

The Growth Assessment Protocol: a national programme to improve patient safety in maternity care

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Lack of antenatal recognition of fetal growth problems is one of the most common causes of avoidable adverse outcome. The Perinatal Institute's (PI) programme of accreditation, training, and implementation of protocols in fetal growth assessment, has led to reductions in stillbirths in each of the three NHS regions that have implemented it, and resulted in an overall drop in Office for National Statistics' (ONS 2013) stillbirth rates in

England to their lowest levels in 20 years. This work has won the prestigious 'National Patient Safety Award for Clinical Leadership', and is now being offered to all UK maternity units, as the comprehensive, evidence-based 'Growth Assessment Protocol' (GAP). Here, the team from the PI explain the background, rationale and details of the GAP programme.

Low birth weight, small for gestational age and fetal growth restriction

Fetal growth restriction (FGR) is associated with many complications in pregnancy, including stillbirth, prematurity, perinatal morbidity, cerebral palsy, neonatal death and conditions later in life (eg type 2 diabetes, coronary heart disease and obesity) (Shankaran et al 2006, Gortner 2007, Jansson & Powell 2007, Confidential

Enquiry into Maternal and Child Health 2008, Serena et al 2013). Some of these associations were not apparent until relatively recently, as prematurity and FGR used to be lumped together under the definition of 'low birth weight babies' defined as <2.5 or <1.5 kg. But it has become increasingly recognised that it is more helpful to express fetal and neonatal weight in relation to the length of pregnancy, and use the term 'small for gestational age' (SGA), defined as below the 10th weight percentile.

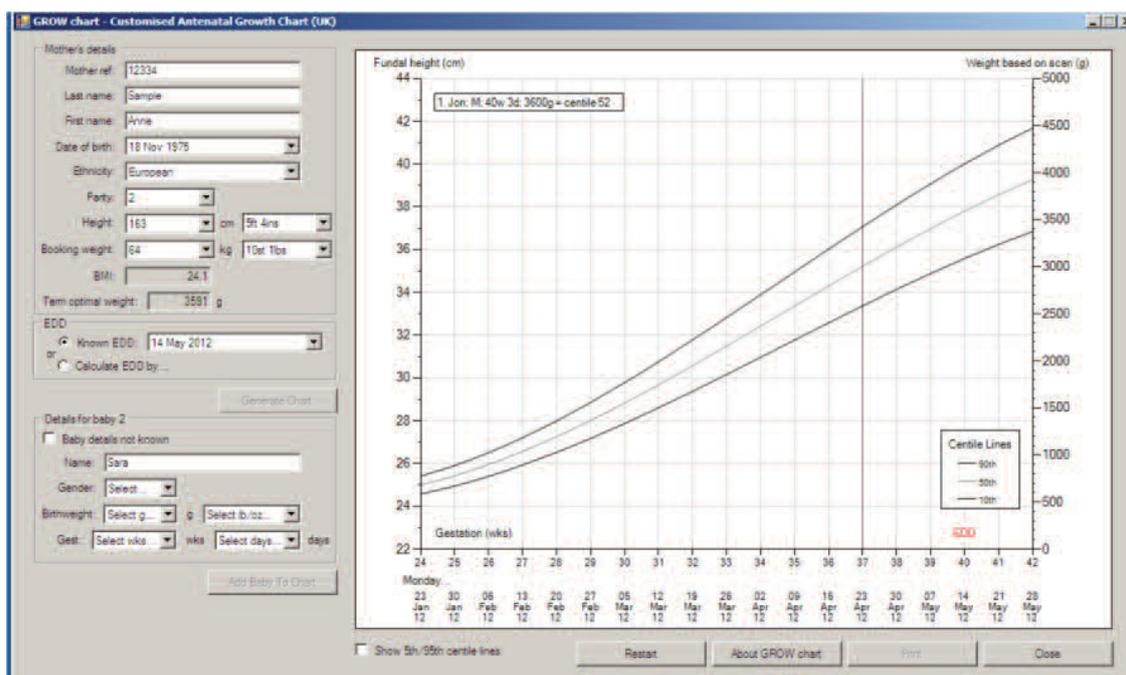


Fig 1. Customised chart adjusted for maternal characteristics, for plotting fundal height and estimated fetal weight.

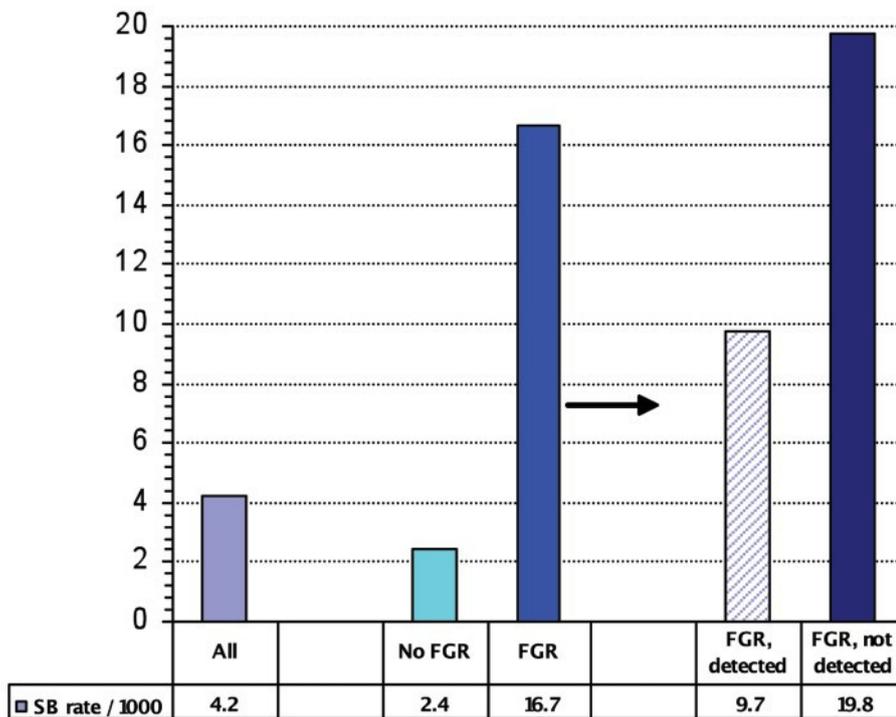


Fig 2. Stillbirth rates in pregnancies with and without fetal growth restriction (FGR), and according to whether FGR was or was not detected antenatally.

Most babies born SGA are in fact born at term, but are not necessarily below 2.5kg.

The next step was to recognise that one size does not fit all, and individual variation needs to be taken into consideration in any heterogeneous maternity population. This can be achieved by using customised centiles adjusted for constitutional variation, due to factors such as maternal height, weight, ethnic origin and parity, and the sex of the baby. The adjustment is made by the customised growth chart software called GROW (Gestation Related Optimal Weight) available from the Gestation Network and administered by the Perinatal Institute (PI) (Gestation Network 2012) (see Fig 1. Customised chart).

Adjustment for the GROW variables improves the recognition of babies that are pathologically small. Many SGA babies are only constitutionally small and this becomes evident once customised centiles are applied, which helps to reassure mothers who have small -normal, healthy babies, and reduces unnecessary investigations and intervention. Conversely, SGA by customised centiles has come to be used as synonymous with fetal growth restriction (FGR), as these babies are at significantly

increased risk and are more likely to have an adverse outcome (Clausson et al 2001, McCowan et al 2005, Figueras et al 2007). Plotting fundal height and estimated fetal weight on customised charts has demonstrated increased antenatal detection and reduced unnecessary investigations (Mongelli & Gardosi 1996, Gardosi & Francis 1999, Wright et al 2006, Roex et al 2012).

The use of customised charts and centiles has been recommended by the Royal College of Obstetricians and Gynaecologists' (RCOG) guidelines since 2002, and this has been reinforced in their revised edition published earlier this year (RCOG 2002, RCOG 2013). Their use is described in further detail in a 'Best Practice' series which included definitions (Gardosi 2009) and clinical application (Morse et al 2009).

Lessons learnt from reviews of FGR and adverse outcome

Fetal growth restriction is important to recognise in clinical practice as well as in perinatal audit. In the case of stillbirth, most deaths were historically considered 'unexplained' until classification systems such as ReCoDe were used (Gardosi et al 2005), which have a

separate category for FGR or intrauterine growth restriction (IUGR), defined by antenatal investigations including Doppler, post mortem results, or a birth weight below the 10th customised centile. According to ReCoDe, most normally formed stillbirths are found to be FGR, and are therefore potentially avoidable once the affected baby is mature enough to be delivered.

The large contribution of FGR to stillbirth risk has been confirmed in a recent population-based study of stillbirths in the West Midlands (Gardosi et al 2013a). As Figure 2 shows, presence of FGR increased the risk of stillbirth substantially, and this risk was even higher if FGR was not recognised antenatally. Babies with recognised FGR had a significantly lower stillbirth risk, because they were more likely to receive appropriate investigations and management. These pregnancies were delivered on average ten days earlier, but mostly still at term: 270 vs 280 days. The potential reduction in stillbirth risk with antenatal detection has also been highlighted in a recent study in New Zealand (Stacey et al 2012).

However, in most instances, antenatal growth problems are not detected in everyday NHS practice. Overall, about three quarters of SGA babies are not recognised before they are born (Hepburn & Rosenberg 1986), and in low-risk pregnancies, where the level of suspicion is lower, an even higher proportion - 85% - are missed (Kean & Liu 1996). The issue is compounded by chronic shortages in ultrasound services, which can lead to clinicians being reluctant to refer potentially 'at risk' pregnancies for investigation. Audits have shown that even where pregnancies were at increased risk because of past history, a plan for serial scans had not been implemented or numbers of scans planned were insufficient (PI 2007a).

Confidential enquiry panel assessments into stillbirths with FGR have shown that lack of recognition of growth problems is the single largest avoidable cause of death, and requires better referral protocols and training in risk assessment. Many of the concerns from the independent review panels related to the management of fetal growth surveillance including training, referrals, and ultrasound protocols (PI 2007b).

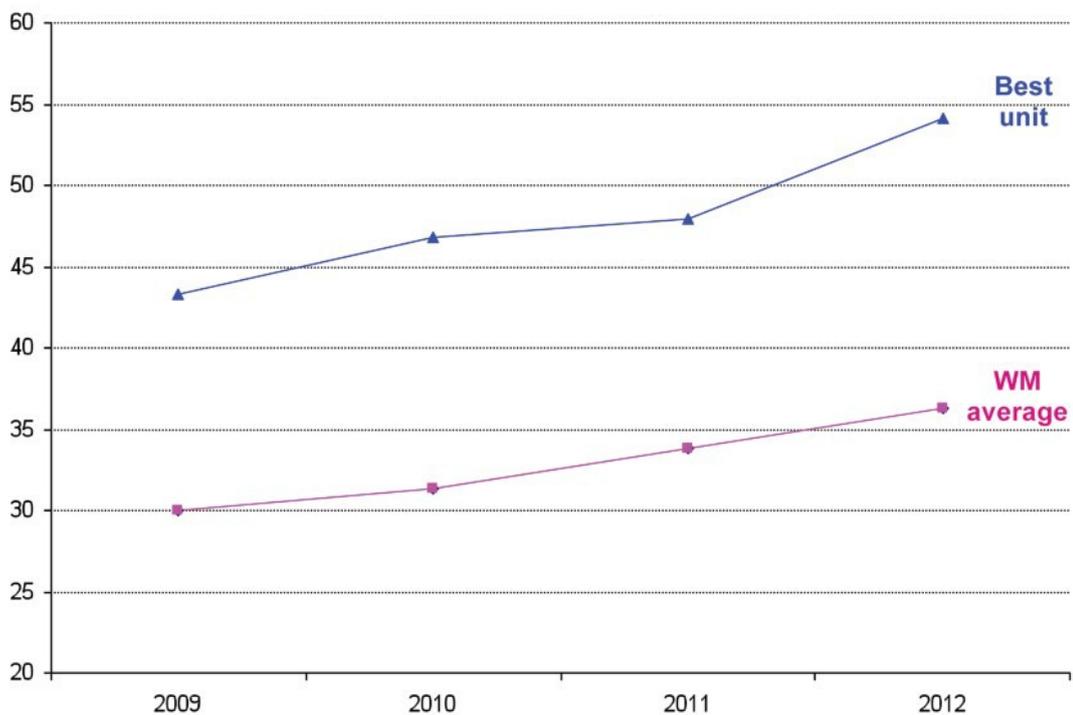


Fig 3. Antenatal detection of babies born with evidence of fetal growth restriction (birthweight < 10th customised centile), 2009–2012 trend. Average for West Midlands (19 units) and best unit shown. Improvement over time was associated with rolling training programme and benchmarking of performance.

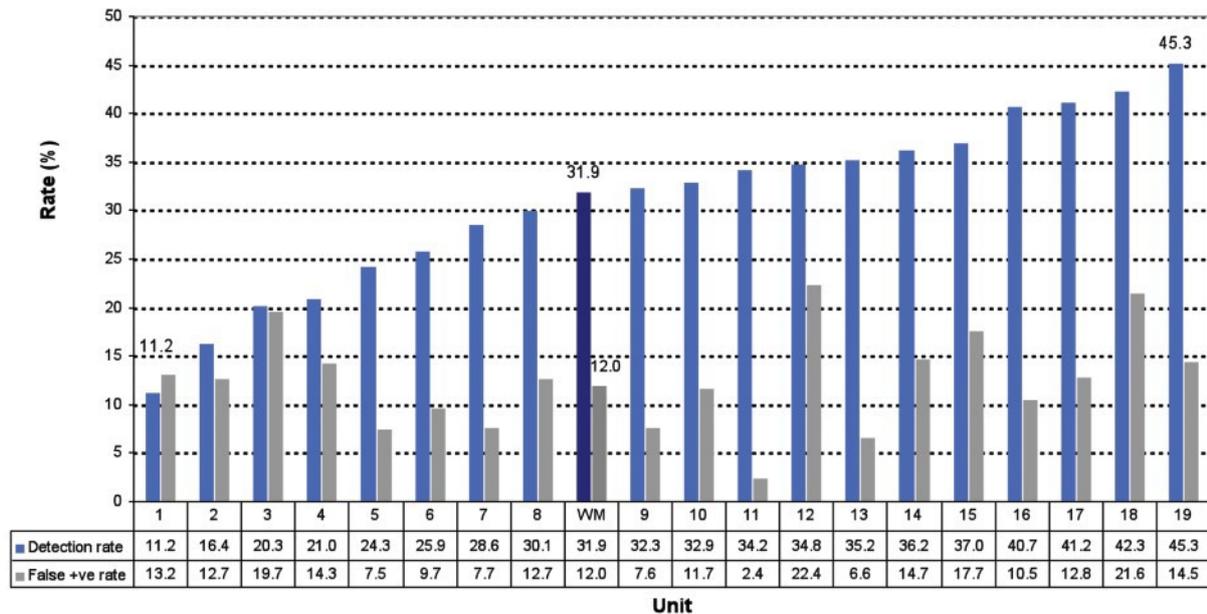


Fig 4. Range of antenatal detection rate of FGR and false positive rate in 19 West Midlands units, 2010. Detection rates were poorest in units with least training, and best in units with highest uptake of training programme and implementation of evidence-based referral protocols. Proportion of false positive rates (unnecessary referrals, where baby was not FGR) was also lower in the better performing units.

Recurring themes were:

- Lack of a comprehensive risk assessment at booking, resulting in women at high risk of IUGR not being identified.
- Where women were found to have risk factors at booking, there was wide variation in protocols for surveillance, with many women receiving no, or only one, third trimester ‘growth’ scan. It appeared that protocols were adjusted to fit the limited ultrasound resources rather than the mother’s need.
- Some units also had protocols which prevented growth scans at term, claiming – without evidence – that they are unreliable. In fact comparison of scan accuracy at term vs preterm gestations confirms that accuracy is as reliable, and often even better, at term (Francis et al 2011).
- Delay between referral and a subsequent scan was often considered unacceptable.
- In some units where the midwife did not have direct access to scan referral, the investigation was not carried out, or the request was overruled by antenatal clinic staff.
- Mistakes were made in the use of customised growth charts, with incorrect plotting and clinicians not referring when growth problems were evident (eg slow or static growth).
- Sole reliance on population-based charts in the ultrasound department to plot individual measurements

could provide false reassurance, where an estimated fetal weight plotted on the customised chart would have highlighted that the baby was too small and therefore at risk.

The West Midlands programme for stillbirth prevention

Based on this experience, and in collaboration with West Midlands Strategic Health authority and Primary Care Trusts, the PI started a rolling programme of GROW accreditation workshops which included training in the assessment of risk factors, standardised fundal height measurement, plotting on customised charts, and evidence-based referral pathways and protocols based on the RCOG guidelines (RCOG 2002, RCOG 2013). The workshops concluded with a test, and candidates who completed the assessment were awarded accreditation certificates.

In addition, a regional ultrasound protocol for high-risk pregnancies was introduced and several units implemented enhanced ultrasound services to improve provision. In Birmingham this was achieved through short ultrasound courses for midwives and midwifery-led community or hospital-based growth scanning clinics which could take referrals based on fundal height measurements or a past history requiring serial growth scans.

Region	% of births in Trusts with GROW training
ENGLAND AND WALES	27.6
WALES	0.0
ENGLAND	29.0
North East	57.6
North West	23.8
Yorkshire and the Humber	71.9
East Midlands	15.7
West Midlands	92.9
East of England	3.4
London	5.2
South East	14.0
South Central	22.5
South West	12.8
High uptake Regions (NE, Y&H, WM)	78.5
Low uptake (rest of Regions and Wales)	12.0

1. Effect on detection of fetal growth restriction

In parallel with training, the PI implemented a data collection system in the West Midlands which included, for a period between 2009 and 2011, data from all maternity units in the region. A variable within this dataset was ‘antenatal suspicion/referral/ detection’ as a data item, based on a record in the notes, plot on the chart and/or results of further investigations such as Doppler to indicate that SGA or FGR was detected.

The results showed a rapid increase in detection rates from a modest baseline of 18% in the 2006–2007 Birmingham baseline audit (PI 2007a) to 36% overall, and up to around 50% in the best performing units (PI 2010). Once a midwife suspected the baby was SGA and referred

for further investigation, the detection rate was higher and ranged from 62% to 85% (PI 2011).

In pregnancies at increased risk, protocols of implementing serial scanning through midwifery-led scanning services also led to significant increases in detection (Tonks et al 2013) (see Fig 3. Improvements in FGR detection 2009–12).

However, as the training was not mandatory, there was wide variation between units in the number of staff trained and whether protocols were implemented. This translated to widely differing detection rates and false positive referral rates, as shown in Fig 4.

2. Effect on stillbirth rates

The accreditation workshops were open to midwives from other regions as well as the West Midlands, either centrally at the PI in Birmingham, or by the team going to individual units in other regions to hold locally organised workshops. In total, over 2000 midwives as well as ultrasonographers and doctors from various different units were trained between 2008 and 2011. However, as shown in a recent analysis (Gardosi et al 2013b) there was wide variation in uptake between different NHS regions (see Table 1).

Uptake of training was highest in three regions — West Midlands, Yorkshire and the Humber and North East — with an average of 78.5% of pregnancies in these three regions being managed in units that had GROW training. In contrast, this figure was only 12.0% for the remaining English regions and Wales.

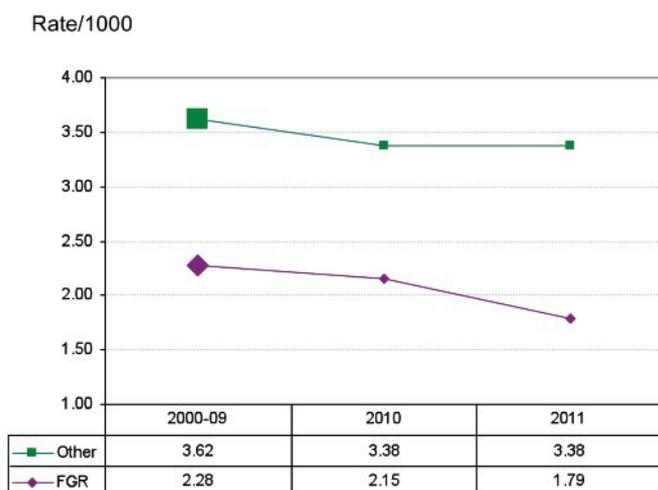


Fig 5. West Midlands stillbirth rates – 2010 and 2011 vs preceding ten year average. Main drop in rates was in the category of stillbirths with fetal growth restriction (FGR).

While the high uptake of training and protocols in the three regions was achieved through different routes and mechanisms, the effect was similar, in that in each region it resulted in a demonstrable positive effect on stillbirth rates according to the latest available data (ONS 2013).

In the West Midlands, the introduction of the GROW accreditation programme in 2008 was complemented by regionally agreed protocols for scanning high-risk pregnancies. Furthermore, from 2008–2011, GROW was also supported by augmented ultrasound resources in

Birmingham, Stoke-on-Trent and several other areas. In addition, a data collection programme reported quarterly on antenatal detection rates of small for gestational age birth weight as an agreed key performance indicator.

The region's stillbirth rates dropped year on year, with the 2011 rate falling for the first time in 50 years to below the national average (PI 2012). The downward trend in regional stillbirth rates, already evident in 2011, could be pinpointed specifically to fewer deaths with FGR, while there was no change in the other main stillbirth categories, including congenital anomalies or miscellaneous causes (Fig 5: Stillbirth rates in West Midlands).

According to ONS data (2013), this fall continued in 2012 to 4.47/1000, which is 1.26/1000 or 22% below the preceding (2000–2007) West Midlands' average of 5.73/1000, and equivalent to 92 fewer deaths in one year. A similar reduction applied to the more than 800,000 annual deliveries in the UK would result in over 1000 fewer stillbirths each year (Gardosi et al 2013a).

In the North East, GROW accreditation training was adopted between 2008–2011 by the majority of Trusts, and the roll-out was facilitated by a preceding strong promotion of the 2002 RCOG guidelines, and protocols for the investigation of 'at risk' babies by the region's lead unit in Newcastle. This resulted in a gradual drop in stillbirths to 3.91/1000, which is also the lowest rate on record for the region.

In Yorkshire and the Humber, the Local Supervisory Authority took on the coordinating role and developed a regional strategy. In 2011, the PI team were invited to give a series of 'train the trainers' workshops, and this was supported by a fetal growth surveillance training and competency programme implemented through supervision. There was a sharp drop in stillbirths from 2011 to 2012 to 5.00/1000, which is also the lowest ever recorded rate in this region. The Yorkshire approach of

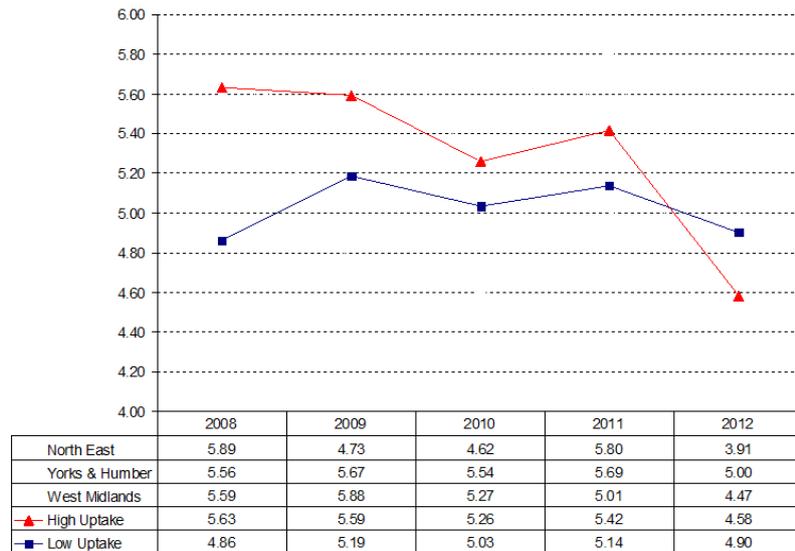


Fig 6. Stillbirth rates 2008–2012 in the three high uptake training areas North East, Yorkshire and the Humber and the West Midlands (Table), and graphs comparing averages for these three regions against the rest of England and Wales, which represent all low uptake areas, as listed in Table 1.

engaging midwifery supervision is particularly encouraging as it seems to be able to effect change quickly.

Other English regions and Wales: In contrast, there was no sustained drop in stillbirth rates in any of the other regions of England or in Wales, none of which had intensive GROW training. The average stillbirth rate for these low uptake areas was 4.90/1000 in 2012, which is comparable with the rate in 2008 of 4.86/1000.

These trends are illustrated in Fig 6, where the stillbirth rates for high uptake areas are compared, highlighting the relative drop in death rates in the high training areas.

Although they represent less than a quarter of the maternity population, together the three high uptake regions were responsible for a significant reduction in the overall stillbirth rate for England to 4.81/1000, which represents the lowest rate recorded since current methods of recording began in 1992.

What these three regions had in common was the greater awareness of the importance of FGR as a contributor to adverse outcome, and the need to establish good training and protocols. As the reduction in stillbirths is a declared objective of the NHS Outcomes Framework (DH 2011) it will be important to ensure that this effort is sustained within the new NHS.

Key points:

- Many stillbirths are preceded by FGR and are potentially avoidable through improved antenatal recognition.
- The three regions with high uptake of GROW accreditation had a drop in stillbirth rates to their lowest ever levels. Although they covered less than a quarter of all maternities in England, the improvement in the high uptake areas resulted in a significant reduction in national stillbirth rates.
- A comprehensive and evidence-based growth assessment programme has been devised which will be able to implement training, protocols, and audits to maternity units.
- More information on GAP is available at www.perinatal.org.uk/GAP/

- a competency document for peer assessment of knowledge of fetal growth surveillance and clinical application
- e-Learning and test package to reinforce the initial training and to facilitate ongoing assessment
- online training and competency log to internally monitor uptake within each Trust.

2. Protocols and guidelines

The GAP programme offers a template, evidence-based protocol to standardise practice in the use of customised growth charts and referral criteria, which clinicians can adapt and integrate in their Trust based protocols. It follows the latest RCOG Green-top guideline for thorough risk assessment and management planning for women in relation to fetal growth surveillance (RCOG 2013).

We concluded from these findings that there was a direct relationship between the training programme and a reduction in stillbirth rates. Although this was an observational study only, the association is strong and likely to be causal because of the temporal link. Our protocols have been further endorsed by the updated RCOG guidelines released in March 2013, which again recommend the use of customised charts for fundal height measurement in low-risk pregnancies, and serial assessment by ultrasound with plotting of estimated fetal weight in pregnancies considered to be at increased risk.

The Growth Assessment Protocol (GAP) programme

In light of this evidence we have since put together an enhanced Growth Assessment Protocol available from late 2013, as an integral part of GROW training. GAP includes comprehensive staff training, evidence-based protocols, routine monitoring of IUGR and detection rates, regular audits of missed cases to help identify training needs and system failures in fetal growth surveillance, and ongoing communication and support between the PI and Trusts.

1. Training & accreditation

The aim is to extend training to all staff who are engaged in antenatal care. The training is supported by:

- local GAP trainers – responsible for cascade training in each Trust

3. Audit

a. IUGR rates and detection rates

Routine quarterly reporting of IUGR and antenatal detection rates is seen as an essential component of the GAP programme to allow accredited Trusts to monitor their performance and benchmark against other units with similar demographics. The GROW software has been enhanced to assist Trusts in the collection of this information and to provide the customised centile at birth for postnatal management.

b. Missed cases of IUGR

Case reviews have highlighted many learning points for training, protocols and systems failures (PI 2007a). GAP includes a tool to assess local issues relating to fetal growth surveillance.

4. Support and communication

To help them take full ownership of the programme, Trusts are asked to nominate link persons from each speciality — a midwifery manager (eg head of midwifery, clinical risk manager, matron), an ultrasonographer and an obstetric/fetal medicine lead. These clinicians provide local leadership assisting all aspects of the implementation of the GAP programme and strengthening the link between their Trust and the GAP team at PI, supporting implementation and feeding back on progress and action plans.



Perinatal Institute – L to R: Sally Clifford, Sally Giddings, Ian Bird, Michelle Southam, Jason Gardosi, Shani Taylor, Mandy Williams, Chris Fernyhough, Lynne Wood.

Conclusion

Fetal Growth Restriction is the primary contributor to stillbirth, and a major cause of perinatal mortality and morbidity. Antenatal detection of FGR reduces stillbirth risk, however detection rates have historically been poor. Regional implementation of accredited GROW training and protocols has been shown to increase FGR detection, and has resulted in substantial improvements in stillbirth rates. If similar programmes are rolled out nationally, potentially 1000 babies could be saved every year.

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