Oxford University Hospitals NHS
NHS Foundation Trust

GS118 - Ultrasound Department Standard Operating Procedure for Growth Scans

Category:	Standard Operating Procedure (SOP)
SOP Number:	GS118
Summary:	This SOP provides guidance for clinical staff performing Growth scans within the Oxford University Hospitals Foundation Trust (OUHFT) Ultrasound Maternity Department
Valid from:	26/09/2022
Date of next review:	This SOP will be jointly reviewed with Anomaly Scan Guideline & Growth Scan Guideline on 27/09/2025
Appraisal score:	Domain | 1 | 2 | 3 | 4 | 5 | Overall Score (%) | | | | | |
Approval date/ via:	26/09/2022, Maternity Clinical Governance Committee
Related documents:	• Anomaly Scan Guideline • Growth Scan Guideline • Transverse, Oblique, Unstable Lie Guideline
Author(s):	Consultant Obstetrician, Fetal Medicine Lead
Clinical lead:	Ultrasound Department Manager
This document replaces:	Growth Scan Full Guideline v1.4

This document is uncontrolled once printed.

It is the responsibility of all users to this document to ensure that the correct and most current version is being used.
This document contains many hyperlinks to other related documents.
All users must check these documents are in date and have been ratified appropriately prior to use.

Document History

Version valid from	Version number	Reason for review/update
26/09/2022	2.0	Reviewed and updated in response to a SIRI and also to align with National guidance Comprehensive 3 yearly review
11/08/2022	1.4	Updates re management/referral of fetal macrosomia for <35+0 weeks gestation and ≥ 35 weeks gestation Change in definition of predicted fetal macrosomia from AC >95th centile to EFW > 95th centile

_	1.3	Review commenced - but version 1.3 not ratified
22/08/2019	1.2	3 yearly review

Consultation Schedule

Who? Individuals or Committees	Rationale and/or Method of Involvement
Consultant Obstetrician	Author and review
Ultrasound Manager	Author and review
Quality Assurance and Improvement Midwife	Review Co-ordinator
Interim Ultrasound Manager	Author and review
Midwife Sonographer	Review
Document Review Group (DRG)	Review and approval

Contents

Who should read this document?

- All clinical staff performing growth scans within the Maternity Ultrasound Department should familiarise themselves and adhere to the guidance within this SOP. Clinical staff involved in providing antenatal/intrapartum care should also familiarise themselves with the guidance in this SOP.

Gender inclusive language in OUH Maternity and Perinatal Services:

- This SOP uses the terms woman and women throughout. These terms should be taken to include people who do not identify as women but who are pregnant. Similarly, where the term parent(s) is used, this should be taken to include anyone who has main responsibility for caring for a baby.
- The term partner refers to the woman's chosen supporter. This could be the baby's father, the woman's partner, a family member or friend, or anyone who the woman feels supported by and wishes to involve in their care.

Key Updates

(New in v2.0) EFW >95th centile will replace AC>95th centile as a predictor of fetal macrosomia.

(New in v2.0) Large for dates/ fetal macrosomia - Action for <35 weeks gestation

- If EFW is >95th centile - blood glucose assessment is worthwhile. Please refer to the Community Midwife via EPR for blood glucose assessment (please see Growth Scan Guideline).

(New in v2.0) Large for dates/ fetal macrosomia - Action ≥ 35+0 weeks gestation

- If EFW is >95th centile - blood glucose assessment **should not be performed.** In this instance, **t**he sonographer should ask the woman if they have missed a GTT and/or assess if the woman has risk factors for GDM which are:
- Previous GDM
- BMI >30
- Previous baby > 4.5kg
- Family history of diabetes (1st degree relative)
- Any ethnicity at high risk of GDM
- If any risk factors are identified women should be referred to the diabetes Midwives via EPR.
- Women with a macrosomic baby (EFW >95th centile) detected at the 36-week scan who have not missed a GTT and have no risk factors for GDM, should be offered referral (by the USS Dept) to a consultant for shared decision making and individualised birth planning.

(New in v2.0) Polyhydramnios - Action required for <35 weeks gestation

- If the AFI ≥ 25cm but <30cm, the woman should be referred to antenatal clinic and have a GTT.
- If the AFI is ≥ 30cm, the woman should be referred to FMU.
- If polyhydramnios is observed in a woman who is known to be diabetic, she does not need referral to FMU.

(New in v2.0) Polyhydramnios - Action ≥ 35+0 weeks gestation

- If the AFI ≥ 25cm but <30cm, the woman should be referred to antenatal clinic – **however a blood glucose assessment should not be performed.**
- If the AFI is ≥ 30cm, the woman should be referred to FMU.
- If polyhydramnios is detected, the sonographer should ask the woman if they have missed a GTT and/or assess if the woman has risk factors for GDM which are:
- Previous GDM
- BMI >30
- Previous baby > 4.5kg
- Family history of diabetes (1st degree relative)
- Any ethnicity at high risk of GDM

If any risk factors are identified women should be referred to the Diabetes Midwives via EPR.

Full SOP

Growth Scan Pathway

1. All pregnant women will be offered scans according to whether they have any of the following risk factors and the results of the uterine artery Dopplers at the anomaly scan.

***Risk factors:**

- Previous (singleton) baby <2500g (5lbs 8oz) at any gestation
- Aged 40 or above and nulliparous
- Smoking ≥10 day (not including e cigarettes)
- PAPP-A <0.3MoMst

2. See the Growth Referral Pathways for 26+0 to 34+6 weeks and 35+0 to 40+ weeks on pages 6 and 7 respectively.

Growth Referral Pathway
26+0 → 34+6/40

(NB: In event of both SGA pathway and also urgent scans e.g. ↓FM's or SFD)

SGA RISK =	**ABNORMAL DOPPLER =**
AC↓ ≥ 40 centiles from anomaly	**Umbilical Artery PI = > 95th centile**
AND/OR	**AND/OR**
EFW <10th centile	**Cerebro Placental Ratio (CPR) = < 1.1**

Finding:	Referral pathway:
Normal growth & normal Doppler PI and CPR	36/40 scan as planned if ≥ 7 days from scan. (NB: No ANC referral)
Normal growth + **Abnormal** umbilical Doppler PI or CPR	Refer FMU. If AEDF/REDF/CPR<1.1 for immediate review in FMU (Refer to MAU if FMU staff nor available)
SGA risk & normal Umbilical Doppler PI and CPR	Repeat scan in 2-3 weeks and arrange follow up ANC on the same day.
SGA risk + **Abnormal** umbilical Doppler PI AND/OR CPR	Refer FMU. If AEDF/REDF/CPR<1.1 for immediate review in FMU (Refer to MAU if FMU staff not available)
Unobtainable MCA + **Abnormal** growth.	Refer to FMU FGA clinic
If other concerns following scan then refer for review. Please highlight "for review" on report and email.	
NB: DCDA twins are NOT referred to FMU FGA clinic as they will be seen by LWI in clinic after scan	
IF THE MCA VMAX (in viewpoint) IS >100CM/SEC REFER TO FMU .	

V 14 01/11/2021

Growth Referral Pathway
35+0 → 40+

(NB: In event of both SGA pathway and also urgent scans e.g. ↓FM's or SFD)

SGA RISK =	**ABNORMAL DOPPLER =**
AC↓ ≥ 40 centiles from anomaly **AND/OR** **EFW <10th centile**	**Umbilical Artery PI = > 95th centile** **AND/OR** **Cerebro Placental Ratio (CPR) = < 1.1**

Finding:	Referral pathway:
Normal growth + Normal umbilical + normal CPR	No FU required.
Normal growth + **Abnormal** Umbilical Doppler AND/OR CPR	Refer to FMU Fetal growth assessment clinic. **If AEDF/REDF/CPR<1.1 for immediate review in FMU** (Refer to MAU if FMU staff not available)
SGA risk + Normal umbilical Doppler + normal CPR	Refer to FMU Fetal growth assessment clinic.
SGA risk + **Abnormal** umbilical AND/OR abnormal CPR	Refer to FMU FGA clinic. **If AEDF/REDF/CPR<1.1 for immediate review in FMU** (Refer to MAU if FMU staff not available)
Unobtainable MCA with normal growth + Normal Umbilical Doppler	No further scans if no SGA risk
Unobtainable MCA + **Abnormal** growth.	Refer to FMU FGA clinic
If other concerns following scan then refer for review. Please highlight "for review" on report and email.	
NB: DCDA twins are NOT referred to FMU FGA clinic as they will be seen by LWI in clinic after scan	
IF THE MCA VMAX (in viewpoint) IS >100CM/SEC REFER TO FMU .	

V 14 01/11/2021

Growth scans outside pathway

3. Clinicians may request growth scans in addition to those booked according to the growth pathway.
4. However, these need to be according to specific criteria, and the relevant indication box ticked on the growth scan request form.
5. These requests will be reviewed a by a senior doctor and may be declined, particularly if the indication is not completed.
6. It will be responsibility of the person requesting the scan to inform the patient that the request has been declined.
7. indications for these growth scans are on the request form as 'New pregnancy complications'.

New Pregnancy complications:

- Previous scan findings requiring follow up
- PV bleeding
- symphysis fundal height ≥3cms or more under gestation if more than 26 weeks
- new hypertension
- gestational diabetes (one extra scan only at discretion of diabetes team: see guideline)
- reduced fetal movements (if criteria met according to reduced fetal movements guideline)
- other (this must be stated on the referral form)

Pre-existing problems:

- Previous SGA baby. Note that if the previous baby was <2500g they would already be on Pathway C or D (i.e. automatically have extra scan(s) in addition to a 36 week scan). However, if the previous birthweight was <10th centile but the baby was born after 36 weeks they may also have a scan(s) from 38 weeks in addition to the routine 36-week scan.
- Previous pregnancy loss after 16 weeks
- pre-existing medical disease (antiphospholipid syndrome, pre-existing diabetes, chronic hypertension requiring treatment etc)
- other (this will be stated)

Additional scans: not permitted

8. The following indications may not be used for referral for ultrasound:

    - Placental site (no PV bleeding) unless not recorded at 20 weeks or equivocal at 36-week scan
    - Presentation - if ≥36 weeks these should be referred to the breech clinic
    - Large for dates
    - Serial growth scans for 'low risk' indications, eg IVF, previous SGA baby >2.5kg, anxiety

9. Growth scan requests for scans (unless Doppler only for known SGA risk baby) within 2 weeks of a previous scan are also not permitted.

ViewPoint Coding

Indication for Growth Scan

10. 'Indication' field should be completed appropriately:

- G2-SGA pathway
- Non-pathway scan - existing pregnancy risk
- New complication
- Follow up- SGA risk fetus

*Note: follow up scans for placental site, presentation, large for dates should NOT be booked.

Diagnosis of growth scan

11. Please complete diagnosis as either:

- 'Normal fetal growth' or
- 'Normal growth but abnormal Dopplers'
- SGA Risk – submenu:
    - With abnormal Dopplers
    - With normal Dopplers

12. In diagnosis field; a secondary diagnosis of the growth pattern can be coded second.
13. Note that 2 diagnoses are possible. With the cursor at the end of the first diagnosis, press the shift button and select a further diagnosis.

- Note also if there is another appropriate diagnosis such a suspected fetal abnormality, placenta praevia, etc. this should be coded first.

14. Please do not use the following diagnoses which also available in the dropdown menu

In utero growth restriction

15. These require detailed fetal medicine scanning and should not be used routinely on Level 4.

Scanning: measurements from 26 weeks:

- Measure presentation and placental site
- Measure BPD, HC, AC, FL (use best image only)
- Measure liquor volume deepest vertical pool (DVP)
- Measure umbA Doppler (PI)

16. The umbA Doppler should be taken in a section of the free loop of cord unless in a twin pregnancy when it should be at the fetal cord insertion.

17. IF the initial Doppler reading appears high, repeat the measurement on a newly acquired image with careful attention to ensure optimal quality (see Doppler guideline).

18. For an optimally acquired image, the lowest, not highest, PI should be reported.

19. From 32+0 weeks *only,* also measure MCA Doppler; the CPR will calculate automatically: a level of <1.1 should be considered abnormal. *Do not display or print the CPR chart* in Viewpoint.
20. Calculate EFW and press display centiles.

21. Press F7 to visually inspect the AC trajectory. If a possible significant change, calculate centile difference in AC between this growth scan and the anomaly scan. If AC has dropped >/=40% compared to anomaly scan, this is an alteration in growth velocity and means the baby is automatically SGA risk.
22. Store the head view, AC, FL, DVP, umbilical artery and middle cerebral artery waveform from which final/selected measurement is taken.
23. Print the report with 2 charts to a page, showing HC, AC, EFW and umbA PI

Action after Growth Scans if performed between 26+0 and 34+6 weeks

SGA Risk = AC drop off of 40 or more centiles from anomaly to current scan or EFW <10th Centile

Scan Findings

Normal Growth with Normal Doppler

(SGA risk: no AC drop, and EFW >10th centile, umbA PI Doppler normal):

Diagnosis in ViewPoint:

- *'Normal fetal growth'*

Action required:

- The routine 36 week scan should proceed if it is ≥7days from this scan but otherwise no further scans need to be booked.
- No new ANC appointment required.

Normal Growth with Abnormal Doppler

(No SGA risk: no AC drop, and EFW >10th centile, but umbA PI Doppler abnormal):

Diagnosis in ViewPoint:

- *'Normal fetal growth but abnormal Dopplers'*

Action required:

- Refer to FMU.
- If there is AEDF/REDF/CPR <1.1 seek immediate medical review.

SGA Risk with Normal Doppler

(SGA risk with *normal* umbilical Doppler PI):

Diagnosis in ViewPoint:

- *'SGA risk with normal Dopplers'*

Action required:

- The scan should be repeated in 2 to3 weeks.
- Ensure/ book Consultant ANC on the same day. Follow up will be determined from there.

SGA Risk with Abnormal Doppler

(SGA risk with *abnormal* umbilical Doppler PI):

Diagnosis in ViewPoint:

- *'SGA risk with abnormal Dopplers'*

Action required:

- Refer to FMU.
- If there is AEDR/REDF/CPR <1.1 seek immediate medical review.

Abnormal growth with Unobtainable MCA

Diagnosis in Viewpoint:

- *'Abnormal growth with unobtainable MCA'*

Action required:

- Refer to FMU

Other growth issues

There are no other referral indications on growth (e.g. HC <5th centile) unless suspected fetal abnormality. Do not arrange repeat scans simply to recheck one measurement. If in doubt discuss with FMU by requesting an image review.

Action after 'routine' 36-week growth scan (range 35+0 to 37+0) or other growth scan >37+0 weeks

SGA Risk = AC drop off of 40 or more centiles from anomaly to current scan or EFW <10th Centile

Scan Findings

Normal Growth with normal Doppler

(No SGA risk i.e. no AC drop, EFW >10th centile, Dopplers normal):

Diagnosis in ViewPoint:

- *'Normal fetal growth'*

Action required:

- No routine scan follow up.
- No new ANC appointment required.

Normal Growth with Abnormal Doppler

(No SGA risk but abnormal umbilical, or CPR Dopplers, irrespective of whether SGA risk):

Diagnosis in ViewPoint:

- *'Normal fetal growth but abnormal Dopplers'*

Action required:

- Referral to FMU fetal growth assessment clinic
- If there is AEDR/REDF/CPR <1.1 seek immediate medical review

SGA Risk with Normal Doppler

(If SGA risk with normal umbilical *and* CPR Dopplers):

Diagnosis in ViewPoint: *'SGA risk with normal Dopplers'*

Action required:

- Referral to FMU fetal growth assessment clinic No further scans need be booked.
- If SGA risk with abnormal umbilical *or* CPR Dopplers:

SGA Risk with Abnormal Doppler

(SGA risk with abnormal umbilical and/or abnormal CPR):

Diagnosis in ViewPoint: *'SGA risk with abnormal Dopplers'*

Action required:

- Referral to FMU fetal growth assessment clinic. If there is AEDR/REDF/CPR <1.1 seek immediate medical review
- No further scans need be booked.

The MCA not obtainable and normal growth:

- **Diagnosis in Viewpoint:** 'MCA unobtainable and normal growth and Dopplers'

Action required:

- No further scans

The MCA not obtainable and abnormal growth:

Diagnosis in Viewpoint:

- *'MCA unobtainable and abnormal growth'*

Action required:

- Refer to FMU Fetal Growth Assessment Clinic

Other issues at growth scans from 28 weeks

Large for dates/ fetal macrosomia

24. Obstetric intervention is not routinely recommended with a large baby and ultrasound of these babies may be more inaccurate. The detection of a large baby may provoke maternal anxiety. The sonographer, whether qualified as a midwife or not, *must not* enter into discussion about management of a large baby *or* make unprompted comments about size.
    - However, gestational diabetes is more common in this situation.

Definition:

25. Fetal macrosomia is diagnosed when the EFW > 95th centile.

(New in v2.0) Action for <35 weeks gestation

26. If EFW is >95th centile - blood glucose assessment is worthwhile. Please refer to the Community Midwife via EPR for blood glucose assessment (please see Growth Scan Guideline).

(New in v2.0) Action ≥ 35+0 weeks gestation

27. If EFW is >95th centile - blood glucose assessment **should not be performed.** In this instance, **t**he sonographer should ask the woman if they have missed a GTT and/or assess if the woman has risk factors for GDM which are:
28. Previous GDM
29. BMI >30
30. Previous baby > 4.5kg
31. Family history of diabetes (1st degree relative)
32. Any ethnicity at high risk of GDM

    If any risk factors are identified, please refer to the diabetes Midwives via EPR.

33. Women with a macrosomic baby (EFW >95th centile) detected at the 36-week scan who have not missed a GTT and have no risk factors for GDM, should be offered referral (by the USS Dept) to a consultant for shared decision making and individualised birth planning.

34. Repeat scans to assess the growth of a large baby should not be routinely arranged unless requested in a pre-existing diabetic woman.

Polyhydramnios

35. Use the appropriate growth scan code in Viewpoint (see above).

Definition:

36. If the deepest vertical pool is ≥ 8cms, measure the amniotic fluid index (AFI). An AFI ≥25cms is considered to be polyhydramnios.

(New in v2.0) Action required for <35 weeks gestation

37. If the AFI ≥ 25cm but <30cm, the woman should be referred to antenatal clinic and have a GTT.
38. If the AFI is ≥ 30cm, the woman should be referred to FMU.
39. If polyhydramnios is observed in a woman who is known to be diabetic, she does not need referral to FMU.

(New in v2.0) Action ≥ 35+0 weeks gestation

40. If the AFI ≥ 25cm but <30cm, the woman should be referred to antenatal clinic – **however a blood glucose assessment should not be performed.**
41. If the AFI is ≥ 30cm, the woman should be referred to FMU.

42. If polyhydramnios is detected, the sonographer should ask the woman if they have missed a GTT and/or assess if the woman has risk factors for GDM which are:
43. Previous GDM
44. BMI >30
45. Previous baby > 4.5kg
46. Family history of diabetes (1st degree relative)
47. Any ethnicity at high risk of GDM

    If any risk factors are identified, please refer to the Diabetes Midwives via EPR.

Placental Site

48. If the placenta is found to be low at any scans before 36 weeks and there has been no vaginal bleeding, no additional action is required. However, if a placenta is low (and anterior) in a woman with a previous caesarean section, **please ensure a referral to FMU placenta clinic has been made.**
49. In the diagnosis field, if the placenta is over the internal os, record 'Placenta praevia' (a second diagnosis can be used if appropriate) and describe whether the placenta is anterior or posterior.
50. In the diagnosis field if the placenta is not over the internal os, but is within 20mm of it, record 'placenta low' and describe whether the placenta is anterior or posterior. Please also state the distance from internal cervical os (in mm).
51. In women whose placenta is low or praevia, please ask if they have had a caesarean section. If they have, check they have been referred to FMU placenta clinic.

Middle cerebral artery measurements out of 'normal' range

52. If the Vmax of the MCA is >100cm/sec refer to FMU for review. No other MCA measurement (excluding where CPR is <1.1) should prompt referral.

Suspected fetal abnormality

53. These should be referred in the normal manner (see anomaly scan guideline) to FMU.

Liquor volume

54. The deepest vertical pool (cord and limb-free) should be measured at a growth scan. This should always be recorded on Viewpoint. If this is normal, use the "normal with AFI" function and enter the measurement under "PD".

Oligohydramnios

55. Use the appropriate growth scan code in Viewpoint (see above)

Definition:

- If deepest vertical pool is < 2cm, this is oligohydramnios. DO NOT measure the AFI.

Action required:

- If <35/40 the patient should be referred to the Maternity Assessment Unit for the same day review to exclude ruptured membranes.
- If ≥35/40 ask if there is a history of fluid leaking. If there is the woman should be referred to the Maternity Assessment Unit for the same day review to exclude ruptured membranes.
- If there is no such history, an antenatal clinic appointment, but no further routine scans, should be ensured.

Breech presentation/ transverse lie

56. Use the appropriate growth scan code in Viewpoint (see above).
57. **Ensure the presentation is recorded.**

Definition:

- Breech presentation or transverse lie is irrelevant before 35 weeks

Action required:

- Breech / Transverse <35+0 weeks. No action is required.
- Breech / Transverse >35+0 weeks:
- **Breech nulliparous women**: refer to Breech Clinic (via Delivery Suite on ext 21987 or 21988) for the first available appointment after 36+0 weeks
- **Breech multiparous women:** refer to Breech Clinic (via Delivery Suite) for first appointment available after 37+0 weeks
- Please record the position of the legs (extended, flexed or footling) that of the back (left right or midline) and whether there is neck extension
- **Transverse nulliparous:** recheck placental site and refer to Breech Clinic (via Delivery Suite on ext 21987 or 21988) for the first Tuesday after 36+0 weeks.
- **Transverse multiparous:** ensure the woman has an antenatal check with midwife or consultant clinic at 38 weeks to recheck the lie.

Arranging antenatal clinic reviews/ appointments

58. Clinic: Look at the front of the patient's notes to check if she is already under consultant care. Wherever possible, referrals from level 4 scan should be made to the consultant the patient is already under.
59. Where criteria for an FMU referral are present, referral MUST be made even if the patient has an antenatal clinic (including Silver Star) appointment.
60. FMU: Contact via EPR. If urgent, call FMU directly; contact MAU if not available.

Hints and Tips

Reports:

- Code according to growth only unless there is a fetal abnormality
- Always use the DICOM function but check that the Doppler measurements are displayed using the lowest umbA measurement obtained.
- Use HC, AC, EFW and umbA PI Doppler charts
- Do NOT print CPR or uterine artery charts.

Measurements:

- Abnormal umbilical artery Doppler in a normally grown baby is usually due to overestimation of the PI.
- Abnormal MCA Doppler is often due to too much pressure being used on the fetal head.

Referrals:

- Please note in all Antenatal Clinic referrals if the woman is already under consultant care. Many women are already booked under a consultant and do not need referral to a new one: try to ensure that scans occur on the same day as the clinic.

Review

1. This SOP will be reviewed every 3 years, as set out in the *Policy for the Development and Implementation of Procedural Documents.*

2. *N.B.Policies may need to be revised before this date, particularly if national guidance or local arrangements change, where implementation is unsuccessful or where audits necessitate a policy review.*

3. If the approving committee of the policy has delegated the authority to approve supporting documents to another group, this should be documented here. E.g. The Trust Management Executive has delegated authority to the Health & Safety Committee for the approval of any further supporting or associated documents.

EPR Considerations

4. All referrals to the members of the Multidisciplinary Team (MDT) should be made via 'communicate' on EPR. Note/powerform should also be used to aid communication between the MDT.

Implementation Plan

No.	Recommendation for Implementation	Action to be taken	Evidence of Action	Responsible Person	Date Action to be completed by	R.A.G. Action completion status[2]
1.	Raise awareness of changes to new SOP	Add to Monthly Maternity Clinical Governance Update Table	Email to all Ultrasound staff and Community Midwives- Monthly Maternity Clinical Governance Update Table	Updated SOP to be included Monthly Maternity Clinical Governance Update Table	Within 2 weeks of SOP live date	

Appendix 1: Doppler Guidance for Growth Scans

Obtaining and Measuring the Doppler Signal

Once 4 to 6 cycles are obtained and frozen, press the vessel option (eg umbA) and then Autotrace. Limit the section autotraced to the best 3 consecutive similar waveforms. In case excessive background noise and signal is poor, a manual trace can be used. Store the best image of each vessel. Check the values using the 'report' function. The lowest umbA PI measurement should be kept and the others deleted; for the MCA PI measurement, the highest MCA PI measurement should be kept and the others deleted. This is best done prior to transfer. Use the 'send report' function to ensure measurements are stored in Viewpoint; in the event of a lost connection, manually enter both PI and RI for each vessel.

The following 6 criteria must be satisfied for any of the Doppler measurements obtained:

Magnification	50% of the screen (zoom box) and sample gate in centre of vessel
Angle	less than 30%
Sweep speed	4 - 6 waves insonated with constant signal
Clearance of the IMAGE	Velocity and colour gain correction (no veins signal)
Anatomic site of the Sample	UmbA: free loop (twins at fetal cord insertion) MCA: at the emergence of the MCA from the Circle of Willis
Velocity Scale	75% of the peak systolic velocity

The UmbA Doppler signal should be obtained from the sampling of a free loop of the umbilical cord, during fetal quiescence in absence of significant limbs/breathing movements (Fig 1). The PI and RI should be reported.

The end diastolic flow (EDF) should be considered as present if no discontinuation between the end of the diastolic signal and the beginning of the following systolic signal is seen. Absent or reversed EDF should then be reported.

The MCA Doppler signal should be obtained at the axial section of the brain, including the thalami and the sphenoid bone wings, Colour should be used to identify the circle of Willis and the proximal MCA. (Fig: 2) The pulsed-wave Doppler gate should then be placed at the proximal third of the MCA, close to its origin in the internal carotid artery. The angle between the ultrasound beam and the direction of blood flow should be kept as close as possible to 0 (or modified after acquisition to be reduced to 0.) Care should be taken to avoid any excessive pressure on the fetal head. The PI and PSV should be reported.

Fig 1: UmbA

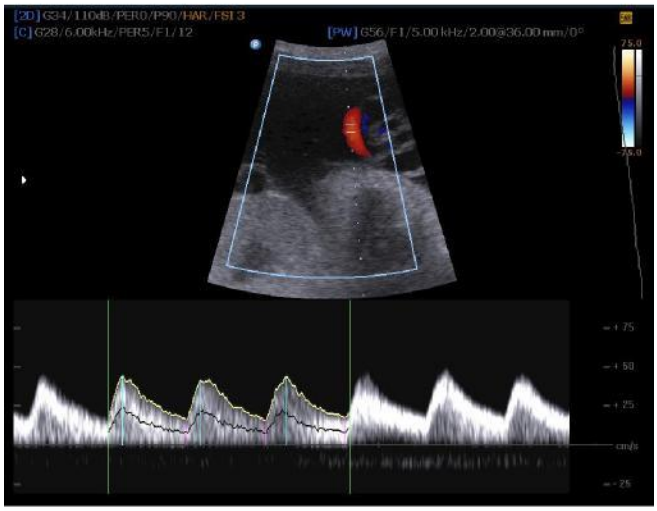
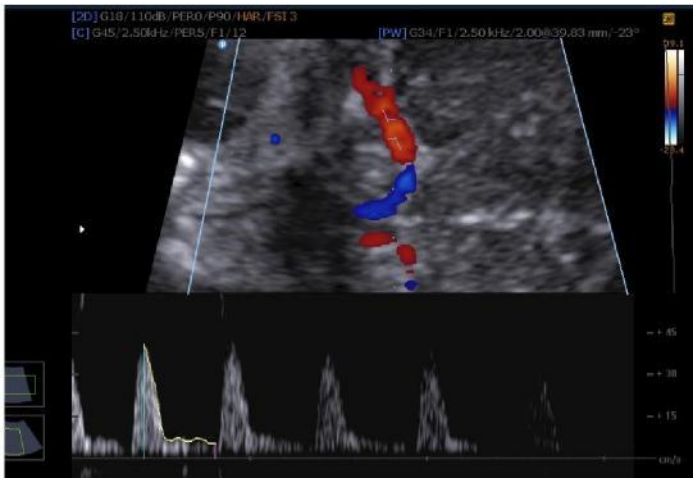
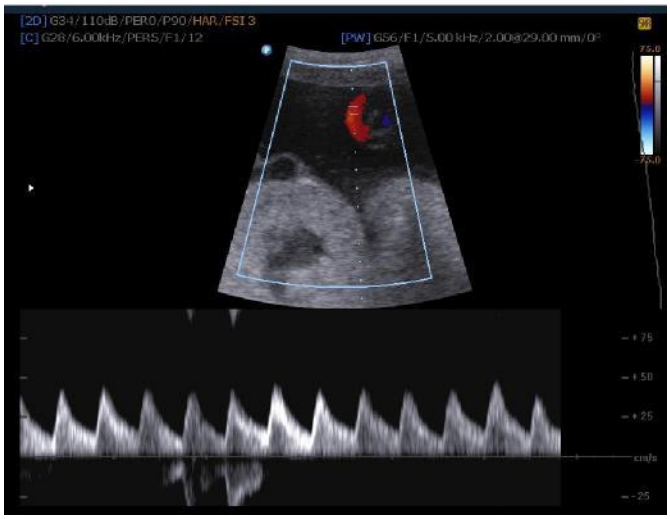


Fig 2: MCA



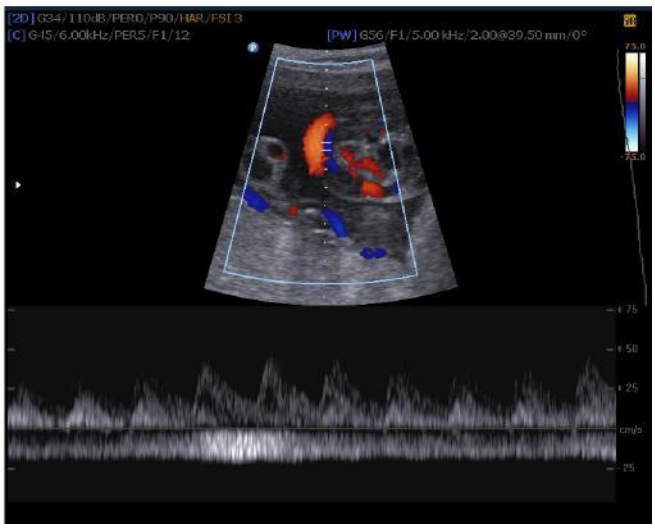
Common Errors

Small sweep and low scale/low pulsatility repetition frequency (PRF) scale



Scale less than 30% of the peak velocity, angle more than 30%

Gate placed not in the centre of the vessel, background noise of the umbilical vein



Appendix 2: Responsibilities

1. It is the responsibility of all staff involved in performing Maternity Ultrasound scans (USS) and those involved in providing antenatal care that involves the use/interpretation of ultrasound scans to assess Maternal and fetal wellbeing to familiarise themselves with this SOP.

Appendix 3: Definitions

AC	Abdominal circumference
AFI	Amniotic fluid Index
CPR	Cerebroplacental ratio (MCA PI/ UmbA PI)
DVP	Deepest vertical pocket
EDF	End diastolic flow
EFW	Estimated fetal weight
FL	Femur length
FMU	Fetal Medicine Unit
HC	Head Circumference
IVF	In-vitro fertilisation
MAU	Maternity Assessment Unit
MCA	Middle cerebral artery
OUH	Oxford University Hospitals
PI	Pulsatility index
PSV	(Vmax in Viewpoint) peak systolic velocity
PV	Per vaginum
RI	Resistance index
SGA	Small for gestational age
UmbA	Umbilical Artery
USS	Ultrasound scan
UtA	Uterine Artery

1. The purpose of this guidance is to standardise and optimise the technique of Doppler signal acquisition. Poor acquisition with umbA and MCA Doppler commonly results in false positives and therefore unnecessary referral.
2. UmbA PI and RI should be obtained from 24 weeks at any growth scans; from 32+0 weeks the MCA PI should also be measured.

Appendix 4: Education and Training

1. There is no mandatory training associated with this policy. Ad hoc training sessions based on an individual training needs will be defined within their annual appraisal or job plan.
2. Individual training needs will be identified through annual appraisal and supervision.
3. Where mandatory training is identified, the author must ensure that this is updated in the Trust's training needs analysis.

Appendix 5: Monitoring Compliance

Compliance with the document will be monitored in the following ways – this audit should be performed in conjunction with the Growth Scan Guideline audit.

Compliance Standard	Monitoring method	By whom and when	Reporting to
% Women having 36-week growth scan and within +/- 5 days	Viewpoint	Ultrasound Department Manager – 6 months after launch of SOP and 3 yearly thereafter	MCGC/AHSN
% Women having 36-week growth scan who are getting CPR calculation	Viewpoint	Ultrasound Department Manager – 6 months after launch of SOP and 3 yearly thereafter	MCGC/AHSN
No of women having growth scans outside standard pathway	Viewpoint	Ultrasound Department Manager – 6 months after launch of SOP and 3 yearly thereafter	MCGC/AHSN