Conference Paper

Preventing stillbirths through improved antenatal recognition of pregnancies at risk due to fetal growth restriction[☆]

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ABSTRACT

Most stillbirths used to be categorized as 'unexplained' and were considered, by implication, unavoidable. Recent evidence indicates that they represent a combined challenge for public health and for clinical services. Independent case reviews have found that many deaths are associated with a failure to recognize risk factors and to afford them the appropriate standard of care. The majority of normally formed fetal deaths had preceding, unrecognized intrauterine growth failure. Improved training and adoption of standardized protocols has led to increased antenatal detection of fetal growth restriction, and this in turn has resulted in significant reductions in stillbirths in areas with high uptake of the training programme. A comprehensive, evidence-based growth assessment protocol (GAP) is currently being rolled out across the NHS to implement this strategy for stillbirth prevention.

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Stillbirth: a public health challenge

Stillbirth rates in England and Wales are the highest in Western Europe and have seen little change in the past 20 years.[1,2] Each death is a tragic loss and causes much grief to the parents and extended family. It also affects clinicians and society as a whole. Stillbirths are associated with public health challenges such as maternal obesity, smoking, ethnic factors, and social inequalities.

In the West Midlands, a region with large ethnic minorities and social deprivation, stillbirth rates have been running consistently above the national average.[2] To be able to implement strategies for prevention, we sought to improve our understanding of the causes and associated factors. There were several obstacles to overcome:

1. The traditional Wigglesworth[3] perinatal mortality classification system, in common use over the last two decades, consistently resulted in two thirds of stillbirths being categorized as unexplained, and by implication, unavoidable.[4,5] We developed a new classification (ReCoDe – relevant condition at death)[5] which significantly reduces the

proportion of deaths considered 'unexplained', and identifies fetal growth restriction (defined as low customized weight-for-gestational age percentile) as the single largest category (Fig. 1). These findings helped to achieve a radical rethink, and suggested that many deaths are in fact *not* unavoidable.

2. Unit-based clinical reviews of perinatal deaths failed to identify the causes of these losses, leaving many cases also 'unexplained'. In large part, this was associated with a lack of standardization of the mortality review. Often this consisted merely of a short discussion after a summary presentation at the departmental perinatal mortality meeting. As a result, there were few processes in place whereby the service could identify system errors and learn from its mistakes.

The Perinatal Institute ran a series of confidential enquiries with multidisciplinary, independent panels assessing case notes of perinatal deaths in a structured manner, developing paper based and electronic software tools (SCOR — standardised clinical outcome review). These reviews identified that the majority of normally formed stillbirths were potentially avoidable.[6] They also pointed to fetal growth restriction (FGR) as a frequent precursor of intrauterine demise.

3. There was a lack of routinely collected denominator data to ascertain the risk factors in pregnancy which relate to adverse outcome. This was an important deficiency in a maternity population like the West Midlands, with its large areas of social deprivation, migrant populations, high obesity rates and other public health challenges. We implemented the electronic collection of a dataset from all pregnancies delivered in the region's 19 maternity units, using the standardized hand held pregnancy notes as the source for the information. Analysis of the resultant database of over 90,000 pregnancies helped establish risk factors for stillbirth and found that first, after including all known variables such as smoking, obesity, ethnic origin and social deprivation, fetal growth restriction was the single largest population attributable risk; and that second, this risk could be significantly ameliorated by antenatal recognition (Fig. 2).[7]
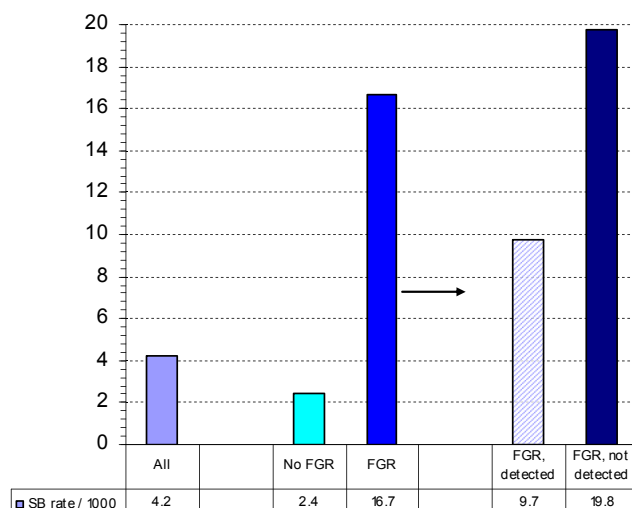

	All	No FGR	FGR	FGR, detected	FGR, not detected
SB rate / 1000	4.2	2.4	16.7	9.7	19.8

Fig. 2 — Stillbirth rates with and without Fetal Growth Restriction (FGR) and the effect of antenatal detection (Ref. 7).

Fetal growth restriction

This evidence pointed towards FGR as a frequent, avoidable contributor to adverse outcomes. We therefore focussed attention on improving antenatal recognition of FGR to allow appropriate investigations such as ultrasound and Doppler to be undertaken. In systematic reviews, Doppler investigations have been shown to reduce stillbirths[8] as they can identify the fetuses which require timely delivery from an unfavourable intrauterine environment. However, in most pregnancies ending with delivery of a small for gestational age (SGA) baby, the fact that the fetus was SGA (and hence at risk and needing further tests) was not recognized antenatally, with detection rates ranging from 15 to 24% in published studies,[9,10] and 18% in a casenote audit in three Birmingham maternity units.[11]

We therefore implemented a training programme for fetal growth surveillance which included hands on training, risk assessment at the beginning of pregnancy, evidence-based
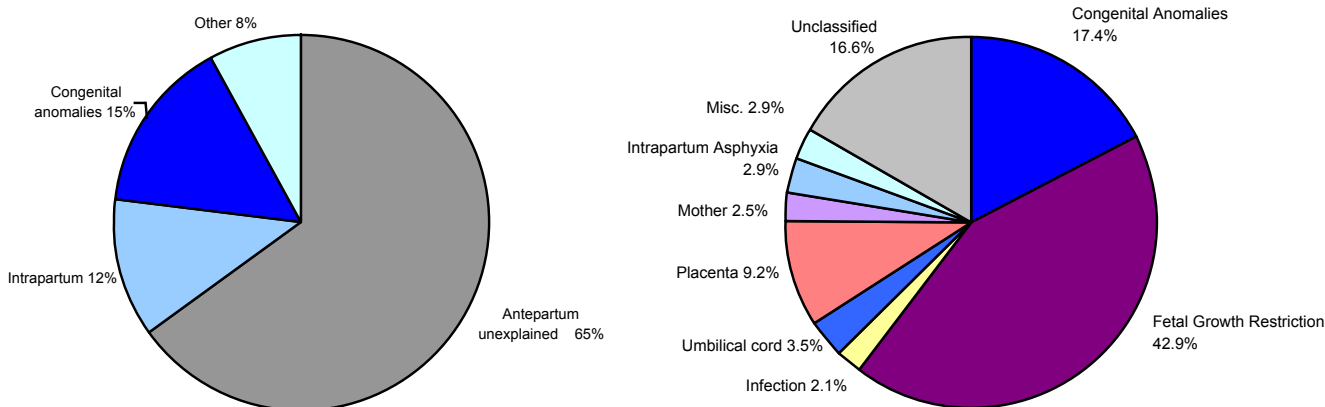

Fig. 1 — **Proportion of stillbirths designated 'unclassified' or 'unexplained' by Wigglesworth (left) and ReCoDe classifications According to ReCoDe, the largest category of stillbirths (43% in this sample) have fetal growth restriction (Ref. 5).**

protocols for surveillance of fetal growth in low and high risk pregnancy, and a rolling programme of audit and bench-marking of performance.

Surveillance in *low risk pregnancy* included a standardized technique for fundal height measurement and plotting on antenatal growth charts which are customized for maternal characteristics including height, weight, ethnic origin and parity. Serial fundal height assessment in the third trimester and plotting on the customized chart seeks to establish the growth velocity of the fetus, with referral for further investigation (scan and Doppler) when the sequential measurements do not follow the predicted, optimal growth curve. The use of customized growth charts increases antenatal detection and helps to reduce unnecessary referral and investigation for small-normal babies.[12,13]

In pregnancies at *increased risk of fetal growth restriction*, e.g. due to past history of a small for gestational age baby, or when fundal height measurements are unreliable (e.g. obesity, multiple pregnancy), serial assessment by three weekly ultrasound scan is recommended, and has since been endorsed by RCOG guidelines.[14] Such a protocol poses a challenge to many units in light of a chronic shortage of ultrasound resources in the NHS. We have shown that scan provision can be effectively supplemented by midwives who had undergone short, focussed, accredited training courses for third trimester growth scanning.[15]

Regional training

The training programme was implemented between 2008 and 2011 through a series of central or local workshops. Antenatal detection rates were monitored in the West Midlands through the regional electronic data collection system and by 2011, had reached 36% overall. However performance was found to be heavily dependent on the amount of training that staff at respective units had received,[16] with antenatal detection rates reaching 54% or more in well-trained units [Fig. 3]. Furthermore, the proportion of false positive referrals decreased.[16]

As it was non-compulsory and not accompanied by central guidance, uptake and engagement with the training programme varied between maternity units/Trusts and depended on local interest and perceived need to address issues related to FGR. Uptake was high (>50%) in three NHS regions (West Midlands, Yorkshire and the Humber and North East), resulting in 78.5% of pregnancies being cared for in trained units in these regions (Table 1). The remaining NHS regions and Wales had low levels or no training, with on average only 12% of pregnancies being cared for in trained units.[17]

Effect on stillbirth rate

In 2011, West Midlands stillbirths dropped for the first time to below the national average. Subgroup analysis based on the regional database indicated that this reduction was specifically due to fewer deaths with fetal growth restriction, while deaths due to other causes remained unchanged.[18]

According to the latest ONS data for English regions and Wales,[2,17] stillbirth rates (per 1000) continued to fall in the West Midlands to 4.47 in 2012, which is 1.26/1000 lower than the average preceding the training programme (2000–2007: 5.73). A similar reduction extrapolated to the >800,000 births in the UK would indicate more than 1000 fewer stillbirths per year.[17]

Downward trends in stillbirths were also observed in each of the other regions which had a high uptake of the Perinatal Institute's accreditation training programme (North East and Yorkshire and the Humber). In contrast, there was no change in the stillbirth trend in each of the remaining English regions and Wales (Fig. 4).

Although they represented less than 25% of births in England, the three high uptake regions were responsible for a national drop in stillbirth rates to 4.81/1000, the lowest ever since the current method of counting was introduced in 1992.

Fig. 3 – Antenatal detection rates (%) of babies born with evidence of fetal growth restriction (birthweight <10th customized centile); 2009–2012. Average for West Midlands (19 units) and best unit with high uptake of training shown (Ref. 16).

Table 1 – Uptake of GROW accreditation training in English Regions and Wales, 2008–2011. High uptake (>50%) shaded.[16]

	% 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

Stillbirth rate/1000

	2007-9	2008-10	2009-11	2010-12
Yorkshire and the Humber	5.68	5.59	5.63	5.41
North East	5.18	5.08	5.05	4.78
West Midlands	5.62	5.58	5.39	4.92

Stillbirth rate/1000

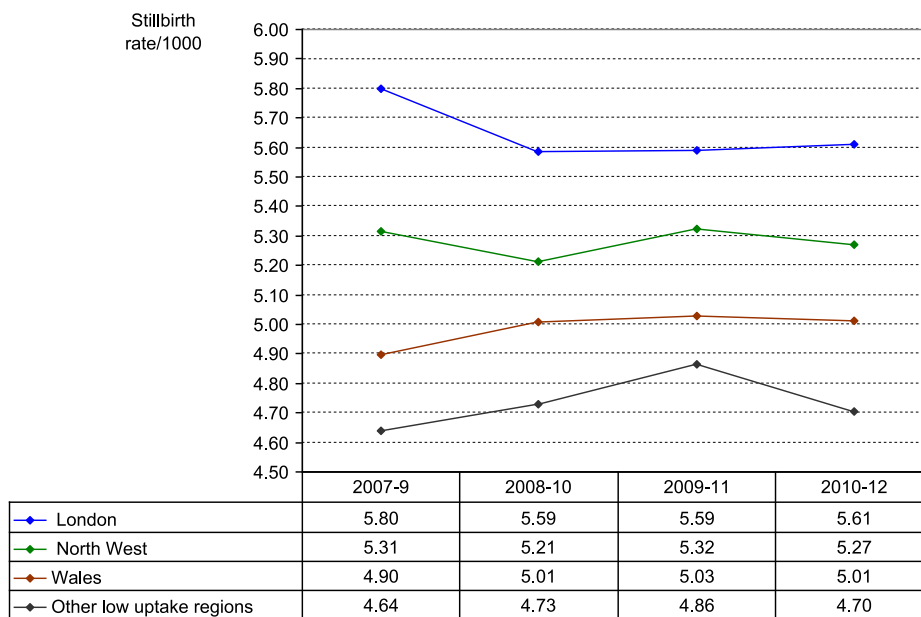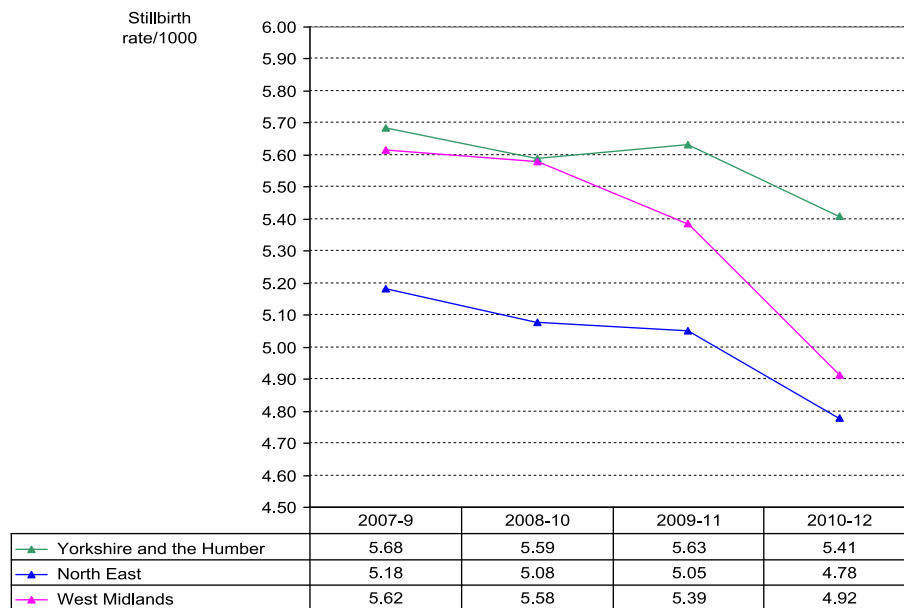|	2007-9	2008-10	2009-11	2010-12
London	5.80	5.59	5.59	5.61
North West	5.31	5.21	5.32	5.27
Wales	4.90	5.01	5.03	5.01
Other low uptake regions	4.64	4.73	4.86	4.70

Fig. 4 − a & b. Stillbirth rates in Regions with high uptake (top) and low uptake (bottom) of GROW training and protocols, 2007−2012 (3 year moving average) (Ref. 17).

Examination of association according to Bradford Hill's nine causality criteria[19] confirmed that the association was causal, i.e. that the training programme was responsible for the reduction in stillbirths.[17]

The growth assessment protocol (GAP)

Based on these findings, we put together an extended programme in 2013, comprising a comprehensive growth assessment protocol (GAP) which includes train the trainers workshops (theory and practice), e-learning, evidence-based protocol templates for local implementation, upgraded GROW customized chart software, and audit tools to assess antenatal detection rates and to review reasons for missed cases (www.perinatal.org.uk/GAP). The programme is underpinned by the latest RCOG guidelines on the management of small-for-gestational age babies.[14]

The initiative has received no central funding, but is supported by recently issued commissioning guidance from NHS England[20] and the Scottish Government. The GAP programme is being offered at a cost equivalent to 50 pence per pregnancy, or £ 2000 for a unit delivering 4000 pregnancies per year. As of May 2014, over 120 Trusts and Health Boards in the UK have already implemented the programme or are in the process of doing so. Due to increasing enquiries from expectant mothers

or their partners, whether the maternity unit providing their antenatal care is within the GAP programme, the Perinatal Institute has recently made this information available on line (http://www.perinatal.org.uk/gap-uptake.aspx).

Conclusion

Stillbirths represent a challenge for public health and for clinical services. Case reviews indicate that many deaths are associated with a failure to recognize risk factors and to afford them the appropriate standard of care. The case review findings that many deaths are preventable adds urgency to the need for appropriate strategies to improve awareness of risk factors such as obesity and smoking in pregnancy. Obstetric and midwifery services need to improve recognition and management of at-risk babies through implementation of best practice protocols for antenatal detection of fetal growth restriction. Recent evidence has shown that such a programme reduces avoidable deaths in areas where it has been taken up. To avoid a postcode lottery in patient safety, it is now essential that such a programme is standardized throughout the health service, and that the public health messages and clinical guidelines are implemented uniformly across the NHS.

Author statements

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