

Rhwydwaith Mamolaeth a Newyddenedigol Cymru Wales Maternity and Neonatal Network

## All Wales Maternity & Neonatal Network Guidelines

# Small for Gestational Age and Fetal Growth Restricted Babies – Antenatal Management

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Disclaimer: These guidelines have been ratified at the Maternity/Neonatal Guideline Committee Meeting; however clinical guidelines are guidelines only. The interpretation and application of clinical guidelines will remain the responsibility of the individual clinician. If in doubt contact a senior colleague or expert. Caution is advised when using guidelines after the review date.

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#### The Investigation and Management of the Small for Gestational Age Fetus

#### 1. Introduction, Purpose and Scope

Small for gestational age (SGA) refers to an infant born with a birth weight less than the  $10^{th}$  centile, and corresponds to an estimated fetal weight (EFW) or abdominal circumference (AC) of < $10^{th}$  centile.

Severe SGA is considered to be an EFW or fetal AC of < 3<sup>rd</sup> centile. [1]

Fetal growth restriction (FGR) is not synonymous with SGA, as 50-70% of SGA fetuses are constitutionally small with appropriate growth for maternal size and ethnicity. However the likelihood of FGR is higher in SGA infants, and involves a pathological restriction of the genetic growth potential, perhaps leading to fetal compromise.

SGA fetuses are at increased risk of perinatal morbidity and mortality but most adverse outcomes are concentrated to the FGR group.

Diagnosis of SGA fetuses relies on ultrasound measurement of fetal AC or EFW.

This document contains guidelines for management of SGA babies and babies with FGR but they are not meant to be exhaustive or fully comprehensive encompassing all possible clinical variations. While implementing this guideline, health care providers must exercise their own clinical judgement dependent on individual clinical circumstance.

#### 2. Causes

Constitutionally Small	Non-placenta mediated growth restriction	Placenta mediated growth restriction
<ul> <li>Normal growth achieved</li> </ul>	<ul> <li>Structural anomaly</li> <li>Chromosomal anomaly</li> <li>Inborn error of metabolism</li> <li>Fetal infection</li> </ul>	<ul> <li>Low maternal BMI (&lt;18)</li> <li>Maternal malnutrition</li> <li>Substance abuse</li> <li>Severe anaemia</li> <li>Pre-eclampsia</li> <li>Autoimmune disease</li> <li>Thrombophilias</li> <li>Renal disease</li> <li>Diabetes</li> <li>Essential hypertension (HTN)</li> </ul>

# 3. Diagnosis and definition of Small for Gestational Age (SGA) and Fetal Growth Restriction (FGR)

In Fetal growth restriction (FGR), the fetus does not reach its biological growth potential as a consequence of impaired placental function, which may be because of a variety of factors. Fetuses with FGR are at risk for perinatal morbidity and mortality, and poor long-term health outcomes, such as impaired neurological and cognitive development, and cardiovascular and endocrine diseases in adulthood.

The curve generated by plotting EFW s of a normally growing baby on Gestation Related Optimal Weight (GROW) chart, should follow any particular centile or remain parallel to the printed centile curves on the GROW chart.

SGA is diagnosed when estimated fetal weight (EFW) is <10<sup>th</sup> centile on Customised growth chart. The EFW should be plotted on a customised fetal weight chart, i.e. Gestation Related Optimum Weight (GROW) chart.

Available individual biometry measurements do not have any customized centiles. For population charts readers should refer to the standard fetal biometry measurements. [2,3,4,5]

FGR is diagnosed when the curve resulting from plotting of EFW s on GROW chart crosses centiles and shows a downward trend, that is, their growth curve does not run parallel to any of printed centile curves and it tends to deviate downwards suggesting slowing of rate of growth. For diagnosis of fetal growth restriction (FGR) two consecutive ultrasound measurements of EFW should be at least 3 weeks apart to minimize false positive diagnosis.

SGA (EFW below 10<sup>th</sup> centile) differs from FGR principally because it also encompasses a majority of constitutionally small but healthy fetuses at lower risk of abnormal perinatal outcome. On the other hand, growth-restricted fetuses with estimated fetal weight (EFW) or biometry>10th centile may not meet their growth potential, and may remain undiagnosed despite being at increased risk of adverse outcome. This means that FGR could be present at EFW s above the 10<sup>th</sup> centile for gestational age.

Severe SGA is defined as EFW <3<sup>rd</sup> centile at any gestational age or fetal AC < 3<sup>rd</sup> centile at routine anomaly scan.

FGR babies might present with abnormal umbilical artery Doppler (UAD) pulsatility index (PI) of >  $95^{th}$  centile, absent or reversed end diastolic flow (EDF) in umbilical artery or cerebroplacental ratio of <  $5^{th}$  centile [6]

For further description about diagnosis of SGA and FGR and plotting of EFW on GROW chart, please refer to the following website links.

https://www.perinatal.org.uk/FetalGrowth/Examples

https://www.perinatal.org.uk/GAP/slow\_growth.mp4

#### 4. Fundal height measurement

Fundal height is a better terminology to use to indicate symphysis fundal

height as the recommended measurement technique is from the top of the uterine fundus to the symphysis pubis. Whereas Symphysis fundal height is prone to make the wrong impression that uterine fundal height should be measured from the Symphysis pubis to the uterine fundus.

Measurement should commence at 26 to 28 weeks of gestation.

Serial measurement of fundal height should be done at each antenatal appointment from 26 to 28 weeks. All SFH measurement should be plotted on customised growth charts.

Refer to local Health Board Guidelines on this matter.

#### 4.1 First measurement of Fundal height < 10<sup>th</sup> centile or static growth

A single fundal height measurement below the 10<sup>th</sup> centile or serial measurements demonstrating slow or static growth should be referred for ultrasound assessment in Ultrasound Department to be done as soon as possible, ideally within 72 hours or as soon as possible. The ultrasound scan should estimate fetal weight, deepest vertical pool of amniotic fluid and umbilical artery Doppler.

If the ultrasound scan findings are all normal in a low risk woman then continue antenatal care as usual

If ultrasound scan is not possible within 72 hours, then obstetric review must take place as soon as possible for clinical examination and consideration about fetal monitoring with cardiotocogram

For women in whom fundal height is prone to be inaccurate (e.g. hydramnios, multiple pregnancy, BMI > 35, uterine fibroid) refer to local guidelines or obstetrician's opinion or guidance below for considering fetal growth scans.

#### 5. Booking Risk Assessment

All women should be assessed at booking for risk factors for an SGA fetus to identify those requiring care led by the consultant team including need for increased surveillance.

Women with **one major** risk factor (section 6) for SGA neonate should be offered serial ultrasound measurement of fetal size and wellbeing with umbilical artery Doppler.

Women with certain major risk factors (section 6) should be offered uterine artery Doppler (UtAD) screening. See section 9.

Women with BMI equal to or more than 35, large or multiple fibroids should be offered serial fetal growth scans.

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Uterine artery Doppler will be performed in Fetal Medicine Unit (FMU) or by an appropriately qualified Sonographer between 20 to 23 weeks of gestation.

# 6. Risk Assessment (by community or hospital midwife, General Practitioner or obstetrician) for small for gestational age fetus.

#### Major Risk Factors

#### Personal

- Maternal age equals or more than 40 years
- Smoker (Any)
- Cocaine use or drug misuse
- Maternal BMI at booking <18

#### **Past History**

- Previous SGA (Birth weight < 10<sup>th</sup> centile)
- Previous stillbirth
- Previous pre-eclampsia resulting in birth before 34 weeks of gestation
- Previous pre-eclampsia

#### **Current Pregnancy factors**

- Low serum PAPP-A (<0.415 MoM) in first trimester
- Chronic hypertension
- Cyanotic Heart disease
- Diabetes and vascular disease
- Renal disease
- Anti-phospholipid syndrome or Systemic Lupus Erythematosus
- Heavy bleeding (like menstrual period) or recurrent vaginal bleeding in first trimester
- Significant bleed in pregnancy
- Women with large or multiple uterine fibroid which leads to clinically significant distortion of size or shape of uterus
- Maternal BMI > 35.
- Echogenic fetal bowel

#### 7. Overall plan for antenatal care

Women with one major risk factor for SGA neonate:

- Should be offered serial ultrasound measurement of fetal weight every 3-4 weeks starting at 28 weeks and where indicated, umbilical artery Doppler, until birth (except those with abnormal uterine artery Doppler)
- All estimated fetal weight (EFW) should be plotted on customized growth chart, that is **G**estation **R**elated **O**ptimal **W**eight (GROW) chart.
- If SGA or FGR is detected then follow guidelines as stated below.
- Consider aspirin (75 to 150 mg) from 12 weeks 0 days if risk factors for pre-eclampsia (see section 8).

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  - Refer for UtA Doppler where indicated as mentioned in section 9.

#### 8. Prophylactic administration of 75-150 mg Aspirin (to be started after 12 weeks 0 days until birth) [7]

#### 8.1 **High Risk factors**

Give prophylactic aspirin if **any one** of the following high-risk factors present

- Hypertensive disease during previous pregnancy
- Chronic kidney disease
- Autoimmune disease- Systemic Lupus Erythematosus (SLE), Antiphospholipid antibodies (APLA).
- Type 1 or 2 Diabetes Mellitus (DM)
- Chronic hypertension

#### Moderate Risk factors 8.2

Give prophylactic aspirin from 12 weeks 0 days if more than one moderate risk factor present.

- First pregnancy
- Age > 40 years
- Pregnancy interval > 10 years
- BMI >35 kg/m2
- Family history of pre eclampsia
- Multi-fetal pregnancy

#### 9 Uterine Artery Doppler (In Fetal Medicine Unit or by appropriately trained sonographer). See Appendix 2C.

#### 9.1 Indications

- Previous hypertensive disorder of pregnancy (including pre-eclampsia) • requiring birth before 34 weeks 0 days.
- Previous stillbirth with EFW <10<sup>th</sup> centile in the absence of any congenital • abnormality or infective etiology.
- Previous SGA or FGR baby weighing < 3<sup>rd</sup> centile for gestational age in the absence of congenital or infective etiology.
- Hypertensive disease in current pregnancy requiring treatment with anti-• hypertensive medication in pregnancy before 20 weeks of gestation.

#### 9.2 Timing of Uterine artery Doppler

20 weeks 0 days to 23 weeks 0 days.

Normalization of uterine artery flow velocity indices at later gestation does not abolish risk of SGA.

#### 9.3 If normal Uterine artery Doppler

- Serial ultrasound scan (USS) from 28w 0d every 3 to 4 weeks until birth. USS should include calculation of EFW, measurement of amniotic fluid (AF) deepest vertical pool (DVP).
- Every measurement of EFW should be plotted on GROW chart
- If EFW < 10<sup>th</sup> centile (i.e. SGA) or FGR then Umbilical artery Doppler and AF DVP should be measured and documented.
- If static growth or FGR then Umbilical artery Doppler and AF DVP should be measured and documented.
- 9.4 If **abnormal** uterine artery Doppler (pulsatility index > 95<sup>th</sup> centile) and/or notching.

(For suggested example of uterine artery and other fetal vascular Doppler values, see Appendix 1)

- Serial ultrasound assessment of fetal size, AF DVP and umbilical artery Doppler starting at 24 weeks at intervals of 3 weeks.
- Every measurement of EFW should be plotted on GROW chart

#### 10. Fetal Surveillance

#### **10.1 Umbilical Artery Doppler (UAD)**

UAD should be performed for all SGA and FGR babies.

**Normal** UAD is a Pulsatility Index (PI) value equal to or less than 95<sup>th</sup> centile.

**Abnormal** UAD is a PI value of >95<sup>th</sup> centile or absent or reversed end diastolic flow (EDF).

If EDF is present then UAD examination should be performed to measure and document Pulsatility Index (PI).

All UAD PI more than 95<sup>th</sup> centile should be documented as such in the report (please see reference values in Appendix 1)

Absent or reversed PI should be documented.

(For suggested example of reference charts of umbilical artery PI values and other fetal vessel Doppler values, see Appendix 1)

 For SGA or FGR fetus (where delivery is not indicated) with abnormal UAD more frequent UAD surveillance is necessary as follows (RCOG GTG No.31)<sup>1</sup>

UAD PI value more than 95<sup>th</sup> centile but EDF present: repeat UAD **twice** every week

If absent/reversed EDF (AREDV) or flow: Consultant to review and decide. If

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delivery is not indicated, then **daily** UAD should be undertaken

#### 10.2 Cardiotocography (CTG)

- This should be used as complimentary method to other methods of surveillance.
- Ideally computerized CTG (cCTG) should be used and interpretation should be based on short term variation (STV) of fetal heart rate on computerized analysis (RCOG GTG No.31)<sup>1</sup>.
  - Refer to local Health Board Guidelines on Computerized CTG.
- Generally, if UAD PI >95<sup>th</sup> centile in a SGA or FGR baby then CTG should be considered twice a week.
- If UAD shows AREDF and **delivery is not indicated** then CTG should be carried out at least twice a day.

#### 10.3 Amniotic fluid volume

- Should be reported as Deepest Vertical Pool (DVP)
- Reference should be made to local Health Board Guidelines on increased amniotic fluid volume.
- This should be used as complimentary method to other methods of surveillance.
- A DVP value between 2 to 8 cm is normal.
- **10.4. Middle cerebral artery (MCA) Doppler.** In most health boards this is likely to be done in Fetal Medicine Unit.
  - In preterm SGA fetus MCA Doppler alone has limited role in timing delivery (RCOG GTG No.31)
  - In SGA fetus at more than 34w 0d of gestation MCA Doppler may be considered for calculation of Cerebroplacental ratio to time delivery.

(Refer to chart in Appendix 1)

- **10.5. Ductus venosus Doppler.** In most health boards this is likely to be done in Fetal Medicine Unit.
  - Has moderate predictive value for acidaemia and adverse outcome.
  - Should be used for surveillance in SGA/FGR fetus at <32 weeks of gestation and with absent or reverse end diastolic flow (AREDF) on umbilical artery Doppler and used to time delivery.
  - 11. Indication for referral to Fetal Medicine Unit (FMU). See Appendix 3.

- EFW < 3<sup>rd</sup> centile for gestational age (severe SGA) at or less than 24 weeks of gestation.
- Static growth or FGR on ultrasound assessment with EFW < 10<sup>th</sup> centile and at < 32 weeks of gestation with abnormal Umbilical artery Doppler (see below) with or without AF DVP < 2 cm [not spontaneous rupture of membrane (SROM)]</li>
- Normal growth at < 32 weeks of gestation with abnormal umbilical artery Doppler or AF DVP < 2 cm (not SROM).</li>
- Static growth or FGR on ultrasound assessment at > 32 weeks with EFW < 3<sup>rd</sup> centile and abnormal umbilical artery Doppler
- Fetal abdominal circumference measurement < 3<sup>rd</sup> centile at routine fetal anomaly scan (FAS).

# 11.1 Actions to be taken for severe SGA fetus (EFW < 3<sup>rd</sup> centile for gestation) detected at less than 24 weeks of gestation

- If severe SGA diagnosed at 18-20 week scan refer to the Fetal Medicine Clinic for detailed anatomical survey & uterine artery Doppler.
- Karyotyping should be offered in severely SGA fetuses (EFW < 3<sup>rd</sup> centile on GROW chart) and/or those babies with structural anomalies and in those < 23 weeks gestation, particularly if uterine artery Doppler is normal.
- Serological screening for cytomegalovirus (CMV) and toxoplasmosis should be offered in severe SGA fetuses.
- In high risk populations consider testing for syphilis and malaria.
- Serial scan for fetal growth, amniotic fluid DVP and UAD should be carried out at intervals of 2 weeks followed by review by obstetrician.
- If abnormal UAD, then act as mentioned in section 8.1.
- If delivery is considered between 24 weeks and 34 weeks 6 days, or if planned caesarean section is necessary for delivery before 39 weeks, a single course of prophylactic antenatal corticosteroids should be offered.

#### 12. TIMING OF DELIVERY

#### Refer to local Health Board Guidelines for guidance on Computerized CTG.

Prophylactic antenatal steroid should be considered for births before 35 weeks 6 days of gestation. [8]

SGA < 32 weeks with absent or reverse end diastolic flow (AREDF) in Umbilical artery (UA)

#### Referral to FMU

- Ductus venosus (DV) and umbilical vein Doppler is recommended, and if abnormal, delivery is indicated provided the fetus is considered viable<sup>\*</sup> and steroids have been given. Even with normal DV Doppler, delivery should be considered between 30-32 weeks.
- Computerised CTG (cCTG) should be used if DV Doppler service unavailable. Delivery is recommended with short term variability (STV) equal to or less than 3ms or if persistent deceleration or bradycardia.

## SGA equals or >32 weeks with AREDF in UA

• Delivery should be considered if viable baby<sup>\*</sup>.

## SGA >32 weeks with abnormal umbilical artery Doppler (PI > 95<sup>th</sup> centile).

- Dependent on whether associated FGR, delivery should be considered no later than 37/38 weeks of gestation. If no fetal growth for 2-3 weeks then consider delivery before 37 weeks.
- If STV on cCTG is equal to or less than 3 ms or if persistent decelerations or bradycardia, delivery is recommended.

## SGA >32 weeks with normal umbilical artery Doppler.

- A senior obstetrician should decide mode of delivery.
- If no FGR, delivery should be considered at 37 to 39 completed weeks of gestation.

## Mode of Delivery

- For SGA fetus with AREDV, caesarean section is recommended.
- For SGA fetus with normal or abnormal umbilical artery PI (PI>95<sup>th</sup> centile but end diastolic velocities present), induction of labour may be offered. Continuous CTG should be performed from onset of uterine contractions.
- Those in spontaneous labour should be admitted early for continuous CTG.

\*baby may be considered to be viable if EFW is more than 500 g and no fetal abnormality. If delivery is considered then discussion should take place with local neonatologist or paediatrician before delivering baby. A full course of antenatal prophylactic steroids to mother is recommended in these circumstances.

#### 11. References

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# Appendix 1: suggested example of reference tables for Doppler of umbilical Artery, middle cerebral artery & uterine artery and cerebroplacental ratio

	Umbilical Artery PI °		MCA PI °		Cerebroplacental Ratio (CPR) °		Mean Uterine Artery PI	
	>95th percentile is abnormal		percentile is abnormal <5 <sup>th</sup> percentile is abnormal		CPR = MCAPI/UAPI <5th percentile is abnormal		MænPi=(RTPI+L <b>t</b> PI/2) > <b>95ª percentileisabnormal</b>	
Gestation	50th	95th	E0th	E+b	50th	5th	50th	95th
Weeks	percentile	percentile	JUUI	Durcentile	percentile	percentile	percentile	percentile
18			percentile	percentule			1.20	1.79
19	1.25	1.63					1.15	1.70
20	1.22	1.59					1.10	1.61
21	1.19	1.55					1.05	1.54
22	1.17	1.52					1.00	1.47
23	1.14	1.48					0.96	1.41
24	1.12	1.47	1.86	1.38	1.74	1.16	0.93	1.35
25	1.09	1.44	1.94	1.44	1.85	1,24	0.89	1.30
26	1.06	1.41	2.01	1.50	1.95	1.32	0.86	1.25
27	1.03	1.38	2,06	1.55	2.05	1.40	024	1.21
28	LOD	1.35	2.11	1.58	2.14	1.47	0.81	1.17
29	0.98	1.32	2.15	1.61	2.21	1.53	0.79	1.13
30	0.95	1.29	2.16	1.62	2.28	1.58	0.77	1.10
31	0.93	1.27	2.16	1.62	2.32	1.62	0.75	1.06
32	0.90	1.25	2.14	1.61	2.35	1.64	0.73	1.04
33		1.22	2.10	1.58	2.36	1.65	0.71	1.01
34	0.86	1.20	2.04	133	2.35	1.63	0.70	0.99
35	0.84	1.18	136	1.47	2.32	1.60	0.69	0.97
36	0.82	1.16	1.86	1.39	2.27	1.55	0.68	0.95
37	0.80	1.14	1.75	1.30	2.19	1.48	0.67	0.94
38	0.78	1.12	1.63	1.20	2.09	1.40	0.66	0.92
39	0.76	1.10	1.49	1.10	1.97	1.29	0.65	0.91
40	0.75	1.09	1.29	1.02	1.80	1.24	0.65	0.90

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ratio: longitudinal reference ranges and terms for serial measurements. Ultrasound Obstet Gynecol, 2007. 30(3): p. 287-96. Baschat AA, Gembruth U. The cerebroplacental Doppler ratio revisited, Ultrasound Obstet Gynecol 2003; 21:124-127.

° Gomez 0, et al Reference ranges for uterine mean pulsatility index at 1141 weeks of gestation. Ultrasound Obstet Gynecol 2008; 32: 128-131

# Appendix 2 A: Major Risk Factors (High Risk Pregnancy)

**Need serial growth scans from 28 weeks every 4 weeks until birth** (except those who qualify for uterine artery Doppler -see Appendix 2C)

#### Major Risk Factors

#### Personal

- Maternal age equals or more than 40 years
- Smoker (Any)
- Cocaine use or drug misuse
- Body mass index less than 18.

#### Past History

- Previous SGA (Birth weight < 10<sup>th</sup> centile)
- Previous stillbirth
- Previous pre-eclampsia resulting in birth before 34 weeks of gestation
- Previous pre-eclampsia

#### **Current Pregnancy factors**

- Low serum pregnancy associated placental protein (PAPP-A) at <0.415 MoM in first trimester
- Chronic hypertension
- Cyanotic Heart disease
- Diabetes and vascular disease
- Renal disease
- Anti-phospholipid syndrome or Systemic Lupus Erythematosus
- Heavy bleeding (like menstrual period) or recurrent vaginal bleeding in first trimester
- Significant bleed in pregnancy
- Women with large or multiple uterine fibroid which leads to clinically significant distortion of size or shape of uterus
- Maternal BMI > 35.
- Echogenic fetal bowel

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#### Appendix 2 B : Low Risk Pregnancy

(Abbreviations:AF DVP: amniotic fluid deepest vertical pool; CTG: cardiotocography; EFW: estimated fetal weight; FMU: Fetal Medicine Unit; GROW: Gestation related optimum weight; HT: hypertension; PET: pre-eclampsia; UAD: umbilical artery Doppler)



#### Appendix 2 C: High Risk Pregnancies and Uterine artery Doppler (In FMU or US department)

(Abbreviations: AF DVP: amniotic fluid deepest vertical pool; CTG: cardiotocography; EFW: estimated fetal weight; FMU: Fetal Medicine Unit; HT: hypertension; PET: pre-eclampsia; UAD: umbilical artery Doppler)



#### Appendix 2 D: High Risk Pregnancy EFW < 10<sup>th</sup> centile AND static growth or FGR on US scan

(Abbreviations: AF DVP: amniotic fluid deepest vertical pool; CTG: cardiotocography; EFW: estimated fetal weight; FMU: Fetal Medicine Unit; HT: hypertension; PET: pre-eclampsia; UAD: umbilical artery Doppler)



# Appendix 3: Fetal Medicine Unit or Assessment by qualified obstetrician with special interest in Fetal Medicine

(Abbreviations: AF DVP: amniotic fluid deepest vertical pool; AREDF: absent/reversed end diastolic flow; CTG: cardiotocography; EFW: estimated fetal weight; FMU: Fetal Medicine Unit; HT: hypertension; PET: pre-eclampsia; PI: pulsatility index; UAD: umbilical artery Doppler)



AREDF in UA: Consider delivery

UAD PI > 95<sup>th</sup> centile: FMU to advise plan for surveillance and timing of delivery. Consider use of Doppler Cerebro-placental ratio