POSITION STATEMENT

DETECTION AND MANAGEMENT OF FETAL GROWTH RESTRICTION IN SINGLETON PREGNANCIES

Version: 2.0 August 2023

ENDORSING ORGANISATIONS

Please note: This is a position statement and should not replace local guidelines. It is intended to provide a consensus view and a current summary of available evidence in an area of uncertainty.

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Contributing authors: Glenn Gardener, Fabricio da Silva Costa, Ngaire Anderson, Christine Andrews, Billie Bradford, Natasha Cocker, David Ellwood, Vicki Flenady, Adrienne Gordon, Christoph Lehner, Natasha Meredith, Tionie Newth, Joanne Said, Sean Seeho, Roshan Selvaratnam, Susan Walker, Megan Weller.

TERMINOLOGY

The Stillbirth CRE recognise that individuals have diverse gender identities. In this guideline, we use the term 'woman' or 'mother' throughout. When we use these words, it is not meant to exclude those who are pregnant or breastfeeding and do not identity as women. Healthcare professionals should provide respectful care to all people and use the pronouns that individuals themselves prefer.

KEY MESSAGES

1. Stillbirth is a serious public health problem with far-reaching negative psychosocial and financial implications for families and society, with little improvement in rates in Australia and New Zealand.
2. In 2020 there were 710 late gestation stillbirths (28-41 weeks gestation) in Australia among 291,844 births[1], and 139 in New Zealand among 58,853 births[2]. While some reductions in these rates have been shown, further reduction is possible based on local data and international comparisons.
3. Improving detection of Fetal Growth Restriction (FGR) is an important strategy to reduce perinatal morbidity and mortality.[3,4]
4. Risk assessment for FGR should be undertaken as early in pregnancy as possible.
5. Where modifiable risk factors for FGR are identified (e.g. smoking), follow recommended care pathways.
6. When measuring symphyseal fundal height (SFH) use a standardised technique. Plotting SFH on a chart may alert the healthcare professional to Small for Gestational Age (SGA) and/or slowing of fetal growth.
7. Where the SFH measures <10th centile or where static or slow growth is suspected, ultrasound assessment is recommended.[4]
8. Low dose aspirin (LDA) reduces the risk of preterm preeclampsia in women assessed as high risk. However there is a lack of evidence to support the use of LDA to prevent SGA/FGR[5]
9. Seek obstetric opinion for ongoing management when FGR is suspected by ultrasound.[6,7]
10. The following investigations are commonly used for the diagnosis and management of SGA/FGR: ultrasound assessment of fetal biometry, amniotic fluid measurement, umbilical artery Doppler and cardiotocography. Additional investigations such as middle cerebral artery Doppler, ductus venosus Doppler, uterine artery Doppler and biophysical profile scoring are individualised according to the clinical circumstances and specialist preference.
11. When planning the birth of a fetus with suspected FGR, care should be individualised and take into consideration the woman's preferences, maternal health (including any known complications e.g. preeclampsia) fetal well-being, gestational age, planned mode of birth, intrapartum monitoring and access to appropriate neonatal services.

12. For maternity care providers in New Zealand, the national recommended FGR education program is the Growth Assessment Program (GAP).[8,9] An Australian FGR education program (face to face workshop and eLearning program) has been developed as part of the national Safer Baby Bundle.

13. Clinical audit and feedback are key drivers of practice change and should be undertaken to enhance best practice for FGR.[10]

CONTENTS

PURPOSE OF THIS STATEMENT

This position statement is part of the National 'Safer Baby Bundle', comprising five elements to reduce late-gestation stillbirths in Australia. This statement addresses the second element of care: Detection and management of women with Fetal Growth Restriction in singleton pregnancies.

The purpose of this position statement is to improve perinatal outcomes through better detection and management of pregnancies with FGR. These recommendations have been derived from a literature review including reference to several international SGA/FGR guidelines.[11-19]

TARGET AUDIENCE

Midwives, obstetricians, general practitioners, childbirth educators, and other health professionals who provide pregnancy care across Australia and New Zealand.

DEFINITIONS

FGR is best defined as a fetus that has not reached its growth potential. In practice, SGA (less than the 10th centile) is often used as a proxy for FGR (see Table 1). However, not all SGA fetuses are growth restricted, and some growth restricted fetuses are not SGA.[20] There are also differences between early and late FGR,[21] aspects of which are summarised in Table 2.

A new international consensus-based definition for FGR including biometric and functional parameters was published in 2016 (Table 3).[22] A validation study of the Delphi consensus definition compared to the standard definition (FEW <10th Hadlock) reported that both definitions performed poorly for predicting adverse neonatal outcomes[23]. Further studies are required to validate any definitions for SGA or FGR.

Table 1: Definitions relating to FGR

TERM	DEFINITION
Fetal Growth Restriction (FGR)	A fetus that has not reached its growth potential (in practice, small for gestational age (SGA) is often used as a proxy for FGR)
Small for gestational age (SGA)	Estimated fetal weight/birthweight <10th centile
Severe FGR	SGA <3rd centile is often used as a proxy for severe FGR
Early FGR	FGR diagnosed <32 weeks gestation
Late FGR	FGR diagnosed≥32 weeks gestation

Table 2: Early vs Late FGR, Adapted from Figueras et al.[21]

	EARLY FGR	LATE FGR
Gestation	<32 weeks	≥32 weeks
Prevalence[24]	0.5 – 1%	5 – 10%
Pre-eclampsia	Strong association	Weak association
Placental pathology	Strong association	Less common
Relation to SGA	Often SGA <10th centile	Not always SGA
Umbilical artery Dopplers	Often Abnormal	Usually normal
Detection[8]	Detected more commonly	Challenging to detect
Clinical consequences[8]	Risks of prematurity, high mortality and morbidity	Associated with increased mortality and morbidity

Table 3: Consensus statement definition, Adapted from Gordijn et al.[22]

Early FGR: GA < 32 weeks, in absence of congenital anomalies	Late FGR: GA ≥ 32 weeks, in absence of congenital anomalies
AC and/or EFW < 3rd centile *or* UA-AEDF	AC/EFW < 3rd centile
Or	*Or at least two out of the three of the following*
1. AC or EFW < 10th centile *combined with*	1. AC or EFW < 10th centile
2. UtA-PI > 95th centile *and/or*	2. AC or EFW crossing centiles > 2 quartiles on growth centiles *
3. UA-PI > 95th centile	3. CPR < 5th centile *or* UA-PI > 95th centile

* Growth centiles are non-customised centiles.

AC, fetal abdominal circumference; AEDF, absent end-diastolic flow; CPR, cerebroplacental ratio; EFW, estimated fetal weight; GA, gestational age; PI, pulsatility index; UA, umbilical artery; UtA, uterine artery

RISK ASSESSMENT

Risk assessment (see Figures 1 and 2) for FGR should be undertaken as early in pregnancy as possible, ideally by the end of the first trimester ,[11,25] through inquiry about:

- maternal characteristics and medical history
- previous obstetric history (including accurately establishing gestational age)
- formal first trimester screening for preeclampsia where performed

It is good practice to inform women with identified risk factors for FGR [3] early in pregnancy about planned care and risk assessment. Where SGA/FGR is suspected, there should be ongoing communication about the recommended management throughout pregnancy. Where modifiable risk factors for FGR are identified (e.g. smoking), follow recommended care pathways.

Decreased fetal movements (strength and/or frequency) may be associated with placental dysfunction, which could lead to FGR and/or stillbirth.[26]

Antenatal surveillance for FGR may be modified according to a woman's individual risk factors and this is detailed in the Australian Fetal Growth Restriction (FGR) Care Pathway (appendix 1), and the New Zealand Recommended antenatal screening pathway (appendix 2).

SYMPHYSEAL FUNDAL HEIGHT (SFH) MEASUREMENT

Measurement of symphyseal fundal height (SFH) can be undertaken at each antenatal visit starting from 24 weeks gestation.[3,20] SFH measurement may not be reliable in women with a high body mass index, or who have uterine fibroids, in which case ultrasound can be considered for assessment of fetal size and growth.[27]

The limitations of SFH measurement in the detection of SGA/FGR are well described.[18,28] A standardised approach to SFH measurement may reduce inter and intra-observer error.[3,4] The United Kingdom, Australia and New Zealand have adopted standardised education for SFH measurement,[3] incorporating measuring from the fundus to the superior margin of the symphysis pubis, using a non-elastic tape measure with numbers on the tape measure facing downwards.

Serially plotting SFH measurements on a growth chart may assist in the detection of SGA/FGR. Although evidence is lacking, tracking growth utilising a graph to visually assist detection of change over time is widely used. Programs to improve detection of SGA/FGR have used this methodology and have demonstrated an increase in the antenatal detection of SGA/FGR.[4] Ultrasound assessment is recommended when a SFH measurement is <10th centile, or if there is clinical suspicion of static or slowing growth on serial SFH measurements.[4]

There are different SFH charts available for plotting SFH measurements, e.g. standardised, customised [29] or population based.[30] The choice of chart for use is usually directed by the preference of each jurisdiction.

DIAGNOSIS AND MANAGEMENT OF FGR

Accurate gestational age dating is important in the assessment of later fetal size.[31,32] Investigations summarised in Table 4 are commonly used for the diagnosis and management of suspected FGR.

Seek obstetric consultation for review and planning ongoing management when SGA/FGR is suspected.[3] For midwifery led care, refer to the appropriate consultation and referral guidelines.[33,34]

Additional ultrasound investigations such as uterine artery Doppler, middle cerebral artery Doppler, cerebroplacental ratio and ductus venous Doppler may be utilised to assist in the investigation and management of established FGR. These investigations are recommended in NZ for further evaluation in late onset FGR. Computerised CTG may be used in place of conventional CTG where available.[35]

Table 4: Common investigations for diagnosis and management of suspected SGA/FGR

Investigation	Description	Suggestive of SGA/FGR
Fetal biometry by ultrasound	• Abdominal circumference (AC) • Head circumference (HC) • Femur length (FL) • Estimated fetal weight (EFW) using Hadlock 3 algorithm (HC,AC,FL)[36]	EFW or AC <10th centile and/or reduced growth velocity (>50 centiles[37,38]) of EFW or AC

Amniotic fluid volume (AFV)	Measured by the single deepest vertical pocket (DVP) of amniotic fluid[39,40]	DVP <2cm
Umbilical artery Doppler (UAD)	Measures resistance to blood flow in the umbilical artery and placenta	UAD Pulsatility (PI) >95th centile, absent or reverse end diastolic flow (AREDF)
Cardiotocography (CTG)	Recording of fetal heart rate and uterine activity	Abnormal CTG trace

BIRTH PLANNING

When planning the birth of a baby with suspected SGA/FGR, the aim is to achieve the maximum maturity possible while balancing the risks to the mother and fetus of continuing the pregnancy[17,18]. Benefits of early birth to reduce stillbirth need to be carefully weighed against the risk of intervention for the baby at any given gestation.[41] Care should be individualised and woman-centred, based on shared decision-making. The following points should be considered and discussed:

- Woman/family preferences.
- Maternal medical condition, particularly the presence of preeclampsia.
- Gestational age, EFW and fetal condition (including interval growth, severity of FGR (e.g. <3rd centile, presence of any Doppler abnormalities, amniotic fluid volume, CTG).
- Method of induction. Mechanical cervical ripening (e.g. balloon catheter) may be safer compared to prostaglandin induction to avoid hyperstimulation.[42,43]
- Mode of birth: If there is evidence of fetal compromise caesarean section should be considered.
- Intrapartum monitoring: Women who start spontaneous labour should be advised to be admitted early in labour to facilitate electronic fetal monitoring.[44]
- Access to appropriate neonatal services.
- Recommend corticosteroid use up to 34+6 weeks[45] and MgSO4 < 30 weeks.[44]
- Consider delayed cord clamping where possible.[46]

PLACENTAL EXAMINATION

The major underlying cause of FGR is placental in origin.[47] Early onset FGR is often associated with maternal vascular malperfusion of the placenta resulting in poor early placentation or placental infarction.[47]

Rarer causes of placental pathology associated with FGR include: massive perivillous fibrin deposition (maternal floor infarction), chronic intervillositis and villitis of unknown etiology (inflammatory processes within the placenta) all of which have high recurrence rates in subsequent pregnancies.[47]

Compared to early onset FGR, the incidence and severity of placental pathology in late onset FGR is less common, but still occurs frequently even in pregnancies with normal umbilical artery Doppler studies.[48]

It is recommended that the placentae of suspected SGA/FGR neonates be sent for histopathology, the results of which may support the clinical findings and influence care in subsequent pregnancies.[11]

NEONATAL MANAGEMENT

The clinical diagnosis of FGR in the neonate can be as challenging as it is antenatally.[21] 2. Facilitate family involvement in all aspects of care.

Care of the newborn with SGA/FGR should include monitoring and maintenance of oxygenation, temperature and blood glucose levels. Consider referring to local guidelines for nutrition and feeding especially if the neonate is born preterm or <1500g

Paired cord blood gases or lactate should be undertaken to assess acid base status at birth.

In the care of the preterm growth restricted neonate, consider specific issues relating to prematurity such as lung disease, increased risk of infection, neurological complications and necrotising enterocolitis.

SUBSEQUENT PREGNANCY CARE

The birth of a baby with SGA/FGR is a major risk factor for FGR in a subsequent pregnancy.[11] Where possible, the underlying cause for FGR should be sought to assess for recurrence risk. This includes review of previous birth history, condition of the baby after birth, placental histopathology and any relevant investigations undertaken.[47]

Where SGA/FGR has been associated with stillbirth or severe long-term adverse outcomes, parental psychosocial support may be helpful in a subsequent pregnancy.[49]

Prior to a subsequent pregnancy is an opportunity to address modifiable risk factors for FGR (e.g. smoking cessation, optimising pre-existing medical conditions and weight reduction if obese).[3]

Consider low dose aspirin 100-150mg prior to 16 weeks' gestation until 36 weeks gestation to reduce the risk of preterm preeclampsia in women assessed as high risk (Refer to appendix 1).[11,50,51] While it has been common practice in the past to prescribe LDA to women at increased risk of SGA/FGR, current evidence does not support recommending LDA for this indication alone.

Consider specialist review at booking where available. Timing of ultrasound surveillance in a subsequent pregnancy can be tailored according to gestation at previous birth and underlying cause of previous FGR.

EDUCATION AND CLINICAL AUDIT

Improving the detection and management of SGA/FGR is an opportunity to improve health outcomes.[3,52]

Educational programs for maternity care providers have been shown to improve the detection of SGA/FGR and reduce stillbirth rates in the UK.[4] The Perinatal and Maternal Mortality Review Committee (PMMRC) in New Zealand[2] have reported a reduction in perinatal mortality in SGA babies after 26 weeks. Although a causal relationship cannot be established, this has occurred concurrently with introduction of a national SGA guideline and roll out of the Growth Assessment Protocol (GAP) education program.[29] An Australian FGR education program (face to face workshop, online webinar and eLearning program) has been developed as part of the national Safer Baby Bundle.

Clinical audit and feedback are key drivers of practice change.[10] Clinical case audit of best practice recommendations for SGA/FGR enables monitoring of practice change and evaluation of the impact on health outcomes. This should include false positive and false negative findings.[52]

Benchmarking practice across services identifies variation upon which to focus to improve outcomes.[53,54] In Australia, the national core maternity indicator for SGA/FGR is the proportion of babies born at or after 40 weeks gestation who weighed less than 2750g at birth.[1,55] In New Zealand, the national maternity indicator is proportion of small babies (under the 10th percentile for birthweight on the INTERGROWTH-21 growth charts) born at term (37 to 42 weeks) and at 40-42 weeks' gestation.[56]

The benchmarking measures below are the agreed National Safer Baby Bundle measures for FGR, utilised at a jurisdictional and/or facility level to measure performance across detection and management of SAG/FGR.

- Undetected FGR
  Proportion of severe FGR (birthweight <3rd centile) singleton babies undelivered by 40 weeks gestation.
- Suspected FGR iatrogenically delivered
  Proportion of singleton babies iatrogenically delivered after 37 weeks gestation (via IOL or caesarean section) for suspected FGR who had a birthweight of >= 25th centile.

There are some additional measures than may be used at a facility/jurisdictional level when performing a more in-depth review of FGR detection and management.

- Proportion of babies born after 28 weeks' gestation with SGA/FGR, based on birthweight centiles (<10th and <3rd centiles).
- Number of babies born (at any gestation) with unknown SGA/FGR based on birthweight centiles (<10th and <3rd centiles).
- Number of babies born (at any gestation) with known FGR/SGA
- Number of babies iatrogenically delivered (at any gestation) for the indication of suspected SGA/FGR, with a birthweight of above the 10th and/or 25th centiles.
- Number of babies delivered (at any gestation) for the indication of suspected SGA/FGR, with SGA/FGR confirmed by birthweight centiles (<10th and <3rd centiles).

EVIDENCE GAPS

Further high-quality studies are required to improve practice and health outcomes.

Current evidence gaps in FGR research include:

- Better defining FGR
- Placental biomarker and ultrasound screening for FGR
- Role of routine ultrasound to detect FGR
- Understand which growth charts are best for predicting FGR morbidity and mortality
- Interventions to reduce FGR
- Optimal frequency of fetal surveillance in suspected FGR
- Screening and management using a risk factor-based approach
- Defining the degree of decline in growth velocity that is clinically important
- Systematic review of neonatal growth charts

- Growth charts and screening for neonatal hypoglycaemia
- Reassess national benchmarking for outcomes relating to FGR

FURTHER INFORMATION AND RESOURCES

Australia

Stillbirth CRE website: www.stillbirthcre.org.au

Safer Baby Bundle eLearning module: www.learn.stillbirthcre.org.au

REFERENCES

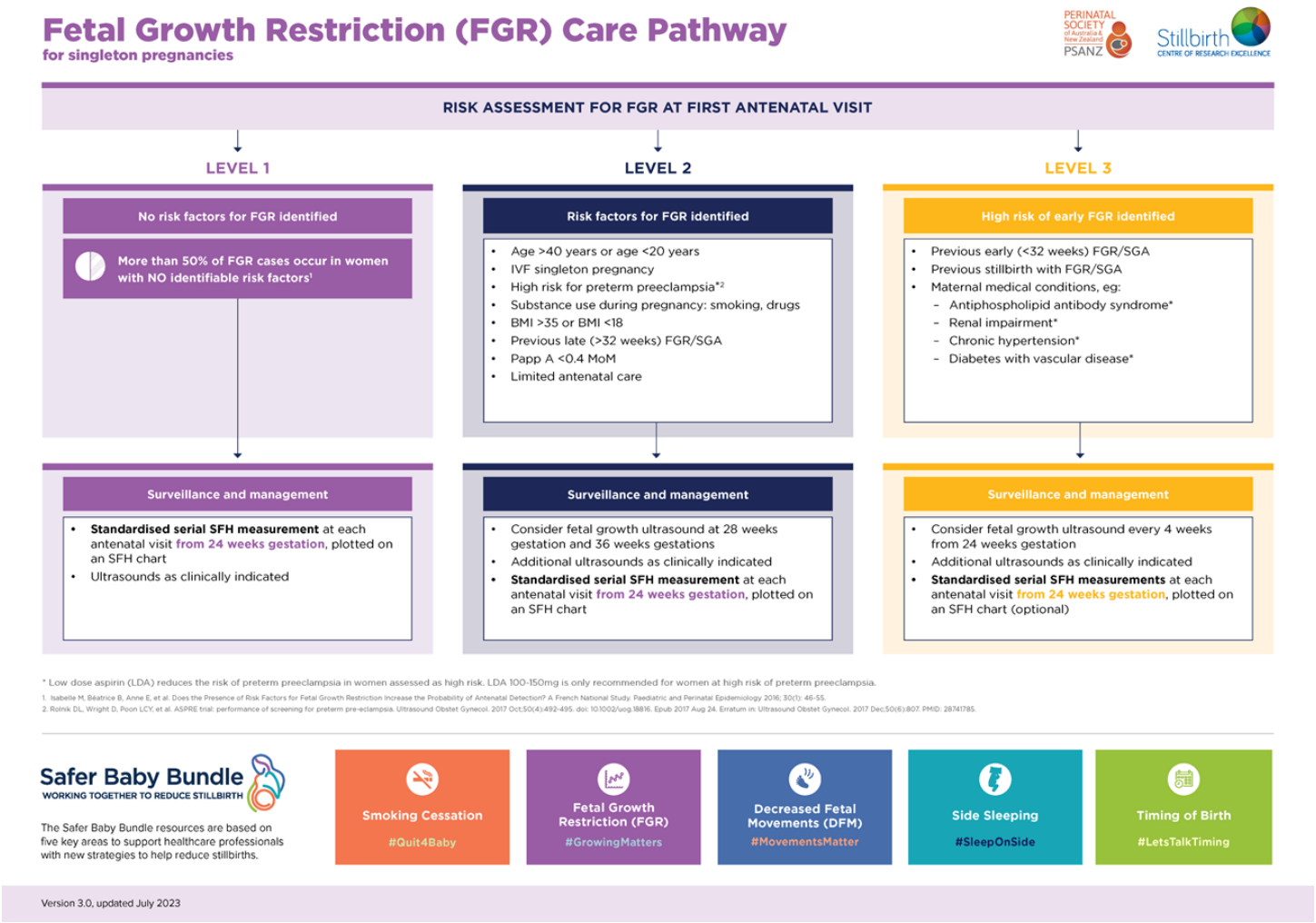
1. Australian Institute of Health and Welfare. Australia's mothers and babies. Canberra: AIHW, 2022.
2. Perinatal and Maternal Mortality Review Committee. Fifteenth Annual Report of the Perinatal and Maternal Mortality Review Committee: Reporting Mortality and Morbidity 2020. Wellington: Health Quality and Safety Commission, 2022.
3. Department of Health. Clinical Practice Guidelines: Pregnancy Care. Canberra: Australian Government Department of Health, 2018.
4. 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* 2013; **3**(12): e003942.
5. Tan MY, Wright D, Syngelaki A, et al. Comparison of diagnostic accuracy of early screening for pre-eclampsia by NICE guidelines and a method combining maternal factors and biomarkers: results of SPREE. *Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology* 2018; **51**(6): 743-50.
6. Australian College of Midwives. National Midwifery Guidelines for Consultation and Referral, 2014.
7. RANZCOG. Maternal Suitability for Models of Care, and Indications for Referral Within and Between Models of Care. 2015.
8. Figueras F, Gardosi J. Intrauterine growth restriction: new concepts in antenatal surveillance, diagnosis, and management. *American journal of obstetrics and gynecology* 2011; **204**(4): 288-300.
9. Perinatal Institute. GAP in Aotearoa New Zealand. 2022. https://perinatal.org.uk/GAP/NZ.
10. Ivers N, Jamtvedt G, Flottorp S, et al. Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev* 2012; (6).
11. Royal College of Obstetricians and Gynaecologists. The investigation and management of the small-for-gestational-age fetus, 2013.
12. New Zealand Maternal Fetal Medicine Network. Guideline for the mangment of suspected small for gestational age singleton pregnancies and infants after 34 weeks' gestation, 2014.
13. Lausman A, Kingdom J. Intrauterine Growth Restriction: Screening, Diagnosis, and Management. *Journal of Obstetrics and Gynaecology Canada* 2013; **35**(8): 741-8.
14. Institute of Obstetricians and Gynaecologists and Royal College of Physicians of Ireland and Directorate of Clinical Strategy and Programmes and Health Service Executive. Clinical practice guideline: Fetal growth restriction - recognition, diagnosis and management, 2017.
15. Gynecologists ACoOa. Fetal growth restriction. ACOG Practice bulletin no. 134. *Obstet Gynecol* 2013; **121**: 1122-33.
16. Berkley E, Chauhan SP, Abuhamad A. Doppler assessment of the fetus with intrauterine growth restriction. *American journal of obstetrics and gynecology* 2012; **206**(4): 300-8.
17. Lees CC, Stampalija T, Baschat A, et al. ISUOG Practice Guidelines: diagnosis and management of small-for-gestational-age fetus and fetal growth restriction. *Ultrasound Obstet Gynecol* 2020; **56**(2): 298-312.
18. Melamed N, Baschat A, Yinon Y, et al. FIGO (International Federation of Gynecology and Obstetrics) initiative on fetal growth: Best practice advice for screening, diagnosis, and management of fetal growth restriction. *International Journal of Gynecology & Obstetrics* 2021; **152**(S1): 3-57.
19. Te Whatu Ora Health New Zealand. Small for gestational age and fetal growth restriction in Aotearoa New Zealand He Aratohu Ritenga Haumanu mō te Tōhuatanga Kōpiri me te Pakupaku Rawa. A clinical practice guideline: Summary of recommendations. Wellington: Te Whatu Ora – Health New Zealand, 2023.
20. McCowan LM, Figueras F, Anderson NH. Evidence-based national guidelines for the management of suspected fetal growth restriction: comparison, consensus, and controversy. *American journal of obstetrics and gynecology* 2018; **218**(2s): S855-s68.
21. Figueras F, Caradeux J, Crispi F, Eixarch E, Peguero A, Gratacos E. Diagnosis and surveillance of late-onset fetal growth restriction. *American journal of obstetrics and gynecology* 2018; **218**(2s): S790-S802.e1.
22. Gordijn SJ, Beune IM, Thilaganathan B, et al. Consensus definition of fetal growth restriction: a Delphi procedure. *Ultrasound in Obstetrics and Gynecology* 2016; **48**(3): 333-9.

23. Molina LCG, Odibo L, Zientara S, et al. Validation of Delphi procedure consensus criteria for defining fetal growth restriction. *Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology* 2020; **56**(1): 61-6.
24. Krauskopf AL, Knippel AJ, Verde PE, Kozlowski P. Predicting SGA neonates using first-trimester screening: influence of previous pregnancy's birthweight and PAPP-A MoM. *The Journal of Maternal-Fetal & Neonatal Medicine* 2016; **29**(18): 2962-7.
25. Monier I, Blondel B, Ego A, Kaminski M, Goffinet F, Zeitlin J. Does the presence of risk factors for fetal growth restriction increase the probability of antenatal detection? A French national study. *Paediatric and Perinatal Epidemiology* 2016; **30**(1): 46-55.
26. Warrander LK, Batra G, Bernatavicius G, et al. Maternal perception of reduced fetal movements is associated with altered placental structure and function. *PLoS One* 2012; **7**(4): e34851.
27. Whelan R, Schaeffer L, Olson I, et al. Measurement of symphysis fundal height for gestational age estimation in low-to-middle-income countries: A systematic review and meta-analysis. *PLoS One* 2022; **17**(8): e0272718.
28. Pay ASD, Wiik J, Backe B, Jacobsson B, Strandell A, Klovning A. Symphysis-fundus height measurement to predict small-for-gestational-age status at birth: a systematic review. *BMC pregnancy and childbirth* 2015; **15**(1): 22.
29. Gardosi J, Francis A, Turner S, Williams M. Customized growth charts: rationale, validation and clinical benefits. *American journal of obstetrics and gynecology* 2018; **218**(2s): S609-s18.
30. Stirnemann J, Villar J, Salomon LJ, et al. International estimated fetal weight standards of the INTERGROWTH-21st Project. *Ultrasound in Obstetrics & Gynecology* 2017; **49**(4): 478-86.
31. Butt K, Lim K, Lim K, et al. Determination of Gestational Age by Ultrasound. *Journal of Obstetrics and Gynaecology Canada* 2014; **36**(2): 171-81.
32. Whitworth M, Bricker L, Mullan C. Ultrasound for fetal assessment in early pregnancy. 2015; (7).
33. Australian College of Midwives. National Midwifery Guidelines for Consultation and Referral. Canberra, 2021.
34. Ministry of Health. Guidelines for Consultation with Obstetric and Related Medical Services (Referral Guidelines). Wellington, 2012.
35. Lees CC, Marlow N, van Wassenaer-Leemhuis A, et al. 2 year neurodevelopmental and intermediate perinatal outcomes in infants with very preterm fetal growth restriction (TRUFFLE): a randomised trial. *The Lancet* 2015; **385**(9983): 2162-72.
36. Nicolaides KH, Wright D, Syngelaki A, Wright A, Akolekar R. Fetal Medicine Foundation fetal and neonatal population weight charts. *Ultrasound in Obstetrics & Gynecology* 2018; **52**(1): 44-51.
37. MacDonald TM, McCarthy EA, Walker SP. Shining light in dark corners: Diagnosis and management of late-onset fetal growth restriction. *Aust NZ J Obstet Gynaecol* 2015; **55**(1): 3-10.
38. Larsen ML, Schreiber V, Krebs L, Hoei-Hansen CE, Kumar S. The magnitude rather than the rate of decline in fetal growth is a stronger risk factor for perinatal mortality in term infants. *Am J Obstet Gynecol MFM* 2022: 100780.
39. Nabhan AF, Abdelmoula YA. Amniotic fluid index versus single deepest vertical pocket as a screening test for preventing adverse pregnancy outcome. *Cochrane Database of Systematic Reviews* 2008; (3).
40. Larsen ML, Schreiber V, Krebs L, Hoei-Hansen CE, Kumar S. The magnitude rather than the rate of decline in fetal growth is a stronger risk factor for perinatal mortality in term infants. *Am J Obstet Gynecol MFM* 2022; **5**(2): 100780.
41. Veglia M, Cavallaro A, Papageorghiou A, Black R, Impey L. Small-for-gestational-age babies after 37 weeks: impact study of risk-stratification protocol. *Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology* 2018; **52**(1): 66-71.
42. Jozwiak M, Bloemenkamp KW, Kelly AJ, Mol BWJ, Irion O, Boulvain M. Mechanical methods for induction of labour. *Cochrane Database of Systematic Reviews* 2012; (3).
43. Villalain C, Herraiz I, Quezada MS, et al. Labor Induction in Late-Onset Fetal Growth Restriction: Foley Balloon versus Vaginal Dinoprostone. *Fetal Diagn Ther* 2018: 1-8.
44. Sotiriadis A, Tsiami A, Papatheodorou S, Baschat AA, Sarafidis K, Makrydimas G. Neurodevelopmental Outcome After a Single Course of Antenatal Steroids in Children Born Preterm: A Systematic Review and Meta-analysis. *Obstet Gynecol* 2015; **125**(6): 1385-96.

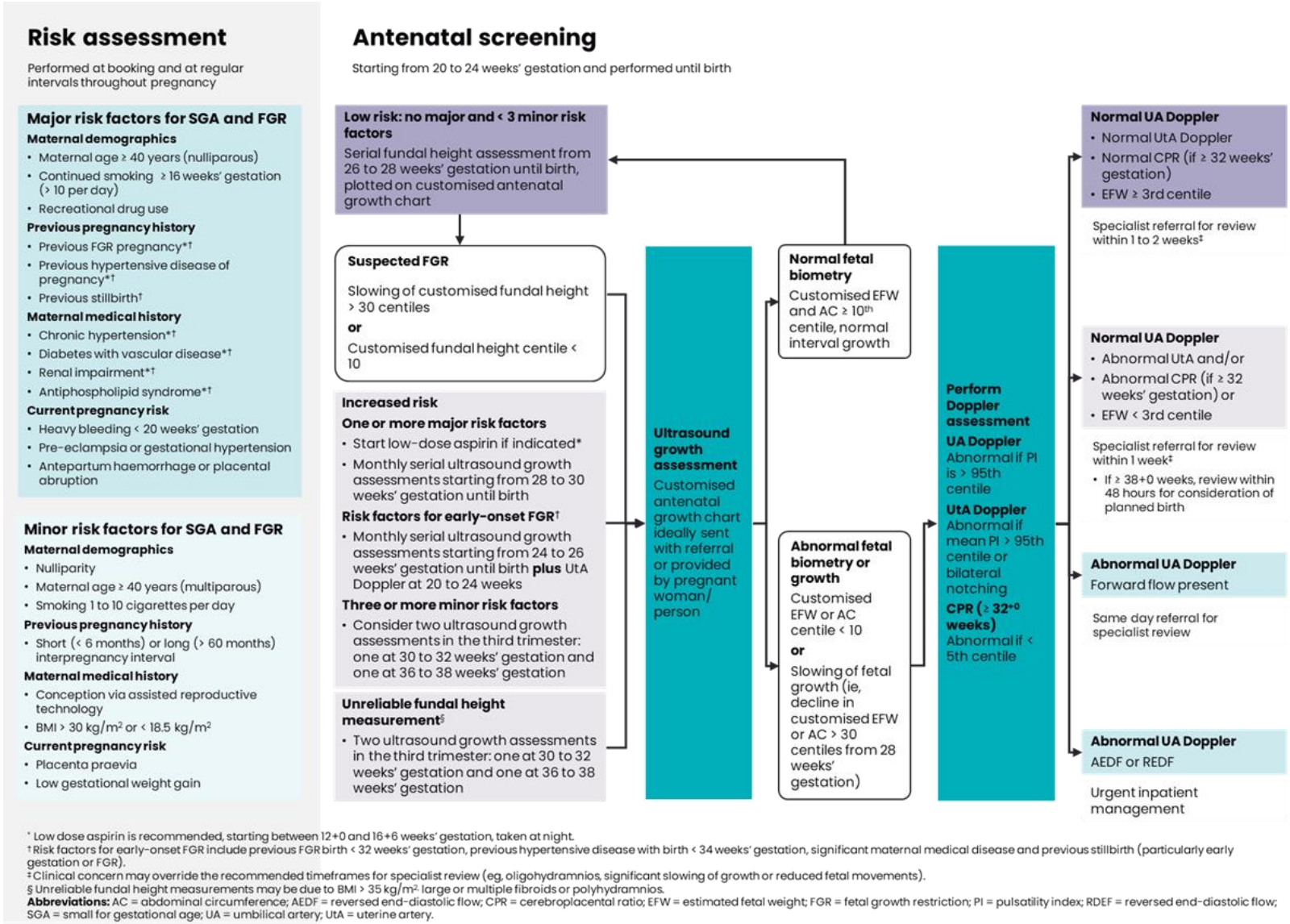
45. Antenatal Corticosteroid Clinical Practice Guidelines Panel. Antenatal corticosteroids given to women prior to birth to improve fetal, infant, child and adult health: Clinical Practice Guidelines. 2015.
46. Wang M, Mercer JS, Padbury JF. Delayed Cord Clamping in Infants with Suspected Intrauterine Growth Restriction. *J Pediatr* 2018; **201**: 264-8.
47. Kingdom JC, Audette MC, Hobson SR, Windrim RC, Morgen E. A placenta clinic approach to the diagnosis and management of fetal growth restriction. *American journal of obstetrics and gynecology* 2018; **218**(2s): S803-s17.
48. Parra-Saavedra M, Crovetto F, Triunfo S, et al. Placental findings in late-onset SGA births without Doppler signs of placental insufficiency. *Placenta* 2013; **34**(12): 1136-41.
49. Mills TA, Ricklesford C, Cooke A, Heazell AE, Whitworth M, Lavender T. Parents' experiences and expectations of care in pregnancy after stillbirth or neonatal death: a metasynthesis. *Bjog* 2014; **121**(8): 943-50.
50. Roberge S, Nicolaides K, Demers S, Hyett J, Chaillet N, Bujold E. The role of aspirin dose on the prevention of preeclampsia and fetal growth restriction: systematic review and meta-analysis. *American journal of obstetrics and gynecology* 2017; **216**(2): 110-20.e6.
51. Van Doorn R, Mukhtarova N, Flyke IP, et al. Dose of aspirin to prevent preterm preeclampsia in women with moderate or high-risk factors: A systematic review and meta-analysis. *PLoS One* 2021; **16**(3): e0247782.
52. Diksha P, Permezel M, Pritchard N. Why we miss fetal growth restriction: Identification of risk factors for severely growth-restricted fetuses remaining undelivered by 40 weeks gestation. *Aust N Z J Obstet Gynaecol* 2018.
53. Selvaratnam RJ, Davey MA, Anil S, McDonald SJ, Farrell T, Wallace EM. Does public reporting of the detection of fetal growth restriction improve clinical outcomes: a retrospective cohort study. *Bjog* 2020; **127**(5): 581-9.
54. Selvaratnam RJ, Wallace EM, Hunt RW, Davey MA. Preventing harm: A balance measure for improving the detection of fetal growth restriction. *Aust N Z J Obstet Gynaecol* 2021; **61**(5): 715-21.
55. AIHW Perinatal Epidemiology and Statistics Unit. National core maternity indicators. Canberra, 2013.
56. Ministry of Health. New Zealand Maternity Clinical Indicators: background document. Wellington, 2022.

APPENDIX

1. Fetal growth restriction (FGR) care pathway for singleton pregnancies (Australia)



2. Algorithm and SGA risk assessment tool for (New Zealand)[19]



* Low dose aspirin is recommended, starting between 12+0 and 16+6 weeks' gestation, taken at night.
† Risk factors for early-onset FGR include previous FGR birth < 32 weeks' gestation, previous hypertensive disease with birth < 34 weeks' gestation, significant maternal medical disease and previous stillbirth (particularly early gestation or FGR).
‡ Clinical concern may override the recommended timeframes for specialist review (eg, oligohydramnios, significant slowing of growth or reduced fetal movements).
§ Unreliable fundal height measurements may be due to BMI > 35 kg/m² large or multiple fibroids or polyhydramnios.
Abbreviations: AC = abdominal circumference; AEDF = reversed end-diastolic flow; CPR = cerebroplacental ratio; EFW = estimated fetal weight; FGR = fetal growth restriction; PI = pulsatility index; RDEF = reversed end-diastolic flow; SGA = small for gestational age; UA = umbilical artery; UtA = uterine artery.