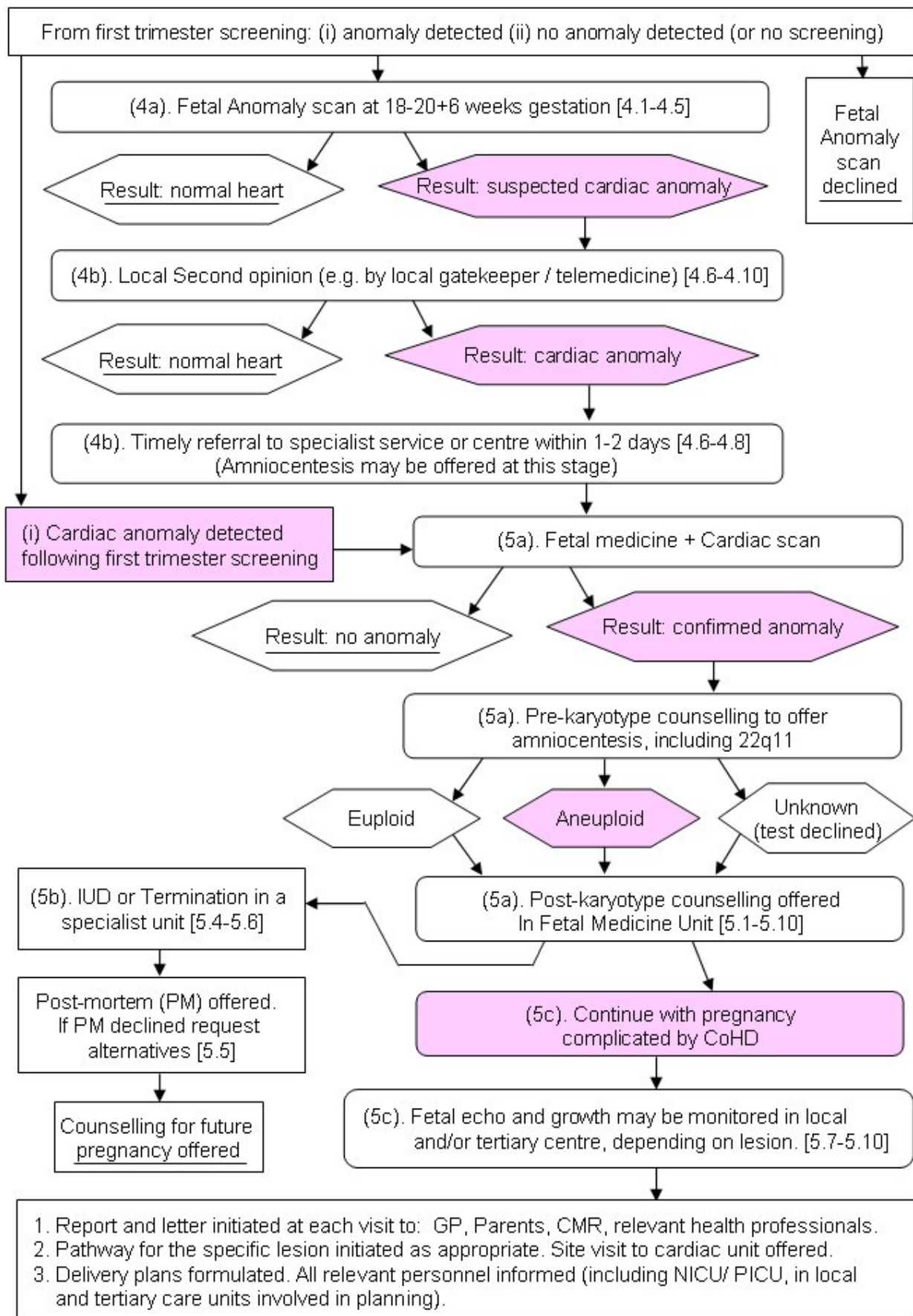
### ABBREVIATIONS

**CCAD:** Central Cardiac Audit Database  
**CoHD:** Congenital Heart Disease  
**CMR:** Congenital Malformation Register  
**CPE:** Continuing Professional Education  
**FASP:** Fetal Anomaly Screening Programme (part of the NSC)  
**FMU:** Fetal Medicine Unit  
**IUD:** Intra-uterine death  
**MDT:** Multi-disciplinary team  
**MFM:** Materno-fetal medicine specialist  
**NICU/PICU:** Neonatal/Paediatric Intensive Care Unit  
**NSC:** UK National Screening Committee  
**NT:** Nuchal Translucency  
**PEC:** Paediatrician with expertise in cardiology  
**PICANet:** The Paediatric Intensive Care Audit Network  
**PM:** Post-mortem  
**RCOG:** Royal College of Obstetricians and Gynaecologists  
**TOP:** Termination of pregnancy

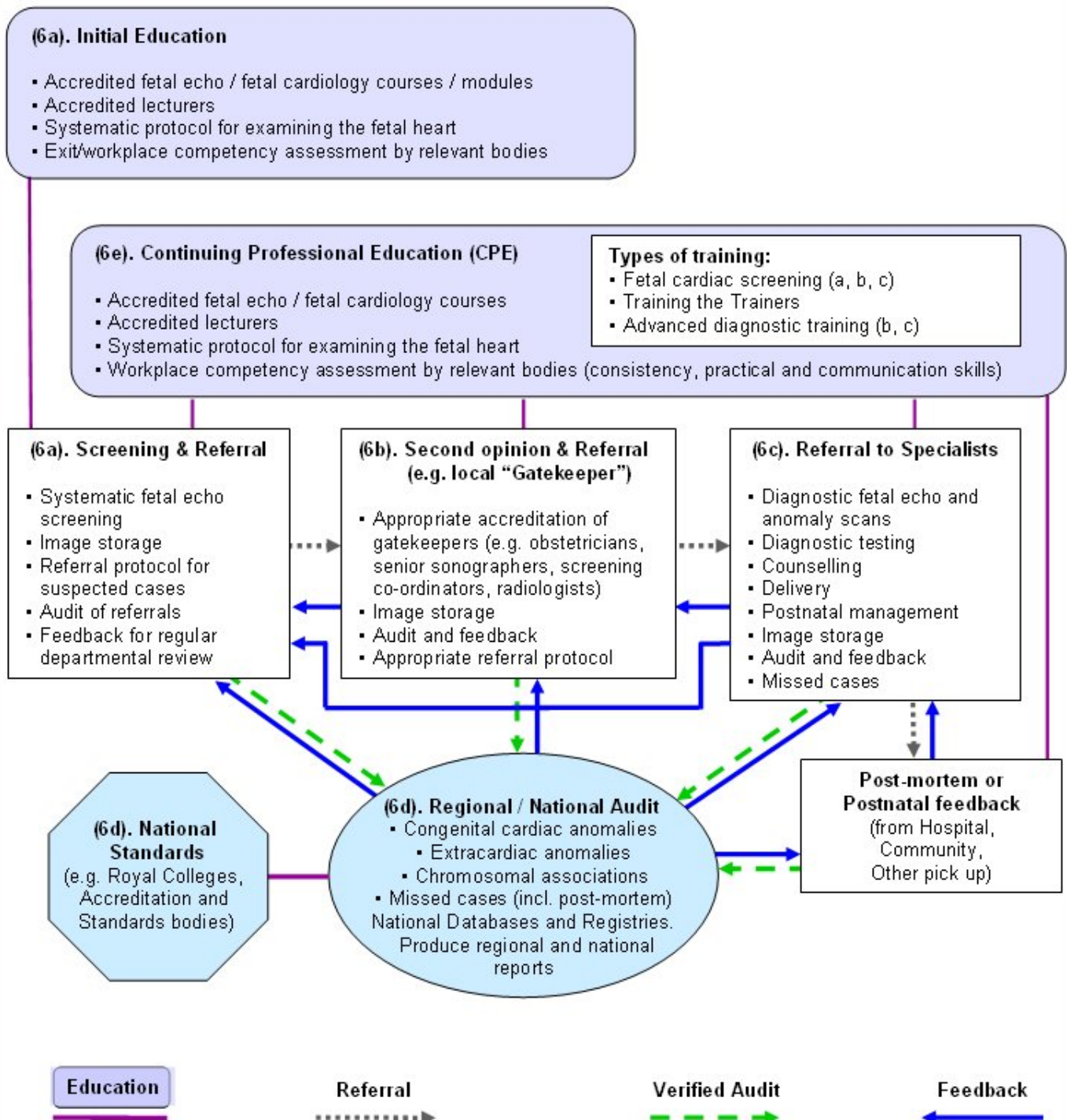
### DEFINITIONS

**Aneuploid:** Abnormal chromosomes (karyotype)  
**Booking:** Process whereby primary health care physician (GP) arranges antenatal care and delivery of a pregnant woman  
**Euploid:** Normal chromosomes (karyotype)  
**Karyotype:** Chromosomes

**Map 2: “Recommended pathway for fetal cardiac anomaly screening (second trimester)”**



**Map 3: “Recommended professional process for education, audit and feedback to improve cardiac screening, referral and diagnosis (second trimester)”**



**This document was compiled by:** H. Gardiner, J. LaRovere, A. Pike, I. Averiss

## **Workshop participants:**

### **Invited Speakers**

Dr Kate Bull, Senior Lecturer in Paediatric Cardiology and Medical Advisor to the Family Policy Unit, Institute of Child Health, London

Professor Alan Cameron, Consultant Obstetrician and Feto-maternal Specialist, Queen Mother's Hospital, Yorkhill NHS Trust, Glasgow

Dr Frank Casey, Consultant Paediatric and Fetal Cardiologist, Department of Paediatric Cardiology, Royal Belfast Hospital for Sick Children, Belfast

Dr Trish Chudleigh, Advanced Practitioner Manager, Rosie Ultrasound Department, Cambridge University Hospitals NHS Foundation Trust and Fetal Anomaly Screening Programme (FASP)

Mr David Cunningham, Heart Disease Project Manager, Central Cardiac Audit Database (CCAD)

Ms Alexandra Drought, Superintendent Ultrasonographer, West Middlesex University NHS Trust Hospital, London

Dr Helena Gardiner, Senior Lecturer/Consultant, Perinatal Cardiology, Imperial College at Royal Brompton and Queen Charlotte's and Chelsea Hospitals, London and Tiny Tickers Medical Advisor

Mrs Rosemary Johnson, All Wales Programme Co-ordinator, Antenatal Screening Wales, Cardiff

Dr Wilf Kelsall, Consultant Neonatologist, Rosie Maternity Hospital, Cambridge University Hospitals NHS Foundation Trust, Cambridge

Dr Gurleen Sharland, Reader/Consultant, Fetal Cardiology, Evelina Children's Hospital, London

Mr David Tucker, Congenital Anomaly Register & Information Service for Wales (CARIS)

Dr Graham Tydeman, Consultant in Obstetrics and Gynaecology, NHS Fife - Forth Park Hospital, Kirkcaldy

Ms Diana Wellesley, Clinical Geneticist and Wessex Antenatally Detected Anomalies (WANDA)

Mrs Wendy Weston, Superintendent Sonographer and Tiny Tickers Trainer

Mr Ruwan Wimalasundera, Consultant Obstetrician and Fetal Medicine Specialist, Centre For Fetal Care, Queen Charlotte's and Chelsea Hospital, London

### **Invited Professionals**

Ms Allyson Arnold, Diagnostics Programme Manager, British Heart Foundation

Mr Ian Averiss, CEO, Tiny Tickers

Professor Roger Boyle, Cardiologist and National Director for Heart Disease and Stroke

Ms Archana Dodhia, Children's Heart Federation

Dr Joan LaRovere, Paediatric Cardiac Intensivist, Royal Brompton Hospital

Dr Pam Loughna, Senior Lecturer/Honorary Consultant Obstetrician, Nottingham University and BMUS representative

Ms Katharine Peel, Head of Heart Save, British Heart Foundation

Ms Rita Phillips, Radiographer, Society and College of Radiographers

Ms Anne Pike, Integrated Care Pathway Facilitator, Royal Brompton Hospital

Dr Sheila Shribman, Paediatrician and National Clinical Director for Children, Young People and Maternity Services