Growth Assessment Protocol

GAP Guidance v3

July 2023

https://perinatal.org.uk/GAPguidance.pdf

perinatal institute

for maternal and child health

CONTENTS

Disclaimer: We have made this guidance as evidence based as possible. It is intended to supplement, not substitute maternity care, which needs to be personalised and based on good clinical judgement. The Perinatal Institute and its staff cannot be held responsible for any adverse outcome.

1 | INTRODUCTION

The Perinatal Institute provides the Growth Assessment Protocol as a licensed and supported service to assist clinicians and their health organisations with the assessment of fetal growth. This priority has arisen from evidence that many adverse outcomes in maternal and perinatal care are associated with unrecognised fetal growth problems, and can be prevented by improved awareness and detection of the pregnancies affected.

This document should be read in conjunction with the GAP service level agreement which sets out the proposed partnership between the PI's GAP team and each organisation's 'champions' / leads tasked with implementating and running the programme. An award winning analysis of Office of National Statistics (ONS) data has emphasised the benefits of thorough implementation and adherence to GAP protocol on stillbirth prevention [1].

Here, we summarise the main components of GAP, and present the Care Pathway with evidence based guidelines which can be adapted into local protocols.

2 | IMPLEMENTATION OF THE GAP PROGRAMME

The main components of GAP are training, protocols / algorithms, growth charts, benchmarking and missed case audit.

2.1 Training and accreditation of all staff involved in maternity care

Face to face training and remote workshops on all aspects of theory as well as practice including standardised fundal height measurements, ultrasound and Doppler parameters, generation and plotting on customised charts, early pregnancy risk assessment and referral pathways, and data collection and audit. This is supported by e-learning with theoretical and practical modules, which include a short theoretical assessment and provision of an e-certificate Compliance reports for eLearning are available upon request.

2.2 Adoption and local adaptation of growth assessment protocols, algorithms and guidelines

Includes the GAP Care Pathway, with early pregnancy 'booking' risk assessment, triage for low risk care through serial fundal height measurement, and indications for referral; and increased risk care, obstetric review, serial growth scans with assessment of size as well as growth rate, and appropriate additional Doppler investigations and implications for management.

2.3 Implementation and training in use of customised GROW software

Provision of GROW-App, (stand-alone or integrated with hospital electronic record), for plotting measurements of standardised fundal height (SFH), estimated fetal weight (EFW) and Dopplers. The growth chart is customised for constitutional variation (ethnic origin, maternal size, parity) and optimised by excluding pathological factors (e.g. high BMI, smoking), thus improving the ability to identify abnormal growth while reducing false positive diagnoses. The software will highlight to the user growth that is out of normal range and encourages risk assessment at each appointment.

2.4 Recording pregnancy outcome and generating reports on progress

The software prompts the recording of key indicators following delivery, including the outcome and condition of the baby, the calculation of the birthweight centile and, if SGA/FGR was detected antenatally. False positive rates for each are also calculated. To assess performance and progress, quarterly standardised unit-specific reports are generated, and benchmarked against national GAP user average for SGA <3rd and <10th detection, as well as averages of best performing units ('TopTen').

2.5 Missed case audit

Software and training is also provided to allow clinicians to undertake a 'standardised clinical outcome review and evaluation' (SCORE) of their SGA deliveries that were not recognised antenatally. GAP leads are encouraged to undertake this regularly on a proportion of cases, to check for avoidable factors such as failure to follow risk assessment protocol, inaccurate measurement or plotting, lack of referral for investigation, etc.

2.6 Further information is available in the GAP Site - Service level agreement :

SLA Annex A – Key responsibilities - sets out the respective roles and responsibilities for the Perinatal Institute and the local health service to ensure effective implementation and running of the GAP programme.

SLA Annex B – Help Desk Services - outlines the support that hospitals and individual users can expect when assistance is required from the Perinatal Institute, including clinical and technical helpdesks.

3 | THE GAP CARE PATHWAY

3.1 Introduction

Following publication in May 2023 of NHS England's Saving Babies' Lives Care Bundle version 3 (CBv3) [2], the Perinatal Institute has updated it's care pathway for NHS Trusts in the GAP programme for continued alignment, while maintaining the benefits of a tried and tested protocol that has been credited as a key contributor to the reduction of stillbirth rates in England [1, 3, 4, 5, 6].

At introduction of CBv2, we offered algorithms/pathways in two phases, according to maternity unit capacity for ultrasound and Doppler. Most units have since been able to implement Phase II or are in the process of doing so, so here we have omitted the interim Phase I version of the algorithm.
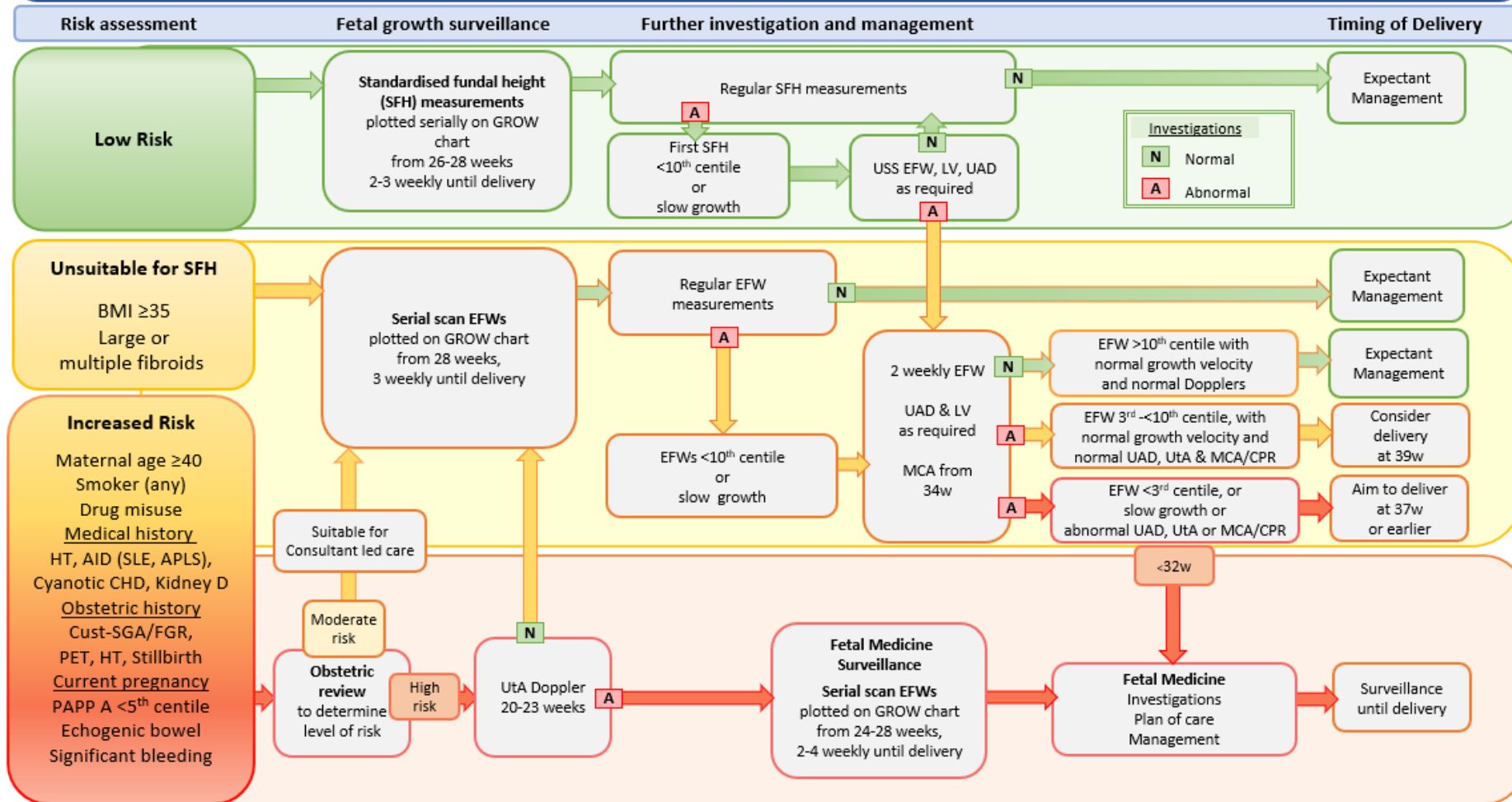
Our updated care pathway seeks to balance the need to identify, investigate and appropriately manage at-risk pregnancies with the aim to avoid unnecessary intervention. It continues the emphasis on surveillance according to risk assessment, by pathways including standardised fundal height (SFH) or estimated fetal weight (EFW) measurements, serially plotted on customised charts to improve the distinction between constitutional and pathological smallness [7, 8 ,9, 10]. A focus of this revision is a new, evidence-based definition of slow growth.

The release of GROW 2.0 with a fully electronic system is aligned with the GAP Care Pathway, identifies slow and accelerated growth, prompts risk review at each visit, and supports decision making.

GAP Care Pathway
Risk assessment, surveillance, investigation and management

See notes in sections 3.3 – 3.6 of GAP Guidance (https://perinatal.org.uk/GAPguidance.pdf)

Risk assessment	Fetal growth surveillance	Further investigation and management	Timing of Delivery

Low Risk

Standardised fundal height (SFH) measurements plotted serially on GROW chart from 26-28 weeks 2-3 weekly until delivery

→ Regular SFH measurements

A → First SFH <10th centile or slow growth → USS EFW, LV, UAD as required

N → Expectant Management

Investigations
- **N** Normal
- **A** Abnormal

Unsuitable for SFH

BMI ≥35
Large or multiple fibroids

Serial scan EFWs plotted on GROW chart from 28 weeks, 3 weekly until delivery

Regular EFW measurements **N** → Expectant Management

A → EFWs <10th centile or slow growth → 2 weekly EFW UAD & LV as required MCA from 34w

N → EFW >10th centile with normal growth velocity and normal Dopplers → Expectant Management

A → EFW 3rd -<10th centile, with normal growth velocity and normal UAD, UtA & MCA/CPR → Consider delivery at 39w

A → EFW <3rd centile, or slow growth or abnormal UAD, UtA or MCA/CPR → Aim to deliver at 37w or earlier

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Increased Risk

Maternal age ≥40
Smoker (any)
Drug misuse
Medical history
HT, AID (SLE, APLS), Cyanotic CHD, Kidney D
Obstetric history
Cust-SGA/FGR, PET, HT, Stillbirth
Current pregnancy
PAPP A <5th centile
Echogenic bowel
Significant bleeding

Suitable for Consultant led care

Moderate risk

Obstetric review to determine level of risk

High risk

UtA Doppler 20-23 weeks **N** / **A**

Fetal Medicine Surveillance Serial scan EFWs plotted on GROW chart from 24-28 weeks, 2-4 weekly until delivery

<32w →

Fetal Medicine Investigations Plan of care Management → Surveillance until delivery

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Abbreviations: AID= Autoimmune Disease; APLS= Antiphospholipid Syndrome; BMI= Body Mass Index; CHD= Coronary Heart Disease; CPR= Cerebro-Placental Ratio; EFW= Estimated Fetal Weight; FGR= Fetal Growth Restriction; SFH= Standardised Fundal Height; HT= Hypertension; LV= Liquor Volume; MCA = Middle Cerebral Artery; PET= Pre-eclampsia; SGA= small for gestational age; SLE= systemic lupus erythematosus; UAD= Umbilical Artery Dopplers: UtA = Uterine Artery Doppler. **NB:** 'Slow growth' includes 'no' or 'static' growth.

3.3 Risk Assessment

1. Early pregnancy risk assessment and assignment to the correct care pathway is essential. As the significance of risk factors is often determined by the severity of current and previous conditions and various other circumstances, moderate and high risk categories are amalgamated into an 'Increased risk' group, which should undergo obstetric review to help determine the appropriate pathway and level required for investigations and surveillance.

2. Pre-existing diabetes, diabetes arising during pregnancy, or twins and other multifetal pregnancy are covered by their respective NICE guidelines and are out of scope of this document. GROW 2.0 supports the entry of twins and is able to calculate twin discordance.

3. Previous 'SGA <10th', if determined by customised centiles, is more likely to be due to fetal growth restriction (FGR) than if SGA is determined by population centiles. We therefore do not distinguish between SGA<3 and <10 by GROW centiles, in terms of the need for increased surveillance in subsequent pregnancies. Obstetric review should nevertheless consider severity, gestational age at onset (if known), gestational age at delivery and associated factors such as preeclampsia.

4. Previous stillbirth is considered an increased risk, regardless of size and stated cause, unless placental insufficiency has been reliably excluded by histopathological examination.

5. Calculating an estimated fetal weight (EFW) at the time of the anomaly scan is not recommended, as good evidence is lacking about its efficacy to predict adverse outcome. The narrow normal range at 20-23 weeks can frequently lead to a false positive suspicion of SGA [11]. The error is substantially increased with population based fetal weight standards. If units nevertheless wish to assess EFW at this time, GROW 2.0 is introducing the functionality to record this data and give users a customised centile.

6. For women with a history of, or significant risk factor(s) for, placental dysfunction (including history of pre-eclampsia or fetal growth restriction), Aspirin 75-150mg nocte is recommended from 12 weeks to birth according to latest NICE guidelines [12].

7. An **obstetric review** is recommended of pregnancies considered at increased risk of early or late onset FGR, based on history and early pregnancy assessment including uterine artery Doppler; this should determine next steps in the care pathway according to severity of risk and unit policy.

3.4 Fetal growth surveillance

1. The **low risk pathway** follows the existing algorithm, with 2-3 weekly clinical assessment and fundal height measurement from 26-28 weeks until birth, according to unit policy, using a standardised technique [13] and with measurements plotted on the customised GROW chart. If suboptimal growth is suspected (first fundal height measurement <10th centile; or slow growth), direct referral for growth scan and/or Doppler is recommended. If resources permit, a scan EFW should be repeated in 3 weeks' time to ascertain velocity, as a single scan cannot provide reassurance about the growth trajectory of the fetus (see B4).

2. **Where SFH is unreliable** because of high BMI (35+) or large or multiple fibroids [6], growth monitoring by serial ultrasound scan is indicated. Where resources allow, this should be done 3 weekly and, starting from **28 weeks** (rather than 32), as an EFW at this gestational age serves as an important **baseline** for assessment of fetal growth in the third trimester.

3. **Normal growth rate / velocity** varies with gestational age and is highest in the middle of the third trimester. It also varies with the customised growth potential of each fetus. For example, the average (50th centile) velocity, expressed in grams per day (g/d), can range from 22g/d between 28-31 weeks in a small mother with a baby of expected term weight of 3100g, to 32g/d between 34-37 weeks for a larger mother expecting a baby weighing 3700 g - i.e. 50% higher. Similarly, the 10th and 3rd centile growth rates shown on the GROW chart also vary with gestational age and expected birthweight.

4. Slow growth by **serial** SFHs can be determined by using the fundal height function in the Fetal Growth Rate tool which is also embedded into the GROW 2.0 software so additional calculation is not required.

5. Slow or 'restricted' growth by **serial EFWs** is defined by the projected optimal weight range method [14]. It demonstrates a model for defining normal and abnormal growth velocity which is predictive of pregnancy outcome, specific to gestational age and measurement interval, and restricted to a 10% false positive rate to limit the effect of scan inaccuracies. This functionality is embedded into GROW 2.0 allowing easy recognition of abnormal growth, or available as a function in the Fetal Growth Rate tool. A comparison between five clinically used methods to define slow growth has shown that the measurement interval specific model of projected weight range can identify non-SGA fetuses with slow growth that are at increased risk of stillbirth, thus the preferred standard to identify at risk fetus' [15]. For precision and reduced effect of scan error,

routine serial EFW measurements to assess growth velocity should be at least 2 weeks apart [9]. While third trimester EFW measurements in routine NHS practice have been shown to be accurate to within +/-10% in 70% of cases [16], consideration should be given to the clinical implication of potential scan error, as well as the overall need for quality assurance. The Perinatal Institute has developed a free audit tool for EFW error, available from the GAP Team.

3.5 Further Investigation and Management

1. The Care Pathway outlines the suggested level of surveillance when placental insufficiency is suspected - by an EFW <10th centile, or by slow growth, with or without abnormal Dopplers. At early gestations i.e. before 32-34 weeks, fetal medicine involvement should be sought.

2. In pregnancies with evidence of growth restriction (EFW<3rd centile and/or slow growth rate, and/or abnormal Dopplers), delivery will be indicated by 37.0 weeks or earlier, depending on severity and Doppler findings. If growth velocity and Dopplers are normal, an EFW <3rd centile should still be considered FGR and the baby delivered before the end of 37 *completed* weeks (37 weeks 6 days).

3. An EFW between the 3rd and 10th centile, on a customised chart adjusted for constitutional variation, is also associated with increased risk of adverse perinatal outcome. Concern about early term delivery because of an association with special educational needs (SEN) in infancy and childhood [17] needs to be balanced by the significantly increased cerebral palsy risk in SGA babies delivered at term [18]. Furthermore, the risk of stillbirth is also increased; the majority of deaths prevented since the introduction of GAP had late onset FGR in the 3rd to 10th centile band [19]. Consideration of timing of delivery should include uterine and middle cerebral artery Doppler findings: if all Dopplers are normal, expectant management to 39 weeks is likely to be safe [20]. When such investigations are not available and growth restriction cannot be excluded, earlier delivery is advisable.

3.6 Audit

Ongoing audit of detection rates is essential to monitor progress. The GROW App will produce the following reports to assist units – quarterly depending on the size of the service:

1. Number and proportion of babies born <10, 10-3 and <3rd centile
2. Antenatal detection rates in same categories
3. False positive detection rates of babies born <10th
4. The reports will also include a national average comparison and a top 10-unit comparison. With approval of participating units, reports can also be produced for networks and regions.

Optional data fields have been included in GROW 2.0 to enable units to undertake a more thorough assessment of service and outcome. These will include:

• Proportion of pregnancies identified as increased risk in early pregnancy, and care offered
• Aspirin use and outcome
• Third trimester scan regime and outcome, stratified according to risk factors

In addition, later this year GROW 2.0 will integrate with the GAP-SCORE tool which will facilitate ongoing case-note review of 'missed' SGA cases (neonates with birthweight <10th or <3rd centile) and reasons why they were not detected antenatally.

3.7 Conclusion

The new GAP Care Pathway aligns itself with the main recommendations of version 3 of the Care Bundle while retaining the key elements of the successful GAP algorithm and customised surveillance. Assessment of fetal growth rate is an important new, evidence based parameter which will add to the detection of at risk babies.

3.8 Next steps

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1. The Institute offers free on-line training workshops with Q & A to all GAP users
2. E-learning modules are available through NHS E-learning for Healthcare.

For further information, please write to gap@perinatal.org.uk

3.9 References

1. Hugh O, Williams M, Turner S, Gardosi J. Reduction of stillbirths in England according to uptake of the Growth Assessment Protocol, 2008-2017: 10 year population based cohort study. Ultrasound in Obstetrics & Gynecology 2020 https://doi.org/10.1002/uog.22187

2. NHS England. Saving Babies' Lives v3: A care bundle for reducing perinatal mortality. NHS England. 2023. https://www.england.nhs.uk/publication/saving-babies-lives-version-three/

3. Gardosi J, Giddings S, Clifford S, Wood L, Francis A. Association between reduced stillbirth rates in England and regional uptake of accreditation training in customised fetal growth assessment. BMJ Open 2013;3(12). http://dx.doi.org/10.1136/bmjopen-2013-003942

4. Widdows K, Roberts S, Camacho E, Heazell A. Evaluation of the implementation of the Saving Babies' Lives Care Bundle in early adopter NHS Trusts in England (SPIRE) Manchester, UK: Maternal and Fetal Health Research Centre, University of Manchester; 2018 https://bit.ly/2LZFbBv

5. Williams M, Turner S, Butler E, Gardosi J. Fetal growth surveillance – current guidelines, practices and challenges. Ultrasound 2018 https://bit.ly/2XKypZB

6. Butler E, Hugh O, Gardosi J. Evaluating the Growth Assessment Protocol for stillbirth prevention: progress and challenges. Journal of Perinatal Medicine. 2022;50:737–47. https://doi.org/10.1515/jpm-2022-0209

7. Gardosi J, Francis A. Controlled trial of fundal height measurement plotted on customised antenatal growth charts. Br J Obstet Gynaecol. 1999;106(4):309–317 https://doi.org/10.1111/j.1471-0528.1999.tb08267.x

8. Clifford S, Giddings S, Southam M, Williams M, Gardosi J. The Growth Assessment Protocol: a national programme to improve patient safety in maternity care. MIDIRS Digest. 2013;23:516–23 https://bit.ly/2Do0tGw

9. RCOG. The investigation and management of the small-for-gestational-age fetus. Green Top Guideline 31. RCOG 2013 https://www.rcog.org.uk/globalassets/documents/guidelines/gtg_31.pdf

10. Jayawardena L, Sheehan P. Introduction of a customised growth chart protocol increased detection of small for gestational age pregnancies in a tertiary Melbourne hospital. Aust N Z J Obstet Gynaecol. 2018 https://doi.org/10.1111/ajo.12902

11. Hugh O, Francis A, Gardosi J. Customised vs population based fetal weight standards to define small for gestational age as a risk factor at 22 weeks gestation. 8th International Conference of Fetal Growth, Berlin 2019 www.fetalgrowth.org Abstract PO8 https://bit.ly/2XQuiZH

12. National Institute for Health and Care Excellence. Hypertension in pregnancy: diagnosis and management (Clinical Guideline 133). NICE 2019 www.nice.org.uk/guidance/ng133

13. Morse K, Williams A, Gardosi J. Fetal growth screening by fundal height measurement. https://bit.ly/327QJLM

14. Hugh O, Gardosi J. Fetal weight projection model to define growth velocity and validation against pregnancy outcome in a cohort of serially scanned pregnancies. Ultrasound in Obstetrics & Gynecology. 2022;60(1):86–95. https://doi.org/10.1002/uog.24860

15. Gardosi J, Hugh O. Outcome-based comparative analysis of five fetal growth velocity models to define slow growth. Ultrasound in Obstetrics & Gynecology. 2023; https://doi.org/10.1002/uog.26248

16. Francis A, Tonks A, Gardosi J. Accuracy of ultrasound estimation of fetal weight at term. ADC Fetal and Neonatal http://dx.doi.org/10.1136/adc.2011.300161.24

17. MacKay DF, Smith GCS, Dobbie R, Pell JP. Gestational Age at Delivery and Special Educational Need: Retrospective Cohort Study of 407,503 Schoolchildren. PLoS Med. 2010 Jun 8;7(6):e1000289 https://doi.org/10.1371/journal.pmed.1000289

18. Jacobsson B, Ahlin K, Francis A, Hagberg G, Hagberg H, Gardosi J. Cerebral palsy and restricted growth status at birth: population-based case-control study. Br J Obstet Gynaecol. 2008 Sep;115(10):1250–5 https://doi.org/10.1111/j.1471-0528.2008.01827.x

19. Williams M, Turner S, Hugh O, Gardosi J. Reduction of small-for-gestational-age stillbirths at term in the GAP programme 2015-2018. Br J Obstet Gynaecol. 2019;126(S2):53. https://bit.ly/2YxH7a5

20. Figueras F, Gratacos E. An integrated approach to fetal growth restriction. Best Practice Research Clin Obstet Gynaecol 2017;38:48-58. https://bit.ly/2XevtA5