

Health and Social care Committee
Inquiry into stillbirths in Wales
SB 12 – BMA Cymru



June 2012

British Medical Association Cymru / Wales

Response to Health and Social Care Committees inquiry into stillbirths in Wales.

INTRODUCTION

BMA Cymru Wales is pleased to provide a response to the Health and Social care Committees one-day inquiry into stillbirths in Wales.

The British Medical Association represents doctors from all branches of medicine all over the UK. It has a total membership of nearly 150,000 including more than 3,000 members overseas and over 19,000 medical student members.

The BMA is an independent trade union and the largest voluntary professional association of doctors in the UK.

BMA Cymru Wales represents some 7,500 members in Wales from every branch of the medical profession.

BMA EVIDENCE ON STILLBIRTHS IN WALES: JUNE 2012

Aims and Introduction

This paper gives an overview of the current situation and problems and the plans to address the finding that the stillbirth rate in Wales has not fallen for the last 10 years, whilst the rate in many other countries is much lower.

It considers, specifically, stillbirths in relation to reduced fetal movements and fetal growth restriction.

It is not intended that this is a comprehensive review of stillbirth prevention and management, but it necessarily mentions the current situation in regards to research into intrapartum fetal monitoring in Wales and the new stillbirth work-stream of the 1000 Lives Plus Transforming Maternity Services mini-collaborative as this may be useful to the Committee's deliberations.

The following areas are addressed in this paper, aiming to provide clarity in some areas of potential confusion:

- Stillbirth rates
- Local and national enquiries

Welsh Secretary: Dr Richard JP Lewis, CSJ MB ChB MRCGP Dip IMC RCS (Ed)
Chief Executive/Secretary: Tony Bourne

- Classifications of stillbirths
- 'High risk' pregnancy
- Mechanism of fetal compromise and demise
- Fetal movements
- Fetal growth
- Electronic fetal monitoring
- The challenge in 'low risk' women
- Finding evidence
- Data in Wales
- The 1000 Lives Plus Transforming Maternity Services mini-collaborative

Stillbirth rates

Technically, stillbirth is defined as fetal death prior to delivery of a potentially viable baby. Prior to viability, fetal death is termed as a miscarriage.

In the UK, this means that the definition for statistical purposes is a baby "issued forth" at or after 24 weeks, showing no signs of life. Many countries regard viability as being 28 completed weeks of pregnancy and thus record fewer stillbirths than in the UK. A baby born prior to 24 weeks is unlikely to survive, and if they do, the rate of serious handicap is high.

Many countries do not routinely collect data on all pregnancies. In addition, routine ultrasound scanning to confirm or estimate gestation is not universally available, nor do many women know how pregnant they are in many countries hence the WHO recommendation for the collection of data on pregnancies at more than 22 weeks. This can explain some of the difference between quoted stillbirth rates and some of the variation.

The stillbirth rate in Wales in 2010 was 5.3 per 1000 births - that equated to 190 babies. Scandinavian countries have far lower stillbirth rates at 2 - 3.5 per 1000 births. If Wales was to reduce its stillbirth rate to these figures, there would be at least an extra 64 babies alive each year. This is not directly transferable to Wales because of different population demographics (for example, there is an association between deprivation and increased stillbirth rates) but nevertheless this produces a figure that Wales can and should aspire to.

Stillbirth rates in the UK have fallen over recent decades, but have been steady for the last 10 years. There is a natural variation in rate because stillbirth is relatively uncommon (1:200 pregnancies) which makes comparisons between individual practice and maternity units difficult as the confidence in a rate in terms of statistically significant differences is often very wide. It is not possible to be exact about numbers of stillbirths for several reasons such as, for example, uncertainty about gestation at delivery for some women. Combined with differences in notification, this explains why there is often a discrepancy in different data sets – such as the All Wales Perinatal Survey and the Office for National Statistics.

As discussed above, in many other industrialised countries stillbirth rates have dropped to be consistently lower than those in the UK. Although this may be due to increased medicalisation of pregnancy and childbirth compared to the UK – there are fewer home births, continuous electronic fetal monitoring in labour is more common and new technologies are more often employed – the situation in the UK remains confusing because of a lack of accurate routine high quality clinical data.

Stillbirth rates vary most notably when consideration is made of the effects of antenatal programmes screening for congenital abnormalities and it is common to see stillbirth rates quoted that exclude such cases. The effectiveness or otherwise of antenatal screening is not part of this paper.

Local and national inquiries

Obstetricians have long been held to be the originators of maternal and perinatal audit, firstly with the establishment of the Confidential Inquiries into Maternal Death for England and Wales in 1957, which was extended to all four UK countries in 1985. The confidential inquiries into stillbirths and deaths in infancy (CESDI) published several annual reports and highlighted important deficits in care, discussed below. This joined with the maternal inquiry mechanism in 2003 to become CEMACH (Confidential inquiry into Maternal and Child Health) which was part of the Royal College of Obstetricians and Gynaecologists (RCOG), but which became an independent body (Centre for Maternal and Child Enquiries - CMACE) in 2009.

There is currently a gap in confidential inquiries, but the contract to run these in the future has been won by the National Perinatal Epidemiology Unit in Oxford. They are in the process of organising a national advisory group to review the classification of stillbirths in the UK.

The importance of such national inquiries is clear because they have established several clear messages:

1. The 6th Annual CESDI report 1996-97 examined a random 1:10 sample of the deaths reported to CESDI excluding babies weighing less than 1000g, major congenital abnormalities and post neonatal deaths. About $\frac{3}{4}$ of these, nearly 600 deaths, were stillbirths. The expert panel reviews found that 45% of these stillbirths were associated with care that was 'suboptimal' to a degree that the outcome might or would have been more favourable if this was not the case.
2. In the 8th report, the majority of stillbirths are classed as "unexplained" by the conventional classification system. This is considered further below, but the combination of these two observations would suggest that 'unexplained' does not necessarily mean that such deaths were unavoidable.
3. The five most frequent areas of suboptimal care relevant to this paper are:
 - i. Assessment and communication of risk by and between primary care, midwives and obstetricians;
 - ii. A failure to take into account a previous pregnancy with intrauterine growth restriction or to suspect or detect it, or a failure to manage this appropriately;
 - iii. A failure of women to appreciate the significance of reduced movements of their baby, to report this in a timely manner or of the clinical team to respond appropriately;
 - iv. A failure of women to engage with advice on smoking cessation or for services to support this to be provided or for health professionals to refer to such programmes;
 - v. A failure to suggest, or for consent not to be given for, postmortum or specialist histological analysis of the placenta. Postmortum rates have fallen since the events at Alder Hey. Specialist pathological services are provided in Cardiff.

The All-Wales Perinatal Survey was established in Cardiff in 1993 and has now published its 18th report. It has the advantage of reporting stillbirths and neonatal outcomes in simple and aggregated triennia, together with statistical 95% confidence limits. It is important because it publishes information about babies actual and intended place of birth which enables some interpretation to assess outcomes in women or babies transferred from one place of birth to another. Because it also gives details by place of residence, there is the possibility of tracking care for some of the demographics known to influence perinatal mortality rates – such as deprivation for example.

The 2010 report confirmed that maternal cigarette smoking, obesity and advancing maternal age are major risk factors for stillbirth, and stated that public health initiatives to address these should be a priority. This report also found a large number of unexplained stillbirths by conventional classification (41.7%) and recommended further research in this area. This is partially linked to the declining autopsy rates in Wales.

Local perinatal reviews

Although local reviews of stillbirths are held in all hospitals on a regular basis, stillbirths are too rare for trends to be deduced, although the process usually feeds into the All Wales Perinatal Service and the Congenital Anomaly Register Information Service (CARIS), based in Swansea. There have been formal structured processes developed, which could be implemented to improve the standard and usefulness of local perinatal audit.

Classifications of stillbirths

The two most common classification systems for stillbirth in the UK attempt to provide a clinical correlation with pathological findings at postmortem. They are hierarchical in that there is an order of listing, with major (lethal) congenital anomalies at the top. Both systems have been considered the best we have, but fail to find a specific named cause in over 50% of cases – for example, the 8th CESDI report found 70% were “unexplained” by the Wigglesworth and “unclassified” by the Aberdeen classifications (no congenital abnormality, antepartum haemorrhage, intrapartum anoxia etc). This has been a consistent finding in the UK.

Other classification systems have been developed in Scandinavia and Australia / New Zealand, but there is also great interest in the work from the West Midlands Perinatal Institute led by Professor Jason Gardosi, who developed the Re/Co/De classification that searches for and recognises abnormal fetal growth from dysfunction of the utero-placental unit, through the use of ‘customised fetal growth charts’ and detailed pathological examination of the placenta and fetal organs to look for specific evidence of this. He reports that, using this classification, the number of unexplained or unclassified stillbirths falls to 15%.

‘High risk’ pregnancy

A most useful definition of ‘high risk’ was given by Professor David James in his 2010 Eponymous William Fletcher Shaw lecture at the Royal College of Obstetricians and Gynaecologists (RCOG): “*A pregnancy is high risk when the likelihood of an adverse outcome (mortality or morbidity) in the mother and / or the baby is greater than in the general population*”.

The stillbirth rates for women identified with risk factors have fallen – and the management of ‘high risk’ pregnancy has slowly and consistently led to better mortality figures in this group. This is partly because of improved therapies and surveillance, but also because the obstetrician has the ultimate intervention – delivery of the baby – at their disposal. This can, of course, mean that mortality is shifted from the antenatal or intrapartum to the neonatal period – early delivery may expose the newborn to the risks of prematurity, for example, but perinatal mortality rates (stillbirths and neonatal deaths to 28 days) are slowly and consistently falling.

First of all – ‘do no harm’

Gestation, however, is an important factor, when considering whether identification of an increased risk should result in immediate delivery as this has implications on the provision and configuration of obstetric and neonatal services – even a baby delivered by elective caesarean section at 37 weeks, generally considered to be ‘term’ – has a ten-fold increased risk of dying or developing respiratory complications compared to the equivalent baby experiencing labour. This is because the ‘stress’ of labour helps finish fetal lung maturity through the production of stress hormones – the adverse effect of an ‘early’ caesarean section can be halved through giving two doses of steroid intramuscularly to the mother before delivery, but it does not eliminate this risk.

The decision to deliver a baby with extreme prematurity is one of the most difficult that many obstetricians face as the baby’s outcome after delivery is predictable from a population point of view – we have good data on the survival and morbidity of babies at different weights at various gestations – versus the uncertainty of how an individual baby will fare if left in-utero. Sometimes the decision is

straightforward – a woman is haemorrhaging at 26 weeks and delivery is necessary to save the mother’s life, for example – but more often than not there is a discussion of what is known and unknown between the clinical team and the parents in order to seek an individual plan of management.

Currently, most stillbirths occur in conditions where no excessive maternal risk has been identified – the women are considered ‘normal’ or ‘low risk’. The rates of stillbirth have been shown in several reports to be higher in ‘low risk’ than in ‘high risk’ women. This begs the question, “can the gap be narrowed to predict better the outcome of normal pregnancy?”

Mechanism of fetal compromise and demise

It is useful to consider what the sequence of events may be as a fetus becomes compromised because this helps in the discussion of potential screening processes and interventions. Importantly, it explains limitations of our current strategies. Again, it is easiest to refer to Professor James:

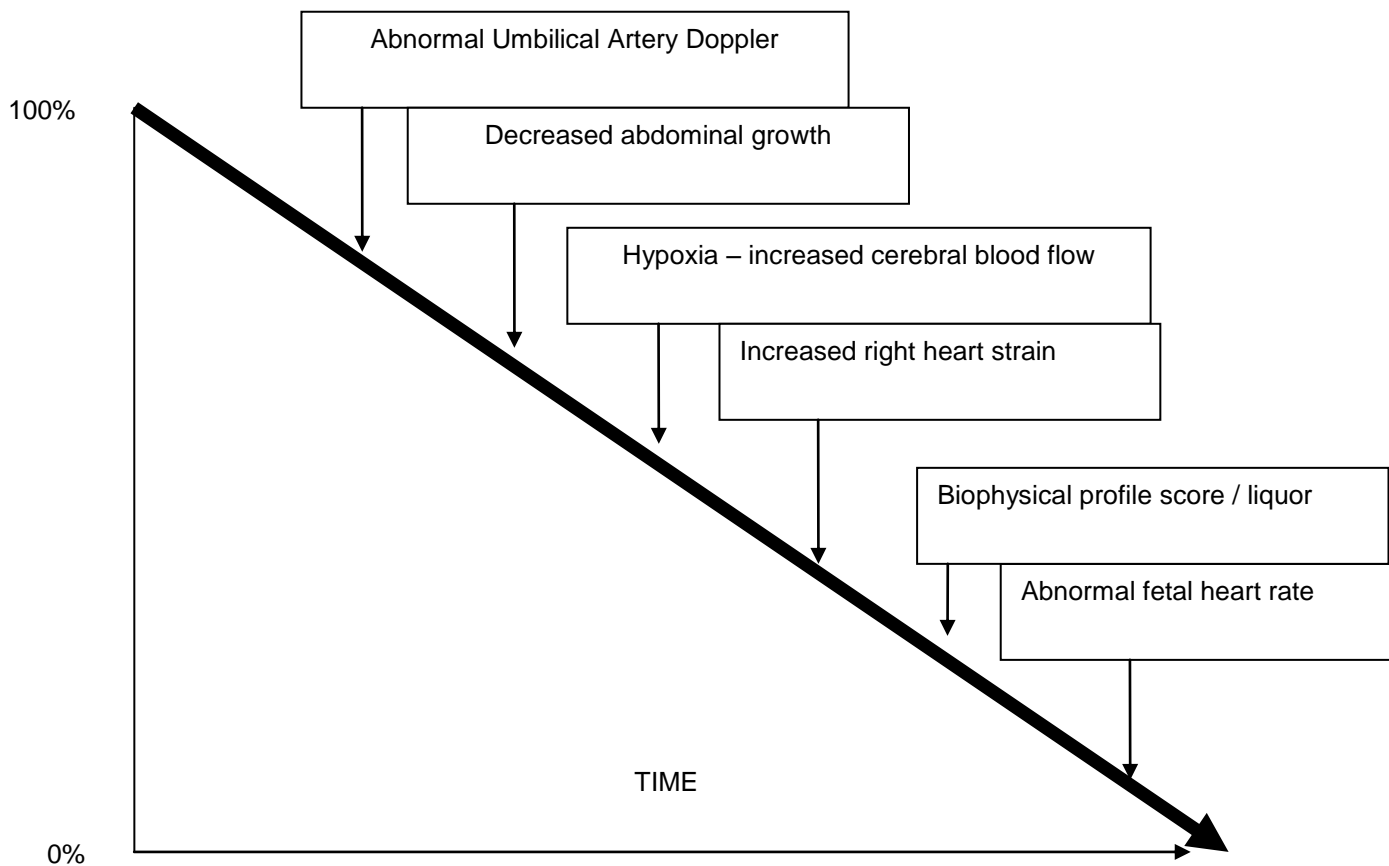


Figure 1: Schematic of optimal placental function against time and the approximate order in which clinical abnormalities could be found. The rate of slope (rate of deterioration) varies between individuals. (Modified from Prof James).

If the optimal placental function starts at 100%, but there is a deterioration in function (from whatever pathological cause) there is debate about whether the uterine artery Doppler or abdominal growth tail off first – as the liver forms a large part of the fetus, alterations in metabolism and therefore glycogen stores result in a reduction in abdominal circumference. As oxygen falls – hypoxia – there is a protective redistribution of blood to the fetal brain, which can be detected by altered blood flow in the middle cerebral artery. Strain on the right side of the heart follows and this leads to reduced blood flow through the ductus venosus – the blood vessel that shunts oxygenated blood from the umbilical vein directly to the inferior vena cava (bypassing the fetal liver) to increase blood flow to the fetal brain. This can be measured on ultrasound and correlates reasonably with a build up of acid (acidaemia) – the product of needing to produce energy without oxygen (anaerobic glycolysis – which depletes glycogen stores from the fetal liver).

Alteration in fetal heart rate occurs relatively late in the process, even when it forms part of a biophysical score that includes liquor volume. The fetal heart can show reductions in variability that cannot be picked up easily on auscultation and computerised analysis appears to be more sensitive in this respect. By the time there is a pathological CTG, there may be a maximum of 72 hours before a baby dies. It is interesting to note that maternal perception of reduced fetal movements is often earlier in the process than abnormalities of the fetal heart rate.

Conversely, if a baby is small but dopplers are normal, then the outlook is usually very good – the test is reasonably sensitive in high risk pregnancies.

Fetal movements

It is perhaps somewhat surprising that only 50% of women complain of reduced fetal movements prior to presenting with an antepartum stillbirth. However, this association does exist and 1:6 still births from the 8th CESDI report were associated with suboptimal care in response to accepted current practice.

Randomised trials of formal fetal movement 'kick charts' did not have the anticipated effect – there was no improvement in neonatal outcomes and maternal anxiety was increased. This is reinforced by the Cochrane Review and NICE guidance on antepartum care. However, there is a sense that a change in character or relative number of movements may indeed be clinically significant, and there are studies underway to investigate this further.

From the schematic presented, it is not surprising that reduced fetal movements are not an accurate predictor of fetal well-being as they are affected relatively late in processes increasing placental dysfunction. However, there may be an association between placental abnormalities and reduced movements when the placenta is looked at in meticulous detail (Warrander et al 2012).

Fetal growth

In a perfect world, a fetus reaches its genetic growth potential in an optimum uterine environment with a perfectly functioning interface with the outside world (the placenta). Scientifically object assessment of this growth process is poor – we use a tape measure to assess growth believing this to be accurate because it has numbers on it, when we are measuring the baby, liquor, uterus and a varying degree of maternal body as well. As a rough screening tool it is relatively poor, but allows entry into more formalised fetal growth assessment using ultrasound. 50% of babies who do not reach their growth potential are missed by this approach and wrongly classified as being 'low risk'. Stillbirths contain a disproportionate number of growth restricted babies and even more so when one considers more accurate means of ascertaining growth potential.

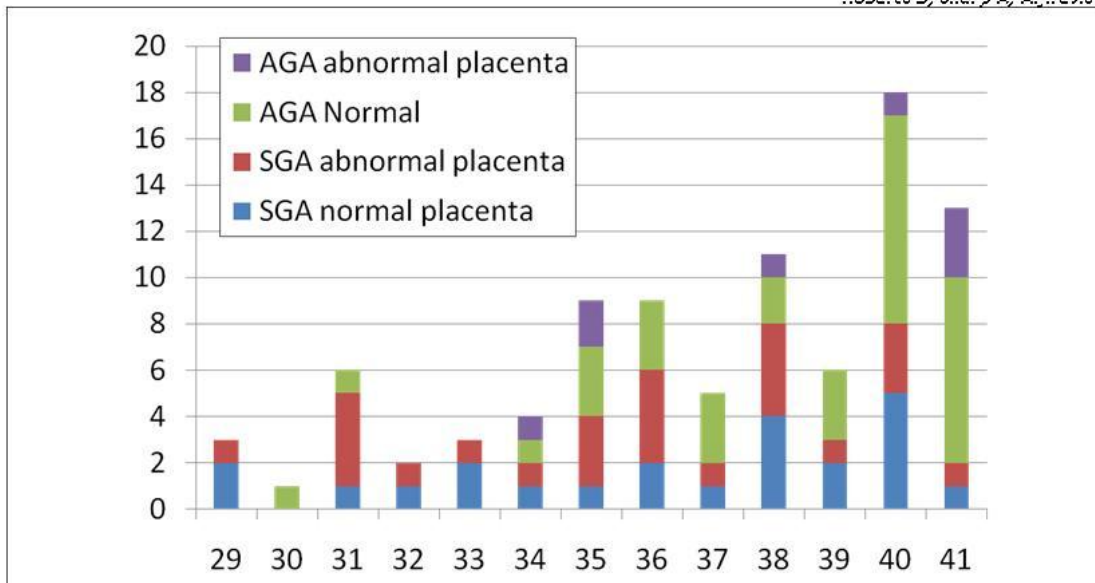
The crude population growth charts used to plot growth parameters for fetal ultrasound are derived from different populations and therefore there are several variations available. Male and female fetuses are expected to have different birth weights, first babies are generally lighter than subsequent babies, the birthweight norms for different ethnic populations vary and twins are generally lighter week for week than

their singleton counterparts – yet all may have their growth plotted on a single standard chart. Jason Gardosi has developed ‘customised growth charts’ in the West Midlands which appear not only to highlight growth problems in-utero, but which significantly reduce the number of ‘unexplained’ stillbirths when applied to such babies.

The use of customised growth charts is unproven, but shows huge potential and the need to fund further research in this area nationally is essential. The effect of customised growth charts in categorising ‘unexplained’ stillbirths is seen also from data from Liverpool (figure 2) below:

Unexplained antenatal stillbirths in Liverpool Women’s from 2005-2010 (total births 49,110)

Roberto D, Sharp L, Liferavis Z 2011



- SGA with normal placenta 25%
- SGA with abnormal placenta 28%
- AGA with normal placenta 38%
- AGA with abnormal placenta 9%

Using ongoing pregnancies as the denominator AGA with normal placenta after 41⁺⁰ weeks is the largest group

* SGA = <10th centile on customised growth charts

Figure 2: 'Unexplained' stillbirths with regards to being Small for Gestational Age (SGA) or Appropriate for Gestational Age (AGA) and accounting for specialist placental histopathological examination (courtesy of Professor Alfirevic).

Thus, for both reduced fetal movements and the identification of fetal growth restriction, the evidence for a standardised routine application for all women is incomplete (appendix 1). Wales needs to find a pragmatic approach to dealing with this.

Electronic fetal monitoring

Intrapartum fetal hypoxia remains an important cause of death and permanent handicap and there are many studies reporting a significant proportion of cases with evidence of suboptimal care related to fetal surveillance. Cardiotocographic (CTG) monitoring remains the basis of fetal surveillance during labour, but its interpretation by healthcare professionals is subject to great variation between observers and between the same clinician at different times – especially where a good or poor neonatal outcome is known (hindsight bias). Thus, there is often poor agreement on the features of a CTG – the presence and significance of slowing of the heart beat, for example and the overall classification of whether the trace is normal or needs intervention – and then what that intervention might be.

The RCOG has developed and launched an e-learning tool that is freely available to all NHS staff. It is both educational and assessed and is a key potential element in improving clinical staff skills in intrapartum fetal monitoring.

Several countries with lower stillbirth and neonatal death rates have introduced developments of the conventional CTG. ST Analysis (STAN) looks at the part of the fetal ECG that changes in the presence of hypoxia – a bit like changes in an adult ECG during angina or a heart attack. These changes are much more frequent than one might expect and thus interpretation depends on the likelihood that any event is significant – which means that it is used in conjunction with the need to interpret the conventional CTG reliably. The consequence to this is a huge training commitment and some people find the technology cumbersome and invasive. The STAN machines cost about five times that of a CTG machine, although it is not clear why this should really be the case. The addition of fetal electrocardiogram analysis has increased the potential to avoid adverse outcomes, but CTG interpretation remains its main weakness.

A program for computerised analysis of intrapartum fetal signals, incorporating real-time alerts for healthcare professionals has recently been developed by the University of Porto and Welsh patients participated in the validation study of this system in the 1990s (Glan Clwyd Hospital). There is a need to determine whether this technology can result in better perinatal outcomes and thus two hospitals in Wales (Cardiff and Glan Clwyd) form part of the four hospitals currently involved in a multicentre randomised clinical trial aiming to provide evidence of the impact of computer analysis for intrapartum monitoring with real-time alerts on the incidence of adverse perinatal outcomes, intrapartum interventions and signal quality. (Current controlled trials ISRCTN42314164).

The challenge in 'low risk' women

There are inherent problems in dealing with women judged to be at 'low risk' of adverse perinatal outcome, because there is a temptation not to tell women about things that can go dreadfully wrong. There is a paradox between the way we assess women as being normal and the science that may detect abnormality. In addition, there is a potential conflict between causing unnecessary anxiety for women and their families or harm from unproven interventions in women striving for the normality that occurs in the vast majority of low risk women otherwise.

From the previous discussion, it is apparent that there are inherent flaws in the way we assess 'normality' in terms of being 'low risk'.

David James highlighted this discrepancy – we ask non-specifically whether a woman feels her baby is moving, without an ability to provide evidence of the significance from randomised trials about what our response should be.

We attempt to make an estimate of appropriate growth, with no knowledge of what might be appropriate for that pregnancy, in measuring symphysis-fundal height and make it slightly more reproducible by using a tape measure, which we turn back over and re-measure when we don't match the number of expected weeks with our centimetres. We are measuring the fetus, uterus, amniotic fluid and maternal abdomen, with at best a 50% positive predictive value for fetal growth restriction.

Fetal heart rate is recorded merely as being present and vaguely an acceptable rate with no information on the parameter most sensitive to hypoxia – the baseline variability – and no randomised controlled trial of this as an effective manoeuvre. When we do a CTG it should not really reassure us, because it deteriorates late in the process of placental dysfunction and fetal compromise.

We are left with the only randomised trials of procedures in fetal surveillance being those surrounding doppler in high risk pregnancy, but a Cochrane Review by Zarko Alfirevic concluded that there was insufficient evidence to recommend this as a screening tool in low risk pregnancy.

The challenge, therefore, is two fold: firstly, to know when 'normal' really does translate into 'low risk' in terms of outcomes, by either deciding on appropriate extra surveillance to alter risk status and secondly to instigate optimal monitoring or delivery.

It is tempting to say that, if 'term' is regarded as 37 – 40 weeks, then elective delivery at 37 weeks would reduce the risk of stillbirth. Whilst this is intuitively true, induction of labour is an invasive procedure and elective caesarean section under 39 weeks is associated with increased risks of neonatal respiratory distress and perinatal mortality.

The average length of pregnancy estimated from a woman's last menstrual period, where this is known with certainty (28 day cycle) is about 3 days shorter than when calculated from an ultrasound scan in early pregnancy, making the mean date of delivery about Term +3 and 50% of women would naturally labour on or prior to this date.

For a woman to give birth, the cervix must soften, shorten and dilate (from being closed to 10cm – or full dilatation). The shorter, softer and more open the cervix is, and the lower the fetal head is within the pelvis at the point of induction of labour, the more straightforward and quicker the induction and subsequent labour tend to be. The commonest reason that a woman is 'overdue' (when the dates are confirmed by early scan) is because the baby's back lies to the mother's back. The head extends a little and is therefore not tucked in so does not press so firmly on the cervix. This quarter turn that occurs in the baby, from facing sideways as the pelvis is entered, means that either the baby is born face upwards or a further 180 degree rotation happens, which is usually associated with a slower and more painful labour – with much more back pain.

Thus, women who go 'overdue' may not be representative of the women who have laboured spontaneously and the extra 'ripening' of the cervix from the longer pregnancy may be offset by a naturally more difficult labour.

Although it is usually held that induction of labour is associated with higher intervention rates in terms of vaginal operative delivery (forceps or ventouse) or caesarean section, the latest Scottish data suggest the growth velocity of a baby slows down towards term. Elective induction of labour for a large fetal size is not associated with improved delivery rates unless the woman is proven to have developed diabetes in pregnancy.

Finding evidence

The problem with deriving appropriate evidence arises because of the relatively rare nature of the adverse event – 1:200. For example, in the Dublin random controlled trial (RCT) of electronic fetal monitoring, the sample size of 10,000 women was not enough to deduce differences in perinatal mortality – even a study of this size was just not big enough. RCTs of screening procedures and interventions in low risk women would need hundreds of thousands of women to show a 10% improvement in rare outcomes. There is therefore a further complexity – we are asked to practice ‘evidence-based’ medicine in a context where the evidence is unlikely to be available in a ‘gold-standard’ form – the randomised controlled trial.

Data in Wales

National data are provided from the All Wales Perinatal Survey and the Congenital Anomaly Register Information Service (CARIS) both of which have core funding support from Welsh Government, but both rely on local notification from nominated staff in each maternity unit in Wales.

National statistics on deliveries are compiled using the Patient Episode Database for Wales (PEDW) which is a database of individual hospital patient records. Although the preferred Patient Administration System (PAS) for Wales – Myrddin – has developed a maternity module, there has been insufficient investment in completing the module enough for national implementation. There are local clinically useful maternity information systems in a minority of maternity units in Wales; clinicians’ ability to perform surveillance or clinical audit routinely is limited by this on-going problem.

It would seem essential to establish a formal stillbirth register for Wales, funded appropriately and linked closely with the All Wales Perinatal Survey and CARIS.

The 1000 Lives Plus Transforming Maternity Services mini-collaborative

The overall aim of the Transforming Maternity Services Mini-Collaborative is to improve the experience and outcomes for women, babies and their families within Maternity Services. Two of the drivers in achieving this aim are to reduce the risk of venous thromboembolism in pregnancy and to improve the recognition and management of critically ill pregnant women in Wales, with a particular emphasis on sepsis.

The Transforming Maternity Services Mini-Collaborative brings together experts, clinicians and managers to effect change at the bedside (from the ‘bottom up’). It is endorsed by Welsh Government, all Health Boards in Wales, the Royal College of Midwives (RCM), and the Royal College of Obstetricians and Gynaecologists (RCOG) in Wales. Crucially, it has found a pragmatic solution to reaching consensus for the implementation of pathways of care where the evidence base is unknown or uncertain. This was the situation when the mini-collaborative steering group considered the initial evidence-base for interventions – appendix 1. However, the methodology developed may be applicable to interventions aiming to reduce stillbirths in Wales.

This reducing stillbirth work stream was launched at a learning session of the mini-collaborative in May 2012.

- Ends -

Reference:

Warrander LK, Batra G, Bernatavicius G, Greenwood SL, Dutton P, et al. (2012) Maternal Perception of Reduced Fetal Movements Is Associated with Altered Placental Structure and Function. PLoS ONE 7(4): e34851. doi:10.1371/journal.pone.0034851

APPENDIX 1:

**1000 Lives Plus Transforming Maternity Services mini-collaborative:
Public Health Wales Review of the literature 2010.**

The following is taken from Dr Mary Webb, Public Health Practitioner, commissioned by Dr Alan Wilson, Director 1000 Lives Plus in November 2010 when looking at evidence-based care bundles for the Transforming Maternity Services mini-collaborative.

Standardising the detection and management of intrauterine growth restriction (IUGR) and the response to reduced fetal movements.

Reduced fetal movements

There is no evidence that any absolute definition of reduced fetal movements is of greater value than maternal subjective perception of reduced fetal movements in the detection of intrauterine fetal death or fetal compromise (2007 Cochrane review - 4 trials, 71,370 women).

There are many guidelines for the management of decreased fetal movements but as yet none have complete international acceptance. The NICE antenatal care guideline states that routine formal fetal-movement counting should not be offered¹. For production of the NICE guidance one RCT was found that assessed the ability of the 'count to ten' method to reduce the prevalence of antenatal fetal death. The cluster RCT randomised 68,000 women to either routine formal fetal-movement counting or to standard care. It found that there was no decrease in perinatal mortality in the test group and this policy would have to be used by about 1,250 women to prevent one unexplained death. One paper has examined the apparent divided opinion on the NICE recommendation for abandoning routine monitoring of fetal movements. The question faced by professionals in antenatal care is when to accept that fetal movements have been reduced for long enough to warrant intervention. The author reviewed a wider category of evidence than would have been included for the NICE recommendation. He concluded that the evidence supported the recommendation for abandonment of routine monitoring of fetal movements, but that if pregnant women have noticed a decrease in fetal movements for more than 12 hours then further assessment in hospital is indicated².

St Thomas's Hospital research group is also looking at whether fetal movement is a useful measure of baby health. The group is currently recruiting 300 women who report reduced fetal movements to join a study that will test this theory. The women are assessed clinically, then a blood sample is taken and an ultrasound scan performed to measure fetal growth, the volume of liquor around the baby and blood flow through the umbilical cord. This will allow the evaluation of whether fetal movement monitoring combined with any of these investigations could decrease stillbirths. The group has also developed guidelines on fetal movements. The group's research has shown that reduced fetal movement is a very reliable

¹ National Institute for Health and Clinical Excellence. Antenatal Care: routine care for the healthy pregnant woman. CG 62; NICE 2008.

² Hill-Smith, I. Professional and patient perspectives of NICE guidelines to abandon maternal monitoring of fetal movements. Br J Gen Pract. 2004; 54: 858-86. (Evidence Level 3/4)

predictor of pregnancy complications and that previous practice in this area was chaotic and non-evidence-based³.

Intrauterine growth restriction

A major focus of prenatal care is to determine whether a fetus is at risk for growth restriction and to identify the growth restricted fetus. Fetal growth is important because there is an inverse relationship between the fetal/neonatal weight percentile and adverse perinatal outcome, with the greatest risk at weights below the third percentile for gestational age. Intrauterine growth restriction (IUGR) / fetal growth restriction (FGR) is a condition where a baby's growth slows or ceases when it is in the uterus. It is part of a wider group under the term small for gestational age (SGA) fetuses which includes fetuses that have failed to achieve their growth potential and fetuses that are constitutionally small⁴.

INVESTIGATIONS

Numerous approaches to differentiate the fetus or infant with growth restriction from the small, but otherwise healthy, baby have been proposed. Clinical assessment is a reasonable screening tool for FGR in low risk pregnancies, as there is no high quality evidence that alternative approaches, such as routine ultrasound examination, improve outcome over clinical assessment alone.

Abdominal circumference

Most studies report that reduced abdominal circumference (AC) is the most sensitive single morphometric indicator of FGR. The AC measurement is the best single measurement to assess fetal growth because where growth is restricted, the liver is usually affected⁵.

Abdominal palpation

Clinical assessment of fetal size by abdominal palpation does not perform well as a test for detecting FGR with sensitivities ranging from 30% to 50%. Physical examination of the abdomen by inspection and palpation detects as little as 30% SGA fetuses. Therefore, if SGA is suspected, it is necessary to supplement abdominal palpation with ultrasound. Correct assessment of gestational age is essential and an ultrasound examination in the first trimester should be routine⁴.

Ultrasound diagnosis

Clinical assessment alone is not adequate in pregnancies at high risk for FGR, given the low sensitivity. A variety of sonographic parameters has been used to screen for and diagnose FGR. A major limitation in interpreting the predictive value of ultrasound for diagnosing FGR and comparing predictive values derived from different studies is that these values depend upon the prevalence of FGR in the population studied. Thus, ultrasound results need to be interpreted in terms of pretest risk of FGR and take into account whether the subject population is at low, moderate, or high risk of fetal growth abnormality.

The use of Doppler ultrasonography to measure umbilical artery waveforms should be considered a part of fetal evaluation once IUGR is suspected or diagnosed. Modern techniques give very accurate information. One expert review indicates that the ultrasound criteria for IUGR include:

- An elevated ratio of femoral length to abdominal circumference
- An elevated ratio of head circumference (HC) to AC.
- Unexplained oligohydramnios

Measurement of symphysis-fundal distance

Measurement of the distance between the upper edge of the pubic symphysis and the top of the uterine fundus using a tape measure is a simple, inexpensive, and widespread procedure performed during

³ St Thomas's Hospital. Pregnancy research. Available at: <http://www.tommys.org>. [Accessed 20th November 2010].

⁴ Patient UK. Intrauterine growth restriction. Patient UK 2010. Available at: <http://www.patient.co.uk/doctor/Intrauterine-Growth-Retardation.htm>. [Accessed 20th November 2010].

⁵ Divon MY, Ferber A. Diagnosis of fetal growth restriction. UpToDate 2010: 1-25. (Evidence Level 2-)

antenatal care to detect fetuses that are growing poorly. The accuracy of fundal height measurements for screening for and diagnosis of FGR is controversial; a systematic review concluded there was not enough evidence to evaluate the use of this technique during antenatal care. Observational studies using symphysis-fundal height measurements have reported a wide range of sensitivities: 28% to 86% of small fetuses were detected. The NICE antenatal care guideline suggests that further research is needed to establish the diagnostic value and effectiveness of customised fetal growth charts to plot small for dates (SFD), particularly in relation to those pregnancies that appear small for gestational age⁶.

MANAGEMENT

One review concluded that the optimal method of monitoring the fetus with suspected FGR has not been established. Periodic assessment, once or twice weekly from the age of viability, using the biophysical profile (BPP) and Doppler velocimetry is acceptable. The purpose of antenatal monitoring is to try to identify those fetuses that are at highest risk of in utero demise and neonatal morbidity, and thus may benefit from intervention by preterm delivery⁵. Ultrasound evaluation of fetal growth, fetal behaviour, amniotic fluid volume, and impedance to blood flow in fetal arterial and venous vessels, form the cornerstone of evaluation of the fetal condition and decision making. Serial examinations should be performed with the frequency based upon the severity of findings and whether the examinations are being done to monitor fetal well-being (one to seven times per week) or fetal growth (every three to four weeks).

Medical interventions

There was a paucity of evidence from randomised trials that any specific antenatal treatment for the growth restricted fetus is beneficial. Numerous approaches have been used, including nutritional supplementation, plasma volume expansion, low-dose aspirin, heparin, bed rest, maternal oxygen therapy, and beta-mimetics/calcium channel blockers to improve blood flow to the placenta. None have consistently been shown to be of value⁵.

Timing of delivery

The growth restricted fetus should be delivered if the risk of fetal death, as determined by antepartum monitoring tests, exceeds the risk of neonatal death. The difficulty in making this assessment was illustrated by the Growth Restriction Intervention Trial (GRIT), which randomly assigned pregnant women between 24 and 36 weeks to immediate (n = 296) or delayed (n = 291) delivery if their obstetrician was uncertain about when to intervene.⁷ Ninety percent of the pregnancies were complicated by clinical evidence of growth restriction and 40% had absent or reversed end diastolic umbilical artery flow. In the delayed delivery group, delivery occurred when the obstetrician was no longer uncertain about intervening (median delay 4.9 days). Deaths prior to hospital discharge were similar in both groups (29 deaths with immediate delivery and 27 deaths with delayed delivery). The immediate delivery group had fewer stillbirths (2 versus 9), but more neonatal and infant deaths (27 versus 18). Follow-up data at two years of age showed that the proportion of children with death or severe disability was similar for both groups (19% of immediate and 16% of delayed births)⁸. The small excess risk of mortality/severe disability in the immediate delivery group was primarily related to children randomised before 31 weeks of gestation. For this reason, the authors recommended delayed delivery in very preterm gestations if there was uncertainty about the need for intervention.

⁶ National Institute for Health and Clinical Excellence. Antenatal Care: routine care for the healthy pregnant woman. CG 62; NICE 2008.

⁷ The GRIT Study Group. When do obstetricians recommend delivery for a high-risk preterm growth-retarded fetus? Growth Restriction Intervention Trial. *Eur J Obstet Gynecol* 1996; 67:121. (Evidence Level 4)

⁸ Thornton JG, Hornbuckle J, Vail et al. Infant wellbeing at 2 years of age in the Growth Restriction Intervention Trial (GRIT): multicentred randomised controlled trial. *Lancet* 2004; 364: 513. (Evidence Level 1-)

The NICE guideline for labour gives the following evidence statements⁹ :-

- For FGR identified between 24 and 36 weeks of gestation, there is insufficient evidence to determine whether immediate or delayed birth is beneficial. [Evidence Level 1+]
- For FGR at term, one small RCT reported that induction of labour (with PGE2 and amniotomy/intravenous oxytocin) and expectant management achieved similar maternal and fetal outcomes. [Evidence Level 1+]
- There is therefore little evidence of benefit for induction of labour in the presence of severe FGR. The guideline development group considered that labour in the presence of FGR may result in perinatal loss and that, in such cases, induction of labour should thus be avoided.

PREVENTION

In subsequent pregnancies, prevention methods should be aimed at encouraging smoking cessation, reduction of alcohol intake and a balanced energy/protein supplementation in women with significant nutritional deficiencies. Avoiding a short inter-pregnancy interval may also be beneficial. Although some randomised trials reported low-dose aspirin prophylaxis during pregnancy reduced the risk of recurrent FGR in women at high-risk (e.g. FGR in a previous pregnancy) larger randomised trials did not confirm significant risk reduction⁵.

Aspirin may however be effective when FGR is related to pre-eclampsia. In a systematic review of 36 randomised trials including 23,638 women at high risk of developing pre-eclampsia, use of anti-platelet agents compared to placebo was associated with a 17% reduction in the risk of pre-eclampsia and a 10% reduction in the risk of SGA births (RR 0.90, 95% CI 0.83-0.98). Further study is urgently required¹⁰.

CONCLUSIONS – Option 3

National evidence based guidelines do not recommend the use of routine monitoring of fetal movements. Expert reviews were used to inform the detection and management of intrauterine growth restriction (IUGR). Whilst some interventions were supported by good quality evidence there was inconsistency in the evidence for some interventions. These issues need to be addressed by large multicentre studies employing consistent definitions, randomly assigned interventions, and with long-term follow-up.

The evidence presented in this review, some of which is international, for IUGR, requires expert analysis by healthcare staff involved in maternity care in Wales to verify its appropriateness and applicability.

Summary of references from the main review text:

- Divon MY, Ferber A. Diagnosis of fetal growth restriction. UpToDate 2010: 1-25. (Evidence Level 2-)
- Resnik R. Fetal growth restriction: evaluation and management. UpToDate 2009: 1-25. (Evidence Level 2-)
- Mangesi L, Hofmeyr GJ. Fetal movement counting for assessment of fetal wellbeing. Cochrane Database of Systematic Reviews 2007, Issue 1. Art. No.: CD004909. DOI: 10.1002/14651858.CD004909.pub2 (Evidence Level 1++)

⁹ National Institute for Health and Clinical Excellence. Intrapartum care: management and delivery of care to women in labour. CG55; NICE 2007.

¹⁰ Duley L, Henderson-Smart DJ, Meher S et al. Antiplatelet agents for preventing pre-eclampsia and its complications. Cochrane Database of Systematic Reviews 2007, Issue 2. Art. No.: CD004659. DOI: 10.1002/14651858.CD004659.pub2. (Evidence Level 1++)

- National Institute for Health and Clinical Excellence. Antenatal Care: routine care for the healthy pregnant woman. CG 62; NICE 2008.
- Hill-Smith, I. Professional and patient perspectives of NICE guidelines to abandon maternal monitoring of fetal movements. Br J Gen Pract. 2004; 54: 858-86. (Evidence Level 3/4)
- St Thomas's Hospital. Pregnancy research. Available at: <http://www.tommys.org>. [Accessed 20th November 2010].
- Patient UK. Intrauterine growth restriction. Patient UK 2010. Available at: <http://www.patient.co.uk/doctor/Intrauterine-Growth-Retardation.htm>. [Accessed 20th November 2010].