A re-examination of antenatal care

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Eighty years have passed since Ballantyne put forward his ideas which led to a system providing antenatal care to some 98% of pregnant women in this country. A large amount of manpower and money is involved by the professionals – the doctors, nurses and administration teams; many of the patients themselves are working women giving up time and money to attend clinics. Perhaps a re-emphasis of ideas could save effort and improve the efficiency of care; to the traditional laying-on-of-hands have been added many investigations, some of which might replace clinical estimates, while others could improve diagnosis and prediction. Unfortunately, few of the tests have been evaluated methodically and their use in many places owes more to individual enthusiasm or to a patchy local availability of money than to population needs.

Three factors have stood in the way of auditing clinical practice. Medicine is a traditional subject, based mostly upon accumulated experience; it is still an art, but over the last few decades there has been an attempt to justify clinical practice by scientific evaluation. Unfortunately, while some accept these circumstances when science validates the art, they are unhappy when measurement does not exonerate practice; then they tend to dismiss the assessment and continue with their current clinical practice instead of re-examining the basis of this practice. Further, some aspects of health care are only capable of proper assessment by methods involving complex data processing. Most doctors are literate but few are numerate, and statistically-based material is sometimes disparaged in medicine. Lastly, much in clinical practice – particularly that of a socioeconomic and psychological nature – has no valid measure of outcome, and so an acceptable measurement of these factors cannot be made. Despite these comments, it is still worth trying to re-examine current ideas and not to accept blindly that every medical procedure is bound to be helpful. Everything should be assessed periodically to see if it is effective and being used efficiently. Such scrutiny may improve both care of the individual patient and the more general use of facilities. In many ways antenatal care is a good subject for such an assessment.

The purpose of antenatal care

Antenatal care should be designed to maintain and improve the health of the mother and the fetus, so that both are brought to labour – the highest risk time of pregnancy – in a good state of health. Such care should detect variations from normal in either of the patients and should allow a prognosis to be made with sufficient accuracy that it can be decided to avoid the extremes of risk in labour, bypassing them by elective caesarean section. Prediction of smaller degrees of risk can then be associated with various levels of intensive care in labour.

To achieve this, antenatal surveillance aims to: (1) diagnose and treat abnormalities soon after presenting symptoms are reported; (2) detect asymptomatic diseases, including those with early signs, which present before symptoms are noticed. In the first of these aims, the

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antenatal clinic is like any other outpatient department, dealing with problems after the patient draws attention to them by reporting symptoms. In the second, it is a multiphasic screening system. As such, it should follow the principles of screening for presymptomatic disease – the tests must be readily available, of proven efficiency and definitive treatment should be available (Chamberlain 1975).

No one concerned with antenatal care should have to be reminded that having a baby is the major emotional event in many women's lives. Both the formal and the unconscious preparations for childbirth are developed during the months of pregnancy and the clinical team must play their part in this. This is a good example of one of the zones, referred to above, which are difficult to evaluate; attempts have been made to measure psychological factors (Huttel *et al.* 1972), the benefits of psychoprophylaxis (Shapiro & Schmitt 1973) and attitudinal aspects to antenatal education (Chamberlain & Chave 1977), but none have the precision of outcome which the obstetrician expects from tests of somatic function. Many doctors, therefore, leave antenatal education to others who, although enthusiastic and willing, may lack the current knowledge needed to evaluate contemporary obstetric practice. No more will be said of this aspect of antenatal care in this review, not because it is unimportant but because it is largely unexplored.

Measuring the effects of antenatal care

Traditionally, fetal death rates are used as a measure of the effectiveness of maternity services. It can be shown that patients who attend for antenatal care have generally a lower perinatal death rate (Butler & Bonham 1963) compared with patients who receive fewer antenatal visits (Table 1). A patient who delivers prematurely will have fewer visits, the shortfall being related to gestation, since most clinic visits are in the last few weeks of pregnancy; further, those with a very large number of visits would have an increased perinatal mortality rate because of the risks of the condition which necessitated those increased number of visits. On the lower side of the distribution spread, the perinatal mortality is related more to the patient's socioeconomic background, her parity and her attitude to health care.

Table 1. The distribution of the population (n = 16994), the perinatal deaths and the mortality ratio by numbers of antenatal visits (Butler & Bonham 1963)

Numbers of antenatal visits	% of population	% of deaths	Mortality ratio
0	0.6	3.2	502
1	0.4	1.9	409
2	0.8	3.2	378
3 or 4	3.4	10.6	315
5–9	28.6	36.1	126
10–14	40.2	26.9	67
15–19	16.5	9.6	58
20–24	5.3	3.1	58
25–29	1.6	1.2	78
30 or more	1.0	1.2	122
No information	1.6	3.0	199

Another method of assessing antenatal care is to examine the use of certain tests which in current obstetric opinion would be considered to be essential to good care. In the British Births 1970 survey, Chamberlain *et al.* (1978) showed that the haemoglobin estimation was reported as not known in 3.8% and the Rh factor was not known in only 0.8% of women at the time of delivery. By comparison, in the 1958 Perinatal Mortality Survey (Butler & Bonham 1963), a third of the population had no haemoglobin estimation performed and 5.5% either did not have the rhesus group tested, or there was no record of this test.

The practice of antenatal care

Patterns of care vary from one centre to another. Over 70% of women in the United Kingdom attend a hospital clinic at some time during their pregnancy; in some 38%, care is shared between hospital and general practitioner. While having the family doctor involved in part of the antenatal preparation has the attraction of familiarity in some cases, and perhaps a shorter journey and wait in others, it is not considered ideal by all. In such cases the delivery team often do not have access to data about antenatal incidents. In the 1970 survey, of those cases in which the general practitioner was involved in care, there were 83.3% for whom – at the time of labour – either no records were available or no communication had been made (Chamberlain *et al.* 1978).

The first booking visit is time consuming, but it is the most revealing in detecting those problems that can affect a pregnancy and its outcome. More is gained at this visit than at any other.

The first visit

Notes are taken of past events, a general examination of the current state is made and certain investigations are performed.

History

Personal history: The patient will know if she has had many of the diseases that affect pregnancy, e.g. diabetes, or whether she has a disease that might deteriorate, e.g. heart disease. Specific questioning will be more revealing than examination or investigations made later. Past psychological disease is likely to recur in pregnancy, but our inhibitions about this subject may account for a lack of historical data. Past abdominal operations will be diagnosed from the scars seen but vaginal operations cannot be so easily recognized; they can affect the outcome of pregnancy, e.g. previous terminations of pregnancy.

Family history: A first-degree family history of diabetes has a significant correlation with a raised stillbirth rate and increased fetal size. Multiple pregnancies in the family are always asked about, but the most significant relationship is that of dizygous twins on the maternal side. Dizygosity on the husband's side will have no effect and monozygosity is much less common. Hypertension in older members of the family is usually irrelevant to the present pregnancy. Miall (1971) demonstrated that familial factors are only associated with a third of the variants of a systolic blood pressure and a fifth of those of a diastolic blood pressure.

Obstetrical history: Women who have had a previous stillbirth or neonatal death have a higher risk of fetal problems in the current pregnancy; however, so also have those who have had a premature baby, an abortion or an ectopic pregnancy. Morbidity risks are also attached to a history of toxaemia, antepartum haemorrhage or a caesarean section. There is undoubtedly a pattern of reproductive behaviour and so infant size and gestation on previous occasions should be known; these are well remembered by the mother.

A previous child may have been born with a congenital abnormality. While expert genetic counselling can discuss degrees of risk of recurrences, especially of the chromosomally-flagged abnormalities, the patient in early pregnancy will want to know the risks of recurrence of the other 2500 congenital abnormalities which have been described. Table 2 gives some indication of the approximate rates of recurrence.

Events of this pregnancy: The dating of the last normal menstrual period and the patient's previous menstrual cycle are very important for judging the length of gestation. Fifteen percent of women are uncertain of their dates, 13% have an irregular menstrual cycle and some 20% of women may have been on oral contraceptives recently; there is some overlap between these three groups. An attempt must be made to record the first day of the last menstruation and to ascertain the degree of precision of the calculated date, for at the other end of pregnancy this

Table 2. Recurrence rate of some categories of congenital abnormalities (after Galguard 1978)

Disorder	Recurrence rate (%)
Down's syndrome	1–2●
Anencephaly	2–5
Spina bifida	3–5
Hare lip/cleft palate	3–4
Talipes	2–6
Congenital heart disease	1–6

● depending on the age of the mother

information can be very important. However, for approximately a quarter of the patients attending antenatal clinics, such a date, calculated in the usual way, is unreliable.

Clinical examination

The patient's height and weight should be measured: the first because of its association with pelvic size, the second as a baseline reading for weight increases during pregnancy. Obesity starting in pregnancy can lead to subsequent chronic health problems. There is a loose correlation between weight gain during pregnancy and mild or moderate preeclampsia; weight loss in late pregnancy may be associated with poor fetal growth, particularly in women with hypertension.

Examination of the cardiovascular system may reveal signs of an increased hypervolaemic state. For a more accurate assessment, the patient is often referred to a cardiologist; in a recent study at this hospital only 38 of 189 patients so referred had organic heart disease. The patient's blood pressure should be checked at the first visit, both as a baseline for further readings and to detect any unsuspected hypertension. In a recent year at this hospital, 36 out of 3520 patients had an initial diastolic blood pressure reading above 90 mmHg; these patients had a subsequent perinatal mortality rate of 83 per 1000, compared with a background figure for that year of 21 per 1000 total births. A standardized technique should be used to measure blood pressure at each hospital clinic so that with many observers taking subsequent readings, variations are reduced as far as possible.

The spine and legs should be examined for deformities; a very small outlay of effort produces a high index of suspicion of abnormalities of the bony pelvis. A pelvic examination is commonly performed at this stage to assess the uterine size rather than the bony pelvic capacity. The uterus grows rapidly in early pregnancy and the obstetrician is much more likely to determine accurately alterations in size when the organ is small. A pelvic examination in the early weeks delineates the upper and lower poles of the uterus. An assessment of the bony pelvis is best left until late pregnancy when the effects of softening of pelvic ligaments have occurred. The fetal presenting part can also then be used to help assess the pelvic size.

Investigations

Blood: At the booking visit, 10 ml of venous blood is usually taken. A haemoglobin estimation is performed, giving a rough indication of the past dietary iron intake. As the woman advances through pregnancy, plasma volume does not increase as red cell volume does, and thus haemoglobin estimations made later in the pregnancy may be measuring too many things at once. Some think that a normal blood film in the presence of an adequate iron intake is the best reassurance of a normal blood state (Lilley 1970). In many centres, particularly those dealing with immigrant populations, an electrophoresis for abnormal haemoglobins is done as a matter of routine. The pick-up rate depends on the population structure.

The ABO group is checked in order to give the pathologist some indication of which group

of donors should be crossmatched against the patient should blood be required later in pregnancy. Checking the rhesus group is an important screening test: if the woman is rhesus negative, antibodies should be determined, for there is a rough correlation between their level and the severity of any rhesus effect. The Wasserman reaction is commonly checked; this is a loose screening test, for less than 10% of those who have a positive result actually have or have had syphilis. The remainder can have influenza, infective mononucleosis or some transient pyrexia.

In large centres the plasma is often checked for alphafetoprotein (AFP) to screen for fetal neural-tube defects early in pregnancy. The serum test is not precise; should a positive level (above the 98th percentile for the stage of gestation) be obtained, it is wise to check with a second blood test. If this is also raised, an amniocentesis should be recommended. Only if there is abnormal amniotic fluid AFP should termination be advised. Brock (1978) reported a series of such tests (*see* Table 3). Before tests like these are transferred to the wider population, it must be remembered that the trial described was meticulously performed by enthusiastic workers with good facilities; similar results might not be obtained under service conditions. It is crucial that an accurate gestational staging is performed and ultrasound by competent ultrasonographers will be needed for this. If this is not available, there is little point in measuring alpha-fetoprotein in the first place. Further, twins and those threatening to abort should be excluded. It is possible that a 75% reduction in the incidence of neural-tube defect of term infants could be obtained by the use of a properly set up AFP screening service.

The blood sample is also checked for Australia antigen. A high titre of antibodies will warn the obstetrician which patients could be potentially dangerous should their blood be spilt onto others; they should be delivered and nursed separately. Rubella antibodies are also checked and, if they are present, the patient who comes in contact with German measles in early pregnancy can be reassured that her antibody state will probably prevent her from getting an infection. Those women who are seronegative can be offered inoculation in the immediate puerperium when the obstetrician is certain they are not pregnant.

Table 3. Some results of a prospective maternal alphafetoprotein (AFP) screen (see *Brock 1978*)

	No. of patients	%
Samples taken (15–21 weeks)	6034	—
Raised plasma AFP (1st sample)	329	5.5
Raised plasma AFP (2nd sample)	195	3.2
Amniocentesis	125	2.1
Raised liquor AFP	19	0.3
Fetal neural tube defects	18	—

Ultrasound: Since it is important to assess gestational age in early pregnancy, some doctors are now doing an ultrasound measurement on all patients. They have an estimation made of the biparietal diameter at about sixteen weeks and thus can be given a reasonable assurance of the stage of gestation of the fetus. This can be very useful if induction is required later. Whilst the accuracy of this measurement is in little doubt in the individual case, there is no evidence yet that such a screening would benefit the general population sufficiently to justify the enormous costs that such a use of ultrasound would involve. The possibility of using such tests as part of a screening procedure brings obstetricians into conflict with those responsible for cost-benefit assessments for the total health of the population.

Chest X-ray: It used to be traditional for all pregnant women to have a chest X-ray sometime after the fourteenth week. However, with the reduction of pulmonary tuberculosis in the younger population, this is less useful as a screening test. Stanton (1968), at Queen Charlotte's

Hospital, showed that in a population of over 19 000 only 1.3 per thousand had an X-ray showing clinically unsuspected disease. Most units now reserve their radiological resources for high-risk groups – those with a personal or family history of tuberculosis or those who come from populations in which tuberculosis is still endemic.

Cervical smear: The antenatal clinic is a convenient place to take a cervical smear, for many women who would never see any doctor on other occasions come to the clinic and are examined vaginally. There are some problems for cytologists since the changes of pregnancy can mask those of hypertrophy, but the benefits of using the antenatal clinic for screening outweigh these.

Urine: The urine is checked for protein and sugar at this and each subsequent visit. Protein detection is cheap and easy; provided both an extraurinary source and urinary infective are excluded, proteinuria is highly significant indicating a glomerular leak. Similarly, glycosuria can be cheaply detected, although the correlations of this with serious alteration of carbohydrate metabolism are weaker. Approximately 2% of patients aged 20 to 39 years will have glycosuria but only 13% of these will have a serious metabolic upset (Sharp 1964).

Depending on the population tested, 2–4% of women at antenatal clinics will have asymptomatic bacilluria. There may be some doubt about the correlation of this with preeclampsia and prematurity, but there is a relationship between persistent bacilluria and structural alterations in the kidneys. It is probably wise to treat asymptomatic bacilluria with rotating chemotherapy and then check the urinary tract when pregnancy is over.

Surveillance visits

Throughout pregnancy the patient is requested to return to the antenatal clinic at intervals which become shorter as the obstetric needs increase. The clinics still perform their screening function, although this will obviously yield a smaller return than did the first visit. At each attendance a history of events since the last consultation is taken and the blood pressure and urine are checked. Usually the uterus is examined through the abdominal wall. Mostly this is not very rewarding, for conventional ideas of fundal height assume the rate of growth of the uterus to be uniform and that all patients have a standard distance from their pubis to their xyphisternum. These observations have been shown to be erroneous (Beazley & Underhill 1970) and a much more useful clinical guide of gestational staging is the total size of the fetus in the last trimester. Another useful clinical observation in the last few weeks of pregnancy is the engagement of the fetal head into the pelvis: in a Caucasian population, 95% of those in whom the head engages will deliver vaginally, since outlet disproportion is unusual in this group. Listening to the fetal heart in the clinic is of little value since no action is taken on the findings. Very rarely a congenital abnormality of the fetal heart may be diagnosed, but this is a very small pick up with a high false-positive rate. The value of the fetal heart auscultation in labour is enormous and perhaps in the antenatal clinic it helps to teach the technique and is reassuring to the mother, but little action can be taken if the fetal heart is not heard. Oedema of the ankles in later weeks is commonplace, especially in afternoon clinics in hot weather, but blood pressure measurements can indicate the development of pre-eclampsia.

In the middle months of pregnancy, less value results from the patients' visits, but they can be useful in the detection of anaemia, multiple pregnancy or early pre-eclampsia. In the last weeks, the lie, presentation and fit of the fetus in the pelvis are the principal reasons for antenatal visits. Such assessments require skills sometimes not held by those who do the actual examination, and senior staff should concentrate their time on the first visit and the last weeks of pregnancy.

Conclusion

Over the years, antenatal procedures have grown as knowledge has increased. Some are not very rewarding and should perhaps be pruned back, leaving more time for other diagnostic

tests which have a better correlation with improving the outcome. Each visit may help to improve the rapport between the patient and the team of people who are going to deliver her. This is one of the strong arguments for antenatal care being done by those who will be looking after the woman in labour, but manpower distribution and patients' time and distance from hospital may dictate other patterns of care.

Recommendations for the future might include: (1) A proper assessment of the value of many of the established and newly introduced antenatal investigations. (2) Those tests shown to be of low value or with unacceptable false-positive rates should be put to one side. (3) The tests of proven prognostic value should be more widely introduced with a policy of proper training and provision of facilities to use them universally. (4) The patient should be seen earlier in pregnancy to help her avoid potential teratogens. For some, a visit to a prepregnancy clinic may be the best way of forestalling problems. (5) There might be less examination of the normal in mid-pregnancy and more concentration of clinical skills at the two extremes of pregnancy. A wider use of antenatal biochemical and biophysical tests could be combined with such a policy possibly to give better but less expensive patient care, for correctly deployed investigations are cheaper than the labour costs of doctors and midwives. (6) A greater humanization of the whole system might allow women to feel at home in the antenatal clinic and so accept the well-meaning scientific efforts made to increase the safety of mother and child.

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