

Evidence evaluation report — Fetal growth and well-being

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Fetal growth

Evidence summary

No searches were conducted for this topic as it was agreed that the recommendations from *The Investigation and Management of the Small-For Gestational Age Fetus: Green-Top Guideline 31* (RCOG 2014) be used.

Translation of EWG questions to RCOG questions

Abdominal palpation

EWG questions:

- What is the predictive and diagnostic accuracy of performing abdominal palpation for determining fetal growth and wellbeing?
- What are the benefits and risks of performing an abdominal palpation at each antenatal visit?
- At what gestation is abdominal palpation effective and/or accurate?

Corresponding RCOG question:

- What is the optimum method of screening for the SGA fetus/neonate and care of "at risk" pregnancies?

Measurement of symphysis fundal height

EWG question:

- Do customised fundal height charts improve the detection of fetal growth restriction?

Corresponding RCOG question:

- What is the optimum method of screening for the SGA fetus/neonate and care of "at risk" pregnancies?

Prevention

EWG question:

- What do women need to know in order to prevent fetal growth restriction and/or to lessen its impact; and when is this information needed?

Corresponding RCOG question:

- What are the risk factors for a SGA fetus/neonate?

Aboriginal and Torres Strait Islander women

EWG question: What are the additional considerations for Aboriginal and Torres Strait Islander women?

No corresponding RCOG question

ROCG classification of evidence levels and grades of recommendations

Classification of evidence levels	Grades of recommendations
1++ High-quality meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a very low risk of bias	A At least one meta-analysis, systematic review or randomised controlled trial rated as 1++ and directly applicable to the target population; or
1+ Well-conducted meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a low risk of bias	A systematic review of randomised controlled trials or a body of evidence consisting principally of studies rated as 1+ directly applicable to the target population and demonstrating overall consistency of results
1– Meta-analyses, systematic reviews of randomised controlled trials or randomised controlled trials with a high risk of bias	
2++ High-quality systematic reviews of case–control or cohort studies or high-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal	B A body of evidence including studies rated as 2++ directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+
2+ Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal	C A body of evidence including studies rated as 2+ directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++
2– Case–control or cohort studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal	
3 Non-analytical studies, e.g. case reports, case series	D Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+
4 Expert opinion	

Definition of small-for gestational age

Small-for-gestational age (SGA) refers to an infant born with a birth weight lower than the 10th centile. Historically SGA birth has been defined using population centiles. But, the use of centiles customised for maternal characteristics (maternal height, weight, parity and ethnic group) as well as gestational age at delivery and infant sex identifies small babies at higher risk of morbidity and mortality than those identified by population centiles (Clausson et al 2001; Figueras et al 2007). With respect to the fetus, definitions of SGA birth and severe SGA vary. For the purposes of these Guidelines, SGA birth is defined as an estimated fetal weight or abdominal circumference less than the 10th centile and severe SGA as an estimated fetal weight or abdominal circumference less than the 3rd centile (Chang et al 1992).

Fetal growth restriction (FGR) is not synonymous with SGA. Some, but not all, growth restricted fetuses/infants are SGA while 50–70% of SGA fetuses are constitutionally small, with fetal growth appropriate for maternal size and ethnicity (Alberry & Soothill 2007). The likelihood of FGR is higher in severe SGA infants. Growth restriction implies a pathological restriction of the genetic growth potential. As a result, growth restricted fetuses may manifest evidence of fetal compromise (abnormal Doppler studies, reduced liquor volume).

Risk factors for small-for-gestational age

Significant risk factors (OR >2.0) for having a small-for-gestational age fetus or newborn include (RCOG 2014):

- having diabetes with vascular disease (OR 6.0, 95%CI 1.5 to 2.3), renal impairment (AOR 5.3, 95%CI 2.8 to 10) or Antiphospholipid syndrome (RR 6.22, 95%CI 2.43 to 16.0).

- having a previous SGA baby (OR 3.9, 95%CI 2.14 to 7.12) or stillbirth (OR 6.4, 95%CI 0.78 to 52.56)
- daily exercise leading to heavy breathing or being out of breath (AOR 3.3, 95%CI 1.5 to 7.2)
- maternal age >40 years (OR 3.2, 95%CI 1.9 to 5.4)
- using cocaine in pregnancy (OR 3.23, 95%CI 2.43 to 4.3)
- having chronic hypertension (ARR 2.5, 95%CI 2.1 to 2.9)
- smoking 11 or more cigarettes a day in pregnancy (OR 2.21, 95%CI 2.03 to 2.4).

Maternal (OR 2.64, 95%CI 2.28 to 3.05) or paternal (OR 3.47, 95%CI 1.17 to 10.27) history of being a SGA baby is also a significant risk factor but may not be ascertainable.

Minor risk factors include nulliparity, low fruit intake pre-pregnancy, IVF singleton pregnancy, any smoking and smoking less than 10 cigarettes a day, history of pre-eclampsia, pregnancy interval of <6 months or ≥60 months and BMI <20 or >25 (RCOG 2014).

RCOG recommendations and practice points

- All women should be assessed at booking for risk factors for a SGA fetus/neonate to identify those who require increased surveillance (practice point).
- Women who have a major risk factor (OR >2.0) should be referred for serial ultrasound measurement of fetal size and assessment of wellbeing with umbilical artery Doppler from 26–28 weeks of pregnancy (Grade B recommendation).
- Women who have three or more minor risk factors should be referred for uterine artery Doppler at 20–24 weeks of gestation (practice point).

EWG wording of RCOG recommendations

Note that an additional consensus-based recommendation has been included.

Draft practice point

Early in pregnancy, assess women for risk factors for having a SGA fetus/newborn.

Draft consensus-based recommendation

When women are identified as being at risk of having a SGA fetus or newborn, provide advice about modifiable risk factors.

Draft qualified recommendation

Consider referring women who have a significant risk factor for having a SGA fetus/newborn for serial ultrasound measurement of fetal size and assessment of wellbeing with umbilical artery Doppler from 26–28 weeks of pregnancy.

Draft practice point

Consider referring women who have three or more minor risk factors for uterine artery Doppler at 20–24 weeks of pregnancy.

Summary of risk factors

Risk category	Definition of risk	Definition of outcome measure	Point estimate (95% CI)
<i>Maternal Risk Factors</i>			
Age	Maternal age ≥ 35 years	BW < 10th centile population	OR 1.4 (1.1–1.8)
	Maternal age > 40 years	BW < 10th centile population	OR 3.2 (1.9–5.4)
Parity	Nulliparity	BW < 10th centile population*	OR 1.89 (1.82–1.96)
BMI	BMI < 20	BW < 10th centile customised	OR 1.2 (1.1–1.3)
	BMI 25–29.9	BW < 10th centile customised	RR 1.2 (1.1–1.3)

Risk category	Definition of risk	Definition of outcome measure	Point estimate (95% CI)
Maternal substance exposure	BMI ≥ 30	BW < 10th centile customised	RR 1.5 (1.3–1.7)
	Smoker	BW < 10th centile customised	AOR 1.4 (1.2–1.7)
	Smoker 1–10 cigarettes per day	BW < 9.9th centile population	OR 1.54 (1.39–1.7)
	Smoker ≥ 11 cigarettes per day	BW < 9.9th centile population	OR 2.21 (2.03–2.4)
	Cocaine	BW < 10th centile population	OR 3.23 (2.43–4.3)
IVF	IVF singleton pregnancy	BW < 10th centile	OR 1.6 (1.3–2.0)
Exercise	Daily vigorous exercise	BW < 10th centile customised	AOR 3.3 (1.5–7.2)
Diet	Low fruit intake pre-pregnancy	BW < 10th centile customised	AOR 1.9 (1.3–2.8)
<i>Previous Pregnancy History</i>			
Previous SGA	Previous SGA baby	BW < 10th centile customised	OR 3.9 (2.14–7.12)
Previous Stillbirth	Previous stillbirth	BW < 10th centile customised	OR 6.4 (0.78–52.56)
Previous pre-eclampsia	Pre-eclampsia	BW < 10th centile population	AOR 1.31 (1.19–1.44)
Pregnancy Interval	Pregnancy interval < 6 months	SGA not defined*	AOR 1.26 (1.18–1.33)
	Pregnancy interval ≥ 60 months	SGA not defined*	AOR 1.29 (1.2–1.39)
<i>Maternal Medical History</i>			
SGA	Maternal SGA	BW < 10th centile population*	OR 2.64 (2.28–3.05)
Hypertension	Chronic hypertension	BW < 10th centile population	ARR 2.5 (2.1–2.9)
Diabetes	Diabetes with vascular disease	BW < 10th centile population	OR 6 (1.5–2.3)
Renal disease	Renal impairment	BW < 10th centile population	AOR 5.3 (2.8–10)
APLS	Antiphospholipid syndrome	FGR no definition	RR 6.22 (2.43–16.0)
<i>Paternal Medical History</i>			
SGA	Paternal SGA	BW < 10th centile population	OR 3.47 (1.17–10.27)

* Data from systematic review

Source: (RCOG 2014).

Abdominal palpation

Cohort and case-control studies performed in low-risk populations have consistently shown abdominal palpation to be of limited accuracy in the detection of a SGA neonate (sensitivity 19–21%, specificity 98%) and severely SGA neonate (<2.3rd centile, sensitivity 28%) (Kean & Liu 1996; Bais et al 2004). In mixed-risk populations, the sensitivity increases to 32–44% (Hall et al 1980; Rosenberg et al 1982). In high-risk populations sensitivity is reported as 37% for a SGA neonate and 53% for severe SGA (Bais et al 2004).

Evidence level 2+

RCOG recommendation

- Abdominal palpation has limited accuracy for the prediction of a SGA neonate and thus should not be routinely performed in this context (Grade C).

EWG wording of RCOG recommendation

Qualified recommendation

Do not assess fetal growth based solely on abdominal palpation.

Measurement of symphysis fundal height

Symphysis fundal height (SFH) should be measured from the fundus (variable point) to the symphysis pubis (fixed point) with the cm values hidden from the examiner (Rosenberg et al 1982). Measurements should be plotted on a customised centile chart (see below). Women with a single SFH which plots below the 10th centile or serial measurements which demonstrate slow or static growth (ie they cross centiles in a downward direction) should be referred for further investigation. There is no evidence to determine the number of centiles to be crossed to prompt referral.

A recent systematic review of five studies highlighted the wide variation of predictive accuracy of SFH measurement for a SGA infant (Morse et al 2009). Although early studies reported sensitivities of 56–86% and specificities of 80–93% for SFH detection of a SGA neonate (Belizan et al 1978; Cnattingius et al 1984; Mathai et al 1987), a large study (n= 2,941) reported SFH to be less predictive with a sensitivity of 27% and specificity of 88% (LR+ 2.22, 95% CI 1.77 to 2.78; LR- 0.83, 95% CI 0.77 to 0.90) (Persson et al 1986). Maternal obesity, abnormal fetal lie, large fibroids, hydramnios and fetal head engagement contribute to the limited predictive accuracy of SFH measurement. SFH is associated with significant intra- and inter-observer variation (Bailey et al 1989; Morse et al 2009) and serial measurement may improve predictive accuracy (Pearce & Campbell 1987). **Evidence level 2++**

The impact on perinatal outcome of measuring SFH is uncertain. A systematic review found only one trial (n=1,639), which showed that SFH measurement did not improve any of the perinatal outcomes measured (Neilson 2000).

RCOG recommendation

- Serial measurement of symphysis fundal height (SFH) is recommended at each antenatal appointment from 24 weeks of pregnancy as this improves prediction of a SGA neonate (Grade B).

EWG wording of RCOG recommendation

Draft qualified recommendation

At each antenatal visit from 24 weeks, measure symphysis-fundal height.

Customised charts

A customised SFH chart is adjusted for maternal characteristics (maternal height, weight, parity and ethnic group). No trials were identified that compared customised with non-customised SFH charts and thus evidence for their effectiveness on outcomes such as perinatal morbidity/mortality is lacking.

However observational studies suggest that customised SFH charts may improve the detection of a SGA newborn. In one study, use of customised charts, with referral when a single SFH measurement fell below the 10th centile or the last two measurements were above 10th centile but the slope was flatter than the 10th centile line, resulted in improved sensitivity for a SGA newborn (48% vs 29%, OR 2.2, 95% CI 1.1 to 4.5) compared to abdominal palpation (Gardosi & Francis 1999). Use of customised charts was also associated with fewer referrals for investigation and fewer admissions. An audit study also showed that use of customised SFH charts detected 36% of SGA neonates compared with only 16% when customised charts were not used (Wright et al 2006).

RCOG practice points

- SFH should be plotted on a customised chart rather than a population-based chart as this may improve prediction of a SGA neonate.

- Women with a single SFH which plots below the 10th centile or serial measurements which demonstrate slow or static growth by crossing centiles should be referred for ultrasound measurement of fetal size.
- Women in whom measurement of SFH is inaccurate (for example: BMI > 35, large fibroids, hydramnios) should be referred for serial assessment of fetal size using ultrasound.

EWG wording of RCOG practice points

Practice points

If plotting symphysis fundal height, use a customised chart rather than a population-based chart.

Women with a single symphysis fundal height which plots below the 10th centile or serial measurements which demonstrate slow or static growth by crossing centiles should be referred for ultrasound measurement of fetal size.

Women in whom measurement of symphysis fundal height is inaccurate (for example: BMI >35, large fibroids, hydramnios) should be referred for serial assessment of fetal size using ultrasound.

Fetal movements

Evidence summary

No searches were conducted for this topic as it was agreed that the recommendations from *Clinical Practice Guidelines for Women Who Report Reduced Fetal Movements* (Gardener G. et al 2016) be used.

Translation of EWG questions to PSANZ questions

Definition of normal fetal movements

EWG question: What is considered to be a normal fetal movement pattern?

Corresponding PSANZ question: What is the definition of decreased fetal movements?

Monitoring fetal movements

EWG question: What is the diagnostic accuracy of using a fetal kick chart?

Corresponding PSANZ question: What is the role of formal fetal movement monitoring in reducing adverse pregnancy outcome?

EWG question: What advice should be provided to women who report a change in fetal movement pattern?

Corresponding PSANZ questions:

- Within what time frame should a women report concerns of DFM?

Aboriginal and Torres Strait Islander women

EWG question: What are the additional considerations for Aboriginal and Torres Strait Islander women?

No corresponding PSANZ question

PSANZ classification of evidence levels and grades of recommendations

Levels of Evidence	Grades of recommendations
I Evidence obtained from a systematic review of all relevant randomised controlled trials.	A Body of evidence can be trusted to guide practice
II Evidence obtained from at least one properly designed randomised controlled trial.	B Body of evidence can be trusted to guide practice in most situations
III-1 Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method).	C Body of evidence provides some support for recommendation(s) but care should be taken in its application
III-2 Evidence obtained from comparative studies with concurrent controls and allocation not randomised (cohort studies), case control studies, or interrupted time series with a control group.	D The body of evidence is weak and the recommendation(s) must be applied with caution.
III-3 Evidence obtained from comparative studies with historical control, two or more single-arm studies, or interrupted time series without a parallel control group.	
IV Evidence obtained from case series, either post-test or pre-test and post-test.	

Definition of reduced fetal movements

There is no universally agreed definition of decreased fetal movements. The most vigorously tested definition is 'less than 10 movements within 2 hours when the fetus is active' (Moore & Piacquadio 1989). This is also the currently recommended alarm limit adopted by the American Academy of Paediatrics and the American College of Obstetricians and Gynaecologists (ACOG 2002).

In a study of women with normal, uncomplicated pregnancies, 99% of women were able to feel 10 movements within 60 minutes (Tveit et al 2006). In a study of low-risk women using a modified 'count to 10' method in the second half of pregnancy, 90% of women perceived 10 movements within 25 minutes at 22–36 weeks gestation and within 35 minutes at 37–40 weeks (Kuwata et al 2008).

Information on fetal movements

Antenatal education about fetal movement has been shown to reduce the time from maternal perception of decreased fetal movements to health-seeking behaviour (Tveit et al 2009). A reduction in stillbirth rates has been associated with increased awareness of decreased fetal movements among women and health professionals in both the overall study population (OR 0.67, 95% CI: 0.49-0.94) and in women with decreased fetal movements (aOR 0.51, 95% CI: 0.32 to 0.81) (Tveit et al 2009; Saastad et al 2010). However, many women do not receive adequate information about fetal movements (Saastad et al 2008; Peat et al 2012). A recent study found that more than one-third of women at 34 weeks gestation or later did not recall receiving information from their healthcare professional about fetal movement (McArdle et al 2015). Pregnant women preferred to be given as much information as possible, and cited health professionals as a trustworthy source.

PSANZ recommendations

- All pregnant women should be routinely provided with verbal and written information regarding normal fetal movements during the antenatal period. This information should include a description of the changing patterns of movement as the fetus develops, normal wake/sleep cycles and factors which may modify the mother's perception of movements such as maternal weight and placental position (Level III-3; Grade C).
- All women should be advised to contact their health care provider if they have any concern about decreased or absent fetal movements and be advised not to wait until the next day to report decreased fetal movements (Level III-3; Grade C).
- Clinicians should emphasise the importance of maternal awareness of fetal movements at every routine antenatal visit (practice point).

EWG wording of recommendations

Note that the evidence base was not considered sufficient to support evidence-based recommendations.

Consensus-based recommendations

Routinely provide women with verbal and written information about normal fetal movements.

Advise women to contact their health care professional if they have any concern about decreased or absent fetal movements and not to wait until the next day to report decreased fetal movements.

Practice point

Emphasise the importance of maternal awareness of fetal movements at every antenatal visit.

Monitoring fetal movements

A recent Cochrane review assessed the effect of formal fetal movement counting and recording on perinatal death, major morbidity, maternal anxiety and satisfaction, pregnancy intervention and other adverse pregnancy outcomes (5 RCTS; n=71,458) (Mangesi et al 2015). The review did not find sufficient evidence to influence practice. In particular, no trials compared fetal movement counting with no fetal

movement counting. Only two studies compared routine fetal movements with standard antenatal care. Indirect evidence from a large cluster-RCT suggested that more babies at risk of death were identified in the routine fetal monitoring group but this did not translate to reduced perinatal mortality.

PSANZ recommendations

- The use of kick-charts can currently not be recommended as part of routine antenatal care (Level I; Grade B).
- After discussion, women who remain unsure whether fetal movements are decreased should be given guidance on counting fetal movements; i.e. to count while lying down on her side and concentrating on fetal movements. As a rule, when the baby is awake, if there are less than 10 movements felt in 2 hours she should contact her health care provider (Level III-3; Grade C).
- Maternal concern of DFM overrides any definition of DFM based on numbers of fetal movements and women with a concern about DFM should be encouraged to contact their health care provider (practice point).

EWG wording of recommendations

Recommendation

Do not advise the use of kick charts as part of routine antenatal care.

Consensus-based recommendation

Advise a woman who is unsure whether fetal movements are decreased to count while lying down on her side and to contact her health care professional if there are less than 10 movements in 2 hours.

Practice point

Maternal concern about decreased fetal movements overrides any definition of decreased fetal movements based on counting and women with a concern about decreased fetal movements should be encouraged to contact their health professional.

Fetal heart rate

Questions

1. What is the definition of routine auscultation?
2. What is the predictive and diagnostic accuracy of performing auscultations?
3. When is it appropriate to perform routine auscultation?
4. What are the additional considerations for Aboriginal and Torres Strait Islander women?

No new evidence was identified for these questions

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