Use of the fetal movement chart

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SUMMARY. Over a five-year period in general practice, 44 antenatal patients with the risk of placental insufficiency charted the movements of their fetuses. Two stillbirths were possibly prevented and four patients had a false positive result—that is, an abnormal recording without fetal compromise. The method of charting fetal movements is discussed and results are presented in support of the chart's use.

Introduction

THE development of the Cardiff 'Count-to-ten' chart[1] gave practical application to the concept of a mother-to-be recording her own fetus's movements as a means of monitoring fetal wellbeing. The chart allowed a woman with an active fetus to count for only a few hours a day, whereas she would have to count for a longer time if fetal movements were few. The authors[1] demonstrated that the daily fetal movement count (DFMC) was at least as reliable as was a measurement of 24-hour total excretion of urinary oestrogen and had the advantage of being non-invasive, independent of an exact knowledge of dates for interpretation and independent of a laboratory. The authors[1] also confirmed the earlier finding[2] of continuing fetal heartbeat for 12 to 48 hours after fetal movements had ceased, and they advised external cardiotocography (CTG) for patients with a 12-hour count of less than 10 movements, to distinguish between fetal distress and the fetus being asleep or inactive by day.

Because the method was applicable to antenatal care in general practice and seemed likely to be useful, we started using charts in 1977. We are now reporting our findings, since our results are at variance with the criticisms[3] and reservations[4] about the method.

Method

The patients were cared for in a Plymouth general practice, and antenatal care was shared for those patients who were booked for delivery in the Freedom Fields obstetric unit.

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Using the Cardiff Count-to-ten chart, a daily fetal movement count (DFMC) was initiated for patients who were considered to be at risk; if the indication of risk was apparent sufficiently early, a fully planned chart, starting at about 34 weeks, could be undertaken. Where indications of risk developed later in pregnancy, the time span of the chart was often shorter, sometimes covering only the last few days of pregnancy. Patients were taught how to count fetal movements, to regard a flurry of activity as one movement, and they were told to contact us at the practice if the count was less than 10.

Accuracy of estimated date of delivery (EDD) was assessed clinically by successive comparisons of the height of the uterine fundus, and most of the patients had an ultrasonic scan. Measurement of 24-hour total excretion of urinary oestrogen (or, more recently, the total oestrogen/creatinine ratio) and antenatal CTG tracings were undertaken by the obstetric unit when indicated.

Our initiation of DFMCs did not represent a joint study with the obstetric unit. Nevertheless, the unit co-operated immediately and totally whenever the recording on a chart indicated that fetal wellbeing was compromised.

Results

Forty-four antenatal patients charted a daily fetal movement count (DFMC) during the period May 1977 to October 1982—counts being made by four patients in 1977, five in 1978, six in 1979, nine in 1980, seven in 1981 and 13 in 1982. The 44 patients represented about a quarter of those receiving antenatal care, and 41 of the 44 gave birth in the obstetric unit.

The indications for initiating a DFMC are listed in Table 1. Over and above these indications, 13 of the 44 patients had a later further reason which of itself would have justified a DFMC: two patients developed pre-eclampsia, two became small-for-dates, one had a scan diagnosis of intrauterine growth retardation (IUGR), five went past the expected date of delivery, one had an antepartum haemorrhage (APH), one had poor weight gain, and in one patient few fetal movements were felt.

Expected dates of delivery were correct for 36 patients when judged clinically by successive comparisons with height of uterine fundus, and 30 of these patients had confirmatory scans. A further two patients were correctly dated for delivery by three successive scans each, but were shown to be a month earlier in their pregnancy than originally thought. The remaining six patients had uncertain dates.

All 44 patients were safely delivered, with birth weights varying between 2,315 g and 4,592 g. The

relationship of the DFMC to the outcome is shown in Table 2.

Normal charts

Twenty-eight patients with fetal wellbeing had daily counts which either remained at the same level until delivery (Figure 1) or showed the reduction in fetal activity often seen in the last two or three weeks of pregnancy. Nineteen of these 28 patients had either oestrogen estimations and/or CTG in the later stages of pregnancy, but the tests were performed independently of the charts for reasons such as pre-eclampsia and suspected IUGR, and all results were normal. One of these patients, with a scan diagnosis of IUGR at 37 weeks, was thought initially to represent a false negative result. However, daily CTGs and two consecutive oestrogen estimations before spontaneous labour at 37.5 weeks excluded both placental insufficiency and fetal distress, and the birth weight of 2,720 g was acceptable for her period of gestation. The two patients with fetal distress also apparently represented a false negative result, but one patient was a 28-year-old primigravida who had a prolonged labour with type I dips, and the other patient had a face-to-pubis delivery with meconium-stained liquor. Both these patients had spontaneous deliveries at term, and in both cases oestrogen estimations in late pregnancy had been normal.

Charts with falling counts

In six cases the DFMC charts suggested that a continuation of pregnancy might lead to fetal distress (Figure 2). All these patients were at or near term, and four went into spontaneous labour at this stage but a fifth was admitted to hospital and had daily CTGs (normal) until spontaneous delivery occurred four days later; one of the first four did have fetal distress during labour (type II dips), but she had had an antepartum haemorrhage and the presence of a retroplacental clot was noted later. The sixth patient had been admitted with pre-eclampsia at 38 weeks, and labour was induced at 39 weeks, serial CTGs being normal. This patient had continued to count fetal movements while in hospital and the chart was a contributory factor in the decision to induce labour.

Charts with below-the-line counts

Three patients had evidence of fetal compromise. In one patient who had previously had decreasing birth weight the DFMC chart (Figure 3) was the sole factor responsible for induction 16 days before the expected date of delivery. Her dates were in agreement with both clinical examination and ultrasonic scan at 19 weeks. The chart showed the fall in fetal activity which is often seen near term, but the fall occurred about three weeks earlier than expected. Cardiotocography on admission showed decelerations; she had type I dips during labour and at delivery the cord was once round the neck of the baby (birth weight 2,900 g, Apgar 9 at 1 minute). The counts under 10 were prolonged because she failed to inform us about them and they were only noticed when she next attended the weekly antenatal clinic. For the second

Table 1. Indications for initiating a daily fetal movement count (DFMC).

Reasons	Number of patients
Reason known early in pregnancy (12 patients)	
Fetus survived threatened abortion	6
Fetal distress in previous pregnancy resulted in Caesarian section	2
Previous stillbirth	1
Requested monitoring (relative had a stillbirth)*	1
Aged 39 years	1
Previous decreasing birth weights (3,062 g, 2,551 g, 2,409 g)	1
Date discrepancy and suspected IUGR (15 patients)	
Date uncertainty	5
Small for dates recognizable clinically between 29 and 36 weeks**	10
Reasons which developed later in pregnancy (17 patients)	
Failure to gain weight over previous 3–5 weeks, recognizable between 34 and 38 weeks	5
Weight loss at 38 weeks	1
Pre-eclampsia recognizable between 35 and 38 weeks	4
Maternal awareness of reduced fetal movement at 38 and 39 weeks respectively	2
APH at 33 and 36 weeks respectively	2
Raised blood pressure at 34 weeks (previous pre-eclampsia)	1
Past the expected date of delivery	1
For reassurance of patient at 39 weeks	1

IUGR = intrauterine growth retardation, APH = antepartum haemorrhage.
*This patient had also had previous low and decreasing birth weights (2,448 g, 2,086 g).
**One of these patients had date uncertainty.

Table 2. Relationship of the DFMC to outcome of pregnancy.

Charting result	Number of patients
Counts well above the line (30 patients)	
Fetal wellbeing	28
Fetal distress	2
Counts falling towards or near the line (six patients)	
Fetal wellbeing	5
Fetal distress	1
Counts below the line (eight patients)	
Fetal distress	3
Coincidental onset of labour	1
False positive result	4

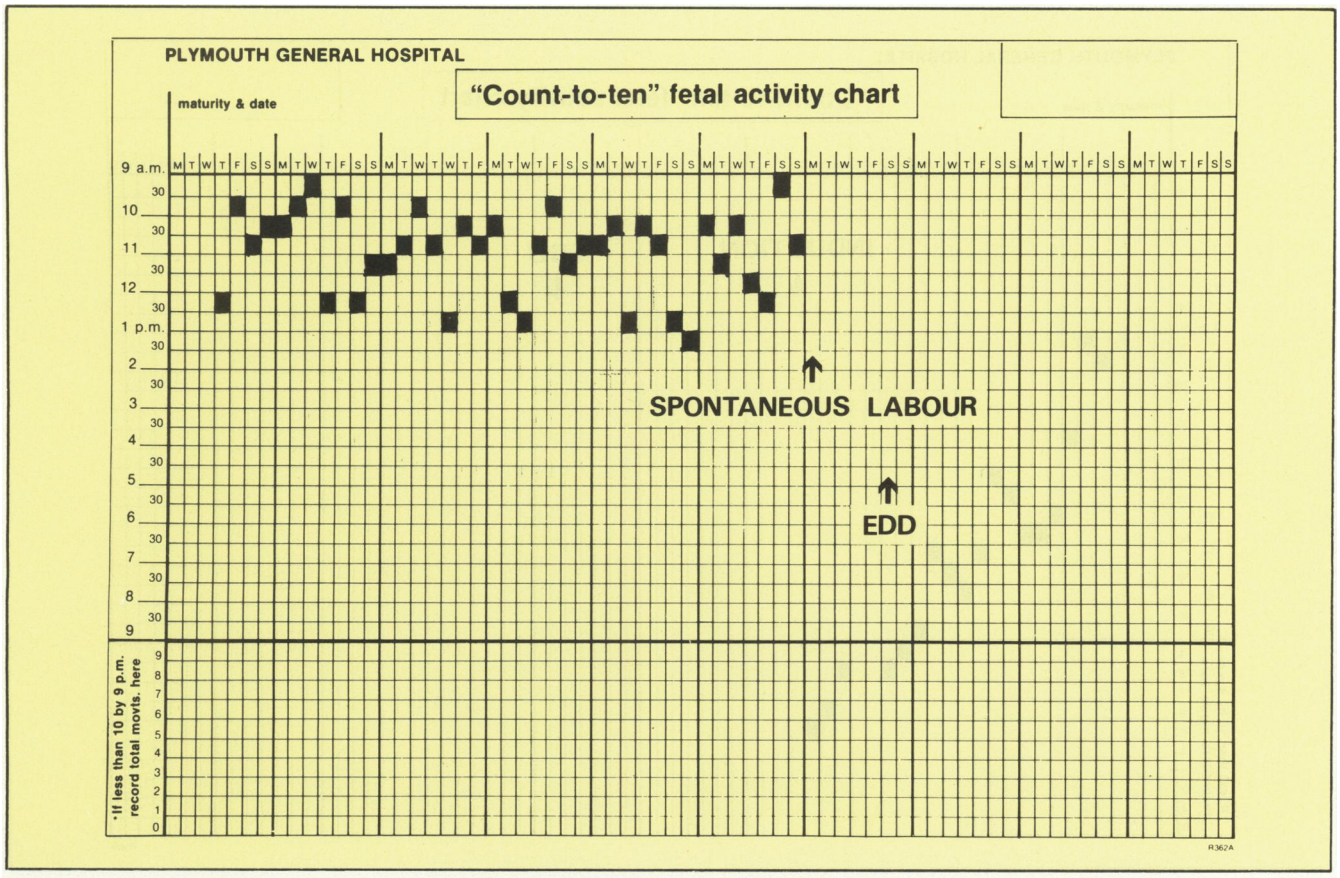
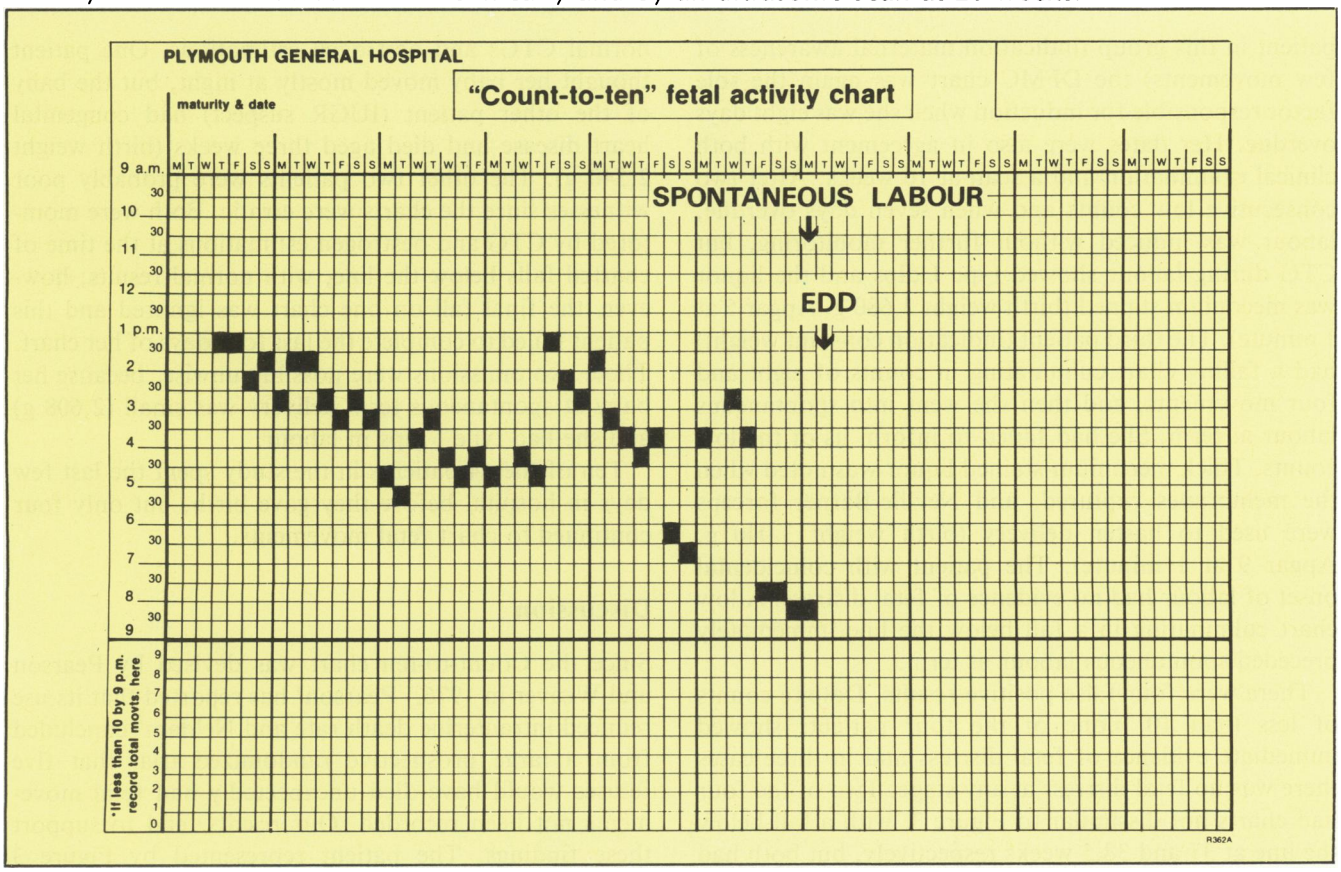


Figure 1. *Normal chart, with counts well above the line. EDD (estimated date of delivery) for this patient was confirmed clinically and by an ultrasonic scan at 15 weeks.*

Figure 2. *Chart with counts falling towards or near the line. This patient did not record counts on two of the days. Her EDD was confirmed clinically and by an ultrasonic scan at 20 weeks.*



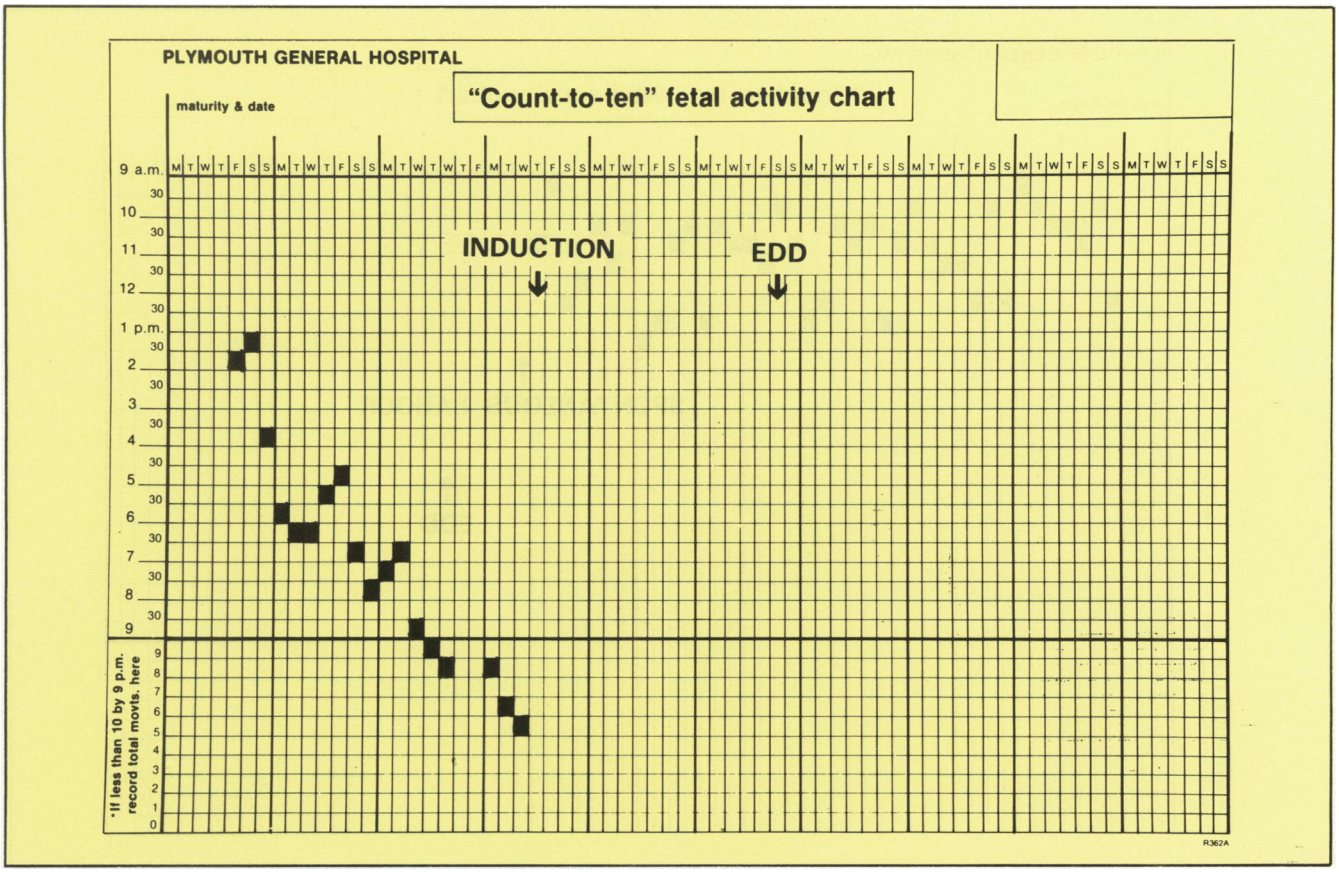


Figure 3. *Chart with counts falling earlier than expected and continuing below the line. The patient missed counting on two days. Her EDD was confirmed clinically and by an ultrasonic scan at 19 weeks.*

patient in this group (indication maternal awareness of few movements) the DFMC chart was again the sole factor responsible for induction when she was eight days overdue. Her dates were also in agreement with both clinical examination and a scan at 16 weeks. After two consecutive low counts and when seven days overdue, labour was induced without further monitoring, but CTG during labour showed type I dips and the liquor was meconium stained (birth weight 3,680 g, Apgar 5 at 1 minute). The third patient (indication constant weight) had a falling chart culminating in counts of eight and four movements, and then she went into spontaneous labour at term. She had failed to inform us of the low counts. Thick meconium-stained liquor was noted when the membranes ruptured, and Neville-Barnes forceps were used to hasten delivery (birth weight 3,040 g, Apgar 9 at 1 minute). The patient with coincidental onset of labour had no evidence of fetal distress. A low chart culminating in a fall below the line immediately preceded spontaneous labour at term.

There were four false positive results. Despite counts of less than 10, none of the four patients showed immediate evidence of fetal distress and in three cases there was no fetal distress at any stage. Two of the four had charts not dissimilar to Figure 3, with a fall below the line at 37 and 38.5 weeks respectively, but both had normal CTGs and oestrogen estimations. One patient thought her baby moved mostly at night, but the baby of the other patient (IUGR suspect) had congenital heart disease and died aged three weeks (birth weight 2,540 g). The other two patients were probably poor witnesses since the charts were erratic. Both were monitored by CTG and oestrogen estimations at the time of charted falls below the line, with normal results; however, the final fall on one chart was ignored and this patient failed to complete the last four days of her chart. These two omissions were possibly unwise, because her baby at spontaneous term delivery was small (2,608 g) and she had type I dips in labour.

Ten of the 44 patients in the study spent the last few days in hospital before they gave birth, but only four continued to chart fetal movements.

Discussion

Since the Count-to-ten chart was devised by Pearson and Weaver in 1976,[1] Pearson[5] has reported that its use reduced intrauterine death rate and Neldam[6] concluded from a large prospective randomized trial that five fetuses would have died unexpectedly had fetal movements not been recorded. Our results tend to support these findings. The patient represented by Figure 3

would almost certainly have had a stillbirth had the DFMC not been monitored, and the same possibility applied to another patient who was overdue.

The four false positive results represented 50 per cent of those patients who had DFMC counts of less than 10. Although this incidence is proportionately high, the absolute number is small, and the inconvenience of hospital monitoring is offset by the gain achieved for those patients who are really at risk. We therefore disagree with the implication[4] that the false positive rate may be too high to justify use of the DFMC.

Analysis of our results revealed certain shortcomings. The need for continuing with DFMC after admission to hospital is clearly precluded by a daily CTG, which is an acceptable method of antenatal monitoring.[7] Nevertheless, patients who are admitted near term are sometimes sent home again before the onset of labour, and this is when absence of the DFMC might be disadvantageous. A second problem, which was also noted by Neldam,[8] concerns the motivation of the mother to inform. Two of our patients failed to inform us of counts below 10, and both had fetal distress. Awareness of the problem should aid in its avoidance: for example, we would not now allow a patient to go as long as a week without being checked if the count was falling and was near the line. The final precaution is to avoid being lulled into a sense of false security by false positives. Repeated admissions to hospital for monitoring are inconvenient for all concerned, but even if earlier counts of less than 10 do not represent fetal distress, a later fall may be significant.

Clearly it makes sense to monitor the patient at risk, but a routine DFMC check on all patients would be necessary in order to prevent a higher proportion of unexpected stillbirths. The drawback to a routine DFMC is that it might be done less well than the one undertaken for a reason, but we feel that this is unlikely and we are now initiating a DFMC check on all antenatal patients.

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Health care

There is a need for indicators of the outcome of health-care services against which the use of resources can be evaluated. From a previously published series of outcome indicators, which included diseases for which mortality is largely avoidable given appropriate medical intervention, causes were selected which were regarded as most amenable to medical intervention (excluding conditions whose control depends mainly on prevention) and for which there were sufficient numbers of deaths to allow an analysis of the variation in mortality rates among the 98 area health authorities of England and Wales. Considerable variation between AHAs was found in mortality from most of these diseases, and this variation remained even after adjustment for social factors.

Source: Charlton JRH, Hartley RM, Silver R, Holland WW. Geographical variation in mortality from conditions amenable to medical intervention in England and Wales. *Lancet* 1983; **1:** 691.

Cardiovascular disease and vasectomy

Two epidemiological studies used routine abstracts of medical records to test the hypothesis that vasectomy may predispose men to cardiovascular disease. In a case-control study 1,512 men who were under 55 years of age and had a history of myocardial infarction, stroke, or hypertension were matched with 3,024 controls with other conditions; 2.4 per cent of the cases and 2.7 per cent of the controls were identified as having undergone vasectomy. In a cohort study, data covering a mean period of $6\frac{1}{2}$ years after surgery were available on 1,764 men who had had a vasectomy and on three comparison cohorts of men who had had other minor surgical procedures. There was no consistent evidence from these studies to support the hypothesis that vasectomy predisposes young men to cardiovascular disease in the short-term.

Source: Goldacre MJ, Holford TR, Vessey MP. Cardiovascular disease and vasectomy. Findings from two epidemiologic studies. *New Engl J Med* 1983; **308:** 805-808.