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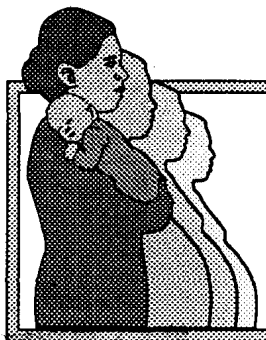

MATERNAL HEALTH AND SAFE MOTHERHOOD PROGRAMME

THE PARTOGRAPH:

THE APPLICATION OF THE WHO PARTOGRAPH IN THE MANAGEMENT OF LABOUR

Report of a WHO multicentre study
1990-1991

World Health Organization
Division of Family Health
Geneva

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INTRODUCTION

Despite extensive research particularly in the 1970s, the active management of labour remains a topic of controversy.[1] Practices vary enormously worldwide and within individual health systems. This disparity exists against a background of depressingly high maternal mortality rates throughout most of the developing world[2] and a rising caesarean section rate in the developed world, but with little evidence that fetal outcome is the better for it.[3,4]

Half a million women worldwide die annually as a result of pregnancy and childbirth.[5] Most of these deaths are theoretically preventable and many die as a result of inappropriately timed referral to an obstetric unit and poor management within obstetric units. For those who survive, the sequelae of difficult labour (anaemia, infertility through puerperal infection, and vesico-vaginal fistulae) may be devastating. Fetal outcome in such cases is also poor.

Although maternal deaths in developed countries are relatively rare, those that do occur are frequently associated with delivery by caesarean section.[6] This, together with rising public opinion against intervention in obstetric care, makes the rising caesarean section rate a matter of concern and increases the need for a clearer definition of the correct management of labour.The pattern of progressive cervical dilatation in normal labour was identified by Friedmann nearly 40 years ago.[7] The application of this knowledge to the management of labour with the aid of a partograph to graphically record the progress of labour was developed by Philpott in Zimbabwe,[8,9] Studd in the United Kingdom[10] and O'Driscoll in Ireland[11] who reported improved results in the outcome of labour. Reports of the use of the partograph in many other countries have also been published.[12,13,14,15,16,17,18,19,20,21] It has become clear that the pattern of cervical dilatation in normal labour in different racial and ethnic groups is so similar[22] that it should be possible to produce a partograph suitable for worldwide application.

Despite the encouraging results from publications in the early 1970s, and in particular the pioneering work of Philpott in Zimbabwe, the partograph has not been adopted universally either as a means of graphically recording labour or, even less, as a management tool for labour. Few publications of significance on the topic have appeared in the last 15 years. Caesarean section rates in the developed world continue to rise and there is no sign of a drop in worldwide maternal mortality rates.

Recognizing the unacceptable levels of maternal mortality, the Safe Motherhood Conference organized jointly by the World Bank, the World Health Organization and the United Nations Population Fund and held in Nairobi in 1987 concluded with a "call to action".[5] Among the recommendations was the need to ensure that all pregnant women are managed in labour by appropriately trained personnel using practical and relevant technology. Responding to this call, WHO developed a project to investigate and promote the management of labour using a partograph.

This project included the development of a printed partograph by a WHO Technical Working Group (1987) which reviewed all available partographs, published manuals, teaching aids and operations research guidelines.[24,25] A large multicentre trial on the impact of partography on labour management and outcome was conducted by WHO in Thailand, Malaysia and Indonesia from January 1990 to April 1991. This document reports on the outcome of this trial and discusses the implications of the results.

After a brief description of the WHO partograph and of the rationale behind the trial (Chapter 1), a detailed description of the methodology is given (Chapter 2). The remaining chapters describe in detail various elements of the results. Most chapters consist of a summary, a short introduction, a presentation of particular results and a commentary. Chapters 5-12, which contain related information, have a single joint commentary which comprises Chapter 13.

A complete list of references is contained at the end, followed by Appendices which show some of the results for individual participating centres.

1. THE WHO PARTOGRAPH AND THE NEED FOR A TRIAL

1.1 Design of the WHO Partograph

Partography is a method of graphically recording the progress of labour. It may be used purely to record observations but management guidelines to indicate the appropriate timing of certain interventions can be incorporated. Recognizing the potentially important role for such a tool in labour management, an Informal Working Group was convened by WHO in Geneva in 1988 to develop a partograph suitable for universal application. All available partograph designs were reviewed and an agreed model developed. The final version closely resembles that promoted by Philpott in Africa in the 1970s.[26] Detailed descriptions of the WHO partograph are available in other WHO documents[24,25] and an example of normal labour plotted on the partograph is illustrated in Figure 1.1. The essential features and the rationale are, however, summarized below.

The central feature is the cervicograph where cervical dilatation is plotted against time. While accepting that the transition from the latent to the active phase of labour may take place at differing cervical dilatations in individual cases, 3 cm dilatation is believed to be the most frequent dilatation at which the transition takes place and the cervicograph is marked accordingly. It was thought that the observed length of the latent phase should not be more than 8 hours, and a heavy vertical line from 0 to 3 cm dilatation after 8 hours of observed latent phase indicates this.

In the active phase of labour, a rate of dilatation of 1 cm per hour represents the mean dilatation rate of the slowest 10% of Zimbabwe primigravida.[8] All partographs designed accept 1 cm per hour or faster as an acceptable level of dilatation. This rate is designated the **alert line** on the partograph. The **action line** on the partograph is drawn parallel to, but 4 hours to the right, of the alert line. The "four hour action line" was found by Philpott[9] and Bird[13] to be the most efficient means of identifying particularly slow labours and avoiding unnecessarily early or dangerously late intervention.

The cervicographic features are incorporated into the WHO partograph together with the facility to record all other essential observations in labour on an hourly or half hourly basis. Experience with partography has shown that fewer recording errors are made when the action, alert and latent phase lines are pre-printed on to the partograph rather than being drawn on by the observer.[16] When admitted in labour in the latent phase (cervix <3 cm dilated with 2 contractions or more in 10 minutes, lasting 20 seconds or more), cervical dilatation is plotted at '0' hours at the beginning of the partograph. When labour subsequently reaches the active phase (cervix ≥3 cm dilated) within 8 hours of admission, plotting is transferred to the alert line (see Figure 1.1). If admission occurs already in the active phase, the cervical dilatation is plotted directly on to the alert line but contractions must be 1 or more in 10 minutes, lasting 20 seconds or more. Vaginal examinations are recommended at 4 hourly intervals, though more frequently if indicated by complications or advanced labour.

The level of the fetal head and the duration and frequency of contractions are also recorded in the central part of the partograph. All routine observations of maternal and fetal condition are also recorded on the partograph (Figure 1.1). Additional writing is rarely needed.

1.2 Management of Labour Using the WHO Partograph

The partograph with associated management guidelines is designed to improve the timing of critical management decisions in labour. These are:

a. Transfer of a woman in labour from a peripheral unit (health centre) to a central unit (hospital with facilities for caesarean section delivery).

b. Augmentation of labour with oxytocin infusion.

c. Termination of labour by operative delivery (usually caesarean section).

Poor timing of, or failure to perform, these actions may lead to problems of iatrogenesis or neglect. Without management guidelines, these decisions may be made on the basis of intuition or experience which probably contributes to the widely varying rate of, for example, caesarean section delivery.

Based on the experiences of Philpott[8,9] and Bird,[13] the WHO Working Group considered that the actions appropriate at different points on the partograph should be as follows:

a. If cervical dilatation remains on or to the left of the alert line in the active phase - no action is indicated.

b. If cervical dilatation moves between the alert and action lines (but not to the action line)

- if in a peripheral unit, transfer to a central unit
- if in a central unit, no specific action indicated.

c. If cervical dilatation reaches or crosses the action line:

- review by medical staff with a view to augmentation, termination of labour, or supportive therapy.

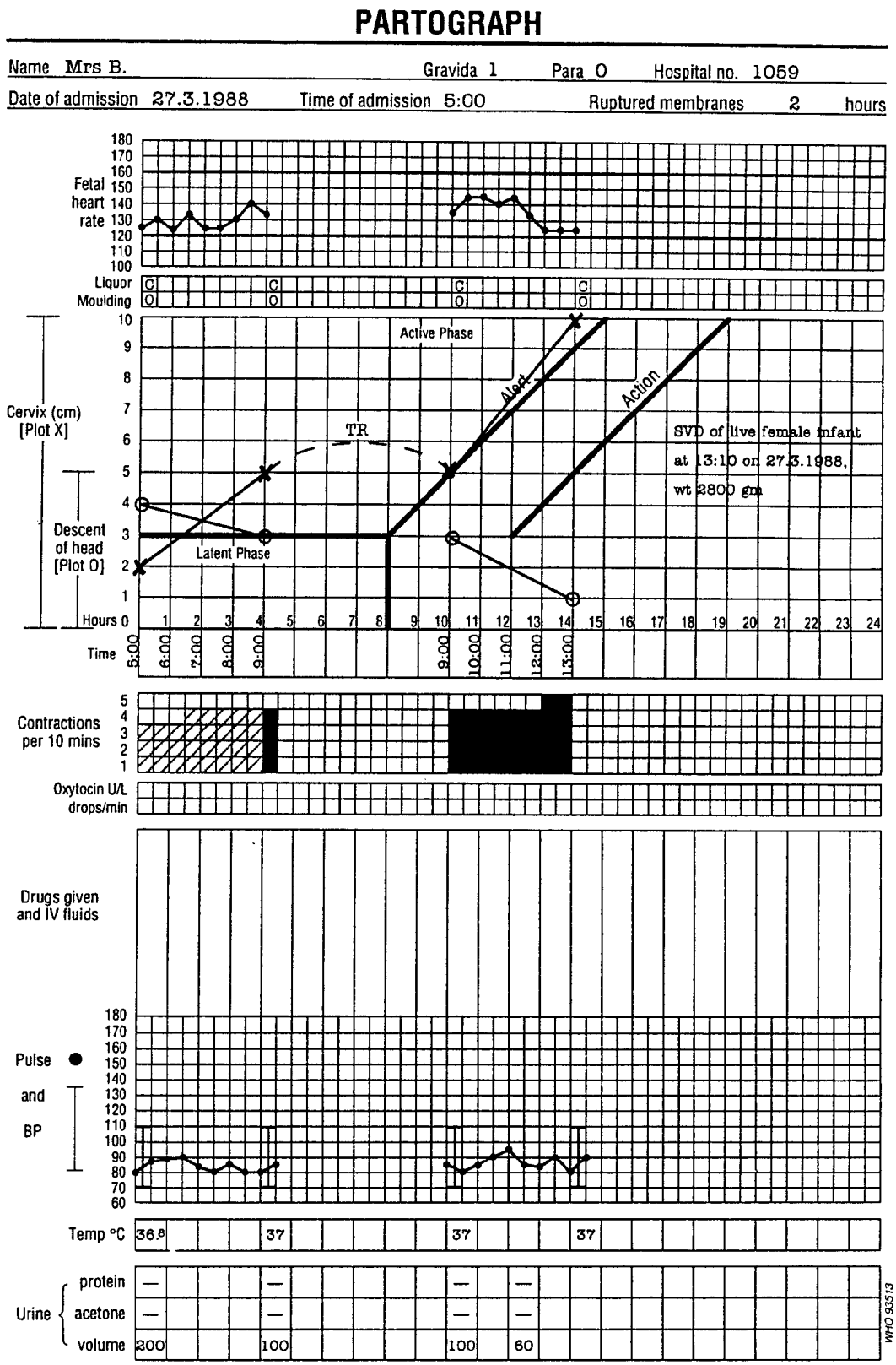
d. Prolonged latent phase (8 hours of observed latent phase):

- review by medical staff.

The WHO manuals for use with the partograph give little detail on the suggested managements. The manuals advise the development of local protocols.

FIGURE 1.1

LABOUR PLOTTED ON THE WHO PARTOGRAPH



1.3 The Need for a Trial

It can be seen above that the design of the partograph was thought to represent the best available from published information but the management guidelines were not spelt out in any detail. Operations research is encouraged and a booklet describing the methodology of operations research using the WHO partograph has been produced.[25] Three particular issues, however, were of clear importance.

First is the failure of the obstetric world to adopt fully the partographic principles so well demonstrated by Philpott[26] who dramatically improved obstetric outcome with the use of the partograph. Second, there is continuing uncertainty about the best possible design of the partograph, illustrated by the variety of published partographs. Third is the lack of a specific management protocol accompanying the partograph. WHO, through the Safe Motherhood Initiative, organized the multicentre trial reported here using the WHO partograph to address these issues particularly. In addition, it was hoped that the trial could confirm that the WHO partograph can be accurately and correctly completed and used by medical and midwifery staff, that it is of use in abnormal as well as apparently normal pregnancies and also that it is of use in management decisions in the latent phase of labour.

It was hoped that a thorough examination of these issues would confirm the value of the WHO partograph as a tool for improving the outcome of labour and promote its more widespread adaptation worldwide.

In the developing world the partograph is of value in two circumstances: in a peripheral centre to indicate the correct time to transfer a women whose labour is prolonged and, in a central unit, to indicate the correct timing of certain interventions. A trial in the first setting is best conducted in a local setting following the WHO Operations Research guidelines.[25] The logistical difficulties of a large international multicentre trial at the health centre/hospital interface are considerable. It was therefore decided to conduct a trial based in hospitals not previously using a partograph which influenced labour management. The impact on labour management and outcome made by the introduction of the partograph would be studied, together with a detailed analysis of the progress of labour charted on the partograph. In this way it was hoped that the potential role of the partograph as a tool to aid referral decisions in labour could also be made more clear.

The partograph alone is unlikely to have an influence on the progress of labour unless a labour management protocol is introduced as well. The management guidelines described in the WHO manuals on the partograph are not at all detailed. It was recognized that the establishment of a labour management protocol needed to be included in the multicentre trial. However, hospitals in the trial would need to be already practising active management of labour so that the protocol in combination with the partograph merely influenced the timing of management decisions rather than introducing entirely new methods of management.

It would be impossible to randomly allocate individual women within one hospital to labour with or without a partograph as cross-contamination would be considerable. The design of the study therefore required the identification of matched pairs of similar hospitals with random allocation of one hospital to partographic usage. The principle involved the collection of baseline data from all participating hospitals with the subsequent introduction of the partograph to one member of each matched hospital pair. It was decided that all hospitals would ultimately use the partograph using a phased implementation programme.

As a major objective of the trial was to prove that the introduction of the partograph improved the outcome of labour by reducing the rates of operative deliveries and maternal and neonatal morbidity and mortality, a large number of deliveries would be required to achieve statistical significance.

Within the above principles and objectives, the methodology described in the following chapter was established.

2. METHODOLOGY OF MULTICENTRE TRIAL

The Ministries of Health in Indonesia, Malaysia and Thailand were approached by WHO in order to identify hospitals for participation in the trial. In Indonesia, the Society of Obstetrics and Gynaecology also assisted in the identification procedure. The preparation work took 15 months during which time all proposed centres were visited and assessed by the study coordinator. At the same time, collaboration was established between WHO's Maternal and Child Health and Family Planning Programme (MCH) and the Special Programme of Research, Development and Research Training in Human Reproduction (HRP). Questionnaires were designed and pre-tested twice.

Four matched pairs of hospitals were identified in South East Asia to participate in the trial (2 pairs in Indonesia, 1 each in Thailand and Malaysia). Each centre had to fulfil the following criteria:

a. A minimum of 3000 confinements annually
b. Practising active management of labour
c. Midwife involvement in labour and delivery
d. Sufficiently geographically removed from its matched pair to avoid contamination.

Two of the centres were already using a form of partograph as an observation tool but without alert and action lines. All the centres functioned as district general hospitals in urban environments with adequate medical and midwifery staffing levels and suitable facilities for operative obstetric care. Referrals in labour from outlying health centres or from home were 13%, of which 2.6% were self-referrals. In Indonesia only 10-20% of births take place in hospitals, while this percentage rises to about 60% in Malaysia and Thailand.

The study was scheduled to run from 1 January 1990 to 31 March 1991. During the first five months, all centres collected data on their deliveries on a standardized form for entry onto the database held on computer at WHO headquarters in Geneva. After five months, the WHO partograph was introduced into one randomly selected member of each paired hospital.

Ten months into the study, the partograph was introduced into the other half of the matched pairs of hospitals. Thus, half of the centres collected data only for five months (before implementation) and used the partograph for the following ten (after implementation), while the other half spent ten months in the phase before implementation and five after implementation (Figure 2.1). Meetings between principal investigators and WHO consultants were held at three important stages of the study. Before the commencement, the principle investigators from all eight centres were introduced to the rationale and methodology of the trial at a meeting with WHO consultants. Detailed descriptions of the partograph were not given nor was labour management discussed in order to influence change as little as possible during the baseline data collection.

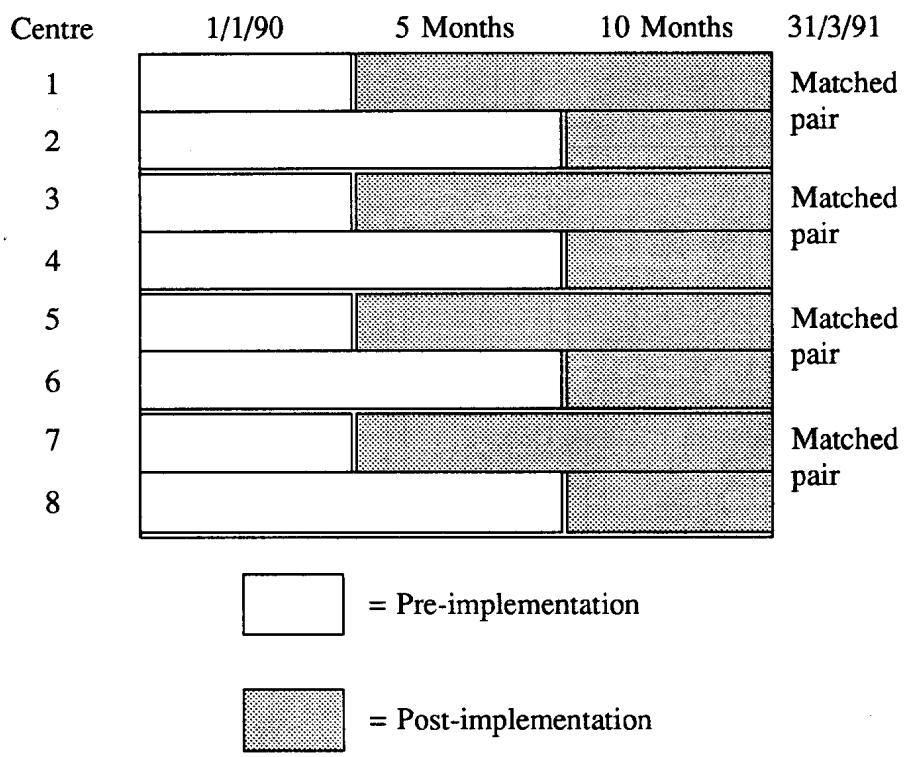
Prior to the introduction of the partograph into each group of four centres, intensive instruction was given to the principle investigators into the use of the partograph at a combined meeting. At the first of these meetings, involving the centres implementing the partograph after five months (early implementers), common protocols were agreed to, after discussion between the principal investigators and the WHO consultants, for commencing women on the partograph and for labour management. These protocols related the timing of certain actions and interventions to the progress of labour on the partograph but did not

introduce any new activity which was not already being carried out by each of the participating centres. The timing of any activities was what could be changed through use of the partograph.

At the meeting of principal investigators implementing the partograph after ten months (late implementers), the agreed protocols were presented together with the partograph and a stipulation that they must be followed.

FIGURE 2.1

PHASED IMPLEMENTATION OF PARTOGRAPH



Criteria for commencing women on the partograph were important to avoid starting too many partographs on women who were not in labour. The agreed criteria are shown in Table 2.1

TABLE 2.1

CRITERIA FOR COMMENCING PARTOGRAPH

In latent phase (cervix 0-2 cm)

Contractions must be 2 or more in 10 minutes lasting 20 seconds or more

In active phase (cervix ≥3 cm)

Contractions must be 1 or more in 10 minutes lasting 20 seconds or more.

It was also agreed that a partograph should not be completed for the following cases:

a. Pregnancy gestation less than 34 weeks (for the purpose of the trial)
b. Cervix 9 or 10 cm dilated on admission
c. Elective caesarean section
d. Emergency caesarean section (on or within one hour of admission).

A partograph was to be commenced in all other cases of labour including inductions, malpresentations and multiple pregnancies.

Although the introduction of the partograph was expected to influence the timing of management decisions in labour, no other changes were imposed on each centre. In particular, no alterations were made to the local oxytocin regime or to local policies on the diagnosis and management of additional problems in labour, such as fetal distress or hypertension.

The agreed management protocol to accompany the partograph is summarized in Table 2.2. Vaginal examinations during labour were to be performed every four hours except where indicated in the protocol or when complications (e.g. fetal distress) developed.

The introduction of the partograph was achieved by several days of intensive teaching of midwifery and medical staff with the help of a WHO consultant in each centre.

Data collection for each delivery was continued and this, together with a copy of the completed partograph for each delivery, was forwarded to Geneva for analysis.

Data collection, protocol management, and standards were monitored throughout the study by regular field visits by the Study Coordinator and by assessment of forms returned to Geneva. Where clarification of data on individual cases was required, this was sought from the principal investigator in each centre. All returns from centres were scrutinised by the Study Coordinator (BEK) and Technical Officer (MK) for quality of partography and for protocol adherence. Particularly complicated cases were forwarded to a WHO consultant (CEL) for coding verification.

The results were analysed in order to examine the issues raised in the rationale described at the beginning of this chapter.

TABLE 2.2

AGREED LABOUR MANAGEMENT PROTOCOL AT DIFFERENT POINTS ON WHO PARTOGRAPH

1. **NORMAL LATENT AND ACTIVE PHASES**

   a. Do not augment or intervene unless complications develop

   b. ARM - active phase - at any time
      - latent phase - no ARM

2. **BETWEEN ALERT AND ACTION LINES ("REFERRAL ZONE")**

   a. Do not intervene or augment unless complications develop

   b. ARM at vaginal examination if membranes are still intact

3. **AT OR BEYOND ACTIVE PHASE ACTION LINE**

   a. Full medical assessment

   b. Consider intravenous infusion/bladder catheterisation/analgesia

   c. Options:

      i. Delivery (normally caesarean section) if fetal distress or obstructed labour

      ii. Oxytocin infusion - if no contra-indications

      iii. Conservative management - supportive therapy only (if satisfactory progress now established and could be anticipated at 1 cm/hour or faster)

   d. Further review (in cases continuing in labour)

      i. Vaginal examination after 3 hours

         - then after 2 more hours
         - then after 2 more hours

         Progress, <1 cm/hour between any of these examinations means delivery is indicated. (A woman's labour should not continue for longer than 7 hours beyond the action line.)

      ii. Fetal heart while on oxytocin must be checked at least every half hour

TABLE 2.2 (cont'd)

4. **PROLONGED LATENT PHASE (8 HOURS)**

a. Full medical assessment

b. Options:

i. No action
Women not in labour - abandon partograph

ii. Delivery (caesarean section)
If fetal distress or factors likely to lead to obstruction or other medical complications necessitating termination of labour

iii. ARM + Oxytocin
If contraction pattern and/or cervical assessment suggest continuing labour

c. Further review (in cases continuing in labour)

i. Continue vaginal examinations every four hours up to 12 hours

ii. If not in active phase after 8 hours of oxytocin, delivery by caesarean section

iii. If active phase is reached within or by 8 hours but subsequent progress in active phase is <1 cm/hour over 4 hours, delivery by caesarean section may be considered

iv. Monitor fetal heart every ½ hour on oxytocin

3. BIO-SOCIAL AND OBSTETRIC CHARACTERISTICS OF THE WOMEN STUDIED

With an analysis of maternal age and height and the third stage of labour

3.1 Summary

A total of 35 484 women were included in the study. Most had had some form of antenatal care and were planning deliveries in the 8 participating hospitals. 85.6% presented in spontaneous labour and 7.1% of labours were induced. The caesarean section rate was 12.0% and the operative vaginal delivery rate 9.9%. Neonatal deaths were under-recorded but the stillbirth rate was 2.6%; in most of these cases the fetus was already dead in utero on admission. There were 47 maternal deaths, but none of these was a consequence of partographic management. An examination of labour outcome related to maternal age showed a steady decline in obstetric performance with advancing years, with an increase in caesarean sections and stillbirths. The outcome of teenage pregnancies was good. The only association between labour outcome and small maternal stature was an increased caesarean section rate, though even among very short women (<140 cm), only 32% were delivered abdominally.

The study appeared to confirm that the optimum management of the third stage of labour is the administration of intramuscular syntometrine after delivery of the baby, followed by controlled cord traction delivery of the placenta. However, the number of recorded postpartum haemorrhages (blood loss ≥500 ml) in a defined "normal" group of women was low (2.5%) and may reflect under-reporting. The incidence of postpartum haemorrhage fell with increasing parity, confirming the findings of other recent studies.

3.2 Introduction

This chapter describes in detail the total population included in the study regardless of use of the partograph. Subsequent chapters report on the impact of the implementation of the partograph on obstetric outcomes and provide a detailed analysis of the partograph with associated labour management protocol in use.

The dataset is extremely large and the opportunity was taken to examine certain variables independent of the partograph, namely the relationship between maternal age and height and obstetric outcome and the management of the third stage of labour and its association with postpartum haemorrhage. While not the main purpose of this study, this information is of considerable interest and may be the basis for further studies. It is inevitable that, in a study of this size, each variable contains some missing or unknown data. The missing numbers are noted at the foot of each table in this and subsequent chapters.

3.3 General Data

General background information is shown in Table 3.1 A total of 35 484 women were included in the study. Indonesia's contribution coming from four centres, Thailand and Malaysia's from two each. 32 128 (91%) of women were between 20 and 40 years of age, and most had had some form of education. This does not necessarily reflect the educational status of women in these countries; all the hospitals involved were in an urban environment and some form of payment was usually necessary to secure the services of the hospitals' maternity services.

The mean parity of the women studied was 1.59 (SD[1] 1.99); 39% were nullipara and 9% grand multipara (para 5 or more). Most (93%) reported a minimum of two episodes of antenatal care, the form of which was not recorded; 8411 (24%) had developed a recognized antenatal complication. The most frequent antenatal complications recorded were hypertensive disorders, anaemia and antepartum haemorrhage.

3.4 Admission Findings

Details of the findings on admission in labour are shown in Table 3.2. The mean gestation at the onset of labour was 39 weeks, with 8.4% of women presenting in preterm labour (<37 weeks) and 1.7% with prolonged pregnancy (>42 weeks). Most labours (85.6%) were spontaneous. The overall induction rate was 7.1% and a further 7.8% were delivered without labour, either by elective or emergency caesarean section.

Most women (87%) planned delivery in hospital and presented themselves in labour without referral. Of other routes of admission, the most frequent was referral from a domiciliary midwife (3.9%); 2.9% were referred from another hospital, 2.0% from a health centre and 1.0% from a maternity home. Only 95 women were referred by a traditional birth attendant. The 931 (2.6%) "unplanned self-referrals" were those intending to deliver at home but who developed complications and were brought to hospital, usually by relatives.

There were 34 997 singleton pregnancies and 487 (1.4%) multiple pregnancies, of which 8 were triplets. Among singleton pregnancies, 94.2% were cephalic presentations, 5.1% breech and 0.7% other (shoulder and compound).

In 1038 cases an admission cervical dilatation was not recorded, usually because of admission for planned caesarean section or an emergency, such as antepartum haemorrhage. Among the remaining cases, 13% were admitted in the second stage, 62% between 3 and 9 cm dilatation (active phase) and 25% between 0 and 2 cm dilatation (latent phase). However, some of these, particularly at 0-2 cm dilatation, were not in labour on admission.

3.5 Mode of Delivery and Fetal Outcome

The mode of delivery for singleton infants is shown in Table 3.3. The overall caesarean section rate was 12.0%, with 2.5% of deliveries elective caesarean sections, and 9.5% emergencies. More vacuum extractions (6.9%) were performed than forceps deliveries (3.0%). There were 85 destructive deliveries and 44 laparotomies for ruptured uterus before delivery. Vaginal breeches comprised 3.6% of deliveries, and 74.1% were spontaneous vertex deliveries (SVDs).

Among twin pregnancies, 337 (70.5%) were both delivered spontaneously; in 65 (13.6%), at least one twin required operative vaginal assistance and in 76 (15.9%) at least one twin was delivered by caesarean section. The mode of delivery for one set of twins was unknown. All babies (singleton and multiple) are included in Table 3.4 which summarizes the fetal outcome.

Neonatal deaths were poorly and almost certainly under-recorded and are not shown in Table 3.4. The total stillbirth rate was 2.6%, but the majority of these (2.2% of all babies) were already dead on admission. A total of 148 (0.4%) of babies alive on admission died

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[1] *Standard deviaton.*

during labour or delivery. The mean birth weight was 3055 grams and 10.5% of babies weighed under 2500 grams.

There were 47 maternal deaths and 55 cases of uterine rupture. As these are such important events they are described separately in Chapter 17.

3.6 Maternal Age and Obstetric Outcome

Table 3.5 shows the influence of maternal age on the mode of delivery, length of labour, oxytocin augmentation, stillbirth rate (on admission and intrapartum), birth weight and multiple pregnancy rate.

As parity may influence some of the outcomes in Table 3.5, the same information is shown for nulliparous and for parous women by maternal age in Tables 3.6 and 3.7. The obstetric performance of even young teenagers in this population is excellent. There was a steady decline in the rates of spontaneous vertex delivery and a rise in both elective and emergency caesarean sections with advancing years. Augmentation rates and the mean length of labour showed no particular trends. Age also appeared to have no influence on the rates of intrapartum fetal loss (after admission), but there was a marked rise with age in the number of fetuses found to be dead on admission, from 0.7% of 16 year olds to 4.4% of those over 40 years. Both mean birth weight and multiple pregnancy rates increased slightly with advancing age.

Among nullipara (Table 3.6) the decline in spontaneous delivery rates and rise in caesarean section rates was even more marked. Among nullipara over 40 years, only 32.7% achieved a spontaneous vertex delivery, compared to 72-85% of teenagers. More older, than younger, nullipara were augmented in labour and the mean duration of labour increased with age. The association between increase in age and intra-uterine death on admission remained among nullipara, showing that this feature was not just associated with rising parity. Mean birth weight also still showed a slight increase with age among nullipara but there seemed no association between the incidence of multiple pregnancy and age.

Few teenagers were parous but the same trends as among nullipara are observed among multipara (Table 3.7). The two 14 year olds reported as parous may not have been. The only difference in trends between nullipara and multipara was that there appeared to be a slight correlation between rising age and the incidence of multiple pregnancy among multipara.

3.7 Maternal Height and Obstetric Outcome

In Table 3.8 the same variable outcomes as were studied in relation to maternal age are related to maternal height. All parities are combined. The rate of spontaneous vertex delivery rises with increasing height with a corresponding fall in both elective and emergency caesarean sections, though even women under 140 cm in height achieved 56% spontaneous deliveries. There was no particular correlation between height and augmentation rates or duration of labour. The tallest women (≥170 cm) had the highest augmentation rates (25%) but this was the smallest group numerically and this is likely to have arisen by chance.

Stillbirths, whether intrapartum or intra-uterine deaths before admission, also showed no trends; indeed the highest incidence of both types of stillbirth occurred among women in the modal height group (150-154 cm), with the exception of the higher incidence of intrapartum deaths among the smallest women who were also a small group numerically. Mean birth weight increased with increasing height. Multiple pregnancies showed no correlation.

3.8 Third Stage Management

The management of the third stage varied from centre to centre, both in terms of the method of delivery of the placenta and the use of oxytocic drugs. The rate of postpartum haemorrhage was studied in relation to these varying practices. In order to obtain a pure group for this comparison, only women who had no risk factors in pregnancy or in labour and who were given no oxytocin to augment labour and who delivered vaginally were studied. Postpartum haemorrhage (PPH) was defined as a blood loss of 500 ml or more.

Table 3.9 relates the four methods by which the placenta was delivered to PPH rates, further showing the rate of PPH by parity grouping. With all methods there was a decline in PPH with increasing parity, from 3.0% overall among nullipara, to 2.3% among para 1-4, and 1.8% among grand multipara. Overall and among all parities, the lowest PPH rate (1.4% overall) was achieved when the placenta was delivered by controlled cord traction usually after prophylactic use of syntometrine.

The same "normal" cases as in Table 3.9 with unaugmented labours culminating in vaginal delivery are presented in Table 3.10 where PPH rates are studied in relation to different oxytocic drugs given at different times in the third stage.

Some centres routinely gave an oxytocic before delivery of the placenta (usually syntometrine or oxytocin IM), and some routinely afterwards (usually methergin IM). When more than one agent was used and/or agents were given before and after delivery of the placenta, this was probably because of the presence of PPH and this is reflected in the high PPH rates in these cases. A small number of cases (153) apparently had no oxytocic agent given but the rate of PPH in this group was very low and it is likely that there was a failure to record the giving of an agent.

The lowest PPH rate occurred in those women given intramuscular syntometrine before delivery of the placenta.

3.9 Commentary

This chapter describes the obstetric and, to a lesser extent, the social characteristics of the women studied. The women included were, by and large, those who had elected to deliver in hospital and were not, therefore, necessarily representative of the population at large. In addition, maternal mortality not related to labour and the early puerperium was not studied. The maternal mortality rate of 1.3/1000 (47 deaths among 35 484) is therefore lower than that expected or previously estimated.[2,28] Other rates of major complications resulting largely from neglect before admission, especially uterine rupture, are probably also lower than the true rate among all women delivering in the areas described. This was not a community-based study and no attempt was made to calculate the proportion of women delivering in hospital. Most of the study population had received some form of education and some antenatal care during the index pregnancy.

The incidence of breech presentation in labour (5.1%) and multiple pregnancy (1.4%) were within the expected range. The rates of intervention in labour were also typical of modern hospital obstetric practice; 7.1% of labours were induced and the overall caesarean section rate was 12.0%. Most stillbirths occurred in cases where the fetus was already dead on arrival, often because of neglect and a lack of intrapartum care at home. The proportion of low birth weight babies (10.5% under 2500 g) conformed to recognized expectations.

The opportunity was taken to study three particular features not directly related to the purpose of this study. When maternal age and height are considered as risk factors, they may prove to be a self-fulfilling prophecy as intervention decisions may be based on the attendant's expectations of, rather than the reality of, difficulty.[29] In this context, the excellent obstetric performance of teenagers in this study is noteworthy and in marked contrast to the poor outcomes among teenagers in Africa.[30] Obstetric performance did, however, appear to decline steadily with advancing years in this study. The high rate of intra-uterine deaths before admission may partly be explained by older parous women neglecting themselves in labour and presenting late, but the rise with advancing age remained even among nullipara. In this population, rising parity seemed a more important determinant of multiple pregnancy than rising age.

The pattern of delivery mode in relation to maternal height was as expected although the high rate of elective caesarean section (6.8%) among the shortest women suggests an element of the self-fulfilling prophecy. A spontaneous delivery rate of 56% among women under 140 cm and a similar mean length of labour for all maternal heights suggests that few women should be denied a trial of labour on the basis of height alone provided, of course, that facilities are on hand for intervention if indicated. Maternal height was not taken into account as a risk factor in this partographic study except in cases of extreme short stature (<1.40 m). These findings confirm that it should not have been. They also demonstrate that maternal height alone is considerably less of a risk factor in this Asian population than in Africa.[31]

A detailed examination of the third stage of labour was not part of the remit of this study. No particular method was laid down for the measurement or estimate of blood loss and there is likely to have been variation between centres in their estimation of blood loss. As centres also varied in their method of placental delivery, this is certainly a potential source of bias in the results. However, the results presented in Tables 3.9 and 3.10 confirm the recommendations for the active management of the third stage made in the WHO Technical Working Group on the subject[32] and supported by recent publications.[33,34,35] Delivery of the placenta by controlled cord traction after the prophylactic use of syntometrine resulted in the lowest rate of postpartum haemorrhage (PPH) in this population. It is likely that, as in most routine practice,[36] the postpartum blood loss incurred by women in this study was under-estimated, and that this explains the apparently low PPH rate. The fall in the incidence of PPH with rising parity was, however, consistent and there is no reason that estimates of blood loss should vary in accuracy with different parities. The higher risk of PPH among nullipara and low rates among grand multipara is consistent with recent reports.[36,37,38]

TABLE 3.1

POPULATION CHARACTERISTICS

General		
Total number of women	35 484	(8 centres)
from Indonesia	13 803	(4 centres)
from Thailand	9 627	(2 centres)
from Malaysia	12 054	(2 centres)
Age[1]: Mean (years)	27.23	(Stand. dev. 5.72)
<20 years	2 422	(6.8%)
>40 years	910	(2.6%)
Education[2] and employment[3]		
with some schooling	30 777	(87.1%)
with secondary education or higher	16 705	(47.3%)
in paid employment	16 342	(46.2%)
Obstetric		
Parity[4]: Mean	1.59	(Stand. Dev. 1.99)
nullipara	13 845	(39.1%)
para 1-4	18 374	(51.9%)
para 5+	3 167	(8.9%)
Antenatal: At least two antenatal visits[5]	32 849	(92.7%)
antenatal complications[6]	8 411	(23.7%)

[1] *Value missing or unknown in 24 cases.*
[2] *Value missing or unknown in 165 cases.*
[3] *Value missing or unknown in 134 cases.*
[4] *Value missing or unknown in 98 cases.*
[5] *Value missing or unknown in 79 cases.*
[6] *Value missing or unknown in 18 cases.*

TABLE 3.2

FEATURES OF LABOUR ON ADMISSION

Gestation in labour (weeks)[1]:		
Mean	39.0	(Stand. dev. 2.1)
<37	2 970	(8.4%)
>42	584	(1.7%)
Type of labour[2]:		
Spontaneous	30 083	(84.8%)
Induced	2 529	(7.1%)
Not in labour (Elective or immediate caesarean section)	2 763	(7.8%)
Route of admission[3]:		
Planned self-referral	30 961	(87.3%)
Unplanned self-referral	931	(2.6%)
Domiciliary midwife	1 400	(3.9%)
Other hospital	1 042	(2.9%)
Health centre	708	(2.0%)
Maternity home	341	(1.0%)
Traditional birth attendant	95	(0.3%)
Presentation on admission[4]:		
Singleton		
Cephalic	32 121	(94.2%)
Breech	1 740	(5.1%)
Other	243	(0.7%)
Multiple	487	(1.4%)
Cervical dilatation on admission[5]:		
10 cm	4 410	(12.8%)
3-9 cm	21 368	(62.0%)
0-2 cm	8 668	(25.2%)

[1] *Value missing or unknown in 118 cases.*
[2] *Value missing or unknown in 109 cases.*
[3] *Value missing or unknown in 6 cases.*
[4] *Value missing or unknown in 893 cases.*
[5] *Value missing or unknown in 1038 cases.*

TABLE 3.3

MODE OF DELIVERY
(Singletons only)

Spontaneous vertex	26 199	(74.1%)
Vaginal breech	1 267	(3.6%)
Forceps	1 045	(3.0%)
Vacuum extraction	2 443	(6.9%)
Caesarean section	4 244	(12.0%)
[895 (2.5%) elective and 3 349 (9.5%) emergency]		
Destructive	85	(0.2%)
Laparotomy	44	(0.1%)
(Ruptured uterus)		
* Unknown or unclear	149	

** Not included for percentages.*

TABLE 3.4

FETAL OUTCOME

Total number of babies	35 979	
Liveborn[1]	34 876	(97.0%)
Fetus dead on admission	781	(2.2%)
Fetus died after admission	148	(0.4%)
Total stillbirths	928	(2.6%)
Mean birth weight (g)[2]	3 055	(Stand. dev. 513)
<2500 g	3 787	(10.5%)

[1] *Status of 35 infants unknown.*
[2] *Birth weight of 230 infants unknown.*

TABLE 3.5

SELECTED MATERNAL AND FETAL OUTCOMES AND VARIABLES BY MATERNAL AGE (All parities)

Variables[1]	Maternal age (years)								
	≤14	15	16	17-19	20-24	25-29	30-34	35-39	40+
Total number[2]	**24**	**72**	**141**	**2 185**	**9 848**	**11 424**	**7 350**	**3506**	**910**
Spontaneous vertex delivery	18 (75.0)	52 (72.2)	121 (85.8)	1 684 (77.1)	7 395 (75.1)	8 439 (73.9)	5 327 (72.5)	2509 (71.6)	602 (66.2)
Elective caesarean section	0	1 (1.4)	1 (0.7)	19 (0.9)	146 (1.5)	279 (2.4)	283 (3.9)	126 (3.6)	42 (4.6)
Emergency caesarean section	0	7 (9.7)	5 (3.5)	146 (6.7)	773 (7.8)	1 101 (9.6)	797 (10.8)	404 (11.5)	122 (13.4)
Augmentation	3 (12.5)	11 (15.3)	21 (14.9)	404 (18.5)	1 518 (15.4)	1 763 (15.4)	1 033 (14.1)	458 (13.1)	143 (15.7)
Mean length of labour (hrs)[3]	3.44 (4.10)	5.81 (8.84)	4.81 (5.00)	5.43 (6.16)	5.64 (6.69)	5.59 (6.89)	5.05 (6.57)	4.78 (6.57)	5.21 (7.55)
IUD[4] on admission	0	1 (1.4)	1 (0.7)	30 (1.4)	170 (1.7)	216 (1.9)	187 (2.5)	135 (3.8)	41 (4.4)
IUD[4] intrapartum	0	0	1 (0.7)	8 (0.4)	32 (0.3)	47 (0.4)	39 (0.5)	16 (0.4)	5 (0.5)
Mean birth weight (g)[3,5]	2 890 (391)	2 854 (542)	2 884 (460)	2 901 (472)	2 990 (477)	3 083 (489)	3 147 (518)	3 142 (555)	3 137 (582)
Multiple pregnancy	0	0	1 (0.7)	22 (1.0)	122 (1.2)	150 (1.3)	115 (1.6)	64 (1.8)	13 (1.4)

[1] *Number in parentheses is percentage of total number in each age group, except where indicated.*
[2] *Age not known in 24 cases.*
[3] *Number in parentheses is standard deviation from mean.*
[4] *IUD = intra uterine death.*
[5] *Mean birth weight of singleton deliveries only.*

TABLE 3.6

SELECTED MATERNAL AND FETAL OUTCOMES AND VARIABLES BY MATERNAL AGE (Nullipara)

Variables[1]	Maternal age (years)								
	≤14	15	16	17-19	20-24	25-29	30-34	35-39	40+
Total number[2]	**22**	**72**	**137**	**1 959**	**6 506**	**3 854**	**970**	**266**	**49**
Spontaneous vertex delivery	17 (77.3)	52 (72.2)	117 (85.4)	1 485 (75.8)	4 588 (70.5)	2 325 (60.3)	469 (48.4)	95 (35.7)	16 (32.7)
Elective caesarean section	0	1 (1.4)	1 (0.7)	17 (0.9)	95 (1.5)	107 (2.8)	71 (7.3)	37 (13.9)	10 (20.4)
Emergency caesarean section	0	7 (9.7)	5 (3.6)	133 (6.8)	600 (9.2)	572 (14.8)	218 (22.5)	83 (31.2)	12 (24.5)
Augmentation	2 (9.1)	11 (15.3)	21 (15.3)	377 (19.2)	1144 (17.6)	865 (22.4)	260 (26.8)	58 (21.8)	10 (20.4)
Mean length of labour (hrs)[3]	3.61 (4.25)	5.81 (8.84)	4.94 (5.02)	5.64 (6.04)	6.50 (6.90)	7.86 (7.59)	8.84 (8.37)	9.17 (10.18)	8.76 (8.13)
IUD[4] on admission	0	1 (1.4)	1 (0.7)	27 (1.4)	93 (1.4)	65 (1.7)	21 (2.1)	8 (3.0)	2 (4.1)
IUD[4] intrapartum	0	0	1 (0.7)	7 (0.4)	26 (0.4)	12 (0.3)	7 (0.7)	3 (1.1)	0
Mean birth weight (g)[3,5]	2 890 (408)	2 854 (542)	2 881 (461)	2 898 (472)	2 957 (459)	3 006 (465)	3 005 (470)	2 938 (513)	2 954 (439)
Multiple pregnancy	0	0	1 (0.7)	20 (1.0)	75 (1.2)	30 (0.8)	10 (1.0)	4 (1.5)	0

[1] *Number in parentheses is percentage of total number in each age group, except where indicated.*
[2] *Age and parity not known in 109 cases.*
[3] *Number in parentheses is standard deviation from mean.*
[4] *IUD = intra uterine death.*
[5] *Mean birth weight of singleton deliveries only.*

TABLE 3.7

SELECTED MATERNAL AND FETAL OUTCOMES AND VARIABLES BY MATERNAL AGE (Multipara)

Variables[1]	Maternal age (years)								
	≤14	15	16	17-19	20-24	25-29	30-34	35-39	40+
Total number[2]	**2**	**0**	**4**	**221**	**3 319**	**7 539**	**6364**	**3 231**	**860**
Spontaneous vertex delivery	1 (50.0)	-	4 (100)	196 (88.7)	2 789 (84.0)	6 091 (80.8)	4 848 (76.2)	2 411 (74.6)	585 (68.0)
Elective caesarean section	0	-	0	2 (0.9)	50 (1.5)	172 (2.3)	211 (3.3)	89 (2.8)	32 (3.7)
Emergency caesarean section	0	-	0	13 (5.9)	173 (5.2)	525 (7.0)	576 (9.1)	318 (9.8)	110 (12.8)
Augmentation	1 (50.0)	-	0	27 (12.2)	370 (11.1)	893 (11.8)	770 (12.1)	395 (12.2)	133 (15.5)
Mean length of labour (hrs)[3]	1.57 (0.80)	-	0.55 (0.34)	3.61 (6.92)	3.95 (5.92)	4.44 (6.19)	4.47 (6.04)	4.41 (6.05)	5.01 (7.47)
IUD[4] on admission	0	-	0	3 (1.3)	76 (2.3)	150 (2.0)	164 (2.5)	127 (3.9)	39 (4.5)
IUD[4] intrapartum	0	-	0	1 (0.4)	6 (0.2)	35 (0.5)	31 (0.5)	13 (0.4)	5 (0.6)
Mean birth weight (g)[3,5]	2 890 (71)	-	3 013 (437)	2 943 (470)	3 055 (504)	3 123 (496)	3 169 (521)	3 160 (556)	3 149 (587)
Multiple pregnancy	0	-	0	2 (0.9)	47 (1.4)	120 (1.6)	104 (1.6)	60 (1.9)	13 (1.5)

[1] *Number in parentheses is percentage of total number in each age group, except where indicated.*
[2] *Age and parity not known in 109 cases.*
[3] *Number in parentheses is standard deviation from mean.*
[4] *IUD = intra uterine death.*
[5] *Mean birth weight of singleton deliveries only.*

TABLE 3.8

SELECTED MATERNAL AND FETAL OUTCOMES AND VARIABLES BY MATERNAL HEIGHT

Variables[1]	Maternal height (centimetres)							
	≤139	140-144	145-149	150-154	155-159	160-164	165-169	170
Total number[2]	**206**	**1 405**	**5 633**	**12 983**	**9 451**	**3 642**	**881**	**107**
Spontaneous vertex delivery	116 (56.3)	930 (66.2)	4 059 (72.1)	9 568 (73.7)	7 120 (75.3)	2 843 (78.1)	708 (80.4)	87 (81.3)
Elective caesarean section	14 (6.8)	48 (3.4)	164 (2.9)	288 (2.2)	253 (2.7)	101 (2.8)	18 (2.0)	1 (0.9)
Emergency caesarean section	52 (25.2)	220 (15.7)	645 (11.5)	1 206 (9.3)	742 (7.9)	263 (7.2)	60 (6.8)	4 (3.7)
Augmentation	21 (10.2)	217 (15.4)	887 (15.7)	2 046 (15.8)	1410 (14.9)	523 (14.4)	113 (12.8)	27 (25.2)
Mean length of labour (hrs)[3]	5.45 (6.71)	6.02 (8.03)	6.30 (7.55)	5.76 (6.91)	5.44 (6.80)	5.27 (6.49)	5.21 (6.36)	5.12 (6.09)
IUD[4] on admission	3 (1.4)	31 (2.2)	104 (1.8)	326 (2.5)	148 (1.5)	50 (1.4)	4 (0.5)	2 (1.9)
IUD[4] intrapartum	4 (1.9)	6 (0.4)	23 (0.4)	64 (0.5)	28 (0.3)	12 (0.3)	1 (0.1)	0
Mean birth weight (g)[3,5]	2891 (511)	2918 (477)	2985 (489)	3 047 (499)	3 117 (497)	3 178 (507)	3 200 (510)	3 184 (452)
Multiple pregnancy	1 (0.5)	13 (0.9)	57 (1.0)	205 (1.6)	121 (1.3)	47 (1.3)	6 (0.7)	1 (0.4)

[1] *Number in parentheses is percentage of total number in each height group, except where indicated.*
[2] *Height not known in 1 176 cases.*
[3] *Number in parentheses is standard deviation from mean.*
[4] *IUD = intra uterine death.*
[5] *Mean birth weight of singleton deliveries only.*

TABLE 3.9

POSTPARTUM HAEMORRHAGE AFTER DIFFERENT METHODS OF PLACENTAL DELIVERY BY PARITY
(Normal group, without augmentation, vaginal deliveries)

Parity number[1]	Controlled cord traction		Fundal pressure		Maternal effort		Manual removal		All methods[2]	
	Total	PPH (%)	Total	PPH (%)	Total	PPH (%)	Total	PPH (%)	Total	PPH (%)
All parities	9 985	140 (1.4)	4 674	200 (4.3)	69	2 (2.9)	172	35 (20.4)	14 900	377 (2.5)
Para 0	3 219	49 (1.5)	2 513	115 (4.6)	31	1 (3.2)	45	11 (24.4)	5 808	176 (3.0)
Para 1-4	5 684	75 (1.3)	2 089	82 (3.9)	33	1 (3.0)	95	20 (21.1)	7 901	178 (2.3)
Para 5+	1 056	15 (1.4)	61	3 (4.9)	5	0	31	3 (9.7)	1 153	21 (1.8)

[1] *Parity unknown in 38 cases.*
[2] *The table excludes 96 cases for whom method of placental delivery was unknown.*

TABLE 3.10

OXYTOCIC USAGE IN THIRD STAGE AND POSTPARTUM HAEMORRHAGE AFTER VAGINAL DELIVERY

Oxytocic usage	Total number	Number with vaginal PPH	(%)
None	153	1	(0.7)
Oxytocic before delivery of placenta	7 712	19	(0.2)
Ergometrine I.M.	540	0	
Ergometrine I.V.	0	0	
Methergin I.M.	22	1	(4.6)
Syntometrine I.M.	4 753	7	(0.1)
Oxytocin I.M.	2 378	8	(0.3)
Oxytocin infusion	11	0	
More than 1 agent	8	3	(37.5)
Oxytocic after delivery of placenta	5 682	176	(3.1)
Ergometrine I.M.	348	4	(1.2)
Ergometrine I.V.	5	0	
Methergin I.M.	4 751	133	(2.7)
Syntometrine I.M.	28	0	
Oxytocin I.M.	178	2	(1.1)
Oxytocin infusion	32	3	(9.4)
More than 1 agent	340	34	(10.0)
Oxytocics before and after delivery of placenta	1 303	186	(14.3)

4. IMPACT OF THE WHO PARTOGRAPH ON OBSTETRIC OUTCOME

4.1 Summary

The outcome of labour among the 18 254 women delivered before implementation of the partograph and the 17 230 delivered after implementation are described. A "normal" group of women among whom labour complications could not be anticipated was selected for particularly detailed analysis. Introduction of the partograph reduced the mean duration of observed labour and halved the proportion of labours requiring oxytocin augmentation although the mean duration of oxytocin usage among those receiving it increased. The total caesarean section rate fell from 12.5% to 11.2%; among the "normal" group it fell from 6.2% to 4.5% (p = 0.056). There was a fall in the already low rates of postpartum haemorrhage and puerperal sepsis. The partograph was unable to have any influence on maternal mortality or uterine rupture because of the circumstances under which these occurred.

There was a marginal improvement in fetal outcome as measured by intrapartum fetal deaths, Apgar scores, resuscitation measures and admission to neonatal special care facilities, though this improvement was not as marked as that in maternal outcomes.

The improvements occurred regardless of the dilatation of the cervix on admission in labour and appeared applicable to both nulliparous and parous women.

The possibility of factors other than the partograph with the associated labour management protocol being responsible for the improved results is addressed but most of the changes can probably be attributed to the implementation of the partograph. The results provide convincing evidence that improved labour outcome in a hospital setting can be achieved with the partograph.

A detailed statistical analysis of the impact of the WHO partograph on obstetric outcome has been published in the Lancet on 4 June 1994 (Lancet 1994, 343: 1399-1404).[59]

4.2 Outcomes Measured

This chapter examines the impact of the introduction of the WHO partograph with the associated labour management protocol on the fetal and maternal outcome of labour. The rates of the following features before and after implementation of the partograph were particularly studied:

a. Operative delivery
b. Prolonged labour (>18 hours)
c. Postpartum haemorrhage (≥500 ml)
d. Puerperal sepsis (pelvic infection with pyrexia)
e. Perinatal mortality
f. Perinatal morbidity.

Perinatal morbidity was assessed by Apgar scores, by the need for resuscitation at delivery and by the need for admission to special or intensive care nurseries. Intra-uterine deaths detected on admission (on which the use of the partograph in hospital after admission could have no impact) and intra-partum deaths after admission were identified separately. Neonatal mortality was poorly and certainly under-reported.

DESCRIPTION OF GROUPS OF WOMEN STUDIED

1. **Partograph not completed**

   a) Pregnancy gestation <34 weeks
   b) Cervix 9 or 10 cm dilated on admission
   c) Elective caesarean section
   d) Emergency caesarean section (on or within one hour of admission)

2. **Inductions**

   Women whose labour was induced by any method. Included in this group were those admitted but who were not in labour according to the criteria for entry on the partograph (Chapter 2) and who required an oxytocin infusion to induce labour.

3. **High risk**

   All women with any risk factor which might have had an influence on the course or management of labour. The most frequent were hypertensive disorders, multiple pregnancy, breech presentation, antepartum haemorrhage, previous caesarean section, preterm labour (34-37 weeks), postmaturity (≥43 weeks) and prolonged rupture of membranes (>12 hours). Medical conditions likely to influence the pregnancy and labour, e.g. cardiac disease and diabetes were also included in this group as were those women with an intra-uterine death on admission and those with a height of less than 1.40 metres.

4. **Normal**

   All women not in groups 1, 2 or 3 above, i.e. singleton pregnancies, 37-42 weeks gestation, with no recorded significant past obstetric or antenatal complication, with a cephalic presentation and presenting in spontaneous labour (fulfilling entry criteria for partograph), with the fetus alive on admission.

Maternal deaths and uterine rupture were also compared but are the subject of a separate detailed examination in Chapter 17.

The influence of the partograph on the practice of labour management was explored by comparing oxytocin usage and vaginal examinations in labour as well as the mean duration of labour.

4.3 Case Grouping

It has already been explained (Chapter 2) that a partograph was not completed in some cases because of contra-indications or exclusion criteria for partography in this trial. These women were recognized as a discrete group for analytical purposes. All other women were recognized as falling into one of three other groups, viz women whose labours were induced, those with high-risk pregnancies and women considered normal on admission in labour. These groups are described below.

Parity alone was not considered a risk factor and each of the groups described included women of all parities. Small stature (except for those under 1.40 metres) and maternal age were also not considered risk factors, although these were studied to a limited extent (see Chapter 3). All women in group 2, 3 or 4 were eligible for commencement and completion of a partograph.

The impact of the introduction of the partograph was studied in detail on all of these groups and on all women combined. Particular detailed analysis has, however, been carried out on group 4 (normal cases). These are women among whom problems cannot easily be anticipated and for whom the partograph may be most useful.

4.4 Distribution of Cases

4.4.1 Distribution by centre before and after implementation

There was an equal distribution of women entered into the study throughout its duration, each 5 month period of the 15 months seeing respectively 12 008, 12 358, and 11 118 cases entered. There was a satisfactory equal division of cases between those four centres who implemented the partograph after five months (early implementers) and those four centres implementing after ten months (late implementers), with 18 030 and 17 454 in each group respectively.

In total, 18 254 women were delivered before implementation and 17 230 after. The distribution of cases before and after implementation in each centre is shown in Table 4.1.

4.4.2 Distribution of risk groups before and after implementation

The numbers of women in each of the defined groups before and after implementation of the partograph are shown in Table 4.2. The proportion of normal cases showed little change before and after implementation but the induction rate dropped from 8.1% to 6.1% and cases who by definition would be excluded from partography rose from 19.3% to 24.1%. The distribution of cases with different reasons for exclusion from partography before and after implementation are shown in Table 4.3. Most of the rise in the number of cases after implementation in this group occurred in women admitted in advanced labour (9 or 10 cm cervical dilatation).

Table 4.4 shows the distribution of the more frequently observed high risk cases before and after implementation. There were some distinct changes in the rate of some high risk factors before and after implementation; notably there was a fall in cases with significant anaemia (from 13.2% of all high risk women to 4.5%) and rises in prematurity (34-37 weeks) from 16.7% to 20.9%, previous caesarean section (3.2% to 5.1%), prolonged pregnancy (3.9% to 6.9%) and prolonged rupture of the membranes (1.9% to 4.5%).

Some possible reasons are discussed in the commentary to this chapter.

4.5 Impact of Partography

4.5.1 Labour duration, labour management and complications

The effect of implementing the partograph on the duration of labour (from the time of admission in labour), on oxytocin usage, on vaginal examinations in labour and on the incidence of postpartum haemorrhage and puerperal sepsis is examined here. The rates of maternal death and uterine rupture are also presented but studied in detail in Chapter 17.

Cases from all groups and all centres are included in Table 4.5. The most striking effect of introducing the partograph was to halve the number of labours augmented with oxytocin, from 20.7% to 9.1%. Despite this, the mean duration of observed labour after admission fell from 5.72 to 5.05 hours, with an increase in short labours of less than 12 hours and a drop of almost half in the percentage of prolonged labours (>18 hours). Vaginal examinations in labour fell from a mean of 1.78 per woman to 1.52. The mean duration of oxytocin usage in those fewer labours augmented increased from 3.83 to 4.34 hours.

The low rates of postpartum haemorrhage have already been noted in Chapter 3. This may partly explain the unchanged postpartum haemorrhage rate following vaginal delivery although there was a small drop in postpartum haemorrhage associated with caesarean section delivery. There was a small fall in puerperal sepsis.

The same information displayed in Table 4.5 was analysed for the four previously identified risk groups and is presented in Tables 4.6, 4.7, 4.8 and 4.9. A change would not have been expected in the group excluded from partography, but Table 4.6 shows that some changes did occur. The direction of change was the same as in all groups combined but was less marked. As would be expected from the definition of the group, the majority of labours were short (or non-existent in the case of elective caesarean sections). The small number of long labours occurred mainly among premature labours (<34 weeks). Inaccurate cervical assessment may also have played a part, as did delays in "emergency" caesarean sections. With greater clarity of diagnosis and definitions after implementation, the numbers with these (on the face of it) surprisingly long labours fell.

The high risk group is shown in Table 4.7. The partograph would be expected to have less influence on this group because of risk factors affecting the course and management of labour. Again, however, the trend in this group shows similar changes but of smaller magnitude than in Table 4.5.

The changes in the induction group (Table 4.8) were the least pronounced of any group, but the proportion of labours augmented with oxytocin (when this had not been used as an original agent for induction) was halved when the partograph was introduced despite the lack of any specific protocol to apply to induced labours plotted on a partograph. Unlike any of the other groups,the mean duration of oxytocin use fell in this group.

As was anticipated, the group containing defined "normal" women showed the most marked changes after implementation of the partograph (Table 4.9). Oxytocin usage dropped in this group from 25.6% of labours to 10.6%. Despite this, the mean duration of labour dropped from 5.91 hours to 5.67 hours with labours over 18 hours falling from 5.5% to 2.7%. The mean duration of oxytocin use increased from 3.47 hours to 4.18 hours. Vaginal examinations

in labour fell from a mean of over to under two. There was a fall in puerperal sepsis but there was little impact on the postpartum haemorrhage rate.

The normal group was analysed further by breaking it down into nulliparous (Table 4.10) and parous women (Table 4.11). There was a similar degree of improvement among nulliparous and parous women; all parameters shifted in the same direction within the differences expected through the shorter labours of parous women.

4.5.2 Mode of delivery

This section examines the rates of different modes of delivery before and after implementation of the partography. As in the previous section (4.4.1) data on all women are presented first, followed by group presentations, with the normal group subsequently broken down by parity.

Among singleton deliveries for all women (Table 4.12), there was a small rise in the rate of spontaneous cephalic deliveries, from 72.2% to 73.7%. The rates of vaginal breech and operative vaginal deliveries were virtually unchanged as was the rate of elective caesarean section deliveries. Emergency caesarean sections fell from 9.7% to 8.3%. Among multiple deliveries, no particular trend was observed.

Among the group excluded from partography, the caesarean section rate fell from 18.9% to 16.9% (Table 4.13). By definition of this group, these caesarean sections included all elective caesarean sections and immediate emergency caesarean sections. Although the overall rate of operative vaginal deliveries was unchanged, there was a rise in vacuum extraction deliveries and a fall in forceps deliveries. This is reproduced in all the groups.

The smallest fall in the caesarean section rate (from 22.9% to 22.7%) was found in the high risk group (Table 4.14). Nevertheless, the rate of spontaneous cephalic delivery rose from 48.3% to 49.8%. This group, by definition, included a wide variety of risk factors and the partograph would not necessarily have been expected to influence the mode of delivery in many cases.

Women induced into labour shared a similar small rise in the rate of spontaneous cephalic deliveries and a fall in the caesarean section rate, from 17.3% to 15.2%.

For the purposes of this study, it was considered that the normal group of women were the most important and the most likely to benefit most from the use of a partograph in labour. It was, therefore, encouraging to note the significant fall in the caesarean section rate from 6.2% to 4.5% (Table 4.16). Spontaneous cephalic deliveries rose from 83.9% to 86.2%, and there was a small drop in the rate of operative vaginal deliveries although the persistent rise in vacuum extraction and corresponding fall in forceps deliveries was again noted. Breech and multiple pregnancies are, by definition, excluded from this group.

The largest fall in caesarean section rates following implementation of the partograph (from 9.8% to 6.9%) occurred among normal nulliparous women (Table 4.17); normal parous women sustained a smaller drop from 3.5% to 2.7% (Table 4.18).

4.5.3 Fetal outcome

The tables comparing fetal outcome before and after implementation of the partograph (Tables 4.19-4.25) are laid out as in the previous two sections. Table 4.19 shows the results

for all babies (singleton and multiple) from all groups. Among stillbirths, it was important to differentiate between those fetuses already dead on admission and those dying in labour after admission. The partograph in hospital could have no influence on the former group but could be expected to reduce the stillbirth rate in the latter. This was indeed the case, as intrapartum deaths fell from 0.5% to 0.3%, but there was also a drop (2.3% to 2.1%) among fetuses found to be dead on admission.

Neonatal deaths were certainly under-recorded and no conclusions can be drawn from the figures concerning neonatal deaths reported in Table 4.19 and subsequent tables.

Neonatal morbidity was estimated from Apgar scores, the need for resuscitation and the need for admission to special or intensive care nurseries. From these measures, there appears to have been a slight (though not statistically significant) improvement. There was no difference in the mean birth weight before and after implementation.

These trends towards a slight improvement in fetal outcome are shown in all groups with the exception of the high risk group (Table 4.21) among whom there was no particular change in morbidity measures, although stillbirths fell. Among normal women (Table 4.23), intrapartum deaths were very few (three before and three after implementation), but low Apgar scores at one minute were slightly fewer after implementation and fewer babies required admission to a neonatal special care unit. These trends were observed in normal nulliparous and parous women (Tables 4.24 and 4.25).

4.5.4 Fetal outcome and mode of delivery

A cross-tabulation comparing fetal outcome with mode of delivery before and after implementation of the partograph was carried out in the normal group of women (Table 4.26). Because of the similar trends in all parities, information is shown for all parities combined. Only Apgar scores and intrapartum deaths are included in this analysis. As noted before, there were too few stillbirths for comment to be of value, but it was noted that one of the three stillbirths after implementation occurred in a labour which was apparently poorly managed with deviation from the recommended protocol with inappropriate use of oxytocin.

The noteworthy feature of Table 4.26 is the increase in the proportions of babies with very low Apgars (<4) delivered by caesarean section after implementation (5.1%) compared to those delivered by the same method before implementation (2.9%). The number of babies delivered by caesarean section with intermediate Apgar scores (4-7) also rose, from 18.4% before implementation to 30.6% after. This was reflected in an increased rate of endotracheal intubation and of admission to neonatal intensive care units required after birth among babies born by caesarean section after implementation. Before implementation, 13 of 621 caesarean section deliveries (2.1%) required intubation and four (0.6%) required intensive care. The corresponding figures after implementation were 21 (5.2%) of 408 and 5 (1.2%) of 408. Neonatal morbidity among babies born by other modes of delivery was unaffected by implementation of the partograph.

4.6 Impact of Partography on Durations of Labour and Mode of Delivery at Different Admission Cervical Dilatations

It has been reported above (Section 4.4.1) that labour was shortened when the partograph with an associated labour management protocol was implemented. To study whether this overall effect occurred regardless of the degree of advancement of labour or was confined to certain admission dilatations, the mean duration of labour before and after

implementation of the partograph at different admission cervical dilatations was compared (Table 4.27). Modes of delivery before and after implementation dependent on the cervical dilatation on admission were similarly studied and are shown in Table 4.28.

Table 4.27 shows the mean duration of labour from admission to delivery among all women and among women from the normal group only. In both cases the results are similar. There was a reduction in the duration of labour regardless of the cervical dilatation on admission, with the exceptions of those small numbers of women (76 before and 24 after implementation) from the normal group admitted with an undilated cervix, and of women admitted in advanced labour (7 or more centimetres dilatation). The greatest reductions in mean duration of labour occurred among women admitted early in the active phase, at 3-4 cm dilatation.

The reduction in caesarean section rates was more marked when admission occurred at lower cervical dilatations (Table 4.28). Only women from the normal group are shown. There was a consistent decline in the amount by which the caesarean section rate was reduced from 0 cm admission dilatation (with a 21.3% reduction) to 5 cm admission dilatation (with a 0.7% reduction). From 6-8 cm admission dilatation there was no particular trend. Regardless of the admission dilatation, the operative vaginal delivery rate was little affected by implementation of the partograph; an increase in spontaneous deliveries occurred after all admission dilatations and reflected mainly the decline in caesarean section rates.

4.7 Impact within Individual Centres

The appendix reproduces most of the information from Tables 4.2, 4.5, 4.12 and 4.19 for each of the eight individual centres. The different proportions of case groupings in different centres is largely accounted for by the different populations served. The high proportion of "high risk" women, for example, at Centre 1947 (Palembang) reflect that hospital's position as a referral centre.

The changes seen with the implementation of the partograph show similar trends in most centres. Differences from the overall results were an increase in labour duration at Centre 1942 (Kuala Pilah) and Centre 1945 (Buddhachinarag), in the former case associated with a fall in the mean duration of oxytocin usage. In five other centres (1943: Muar, 1946: Medan, 1947: Palembang, 1948: Tangerang, 1949: Budi Kemuliaan) there was a fall in the mean duration of oxytocin usage. Caesarean section rates rose slightly in 1946: Medan and 1948: Tangerang.

The differences between centres in admissions to neonatal special care and intensive care largely reflect the varying availability of these facilities.

4.8 Commentary

The results presented in this chapter are central to the purpose of the multi-centre trial and provide clear evidence that the WHO partograph improves the outcome of labour. Despite a wealth of descriptive literature on partography, there is a paucity of comparative data before and after introduction and implementation of the partograph into labour management. As described in Chapter 2 of this report, a randomized controlled trial of the partograph would be impracticable because of contamination and the impossibility of blinding. Despite this, it is surprising that more "before and after" comparisons have not been attempted. The most convincing results were achieved among primigravidae by Philpott and Castle[9] in Zimbabwe who reduced the proportion of labours augmented with oxytocin as well as reducing prolonged

labour, caesarean section rates and perinatal deaths. Similar, though less pronounced improvements have been reported from Malawi.[39] In Papua New Guinea, Bird[13] reduced caesarean section rates from 5.3% to 2.1% apparently as a result of introducing the partograph but Lennox[16] found no improvement other than a slight reduction in caesarean sections offset by a rise in symphysiotomies. Beazley and Kurjak[40] found an increase in oxytocin augmentation and a shortening of labour. No other genuine studies of the impact of partography on the outcome of labour have been published. The results of the trial reported here thus assume major importance, especially in view of the very large numbers involved.

The introduction of the partograph in this multi-centre trial led to a reduction in the mean duration of labour with a corresponding fall in the incidence of prolonged labour. This was achieved despite halving the proportion of labours receiving oxytocin augmentation. Caesarean section rates fell and there was a corresponding rise in spontaneous vaginal deliveries; operative vaginal deliveries were unchanged. The incidence of puerperal sepsis and of postpartum haemorrhage fell slightly from levels which were already low. There was no impact on the small number of maternal deaths or cases of uterine rupture but the circumstances of these events were such that the partograph in hospital could not have been expected to influence the outcome. These events are described in detail in Chapter 17.

The mean duration of oxytocin usage rose after implementation of the partograph although there were inter-centre variations in this finding. This, combined with the other results summarized above, suggests that oxytocin augmentation was used more selectively and efficiently. It is a striking finding that reducing the use of oxytocin was associated with a reduction in the mean duration of labour. This accords with the findings of Philpott and Castle[9] but is in marked contrast to the findings of most other authors[11,40]. That the labours were more efficient appears to be confirmed by the reduced rate of caesarean sections.

The small fall in postpartum haemorrhages may also be a result of more efficient labour while the fall in puerperal sepsis may be related to the welcome reduction in prolonged labours and the number of vaginal examinations performed in labour.

When fetal outcome was examined, there was a definite trend towards an improvement with small reductions in intra-partum stillbirths, low Apgars, resuscitation and admission to special care facilities but this did not reach statistical significance. This relatively small improvement was doubtless partly because the fetal outcome in this population was already good and active management of labour was already being practised, albeit on an ad hoc basis. The finding of a poorer fetal outcome as measured by neonatal morbidity among infants born by caesarean section after implementation (Table 4.26) is at first sight worrying, but is almost certainly explained by the fall in caesarean sections after implementation. The actual number of depressed babies born by caesarean section after implementation was virtually unchanged but the proportion of them relative to all caesarean sections increased. It is likely that caesarean sections were performed more selectively in circumstances where there was a clearer indication after introduction of the partograph.

Overall, the fetal outcome appeared to be marginally improved by the use of the partograph and was certainly not compromised by the more significant improvements in maternal outcome.

The improvements described above were seen among all the groups of women described and occurred among multiparous, as well as nulliparous women, at least in the "normal" group studied by parity. The partograph appeared equally applicable as a tool for improving the outcome of labour regardless of the dilatation of the cervix on admission. Only

when admission occurred in advanced labour was there no reduction in the mean duration of labour or in the rate of caesarean section delivery. Most of these women were admitted during a short and efficient labour when no particular management decisions were required and the partograph would not be expected to have any influence on the (generally good) outcome.

The improved results achieved in all the groups of women do, however, show a possible source of bias in the results. A partograph was not commenced on women of less than 34 weeks gestation, or on those admitted at 9 or 10 cm cervical dilatation, or who had an elective or immediate emergency caesarean section. The partograph itself could therefore not be expected to influence the outcome in this group. Nonetheless, the outcome was improved to an extent similar to that seen among the other groups. The total numbers in the group of women excluded from partography increased after implementation; indeed this was the only group among whom there was a significant change (Table 4.2). Table 4.3 shows that the increased size of this group after implementation came about because of a greater number of women admitted in advanced labour (at 9 or 10 cm cervical dilatation). Presumably this was a chance occurrence. Although partographs were not used among these women, their care in late labour may have altered because of the pattern of labour management brought about through use of the partograph with other women. In addition, those women in labour at less than 34 weeks gestation were not included in the trial of partography, but may have had a partograph completed; this may then have influenced the management of labour. As with any trial which is not randomized, however, it is impossible to deny the possibility of influences other than the partograph (with the associated labour management protocol) affecting the results.

Other pointers which indicate the possibility of other influences at work include the change in the method of operative vaginal delivery and the fall in the number of admissions with the fetus already dead in utero. It is difficult to see any explanation other than chance in the latter situation, but the change in labour management brought about by the partograph may have influenced the decline in forceps deliveries and increase in vacuum extractions which resulted in a similar overall operative vaginal delivery rate before and after implementation of the partograph. The 9-10% of women delivered by forceps or vacuum extractor may not be the same type of women before and after implementation. The shift away from caesarean section brought about by the partograph may have resulted from better selection of the mode of delivery, so that women with possible borderline disproportion laboured better under partographic guidelines and were ultimately delivered by vacuum extraction, increasing the total numbers delivered this way. The decline in forceps deliveries may also have been a result of better labour management with more judicious timing of augmentation with the result that some deliveries which may have required forceps achieved a spontaneous delivery.

The improvements in labour outcome also occurred in induced labours and the overall rate of inductions fell during the study. This apparent fall may have occurred because of a tighter definition of induction after implementation although attempts were made to overcome this possibility by retrospectively allocating cases prior to implementation. The partograph was used in cases of induction although it was made clear that the alert and action lines probably did not apply to these cases. Nonetheless, it is likely that the improved management and outcome of spontaneous labour influenced the management of induced labour.

Although it would be possible to ascribe some of the good results achieved after implementation of the partograph to other unidentified factors, the design of this study with its large numbers, multi-centre format, short time scale and staggered implementation has eliminated other factors as much as possible. In the hospital settings of this trial, there was an overall improvement in labour outcome with the partograph and accompanying labour management protocol.

The failure to have any impact on maternal mortality was disappointing but the partograph could not be expected to influence any of the maternal deaths encountered (see Chapter 17). An impact on maternal mortality and the serious complications of prolonged labour, especially uterine rupture, can probably only be expected when the partograph is used as a tool for aiding referral decisions in women labouring outside the hospital. Its use in this setting has not been addressed in this trial nor in any adequate trial elsewhere. The potential for the use of the partograph as a referral tool is further discussed in Chapters 9 and 13. The positive results of the impact of partography in this multi-centre hospital setting, however, make a strong case for its use as a universal tool among women of all parities to aid the appropriate management of labour.

The change in the incidence of induction may also have played a part in the changes observed before and after implementation in the incidence of prolonged pregnancy and prolonged rupture of the membranes (Table 4.4). However, other factors, such as raised awareness, may have been important and may account for the rise in those recorded with a previous caesarean section after implementation. It is difficult to account for the large fall in reported anaemia after implementation or the small rise in prematurity and it may be that all the observed changes occurred by chance.

TABLE 4.1

NUMBER OF CONFINEMENTS BY CENTRE BEFORE AND AFTER IMPLEMENTATION

Centre	Total	Before implementation	After implementation
1	5 006	1 707	3 299
2	7 048	4 834	2 214
3	3 946	2 629	1 317
4	5 681	1 878	3 803
5	4 215	1 508	2 707
6	2 451	1 729	722
7	3 128	1 217	1 911
8	4 009	2 752	1 257
All	35 484	18 254	17 230

Centres 2, 3, 6 and 8 were early implementers.

TABLE 4.2

DISTRIBUTION OF WOMEN BY GROUP BEFORE AND AFTER IMPLEMENTATION

Group	All women	Before implementation	After implementation
Normal	19 179 (54.0)	10 049 (55.1)	9 130 (53.0)
High risk	6 091 (17.2)	3 196 (17.5)	2 895 (16.8)
Induction	2 529 (7.1)	1 483 (8.1)	1 046 (6.1)
Excluded from partograph	7 685 (21.7)	3 526 (19.3)	4 159 (24.1)
Total women	35 484 (100.0)	18 254 (100.0)	17 230 (100.0)

Results show number of women (percentages in parentheses).

TABLE 4.3

DISTRIBUTION OF CASES "EXCLUDED FROM PARTOGRAPHY" BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH

Reason for exclusion from partograph[1]	Total cases[2]	Before implementation[2]	After implementation[2]
Admitted at 9 or 10 cm cervical dilatation	6 076 (76.6)	2 681 (73.5)	3 395 (79.2)
Elective caesarean section	873 (11.0)	448 (12.3)	425 (9.9)
Immediate caesarean section	276 (3.5)	114 (3.1)	162 (3.8)
Premature (<34 weeks)	708 (8.9)	405 (11.1)	303 (7.1)

[1] *In some cases, more than one reason was given.*
[2] *Number in parentheses is percentage of total number in vertical column.*

TABLE 4.4

DISTRIBUTION OF "HIGH RISK" CASES BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH

High risk feature	Total cases		Before implementation		After implementation	
Hypertensive disease	1 608	(26.4)	863	(27.0)	745	(25.7)
Malpresentation	1 160	(19.0)	642	(20.1)	518	(17.9)
Prematurity (34-37 weeks)	1 136	(18.7)	532	(16.7)	604	(20.9)
Anaemia	553	(9.1)	423	(13.2)	130	(4.5)
Previous caesarean section	249	(4.1)	102	(3.2)	147	(5.1)
Prolonged pregnancy (>42 weeks)	324	(5.3)	125	(3.9)	199	(6.9)
Antepartum haemorrhage	270	(4.4)	116	(3.6)	154	(5.3)
Rupture of membranes >12 hours	193	(3.2)	62	(1.9)	131	(4.5)
Multiple pregnancy	172	(2.8)	92	(2.9)	80	(2.8)
Others	426	(7.0)	239	(7.5)	187	(6.5)
TOTAL	6091	(100.0)	3196	(100.0)	2895	(100.0)

Numbers in parentheses are percentages of total number in vertical column.

TABLE 4.5

LABOUR DURATION, LABOUR MANAGEMENT AND COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION
(All women)

Maternal outcomes	Before implementation		After implementation	
Total women	**18 254**	**(100.0)**	**17 230**	**(100.0)**
Mean no. of VEs[1] in labour	1.78	(1.53)[2]	1.52	(1.45)[2]
Mean duration of labour (hrs)[3]	5.72	(7.41)[2]	5.05	(5.89)[2]
Labour ≤12 hours[3]	15 819	(86.7)	15 424	(89.5)
Labour >12-18 hours[3]	1 079	(5.9)	1 079	(5.9)
Labour >18 hours[3]	1 147	(6.3)	589	(3.4)*
Labour augmented	3 785	(20.7)	1 573	(9.1)*
Mean duration of oxytocin use (hrs)	3.83	(3.98)[2]	4.34	(3.40)[2]
Postpartum haemorrhage[4] (caesarean section)	1 230	(6.7)	1 034	(6.0)
Postpartum haemorrhage[4] (vaginal)	480	(2.6)	476	(2.8)
Puerperal sepsis	127	(0.7)	37	(0.2)*
Uterine rupture	26	(0.1)	29	(0.2)
Maternal death	23	(0.13)	24	(0.14)

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Duration of labour not recorded in 347 cases.*
[4] *Blood loss ≥500 ml.*

* $p < 0.05$

TABLE 4.6

LABOUR DURATION, LABOUR MANAGEMENT AND COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION
(Group excluded from partography)

Maternal outcomes	Before implementation		After implementation	
Total women	**3 526**	**(100.0)**	**4 159**	**(100.0)**
Mean no. of VEs[1] in labour	0.50	(1.88)[2]	0.44	(1.66)[2]
Mean duration of labour (hrs)[3]	2.76	(6.93)[2]	1.97	(5.53)[2]
Labour ≤12 hours[3]	3 243	(92.0)	3 986	(95.8)
Labour >12-18 hours[3]	44	(1.2)	24	(0.6)
Labour >18 hours[3]	194	(5.5)	123	(3.0)
Labour augmented	107	(3.0)	53	(1.3)
Mean duration of oxytocin use (hrs)	2.80	(3.41)[2]	2.64	(2.43)[2]
Postpartum haemorrhage[4] (caesarean section)	361	(10.2)	410	(9.9)
Postpartum haemorrhage[4] (vaginal)	76	(2.2)	90	(2.2)
Puerperal sepsis	30	(0.9)	13	(0.3)
Uterine rupture	14	(0.4)	16	(0.4)
Maternal death	8	(0.2)	11	(0.3)

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Duration of labour not recorded in 71 cases.*
[4] *Blood loss ≥500 ml.*

TABLE 4.7

LABOUR DURATION, LABOUR MANAGEMENT AND COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION
(High risk group)

Maternal outcomes	Before implementation		After implementation	
Total women	**3 196**	**(100.0)**	**2 895**	**(100.0)**
Mean no. of VEs[1] in labour	1.95	(1.25)[2]	1.72	(1.16)[2]
Mean duration of labour (hrs)[3]	6.35	(7.36)[2]	5.81	(5.64)[2]
Labour ≤12 hours[3]	2 715	(84.9)	2 547	(88.0)
Labour >12-18 hours[3]	230	(7.2)	219	(7.6)
Labour >18 hours[3]	195	(6.1)	94	(3.2)
Labour augmented	771	(24.1)	434	(15.0)
Mean duration of oxytocin use (hrs)	4.16	(4.06)[2]	4.68	(3.24)[2]
Postpartum haemorrhage[4] (caesarean section)	421	(13.2)	336	(11.6)
Postpartum haemorrhage[4] (vaginal)	132	(4.1)	99	(3.4)
Puerperal sepsis	32	(1.0)	10	(0.3)
Uterine rupture	8	(0.3)	11	(0.4)
Maternal death	6	(0.2)	9	(0.3)

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Duration of labour not recorded in 71 cases.*
[4] *Blood loss ≥500 ml.*

TABLE 4.8

LABOUR DURATION, LABOUR MANAGEMENT AND COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION
(Induction group)

Maternal outcomes	Before implementation		After implementation	
Total women	**1 483**	**(100.0)**	**1 046**	**(100.0)**
Mean no. of VEs[1] in labour	2.48	(1.51)[2]	2.41	(1.31)[2]
Mean duration of labour (hrs)[3]	10.09	(10.76)[2]	9.58	(8.24)[2]
Labour ≤12 hours[3]	1 068	(72.0)	775	(74.1)
Labour >12-18 hours[3]	161	(10.9)	138	(13.2)
Labour >18 hours[3]	207	(14.0)	123	(11.8)
Labour augmented[4]	332	(22.4)	119	(11.4)
Mean duration of oxytocin use (hrs)	6.29	(5.54)[2]	5.15	(3.79)[2]
Postpartum haemorrhage[5] (caesarean section)	120	(8.1)	77	(7.4)
Postpartum haemorrhage[5]	41	(2.8)	45	(4.3)
Puerperal sepsis	11	(0.7)	4	(0.4)
Uterine Rupture	0		0	
Maternal death	2	(0.1)	1	(0.1)

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Duration of labour not recorded in 57 cases.*
[4] *Inductions which started with either ARM or prostaglandin.*
[5] *Blood loss ≥500 ml.*

TABLE 4.9

LABOUR DURATION, LABOUR MANAGEMENT AND COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION
(Normal group)

Variable	Before implementation		After implementation	
Total women	**10 049**	**(100.0)**	**9 130**	**(100.0)**
Mean no. of VEs[1] in labour	2.06	(1.20)[2]	1.84	(1.16)[2]
Mean duration of labour (hrs)[3]	5.91	(6.54)[2]	5.67	(5.14)[2]
Labour ≤12 hours[3]	8793	(87.5)	8 116	(88.9)
Labour >12-18 hours[3]	644	(6.4)	738	(8.1)
Labour >18 hours[3]	551	(5.5)	249	(2.7)*
Labour augmented	2 575	(25.6)	967	(10.6)*
Mean duration of oxytocin use (hrs)	3.47	(3.60)[2]	4.18	(3.42)[2]
Postpartum haemorrhage[4] (caesarean section)	328	(3.3)	211	(2.3)
Postpartum haemorrhage[4] (vaginal)	231	(2.3)	242	(2.7)
Puerperal sepsis	54	(0.5)	10	(0.1)*
Uterine rupture	0		0	
Maternal death	0		0	

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Duration of labour not recorded in 88 cases.*
[4] *Blood loss ≥500 ml.*

* $p < 0.05$

TABLE 4.10

LABOUR DURATION, LABOUR MANAGEMENT AND COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION
(Normal group, nulliparous women)

Variable	Before implementation		After implementation	
Total women[3]	**4 212**	**(100.0)**	**3 924**	**(100.0)**
Mean no. of VEs[1] in labour	2.38	(1.30)[2]	2.14	(1.33)[2]
Mean duration of labour (hrs)[4]	7.72	(7.28)[2]	7.25	(5.63)[2]
Labour ≤12 hours[4]	3 450	(81.9)	3 243	(82.6)
Labour >12-18 hours[4]	391	(9.3)	494	(12.6)
Labour >18 hours[4]	347	(8.2)	176	(4.5)*
Labour augmented	1 353	(32.1)	539	(13.7)**
Mean duration of oxytocin use (hrs)	3.90	(3.82)	4.77	(3.69)
Postpartum haemorrhage[5] (caesarean section)	211	(5.0)	148	(3.8)
Postpartum haemorrhage[5] (vaginal)	90	(2.1)	120	(3.1)
Puerperal sepsis	34	(0.8)	3	(0.1)***

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Parity not known in 27 cases before, and 14 cases after implementation.*
[4] *Duration of labour not known in 35 cases.*
[5] *Blood loss ≥500 ml.*

* $p = 0.017$
** $p = 0.049$
*** $p = 0.001$

TABLE 4.11

LABOUR DURATION, LABOUR MANAGEMENT AND COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION
(Normal group, parous women)

Variable	Before implementation		After implementation	
Total women[3]	**5 810**	**(100.0)**	**5 192**	**(100.0)**
Mean no. of VEs[1] in labour	1.82	(1.06)[2]	1.60	(0.96)[2]
Mean duration of labour (hrs)[4]	4.60	(5.59)[2]	4.48	(4.38)[2]
Labour ≤12 hours[4]	5 321	(91.6)	4 862	(93.6)
Labour >12-18 hours[4]	249	(4.3)	242	(4.7)
Labour >18 hours[4]	203	(3.5)	72	(1.4)*
Labour augmented	1214	(20.9)	427	(8.2)*
Mean duration of oxytocin use (hrs)	2.99	(3.28)[2]	3.43	(2.87)[2]
Postpartum haemorrhage[5] (caesarean section)	115	(2.0)	63	(1.2)
Postpartum haemorrhage[5] (vaginal)	138	(2.4)	122	(2.3)
Puerperal sepsis	20	(0.3)	7	(0.1)*

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Parity not known in 27 cases before, and 14 cases after implementation.*
[4] *Duration of labour not known in 53 cases.*
[5] *Blood loss ≥500 ml.*

* $p < 0.05$

TABLE 4.12

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION
(All women)

Mode of delivery	Before implementation		After implementation	
Total	**18 254[1]**	**(100.0)**	**17 230[2]**	**(100.0)**
Singleton deliveries				
spontaneous cephalic	13 186	(72.2)	12 704	(73.7)
vaginal breech	618	(3.4)	591	(3.4)
vacuum extraction	1 170	(6.4)	1 240	(7.2)
forceps	623	(3.4)	409	(2.4)
other vaginal	106	(0.6)	70	(0.4)
caesarean section (total)[3]	2 278	(12.5)	1 926	(11.2)
- elective	503	(2.8)	476	(2.8)
- emergency	1 767	(9.7)	1 427	(8.3)
Multiple deliveries	240	(1.1)	247	(1.3)
both vaginal	198	(0.2)	210	(0.2)
at least 1 caesarean section	41	(2.4)	37	(2.7)

[1] This total number includes 23 cases delivered by laparotomy and 11 including 1 multiple) by unknown mode.
[2] This total number includes 28 cases delivered by laparotomy and 15 by unknown mode.
[3] The classification of caesarean section into elective and emergency is unclear in some cases.

TABLE 4.13

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION
(Group excluded from partography)

Mode of delivery	Before implementation		After implementation	
Total	**3 526[1]**	**(100.0)**	**4 159[2]**	**(100.0)**
Singleton deliveries				
spontaneous vertex	2 237	(63.4)	2 679	(64.4)
vaginal breech	203	(5.8)	237	(5.7)
vacuum extraction	217	(6.2)	304	(7.3)
forceps	85	(2.4)	65	(1.6)
other vaginal	40	(1.1)	42	(0.9)
caesarean section	667	(18.9)	701	(16.9)
Multiple deliveries				
both vaginal	52	(1.5)	93	(2.2)
at least 1 caesarean section	8	(0.2)	21	(0.5)

[1] *Includes 13 women with laparotomies and 4 women with unknown mode of delivery.*
[2] *Includes 16 women with laparotomies and 1 woman with unknown mode of delivery.*

TABLE 4.14

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION
(High risk group)

Mode of delivery	Before implementation		After implementation	
Total women	**3 196[1]**	**(100.0)**	**2 895[2]**	**(100.0)**
Singleton deliveries				
spontaneous vertex	1 544	(48.3)	1 443	(49.8)
vaginal breech	369	(11.5)	333	(11.5)
vacuum extraction	202	(6.3)	228	(7.9)
forceps	124	(3.9)	83	(2.9)
other vaginal	55	(1.7)	23	(0.8)
caesarean section	733	(22.9)	657	(22.7)
Multiple deliveries				
both vaginal	132	(4.1)	103	(3.6)
at least 1 caesarean section	27	(0.8)	13	(0.4)

[1] *Includes 6 women with laparotomy and 4 women with unknown mode of delivery.*
[2] *Includes 10 women with laparotomy and 2 women with unknown mode of delivery.*

TABLE 4.15

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION
(Induction group)

Mode of delivery	Before implementation		After implementation	
Total women	**1 483[1]**	**(100.0)**	**1 046[2]**	**(100.0)**
Singleton deliveries				
spontaneous vertex	977	(65.9)	713	(68.2)
vaginal breech	46	(3.1)	21	(2.0)
vacuum extraction	97	(6.5)	94	(9.0)
forceps	73	(4.9)	34	(3.3)
other vaginal	11	(0.8)	5	(0.5)
caesarean section	257	(17.3)	159	(15.2)
Multiple deliveries				
both vaginal	14	(0.9)	14	(1.3)
at least 1 caesarean section	6	(0.4)	3	(0.3)

[1] Includes 1 laparotomy and 1 unknown mode of delivery.
[2] Includes 1 laparotomy and 2 unknown modes of delivery.

TABLE 4.16

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION
(Normal group)

Mode of delivery	Before implementation		After implementation	
Total	**10 049[1]**	**(100.0)**	**9 130[2]**	**(100.0)**
Singleton deliveries				
spontaneous cephalic	8 428	(83.9)	7 869	(86.2)*
vacuum extraction	654	(6.5)	614	(6.7)
forceps	341	(3.4)	227	(2.5)**
caesarean section	621	(6.2)	409	(4.5)***

Results show number of women (percentages in parentheses).
[1] Includes 5 unknown mode of delivery.
[2] Includes 11 unknown mode of delivery.

** p = 0.001*
*** p = 0.005*
**** p = 0.056*

TABLE 4.17

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION
(Normal group, nulliparous women)

Mode of delivery	Before implementation		After implementation	
Total[1]	**4 212**[2]	**(100.0)**	**3 924**[3]	**(100.0)**
Singleton deliveries				
spontaneous cephalic	3 129	(74.3)	3 069	(78.2)*
vacuum extraction	441	(10.5)	413	(10.5)
forceps	227	(5.4)	165	(4.2)**
caesarean section	414	(9.8)	271	(6.9)***

[1] *Parity not known in 27 cases before, and 14 after implementation.*
[2] *Total includes 1 unknown mode of delivery.*
[3] *Total includes 6 unknown mode of delivery.*

* $p < 0.001$
** $p = 0.022$
*** $p = 0.060$

TABLE 4.18

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION
(Normal group, multiparous women)

Mode of delivery	Before implementation		After implementation	
Total[1]	**5 810**[2]	**(100.0)**	**5 192**[3]	**(100.0)**
Singleton deliveries				
spontaneous cephalic	5 275	(90.8)	4 787	(92.2)*
vacuum extraction	213	(3.7)	200	(3.9)
forceps	113	(1.9)	62	(1.2)**
caesarean section	205	(3.5)	138	(2.7)***

[1] *Parity not known in 27 cases before, and 14 after implementation.*
[2] *Includes 4 with unknown mode of delivery.*
[3] *Includes 5 with unknown mode of delivery.*

* $p = 0.044$
** $p = 0.026$
*** $p = 0.170$

TABLE 4.19

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(All babies)

Fetal outcome	Before implementation		After implementation	
Total[1]	**18 483**	**(100.0)**	**17 461**	**(100.0)**
Still births				
total	516	(2.8)	413	(2.4)
intra-partum	92	(0.5)	55	(0.3)
dead on admission	424	(2.3)	358	(2.1)
Neonatal deaths				
total	89	(0.5)	50	(0.3)
<24 hours	66	(0.4)	35	(0.2)
1-7 days	23	(0.1)	15	(0.1)
1 min. Apgar[2]				
0-3	312	(1.7)	267	(1.6)
4-7	1 903	(10.6)	1 980	(11.3)
8-10	15 735	(87.7)	14 795	(86.8)
Resuscitation				
bagging	884	(4.8)	853	(4.9)
ventilation	229	(1.2)	173	(1.0)
Admitted				
neonatal special care	1 974	(10.7)	1 626	(9.3)
neonatal intensive care	87	(0.5)	58	(0.3)
mean birth weight (g)[3]	3 062	(515)[4]	3 068	(496)[4]

[1] *Insufficient data from 16 cases before, and 19 cases after implementation.*
[2] *Apgar not recorded in 533 cases before, and 419 cases after implementation (mainly stillbirths).*
[3] *Singletons only.*
[4] *Standard deviation.*

TABLE 4.20

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(Group excluded from partography)

Fetal outcome	Before implementation		After implementation	
Total babies[1]	**3 577**	**(100.0)**	**4 261**	**(100.0)**
Still births				
total	195	(5.5)	220	(5.2)
intra-partum	34	(1.0)	28	(0.7)
dead on admission	161	(4.5)	192	(4.5)
Neonatal deaths				
total	47	(1.3)	20	(0.5)
<24 hours	39	(1.1)	15	(0.4)
1-7 days	8	(0.2)	5	(0.1)
1 min. Apgar[2]				
0-3	119	(3.5)	110	(2.7)
4-7	465	(13.8)	638	(15.8)
8-10	2 793	(82.7)	3 290	(81.5)
Resuscitation				
bagging	227	(6.4)	274	(6.5)
ventilation	88	(2.5)	57	(1.3)
Admitted				
neonatal special care	474	(13.3)	507	(11.9)
neonatal intensive care	39	(1.1)	15	(0.4)
mean birth weight (g)[3]	2 934	(635)[4]	2 992	(587)[4]

[1] *Insufficient data from 9 cases before, and 12 cases after implementation.*
[2] *Apgar not recorded in 200 cases before, and 223 cases after implementation (mainly stillbirths).*
[3] *Singletons only.*
[4] *Standard deviation.*

TABLE 4.21

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(High risk group)

Fetal outcome	Before implementation		After implementation	
Total babies[1]	**3 356**	**(100.0)**	**3 010**	**(100.0)**
Still births				
total	214	(6.4)	147	(4.9)
intra-partum	37	(1.1)	20	(0.7)
dead on admission	177	(5.3)	127	(4.2)
Neonatal deaths				
total	22	(0.7)	18	(0.6)
<24 hours	17	(0.5)	13	(0.4)
1-7 days	5	(0.1)	5	(0.2)
1 min. Apgar[2]				
0-3	94	(3.0)	91	(3.2)
4-7	604	(19.2)	596	(20.8)
8-10	2 441	(77.8)	2 173	(76.0)
Resuscitation				
bagging	268	(8.1)	261	(8.7)
ventilation	82	(2.5)	63	(2.1)
Admitted				
neonatal special care	641	(19.2)	519	(17.3)
neonatal intensive care	19	(0.6)	23	(0.8)
mean birth weight (g)[3]	2 966	(550)[4]	2 966	(532)[4]

[1] *Insufficient data from 4 cases before, and 4 cases after implementation.*
[2] *Apgar not recorded in 217 cases before, and 150 cases after implementation (mainly stillbirths dead on admission).*
[3] *Singletons only.*
[4] *Standard deviation.*

TABLE 4.22

FETAL OUTCOMES BEFORE AND AFTER IMPLEMENTATION
(Induction group)

Fetal outcome	Before implementation		After implementation	
Total babies[1]	**1 503**	**(100.0)**	**1 063**	**(100.0)**
Still births				
total	104	(6.9)	43	(4.0)
intra-partum	18	(1.2)	4	(0.4)
dead on admission	86	(5.7)	39	(3.7)
Neonatal deaths				
total	11	(0.7)	4	(0.4)
<24 hours	6	(0.4)	2	(0.2)
1-7 days	5	(0.3)	2	(0.2)
1 min. Apgar[2]				
0-3	31	(2.2)	11	(1.1)
4-7	166	(11.9)	132	(12.9)
8-10	1 201	(85.9)	872	(86.0)
Resuscitation				
bagging	92	(6.1)	61	(5.7)
ventilation	22	(1.5)	6	(0.6)
Admitted				
neonatal special care	221	(14.8)	147	(13.8)
neonatal intensive care	13	(0.9)	3	(0.3)
mean birth weight (g)[3]	3 009	(605)[4]	3 087	(539)[4]

[1] *Insufficient data from 1 case before implementation.*
[2] *Apgar not recorded in 105 cases before, and 43 cases after implementation (mainly stillbirths).*
[3] *Singletons only.*
[4] *Standard deviation.*

TABLE 4.23

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(Normal group)

Fetal outcome	Before implementation		After implementation	
Total babies[1]	**10 047**	**(100.0)**	**9 127**	**(100.0)**
Still births				
intra-partum	3	(0.03)	3	(0.03)
Neonatal deaths				
total	9	(0.09)	8	(0.09)
<24 hours	4	(0.04)	5	(0.05)
1-7 days	5	(0.05)	3	(0.03)
1 min. Apgar[2]				
0-3	68	(0.7)	55	(0.6)
4-7	668	(6.7)	614	(6.7)
8-10	9 300	(92.7)	8 455	(92.7)
Resuscitation				
bagging	297	(3.0)	257	(2.8)
ventilation	37	(0.4)	47	(0.5)
Admitted				
neonatal special care	638	(6.3)	453	(5.0)
neonatal intensive care	16	(0.2)	17	(0.2)
mean birth weight (g)	3 142	(420)[3]	3 131	(420)[3]

[1] *Insufficient data from 2 cases before and 3 cases after implementation.*
[2] *Apgar not recorded in 11 cases before, and 3 cases after implementation.*
[3] *Standard deviation.*

TABLE 4.24

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(Normal group, nulliparous women)

Fetal outcome	Before implementation		After implementation	
Total babies[1]	**4 211**	**(100.0)**	**3 922**	**(100.0)**
Still births				
intra-partum	2	(0.05)	1	(0.03)
Neonatal deaths				
total	6	(0.14)	3	(0.08)
<24 hours	2	(0.05)	1	(0.03)
1-7 days	4	(0.09)	2	(0.05)
1 min. Apgar[2]				
0-3	39	(0.9)	35	(0.9)
4-7	397	(9.4)	387	(9.9)
8-10	3 722	(89.6)	3 499	(89.2)
Resuscitation				
bagging	161	(3.8)	157	(4.0)
ventilation	24	(0.6)	25	(0.6)
Admitted				
neonatal special care	315	(7.5)	230	(5.9)
neonatal intensive care	9	(0.2)	10	(0.3)
mean birth weight (g)	3 035	(383)[3]	3 027	(384)[3]

[1] *Parity not known in 27 cases before, and 14 cases after implementation.*
[2] *Apgar not recorded in 3 cases before, and 1 case after implementation.*
[3] *Standard deviation.*

TABLE 4.25

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(Normal group, parous women)

Fetal outcome	Before implementation		After implementation	
Total babies[1]	**5 809**	**(100.0)**	**5 191**	**(100.0)**
Still births				
intra-partum	1	(0.02)	2	(0.04)
Neonatal deaths				
total	3	(0.05)	5	(0.10)
<24 hours	2	(0.03)	4	(0.08)
1-7 days	1	(0.02)	1	(0.02)
1 min. Apgar[2]				
0-3	29	(0.5)	20	(0.4)
4-7	267	(4.6)	227	(4.4)
8-10	5 505	(94.9)	4 942	(95.2)
Resuscitation				
bagging	135	(2.3)	100	(1.9)
ventilation	13	(0.2)	22	(0.4)
Admitted				
neonatal special care	321	(5.5)	221	(4.3)
neonatal intensive care	7	(0.1)	7	(0.1)
mean birth weight (g)	3 219	(429)[3]	3 211	(428)[3]

[1] *Parity not known in 27 cases before, and 14 cases after implementation.*
[2] *Apgar not recorded in 8 cases before, and 2 cases after implementation.*
[3] *Standard deviation.*

TABLE 4.26

FETAL OUTCOME BY MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Normal group)

Fetal outcome	Mode of delivery[1]											
	Before implementation						After implementation					
	Spontaneous vertex delivery		Operative vaginal delivery		Caesarean section		Spontaneous vertex delivery		Operative vaginal delivery		Caesarean section	
All babies	**8 426**		**995**		**621**		**7 868**		**841**		**408**	
Intrapartum fetal death	2		0		1		2		1		0	
Apgar 0-3[2]	29	(0.3)	21	(2.1)	18	(2.9)	20	(0.3)	14	(1.7)	21	(5.1)
Apgar 4-7[2]	337	(4.0)	215	(21.6)	114	(18.4)	306	(3.9)	183	(21.8)	125	(30.6)
Apgar 8-10[2]	8 053	(95.7)	759	(76.3)	486	(78.6)	7 540	(95.9)	644	(76.6)	262	(64.2)

[1] *Mode of delivery unknown in 7 cases before implementation and 13 cases after implementation. Apgar scores unknown in a further 10 cases before and 2 cases after implementation.*
[2] *Numbers in parentheses are percentages of total number at top of each vertical column.*

TABLE 4.27

DURATION OF LABOUR BY DIFFERENT CERVICAL DILATATIONS ON ADMISSION BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH

Cervical dilatation on admission (cm)	Mean duration of labour (from admission) Hours, with standard deviation in parentheses							
	All women				"Normal cases" only			
	Before implementation		After implementation		Before implementation		After implementation	
0	17.8	(15.0)	14.8	(14.2)	13.6	(10.2)	14.7	(12.4)
1	12.6	(10.0)	12.0	(8.2)	12.8	(9.1)	12.6	(7.4)
2	10.2	(8.2)	9.5	(5.6)	10.4	(7.9)	9.8	(5.1)
3	6.8	(6.2)	5.5	(3.7)	6.9	(6.1)	5.4	(3.5)
4	4.7	(4.6)	4.0	(3.1)	4.7	(4.6)	3.9	(2.9)
5	3.4	(3.2)	3.2	(2.8)	3.2	(2.8)	3.0	(2.6)
6	2.7	(2.5)	2.6	(2.1)	2.6	(2.2)	2.4	(1.9)
7	2.2	(2.9)	2.4	(2.1)	2.1	(2.3)	2.1	(1.7)
8	1.7	(2.3)	1.8	(1.5)	1.5	(1.9)	1.8	(1.5)
9	1.2	(1.9)	1.3	(1.9)	-		-	
ALL[1]	6.3	(7.4)	5.7	(5.8)	5.9	(6.5)	5.7	(5.1)

[1] *These means are derived from a total of 29 779 women (19 035 "normal" women) where all the above observations were available and the mean durations therefore differ a little from those in Tables 4.5 and 4.9.*

TABLE 4.28

MODE OF DELIVERY BY CERVICAL DILATATION ON ADMISSION BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH (Normal group[1])

Cervical dilatation on admission (cm)	Mode of delivery											
	All modes		Spontaneous vertex delivery				Operative vaginal				Caesarean section			
	Before[1]	After[2]	Before		After		Before		After		Before		After	
0	76	24	38	(50.0)	15	(62.5)	6	(7.9)	4	(16.7)	32	(42.1)	5	(20.8)
1	596	681	404	(67.8)	517	(75.9)	88	(14.8)	93	(13.7)	104	(17.4)	71	(10.4)
2	1 676	1 817	1 319	(78.7)	1 532	(84.3)	209	(12.5)	189	(10.4)	148	(8.8)	93	(5.1)
3	2 252	2 120	1 884	(83.7)	1 795	(84.7)	229	(10.2)	228	(10.8)	138	(6.1)	94	(4.4)
4	1 773	1 605	1 536	(86.6)	1 438	(89.6)	153	(8.6)	110	(6.9)	84	(4.7)	55	(3.4)
5	1 318	1 157	1 168	(88.6)	1 037	(89.6)	110	(8.3)	91	(7.9)	39	(3.0)	27	(2.3)
6	857	773	762	(88.9)	690	(89.2)	73	(8.5)	61	(7.9)	20	(2.3)	22	(2.8)
7	654	479	588	(89.9)	431	(89.9)	48	(7.3)	35	(7.3)	18	(2.8)	13	(2.7)
8	747	430	662	(88.6)	388	(90.2)	62	(8.3)	27	(6.3)	12	(1.6)	15	(3.5)
All women	9 949[4]	9 086[5]	8 361	(84.0)	7 843	(86.3)	988	(9.9)	838	(9.2)	595	(5.9)	395	(4.3)

Percentages of all modes shown in parentheses.

[1] *For whom information available.*

[2] *Before = before implementation.*

[3] *After = after implementation.*

[4] *Mode of delivery unknown in 5 cases.*

[5] *Mode of delivery unknown in 10 cases.*

5-13. THE WHO PARTOGRAPH AS A TOOL FOR IDENTIFYING ABNORMAL LABOUR

Introduction

Chapters 5-13 analyse the efficiency of the WHO partograph as a tool for identifying those labours which are likely to require intervention. The pattern of cervical dilatation is considered and related to the lines drawn on the partograph. The outcome of labour is related to the course of labour as plotted on the partograph. Particular areas of difficulty and controversy, i.e. the latent/active phase interface and the "referral zone" are studied in detail. The possible role of partography without vaginal examinations is briefly assessed.

The role of the management protocol introduced with the partograph is not specifically addressed in these chapters which study what happens to labours which follow certain patterns of progress. The management protocol itself is studied in detail in Chapter 14.

Each chapter begins with a short summary of its contents and the results are presented with accompanying brief comments.

In Chapter 13, a more detailed commentary is made on the whole pattern of labour on the WHO partograph as described in Chapters 5-12.

5. CERVICAL DILATATION RATES

5.1 Summary

The rates of cervical dilatation from admission in labour to full dilatation or commencement of oxytocin augmentation among women from the normal group (before and after implementation) were studied. The mean rate of cervical dilatation (regardless of the admission dilatation) among 17 875 women was 2.87 cm/hour. The rate for nullipara was 1.63 cm/hour, for multipara (1-4) 3.69 cm/hour and for grand multipara (5+) 4.14 cm/hour. The mean rate of dilatation was close to 1 cm/hour in the latent phase and >2 cm/hour in the active phase. There was no evidence of a deceleration in the rate of dilatation at the end of the active phase. The slowest 25% of women dilated at a mean rate just over 1 cm/hour, with the slowest 10% at just under 1 cm/hour.

Slight differences in the mean rates of cervical dilatation before and after implementation may be related to the earlier timing of artificial rupture of membranes (ARM) in the active phase of labour, encouraged with the introduction of the partograph. Women who had an ARM had a mean cervical dilatation rate of 3.05 cm/hour, compared to 2.18 cm/hour when the membranes ruptured spontaneously after admission in labour.

5.2 Normal Cervical Dilatation Rates

Although this trial examined the role of a predetermined partograph in labour management and outcome, the opportunity was taken to study rates of cervical dilatation among normal, unaugmented labours. Knowledge of the cervical dilatation on admission in labour and of the subsequent interval to full dilatation or to commencement of oxytocin allows the construction of Table 5.1 which shows the mean rate of cervical dilatation from different admission cervical dilatations. This information is available for women both before and after implementation of the partograph and all women included in the trial who were in the "normal" group (as defined in Chapter 4) are shown in Table 5.1. The mean rates of cervical dilatation for all women and for those at the 25th and the 10th percentile rate of dilatation are shown. A breakdown by parity groupings is also given.

It is important that Table 5.1 includes not only those women who never received oxytocin augmentation in labour but also those who did ultimately receive augmentation. However, only the rate of dilatation until augmentation was commenced is included for the latter group. The rates of dilatation in Table 5.1 therefore do include slow labours; this is essential if a true picture of the normal distribution of labour progress is to be compiled. Most reports of the pattern of cervical dilatation either exclude augmented labours altogether[10,22] or do not make it clear whether such labours are included in their compilation.[7,8,41,43]

The small numbers of women admitted at 0 cm cervical dilatation distort the figures for the mean rate of dilatation from that dilatation. Only 20 women, of para 1-4, for example, were admitted with the cervix undilated. A true mean rate of cervical dilatation of 4.58 cm/hour from this position in a larger group of women would be most improbable.

Otherwise, Table 5.1 shows an anticipated pattern, with mean rates of cervical dilatation of about 1 cm/hour among women admitted in the latent phase of labour, but faster than this (2.12-4.58 cm/hour) among women admitted in the active phase.

Friedmann[7] claimed a deceleration phase in the late first stage of labour but the data from this study do not suggest this. Those women admitted at 7 or 8 cm dilatation showed similar rates of cervical dilatation to those admitted at 5 or 6 cm dilatation. The patterns in this study were very similar to those described by Studd,[10] Hendricks et al,[41] and Ledger,[49] with no discernable late deceleration phase.

In assessing the validity of the lines on the WHO partograph, the rate of dilatation in the active phase of labour is of major importance. When all parities are considered together, the slowest 25% of women have a rate of dilatation in the active phase of just over 1 cm/hour; the slowest 10% a rate of under 1 cm/hour. This suggests that a line drawn at 1 cm/hour on the partograph does usefully distinguish between the majority of labours progressing rapidly (>1 cm/hour) and the minority progressing slowly.

When the parities are considered separately, the 1 cm/hour line appears equally valid although parous women certainly dilate more rapidly than nullipara. The 25th percentile dilatation rate among nullipara is very close to 1 cm/hour, whereas it is between 1 and 2 cm/hour among multipara. The slowest 10% of women of all parities dilate at a rate less than 1 cm/hour.

5.3 Influences on Cervical Dilatation rates

5.3.1 Implementation of the partograph

The mean rates of cervical dilatation from different admission cervical dilatations to full dilatation or augmentation among women from the previously defined normal group before and after implementation of the partograph are compared in Table 5.2. There are some slight but interesting differences. In the earlier stages of labour (up to 4-5 cm cervical dilatation), labour tended to be slower before implementation, whereas in more advanced labour, the mean rates of cervical dilatation before implementation are greater than after implementation. An explanation for this difference may lie in the use of a more accurate definition of labour after implementation. At all dilatations, the slowest 10% of women dilated markedly more slowly before than after implementation.

5.3.2 Rupture of membranes

A further plausible explanation for the changes described above (5.2.1), bearing in mind that labours studied here had no augmentation, is a change in the practice of artificial rupture of the membranes (ARM). As a result of the labour management protocol introduced with the partograph, a number of centres ruptured membranes earlier in the active phase of labour than had been their custom. Table 5.3 examines the influence of the membranes on the rate of cervical dilatation. Women before and after implementation but only from the normal group are studied. All parities are combined.

The membranes of a very small number of women (40) remained intact until delivery. This group had a slow mean rate of cervical dilatation (1.70 cm/hour). The most rapid rate of dilatation (3.05 cm/hour overall mean) occurred among women who had an ARM in the unit at some point in labour after admission. Those who arrived with membranes already ruptured before admission were a little slower (2.66 cm/hour) but those with spontaneous rupture of membranes after admission were slower still (2.18 cm/hour). Table 5.3 does not relate to the dilatation at which the membranes ruptured, either artificially or spontaneously, but appears to confirm that labour is more rapid in the presence of ruptured membranes, particularly from 4 cm dilatation.

TABLE 5.1

CERVICAL DILATATION RATES AMONG UNAUGMENTED LABOURS BY ADMISSION CERVICAL DILATATION
(Normal group, by parity*)

Cervical dilatation on admission	Mean rate of cervical dilatation (cm/hour)											
	All parities			Para 0			Para 1-4			Para 5 +		
	Overall	25th centile	10th centile	Overall	25th centile	10th centile	Overall	25th centile	10th centile	Overall	25th centile	10th centile
0	1.86	0.19	0.01	0.53	0.21	0.08	4.58	0.09	0.00	0.40	0.40	0.40
1	0.90	0.29	0.04	0.79	0.26	0.00	1.17	0.32	0.05	0.80	0.24	0.05
2	1.14	0.42	0.02	0.98	0.39	0.00	1.31	0.49	0.05	1.48	0.44	0.00
3	2.12	0.79	0.05	1.51	0.69	0.12	2.49	0.91	0.00	2.75	0.82	0.00
4	3.30	1.14	0.46	1.99	0.91	0.35	4.03	1.33	0.64	3.80	1.24	0.49
5	4.32	1.36	0.77	2.22	1.00	0.53	5.19	1.67	1.02	6.25	1.57	0.98
6	4.58	1.33	0.71	2.46	1.07	0.65	5.50	1.60	0.80	6.18	1.30	0.89
7	4.43	1.20	0.67	2.26	0.92	0.60	5.73	1.50	0.75	5.13	1.26	0.83
8	4.39	1.20	0.52	2.75	1.00	0.53	5.11	1.50	0.56	6.85	1.33	0.32
All	2.87			1.63			3.69			4.14		
Total observations	17 875			7 374			9 190			1 311		

** Women before and after implementation are included.*

TABLE 5.2

CERVICAL DILATATION RATES AMONG UNAUGMENTED LABOURS BY ADMISSION CERVICAL DILATATION
(Normal group, all parities, before and after implementation)

Cervical dilatation on admission	Mean rate of cervical dilatation (cm/hour)								
	All women			Before			After		
	Overall	25th centile	10th centile	Overall	25th centile	10th centile	Overall	25th centile	10th centile
0	1.86	0.19	0.01	2.10	0.22	0.02	1.33	0.19	0.00
1	0.90	0.29	0.04	0.87	0.10	0.00	0.93	0.50	0.13
2	1.14	0.42	0.02	1.13	0.20	0.00	1.16	0.62	0.24
3	2.12	0.79	0.05	1.87	0.49	0.00	2.38	1.05	0.49
4	3.30	1.14	0.46	3.13	0.97	0.16	3.48	1.33	0.78
5	4.32	1.36	0.77	4.43	1.25	0.61	4.20	1.46	0.98
6	4.58	1.33	0.71	5.09	1.12	0.39	4.02	1.60	1.00
7	4.43	1.20	0.67	4.77	1.12	0.46	3.97	1.50	0.75
8	4.39	1.20	0.52	4.95	1.14	0.30	3.40	1.33	0.77
All	2.87			2.99			2.74		
Total observations	17 875			9 237			8 638		

TABLE 5.3

CERVICAL DILATATION RATES AMONG UNAUGMENTED LABOURS BY ADMISSION CERVICAL DILATATION AND STATE OF MEMBRANES
(Normal group, all parities*)

Cervical dilatation on admission	Mean rate of cervical dilatation (cm/hour)											
	Membranes never ruptured			Membranes ruptured prior to admission			Spontaneous membrane rupture in unit			Artificial membrane rupture in unit		
	Overall	25th centile	10th centile	Overall	25th centile	10th centile	Overall	25th centile	10th centile	Overall	25th centile	10th centile
0	-	-	-	1.27	0.22	0.00	0.93	0.22	0.01	2.61	0.19	0.06
1	0.63	0.16	0.00	0.90	0.12	0.00	1.02	0.35	0.00	0.87	0.32	0.07
2	0.39	0.05	0.00	1.35	0.05	0.00	1.42	0.43	0.08	1.02	0.49	0.12
3	1.33	0.17	0.00	1.95	0.54	0.00	1.73	0.59	0.15	2.23	0.86	0.20
4	5.96	2.67	2.67	2.88	0.99	0.00	2.38	1.00	0.37	3.50	1.18	0.57
5	2.69	0.78	0.26	4.17	1.18	0.62	3.43	1.25	0.86	4.48	1.43	0.81
6	1.46	1.45	1.45	3.62	1.00	0.00	3.42	1.13	0.67	4.97	1.45	0.86
7	2.00	2.00	2.00	3.47	0.90	0.45	3.78	1.09	0.61	4.81	1.44	0.75
8	2.37	1.23	0.96	3.88	0.98	0.30	3.56	1.09	0.26	4.72	1.33	0.63
All	1.70			2.66			2.18			3.05		
Total observations	40			2 881			2 319			12 635		

** State of membranes not recorded in 270 cases.*

6. PATTERNS OF CERVICAL DILATATION ON THE PARTOGRAPH

6.1 Summary

The pattern of cervical dilatation on the partograph was studied in the 8810 women from the normal group with a partograph. 73% of women were admitted in the active phase of labour and 27% in the latent phase. Of those admitted in the latent phase, only 112 women (1.3% of the total) failed to progress to the active phase within 8 hours of admission. There was a preponderance of nullipara among latent phase admissions. Nulliparity and admission in the latent phase (regardless of parity) were both associated with a subsequent slower course of labour.

Of the 8698 women with an active phase of labour, 73% remained on or to the left of the alert line. Of those who moved to the right of the alert line, 864 (10% of the total) reached the action line.

6.2 Types of Labour

Cervical dilatation on the partograph may follow certain patterns in relation to the lines printed onto the partograph. The lines which differentiate between labours with different rates of progress are as follows:

a. The horizontal line at 3 cm dividing the latent from the active phase.
b. The vertical action line after 8 hours of latent phase.
c. The alert line in the active phase.
d. The action line in the active phase.

Based on their admission cervical dilatation and on their subsequent course of labour, women in this study were divided into certain types of labour. These types are described in Table 6.1 and examples of each type of labour are illustrated in Figures 6.1 and 6.2. The original WHO advocacy document on the partograph[24] recommends referral of a woman in labour from a peripheral to a central unit if her cervical dilatation moves to the right of the alert line. For simplicity, therefore, cervical dilatations between the alert and action line are referred to as being in the "referral zone".

This chapter describes the number of women in the study following each of these types of labour pattern after admission. This is best examined in the "normal" group of women previously defined (Chapter 4) as the course of labour in this group is unlikely to be influenced by additional complications. Throughout this chapter, therefore, only women in the normal group are considered. The influence of parity on the course of labour as plotted on the partograph was studied by looking at three parity groupings, viz para 0, para 1-4, and para 5+. Obviously only women who had a partograph completed (i.e. after implementation) were studied.

FIGURE 6.1
ILLUSTRATIVE LABOUR TYPES 1A, 1B AND 1C

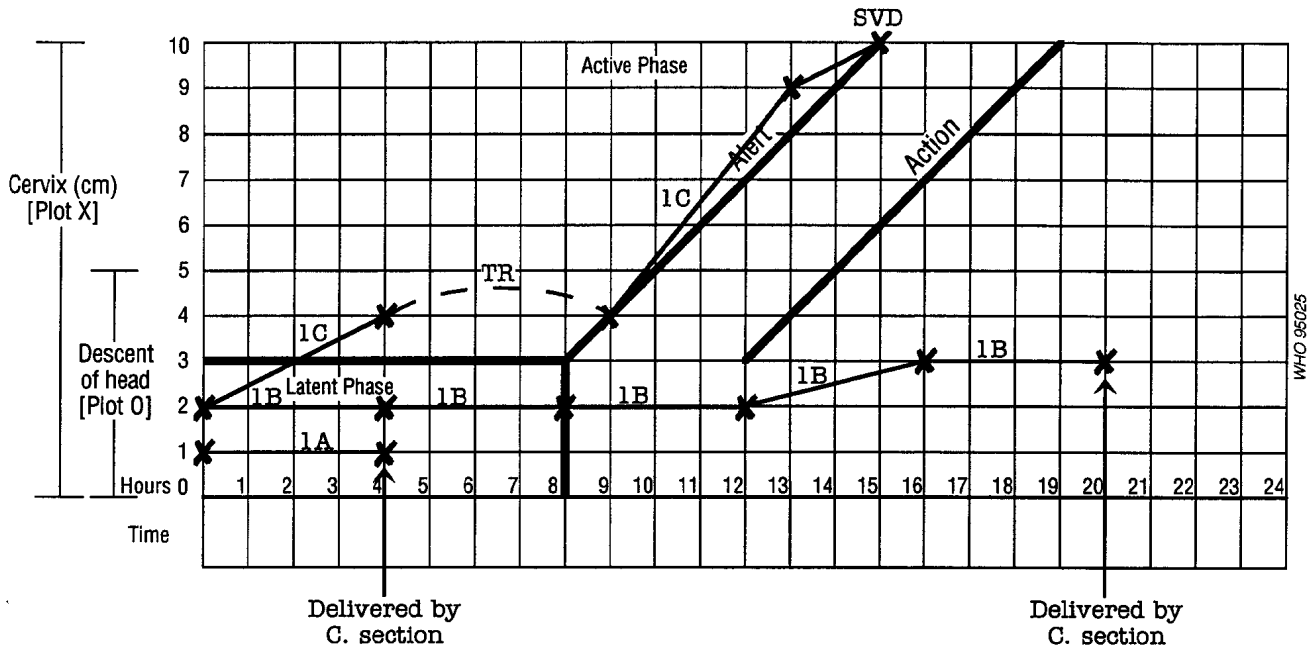

FIGURE 6.2
ILLUSTRATIVE LABOUR TYPES 2A, 2B, 2C AND 2D

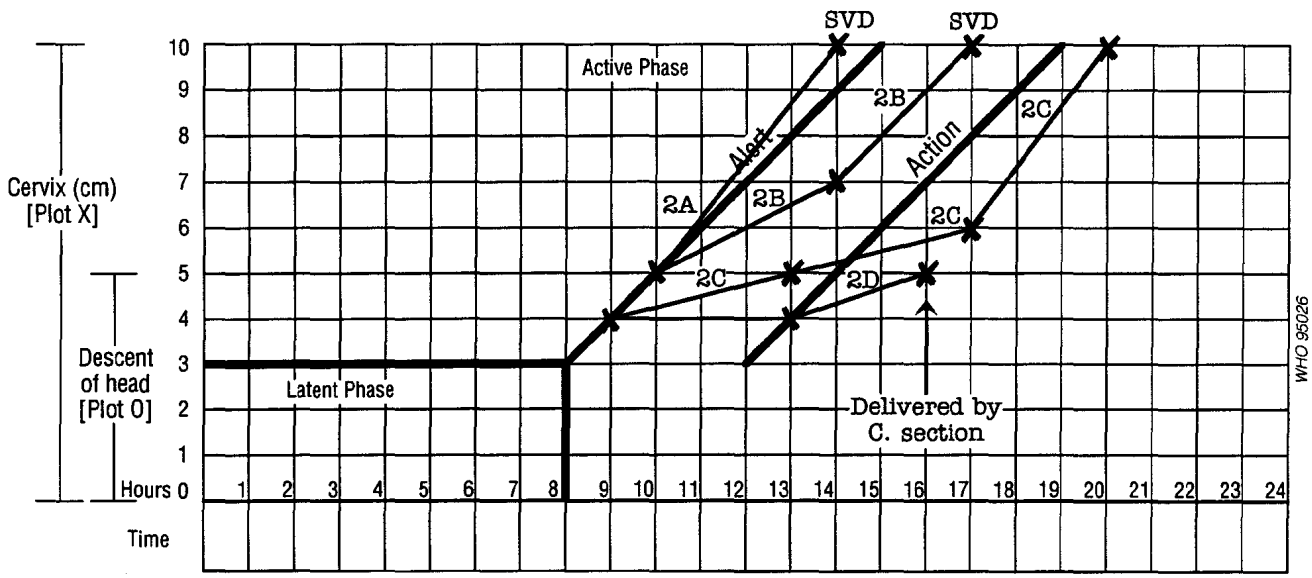

TABLE 6.1

TYPES OF LABOUR BY PHASE ON ADMISSION AND SUBSEQUENT COURSE OF LABOUR

TYPE 1: LATENT PHASE ADMISSIONS

1A: Delivered within a latent phase less than 8 hours (no active phase)

1B: Delivered after prolonged latent phase of 8 hours or more (i.e. reached latent phase action line)*

1C: Latent phase less than 8 hours and progressed to active phase.

TYPE 2: ACTIVE PHASE ADMISSIONS

2A: Labour progress remained on or to the left of the alert line

2B: Cervical dilation moved between the alert and action line ("referral zone") but did not reach the action line

2C: Cervical dilation moved to or beyond the action line with at least one vaginal examination in the "referral zone"

2D: Cervical dilation moved straight from the alert to the action line with no intervening vaginal examinations in the "referral zone"

** Type 1B may have progressed to an active phase but this could not be assessed in relation to lines on the partograph.*

6.3 Admission Phase and Parity

There were 8810 women from the normal group with a partograph. Of these, 2365 (27%) were admitted in the latent phase (Type 1) and 6445 (73%) in the active phase (Type 2). Nulliparous women made up 3793 of the total (43%), women of parity 1-4, 4339 (49%) and women of high parity (5 or more), 678 (8%).

6.4 Latent Phase Admissions

Table 6.2 shows the numbers, including a breakdown by parity, of women following the three possible types of labour after admission in the latent phase.

A relatively high proportion (59%) of nullipara were admitted in the latent phase and very few women of high parity (4%).

If labour is correctly diagnosed, it appears that very few women admitted in the latent phase will fail to progress into the active phase within 8 hours. Only 112 women (1.3% of the

total) fall into Types 1A and 1B. The great majority (95%) of those admitted in the latent phase progressed to the active phase within less than 8 hours.

6.5 Active Phase Admissions

In contrast to the women admitted in the latent phase of labour, a preponderance of active phase admissions were multipara (63%) rather than nullipara (Table 6.3). The labour pattern of nullipara was slower than multipara as shown by the higher proportion of nullipara moving into the referral zone (Type 2B) or reaching the action line (Types 2C and 2D).

The proportion of nullipara and multipara reaching the "referral zone" but not the action line (Type 2B) was, however, closer to the overall distribution of cases by parity though there was a slightly increased proportion of nullipara.

The pattern of labour on the partograph among those of high parity (5 or more) was not strikingly different from multipara of lower parity (1 to 4) except that a relatively high number proceeded directly from the alert to the action line (Type 2D). This may be because of a faulty diagnosis of labour among these highly parous women with some cervical dilatation before the onset of true labour and is further examined later.

6.6 Course of All Active Phase Labours

Those women admitted in the latent phase who progressed to the active phase within 8 hours of admission (Type 1C) continued to have their active phase of labour plotted on the partograph and the active phase could be studied as per the active phase admissions. After reaching the active phase, the course of labour remained on or to the left of the alert line, moved to the referral zone but not the action line, or reached the action line (or beyond) either directly or via the referral zone. Table 6.4 compares the course of labour in the active phase among women admitted in the latent and the active phases of labour. Altogether 8698 women (from the normal group) had an active phase plotted on the partograph. Of these, 6331 (73%) remained on or to the left of the alert line, and 2367 (27%) moved to the right of the alert line. Of these, 1503 (17% of the total) did not reach the action line, while 864 (10%) did reach the action line.

Twenty-four per cent of women admitted in the active phase of labour moved to the right of the alert line, but 37% of those admitted in the latent phase did so. This is partly explained by the preponderance of nullipara in Type 1C, but parous women in Type 1C were also more likely to move to the right of the alert line. This is shown in Table 6.5 which shows the same information as in Table 6.4 but broken down into nulliparous and parous women. All parous women are combined together as the differences between those of para 1-4 and para 5+ were negligible.

When reaching or moving beyond the action line is considered, again there were a high proportion of cases who had been admitted in the latent phase (15%) as compared to those admitted in the active phase (8%) (Table 6.4).

TABLE 6.2

LATENT PHASE ADMISSIONS BY TYPE OF LABOUR AND PARITY

	Delivered in latent phase (<8 hours) (Type 1A)		Delivered after prolonged latent phase (>8 hours) (Type 1B)		Progressed to active phase after latent phase (<8 hours) (Type 1C)		All latent phase admissions (Type 1)	
All parities	9	(100%)	103	(100%)	2 253	(100%)	2 365	(100%)
Para 0	8	(89%)	73	(71%)	1 315	(58%)	1 396	(59%)
Para 1-4	1	(11%)	29	(28%)	848	(38%)	878	(37%)
Para 5+	0		1	(1%)	90	(4%)	91	(4%)

TABLE 6.3

ACTIVE PHASE ADMISSIONS BY COURSE OF LABOUR AND PARITY

	Remained on or left of alert line (Type 2A)		Between alert and action lines but not to action line (Type 2B)		Reached action line via referral zone (Type 2C)		Moved straight from alert to action line (Type 2D)		All active phase admissions (Type 2)	
All parities	4 913	(100%)	1 011	(100%)	249	(100%)	272	(100%)	6 445	(100%)
Para 0	1 656	(34%)	460	(45%)	150	(60%)	131	(48%)	2 397	(37%)
Para 1-4	2 804	(57%)	472	(47%)	81	(33%)	104	(38%)	3 461	(54%)
Para 5+	453	(9%)	79	(8%)	18	(7%)	37	(14%)	587	(9%)

TABLE 6.4

COURSE OF LABOUR IN ACTIVE PHASE DEPENDENT ON PHASE OF LABOUR AT ADMISSION
(All parities)

Course of labour	Admitted in latent phase and progressed to active phase (Type 1C)		Admitted in active phase (Type 2)	
Total cases	**2 253**	**(100%)**	**6 445**	**(100%)**
Remained on or left of alert line	1 418	(63%)	4 913	(76%)
Moved to "referral zone" but not action line	492	(22%)	1 011	(16%)
Moved to action line via "referral zone"	169	(8%)	249	(4%)
Moved straight to action line	174	(8%)	272	(4%)

TABLE 6.5

COURSE OF LABOUR IN ACTIVE PHASE DEPENDENT ON PHASE OF LABOUR AT ADMISSION AND PARITY

Parity and course of labour	Admitted in latent phase and progressed to active phase (Type 1C)		Admitted in active phase (Type 2)	
Total women	**2 253**	**(100%)**	**6 445**	**(100%)**
Total nullipara[1]	**1 315**	**(100%)**	**2 397**	**(100%)**
Total multipara[2]	**938**	**(100%)**	**4 048**	**(100%)**
Remained on or left of alert line				
Nullipara[1]	771	(59%)	1 656	(69%)
Multipara[2]	647	(69%)	3 257	(80%)
Moved to referral zone but not action line				
Nullipara[1]	311	(24%)	460	(19%)
Multipara[2]	181	(19%)	551	(14%)
Moved to action line via referral zone				
Nullipara[1]	126	(10%)	150	(6%)
Multipara[2]	43	(5%)	99	(2%)
Moved straight to action line				
Nullipara[1]	107	(8%)	131	(5%)
Multipara[2]	67	(7%)	141	(3%)

[1] *Percentages are of total nullipara in vertical column.*
[2] *Percentages are of total multipara in vertical column.*

7. ADMISSIONS IN THE LATENT PHASE - OUTCOMES AMONG DIFFERENT TYPES OF LABOUR

7.1 Summary

The outcome of labour among the 2365 women from the normal group admitted in the latent phase of labour was studied. Only 112 did not progress to the active phase within 8 hours (Types 1A and 1B). Caesarean section (20.4%) and augmentation (68.9%) rates were high after a prolonged latent phase (Type 1B), confirming the findings of previous studies, albeit with different definitions of the prolonged latent phase.

Those labours which progressed to the active phase within 8 hours (Type 1C) had a low rate of caesarean section delivery (4.4%), comparable to that of the total normal group of women (4.5%), but there was a slight increase in operative vaginal deliveries (11.1%) compared to the normal group (9.2%). The proportion of labours augmented (16.4%) was high compared to all of the normal group (10.6% augmented). The difference was most marked among parous women. The fetal outcome was good and there were no stillbirths.

7.2 Types of Labour After Admission in the Latent Phase

This chapter examines the outcome of labour among the 2365 women from the normal group who were admitted in the latent phase of labour (Type 1). As described in Chapter 5, these labours could follow one of three possible courses:

a. Type 1A

Delivered within latent phase <8 hours (9 cases)

b. Type 1B

Delivered after a prolonged latent phase (103 cases)

c. Type 1C

Progressed to active phase after latent phase <8 hours (2253 cases)

By definition, Type 1A could have no active phase, but Type 1B may have entered the active phase. However, the alert and action lines on the active phase of the partograph could not be applied after a prolonged latent phase. The active phase of Type 1C labours were plotted normally on the partograph and the progress of these labours in the active phase is studied further in the following chapter.

7.3 Outcome of Labour

Those women whose labour progresses abnormally are thought likely to have a higher incidence of operative delivery and a poorer fetal outcome. Such labours are also more likely to receive augmentation with oxytocin. There may also be an association between abnormal progress in labour and additional complications, such as postpartum haemorrhage. It has already been established that the introduction of the partograph influenced these outcomes (Chapter 4).

In this and the following chapters, the capacity of the partograph to identify labours with a higher chance of complications is tested by examining the mode of delivery, augmentation rates, fetal outcome and postpartum haemorrhage rates in the different types of labour. In these tables "operative vaginal" deliveries include deliveries by forceps or vacuum extraction. Fetal outcome is assessed by intrapartum fetal death and by lowered Apgar scores. As has been discussed in Chapter 4, neonatal mortality was poorly recorded and could not be assessed.

7.3.1 Outcome of labour Types 1A and 1B

The mode of delivery among labour Types 1A and 1B broken into parity groupings is shown in Table 7.1. All women delivered in the latent phase (Type 1A) were inevitably delivered by caesarean section. Delivery after a prolonged latent phase (Type 1B) was associated with a high likelihood of caesarean section (20.4% overall), particularly among nullipara (23.3% caesarean section rate).

The preponderance of nullipara among those with both types of labour is apparent. Table 7.2 presents the rates of augmented labours, postpartum haemorrhage and lowered Apgars in labour Types 1A and 1B. There were no fetal deaths.

Augmentation rates were high in Type 1B (68.9% overall) but the fetal outcome was good. More parous than nulliparous women received oxytocin augmentation after a prolonged latent phase. There was some confusion over the application of the management protocol for those with a prolonged latent phase, particularly in the early part of the study, and this may have had some impact on the results.

As has already been commented on (Chapter 6), the most notable feature of labour Types 1A and 1B is the very small numbers involved. Very few partographic studies have examined the latent phase and management of the prolonged latent phase is controversial.[1] The strict definition of labour probably largely explains the small numbers in this study but, in addition, the definition of prolongation was longer in this study than in some others.[44,45] Others, notably Bird[13] defined the latent phase differently. Nonetheless, figures from these quoted studies show similar outcomes to this study after a prolonged latent phase with augmentation rates of 65-100%[13,44] and caesarean section rates of 8-17%.[44,45]

7.3.2 Outcome of labour Type 1C

Information concerning the mode of delivery, augmentation, postpartum haemorrhage and Apgar scores among women admitted in the latent phase of labour and progressing to the active phase within 8 hours is presented in Table 7.3. There were no stillbirths.

The overall caesarean section rate was 4.4%, comparable with the total caesarean section rate (4.5%) for all women in the normal group after implementation. The caesarean section rates by parity were also similar to the rates for all normal group women; 6.2% for nullipara (6.9% for all normal nullipara) and 2.0% for all multipara (2.7% among all normal multipara). Admission in the latent phase *per se*, unless the latent phase is prolonged, does not appear to be a risk factor for caesarean section delivery. The rate of operative vaginal delivery was, however, slightly higher, at 11.1%, among Type 1C labours compared to all of the normal group (9.2%). When broken down by parity, the differences were small; 15.3% operative vaginal deliveries among Type 1C nullipara compared to 14.7% among all normal group nullipara, with rates of 5.3% and 5.0% respectively for multipara.

Augmentation rates were also higher among Type 1C labours than among the total normal group of women after implementation. 16.4% of Type 1C labours were augmented compared to 10.6% of all normal women. The difference was less marked among nulliparous (17.5% and 13.7%) than parous women (14.9% and 8.2%). Postpartum haemorrhage rates and Apgar scores were similar to those of the total normal group after implementation.

The subsequent course and outcome of labour Type 1C in the active phase is studied in the following chapter.

TABLE 7.1

MODE OF DELIVERY BY PARITY AMONG WOMEN WITH DELIVERY IN LATENT PHASE OR AFTER PROLONGED LATENT PHASE (Types 1A and 1B)

Parity and mode of delivery	Delivery			
	In latent phase (up to 8 hours) (Type 1A)		After prolonged latent phase (Type 1B)	
All parities	9	(100.0)	103	(100.0)
Spontaneous vertex	0	(0.0)	67	(65.0)
Operative vaginal	0	(0.0)	15	(14.6)
Caesarean section	9	(100.0)	21	(20.4)
Nullipara	8	(100.0)	73	(100.0)
Spontaneous vertex	0	(0.0)	43	(58.9)
Operative vaginal	0	(0.0)	13	(17.8)
Caesarean section	8	(100.0)	17	(23.3)
Para 1-4	1	(100.0)	29	(100.0)
Spontaneous vertex	0	(0.0)	23	(79.3)
Operative vaginal	0	(0.0)	2	(16.9)
Caesarean section	1	(100.0)	4	(13.8)
Para 5+	0	(0.0)	1	(100.0)
Spontaneous vertex	0	(0.0)	1	(100.0)
Operative vaginal	0	(0.0)	0	(0.0)
Caesarean section	0	(0.0)	0	(0.0)

TABLE 7.2

AUGMENTATION, POSTPARTUM HAEMORRHAGE AND FETAL OUTCOME BY PARITY AMONG WOMEN WITH DELIVERY IN LATENT PHASE OR AFTER PROLONGED LATENT PHASE (Types 1A and 1B)

Variables	Delivery			
	In latent phase (Type 1A)		After prolonged latent phase (Type 1B)	
All parities total	9	(100.0)	103	(100.0)
Augmentation	3	(33.3)	61	(68.9)
Postpartum haemorrhage[1]	0		5	(4.4)
Apgar 0-3 at 1 min	1	(11.1)	1	(0.9)
Apgar 4-7 at 1 min	2	(22.2)	17	(15.2)
Nulliparous total	8	(100.0)	73	(100.0)
Augmentation	3	(37.5)	36	(49.3)
Postpartum haemorrhage[1]	0		2	(2.4)
Apgar 0-3 at 1 min	1	(12.5)	1	(1.2)
Apgar 4-7 at 1 min	1	(12.5)	13	(15.9)
Para 1-4 total	1	(100.0)	29	(100.0)
Augmentation	0		24	(82.8)
Postpartum haemorrhage[1]	0		3	(10.3)
Apgar 0-3 at 1 min	0		0	
Apgar 4-7 at 1 min	1	(100.0)	4	(13.8)
Para 5+ total	0		1	
Augmentation	-		1	
Postpartum haemorrhage[1]	-		0	
Apgar 0-3 at 1 min	-		0	
Apgar 4-7 at 1 min	-		0	

[1] *Following vaginal delivery.*

TABLE 7.3

OUTCOME OF LABOUR BY PARITY AMONG WOMEN ADMITTED IN LATENT PHASE AND PROGRESSING TO ACTIVE PHASE WITHIN 8 HOURS (Type 1C)

Parity and mode of delivery	Number	(%)
All parities	2 253[2]	(100.0)
Spontaneous vertex	1 900	(84.3)
Operative vaginal	251	(11.1)
Caesarean section	100	(4.4)
Augmentation	370	(16.4)
Postpartum haemorrhage[1]	66	(2.9)
Apgar 0-3 at 1 min	14	(0.6)
Apgar 4-7 at 1 min	192	(8.5)
Nullipara	1 315[3]	(100.0)
Spontaneous vertex	1 032	(78.5)
Operative vaginal	201	(15.3)
Caesarean section	81	(6.2)
Augmentation	230	(17.5)
Postpartum haemorrhage[1]	45	(3.4)
Apgar 0-3 at 1 min	12	(0.9)
Apgar 4-7 at 1 min	139	(10.6)
Para 1-4	848[3]	(100.0)
Spontaneous vertex	781	(92.1)
Operative vaginal	47	(5.5)
Caesarean section	19	(2.2)
Augmentation	127	(15.0)
Postpartum haemorrhage[1]	21	(2.5)
Apgar 0-3 at 1 min	1	(0.1)
Apgar 4-7 at 1 min	47	(5.5)
Para 5+	90	(100.0)
Spontaneous vertex	87	(96.7)
Operative vaginal	3	(3.3)
Caesarean section	0	
Augmentation	13	(14.4)
Postpartum haemorrhage[1]	0	
Apgar 0-3 at 1 min	1	(1.1)
Apgar 4-7 at 1 min	6	(6.7)

[1] *Following vaginal delivery.*
[2] *Mode of delivery unknown in 2 cases.*
[3] *Mode of delivery unknown in 1 case.*

8. LABOUR IN THE ACTIVE PHASE - OUTCOMES AMONG DIFFERENT TYPES OF LABOUR

8.1 Summary

Among the normal group of women, 8698 had an active phase plotted on the partograph. 2 253 of these had been admitted in the latent phase; the subsequent progress of these women tended to be slightly slower than among those 6445 women admitted already in the active phase. When labour remained on or to the left of the alert line, the proportion of labours requiring augmentation was 2.5% and the caesarean section rate 0.6%. Labours moving to the referral zone but not to the action line had an augmentation rate of 9.0% and a caesarean section rate of 3.4%. If the action line was reached via the referral zone, the respective rates were 57.7% and 22.5%; if reached directly from the alert line, 72.6% and 21.1%. The trends were similar regardless of parity although a higher proportion of nullipara than multipara moved to the right of the alert line and/or had caesarean sections.

Comparisons with other partographic studies are presented.

8.2 Types of Labour in the Active Phase

In the "normal" group of women (defined in Chapter 4), among whom labour patterns are best studied, 8698 women after implementation had an active phase which could be plotted on the partograph in relation to the alert and action lines. As reported in Chapter 7, nine women were delivered within a latent phase <8 hours, and 103 women experienced a prolonged latent phase.

Of the 8698 women, 2253 had been admitted in the latent phase (Type 1C labours) and 6445 were admitted already in the active phase (Type 2). These active phase labours were categorised according to their subsequent progress on the partograph relative to the alert and action lines. These patterns were described in Chapter 6 but are summarised again here:

a. Labour remained on or left of alert line (Type 2A and Type 1C following same pattern).

b. Labour moved between alert and action line but did not reach or cross action line (Type 2B and Type 1C following same pattern).

c. Labour reached or crossed action line via an examination in the referral zone (Type 2C and Type 1C following same pattern).

d. Labour moved straight from the alert to the action line with no examination in the referral zone (Type 2D and Type 1C following same pattern).

This chapter reports on the pattern of labour in the active phase and relates this pattern to the outcome of labour by examining modes of delivery, augmentation of labour, postpartum haemorrhage and fetal outcome measured by Apgar scores and intrapartum fetal deaths. The recording of neonatal mortality was too inaccurate to be of value.

8.3 Outcome of Labour Type 1C (admitted in latent phase)

Table 8.1 presents the mode of delivery by course of labour on the partograph and by parity for those 2253 women admitted in the latent phase who progressed to the active phase within 8 hours of admission (Type 1C). The overall caesarean section rate in this group was 4.4%. Provided the cervical dilation remained on or to the left of the alert line, the rate was low (1.0%). However, it rose among women whose cervical dilation moved further to the right on the partograph to 3.3% among women reaching the "referral zone" but not the action line, and to 24.1% among women moving straight from the alert to the action line. There was an intermediate rate of 16.6% among those women whose cervical dilation reached the action line via the referral zone. The general rise in caesarean section rates in relation to slower progress on the partograph applied to all parities although higher rates were observed among nullipara when compared to multipara with a similar course of progress on the partograph. There were no caesarean sections among the small number of women of high parity (67) with labour Type 1C.

A further difference between nullipara and multipara (para 1-4) occurred in the caesarean section rates among women who moved to the action line directly from the alert line or via the referral zone. Among multipara, there was a similar caesarean section rate regardless of the route to the action line (12.3% and 13.2% respectively). Those nullipara who moved straight to the action line had a rate of 31.8%, compared to the 18.3% rate of nullipara with at least one cervical dilatation in the "referral zone".

Augmentation rates (Table 8.2) similarly rose as labour progress was recorded as slower on the partograph, a rate of 6.6% among those remaining on or to the left of the alert line rising to 9.1% in the referral zone, 62.7% when the action line was reached via the referral zone and 71.8% among those moving straight from the alert to the action line. The trend was very similar among all parities. There was no significant association between progress on the partograph and postpartum haemorrhage or fetal outcome. There were no stillbirths.

Table 8.3 and Figure 8.1 summarise the data presented in Table 8.1 and 8.2 and show the augmentation and caesarean section rates in relation to progress in labour relative to the alert and action lines. Parous women of all parities are grouped together as are the rates for all those reaching or crossing the action line (both directly and via the referral zone). The progressive rise in both events as labour is slower is clearly shown in both parity groupings, although the caesarean section rates for parous women are lower than for nullipara.

8.4 Outcome of Labour Type 2 (admitted in active phase)

Labour outcomes by course of labour among the 6445 women admitted in the active phase of labour (Type 2) are presented in Tables 8.4 and 8.5. The mode of delivery broken down by parity is shown in Table 8.4. The overall caesarean section rate was 2.7% with a range from 0.4% among women whose labour remained on or to the left of the alert line (Type 2A) to 26.5% for women whose labours reached or crossed the action line via the referral zone (Type 2C). The caesarean section rate for those who moved straight from the alert to the action line (Type 2D) was lower at 19.1%. Labours which entered the referral zone but did not reach the action line (Type 2B) recorded a caesarean section rate of 3.5%. Operative vaginal deliveries followed a similar pattern, rising from 6.2% of Type 2A labours to 22.1% of Type 2Cs.

Similar trends are seen in the parity groupings, although there is a higher overall caesarean section rate among nullipara.

Augmentation rates among women in Type 2 increased the further right across the partograph that cervical dilation strayed (Table 8.5) and this held true regardless of parity. The highest augmentation rates (73.2%) occurred among women moving straight from the alert to the action line. Postpartum haemorrhage rates showed no significant differences.

The fetal outcomes were generally good, but there was a trend towards a greater number of babies with intermediate Apgar scores (4-7) as labour progressed further to the right on the partograph. No such trend was observed among the very small number of babies with low Apgar scores (0-3). The three intrapartum deaths in Type 2 all occurred in women whose labours remained on or to the left of the alert line (Type 2A). One received augmentation, probably inappropriately.

Table 8.6 and Figure 8.2 summarise the information from Tables 8.4 and 8.5 showing the caesarean section and augmentation rates in relation to the alert and action lines. Multiparous women are grouped together and those reaching the action line directly and via the referral zone are combined. It is of interest to note that caesarean section rates among Type 2 labours were higher than Type 1C labours once the alert line was crossed and yet the total caesarean section rate for Type 2 labours was lower than Type 1C. This is because of the higher proportion of caesarean sections on or left of the alert line in Type 1C as compared to Type 2. The reason for this has not been examined but may be because a great many women with Type 2 labours were admitted in advanced, efficient labour. This led inevitably to a massive dilution of the very small number of caesarean sections. Fewer Type 2 than Type 1C labours were augmented on or left of the alert line which appears to strengthen this hypothesis.

8.5 Outcome of All Labours with an Active Phase (Types 1C and 2)

Overall, there was little difference in outcomes among all women who had an active phase, whether admitted in the latent phase (Type 1C) or the active phase (Type 2). The outcomes among these types of labours are compared in Table 8.7 which comprises data already presented in Tables 8.1 to 8.6. All parities are combined in Table 8.7. As the greatest variations among the features studied were in the mode of delivery and augmentation rates, only these features are presented.

The patterns are similar, regardless of the phase of labour on admission. The most notable feature is the transposition of the highest caesarean section rate among those who moved to the action line via the referral zone and those moving straight from the alert to the action line. Among those admitted in the active phase, the highest caesarean section rate (26.5%) occurred when the action line was reached via the referral zone but among those admitted in the latent phase, the highest caesarean section rate (24.1%) occurred when labour moved directly from the alert to the action line.

A plausible explanation for this finding is that a number of women admitted apparently in the active phase at low cervical dilatations (3-4 cm) may not have been in labour and therefore apparently moved directly from the alert to the action line. Augmentation was then likely to have taken place (although in reality an induction) with subsequent good progress in labour. The high augmentation rate (73.2%) in this group appears to confirm this. Those women admitted in the latent phase of labour had been observed to transfer from the latent to the active phase and subsequent progression directly to the action line was more likely to indicate genuine dysfunctional labour with secondary arrest of progress. The augmentation rate

in this group was also high (71.8%), but was only a little higher than the augmentation rate (62.7%) among those admitted in the latent phase who reached the action line via the referral zone. Those women admitted in the active phase and reaching the action line via the referral zone and therefore genuinely in labour had a lower augmentation rate at 54.2%. These differences appear to confirm the explanation offered for the transposition of the caesarean section rate, but the issue is further explored in Chapter 10, where actual cervical dilatations at different points on the partograph are studied.

Table 8.8 and Figure 8.3 illustrate the caesarean section and augmentation rates relative to the alert and action lines among all women with an active phase. All multipara and those with differing routes to the action line are combined. Throughout, multipara have lower caesarean section rates than nullipara but the differences in rates at different parts of the partograph are striking for all parities. The alert and action lines clearly distinguish those labours with an increased likelihood of augmentation and/or operative intervention.

8.6 Comparison with Other Partographs

This is an appropriate point to compare the course and outcome of labour using the WHO partograph in this trial with other reported studies of partography. The most relevant comparison is with Philpott's partograph[8] which, as reported in 1972, was identical to the WHO partograph (there have since been modifications to Philpott's action line[51]). In that 1972 report (of primigravidae only), 22% of women moved to the right of the alert line and 11% reached the action line. Comparable figures for primigravidae in this study were 31% and 12% respectively if only those admitted in the active phase (as in Philpott's report) are counted (Table 8.3). The proportion reaching the action line is almost identical; the difference between those moving to the right of the alert line may well represent differences in management policy, particularly concerning the timing of artificial rupture of membranes. Racial differences are possible but unlikely; Thom et al[47] found no difference in the proportions of women from different ethnic groups crossing the action line on their partograph.

In Philpott's study, the caesarean section rate among those primigravidae remaining on or left of the alert line was 0.4% (0.7% in primigravidae in this trial) and 20.6% when labour progress moved to or beyond the action line (26.0% among primigravidae in this trial).

In a recent report[48] of a version of the partograph very similar to the WHO partograph but with an action line 3 hours (rather than 4) to the right of the alert line, only 9.8% of women moved to the right of the alert line and 3.4% reached the action line. The modes of delivery were not reported.

Other comparisons with partographic studies are not strictly valid because of the different designs used but Table 8.9 presents an overview of reports for which data comparable with the present study is available. Shown are the percentages of women crossing the "action lines" used for each (often very different) partograph and the proportion of labours augmented and culminating in caesarean section delivery on either side of these action lines. The different proportions of women crossing the action lines is very apparent and reflects the different action lines, but the place of any action line in differentiating labours requiring augmentation and/or likely to end in caesarean section is clear.

An additional uniform finding was the poorer condition of infants born to the right of the action line[8,10,42,44,45,46,47,48] with the single exception of Ledger and Witting[50] who found a higher prenatal mortality among babies born within their defined normal labour pattern. Most

babies in the present trial were born in good condition but there was a trend towards poorer condition (as measured by lower Apgar scores) among slower labours (see Chapter 4).

These comparisons with other partographs are expanded in the commentary in Chapter 13.

FIGURE 8.1

CAESAREAN SECTION AND AUGMENTATION RATES BY PARITY AND COURSE OF LABOUR AMONG CASES ADMITTED IN THE LATENT PHASE AND PROGRESSING TO THE ACTIVE PHASE (Type 1C)

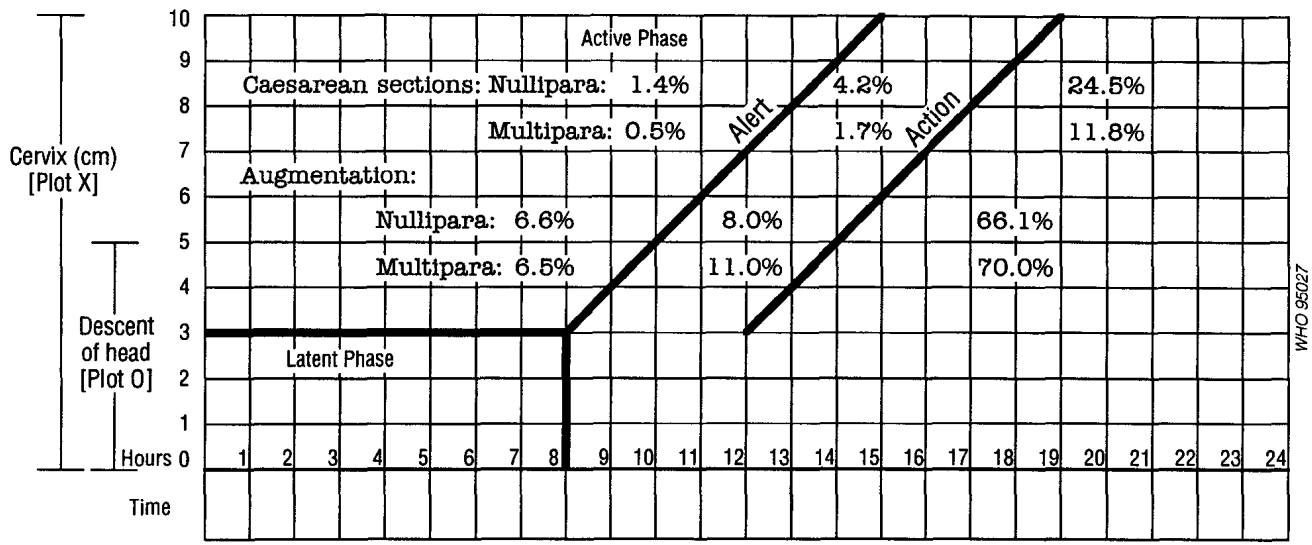

FIGURE 8.2

CAESAREAN SECTION AND AUGMENTATION RATES BY PARITY AND COURSE OF LABOUR AMONG CASES ADMITTED IN THE ACTIVE PHASE
(Type 2)

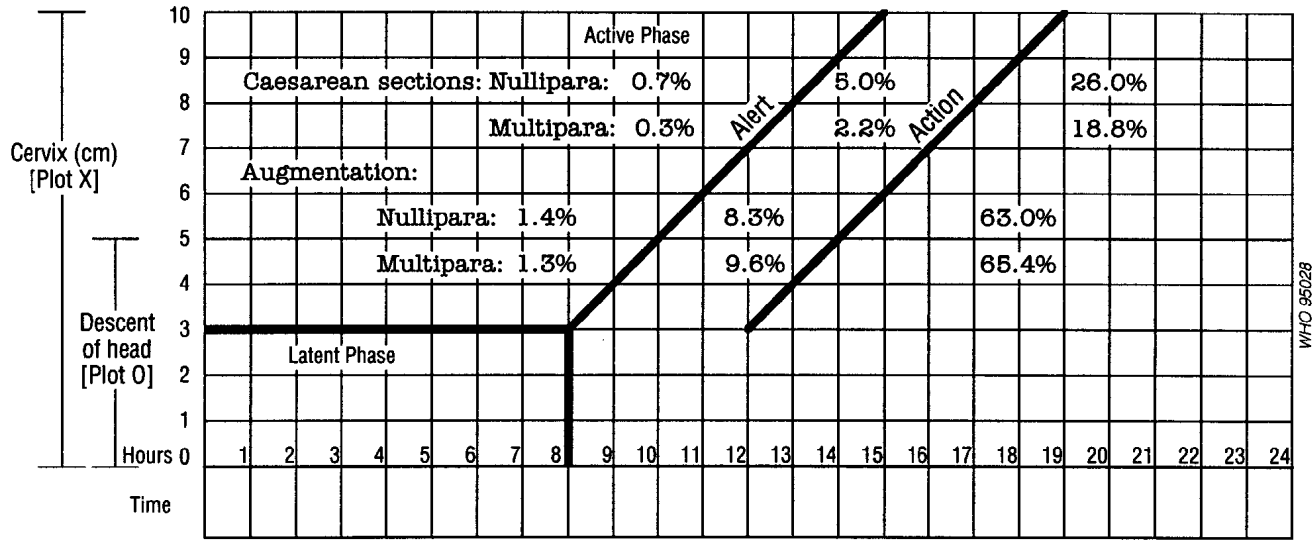

FIGURE 8.3

CAESAREAN SECTION AND AUGMENTATION RATES BY PARITY AND COURSE OF LABOUR FOR ALL WOMEN WITH AN ACTIVE PHASE

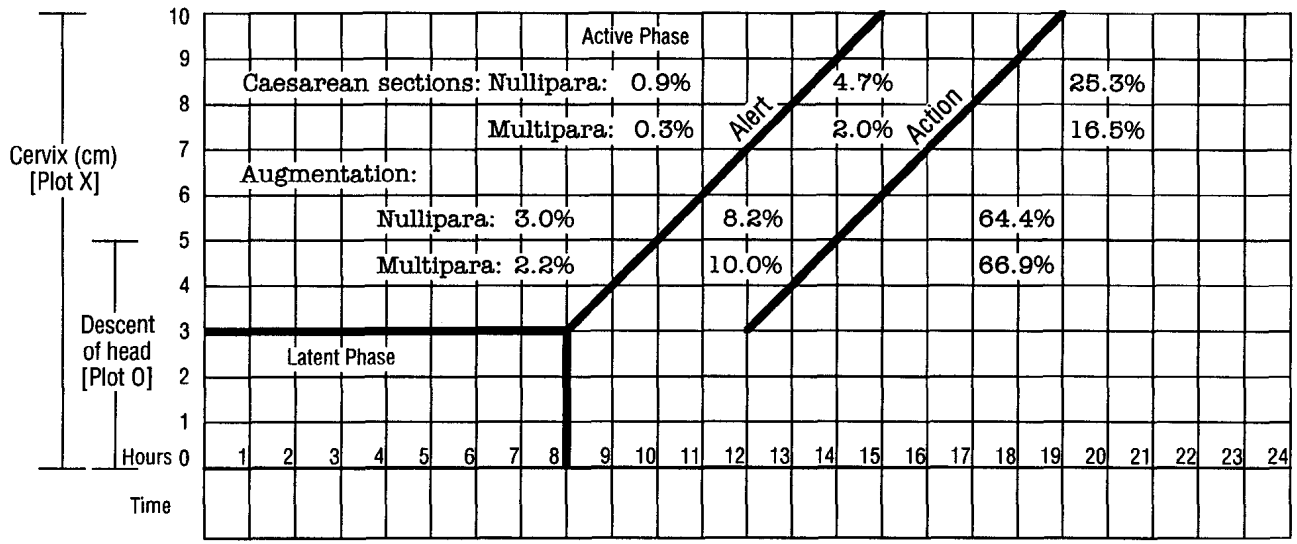

TABLE 8.1

MODE OF DELIVERY AND PARITY BY COURSE OF LABOUR OF WOMEN ADMITTED IN LATENT PHASE WHO PROGRESSED TO ACTIVE PHASE WITHIN 8 HOURS

(Type 1C)

Parity and mode of delivery	Course of labour									
	On or left of alert line		Between alert and action lines		Moved to action line via referral zone		Moved straight to action line		All type 1C	
All parities	1 418[1]	(100.0)	492[1]	(100.0)	169	(100.0)	174	(100.0)	2 253[2]	(100.0)
Spontaneous vertex	1 280	(90.3)	408	(82.9)	106	(62.7)	106	(60.9)	1 900	(84.3)
Operative vaginal	123	(8.7)	67	(13.6)	35	(20.7)	26	(14.9)	251	(11.1)
Caesarean section	14	(1.0)	16	(3.3)	28	(16.6)	42	(24.1)	100	(4.4)
Nullipara	771	(100.0)	311[1]	(100.0)	126	(100.0)	107	(100.0)	1 315[1]	(100.0)
Spontaneous vaginal	665	(86.3)	243	(78.1)	72	(57.1)	52	(48.6)	1 032	(78.5)
Operative vaginal	95	(12.3)	54	(17.3)	31	(24.6)	21	(19.6)	201	(15.3)
Caesarean section	11	(1.4)	13	(4.2)	23	(18.3)	34	(31.8)	81	(6.2)
Para 1-4	580[1]	(100.0)	165	(100.0)	38	(100.0)	65	(100.0)	848[1]	(100.0)
Spontaneous vertex	549	(94.7)	150	(90.9)	30	(78.9)	52	(80.0)	781	(92.1)
Operative vaginal	27	(4.7)	12	(7.3)	3	(7.9)	5	(7.7)	47	(5.5)
Caesarean section	3	(0.5)	3	(1.8)	5	(13.2)	8	(12.3)	19	(2.2)
Para 5+	67	(100.0)	16	(100.0)	5	(100.0)	2	(100.0)	90	(100.0)
Spontaneous vertex	66	(98.5)	15	(93.7)	4	(80.0)	2	(100.0)	87	(96.7)
Operative vaginal	1	(1.5)	1	(6.3)	1	(20.0)	0		3	(3.3)
Caesarean section	0		0		0		0		0	

Percentages in parentheses.

[1] *Mode of delivery unknown in 1 case.*

[2] *Mode of delivery unknown in 2 cases.*

TABLE 8.2

AUGMENTATION, POSTPARTUM HAEMORRHAGE AND FETAL OUTCOME BY PARITY AND COURSE OF LABOUR OF WOMEN ADMITTED IN LATENT PHASE WHO PROGRESSED TO ACTIVE PHASE WITHIN 8 HOURS (Type 1C)

Variables	Course of labour									
	On or left of alert line		Between alert and action lines		Moved to action line via referral zone		Moved straight to action line		All type 1C	
All parities total	1 418	(100.0)	492	(100.0)	169	(100.0)	174	(100.0)	2 253	(100.0)
Augmentation	94	(6.6)	45	(9.1)	106	(62.7)	125	(71.8)	370	(16.4)
Postpartum haemorrhage[1]	42	(3.0)	14	(2.8)	6	(3.6)	4	(2.3)	66	(2.9)
Apgar 0-3 at 1 min	7	(0.5)	2	(0.4)	4	(2.4)	1	(0.6)	14	(0.6)
Apgar 4-7 at 1 min	87	(6.1)	51	(10.4)	32	(18.9)	22	(12.6)	192	(8.5)
Nulliparous total	771	(100.0)	311	(100.0)	126	(100.0)	107	(100.0)	1 315	(100.0)
Augmentation	51	(6.6)	25	(8.0)	79	(62.7)	75	(70.1)	230	(17.5)
Postpartum haemorrhage[1]	30	(4.1)	10	(3.2)	5	(4.0)	0		45	(3.4)
Apgar 0-3 at 1 min	5	(0.6)	2	(0.6)	4	(3.2)	1	(0.9)	12	(0.9)
Apgar 4-7 at 1 min	64	(8.3)	35	(11.3)	23	(18.3)	17	(15.9)	139	(10.6)

Percentages in parentheses.

[1] *Postpartum haemorrhage following vaginal delivery.*

TABLE 8.2 (cont'd)

AUGMENTATION, POSTPARTUM HAEMORRHAGE AND FETAL OUTCOME BY PARITY AND COURSE OF LABOUR OF WOMEN ADMITTED IN LATENT PHASE WHO PROGRESSED TO ACTIVE PHASE WITHIN 8 HOURS (Type 1C)

Variables	Course of labour									
	On or left of alert line		Between alert and action line		Moved to action line via referral zone		Moved straight to action line		All type 1C	
Para 1-4 total	580	(100.0)	165	(100.0)	38	(100.0)	65	(100.0)	848	(100.0)
Augmentation	34	(5.9)	19	(11.5)	26	(68.4)	48	(73.8)	127	(15.0)
Postpartum haemorrhage[1]	12	(2.1)	4	(2.4)	1	(2.6)	4	(6.2)	21	(2.5)
Apgar 0-3 at 1 min	1	(0.2)	0		0		0		1	(0.1)
Apgar 4-7 at 1 min	20	(3.5)	14	(8.5)	8	(21.1)	5	(7.7)	47	(5.5)
Para 5+ total	67	(100.0)	16	(100.0)	5	(100.0)	2	(100.0)	90	(100.0)
Augmentation	9	(13.4)	1	(6.3)	1	(20.0)	2	(100.0)	13	(14.4)
Postpartum haemorrhage[1]	0		0		0		0		0	
Apgar 0-3 at 1 min	1	(1.5)	0		0		0		1	(1.1)
Apgar 4-7 at 1 min	3	(4.5)	2	(12.5)	1	(20.0)	0		6	(6.7)

Percentages in parentheses.

[1] *Postpartum haemorrhage following vaginal delivery.*

TABLE 8.3

CAESAREAN SECTIONS AND AUGMENTED LABOURS BY COURSE OF LABOUR ON PARTOGRAPH IN LATENT PHASE ADMISSION (Type 1C)

	On or left of alert line		Between alert and action lines		Reached or crossed action line	
All parities	1 418	(100.0)	492	(100.0)	343	(100.0)
Caesarean section	14	(1.0)	16	(3.3)	70	(20.4)
Augmentation	94	(6.6)	45	(9.1)	231	(67.3)
Nullipara	771	(100.0)	311	(100.0)	233	(100.0)
Caesarean section	11	(1.4)	13	(4.2)	57	(24.5)
Augmentation	51	(6.6)	25	(8.0)	154	(66.1)
Multipara	647	(100.0)	181	(100.0)	110	(100.0)
Caesarean section	3	(0.5)	3	(1.7)	13	(11.8)
Augmentation	43	(6.6)	20	(11.0)	77	(70.0)

Percentages in parentheses.

N.B.: This Table summarises information from Tables 8.1 and 8.2.

TABLE 8.4
MODE OF DELIVERY AND PARITY BY COURSE OF LABOUR OF WOMEN ADMITTED IN ACTIVE PHASE
(Type 2)

Parity and mode of delivery	Course of labour									
	On or left of alert line (Type 2A)		Between alert and action line (Type 2B)		Moved to action line via referral zone (Type 2C)		Moved straight to action line (Type 2D)		All active phase admissions (Type 2)	
All parities	4 913[1]	(100.0)	1 011[2]	(100.0)	249	(100.0)	272[3]	(100.0)	6 445[4]	(100.0)
Spontaneous vertex	4 583	(93.3)	821	(81.2)	128	(51.4)	178	(65.4)	5 710	(88.6)
Operative vaginal	305	(6.2)	153	(15.1)	55	(22.1)	41	(15.1)	554	(8.6)
Caesarean section	21	(0.4)	35	(3.5)	66	(26.5)	52	(19.1)	174	(2.7)
Nullipara	1 656[3]	(100.0)	460[3]	(100.0)	150	(100.0)	131[3]	(100.0)	2 397[5]	(100.0)
Spontaneous vaginal	1 462	(88.3)	338	(73.5)	67	(44.7)	69	(52.7)	1 936	(80.8)
Operative vaginal	182	(11.0)	98	(20.7)	41	(27.3)	30	(22.9)	351	(14.6)
Caesarean section	11	(0.7)	23	(5.0)	42	(28.0)	31	(23.7)	107	(4.5)
Para 1-4	2 804[2]	(100.0)	472[3]	(100.0)	81	(100.0)	104	(100.0)	3 461[5]	(100.0)
Spontaneous vertex	2 681	(95.6)	413	(87.5)	46	(56.8)	80	(76.9)	3 220	(93.0)
Operative vaginal	111	(3.9)	48	(10.2)	14	(17.2)	9	(8.6)	182	(5.3)
Caesarean section	10	(0.4)	10	(2.1)	21	(25.9)	15	(14.4)	56	(1.6)
Para 5+	453[3]	(100.0)	79	(100.0)	18	(100.0)	37	(100.0)	587[3]	(100.0)
Spontaneous vertex	440	(97.1)	70	(88.6)	15	(83.3)	29	(78.4)	554	(94.4)
Operative vaginal	12	(2.6)	7	(8.9)	0	(0.0)	2	(5.4)	21	(3.6)
Caesarean section	0	(0.0)	2	(2.5)	3	(16.7)	6	(16.2)	11	(1.9)

Percentages in parentheses.

[1] *Mode of delivery unknown in 4 cases.*

[2] *Mode of delivery unknown in 2 cases.*

[3] *Mode of delivery unknown in 1 case.*

[4] *Mode of delivery unknown in 7 cases.*

[5] *Mode of delivery unknown in 3 cases.*

TABLE 8.5

AUGMENTATION, POSTPARTUM HAEMORRHAGE AND FETAL OUTCOME BY PARITY AND COURSE OF LABOUR AMONG WOMEN ADMITTED IN ACTIVE PHASE
(Type 2)

Variables	Course of labour									
	On or left of alert line (Type 2A)		Between alert and action line (Type 2B)		Moved to action line via referral zone (Type 2C)		Moved straight to action line (Type 2D)		All active phase admissions (Type 2)	
All parities total	4 913	(100.0)	1 011	(100.0)	249	(100.0)	272	(100.0)	6 445	(100.0)
Augmentation	66	(1.3)	91	(9.0)	135	(54.2)	199	(73.2)	491	(7.6)
Postpartum haemorrhage[1]	116	(2.4)	27	(2.7)	6	(2.4)	8	(2.9)	157	(2.4)
Intrapartum fetal death	3	(0.1)	0		0		0		3	(0.1)
Apgar 0-3 at 1 min	14	(0.3)	10	(1.0)	3	(1.2)	5	(1.8)	32	(0.5)
Apgar 4-7 at 1 min	161	(3.3)	101	(10.0)	49	(19.7)	41	(15.1)	352	(5.5)
Nulliparous total	1 656	(100.0)	460	(100.0)	150	(100.0)	131	(100.0)	2 397	(100.0)
Augmentation	23	(1.4)	38	(8.3)	85	(56.7)	92	(70.2)	238	(9.9)
Postpartum haemorrhage[1]	54	(3.3)	10	(2.2)	2	(1.3)	5	(3.8)	71	(3.0)
Intrapartum fetal death	1	(0.1)	0		0		0		1	(0.1)
Apgar 0-3 at 1 min	6	(0.4)	6	(1.3)	2	(1.3)	3	(2.3)	17	(0.7)
Apgar 4-7 at 1 min	89	(5.4)	59	(12.8)	30	(20.0)	27	(20.6)	205	(8.6)

Percentages in parentheses.

[1] *Postpartum haemorrhage following vaginal delivery.*

TABLE 8.5 (cont'd)

AUGMENTATION, POSTPARTUM HAEMORRHAGE AND FETAL OUTCOME BY PARITY AND COURSE OF LABOUR AMONG WOMEN ADMITTED IN ACTIVE PHASE
(Type 2)

Variables	Course of labour									
	On or left of alert line (Type 2A)		Between alert and action line (Type 2B)		Moved to action line via referral zone (Type 2C)		Moved straight to action line (Type 2D)		All active phase admissions (Type 2)	
Para 1-4 total	2 804	(100.0)	472	(100.0)	81	(100.0)	104	(100.0)	3 461	(100.0)
Augmentation	34	(1.2)	42	(8.9)	41	(50.6)	81	(77.9)	198	(5.7)
Postpartum haemorrhage[1]	55	(2.0)	15	(3.2)	4	(4.9)	3	(2.9)	77	(2.2)
Intrapartum fetal death	2	(0.1)	0		0		0		2	(0.1)
Apgar 0-3 at 1 min	5	(0.2)	4	(0.8)	0		2	(1.9)	11	(0.3)
Apgar 4-7 at 1 min	63	(2.2)	35	(7.4)	16	(19.8)	9	(8.7)	123	(3.6)
Para 5+ total	453	(100.0)	79	(100.0)	18	(100.0)	37	(100.0)	587	(100.0)
Augmentation	9	(2.0)	11	(13.9)	9	(50.0)	26	(70.3)	55	(9.4)
Postpartum haemorrhage[1]	7	(1.5)	2	(2.5)	0		0		9	(1.5)
Intrapartum fetal death	0		0		0		0		0	
Apgar 0-3 at 1 min	3	(0.7)	0		1	(5.6)	0		4	(0.7)
Apgar 4-7 at 1 min	9	(2.0)	7	(8.9)	3	(16.7)	5	(13.5)	24	(4.1)

Percentages in parentheses.

[1] *Postpartum haemorrhage following vaginal delivery.*

TABLE 8.6

CAESAREAN SECTIONS AND AUGMENTED LABOURS BY COURSE OF LABOUR ON PARTOGRAPH FOR ACTIVE PHASE ADMISSIONS

	On or left of alert line		Between alert and action line		Reached or crossed action line	
All parities	4 913	(100.0)	1 101	(100.0)	521	(100.0)
Caesarean section	21	(0.4)	35	(3.5)	118	(22.6)
Augmentation	66	(1.3)	91	(9.1)	334	(64.1)
Nullipara	1 656	(100.0)	460	(100.0)	281	(100.0)
Caesarean section	11	(0.7)	23	(5.0)	73	(26.0)
Augmentation	23	(1.4)	38	(8.3)	177	(63.0)
Multipara	3 257	(100.0)	551	(100.0)	240	(100.0)
Caesarean section	10	(0.3)	12	(2.2)	45	(18.8)
Augmentation	43	(1.3)	53	(9.6)	157	(65.4)

Percentages in parentheses.

N.B.: This Table summarises information from Tables 8.4 and 8.5.

TABLE 8.7

MODE OF DELIVERY AND AUGMENTATION AMONG ALL WOMEN WITH AN ACTIVE PHASE BY PHASE OF LABOUR ON ADMISSION AND COURSE OF LABOUR

Variable	Course of labour											
	Remained on or left of alert line			Moved between alert and action line			Moved to action line via referral zone			Moved straight to action line		
	Admitted latent phase	Admitted active phase	All	Admitted latent phase	Admitted active phase	All	Admitted latent phase	Admitted active phase	All	Admitted latent phase	Admitted active phase	All
Total number	**1 418 (100.0)**	**4 913 (100.0)**	**6 331 (100.0)**	**492 (100.0)**	**1 011 (100.0)**	**1 503 (100.0)**	**169 (100.0)**	**249 (100.0)**	**418 (100.0)**	**174 (100.0)**	**272 (100.0)**	**446 (100.0)**
Spontaneous vertex delivery	1 280 (90.3)	4 583 (93.3)	5 863 (92.6)	408 (82.9)	821 (81.2)	1 229 (81.8)	106 (62.7)	128 (51.4)	234 (56.0)	106 (60.9)	178 (65.4)	284 (63.7)
Caesarean section	14 (1.1)	21 (0.4)	35 (0.6)	16 (3.3)	35 (3.5)	51 (3.4)	28 (16.6)	66 (26.5)	94 (22.5)	42 (24.1)	52 (19.1)	94 (21.1)
Augmentation	94 (6.6)	66 (1.3)	160 (2.5)	45 (9.1)	91 (9.0)	136 (9.0)	106 (62.7)	135 (54.2)	241 (57.7)	125 (71.8)	199 (73.2)	324 (72.6)

Percentages in parentheses.

TABLE 8.8

CAESAREAN SECTIONS AND AUGMENTED LABOURS BY COURSE OF LABOUR FOR ALL "NORMAL" WOMEN WITH AN ACTIVE PHASE

	On or left of alert line		Between alert and action line		Reached or crossed action line	
All parities	6 331	(100.0)	1 503	(100.0)	864	(100.0)
Caesarean section	35	(0.6)	51	(3.4)	188	(21.8)
Augmentation	160	(2.5)	136	(9.0)	565	(65.4)
Nullipara	2 427	(100.0)	771	(100.0)	514	(100.0)
Caesarean section	22	(0.9)	36	(4.7)	130	(25.3)
Augmentation	74	(3.0)	63	(8.2)	331	(64.4)
Multipara	3 904	(100.0)	732	(100.0)	350	(100.0)
Caesarean section	13	(0.3)	15	(2.0)	58	(16.5)
Augmentation	86	(2.2)	73	(10.0)	234	(66.9)

Percentages in parentheses.

N.B.: This Table contains information from Tables 8.3 and 8.6.

TABLE 8.9

LABOUR COURSE AND OUTCOME WITH DIFFERENT PARTOGRAPHS

Study	Parities studied	Percentage crossing action line	Percentage augmented not crossing action line	Percentage augmented crossing action line	Percentage caesarean section not crossing action line	Percentage caesarean section crossing action line
Present study (Table 8.7)	All	9.9	3.8	65.4	1.1	21.8
Philpott[8]	Nullipara	10.9	-	-	0.4	20.6
Durjardin et al[48]	All	3.4	-	-	-	-
Bird[13]	All	1.3	0.06	69.6	0.14	26.4
Ledger and Witting[50]	Nullipara	17.6	4.5	27.8	1.8	17.6
Studd et al[46]	All	23.6	0	100.0	0	5.7
Cardozo et al[44]	Nullipara	34.0	0	100.0	1.6	21.5
Gibb et al[45]	Multipara	10.3	0	100.0	0.5	11.6

Where figures are not given they were not reported.

9. THE WHO PARTOGRAPH REFERRAL ZONE

9.1 Summary

When cervical dilatation on the WHO partograph moves between the alert and action lines, referral from a peripheral to a central unit has been recommended.[24] The caesarean section rate in such cases was 7.6%, including those women whose dilatation went back to the alert line and ultimately reached or crossed the action line. The subsequent course of labour and mode of delivery after reaching the referral zone was similar regardless of the cervical dilatation at which the referral zone was reached. Even when the referral zone was reached at advanced cervical dilatation (≥8 cm), caesarean section and operative vaginal delivery rates were higher than among those remaining on or left of the alert line. The trends were the same for all parities.

When transfer dilemmas occur, the level of the fetal head may provide further guidance. If the fetal head was two-fifths or less palpable abdominally when the referral zone was reached, caesarean section was less likely to become necessary than if the level of the head was three-fifths or more, palpable abdominally.

9.2 Introduction

WHO guidelines for use with the WHO partograph[24] suggest that, for women labouring outside a centre with facilities for caesarean section, movement of cervical dilatation to the right of the alert line is an indication for referral to a centre with such facilities. Most of these women will have a cervical dilatation placed between the alert and action lines. Hence the usage in this report of the term "referral zone" for dilatations so placed. In a smaller number of cases (5.1% of all women with an active phase in this study) dilatation may move directly from the alert to the action line if there is no dilatation at all within 4 hours. This latter situation is examined further in Chapter 10 where the action line is studied in detail.

Research into the use of a partograph as a referral tool has been negligible. Lennox, in Papua New Guinea,[16] found that, with the use of a partograph in health centres, the rate of referrals in labour rose from 1.1% to 3.2%, but the partograph in that study was poorly used. Leigh[14] reported the use of a partograph to aid referral decisions in labour and found a lower caesarean section rate among those referrals using a partograph compared to those with no partograph, but the influence of the partograph on referral rates was not reported. Although the present hospital based study could not examine the issue of referrals in labour directly, an attempt is made in this chapter to examine in detail those labours which reached the referral zone to help formulate referral guidelines.

The cervical dilatation on reaching the referral zone and the level of the fetal head are studied and related to the subsequent course of labour and mode of delivery. Management actions and their influence on the outcome are not considered here. All women with an active phase (labour Types 1C and 2) are considered together with no distinction made depending on their phase of labour on admission. Only women from the normal group are considered in order to avoid the influence of other risk factors.

9.3 Overall Results from Previous Chapters

It was shown in Chapter 6 that 1921 women (from the normal group), representing 22.1% of all women with an active phase, entered the referral zone; the remaining women either remained on or left of the alert line or moved directly from the alert to the action line. Under the existing WHO guidelines, therefore, 22.1% of women (plus 5.1% moving directly to the action line) would be transferred from a peripheral to a central unit. Of the 1921 women, 418 (21.8%) subsequently reached or crossed the action line and had a caesarean section rate of 22.5% (Chapter 8). The remaining 1503 (78.2%) did not reach the action line and had a caesarean section rate of 3.4%.

The total caesarean section rate for all women with at least one cervical dilatation in the referral zone was 7.5%, compared to 0.6% when labour remained on or to the left of the alert line. This is a significant difference and could justify referral rates of 25-30% in labour but a large number of women may be transferred unnecessarily.

9.4 Course of Labour After Entering Referral Zone at Different Cervical Dilatations

After a vaginal examination places cervical dilatation between the alert and action line, the subsequent course of labour may follow one of three different courses, viz it may move back to or left of the alert line, remain between the alert and action line, or moves to or beyond the action line. This course may be related to the cervical dilatation which first move to the right of the alert line. Tables 9.1-9.3 present this data among all parities and by two parity groupings (nullipara and multipara). The total number of women included in Table 9.1 (1844) is less than the 1921 women who reached the referral zone because of missing data in 77 cases. In addition, the proportion of women reaching the action line is slightly different from that reported in Chapter 6 (see Section 9.2, above), partly because of missing data and partly because, in Table 9.1, the position on the partograph at delivery was taken as representing the subsequent course of labour. Nonetheless, the numbers are sufficient to demonstrate that any subsequent course of labour is possible regardless of the cervical dilatation (except for 10 cm) when the referral zone is reached. If the referral zone is reached at 8 cm dilatation or more, movement out of the referral zone is unlikely. At lower cervical dilatations, a significant proportion may move back to the alert line (indicating more rapid progress) or move to the action line (indicating slow progress). The highest proportion of labours (48.3%) returned to the alert line when the referral zone was reached at 6 cm cervical dilatation, while the highest proportion (32.2%) reached the action line when the referral zone was reached at 4 cm dilatation. The 11 labours recorded as reaching the referral zone at 3 cm cervical dilatation either represent recording errors or vaginal examinations performed earlier than 4 hours after the first examination recorded in the active phase.

When the information in Table 9.1 is broken into nulliparous (Table 9.2) and multiparous (Table 9.3) women, the trends are similar, although at all dilatations nullipara show a greater tendency to ultimately reach the action line.

These results suggest that reaching the referral zone is of broadly similar significance regardless of the dilatation at which the referral zone is reached. A significant proportion of all such labours do reach the action line. This is, however, unlikely to happen when the referral zone is reached at 8 cm or more. The ultimate mode of delivery of these labours is now examined.

9.5 Dilatation on Crossing the Alert Line and Mode of Delivery

The drawing of straight alert and action lines on the partograph assumes that crossing or reaching these lines is of equal significance at all cervical dilatations. To test this hypothesis, the outcome of labour (expressed as mode of delivery) was examined for those moving between the alert and action lines at different dilatations (Table 9.4). The preceding and subsequent course of labour is not considered. Thus Table 5.16 includes all women with a vaginal examination in the "referral zone" regardless of whether they were admitted in the latent or active phase. This is valid as it has already been shown (Chapter 8) that the outcomes in these two admission groups are similar. Parities are, however, considered separately in Table 9.4. Altogether, the outcomes of 1852 women are shown in Table 9.4. In the remaining 69 cases, insufficient data was available for their inclusion.

Cervical dilatations of 3 cm between the alert and action line can only have been recorded when a vaginal examination was performed within less than 4 hours from the previous examination, and there was therefore likely to have been an additional problem, such as fetal distress, which explains the high caesarean section rate (18%) among these very few cases (11 altogether). However, as stated in Section 9.3, there may also have been recording errors. Otherwise, no particular pattern emerges in Table 9.4. Moving between the alert and action line appears to be of similar significance as a predictive indicator of mode of delivery regardless of cervical dilatation and parity allowing for the fact that operative delivery rates are higher for nullipara than for multipara throughout.

Apart from the particularly high rate already noted for 3 cm referral zone entrants, the highest caesarean section rate (11.3%) occurred when the referral zone was reached at 4 cm dilatation. This corresponds with the dilatation following which the greatest proportion of women subsequently reached the action line (Table 9.1). There was a similar correlation in the reverse direction at 6 cm which had the lowest ultimate caesarean section rate (4.7%) and the greatest chance of return to the alert line or left of it (Table 9.1).

Even at advanced cervical dilatations (8-10 cm) when progress either back to the alert line or on to the action line was rare (Table 9.1), caesarean section rates were mainly comparable with other cervical dilatations, and operative vaginal delivery rates were significantly higher (28.6% at 10 cm dilatation).

These results appear to confirm that referral to a centre with facilities for caesarean section is advisable regardless of the dilatation at which the referral zone is reached although the dilemma of transfer difficulties in advanced labour may create local problems.

9.6 Level of Fetal Head in the Referral Zone

The level of the fetal head (in fifths palpable abdominally) is assessed at the same time as cervical dilatation. Table 9.5 presents the mean level of the fetal head at different dilatations when the referral zone is reached and relates this information to the mode of delivery by parity. At all cervical dilatations and for all parities the level of the fetal head was higher when the ultimate mode of delivery was caesarean section than when the delivery was spontaneous. It may be concluded that if the level of the head is two-fifths or less when dilatation is between the alert and action lines, caesarean section is less likely to be ultimately necessary than if the level of the head is three-fifths or more. This may help referral decisions.

TABLE 9.1

COURSE OF LABOUR BY DILATATION AT FIRST EXAMINATION BETWEEN ALERT AND ACTION LINES
(All parities)

Subsequent course of labour[1]	Cervical dilatations at first examination between alert and action lines (cm)								All[2]
	3	4	5	6	7	8	9	10	
Moved back to or left of alert line	7 (63.6)	107 (28.9)	233 (44.6)	217 (48.3)	63 (35.6)	26 (22.0)	1 (1.6)	0	654 (35.5)
Remained between alert and action line	4 (36.4)	144 (38.9)	215 (41.2)	176 (39.2)	82 (46.3)	75 (63.6)	59 (93.7)	134 (100)	889 (48.2)
Moved to or beyond action line	0	119 (32.2)	74 (14.2)	56 (12.5)	32 (18.1)	17 (14.4)	3 (4.8)	0	301 (16.3)
ALL	11 (100.0)	370 (100.0)	522 (100.0)	449 (100.0)	177 (100.0)	118 (100.0)	63 (100.0)	134 (100.0)	1 844 (100.0)

Percentages in parentheses.

[1] *As measured by position on partograph at delivery.*
[2] *See text for explanation of discrepancies between these numbers and those in Chapter 6.*

TABLE 9.2

COURSE OF LABOUR BY DILATATION AT FIRST EXAMINATION BETWEEN ALERT AND ACTION LINES[1]
(Nullipara)

Subsequent course of labour	Cervical dilatations at first examination between alert and action lines (cm)								All[2]
	3	4	5	6	7	8	9	10	
Moved back to or left of alert line	5 (62.5)	35 (16.7)	95 (34.7)	93 (40.6)	24 (26.1)	10 (15.4)	1 (3.2)	0	263 (26.4)
Remained between alert and action line	3 (37.5)	94 (44.8)	125 (45.6)	100 (43.7)	48 (52.2)	47 (72.3)	28 (90.3)	89 (100)	534 (53.5)
Moved to or beyond action line	0	81 (38.6)	54 (19.7)	36 (15.7)	20 (21.7)	8 (12.3)	2 (4.5)	0	201 (20.1)
ALL	8 (100.0)	210 (100.0)	274 (100.0)	229 (100.0)	92 (100.0)	65 (100.0)	31 (100.0)	89 (100.0)	998 (100.0)

Percentages in parentheses.

[1] *See footnotes to Table 9.1.*
[2] *Parity unknown in 5 cases.*

TABLE 9.3

COURSE OF LABOUR BY DILATATION AT FIRST EXAMINATION BETWEEN ALERT AND ACTION LINES[1] (Multipara)

Subsequent course of labour	Cervical dilatations at first examination between alert and action line (cm)								All[2]
	3	4	5	6	7	8	9	10	
Moved back to or left of alert line	2 (100.0)	72 (45.6)	138 (55.9)	124 (56.4)	39 (45.9)	16 (30.2)	0	0	391 (46.5)
Remained between alert and action line	0	49 (31.0)	89 (36.0)	76 (34.6)	34 (40.0)	28 (52.8)	31 (100)	45 (100)	352 (41.9)
Moved to or beyond action line	0	37 (23.4)	20 (8.1)	20 (9.1)	12 (14.1)	9 (17.0)	0	0	98 (11.7)
ALL	2 (100.0)	158 (100.0)	247 (100.0)	220 (100.0)	85 (100.0)	53 (100.0)	31 (100.0)	45 (100.0)	841 (100.0)

Percentages in parentheses.

[1] *See footnotes to Table 9.1.*
[2] *Parity unknown in 5 cases.*

TABLE 9.4

MODE OF DELIVERY BY PARITY AND BY FIRST CERVICAL DILATATION BETWEEN ALERT AND ACTION LINE

Parity and mode of delivery	First cervical dilatation between alert and action lines (cm)								All women
	3	4	5	6	7	8	9	10	
All parities	11 (100.0)	371 (100.0)	525[1] (100.0)	450[2] (100.0)	177 (100.0)	119 (100.0)	63 (100.0)	136 (100.0)	1 852[3] (100.0)
Spontaneous vertex delivery	5 (45.5)	276 (74.4)	427 (81.3)	358 (79.6)	130 (73.5)	85 (71.4)	39 (61.9)	91 (66.9)	1 411 (76.2)
Operative vaginal delivery	4 (36.4)	53 (14.3)	63 (12.0)	69 (15.3)	28 (15.8)	23 (19.3)	17 (27.0)	39 (28.6)	296 (16.0)
Caesarean section	2 (18.2)	42 (11.3)	34 (6.5)	21 (4.7)	19 (10.7)	11 (9.2)	7 (11.1)	6 (4.4)	142 (7.7)
Nullipara	8 (100.0)	211 (100.0)	278 (100.0)	229[2] (100.0)	92 (100.0)	66 (100.0)	31 (100.0)	90 (100.0)	1 005[2] (100.0)
Spontaneous vertex delivery	3 (37.5)	142 (67.3)	201 (72.3)	166 (72.5)	63 (68.5)	45 (68.2)	14 (45.2)	59 (65.6)	693 (69.0)
Operative vaginal delivery	4 (50.0)	39 (18.5)	52 (18.7)	45 (19.7)	17 (18.5)	15 (22.7)	13 (41.9)	27 (30.0)	212 (21.1)
Caesarean section	1 (12.5)	30 (14.2)	25 (9.0)	16 (6.9)	12 (13.0)	6 (9.1)	4 (12.9)	4 (4.4)	98 (9.8)

Percentages in parentheses.

TABLE 9.4 (cont'd)
MODE OF DELIVERY BY PARITY AND BY FIRST CERVICAL DILATATION BETWEEN ALERT AND ACTION LINE

Parity and mode of delivery	First cervical dilatation between alert and action lines (cm)								All women
	3	4	5	6	7	8	9	10	
Para 1-4	2 (100.0)	141 (100.0)	218[1] (100.0)	196 (100.0)	73 (100.0)	44 (100.0)	24 (100.0)	37 (100.0)	735[1] (100.0)
Spontaneous vertex delivery	1 (50.0)	117 (82.9)	197 (90.4)	171 (87.2)	58 (79.5)	34 (77.3)	17 (70.8)	25 (67.6)	620 (84.4)
Operative vaginal delivery	0	14 (9.9)	11 (5.0)	22 (11.2)	8 (11.0)	6 (13.6)	4 (16.7)	10 (27.0)	75 (10.2)
Caesarean section	1 (50.0)	10 (7.1)	9 (4.1)	3 (1.5)	7 (9.6)	4 (9.1)	3 (12.5)	2 (5.4)	39 (5.3)
Para 5+	1 (100.0)	19 (100.0)	29 (100.0)	25 (100.0)	12 (100.0)	9 (100.0)	8 (100.0)	9 (100.0)	112 (100.0)
Spontaneous vertex delivery	1 (100.0)	17 (89.5)	29 (100.0)	21 (84.0)	9 (75.0)	6 (66.7)	8 (100.0)	7 (77.8)	98 (87.5)
Operative vaginal delivery	0	0	0	2 (8.0)	3 (25.0)	2 (22.2)	0	2 (22.2)	9 (8.0)
Caesarean section	0	2 (10.5)	0	2 (8.0)	0	1 (11.1)	0	0	5 (4.5)

Percentages in parentheses.

[1] *Mode of delivery unknown in 1 case.*

[2] *Mode of delivery unknown in 2 cases.*

[3] *Mode of delivery unknown in 3 cases.*

TABLE 9.5

MODE OF DELIVERY BY LEVEL OF FETAL HEAD AND BY PARITY AT DIFFERENT CERVICAL DILATATIONS AT FIRST CERVICAL DILATATION BETWEEN ALERT AND ACTION LINES

Parity and mode of delivery[1]	Mean level of head (fifths palpable abdominally) by cervical dilatation (cm) at first examination between alert and action line							
	3 cm	4 cm	5 cm	6 cm	7 cm	8 cm	9 cm	10 cm
Total observations	**11**	**371**	**525**	**450**	**177**	**119**	**63**	**136**
All parities								
All deliveries[2] (1 852)	3.00	2.84	2.61	2.54	2.33	2.29	1.70	0.69
SVD (1 411)	2.60	2.81	2.60	2.54	2.27	2.28	1.74	0.63
Operative vaginal (296)	3.00	2.77	2.46	2.49	2.32	2.09	1.53	0.64
Caesarean section (142)	4.00	3.12	3.03	2.86	2.68	2.82	1.86	2.00
Nullipara								
All deliveries[3] (1 005)	3.00	2.67	2.47	2.43	2.17	2.14	1.39	0.62
SVD (693)	2.67	2.57	2.41	2.40	2.05	2.11	1.36	0.56
Operative vaginal (212)	3.00	2.80	2.40	2.36	2.41	1.93	1.23	0.59
Caesarean section (98)	4.00	2.97	3.08	2.88	2.50	2.83	2.00	1.75
Para 1-4								
All deliveries[4] (735)	3.00	3.04	2.73	2.65	2.47	2.48	2.00	0.87
SVD (620)	2.00	3.03	2.73	2.64	2.45	2.38	1.94	0.80
Operative vaginal (75)	-	2.71	2.73	2.73	2.13	2.33	2.50	0.70
Caesarean section (39)	4.00	3.60	2.89	2.67	3.00	3.50	1.67	2.50
Para5+								
All deliveries (112)	3.00	3.26	3.10	2.84	2.67	2.56	2.00	0.67
SVD (98)	3.00	3.29	3.10	2.81	2.78	3.00	2.00	0.57
Operative vaginal (9)	-	-	-	3.00	2.33	2.50	-	1.00
Caesarean section (5)	-	3.00	-	3.00	-	3.00	-	-

[1] *Numbers in parentheses are total numbers in each group.*
[2] *Mode of delivery unknown in 3 cases.*
[3] *Mode of delivery unknown in 2 cases.*
[4] *Mode of delivery unknown in 1 case.*

10. THE WHO PARTOGRAPH ACTION LINE

10.1 Summary

The 864 women from the normal group who reached or crossed the active phase action line had a high rate of intervention, with 65.4% of labours augmented and 21.8% delivered by caesarean section. High caesarean section and operative vaginal delivery rates occurred regardless of the cervical dilatation at which the action line was reached or crossed. This was equally true in those cases which moved directly from the alert to the action line, although this most frequently occurred at 3 cm dilatation when there was a somewhat lower caesarean section rate. This suggests that some of these women may not have been in labour. Care must be taken when cervical dilatation moves directly from the alert to the action line at low cervical dilatations that the woman is genuinely in labour. This caution aside, all women reaching or crossing the action line require high risk attention and/or referral to a central unit.

10.2 Introduction

In this study, 864 women, representing 9.9% of the normal group of women, reached the active phase action line (Chapter 6). These women had a high rate of intervention in labour, with 65.4% of these labours receiving oxytocin augmentation and 21.8% being delivered by caesarean section and 18.2% by forceps or vacuum extraction (Chapter 7). This has already been discussed briefly in Chapter 8.

The figures presented justify the action line but, as with the referral zone (Chapter 9), it must be demonstrated whether reaching or crossing the action line is of similar significance regardless of the cervical dilatation. In addition, in this chapter, the differences between those labours which move directly to the action line from the alert line and those which reach the action line via a cervical dilatation in the referral zone are examined separately and compared.

This chapter does not examine the different actions performed at the action line and their consequences.

10.3 Dilatation on Reaching or Crossing the Action Line and Mode of Delivery

The significance of crossing the active phase action line at different cervical dilatations can be assessed in the same way as for the alert line (Chapter 9). The action line can be reached either via an intermediate cervical dilatation in the "referral zone" or by moving straight from the alert line. These cases are considered together in Table 10.1, which examines the mode of delivery among women with different cervical dilatations at their first vaginal examination at or beyond the action line. As numbers are relatively small and the pattern for all parities is similar, all parities are combined in Table 10.1, as are women who were admitted both in the latent and active phase.

It is clear that the action line efficiently identifies those women with a high probability of an operative delivery regardless of the dilatation at which the action line was reached. With the exception of those very few women who reached or crossed the action line at 10 cm dilatation, the lowest caesarean section rate (16.6%) occurred among those women reaching the action line at 3 cm dilatation. This is also the largest group numerically. All of those women must have moved directly from the alert to the action line and are therefore part of a special group who are analysed further in the following section.

10.4 Further Examination of Labours Moving Straight from the Alert to the Action Line

Some differences have already been noted (Chapter 8) in the caesarean section rates between those moving directly from the alert to the action line and those reaching the action line via the referral zone. Among those admitted in the latent phase of labour, the highest caesarean section rate occurred when labour moved directly from the alert to the action line, but among those admitted in the active phase, the highest rate occurred when the action line was reached via the referral zone. It was suggested (Chapter 8) that those admitted in the active phase and moving directly from the alert to the action line may not have been in true labour. This may particularly be true of parous women at low cervical dilatations. This is tested in Tables 10.2 and 10.3 which compare the mode of delivery among women of different parities moving straight to the action line at different cervical dilatations, depending on the phase of labour at admission.

Although 174 women admitted in the latent phase moved directly from the alert to the action line in the active phase, data from 17 cases was insufficient for this analysis and data in Table 10.2 is from the remaining 155 women. Full data from four cases was similarly unavailable for women admitted in the active phase of labour (Table 10.3).

The caesarean section rate among the 158 women admitted in the latent phase who moved directly from the alert to the action line after reaching the active phase was 24.1% (Table 10.2). Two-thirds of these women moved to the action line at 3 cm cervical dilatation and their caesarean section rate was 20.4%. These women probably were genuinely in labour as they had been through an observed latent phase, but their lowered caesarean section rate when compared to those moving straight to the action line at 4 cm (37.1% caesarean section) suggest that some of them may not have been. This difference between the caesarean section rates for those reaching the action line at 3 or 4 cm dilatation persisted when nulliparous and parous women were studied separately. Only two women of high parity moved straight to the action line; both delivered spontaneously.

A greater number (272) of women admitted in the active phase of labour moved directly from the alert to the action line (Table 10.3) but this represents a smaller proportion of all active phase admissions (4.2%) than the proportion of latent phase admissions with the same pattern on the partograph (7.7%). As with the latent phase admissions, the greatest number of women moved straight to the action line at 3 cm dilatation. Some of them may not have been in labour and should not have been on the partograph. This appears to be confirmed by their relatively low caesarean section rate (14.1%). Caesarean section rates rise steadily thereafter with increasing dilatation of direct move from alert to action line. The trend is similar for all parities, including grand multipara.

This analysis shows that moving straight from the alert to the action line at all cervical dilatations does signify a high probability of operative delivery becoming necessary, especially when admission was in the latent phase. However, care must be taken at low cervical dilatations, especially 3 cm, to ensure that the woman is genuinely in labour; the lowered rates of caesarean section among these women suggest that some of the women in this study were not in labour. Any action at the action line at 3 cm dilatation in these cases would technically have been an induction which from 3 cm would have a high chance of achieving a successful vaginal delivery. Nonetheless, for those in labour, these results suggest that women reaching or crossing the action line directly or indirectly and at any cervical dilatation should be treated as high risk cases and managed accordingly (or transferred at once, if not already in a central unit).

TABLE 10.1

MODE OF DELIVERY BY CERVICAL DILATATION AT FIRST VAGINAL EXAMINATION AT OR BEYOND ACTION LINE IN ACTIVE PHASE
(All parities)

Mode of delivery	Cervical dilatation at or beyond action lines (cm)								All women
	3	4	5	6	7	8	9	10	
Spontaneous vertex delivery	161 (66.8)	88 (60.7)	76 (55.5)	61 (61.0)	53 (54.1)	41 (56.9)	12 (42.9)	11 (73.3)	503 (60.2)
Operative vaginal delivery	39 (16.2)	16 (11.0)	23 (16.8)	19 (19.0)	26 (26.5)	14 (19.4)	10 (35.7)	3 (20.0)	150 (17.9)
Caesarean section	40 (16.6)	41 (28.3)	38 (27.7)	20 (20.0)	19 (19.4)	17 (23.6)	6 (21.4)	1 (6.7)	182 (21.8)
All	241[1] (100.0)	145 (100.0)	137 (100.0)	100 (100.0)	98 (100.0)	72 (100.0)	28 (100.0)	15 (100.0)	836[1] (100.0)

Percentages in parentheses.

[1] *Mode of delivery unknown in 1 case.*

TABLE 10.2

MODE OF DELIVERY BY PARITY AND BY CERVICAL DILATATION AT ACTION LINE AMONG WOMEN MOVING DIRECTLY FROM THE ALERT TO THE ACTION LINE; ADMITTED IN THE LATENT PHASE

Parity and mode of delivery	Cervical dilatation at action line (cm)							
	3	4	5	6	7	8	9	All[1]
All parities	103 (100.0)	35 (100.0)	10 (100.0)	5 (100.0)	1	1	3 (100.0)	158 (100.0)
Spontaneous vertex delivery	65 (63.1)	18 (51.4)	9 (90.0)	2 (40.0)	1	0	0	95 (60.1)
Operative vaginal delivery	17	4 (11.4)	0	1 (20.0)	0	1	2 (66.7)	25 (15.8)
Caesarean section	21 (20.4)	13 (37.1)	1 (10.0)	2 (40.0)	0	0	1 (33.3)	38 (24.1)
Nullipara	67 (100.0)	17 (100.0)	6 (100.0)	2 (100.0)	1	1	2 (100.0)	96 (100.0)
Spontaneous vertex delivery	33 (49.3)	5 (29.4)	6 (100.0)	1 (50.0)	1	0	0	46 (47.9)
Operative vaginal delivery	14 (20.9)	3 (17.7)	0	0	0	1	2	20 (20.8)
Caesarean section	20 (29.9)	9 (52.9)	0	1 (50.0)	0	0	0	30 (31.3)

Percentages in parentheses.

[1] *Incomplete data available for a further 17 cases.*

TABLE 10.2 (cont'd)

MODE OF DELIVERY BY PARITY AND BY CERVICAL DILATATION AT ACTION LINE AMONG WOMEN MOVING DIRECTLY FROM THE ALERT TO THE ACTION LINE; ADMITTED IN THE LATENT PHASE

Parity and mode of delivery	Cervical dilatation at action line (cm)							
	3	4	5	6	7	8	9	All
Para 1-4	34 (100.0)	18 (100.0)	4 (100.0)	3 (100.0)	0	0	1	60 (100.0)
Spontaneous vertex delivery	30 (88.2)	13 (72.2)	3 (75.0)	1 (33.3)	0	0	0	47 (78.3)
Operative vaginal delivery	3 (8.8)	1 (5.6)	0	1 (33.3)	0	0	0	5 (8.3)
Caesarean section	1 (2.9)	4 (22.2)	1 (25.0)	1 (33.3)	0	0	1	8 (13.3)
Para 5+	2 (100.0)	0	0	0	0	0	0	2 (100.0)
Spontaneous vertex delivery	2 (100.0)	-	-	-	-	-	-	2 (100.0)
Operative vaginal delivery	0	-	-	-	-	-	-	0
Caesarean section	0	-	-	-	-	-	-	0

Percentages in parentheses.

TABLE 10.3

MODE OF DELIVERY BY PARITY AND BY CERVICAL DILATATION AT ACTION LINE AMONG WOMEN MOVING DIRECTLY FROM THE ALERT TO THE ACTION LINE; ADMITTED IN THE ACTIVE PHASE

Parity and mode of delivery	Cervical dilatation at action line (cm)							
	3	4	5	6	7	8	9	All[1]
All parities	128 (100.0)	72 (100.0)	26 (100.0)	15 (100.0)	12 (100.0)	14 (100.0)	1	268 (100.0)
Spontaneous vertex delivery	88 (68.8)	53 (73.6)	13 (50.0)	8 (53.3)	7 (58.3)	8 (57.1)	0	177 (66.0)
Operative vaginal delivery	22 (17.2)	6 (8.3)	5 (19.2)	3 (20.0)	2 (16.7)	2 (14.3)	0	40 (14.9)
Caesarean section	18 (14.1)	13 (18.1)	8 (30.8)	4 (26.7)	3 (25.0)	4 (28.6)	1	51 (19.0)
Nullipara	64 (100.0)	31 (100.0)	13 (100.0)	7 (100.0)	4 (100.0)	9 (100.0)	1	129 (100.0)
Spontaneous vertex delivery	36 (56.3)	22 (71.0)	3 (23.1)	2 (28.6)	1 (25.0)	5 (55.6)	0	69 (53.5)
Operative vaginal delivery	18 (28.1)	3 (9.7)	5 (38.5)	1 (14.3)	2 (50.0)	1 (11.1)	0	30 (23.3)
Caesarean section	10 (15.6)	6 (19.4)	5 (38.5)	4 (57.1)	1 (25.0)	3 (33.3)	1	30 (23.3)

Percentages in parentheses.

[1] *Incomplete data available for a further 4 cases.*

TABLE 10.3 (cont'd):
MODE OF DELIVERY BY PARITY AND BY CERVICAL DILATATION AT ACTION LINE AMONG WOMEN MOVING DIRECTLY FROM THE ALERT TO THE ACTION LINE; ADMITTED IN THE ACTIVE PHASE

Parity and mode of delivery	Cervical dilatation at action line (cm)							
	3	4	5	6	7	8	9	All
Para 1-4	47 (100.0)	30 (100.0)	10 (100.0)	6 (100.0)	7 (100.0)	2 (100.0)	0	102 (100.0)
Spontaneous vertex delivery	36 (76.6)	24 (80.0)	7 (70.0)	5 (83.3)	6 (85.7)	1 (50.0)	0	79 (77.5)
Operative vaginal delivery	4 (8.5)	2 (6.7)	0	1 (16.7)	0	1 (50.0)	0	8 (7.8)
Caesarean section	7 (14.9)	4 (13.3)	3 (30.0)	0	1 (14.3)	0	0	15 (14.7)
Para 5+	16 (100.0)	11 (100.0)	3 (100.0)	2 (100.0)	1	3 (100.0)	0	36 (100.0)
Spontaneous vertex delivery	15 (93.8)	7 (63.6)	3 (100.0)	1 (50.0)	0	2 (66.7)	0	28 (77.8)
Operative vaginal delivery	0	1 (9.1)	0	1 (50.0)	0	0	0	2 (5.6)
Caesarean section	1 (6.25)	3 (27.3)	0	0	1	1 (33.3)	0	6 (16.7)

Percentages in parentheses.

11. THE LATENT AND ACTIVE PHASE INTERFACE

11.1 Summary

The WHO partograph delineates 3 cm cervical dilatation as the commencement of the active phase of labour. Although most writers have agreed with this, this belief is by no means universal and some doubt the existence of a true latent phase of labour.

This chapter examines the characteristic findings on admission at 2 cm, 3 cm and 4 cm dilatation with the subsequent course of labour and mode of delivery. Although the cervix of a nullipara was more likely to be effaced in early labour than that of a multipara, even at 4 cm cervical dilatation, almost half of nullipara had cervices not fully effaced. Among women of all parity groupings, the pattern of cervical effacement and of the level of the fetal head at 3 cm dilatation more closely resembled that at 4 cm than at 2 cm dilatation.

When the cervix was incompletely effaced, the progress of labour from a given cervical dilatation (2 cm, 3 cm or 4 cm) was slower than if the cervix was fully effaced. However, this relationship was also valid for each cervical dilatation regardless of effacement. The ultimate mode of delivery had no relationship with cervical effacement in early labour.

It is concluded that it is reasonable to plot 3 cm cervical dilatation in the active phase of labour and that the inclusion of cervical effacement as part of the partograph charting of labour is unnecessary. It is more important to confirm that the contraction pattern in early labour indicates that the partograph should be commenced.

11.2 Introduction

The active phase of labour on the WHO partograph has been examined in detail in previous chapters as has the outcome of labour for those with a latent phase. The eight hour action line in the latent phase and the alert and action lines in the active phase appear, from those chapters, to have validity. The line dividing the latent from the active phase, however, also merits examination.

With some notable exceptions,[11,41] the existence of a latent phase of labour is generally acknowledged, and 3 cm cervical dilatation is generally taken, as with the WHO partograph, as the dilatation at which labour is considered to enter the active phase,[8,49] as was Friedman's original findings.[7] Nonetheless, some writers, most notably Bird[13] consider that 4 cm should be taken to mark the onset of the active phase because of the "inherent" inconsistency in vaginal examinations and the difficulty in distinguishing between late latent and early active phase labour.

A further element of uncertainty about the latent and active phase interface is the role of cervical effacement. The WHO partograph takes no account of effacement as this was thought to add an additional complication to the partograph, although Philpott, on whose work the WHO partograph is largely based, did not consider labour to be in the active phase until complete cervical effacement.[52]

This chapter examines the findings on admission and the subsequent labours of those women from the normal group admitted at 2 cm, 3 cm and 4 cm cervical dilatation in an attempt to establish the significance of cervical effacement and to confirm that labour at 3 cm dilatation should be considered in the active phase. There is little disagreement that labour at

2 cm dilatation is in the latent phase and 4 cm in the active phase. The controversy exists over the category into which 3 cm should be placed.

11.3 Cervical Effacement in Early Labour

The WHO partograph places all women of 3 cm dilatation (or more) in the active phase regardless of cervical effacement. Cervical effacement was, however, recorded on admission as part of this study. The degree of effacement was recorded in thirds. Thus $^3/_3$ was fully effaced and $^0/_3$ completely uneffaced. In this section, the relationship between cervical dilatation, effacement, subsequent course of labour and mode of delivery is studied to try to establish, firstly, whether the active phase does start at 3 cm or 4 cm and, secondly, whether the degree of cervical effacement is an important consideration in the diagnosis of active labour. In addition, the level of the fetal head as recorded on admission in fifths palpable abdominally is compared with cervical dilatation in early labour.

11.4 Cervical Dilatation and Effacement at Admission

Table 11.1 is a simple comparison of women with different degrees (in thirds) of cervical effacement on admission at 2 cm, 3 cm and 4 cm cervical dilatation. All women from the normal group both before and after implementation, are included. The direct correlation between effacement and dilatation is clear; the more the dilatation the higher proportion with two-thirds or full effacement. Those at 3 cm dilatation occupy an intermediate position between 2 cm and 4 cm, but the 3 cm dilatation column bears a closer relationship to 4 cm than to 2 cm. Even at 4 cm dilatation, however, over 50% of cervices are not fully effaced, suggesting that full effacement should not be considered a factor in the diagnosis of the active phase of labour.

When the same information is examined by parity, the same broad conclusions apply. For simplicity of interpretation, Table 11.2 only shows the percentages of women by parity with different degrees of effacement at 2 cm, 3 cm and 4 cm dilatation. The pattern at 3 cm dilatation more closely resembles that at 4 cm than at 2 cm for all parities. At all dilatations, nullipara were more likely to be fully effaced than multipara but even at 4 cm, almost half of the nullipara did not have a fully effaced cervix.

11.4.1 Course of labour and mode of delivery from early labour

Information gained about cervical effacement and dilatation on admission can be further examined by studying the subsequent course of labour and mode of delivery.

Table 11.3 shows the course of labour plotted on the partograph and the mode of delivery related to cervical dilatation and effacement at 2 cm, 3 cm and 4 cm dilatation on admission. Clearly, only women after implementation of the partograph are included. A definite relationship emerges between effacement on admission and subsequent course of labour. The more effaced the cervix, the more likely it was that labour remained on or to the left of the alert line on the partograph. Less effacement was associated with slower labour. However, this correlation also exists when dilatation alone is considered, regardless of effacement; the lower the dilatation on admission the slower the subsequent course of labour in the active phase.

The mode of delivery bears a similar relationship to admission cervical dilatation; the lower the admission cervical dilatation, the higher the rate of ultimate caesarean section delivery. However, effacement appears to play little part in this, there is no clear relationship

between cervical effacement on admission and mode of delivery at all three cervical dilatations.

Although not shown in Table 11.3, when the parities were examined separately, the same trends emerged for all parities. Cervical effacement appears to be of little relevance in determining the subsequent pattern of labour and delivery for women of all parities.

11.5 Cervical Dilatation and Level of Fetal Head

In normal labour, the fetal head descends into the pelvis and progressively fewer fifths are palpable abdominally. In a further attempt to assess whether labour at 3 cm dilatation bears more resemblance to labour at 2 cm (latent phase) or 4 cm (active phase), the level of the fetal head on admission was compared at those cervical dilatations. The data for all parities combined is shown in Table 11.4 and by parity groupings in Tables 11.5 to 11.7 as this is new information of interest. The findings reported are those when the partograph was commenced to ensure that the women had been confirmed to be in labour. Thus only women from the normal group after implementation are included.

As with the findings for cervical effacement, the level of the fetal head at 3 cm cervical dilatation occupied an intermediate position between 2 cm and 4 cm but with a tendency to be more closely related to 4 cm than 2 cm. In particular, it is noteworthy that approximately half of women at 2 cm dilatation had a fetal head $^4/_5$ palpable abdominally, whereas half of the women at 3 cm and 4 cm had a fetal head $^3/_5$ palpable abdominally. The findings were consistent for all parity groupings although the mean head level rose with increasing parity. As far as clinical application in individual cases is concerned, however, the level of the fetal head at 3 cm or 4 cm dilatation is likely to be $^3/_5$ regardless of parity and likely to be $^4/_5$ at 2 cm dilatation.

This examination of the characteristics of the findings early in labour and of the subsequent course of outcome of labour confirm that labour at 3 cm dilatation bears an intermediate position between 2 cm and 4 cm but that it is appropriate to consider labour at 3 cm dilatation to be in the active phase. Careful assessment of the contraction pattern is essential to confirm that a woman at early cervical dilatations is in labour and should be on the partograph (see Chapter 2, Table 2.1). This is probably more valuable than a consideration of cervical effacement.

TABLE 11.1

CERVICAL DILATATION AND EFFACEMENT AT ADMISSION
(All parities)

Cervical effacement	Cervical dilatation (cm)					
	2		3		4	
0/3	50	(1.4)	30	(0.7)	14	(0.4)
1/3	1 309	(37.3)	1 270	(29.0)	746	(22.0)
2/3	1 389	(39.6)	1 606	(36.0)	1 177	(34.8)
3/3	764	(21.8)	1 479	(33.7)	1 447	(42.7)
Total observations	**3 512**	**(100.0)**	**4 385**	**(100.0)**	**3 386**	**(100.0)**

Percentages in parentheses.

TABLE 11.2

CERVICAL DILATATION AND EFFACEMENT AT ADMISSION BY PARITY

	Cervical dilatation (cm)								
	2 cm			3 cm			4 cm		
Parity	**0**	**1-4**	**5+**	**0**	**1-4**	**5+**	**0**	**1-4**	**5+**
Cervical effacement									
$^0/_3$	1.0%	1.80%	3.6%	0.5%	0.8%	0.9%	0.3%	0.5%	0.4%
$^1/_3$	30.2%	46.5%	41.9%	23.2%	33.0%	32.80%	19.2%	23.82%	21.9%
$^2/_3$	38.6%	40.1%	46.1%	31.8%	39.09%	46.30%	29.6%	37.3%	40.9%
$^3/_3$	30.2%	11.7%	8.4%	44.53%	27.2%	19.9%	51.1%	38.3%	36.9%
N (total numbers)	1 933	1 405	167	1 811	2 235	326	1 221	1 881	279

1 Parity was unrecorded in 25 cases.

TABLE 11.3
COURSE OF LABOUR AND MODE OF DELIVERY BY CERVICAL DILATATION AND EFFACEMENT IN EARLY LABOUR (All parities)

Course of labour and mode of delivery	Cervical dilatation on admission											
	2 cm				3 cm				4 cm			
	Effacement				Effacement				Effacement			
	0	1/3	2/3	3/3	0	1/3	2/3	3/3	0	1/3	2/3	3/3
Prolonged latent phase	1 (4.4)	20 (3.8)	12 (1.6)	3 (0.6)	NA	NA	NA	NA	NA	NA	NA	NA
All labours on or left of alert line	12 (52.2)	315 (60.0)	463 (61.7)	316 (63.0)	2 (40.0)	273 (57.6)	464 (61.8)	560 (65.0)	3 (100.0)	188 (70.9)	417 (81.6)	640 (79.5)
Labour between alert and action line	8 (34.8)	114 (21.7)	166 (22.1)	112 (22.3)	1 (20.0)	135 (28.5)	180 (24.0)	195 (22.7)	0 (0.0)	39 (14.7)	57 (11.2)	111 (13.8)
Action line reached or crossed	2 (8.7)	76 (14.5)	109 (14.5)	71 (14.1)	2 (40.0)	66 (13.9)	107 (14.3)	106 (12.3)	0 (0.0)	38 (14.3)	37 (7.2)	54 (6.7)
TOTAL NUMBERS[1]	23	525	750	502	5	474	751	861	3	265	511	805
Spontaneous vertex delivery	19 (79.2)	463 (86.7)	633 (83.4)	421 (83.4)	3 (60.0)	426 (88.4)	637 (83.5)	731 (83.7)	3 (100.0)	246 (92.5)	472 (91.3)	716 (87.6)
Operational vaginal delivery	3 (12.5)	39 (7.3)	89 (11.7)	59 (11.7)	2 (40.0)	32 (6.6)	86 (11.3)	108 (12.4)	0	13 (4.9)	25 (4.8)	72 (8.8)
Caesarean section	2 (8.3)	31 (5.8)	36 (4.7)	24 (4.8)	0 -	23 (4.8)	39 (5.1)	33 (3.8)	0 -	7 (2.6)	18 (3.5)	29 (3.6)
TOTAL NUMBERS[2]	24	533	758	504	5	481	762	872	3	266	515	817

[1] *Total numbers where effacement and course of labour known.*
[2] *Total numbers where mode of delivery known.*

TABLE 11.4

LEVEL OF FETAL HEAD AT DIFFERENT ADMISSION DILATATIONS IN EARLY LABOUR
(Normal group, after implementation, all parities)

Level of head (fifths)	Cervical dilatation on admission					
	2 cm		3 cm		4 cm	
0	1	(0.1)	2	(0.1)	6	(0.4)
1	16	(0.9)	13	(0.6)	36	(2.3)
2	112	(6.5)	267	(13.0)	256	(16.4)
3	621	(36.2)	1 083	(52.6)	878	(56.4)
4	841	(49.0)	618	(30.0)	342	(22.0)
5	124	(7.2)	77	(3.7)	40	(2.6)
All	1 715	(100.0)	2 060	(100.0)	1 558	(100.0)
MEAN	3.55		3.23		3.05	

Numbers are women with different levels of head palpable, with percentages of all for that cervical dilatation in parentheses. Mean is mean level of fetal head for all women of that dilatation on admission.

TABLE 11.5

LEVEL OF FETAL HEAD AT DIFFERENT ADMISSION DILATATIONS IN EARLY LABOUR
(Normal group, after implementation, nullipara)

Level of head (fifths)	Cervical dilatation on admission					
	2 cm		3 cm		4 cm	
0	0		1	(0.1)	2	(0.4)
1	11	(1.2)	6	(0.7)	17	(3.1)
2	86	(9.1)	138	(16.1)	99	(18.2)
3	385	(40.9)	501	(58.5)	325	(59.7)
4	437	(46.4)	201	(23.5)	98	(18.0)
5	23	(2.4)	9	(1.1)	3	(0.6)
All	942	(100.0)	856	(100.0)	544	(100.0)
MEAN	3.40		3.08		2.94	

Numbers are women with different levels of head palpable, with percentages of all for that cervical dilatation in parentheses. Mean is mean level of fetal head for all women of that dilatation on admission.

TABLE 11.6

LEVEL OF FETAL HEAD AT DIFFERENT ADMISSION DILATATIONS IN EARLY LABOUR
(Normal group, after implementation, para 1-4)

Level of head (fifths)	Cervical dilatation on admission					
	2 cm		3 cm		4 cm	
0	1	(0.1)	1	(0.1)	4	(0.5)
1	4	(0.4)	6	(0.6)	16	(1.8)
2	25	(3.6)	110	(10.7)	139	(16.1)
3	213	(30.6)	509	(49.6)	478	(55.3)
4	370	(53.2)	351	(34.2)	202	(23.4)
5	82	(11.8)	50	(4.9)	26	(3.0)
All	695	(100.0)	1 027	(100.0)	865	(100.0)
MEAN	3.72		3.32		3.08	

Numbers are women with different levels of head palpable, with percentages of all for that cervical dilatation in parentheses. Mean is mean level of fetal head for all women of that dilatation on admission.

TABLE 11.7

LEVEL OF FETAL HEAD AT DIFFERENT ADMISSION DILATATIONS IN EARLY LABOUR

(Normal group, after implementation, para 5+)

Level of head (fifths)	Cervical dilatation on admission					
	2 cm		3 cm		4 cm	
0	0		0		0	
1	1	(1.3)	1	(0.6)	3	(2.0)
2	1	(1.3)	19	(10.7)	18	(12.1)
3	23	(29.5)	73	(41.2)	75	(50.3)
4	34	(43.6)	66	(37.3)	42	(28.2)
5	19	(24.4)	18	(10.2)	11	(7.4)
All	78	(100.0)	177	(100.0)	149	(100.0)
MEAN	3.89		3.46		3.27	

Numbers are women with different levels of head palpable, with percentages of all for that cervical dilatation in parentheses. Mean is mean level of fetal head for all women of that dilatation on admission.

12. FETAL HEAD LEVEL AS A PREDICTOR OF LABOUR OUTCOME

12.1 Summary

An examination of the level of the fetal head at different points in labour suggested that, in situations when vaginal examinations are not possible, it may be used as a crude predictor of the outcome of labour.

If the fetal head is higher than $^3/_5$ palpable abdominally (regardless of parity) on presentation in labour or at spontaneous rupture of membranes, operative delivery is more likely to be necessary. The association between the level of the fetal head and ultimate mode of delivery was stronger at these two points in labour than in the referral zone or the action line on the partograph.

12.2 Introduction

In common with all other reported partographs, the central feature of the WHO partograph is the progressive assessment of cervical dilatation. This examination, however, requires training and the development of expertise. It also requires privacy and the availability of clean, preferably sterile, gloves and cleansing solution. This is arguably the greatest weakness of the partograph particularly as a tool to aid in referral decisions in labour. Abdominal palpation to assess the level of the fetal head in fifths also requires training but requires no equipment and less privacy.

The opportunity of this trial was taken to conduct an assessment of the level of the head at certain points in labour which can be identified without vaginal assessment to ascertain if this may be used as an indicator for those labours which may have an adverse outcome. In short, to assess whether a partograph without vaginal examinations could be of any value.

12.3 Level of Fetal Head and Outcome of Labour

Table 12.1 includes only women from the normal group after implementation and relates the mean level of the head for different parities and at different points in labour to the ultimate mode of delivery. Entry into the referral zone and arrival at the action line cannot be assessed without measurement of cervical dilatation but the mean fetal head levels at these points and at caesarean section are included for interest.

With the exception of those of high parity, in which group there were very few caesarean sections (11), the mean level of the head at all points in labour was higher where the ultimate mode of delivery was caesarean section. Among all parities, the mean level of head at admission (for all cervical dilatations together) was 3.12 (fifths) when the ultimate mode of delivery was spontaneous vaginal and 3.55 when the ultimate delivery was by caesarean section.

The only other point in labour which may be recognized by an attendant not performing vaginal examination is the time of rupture of the membranes. When the membranes ruptured spontaneously after admission, the mean level of the fetal head was 2.38 when spontaneous vaginal delivery was achieved and 3.15 when caesarean section ultimately became necessary. These differences were similar among nulliparous women and for those of para 1-4. The level of the fetal head among parous women when the outcome was caesarean section was particularly high (mean 3.50).

The differences were less marked at the first examination in the referral zone and at or beyond the action line. Interestingly, at both points in labour, and for all parities, the level of fetal head was lowest when the ultimate mode of delivery was forceps or vacuum extractor. The level of the head is clearly a less useful predictor of the mode of delivery at these points than on admission or at spontaneous membrane rupture. The use of the level of the head to aid referral decisions in the referral zone has already been discussed in Chapter 9.

It can crudely be concluded that, when vaginal examination is not possible, the level of the fetal head at presentation in labour and at the time of rupture of the membranes may give a rough idea of the likely outcome of labour. If, at either point, the head is higher than $^3/_5$ palpable abdominally (regardless of parity), operative delivery is more likely to be ultimately necessary and referral may be considered.

TABLE 12.1
MODE OF DELIVERY BY LEVEL OF HEAD AND BY PARITY AT DIFFERENT POINTS ON PARTOGRAPH

Parity and mode of delivery		Position on partograph				
		At admission in labour	At SRM after admission	At 1st VE in referral zone	At 1st VE at or beyond action line	At caesarean section delivery
Total observations		**8 529**	**702**	**1 849**	**937**	**304**
Mean level of head (fifths palpable abdominally)						
All parities[1]						
All deliveries[2]	(8529)	3.14	2.38	2.43	2.79	2.60
SVD	(7430)	3.12	2.33	2.43	2.81	-
Operative vaginal	(794)	3.14	2.57	2.20	2.47	-
Caesarean section	(295)	3.55	3.15	2.88	2.98	2.60
Nullipara[1]						
All deliveries[3]	(3657)	3.07	2.43	2.26	2.63	2.48
SVD	(2902)	3.04	2.36	2.21	2.60	-
Operative vaginal	(546)	3.10	2.55	2.14	2.39	-
Caesarean section	(204)	3.49	3.11	2.84	2.92	2.48
Para 1-4[1]						
All deliveries[4]	(4210)	3.16	2.34	2.61	3.04	2.88
SVD	(3902)	3.14	2.32	2.62	3.07	-
Operative vaginal	(224)	3.22	2.56	2.35	2.77	-
Caesarean section	(80)	3.76	3.50	3.05	3.06	2.88
Para 5+[1]		3.34				
All deliveries[5]	(662)	3.34	2.26	2.71	3.05	2.82
SVD	(626)	3.42	2.23	2.77	3.00	-
Operative vaginal	(24)	3.27	4.00	2.22	3.00	-
Caesarean section	(11)	-	-	2.40	3.33	2.82

[1] *Numbers in parentheses are total numbers in each group at admission for whom information for this Table available.*
[2] *Mode of delivery unknown in 10 cases.*
[3] *Mode of delivery unknown in 5 cases.*
[4] *Mode of delivery unknown or other in 4 cases.*
[5] *Mode of delivery unknown or other in 1 case.*

13. THE WHO PARTOGRAPH AND THE IDENTIFICATION OF ABNORMAL LABOUR (a commentary on Chapters 5-12)

13.1 Introduction

Chapters 5 to 12 contain a detailed study of the pattern of labour as plotted on the WHO partograph and the relationship of this to the ultimate outcome. Throughout these chapters only women from the normal group were studied. Those excluded from partography did not have a partograph completed, induced labours may follow different patterns, and women from the high risk group had various actual or potential complications likely to influence the course and management of labour. It must be borne in mind, too, that labours from all four groups had an improved outcome after introduction of the WHO partograph with the associated management protocol (Chapter 4).

13.2 Partograph Design

A variety of different partographs were brought into use, particularly in the 1970s.[8,10,13,18,41,49] The principle of all was the same - to aid the identification of abnormal labour progress - and during the active phase of labour, all recognised that a cervical dilatation rate of approximately 1 cm/hour was the slowest rate which could be considered normal. However, the presence of a latent phase was not always acknowledged and, when it was, the cervical dilatation at which transition to the active phase took place varied. Primigravid labour has been studied more extensively than labour in the multipara. Some authors reported the use of stencils to cope with the different rates of progress anticipated from different admission cervical dilatations.[10,13] Such stencils appear to add to the complexity of the application of the partograph in clinical practice.

The WHO partograph is largely based on Philpott's descriptions[8] and assumes that the active phase commences at 3 cm cervical dilatation, that cervical effacement does not need to be considered in the differentiation between the latent and active phase of labour, that the latent phase should be considered prolonged if it lasts for 8 hours or more, and that a cervical dilatation rate of 1 cm/hour (drawn in a straight diagonal alert line on the partograph) effectively differentiates normal from abnormal progress of labour. The action line, drawn 4 hours to the right of, and parallel to, the alert line is arbitrary but also copies Philpott's original reports.[9] Although Friedman's original work on the graphic analysis of labour [7,27] described a late deceleration phase in the active phase of labour, most other writers have disputed the presence of this[10,41,49] and no deceleration phase is allowed for in the WHO partograph.

13.3 Cervical Dilatation Rates

The analysis carried out in Chapters 5-11 confirm that the design of the WHO partograph is suitable for clinical use and does not suggest that any alterations in its design are appropriate. The mean rate of cervical dilatation in labour was 2.87 cm/hour (1.63 cm/hour for nullipara and more rapid for multipara). In the latent phase (0-2 cm) it was close to 1 cm/hour, and >2 cm/hour in the active phase (3-10 cm). The data presented in Chapter 5 showed that a line drawn at a rate of 1 cm/hour in the active phase (the alert line) will separate most of the slowest 25% of women (of all parities) and certainly identify the slowest 10%. Although the rate of cervical dilatation was more rapid at higher cervical dilatations, the differences did not seem sufficient to justify the added complexity of different lines dependent on the dilatation on admission, as advocated by Studd.[10] There was no evidence of a terminal deceleration at the

end of the active phase. Indeed, among primigravidae (on whom Friedman's graph was based [7]), the most rapid rate of cervical dilatation occurred among those admitted at 8 cm dilatation.

13.4 The Latent Phase

Further evidence for the appropriate division of the WHO partograph into the latent phase (up to 2 cm cervical dilatation) and the active phase was presented in Chapter 11. When the clinical findings on admission of women at 2 cm, 3 cm and 4 cm cervical dilatation were compared, it was found that the findings at 3 cm dilatation bore more resemblance to those at 4 cm than at 2 cm when cervical effacement, level of fetal head, and subsequent course and outcome of labour were considered. Although the degree of effacement did have a relationship with the subsequent course of labour, the relationship remained when dilatation alone was considered and effacement disregarded. Effacement of the cervix need not be considered when plotting cervical dilatation on the partograph.

When the 8 hour vertical "action line" in the latent phase was examined (see Chapter 7), it appeared to clearly identify those women likely to have a difficult labour and poor outcome as 68.9% of these women required oxytocin augmentation and the caesarean section rate after a prolonged latent phase was 20.4%. However, the most important finding was the very small number of women (112) who experienced a prolonged latent phase. This represents only 4.7% of all 2365 women from the normal group admitted in the latent phase and reflects the virtue of clearly defining labour and the criteria for starting the partograph (Chapter 2). Because of these small numbers, this study could not contribute as much as was anticipated to developing an appropriate management strategy for those women with a prolonged latent phase. It has, however, confirmed the point made by O'Driscoll and Stronge[53] of the critical importance of the correct diagnosis of labour. Unnecessary intervention may thus be avoided and those that do experience a prolonged latent phase can be recognised as having a genuine problem.

Only 9 women in this study required delivery during the latent phase (<8 hours) suggesting that the 8 hour "action line" is not too long and the high intervention rate after the 8 hour latent stage suggests that it would be unreasonable to allow a longer period of observation in the latent phase.

13.5 The Active Phase

A total of 8810 women from the normal group had a partograph completed. Of these, 2365 (27%) were admitted in the latent phase and 6445 (73%) in the active phase. There was a preponderance (59%) of nullipara among the latent phase admissions. 121 women were delivered in the latent phase or after a prolonged latent phase (and are discussed above). The remaining 8698 women experienced an active phase of labour plotted on the partograph in relation to the alert and action lines. Three patterns of labour emerged: those which remained on or to the left of the alert line (73%), those which moved to the right of the alert line but did not reach the action line (17%) and those which reached the action line (10%). Among the last group, almost equal numbers reached the action line after a previous examination had been placed between the alert and action lines and reached the action line directly from the alert line.

There was a progressive increase in the rate of intervention in labour in relation to the alert and action lines (Chapter 8). Augmentation rates rose from 2.5% when labour remained on or to the left of the alert line, through 9.0% when labour crossed the alert line but did not reach the action line, to 65.4% when the action line was reached. The corresponding rates of

caesarean sections were 0.6%, 3.4% and 21.8%. The augmentation and caesarean section rates were almost identical to those among women experiencing a prolonged latent phase, suggesting that the "action lines" on the WHO partograph in both the latent and active phases are equally valid. The caesarean section rates were almost identical to those reported by Philpott[8,9] although his report described African primigravidae only. Among South-East Asian primigravidae in the present study, the caesarean section rate for those reaching the action line was 26.0%. The similarity of the figures suggests that the design of the WHO partograph is suitable for all races, as has been suggested by the findings of other studies.[22,27]

Chapter 8 includes a comparison of the results reported from other partographs. Apart from Philpott's, the design of the partographs and the placing of the action lines varied considerably, the comparisons are of interest, but of little value in relative evaluation. An examination of these studies does, however, show one trend common to all studies including the present one, i.e. the poorer condition of infants at birth in association with slower progress of labour. The condition of neonates in the present study was generally good so no significant differences emerged but there was a tendency towards a greater proportion of babies with low Apgars as progress in labour was further to the right on the partograph. This detail, however, needs to be associated with the knowledge of a marginal overall improvement in fetal outcome with the introduction of the partograph (see Chapter 4). In addition, most of these infants with low Apgars were born by caesarean section (see Chapter 4) which was inevitably more frequent after the action line was reached. At least one other partographic study[44,45] has demonstrated that all infants born by caesarean section were in poorer condition than those born by other modes, regardless of the pattern of labour.

13.6 The Action Line

Crossing or reaching the alert or action line seemed to be of similar significance regardless of cervical dilatation (Chapters 9 and 10). Drawing these lines as straight diagonals therefore appears appropriate. There was a fairly equal division between those who reached the action line with an intermediate examination between the alert and action line and those who moved directly from the alert to the action line. The majority of women moving directly to the action line did so at a cervical dilatation of 3 cm. Many of these women may not have been in true labour and the critical importance of the correct diagnosis of labour is again emphasised. The partograph also appears to be of similar validity for women of all parity. Although caesarean section rates for parous women were lower than for nulliparous women (women with a previous caesarean section were excluded from the normal group), the proportionate rise in the caesarean section rates dependent on progress in labour was similar.

The placement of the action line 4 hours to the right of the alert line is inevitably arbitrary. No line will unerringly distinguish between all labours which will or will not require intervention. An action line placed too far to the left on the partograph may lead to unnecessarily early intervention; one placed too far to the right may lead to late intervention. Placing the action line on the WHO partograph 4 hours to the right of the alert line will result in later intervention than most writers have espoused. Philpott latterly moved his action line further left, to 2 hours right of the alert line,[51] which corresponds to the suggested intervention point of Studd's partograph.[10] Any deviation to the right of 1 cm/hour dilatation rate merits action according to O'Driscoll[53] and even a recent paper reporting on the use of a version of the WHO partograph[48] moved the action line one hour nearer to the alert line.

The results of the present study, which showed a reduced intervention rate in labour with the introduction of the partograph and a marginal improvement in fetal outcome (Chapter 4), suggest that the placing of the alert and action lines 4 hours apart is appropriate.

No deleterious results were apparent and the saving in resources was clear. When referral from a peripheral to a central unit is indicated, a 4-hour interval will allow many women time to be transferred into a central unit before the action line is reached.

13.7 The WHO Partograph in Referral Decisions

It was impossible in this study to fully address the issue of the partograph as a tool to aid in referral decisions in labour. A proper operations research study along the lines suggested by a WHO publication on this matter[25] in an appropriate environment needs to be conducted to assess this fully. Nonetheless, some conclusions can be drawn from the detailed examination of women reaching the "referral zone" (between the alert and action lines) on the partograph (Chapter 9).

Twenty-seven per cent of the women in this study moved to the right of the alert line, including the 5% of women who moved directly to the action line. This latter group were discussed above and it is clear that, provided they are genuinely in labour, referral to a central unit is strongly indicated. What of the remaining 22% who had a vaginal examination in the referral zone? Approximately half of these remained in the referral zone until delivery, one third moved back on or to the left of the alert line and only 16% of them reached the action line. The figures were similar for nullipara and multipara, although multipara were rather less likely then nullipara to reach the action line.

The caesarean section rate among all women with an examination in the referral zone was 7.7% and the operative vaginal delivery rate 16.0%, significantly higher than the corresponding rates of 0.6% and 6.8% for those remaining on or to the left of the alert line. The majority of caesarean sections occurred among women who ultimately reached the action line but this retrospective assessment is of no value to the attendant of an individual woman faced with a referral decision in a health centre.

Referral rates of 20-30% of labouring women are likely to be unacceptable and impracticable in many settings. An attempt was made in Chapter 9 to more clearly distinguish those women most in need of referral if they entered the referral zone. It was found that entering the referral zone was of similar significance regardless of the cervical dilatation. Assessing the level of the fetal head was slightly more helpful. If the level of the fetal head was 3/5 or more palpable abdominally when the referral zone was reached, caesarean section was a more likely mode of delivery than if it was 2/5 or less. It has to be concluded that, where local circumstances permit (and every effort should be made to ensure that they do permit[23]), women in labour should be transferred to a unit with facilities for caesarean section when the progress of labour moves to the right of the alert line. The possible role of certain actions in the referral zone, particularly rupture of the membranes, is examined in Chapter 14 where management guidelines are suggested.

13.8 Partography without Vaginal Examinations

Chapter 11 briefly addressed the issue of a partograph without vaginal examinations. As with a proper assessment of the WHO partograph as a referral tool, this issue requires a properly conducted trial, and no firm conclusions or directives should be taken from Chapter 11.

Nonetheless, at the two points in the first stage of labour which can be recognised by an attendant without facilities or expertise for vaginal examination, i.e. on presentation in labour and at spontaneous membrane rupture, the level of the fetal head was higher (≥3/5

abdominally) when the ultimate mode of delivery was caesarean section. The potential for labour progress assessment by fetal head level estimation needs further research.

13.9 Conclusions

The method of presentation of clinical information can affect decision making and this may be particularly true in partography.[54] Only one design of partograph was used in this trial but the results discussed in this chapter suggest that the design of partograph clearly identifies abnormal labour. Cartmill and Thornton[54] agreed with this although they had doubts about the latent phase. Any partograph is something of a compromise as each labour is individual but this, the most detailed analysis of a partograph in clinical use to be reported, suggests that the design of the WHO partograph is the best possible compromise in that abnormal labour is identified and the outcome of labour improved. Although its use as a referral tool requires further assessment, this hospital based trial has demonstrated that women moving to the right of the alert line merit special attention, and should normally be referred to a central unit.

14. LABOUR MANAGEMENT PROTOCOL WITH THE WHO PARTOGRAPH

14.1 Summary

The introduction of the WHO Partograph in this trial was accompanied by an agreed labour management protocol (Chapter 2). This protocol encouraged the timing of certain interventions in relation to progress on the partograph. These aspects were examined mainly in the 8840 previously defined "normal" woman. It was found that the timing of interventions (mainly oxytocin augmentation and/or caesarean section) did relate appropriately to the position of cervical dilatation on the partograph in the majority of cases.

The encouragement of earlier rupture of the membranes (ARM) in the active phase of labour probably contributed to the shorter duration of labours noted after introduction of the partograph. After implementation, most ARMs (72%) were carried out at 3-5 cm cervical dilatation. Failure to perform ARM once the active phase was reached seemed more likely to result in labour reaching the "referral zone" and/or the action line. ARM in the latent phase was, however, associated with an increased likelihood of caesarean section. ARM should not normally be performed in the latent phase.

Oxytocin augmentation was commenced later in labour after implementation of the partograph and in fewer cases (Chapter 4). Although the total caesarean section rate fell after implementation, the rate among augmented labours rose. The duration of oxytocin augmentation among labours culminating in caesarean section also rose. The results suggest better selection of cases for augmentation after implementation. In addition, although the condition of neonates overall improved after implementation, the neonatal condition after augmented labour was worse than after unaugmented labour. The improved fetal outcomes in this trial may have been largely the result of reducing the number of augmented labours. A further analysis of the timing of the commencement of oxytocin confirmed that it should not normally be started before the active phase action line. High caesarean section rates were associated with early augmentation.

Recommendations on the best management of a prolonged latent phase could not be made because of the small numbers and very variable management. The value of strict criteria for commencement of a partograph was confirmed.

Recommendations are made for the management of labour in the referral zone when the partograph is being used for referral purposes. These should be field tested.

This analysis showed no reason to alter the labour management protocol recommended for use with the WHO partograph and found no reason to vary the protocol dependent on parity.

14.2 Introduction

The introduction of the WHO Partograph to labour management was supplemented by an agreed management protocol as described in Chapter 2. This did not advocate any new procedures but indicated how the partograph should be used to influence the timing of certain management decisions and procedures. Protocol guidance was provided on the timing of the following procedures:

a. Artificial rupture of membranes

b. Oxytocin augmentation of labour
c. Termination of labour (caesarean section delivery)
d. Supportive management with analgesia and IV fluids but no augmentation (conservative management)

The protocol recommended that the timing of these possible actions was related to the following points on the partograph:

a. Reaching the action line in the latent phase after 8 hours (prolonged latent phase)
b. Reaching the active phase
c. Moving between the alert and action lines
d. Reaching or crossing the active phase action line.

This chapter analyses the timing of the recommended actions in relation to the partograph and examines the subsequent course of labour and outcome. Unless otherwise indicated, only women from the normal group are studied as complicating factors may have influenced the management of labour among women from other groups. After an overview of protocol activity at different positions on the partograph, artificial rupture of membranes (ARM) and oxytocin augmentation are individually examined and then protocol activity in detail at different points on the partograph. The commentary (14.6) gives an overview of the results.

14.3 Protocol Activity at Different Positions on the Partograph

At any one time in labour, cervical dilatation may be in one of 5 different positions on the partograph in relation to the pre-drawn lines, viz, within a normal (<8 hours) latent phase, at or beyond a prolonged latent phase (>8 hours), on or left of the alert line in the active phase, between the alert and action lines, or at or beyond the active phase action line. At any of these positions, management decisions may be taken. These include performing an ARM, commencing oxytocin augmentation or terminating the labour (usually by caesarean section). No particular action may be taken, with supportive management continuing.

The relationship between these actions and the position is shown in Tables 14.1, 14.2 and 14.3. Only women from the normal group are considered, as factors other than position on the partograph are likely to influence women in other groups. All parities are combined in Table 14.1, with nullipara and multipara shown separately in Table 14.2 and 14.3. Only the first action carried out at any point on the partograph is included. Under normal conditions, the protocol recommended that membranes should be left intact until the active phase or until the latent phase was prolonged. Oxytocin augmentation should not be commenced until the latent phase is prolonged or the active phase action line is reached. Table 14.1 reflects this protocol. The majority (95.2%) of women had no particular intervention within a normal (<8 hours) latent phase. The few ARMs, and oxytocin augmentation within the latent phase were not necessarily always appropriate (see Chapter 15). Very few women experienced a prolonged latent phase; the management of these cases is discussed further in Section 14.5.1 of this chapter.

ARM was considered an appropriate action when the active phase was reached. Over half (53.7%) of the 8704 women on or left of the alert line in the active phase had an ARM. Most of the remainder certainly already had ruptured membranes. The few caesarean sections (0.2%) carried out at this stage were probably largely for "fetal distress". It is doubtful if there was justification for the small number of women receiving augmentation (1.7%). The referral zone between the alert and action lines was reached by 1861 women. Of these, 5.0% received

augmentation and 1.5% were delivered by caesarean section but the numbers are still small, reflecting adherence to the management protocol. Most of the women reaching the referral zone with intact membranes had an ARM at this point (19.9% of women in the "referral zone").

There was an appropriately high level of activity once the action line was reached, with only 37.7% of the 884 women reaching the action line having "no" or "conservative" action. Conservative action was considered a possible deliberate policy decision (see Section 14.5.3 of this chapter). 53.5% of labours reaching this point were augmented.

The caesarean section rate of 5.4% at this point does not represent the total caesarean section rate at or beyond the action line. Only caesarean section as a first action at this point is included. Many of those women receiving augmentation or no/conservative action, were ultimately delivered by caesarean section, making the total caesarean section rate at or beyond the action line 21.8%.

The levels of protocol activity at different positions on the partograph were very similar for both nulliparous and multiparous women (Tables 14.2 and 14.3), reflecting the fact that the same protocol was applied to all parities. The only noticeable difference was the higher proportion of multipara on whom an ARM was performed in the active phase, probably reflecting the fact that more nullipara were admitted with membranes already ruptured.

14.4 Specific Management Actions

14.4.1 Artificial rupture of membranes (ARM)

ARM was recommended in the agreed protocol once labour was in the active phase and certainly if cervical dilatation moved to the right of the alert line. Information on the cervical dilatation at which ARM was performed before implementation of the partograph was not obtained. There is no doubt, however, that, particularly in Indonesia, the agreed management protocol led to the rupturing of membranes at lower cervical dilatations in the active phase than had hitherto been the case. This is almost certainly the reason for the more rapid rates of cervical dilatation experienced after implementation of the partograph (see Chapter 5). It had been standard practice in Indonesia to leave membranes intact for as long as possible. It was possible, however, to compare the cervical dilatations at which ARM was performed after implementation with the cervical dilatations at which membranes ruptured spontaneously (SRM) (Table 14.4). Women from the normal group only are considered to avoid the influence of early ARM in complicated cases. Those whose membranes were already ruptured on admission are excluded.

Many more women who were admitted with intact membranes, had them ruptured artificially (N=6695) than spontaneously (N=696). In both cases the modal cervical dilatation at which the membranes were ruptured during the first stage was at 3 cm (30.1% and 19.8% respectively). However, 20.4% of ruptures in the spontaneous group took place in the second stage, compared to 1.7% in the ARM group. Looked at another way, when left alone, 20% of membranes remain intact until the second stage of labour, while 98% of women who had an ARM, came to the second stage with the membranes ruptured. The majority of ARMs (72%) took place at 3-5 cm cervical dilatation. This reflects the management protocol encouraging ARM once the active phase of labour was reached.

Though not presented in tabular form, the data in Table 14.4 was also examined by parity (nullipara and multipara). The pattern of ARM was very similar for both parity

groupings. When SRM was studied, the results for each parity grouping were very similar to that for the total group, except at 3 cm and 10 cm dilatations. At 3 cm dilatation 80/321 (24.9%) of nullipara experienced SRM compared to 58/376 (15.4%) of multipara. At 10 cm, SRM occurred in 44 (13.5%) nullipara, but 98 (25.3%) multipara.

This study was not a trial of ARM so no valid comparisons can be made between those who did or did not have ARM performed particularly as no record was made before implementation of the partograph on the dilatation of the cervix at ARM but the subsequent course, management and outcome of labour when ARM is performed at different cervical dilatations could be studied for those who delivered after implementation of the partograph (Tables 14.5, 14.6 and 14.7). Only women from the normal group are considered.

Many of the ARMs performed in the latent phase were among women experiencing a prolonged latent phase and this is reflected in the relatively high caesarean section and augmentation rates and in their prolonged duration of oxytocin usage and of ARM to delivery interval. ARM early in the active phase (3-4 cm cervical dilatation) was also associated with a higher caesarean section and augmentation rate when compared with those having an ARM at a later stage. ARM at 3-4 cm dilatation led to a caesarean section rate of 3.9% and an augmentation rate of 12.8%. Corresponding rates for ARM at 5-7 cm were 1.5% (caesarean section) and 3.9% (augmentation) and at 8-10 cm were 0.6% (caesarean section) and 1.4% (augmentation). These results largely reflect the later admission of those in advanced efficient labour and do not imply that early ARM is more likely to result in caesarean section. Overall, however, they confirm that ARM before the active phase is inappropriate in the normal course of events.

When examined by parity groupings (nullipara Table 14.6 and multipara 14.7), similar trends are seen, except as shown in earlier chapters, caesarean section and augmentation rates among multipara are approximately half those among nullipara regardless of the dilatation at which ARM is performed. The mean duration of oxytocin usage and of ARM to delivery interval is longer for all cervical dilatations at ARM among nullipara.

14.4.2 Oxytocin augmentation

It has already been shown (Chapter 4) that there was a considerable reduction in the use of oxytocin for augmentation of labour in the first stage after implementation of the partograph. After implementation, most augmentation took place at a position on the partograph as recommended in the labour management protocol (Table 14.1). Although augmentation before and after implementation cannot be compared on the partograph, certain comparisons can be made to study in more depth the impact of the protocol.

Tables 14.8 and 14.9 compare the cervical dilatation at which oxytocin was commenced among nulliparous and multiparous women from the normal group before and after implementation. Only women from the normal group are shown to avoid other influences on oxytocin usage as a result of complications.

The reduction in the total number of labours augmented after implementation has already been described (Chapter 4). Among nullipara, there was also a slight tendency for oxytocin to be commenced later in labour after implementation (Table 14.8). Prior to implementation, 28.5% of all augmented labour commenced oxytocin in the latent phase, compared to 18.9% after implementation. Augmentation early in labour seemed to shift from the latent phase to the early active phase (3 cm dilatation) with an increase from 19.0% to 26.0% of augmented labours at 3 cm after implementation. However, the proportions of

augmented labours among which oxytocin was commenced after 4 cm cervical dilatation showed little difference before and after implementation. The differences between cervical dilatations at which oxytocin was commenced before and after implementation among multipara showed similar, though less marked differences. The changing pattern of oxytocin usage brought about by the partograph with associated management protocol appeared to have occurred at all cervical dilatations.

The outcome of augmented and unaugmented labours is compared in Tables 14.10 (all parities), 14.11 (nullipara) and 14.12 (multipara), both before and after implementation. Again, only the normal group of women is considered. Among unaugmented labours (all parities) the caesarean section rate fell after implementation (from 4.8% to 3.3%). The spontaneous delivery rate was unchanged because of a rise in the operative vaginal delivery rate (6.3% to 8.1%). The intrapartum fetal death rate was too low to be of analytical value, but the incidence of low Apgar scores <4 was unchanged (0.5%)

Among augmented labour, the proportion of caesarean sections rose from 10.2% before implementation of the partograph to 14.3% afterwards. The spontaneous delivery rate fell correspondingly from 69.5% to 66.5%. The total number of caesareans among augmented labours dropped, however, as fewer labours were augmented. There was a minimal rise in the incidence of low Apgar scores (1.1% to 1.2%)

It has previously been noted (Chapter 4), that the mean duration of oxytocin usage in labour rose as the number of labours augmented fell. This is again seen in Table 14.10 with one interesting difference. The duration of oxytocin usage rose when the ultimate mode of delivery was vaginal but fell when the delivery was by caesarean section (from a mean of 5.67 hours to 5.05 hours). The total duration of usage among caesarean section deliveries was, however, longer than among vaginal deliveries, both before and after implementation. These findings reinforce the impression that the protocol used in conjunction with the WHO partograph resulted in a better selection of cases requiring augmentation. The slightly greater though statistically insignificant proportion of babies born with severe asphyxia (Apgar <4) may, however be a result of the increased duration of oxytocin use. The mean duration of use among these babies rose from 4.64 hours before implementation to 6.68 hours afterwards.

Among augmented labour, there was also an increase in babies admitted to special care units after delivery (6.5% to 10.4%). When labour was not augmented, babies admitted after implementation fell to 4.3% compared to 6.3% after unaugmented labour before implementation. The slightly poorer condition of babies born after augmented labour confirms the benefits of reducing the number of labours receiving oxytocin achieved in this trial.

When the same examinations were carried out by parity (Tables 14.11 and 14.12), the patterns were very similar, confirming the appropriateness of the protocol for all parities and the safety of carefully managed oxytocin in parous women. The only feature of note showing a different pattern between nullipara and multipara was the fall in duration of oxytocin usage among severely asphyxiated babies (Agpar <4) among multipara, but the numbers involved are too small to be of significance.

All investigators were asked to state the reasons for oxytocin augmentation and this information related to the different points on the partograph at which oyxtocin was commenced is shown in Tables 14.13 (normal group) and 14.14 (high risk group). All parities are combined in both tables.

In the normal group (Table 14.13), most augmentation took place for "dysfunctional labour" (68.5%) particularly at or beyond the action line where 94% of augmented labours were given oxytocin for this reason. At earlier stages in the active phase of labour, this was also the most frequent indication, but the numbers were lower and there was a distribution of other indications. When oxytocin was commenced in the latent phase, it was most frequently because the latent phase was prolonged. "Dysfunctional labour" in the latent phase was probably for the same reason. The inclusion of "post-maturity" as an indication in the normal group is a reflection of the investigators perceived reason for augmentation. Women with genuine post-maturity (≥43 weeks gestation) were not included in the normal group. Where "prolonged rupture of membranes" was a stated reason, the women must by definition have been in labour, as they would otherwise have been included in the induction group. The management protocol did not state that such women should receive augmentation. "Other" indications for augmentation include minor medical conditions, possible maternal infections and "fetal distress".

As anticipated there was a greater distribution of indications for augmentation in the High Risk group (Table 14.14) although "dysfunctional labour" was still the most frequent indication, especially once the active phase action line was reached. Hypertension and "other" indications (now including antepartum haemorrhage and diabetes) constitute significant factors in augmentation in this group, contributing to 38.7% of augmented labours. These augmentations particularly occurred early in labour. This confirms the need to eliminate the high risk group from an analysis of "normal" labour on the partograph, even though the use of the partograph does clearly improve the outcome of labour in this group (see Chapter 4).

14.5 The Protocol in Action at Different Points on the Partograph

14.5.1 Prolonged latent phase

Presumably because of the strict criteria for commencement of the partograph (Chapter 2, Table 2.1), genuine cases of prolonged latent phase were rare. Of the 2365 women from the normal group admitted in the latent phase of labour, only 103 (4.4 %) were still in the latent phase 8 hours after admission. Nine women were delivered by caesarean section in the latent phase before 8 hours and the remaining 2 253 progressed to the active phase within 8 hours. Eleven cases who may have had a prolonged latent phase had to be excluded from analysis because the partograph had not been completed correctly, usually because no vaginal examination had been performed 8 hours after admission so that the cervical dilatation at that time was unknown. The agreed labour management protocol (Chapter 2, Table 2.2) listed 3 possible options after 8 hours in the latent phase, viz:

a. No action - woman not in labour; abandon partograph. These cases were not included in the study until a subsequent admission in genuine labour.

b. Delivery by caesarean section.

c. ARM with oxytocin augmentation.

It is not known how many cases of "false labour" occurred whose partographs were abandoned.

Four women were delivered by caesarean section after 8 hours in the latent phase. There were no maternal or neonatal complications. Of the remaining 99 women who appeared to have a genuine prolonged latent phase, 66 were nulliparous and 33 multiparous (only one

being of high parity (>4). Seventy seven (78%) arrived at the latent phase "action line" with membranes still intact; the remaining 22 were either admitted with membranes already ruptured or experienced spontaneous rupture of membranes during the observed latent phase.

The correct protocol management of those 77 women with intact membranes should have been ARM with oxytocin augmentation at the 8 hour latent phase action line; only 22 (28.6%) received this management. No action at all was taken in the same number of cases (22) while a further 22 received augmentation alone without ARM and in 11 cases, ARM only (without augmentation) was carried out. Those 22 cases whose membranes were already ruptured after 8 hours in the latent phase should have received oxytocin augmentation; 17 (77.3%) received this, no action being taken in the remaining 5 cases.

Of those with membranes intact after 8 hours of latent phase, 2 (2.6%) never reached the active phase and were delivered by caesarean section 4 hours beyond the latent phase action line; one had received correct protocol management (ARM + oxytocin), the other received neither at any time. One woman whose membranes were already ruptured (4.5%) did not reach the active phase and was delivered by caesarean section after 4 hours of oxytocin augmentation. The remaining cases all reached the active phase. For these cases, the mean duration taken to reach the active phase (first measured cervical dilatation in the active phase) depending on the different managements undertaken is shown in Table 14.15 which also shows the mean time taken to reach full dilatation after reaching the active phase (excluding caesarean sections) and the ultimate mode of delivery.

The small numbers involved make it difficult to draw firm conclusions and the action shown is only that which took place at the latent phase action line. In many cases, actions were taken at a later stage but the timing of these actions deviated from the recommended protocol. The best outcome in terms of rate of progression to the active phase and low caesarean section rate occurred among those 22 women whose membranes were intact and had no action taken at all. It may be that this group were perceived to be progressing satisfactorily without any intervention at that stage. ARM with oxytocin led to the most rapid progression to the active phase but was associated with the highest caesarean section rate (22.7%). However, when the membranes were already ruptured and oxytocin was given for augmentation, there were no caesarean sections.

A simpler and more valid way of testing the agreed management protocol is to divide those women with a prolonged latent phase into those whose management followed the protocol guidelines and those whose did not. Protocol management at the prolonged latent phase consisted of ARM with oxytocin or oxytocin augmentation alone if the membranes were already ruptured. Table 14.16 shows the mean duration of labour from the latent phase action to delivery and the caesarean section rates among women who did or did not receive recommended protocol management. The duration of labour was slightly shorter where protocol management was followed (mean 7.47 hours as compared to 9.40 hours) but caesarean section rates were the same (12.8% and 13.3%).

The optimum management of prolonged latent phase is not clarified by these results but it is likely that each case needs expert individual assessment. Referral to a central unit at the 8 hour action line in the latent phase is certainly appropriate. If labour is correctly diagnosed, the incidence of genuine cases of prolongation of the latent phase is very low.

14.5.2 Actions in the referral zone

The labour management study protocol recommended no particular action when the progress of labour on the partograph moved between the alert and action lines other than performing an ARM if the membranes were still intact (Chapter 2, Table 2.2). It was anticipated that this would usually already have been done as ARM was recommended at any time in the active phase. The purpose of the zone between the alert and action lines is to encourage referral of women from a peripheral to a central unit once that "referral" zone is entered. It has already been shown (Chapter 6) that 22.1% of women from the normal group reached the referral zone and also (Chapter 8) that the outcome of labour when the referral zone is reached is poorer than if labour remains on or to the left of the alert line.

This study could not specifically address the usefulness of moving to the right of the alert line as an indication for referral as all women in the study delivered in a central unit. Nonetheless some attempt can be made to define the usefulness of the referral zone. Although, because of the protocol recommendations, most women arriving at the referral zone did so with membranes already ruptured, in some cases they were intact. Protocol management recommended ARM in the latter case and no action in the former. The use of oxytocin at this stage was not recommended; nonetheless some women received it. The course and outcome of labour subsequent to these various possible actions is studied in Tables 14.17 to 14.28.

The mode of delivery was unknown in three women with intact membranes and these women are excluded from the tables. Table 14.17 includes all of the 470 women whose membranes were intact and Table 14.18 all of the 1350 women with membranes already ruptured. An additional three of the former group (0.6%) and 23 of the latter (1.5%) had a caesarean section performed immediately they reached the referral zone. These 26 women are not analyzed further. Of the 470 with membranes intact who proceeded in labour (Table 14.17), 406 (86.4%) had them ruptured and 8 of those also had oxytocin augmentation. The membranes were left intact in 64 cases (13.6%); 5 of those received augmentation. Of those with membranes already ruptured (Table 14.18) 58 (4.3%) received oxytocin augmentation.

Whether membranes were intact or ruptured on arrival at the referral zone made no difference to the subsequent course of labour. In both cases a similar proportion subsequently reached to or beyond the action line (23.6% of those with membranes intact and 22.9% of those with membranes already ruptured on arrival at the referral zone). However, there was a striking difference in the caesarean section rates. Those who reached the referral zone with membranes intact had a caesarean section rate of 3.4% overall (11.7% if the action line was reached, 0.8% if not). Those reaching the referral zone with membranes already ruptured had a caesarean section rate of 7.3% overall (26.2% reaching action line, 1.7% not). This difference appeared to be attributable to the act of ARM which was carried out on 406 (86.4%) of the 470 reaching the referral zone with intact membranes (8 of these received oxytocin at the same time). When the membranes were left intact after arrival in the referral zone (59 women), 27 (45.7%) reached the action line, and 2 of those 27 (7.4%) were delivered by caesarean section.

When the membranes were already ruptured (Table 14.18), there seemed no advantage in commencing oxytocin augmentation in the referral zone. Ten of 58 (17.2%) receiving oxytocin reached the action line, compared to 299 of 1292 (23.1%) not receiving oxytocin, but more of those receiving oxytocin were delivered by caesarean section (10.3%, compared to 7.2% not receiving oxytocin).

When the same data is analyzed by parity (Tables 14.19-22), similar patterns emerge although fewer multipara then nullipara reach the action line and the caesarean section rates

are lower among multipara. The higher caesarean section rates when the referral zone is reached with membranes already ruptured is confirmed regardless of parity.

The issue of appropriate management in the referral zone is so important that the issue is further examined in Tables 14.23-28 which reproduce the same data as Tables 14.17. and 14.18 by grouped cervical dilatation (3-4 cm, 5-7 cm, 8-10 cm) on arrival in the referral zone. The majority (62.9%) arrived at the referral zone at 5-7 cm cervical dilatation, whether membranes were intact (70.6%) or already ruptured (60.2%). When the membranes were intact there was a steady decline in the proportion of both those reaching the action line and undergoing caesarean section with increasing cervical dilatation on arrival at the referral zone. ARM was usually carried out regardless of dilatation.

Among those reaching the referral zone with membranes already ruptured, there was also a reduction in the proportion reaching the action line as cervical dilatation on arrival at the referral zone increased, but there was less decline in the caesarean section rate. Overall, and regardless of action taken the caesarean section rate among those with ruptured membranes reaching the referral zone at 3-4 cm dilatation was 11.7%, at 5-7 cm 6.8% and at 8-10 cm 4.6%. The equivalent rates for those reaching the referral zone with intact membranes was 7.8% (3-4 cm), 1.8% (5-7 cm) and none.

The implications of those findings for the management of labour before and at the referral zone are discussed further in the commentary for this chapter.

14.5.3 Actions at the action line

Three possible actions were recommended when the action line was reached, viz caesarean section, oxytocin augmentation or conservative management. This last meant that neither delivery nor oxytocin were thought appropriate but that supportive measures (e.g. intravenous hydration, analgesia, catheterisation) might be sufficient to allow satisfactory labour progress. By this point, all women should have had membranes already ruptured, but there were a small number for whom this was not the case. ARM alone was therefore a further possible action which was carried out in some cases. In some cases, none of the above procedures were carried out at the action line. All of these possible actions are related to the ultimate mode of delivery in Table 14.29. In this table (of women from the normal group only) are included all parities, both routes to the action line (straight or via the referral zone) and those reaching (or moving beyond) the action line at all cervical dilatations. Table 14.29 (and 14.30-33) only indicates the action (or non-action) carried out at the first cervical dilatation at or beyond the action line. Subsequent actions (other than caesarean section) are not included in these tables but are examined later.

Of the 884 women reaching or crossing the action line, 47 (5.3%) were delivered immediately by caesarean section, 30 (3.4%) had ARM only performed, 472 (53.4%) received oxytocin augmentation (5 with simultaneous ARM), 53 (6.0%) were managed conservatively (see supportive measures described above) and 282 (31.9%) received no specific additional care or management at this point.

Table 4.29 again demonstrates the importance of ARM in the management of slow labour. Those few women who arrived at (or beyond) the action line with intact membranes and were managed by ARM alone had the lowest rate of caesarean section (6.7%). This remained true in a subsequent analysis of differing parities, routes to the action line and cervical dilatations at the action line. Among the remainder, those who were augmented had the highest SVD rate (66.0%) but the lowest caesarean section rate (15.3%) occurred when "no

action" was taken. For those continuing in labour after reaching the action line, conservative management had the poorest outcome in terms of caesarean section rate (26.4%) and operative vaginal delivery rate (30.2%). These findings were similar when parities were studied separately (Tables 14.30 and 14.31), although the overall caesarean section rate was lower among multipara than nullipara.

The same analysis was carried out dependent on the route to the action line (Tables 14.32 and 14.33), with again a similar pattern emerging, although ARM alone appeared to be less effective management when labour moved directly to the action line (13.3% caesarean section) rather than via the referral zone (no caesarean sections). In both groups, conservative management seemed the least effective. Management was more "aggressive" among women moving straight to the action line; 59.1% (262/443) received oxytocin augmentation, compared to 49.0% (206/420) of those reaching the action line via the referral zone.

Although not shown in tabular form here, the trends shown in Tables 14.29 to 14.33 were similar when differing cervical dilatations on reaching or crossing the action line were studied, both in parity groupings and by route to the action line. In particular, regardless of parity or cervical dilatation, the differences in actions taken between those moving straight to the action line or via the referral zone (shown in Tables 14.32 and 14.33) were maintained but with similar outcomes (mode of delivery) regardless of all these variables.

Because of the high proportion of women either receiving "no action" or conservative action" on arrival at or beyond the action line, the data on actions and outcome for all "normal" women at or beyond the action line were further analysed. Women could be divided into six categories at this point, viz:

a. Those having an immediate caesarean section.

b. Those already on oxytocin augmentation and on whom no additional action (i.e. delivery) was carried out on arrival at or beyond the action line. The simply continued with oxytocin.

c. Those who commenced oxytocin augmentation as a first action on arrival at or beyond the action line.

d. Those having "no action" or "conservative action" on arrival at or beyond the action line but receiving oxytocin augmentation at a later point.

e. Those who at no point received oxytocin augmentation.

f. Those who reached at or beyond the action line with membranes intact and who at that point had rupture of membranes (spontaneously or artificially) but who never received any oxytocin.

The mode of delivery and fetal outcome (1 minute Apgar score <8 and admissions to neonatal special or intensive care) are related to these six possible lines of activity in Table 14.34. All parities and all cervical dilatations and routes to the action line are combined. Those small numbers with ARM or SRM only had the best outcome but probably represent those who would never have reached the action line had ARM been performed, more appropriately, sooner. Otherwise, the outstanding feature of Table 14.34 is the poorest outcome among those women on whom oxytocin was started before the action line. The caesarean section rate among those women was at least twice that of any other group allowed to continue in labour

and the fetal condition at birth was at least twice as bad. There was little difference in outcome whether oxytocin was commenced at the action line, well beyond the action line or never, but starting it at the first examination at or beyond the action line was associated with marginally the highest spontaneous delivery rate and the best fetal outcome.

The implications of these findings for labour management at the action line are discussed in the commentary.

14.6 Commentary

The labour management protocol cannot be dissociated from the WHO Partograph but this chapter has analysed the components of the protocol in detail, particularly to ascertain if any changes to the protocol should be recommended. The broad conclusion is that the protocol devised as part of the trial is appropriate and suitable and contributed to the improved results. The pattern of protocol activity reflected the recommended management. This issue is further addressed in Chapter 15.

The role of ARM in the management of labour remains controversial.[55,56] The results described here confirm that ARM does increase the efficiency of labour and that it is an appropriate action when the active phase of labour is reached. It should probably not normally be carried out in the latent phase. This was associated with an increased caesarean section rate. The argument, however, that leaving membranes intact is more "physiological" is borne out by the fact that in 20% of those women admitted with intact membranes (25% of multipara and 13% of nullipara) the membranes did not rupture spontaneously until full dilatation. It does however seem probable from the results that performing an ARM in the active phase reduces the likelihood of labour progress reaching the referral zone and, for those reaching the referral zone with membranes intact, performing an ARM at that juncture reduces the likelihood of operative intervention becoming necessary.

The results presented in this chapter in conjunction with those of Chapter 9 allow recommendations to be made concerning the management of labour at the referral zone and before the referral zone is reached. In this trial, 27% of women would have been referred from a peripheral to a central unit because of moving to the right of the alert line. This proportion could almost certainly be reduced if the following referral guidelines were followed in a peripheral unit.

a. Perform ARM as soon as the active phase is reached. (This reduces the likelihood of labour reaching the referral zone.)

b. If the referral zone is reached with membranes intact, perform an ARM and repeat vaginal assessment in 2 hours. Only if labour is not progressing at 1 cm/hour or more should referral be arranged.

c. If the referral zone is reached with membranes already ruptured, referral to a central unit is indicated unless delivery appears imminent (although, even in this group, arrival at the referral zone at 8-10 cm dilatation was associated with a caesarean section rate of 7.6% when "immediate" caesarean sections are included).

d. The use of oxytocin in the referral zone confers no particular advantages and its use should be postponed until the action line is reached or crossed.

e. Women moving directly to the action line (without an intervening cervical dilatation in the referral zone) should be referred immediately, although ARM and a short period of observation may be considered if the membranes are intact.

These guidelines should be properly evaluated in a field trial of the use of the WHO Partograph as a tool for referral decisions in labour.

The analysis of women arriving at the action line with intact membranes confirmed the value of ARM in improving the outcome of labour. This group had the best labour outcome of those reaching the action line . However, if ARM had been performed earlier (as per the management protocol) it is unlikely that they would have reached the action line. This is particularly important in order to reduce unnecessary referrals in labour.

There was a high caesarean section rate regardless of the action taken at or beyond the action line. "Conservative" therapy was associated with the highest caesarean section rate and may not often be appropriate. Surprisingly, however, the lowest caesarean section rate occurred when "no action" was taken at the action line. A proportion of these women did receive oxytocin augmentation subsequently (Table 14.34). Apart from those women who had an immediate caesarean section on arrival at or beyond the action line, the highest caesarean section rate and poorest fetal outcome occurred among those women who commenced oxytocin augmentation before the action line. This was true regardless of parity, route to the action line, or cervical dilatation on arrival at or beyond the action line. This confirms the findings from the analysis of actions in the "referral zone". Oxytocin may have been commenced in these cases because of a subjective impression of poor progress, rather than on partographic evidence. The findings here do not support this as a rational policy. It is absolutely clear that decisions concerning oxytocin augmentation must be based on measured progress of cervical dilatation and not on any other subjective parameter. Indeed, the findings suggest that there is no particular advantage in starting oxytocin even at the action line. It is likely, however, that caesarean section rates would have been higher still if no oxytocin augmentation had been used all.

A randomized controlled trial of the use of oxytocin against no use at the action line would be required to resolve this issue. Such a trial could be double-blinded. At present, the evidence from this trial suggests that there is little or no place for the use of oxytocin before the action line and that the action line is an appropriate place to commence augmentation. The overall improved outcome in the trial suggests that this regime should only be changed on the basis of the randomised trial suggested above.

It was hoped that this study would provide evidence for the best management of a prolonged latent phase. It failed to do so because of the small number of women who experienced a prolonged latent phase and because of the very variable management which they received. It is clear, however, that the guidelines for commencing the partograph, established at the start of the trial (see Chapter 2) were important in preventing the over-diagnosis of a prolonged latent phase when labour is, in fact, not established. It is also clear that an ARM should not normally be carried out in the latent phase.

With the exception of some doubt over the ideal management of labour when either the latent or active phase "action lines" are reached, the management protocol for use with the WHO partograph appears to be appropriate, especially when viewed in the light of the improved outcome of labour described in Chapter 4. Guidelines have been suggested in this commentary for the use of the partograph as a referral tool. These should be tested in an appropriately designed study.

TABLE 14.1

DISTRIBUTION OF PROTOCOL ACTIVITY AT DIFFERENT POSITIONS ON PARTOGRAPH
(Normal group, all parities)

Protocol activity[1]	Position on partograph									
	Latent phase				Active phase					
	Normal latent phase		Prolonged latent phase		On or left of alert line		Between alert and action lines		At/beyond action line	
Total number	**2 370**	**(100.0)**	**129**	**(100.0)**	**8 704**	**(100.0)**	**1 861**	**(100.0)**	**884**	**(100.0)**
No specific action (and conservative management)	2 257	(95.3)	57	(44.1)	3 869	(44.5)	1 369	(73.6)	333	(37.7)
ARM alone	24	(1.0)	8	(6.2)	4 673	(53.7)	371	(19.9)	30	(3.4)
Oxytocin + ARM	83	(3.5)	61	(47.3)	144	(1.7)	93	(5.0)	473	(53.5)
Caesarean section	6	(0.3)	3	(2.3)	18	(0.2)	28	(1.5)	48	(5.4)

Percentages in parentheses.

[1] *First action only is considered.*

TABLE 14.2

DISTRIBUTION OF PROTOCOL ACTIVITY AT DIFFERENT POSITIONS ON PARTOGRAPH
(Normal group, nullipara)

Protocol activity[1]	Position on partograph									
	Latent phase				Active phase					
	Normal latent phase		Prolonged latent phase		On or left of alert line		Between alert and action lines		At/beyond action line	
Total number	**1 401**	**(100.0)**	**95**	**(100.0)**	**3 712**	**(100.0)**	**1 008**	**(100.0)**	**521**	**(100.0)**
No specific action (and conservative management)	1 335	(95.3)	44	(46.3)	1 862	(50.2)	782	(77.6)	193	(37.7)
ARM alone	14	(1.0)	6	(6.3)	1 775	(47.8)	160	(15.9)	18	(3.4)
Oxytocin + ARM	46	(3.3)	43	(45.3)	65	(1.8)	48	(4.8)	281	(53.9)
Caesarean section	6	(0.4)	2	(2.1)	10	(0.3)	18	(1.8)	29	(5.6)

Percentages in parentheses.

[1] *First action only is considered.*

TABLE 14.3

DISTRIBUTION OF PROTOCOL ACTIVITY AT DIFFERENT POSITIONS ON PARTOGRAPH
(Normal group, multipara)

Protocol activity[1]	Position on partograph									
	Latent phase				Active phase					
	Normal latent phase		Prolonged latent phase		On or left of alert line		Between alert and action lines		At/beyond action line	
Total number	**969**	**(100.0)**	**34**	**(100.0)**	**4 992**	**(100.0)**	**853**	**(100.0)**	**363**	**(100.0)**
No specific action (and conservative management)	922	(95.2)	13	(38.2)	2 007	(40.2)	587	(68.7)	140	(38.6)
ARM alone	10	(1.0)	2	(5.9)	2 898	(58.1)	211	(24.7)	12	(3.3)
Oxytocin + ARM	37	(3.8)	18	(52.9)	79	(1.6)	45	(5.3)	192	(52.9)
Caesarean section	0		1	(2.9)	8	(0.2)	10	(1.2)	19	(5.2)

Percentages in parentheses.

[1] *First action only is considered.*

TABLE 14.4

CERVICAL DILATATION AT ARTIFICIAL OR SPONTANEOUS RUPTURE OF MEMBRANES

(High risk group, after implementation, all parities)

Cervical dilatation (cm)	ARM in unit		SRM in unit	
	No.	%	No.	%
0	1		0	
1	3	(0.1)	6	(0.9)
2	76	(1.1)	50	(7.2)
3	2 014	(30.1)	138	(19.8)
4	1 575	(23.5)	93	(13.4)
5	1 230	(18.4)	71	(10.2)
6	828	(12.4)	65	(9.3)
7	477	(7.1)	59	(8.5)
8	337	(5.0)	43	(6.2)
9	43	(0.6)	29	(4.2)
10	111	(1.7)	142	(20.4)
ALL	**6 695**	**(100.0)**	**696**	**(100.0)**

TABLE 14.5

MODE OF DELIVERY, AUGMENTATION AND DURATION OF LABOUR AFTER ARTIFICIAL RUPTURE OF MEMBRANES AT DIFFERENT CERVICAL DILATATIONS

(Normal group, after implementation, all parities)

	Cervical dilatation at ARM (cm)*											All women
	0	1	2	3	4	5	6	7	8	9	10	
All women	**1**	**3**	**76 (100.0)**	**2 011 (100.0)**	**1 570 (100.0)**	**1 226 (100.0)**	**828 (100.0)**	**476 (100.0)**	**336 (100.0)**	**43 (100.0)**	**111 (100.0)**	**6 681[1] (100.0)**
Delivery Spontaneous vaginal (%)	1	0	54 (71.1)	1 695 (84.2)	1 397 (88.9)	1 108 (90.2)	744 (89.9)	439 (92.2)	313 (93.2)	40 (93.0)	108 (97.3)	5 901 (88.3)
Operative vaginal (%)	0	2	11 (14.5)	225 (11.2)	125 (8.0)	100 (8.1)	70 (8.5)	31 (6.5)	20 (6.0)	3 (7.0)	3 (2.7)	590 (8.8)
Caesarean section (%)	0	1	11 (14.5)	91 (4.6)	48 (3.1)	18 (1.5)	14 (1.7)	6 (1.3)	3 (0.9)	0	0	192 (2.8)
Oxytocin Augmented (%)	0	2	45 (59.2)	319 (15.8)	141 (9.0)	62 (5.1)	23 (2.8)	13 (2.7)	4 (1.2)	1 (2.3)	2 (1.2)	612 (9.2)
Mean duration of oxytocin use (hrs) (standard deviation)		8.46 (1.12)	6.79 (3.73)	3.99 (2.87)	3.58 (3.74)	3.34 (3.02)	2.83 (1.55)	2.55 (1.57)	2.33 (1.03)	3.25	1.25 (0.35)	3.95 (3.22)
Mean interval from ARM to delivery (hrs) (standard deviation)	2.08	11.57 (7.21)	7.30 (3.43)	5.35 (3.48)	3.81 (2.82)	3.12 (2.36)	2.48 (1.87)	2.09 (1.64)	1.67 (1.24)	0.84 (0.87)	0.38 (0.40)	3.72 (3.04)

** Cases admitted with membranes already ruptured or who had SRM after admission are excluded.*

[1] In 14 cases delivery mode was unknown.

TABLE 14.6

MODE OF DELIVERY, AUGMENTATION AND DURATION OF LABOUR AFTER ARTIFICIAL RUPTURE OF MEMBRANES AT DIFFERENT CERVICAL DILATATIONS

(Normal group, after implementation, multipara[1])

	Cervical dilatation at ARM (cm)*											All women
	0	1	2	3	4	5	6	7	8	9	10	
All women	**1**	**0**	**22 (100.0)**	**1 039 (100.0)**	**963 (100.0)**	**773 (100.0)**	**524 (100.0)**	**299 (100.0)**	**196 (100.0)**	**17 (100.0)**	**67 (100.0)**	**3 901 (100.0)**
Delivery												
Spontaneous vaginal (%)	1	-	19 (86.4)	953 (91.6)	901 (93.5)	733 (94.5)	486 (92.8)	283 (94.6)	191 (97.5)	17 (100.0)	66 (98.5)	3 650 (93.6)
Operative vaginal (%)	0	-	1 (4.5)	60 (5.8)	44 (4.6)	35 (4.5)	32 (6.1)	14 (4.7)	5 (2.5)	0	1 (1.49)	192 (4.9)
Caesarean section (%)	0	-	2 (9.1)	26 (2.5)	18 (1.9)	5 (0.6)	6 (1.2)	2 (0.7)	0	0	0	59 (1.5)
Oxytocin												
Augmented (%)	0	-	10 (45.5)	124 (11.9)	81 (8.4)	31 (4.0)	12 (2.3)	8 (2.7)	2 (1.0)	0	2 (3.0)	270 (6.9)
Mean duration of oxytocin use (hrs) (standard deviation)	-	-	5.56 (3.68)	3.30 (2.32)	3.29 (3.69)	3.19 (2.76)	2.84 (1.46)	2.97 (1.89)	2.75 (1.08)	-	1.25 (0.35)	3.32 (2.87)
Mean interval from ARM to delivery (hrs) (standard deviation)	2.08 -	- -	5.61 (3.15)	4.41 (3.12)	3.20 (2.62)	2.52 (2.00)	2.11 (1.69)	1.70 (1.48)	1.41 (1.14)	0.53 (0.48)	0.32 (0.32)	2.99 (2.62)

** Cases admitted with membranes already ruptured or who had SRM after admission are excluded.*

[1] Parity unknown in 9 cases.

TABLE 14.7

MODE OF DELIVERY, AUGMENTATION AND DURATION OF LABOUR AFTER ARTIFICIAL RUPTURE OF MEMBRANES AT DIFFERENT CERVICAL DILATATIONS

(Normal group, after implementation, nullipara[1])

	Cervical dilatation at ARM (cm)*											All women
	0	1	2	3	4	5	6	7	8	9	10	
All women	**0**	**3**	**54 (100.0)**	**968 (100.0)**	**605 (100.0)**	**451 (100.0)**	**304 (100.0)**	**177 (100.0)**	**140 (100.0)**	**25 (100.0)**	**44 (100.0)**	**2 771 (100.0)**
Delivery												
Spontaneous vaginal (%)	-	-	35 (64.8)	738 (76.2)	495 (81.7)	373 (82.7)	258 (84.9)	156 (88.1)	122 (87.1)	22 (88.0)	42 (95.5)	2 241 (80.9)
Operative vaginal (%)	-	2	10 (18.6)	165 (17.0)	80 (13.2)	65 (14.4)	38 (12.5)	17 (9.6)	15 (10.7)	3 (12.0)	2 (4.5)	397 (14.3)
Caesarean section (%)	-	1	9 (16.7)	65 (6.7)	30 (5.0)	13 (2.9)	8 (2.6)	4 (2.3)	3 (2.1)	0	0	133 (4.8)
Oxytocin												
Augmented (%)	-	2	35 (64.8)	194 (20.0)	60 (9.9)	31 (6.9)	11 (3.6)	5 (2.8)	2 (1.4)	1 (4.0)	0	341 (12.3)
Mean duration of oxytocin use (hrs) (standard deviation)	-	8.46 (1.12)	7.14 (3.72)	4.39 (3.06)	3.97 (3.79)	3.50 (3.30)	2.83 (1.71)	1.88 (0.41)	1.92 (1.18)	3.25 (-)	- -	4.44 (3.38)
Mean interval from ARM to delivery (hrs) (standard deviation)	- -	11.57 (7.21)	7.98 (3.33)	6.36 (3.55)	4.78 (2.87)	4.15 (2.56)	3.13 (1.49)	2.75 (1.69)	2.02 (1.29)	1.05 (1.03)	0.49 (0.48)	4.75 (3.28)

** Cases admitted with membranes already ruptured or who had SRM after admission are excluded.*

[1] Parity unknown in 9 cases.

TABLE 14.8

CERVICAL DILATATION AT COMMENCEMENT OF OXYTOCIN AUGMENTATION BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Normal group, nullipara)

Cervical dilatation (cm) at commencement of oxytocin*	Before implementation (%)		After implementation (%)	
0	6	(0.4)	2	(0.4)
1	108	(8.0)	21	(3.8)
2	272	(20.1)	80	(14.7)
3	257	(19.0)	142	(26.0)
4	205	(15.2)	77	(14.1)
5	162	(12.0)	92	(16.9)
6	92	(6.8)	49	(9.0)
7	93	(6.9)	42	(7.7)
8	109	(8.1)	30	(5.5)
9	47	(3.5)	11	(2.0)
0-9 cm	1 351	(100.0)	546	(100.0)

Percentages in parentheses.

* *Augmentations in the second stage are excluded.*
Those women with missing data excluded.

TABLE 14.9

CERVICAL DILATATION AT COMMENCEMENT OF OXYTOCIN AUGMENTATION BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH

(Normal group, multipara)

Cervical dilatation (cm) at commencement of oxytocin*	Before implementation (%)		After implementation (%)	
0	2	(0.2)	2	(0.5)
1	36	(2.9)	7	(1.7)
2	175	(14.5)	49	(11.6)
3	314	(25.9)	124	(29.4)
4	197	(16.3)	94	(22.3)
5	131	(10.8)	61	(14.5)
6	114	(9.4)	43	(10.2)
7	83	(6.9)	17	(4.0)
8	118	(9.7)	21	(5.0)
9	41	(3.4)	4	(0.9)
0-9 cm	1 211	(100.0)	422	(100.0)

Percentages in parentheses.

* *Augmentations in the second stage are excluded.*
Those women with missing data excluded.

TABLE 14.10

IMPACT OF OXYTOCIN USAGE ON MODE OF DELIVERY AND FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Normal group, all parities)

Oxytocin augmentation, mode of delivery and fetal outcome	Before implementation				After implementation			
	No.	%	Mean duration of oxytocin	Standard deviation	No.	%	Mean duration of oxytocin	Standard deviation
Augmented[1]	2 567	(100.0)	3.47	(3.60)	966	(100.0)	4.17	(3.41)
SVD	1 783	(69.5)	3.19	(3.48)	642	(66.5)	3.74	(3.18)
Operative vaginal	522	(20.3)	3.34	(3.27)	183	(19.0)	4.99	(4.19)
Caesarean section	261	(10.2)	5.67	(4.29)	138	(14.3)	5.05	(2.94)
Intrapartum fetal death	3	-	3.63	(3.12)	1	-	2.25	(-)
1 minute Agpar <4	28	(1.1)	4.64	(3.65)	12	(1.2)	6.68	(7.45)
Not augmented[2]	7 455	(100.0)	-	-	8 150	(100.0)	-	-
SVD	6 621	(88.8)	-	-	7 214	(88.5)	-	-
Operative vaginal	472	(6.3)	-	-	657	(8.1)	-	-
Caesarean section	358	(4.8)	-	-	271	(3.3)	-	-
Intrapartum fetal death	3	-	-	-	2	-	-	-
1 minute Agpar <4	40	(0.5)	-	-	43	(0.5)	-	-

[1] *Mode of delivery uncertain in 1 case before and 3 cases after implementation.*
[2] *Mode of delivery uncertain in 4 cases before and 8 cases after implementation.*

TABLE 14.11

IMPACT OF OXYTOCIN USAGE ON MODE OF DELIVERY AND FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Normal group, nullipara)

Oxytocin augmentation, mode of delivery and fetal outcome	Before implementation				After implementation			
	No.	%	Mean duration of oxytocin	Standard deviation	No.	%	Mean duration of oxytocin	Standard deviation
Augmented[1]	1 353	(100.0)	3.90	(3.82)	539	(100.0)	4.77	(3.69)
SVD	799	(59.1)	3.68	(3.91)	296	(54.9)	4.38	(3.43)
Operative vaginal	362	(26.7)	3.47	(3.16)	144	(26.7)	5.20	(4.40)
Caesarean section	191	(14.1)	5.64	(4.15)	97	(18.0)	5.25	(3.16)
Intrapartum fetal death	1	-	1.42	(-)	0	-	-	(-)
1 minute Agpar <4	19	(1.4)	4.65	(4.15)	9	(1.7)	8.27	(8.06)
Not augmented[2]	2 859	(100.0)	-	-	3 385	(100.0)	-	-
SVD	2 330	(81.5)	-	-	2 773	(81.9)	-	-
Operative vaginal	306	(10.7)	-	-	434	(12.8)	-	-
Caesarean section	223	(7.8)	-	-	174	(5.1)	-	-
Intrapartum fetal death	1	-	-	-	1	-	-	-
1 minute Agpar <4	20	(0.7)	-	-	26	(0.8)	-	-

[1] *Mode of delivery uncertain in 1 case before and 2 cases after implementation.*
[2] *Mode of delivery uncertain in 4 cases after implementation.*

TABLE 14.12

IMPACT OF OXYTOCIN USAGE ON MODE OF DELIVERY AND FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Normal group, multipara)

Oxytocin augmentation, mode of delivery and fetal outcome	Before implementation				After implementation			
	No.	%	Mean duration of oxytocin	Standard deviation	No.	%	Mean duration of oxytocin	Standard deviation
Augmented[1]	1 214	(100.0)	2.99	(3.28)	427	(100.0)	3.43	(2.87)
SVD	984	(81.1)	2.78	(3.02)	346	(81.0)	3.20	(2.84)
Operative vaginal	160	(13.2)	3.05	(3.52)	39	(9.1)	4.24	(3.23)
Caesarean section	70	(5.8)	5.75	(4.71)	41	(9.6)	4.58	(2.33)
Intrapartum fetal death	2	-	5.83	(-)	1	-	2.25	(-)
1 minute Agpar <4	9	(0.7)	4.62	(2.46)	3	(0.7)	1.92	(0.14)
Not augmented[2]	4 596	(100.0)	-	-	4 765	(100.0)	-	-
SVD	4 291	(93.4)	-	-	4 441	(93.2)	-	-
Operative vaginal	166	(3.6)	-	-	223	(4.7)	-	-
Caesarean section	135	(2.9)	-	-	97	(2.0)	-	-
Intrapartum fetal death	2	-	-	-	1	-	-	-
1 minute Agpar <4	20	(0.4)	-	-	17	(0.4)	-	-

[1] *Mode of delivery uncertain in 1 case after implementation.*
[2] *Mode of delivery uncertain in 4 cases before and 4 after implementation.*

TABLE 14.13

STATED REASON FOR OXYTOCIN AUGMENTATION AT DIFFERENT POINTS ON PARTOGRAPH
(Normal group, all parities, after implementation)

Point on partograph at which oxytocin commenced	Prolonged latent phase		Dysfunctional Labour		Meconium staining		Post Maturity		Prolonged rupture of membranes		Other		Total	
In latent phase	65	(34.4)	35	(18.5)	7	(3.7)	14	(7.4)	51	(27.0)	17	(9.0)	189	(100.0)
On or left of alert line	-		66	(43.7)	20	(13.2)	16	(10.6)	35	(23.2)	14	(9.3)	151	(100.0)
Between alert and action line	-		65	(63.1)	14	(13.6)	1	(1.0)	8	(7.8)	15	(14.6)	103	(100.0)
At action line	-		264	(94.6)	12	(4.3)	2	(0.7)	1	(0.4)	0		279	(100.0)
Beyond action line	-		237	(94.1)	5	(2.0)	4	(1.6)	1	(0.4)	5	(2.0)	252	(100.0)
Totals	65	(6.6)	667	(68.5)	58	(6.0)	37	(3.8)	9	(9.8)	51	(5.2)	974	(100.0)

1 Percentages in parentheses.
2 Those women with no stated reason for oxytocin augmentation are excluded.
3 Total numbers are greater than number of women augmented as in some cases more than one reason was given.

TABLE 14.14

STATED REASON FOR OXYTOCIN AUGMENTATION AT DIFFERENT POINTS ON PARTOGRAPH
(Normal group, all parities, after implementation)

Point on partograph at which oxytocin commenced	Prolonged latent phase	Dysfunctional labour	Meconium staining	Post maturity	Hypertension	Prolonged rupture of membranes	Other	Total
In latent phase	20 (17.5)	9 (7.9)	1 (0.9)	9 (7.9)	34 (29.8)	30 (26.3)	11 (9.6)	114(100.0)
On or left of alert line	-	16 (12.3)	8 (6.2)	5 (3.8)	27 (20.8)	50 (38.5)	24 (18.5)	130(100.0)
Between alert and action line	-	32 (40.5)	12 (15.2)	2 (2.5)	20 (25.3)	6 (7.6)	7 (8.9)	79(100.0)
At action line	-	62 (81.6)	3 (3.9)	1 (1.3)	6 (7.9)	1 (1.3)	3 (3.9)	76(100.0)
Beyond action line	-	60 (87.0)	1 (1.4)	0	6 (8.7)	1 (1.4)	1 (1.4)	69(100.0)
Totals	20 (4.3)	179 (38.2)	25 (5.3)	17 (3.6)	93 (19.9)	88 (18.8)	46 (9.8)	468(100.0)

1 Percentages in parentheses.
2 Those women with no stated reason for oxytocin augmentation are excluded.
3 Total numbers are greater than number of women augmented as in some cases more than one reason was given.

TABLE 14.15

MEAN DURATION TO REACH ACTIVE PHASE AND TO REACH FULL DILATATION IN ACTIVE PHASE AND MODE OF DELIVERY BY DIFFERENT ACTIONS AT 8 HOURS OF OBSERVED LATENT PHASE DEPENDANT ON STATE OF MEMBRANES

(Normal group, all parities)

Mean duration and mode of delivery	Action where membranes intact*								Action where membranes already ruptured*			
	None		ARM alone		Oxytocin alone		Oxytocin + ARM		None		Oxytocin	
Mean duration from action to active phase (hrs)	3.95		4.00		6.43		3.23		4.40		4.56	
Mean duration in active phase until full dilatation (hrs)	4.75		3.50		3.60		3.82		5.75		2.67	
Spontaneous vertex delivery	19		6	(54.5)	15	(68.2)	15	(68.2)	2	(40.0)	10	(58.8)
Operative vaginal delivery	1	(4.5)	4	(36.4)	3	(13.6)	2	(9.1)	2	(40.0)	7	(41.2)
Caesarean section	2	(9.1)	1	(9.1)	4	(18.2)	5	(22.7)	1	(20.0)	0	
Total women	22	(100.0)	11	(100.0)	22	(100.0)	22	(100.0)	5	(100.0)	17	(100.0)

Percentages in parentheses.

** In 2 cases from each group caesarean section was performed at 8 hours of latent phase; these cases are not included in this Table.*

TABLE 14.16

INTERVAL TO DELIVERY AND CAESAREAN SECTION RATES DEPENDENT ON PROTOCOL MANAGEMENT AFTER PROLONGED LATENT STAGE

Variable	Recommended protocol management	
	Yes	No
Number of women	39	60
Mean time interval from latent phase action to delivery (hours)	7.47	9.40
Caesarean section rate (%)	12.8	13.3

TABLE 14.17

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES INTACT

(Normal group, all parities, all cervical dilatations)

Action	Course of labour			Mode of delivery					
				SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**359 (100.0)**	**325**	**(89.8)**	**31**	**(8.6)**	**3**	**(0.8)**
	Reached action line[3]	**=**	**111 (100.0)**	**82**	**(73.9)**	**16**	**(14.4)**	**13**	**(11.7)**
ARM	Did not reach action line[2]	=	316 (100.0)	288	(91.1)	26	(8.2)	2	(0.6)
	Reached action line[3]	=	82 (100.0)	60	(73.2)	11	(13.4)	11	(13.4)
ARM + Oxytocin	Did not reach action line[2]	=	7	5		2		0	
	Reached action line[3]	=	1	1		0		0	
Oxytocin only	Did not reach action line[2]	=	4	1		2		1	
	Reached action line[3]	=	1	1		0		0	
None	Did not reach action line[2]	=	32 (100.0)	31	(94.7)	1	(5.3)	0	
	Reached action line[3]	=	27 (100.0)	20	(42.9)	5	(28.6)	2	(28.6)

Percentages in parentheses.

[1] *In 3 cases, caesarean section was performed as an immediate action.*

[2] *Not action line = course of labour never reached action line.*

[3] *Action line = course of labour moved to or beyond action line.*

TABLE 14.18

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES ALREADY RUPTURED

(Normal group, all parities, all cervical dilatations)

Action	Course of labour			Mode of delivery					
				SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**1 041 (100.0)**	**851**	**(81.7)**	**172**	**(16.5)**	**18**	**(1.7)**
	Reached action line[3]	**=**	**309 (100.0)**	**154**	**(49.8)**	**74**	**(23.9)**	**81**	**(26.2)**
Oxytocin	Did not reach action line[2]	=	48 (100.0)	38	(79.2)	7	(14.6)	3	(6.25)
	Reached action line[3]	=	10 (100.0)	3	(30.0)	4	(40.0)	3	(30.0)
No action	Did not reach action line[2]	=	993 (100.0)	813	(81.9)	165	(16.6)	15	(1.5)
	Reached action line[3]	=	299 (100.0)	151	(50.5)	70	(23.4)	78	(26.1)

Percentages in parentheses.

[1] *In 23 cases, caesarean section was performed as an immediate action.*
[2] *Not action line = course of labour never reached action line.*
[3] *Action line = course of labour moved to or beyond action line.*

TABLE 14.19

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES INTACT

(Normal group, nullipara,[4] all cervical dilatations)

Action	Course of labour				Mode of delivery					
					SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**140**	**(100.0)**	**118**	**(84.3)**	**17**	**(12.1)**	**3**	**(2.1)**
	Reached action line[3]	**=**	**63**	**(100.0)**	**40**	**(63.5)**	**13**	**(20.6)**	**10**	**(15.9)**
ARM	Did not reach action line[2]	=	123	(100.0)	104	(84.6)	15	(12.2)	2	(1.6)
	Reached action line[3]	=	46	(100.0)	29	(63.0)	9	(19.6)	8	(17.4)
ARM + Oxytocin	Did not reach action line[2]	=	2		1		1		0	
	Reached action line[3]	=	1		1		0		0	
Oxytocin only	Did not reach action line[2]	=	2		0		1		1	
	Reached action line[3]	=	0		-		-		-	
None	Did not reach action line[2]	=	11	(100.0)	11	(100.0)	0		0	
	Reached action line[3]	=	16	(100.0)	10	(62.5)	4	(25.0)	2	(12.5)

Percentages in parentheses.

[1] In 2 cases, caesarean section was performed as an immediate action.
[2] Not action line = course of labour never reached action line.
[3] Action line = course of labour moved to or beyond action line.
[4] Parity unknown in 1 case.

TABLE 14.20

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES INTACT

(Normal group, multipara,[4] all cervical dilatations)

Action	Course of labour		Mode of delivery		
			SVD	Operative vaginal	Caesarean section
Total group[1]	**Did not reach action line[2]**	**= 221 (100.0)**	**206 (93.2)**	**14 (6.3)**	**0**
	Reached action line[3]	**= 48 (100.0)**	**42 (87.5)**	**3 (6.3)**	**3 (6.3)**
ARM	Did not reach action line[2]	= 192 (100.0)	181 (94.3)	11 (5.7)	0
	Reached action line[3]	= 36 (100.0)	31 (86.1)	2 (5.6)	3 (8.3)
ARM + Oxytocin	Did not reach action line[2]	= 5 (100.0)	4 (80.0)	1 (20.0)	0
	Reached action line[3]	= 0	-	-	-
Oxytocin only	Did not reach action line[2]	= 2	1	1	0
	Reached action line[3]	= 1	1	0	0
None	Did not reach action line[2]	= 21 (100.0)	20 (95.0)	1	0
	Reached action line[3]	= 11 (100.0)	10 (91.0)	1	0

Percentages in parentheses.

[1] *In 1 cases caesarean section was performed as an immediate action.*
[2] *Did not reach action line = course of labour never reached action line.*
[3] *Reached action line = course of labour moved to or beyond action line.*
[4] *Parity unknown in 1 case.*

TABLE 14.21

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT ARRIVAL IN REFERRAL ZONE WHEN MEMBRANES ALREADY RUPTURED

(Normal group, nullipara,[4] all cervical dilatations)

Action	Course of labour			Mode of delivery[1]					
				SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**581 (100.0)**	**434**	**(74.7)**	**120**	**(20.7)**	**13**	**(2.2)**
	Reached action line[3]	**=**	**213 (100.0)**	**99**	**(46.5)**	**59**	**(27.7)**	**55**	**(25.8)**
Oxytocin	Did not reach action line[2]	=	24 (100.0)	16	(66.7)	6	(25.0)	2	(8.3)
	Reached action line[3]	=	8 (100.0)	3	(37.5)	3	(37.5)	2	(25.0)
No action	Did not reach action line[2]	=	543 (100.0)	418	(77.0)	114	(21.0)	11	(2.0)
	Reached action line[3]	=	205 (100.0)	96	(46.8)	56	(27.3)	53	(25.9)

Percentages in parentheses.

[1] *In 14 cases, caesarean section was performed as an immediate action.*
[2] *Did not reach action line = course of labour never reached action line.*
[3] *Reached action line = course of labour moved to or beyond action line.*
[4] *Parity unknown in 1 case.*

TABLE 14.22

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT ARRIVAL IN REFERRAL ZONE WHEN MEMBRANES ALREADY RUPTURED

(Normal group, multipara,[4] all cervical dilatations)

Action	Course of labour				Mode of delivery[1]					
					SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**483**	**(100.0)**	**417**	**(86.3)**	**52**	**(10.8)**	**5**	**(1.0)**
	Reached action line[3]	**=**	**95**	**(100.0)**	**54**	**(56.8)**	**15**	**(15.8)**	**26**	**(27.4)**
Oxytocin	Did not reach action line[2]	=	24	(100.0)	22	(91.7)	1	(4.2)	1	(4.2)
	Reached action line[3]	=	2		0		1		1	
No action	Did not reach action line[2]	=	450	(100.0)	395	(87.8)	51	(11.3)	4	(0.9)
	Reached action line[3]	=	93	(100.0)	54	(58.1)	14	(15.1)	25	(26.9)

Percentages in parentheses.

[1] *In 9 cases, caesarean section was performed as an immediate action.*
[2] *Did not reach action line = course of labour never reached action line.*
[3] *Reached action line = course of labour moved to or beyond action line.*
[4] *Parity unknown in 1 case.*

TABLE 14.23

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES INTACT

(Normal group, all parities, reached referral zone at 3-4 cm dilatation)

Action	Course of labour				Mode of delivery[1]					
					SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**68**	**(100.0)**	**60**	**(88.2)**	**5**	**(7.4)**	**2**	**(2.9)**
	Reached action line[3]	**=**	**60**	**(100.0)**	**43**	**(71.7)**	**9**	**(15.0)**	**8**	**(13.3)**
ARM	Did not reach action line[2]	=	52	(100.0)	49	(94.2)	2	(3.9)	1	(1.9)
	Reached action line[3]	=	39	(100.0)	28	(71.8)	4	(10.3)	7	(18.0)
ARM + Oxytocin	Did not reach action line[2]	=	4		2		2		0	
	Reached action line[3]	=	0		0		0		0	
Oxytocin only	Did not reach action line[2]	=	2		0		1		1	
	Reached action line[3]	=	1		1		0		0	
None	Did not reach action line[2]	=	9	(100.0)	9	(100.0)	0		0	
	Reached action line[3]	=	20	(100.0)	14	(70.0)	5	(25.0)	1	(5.0)

Percentages in parentheses.

[1] In 1 case, caesarean section was performed as an immediate action.

[2] Did not reach action line = course of labour never reached action line.

[3] Reached action line = course of labour moved to or beyond action line.

TABLE 14.24

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES INTACT

(Normal group, all parities, reached referral zone at 5-7 cm dilatation)

Action	Course of labour				Mode of delivery[1]					
					SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	=	**282**	**(100.0)**	**254**	**(90.1)**	**25**	**(8.9)**	**1**	**(0.4)**
	Reached action line[3]	=	**50**	**(100.0)**	**38**	**(76.0)**	**7**	**(14.0)**	**5**	**(10.0)**
ARM	Did not reach action line[2]	=	255	(100.0)	231	(90.6)	23	(9.0)	1	(0.4)
	Reached action line[3]	=	42	(100.0)	31	(73.8)	7	(16.7)	4	(9.5)
ARM + Oxytocin	Did not reach action line[2]	=	3		3		0		0	
	Reached action line[3]	=	1		1		0		0	
Oxytocin only	Did not reach action line[2]	=	2		1		1		0	
	Reached action line[3]	=	0		0		0		0	
None	Did not reach action line[2]	=	20	(100.0)	19	(95.0)	1	(5.0)	0	
	Reached action line[3]	=	7	(100.0)	6	(85.7)	0		1	(14.3)

Percentages in parentheses.

[1] *In 2 cases, caesarean section was performed as an immediate action.*
[2] *Did not reach action line = course of labour never reached action line.*
[3] *Reached action line = course of labour moved to or beyond action line.*

TABLE 14.25

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES INTACT

(Normal group, all parities, reached referral zone at 8-10 cm dilatation)

Action	Course of labour				Mode of delivery					
					SVD		Operative vaginal		Caesarean section	
Total group	**Did not reach action line[1]**	**=**	**12**	**(100.0)**	**11**	**(97.7)**	**1**	**(8.3)**	**0**	
	Reached action line[2]	**=**	**2**		**1**		**0**		**0**	
ARM	Did not reach action line[1]	=	9		8	(88.9)	1	(11.1)	0	
	Reached action line[2]	=	1		1		0		0	
ARM + Oxytocin	Did not reach action line[1]	=	0		-		-		-	
	Reached action line[2]	=	0		-		-		-	
Oxytocin only	Did not reach action line[1]	=	0		-		-		-	
	Reached action line[2]	=	0		-		-		-	
None	Did not reach action line[1]	=	3	(100.0)	3	(100.0)	0		0	
	Reached action line[2]	=	0		-		-		-	

Percentages in parentheses.

[1] *Did not reach action line = course of labour never reached action line.*
[2] *Reached action line = course of labour moved to or beyond action line.*

TABLE 14.26

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT ARRIVAL IN REFERRAL ZONE WHEN MEMBRANES ALREADY RUPTURED

(Normal group, all parities, reached referral zone at 3-4 cm dilatation)

Action	Course of labour				Mode of delivery[1]					
					SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**143**	**(100.0)**	**124**	**(86.7)**	**15**	**(10.5)**	**1**	**(0.7)**
	Reached action line[3]	**=**	**113**	**(100.0)**	**57**	**(50.4)**	**27**	**(23.9)**	**29**	**(25.7)**
Oxytocin	Did not reach action line[2]	=	14	(100.0)	12	(85.7)	1	(7.1)	1	(7.1)
	Reached action line[3]	=	4	(100.0)	2	(50.0)	1	(25.0)	1	(25.0)
No action	Did not reach action line[2]	=	126	(100.0)	112	(88.9)	14	(11.1)	0	
	Reached action line[3]	=	109	(100.0)	55	(50.5)	26	(23.9)	28	(25.7)

Percentages in parentheses.

[1] *In 3 cases, caesarean section was performed as an immediate action.*
[2] *Did not reach action line = course of labour never reached action line.*
[3] *Reached action line = course of labour moved to or beyond action line.*

TABLE 14.27

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT ARRIVAL IN REFERRAL ZONE WHEN MEMBRANES ALREADY RUPTURED

(Normal group, all parities, reached referral zone at 5-7 cm dilatation)

Action	Course of labour				Mode of delivery[1]					
					SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	**=**	**643**	**(100.0)**	**540**	**(84.0)**	**85**	**(13.2)**	**8**	**(1.2)**
	Reached action line[3]	**=**	**170**	**(100.0)**	**81**	**(47.7)**	**42**	**(24.7)**	**47**	**(27.7)**
Oxytocin	Did not reach action line[2]	=	29	(100.0)	24	(82.8)	3	(10.4)	2	(6.9)
	Reached action line[3]	=	4	(100.0)	0		2	(50.0)	2	(50.0)
No action	Did not reach action line[2]	=	604	(100.0)	516	(85.4)	92	(13.6)	6	(1.0)
	Reached action line[3]	=	166	(100.0)	81	(48.8)	40	(24.0)	45	(27.1)

Percentages in parentheses.

[1] *In 10 cases, caesarean section was performed as an immediate action.*
[2] *Did not reach action line = course of labour never reached action line.*
[3] *Reached action line = course of labour moved to or beyond action line.*

TABLE 14.28

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT ARRIVAL IN REFERRAL ZONE WHEN MEMBRANES ALREADY RUPTURED

(Normal group, all parities, reached referral zone at 8-10 cm dilatation)

Action	Course of labour				Mode of delivery[1]					
					SVD		Operative vaginal		Caesarean section	
Total group[1]	**Did not reach action line[2]**	=	**278**	**(100.0)**	**187**	**(67.3)**	**72**	**(25.9)**	**9**	**(3.2)**
	Reached action line[3]	=	**26**	**(100.0)**	**16**	**(61.5)**	**5**	**(19.2)**	**5**	**(19.2)**
Oxytocin	Did not reach action line[2]	=	5	(100.0)	2	(40.0)	3	(60.0)	0	
	Reached action line[3]	=	2	(100.0)	1	(50.0)	1	(50.0)	0	
No action	Did not reach action line[2]	=	263	(100.0)	185	(70.3)	69	(26.2)	9	(3.4)
	Reached action line[3]	=	24	(100.0)	15	(62.5)	4	(16.7)	5	(20.8)

Percentages in parentheses.

[1] *In 10 cases, caesarean section was performed as an immediate action.*
[2] *Did not reach action line = course of labour never reached action line.*
[3] *Reached action line = course of labour moved to or beyond action line.*

TABLE 14.29

MODE OF DELIVERY BY ALTERNATIVE ACTIONS AT ACTION LINE

(Normal group, all parities, all cervical dilatations)

Mode of delivery[1]	Action at action line*											
	All actions		Caesarean section		Augmentation[2]		Conservative		None		ARM only	
SVD	536	(60.6)	-		312	(66.0)	23	(43.4)	178	(63.1)	23	(76.7)
Operative vaginal	161	(18.2)	-		79	(16.7)	16	(30.2)	61	(21.8)	5	(16.7)
Caesarean section	187	(21.2)	47	(100.0)	81	(17.1)	14	(26.4)	43	(15.3)	2	(6.7)
All delivery modes	884	(100.0)	47	(100.0)	473	(100.0)	53	(100.0)	282	(100.0)	30	(100.0)

* *See text for definition of actions.*

[1] *Mode of delivery unknown in 2 cases.*
[2] *5 augmented cases had ARM at same time.*

TABLE 14.30

MODE OF DELIVERY BY ALTERNATIVE ACTIONS AT ACTION LINE

(Normal group, nulliparous, all cervical dilatations)

Mode of delivery[1]	Action at action line*											
	All actions		Caesarean section		Augmentation[2]		Conservative		None		ARM only	
SVD	260	(50.9)	-		156	(56.3)	8	(27.6)	84	(53.2)	12	(66.7)
Operative vaginal	123	(24.1)	-		67	(24.2)	12	(41.4)	40	(25.3)	4	(22.2)
Caesarean section	128	(25.0)	29	(100.0)	54	(19.5)	9	(31.0)	34	(21.5)	2	(11.1)
All delivery modes	511	(100.0)	29	(100.0)	277	(100.0)	29	(100.0)	158	(100.0)	18	(100.0)

* *See text for definition of actions.*

[1] *Mode of delivery unknown in 1 case.*
[2] *2 augmented cases had ARM at same time.*

TABLE 14.31

MODE OF DELIVERY BY ALTERNATIVE ACTIONS AT ACTION LINE

(Normal group, multiparous, all cervical dilatations)

Mode of delivery[1]	Action at action line*											
	All actions		Caesarean section		Augmentation[2]		Conservative		None		ARM only	
SVD	258	(73.7)	-		153	(80.5)	13	(59.1)	81	(75.0)	11	(91.7)
Operative vaginal	34	(9.7)	-		11	(5.8)	4	(18.2)	18	(16.7)	1	(8.3)
Caesarean section	58	(16.6)	18	(100.0)	26	(13.7)	5	(22.7)	9	(8.3)	0	
All delivery modes	350	(100.0)	18	(100.0)	190	(100.0)	22	(100.0)	108	(100.0)	12	(100.0)

* *See text for definition of actions.*

[1] *Mode of delivery unknown in 1 case.*
[2] *2 augmented cases had ARM at same time.*

TABLE 14.32

MODE OF DELIVERY BY ALTERNATIVE ACTIONS AT ACTION LINE AMONG WOMEN MOVING STRAIGHT TO ACTION LINE

(Normal group, all parities, all cervical dilatations)

Mode of delivery[1]	Action at action line*											
	All actions		Caesarean section		Augmentation[2]		Conservative		None		ARM only	
SVD	284	(64.1)	-		179	(68.3)	12	(41.4)	83	(69.2)	10	(66.7)
Operative vaginal	67	(15.1)	-		38	(14.5)	8	(27.6)	18	(15.0)	3	(20.0)
Caesarean section	92	(20.8)	18	(100.0)	44	(16.8)	9	(31.0)	19	(15.8)	2	(13.3)
All delivery modes	443	(100.0)	18	(100.0)	262	(100.0)	29	(100.0)	120	(100.0)	15	(100.0)

** See text for definition of actions.*

[1] Mode of delivery unknown in 2 cases.
[2] 3 augmented cases had ARM performed at same time.

TABLE 14.33

MODE OF DELIVERY BY ALTERNATIVE ACTIONS AT ACTION LINE AMONG WOMEN MOVING TO ACTION LINE VIA REFERRAL ZONE

(Normal group, all parities, all cervical dilatations)

Mode of delivery	Action at action line*											
	All actions		Caesarean section		Augmentation[1]		Conservative		None		ARM only	
SVD	236	(56.2)	-		130	(63.1)	9	(40.9)	84	(56.8)	13	(86.7)
Operative vaginal	90	(21.4)	-		40	(19.4)	8	(36.4)	40	(27.0)	2	(13.3)
Caesarean section	94	(22.4)	29	(100.0)	36	(17.5)	5	(22.7)	24	(16.2)	0	
All delivery modes	420	(100.0)	29	(100.0)	206	(100.0)	22	(100.0)	148	(100.0)	15	(100.0)

** See text for definition of actions.*

[1] 2 augmented cases had ARM performed at same time.

TABLE 14.34

MODE OF DELIVERY AND FETAL OUTCOME BY ACTION AT/BEFORE/AFTER ACTION LINE

(All parities, all cervical dilatations)

Delivery and fetal outcome[1]	Caesarean section now		Oxytocin already		Oxytocin now		Oxytocin later		Never oxytocin		ARM/SRM only now	
SVD	-		12	(35.3)	312	(66.1)	35	(59.3)	149	(64.2)	24	(75.0)
Operative vaginal	-		10	(29.4)	79	(16.7)	16	(27.1)	47	(20.3)	6	(18.8)
Caesarean section	47	(100.0)	12	(35.3)	81	(17.1)	8	(13.6)	36	(15.5)	2	(6.3)
Apgar[2] <8	9	(19.1)	11	(32.3)	83	(17.6)	9	(15.3)	42	(18.1)	4	(12.5)
Admitted special/intensive baby care	7	(14.9)	9	(26.5)	47	(10.0)	5	(8.5)	30	(12.9)	3	(9.4)
Total	47	(100.0)	34	(100.0)	472	(100.0)	59	(100.0)	232	(100.0)	32	(100.0)

Numbers in parentheses are percentages.

[1] *Multiple outcomes are possible.*
[2] *Apgar at 1 minute.*

15. COMPLETING THE PARTOGRAPH AND FOLLOWING THE PROTOCOL

15.1 Summary

All partographs were screened for accuracy of completion and protocol adherence by WHO staff in Geneva. In the great majority of cases, the partograph was correctly completed and examinations performed at recommended intervals. The errors noted did not, in most cases, have major implications for labour management. Particularly critical features were the correct commencement of the partograph following the criteria laid down for the diagnosis of labour and the importance of an assessment of cervical dilatation 8 hours after admission in the latent phase.

The labour management protocol was applied appropriately in 93.0% of women from the normal group. Where (due to complications) appropriate deviation (2.5%) from the protocol took place, operative delivery rates were high. In 4.3% of cases, deviation appeared to be inappropriate. Operative delivery rates in these cases were also raised, though to a lesser extent than where deviation was appropriate. The inappropriate deviation may in itself have contributed to the increased interventions.

The partograph was embraced enthusiastically by all labour ward staff and no design alterations were recommended. Particular advantages included better use of resources, improved communication between all staff and students in the maternity care team, better counselling of women, and improved bonding between mother and neonate as well as the objective improvements reported elsewhere in this report.

15.2 Introduction

For most centres, graphically recording the progress of labour on a partograph was a new experience; for all centres using a partograph to indicate the appropriate timing of interventions in labour was entirely novel. It was, therefore, important to assess the accuracy with which partographs were completed and the diligence with which the recommended labour management protocol was followed. The results of the study could be invalidated if there were major difficulties in either area and any recommendations concerning worldwide promotion of the WHO partograph might require modification if there were problems in accurately completing the partograph.

As described in Chapter 2, all partographs were returned to WHO headquarters in Geneva and scrutinised for accuracy of completion and for compliance with the agreed management protocol. This chapter presents the results of that scrutiny together with a summary of subjective comments on the partograph and its use made by participants in the study.

15.3 Completing the Partograph

Table 15.1 indicates the most frequent faults noted in completing the partograph. In most cases (91.7%) the partograph was correctly completed throughout. The commonest faults were failure to record the fetal heart rate at satisfactory intervals, if at all (3.7% of cases), and incorrect recording of fetal head descent (1.8%). The number of errors in other elements were too few to merit individual inclusion but altogether comprised 2.4% of cases. As inappropriate completion of the partograph in the latent phase affected the further plotting and assessment of the whole partograph, errors in the latent phase were, however, noted separately. There were

major errors in only 0.7% of partographs although the majority of partographs did not include a latent phase.

At each centre, after the initial intensive week of teaching with the help of a WHO consultant at the time of implementation of the partograph, there were later visits by the WHO Study Coordinator (BEK). The impression was gained that the number of faults in completion of partographs decreased as the study progressed and the participants became more familiar with the partograph.

15.4 Frequency of Vaginal Examinations

The agreed protocol for labour management using the partograph included the recommendation that vaginal examinations should be performed every 4 hours unless membranes ruptured spontaneously or complications developed or labour was advanced (see Chapter 2). For many centres, performing vaginal examinations (VEs) at intervals of 4 hours required a change of practice. Before the implementation of the partograph several centres performed VEs more frequently than every 4 hours and it has already been noted (see Chapter 4) that there was a reduction in the number of VEs performed in labour after introduction of the partograph. The frequency of VEs on the partograph was reviewed by WHO staff in Geneva. In some cases, such as when complications developed, a change in the frequency of vaginal examination was clearly justified but, in other cases, there was no apparent justification for the change. Deviations from the recommended frequency were examined separately in the latent and the active phases. The results of this assessment are shown in Table 15.2. Most VEs were performed at the correct interval, but in 5.6% of cases in the latent phase and 4.1% of cases in the active phase the change in interval was considered unjustified. The frequency of this fault also appeared to decrease as the study progressed.

A particularly critical vaginal examination proved to be that performed 8 hours after admission in the latent phase so that a prolonged latent phase could be identified. There should be no flexibility about the timing of this vaginal examination. This is further discussed in the commentary.

15.5 Following the Protocol

In studying the partographs and associated labour management, deviations from the agreed management protocol could be recognised. In certain cases, the reasons for the deviation was recorded by the principal investigator at each centre or the reason was apparent from a study of the case. In these cases, the deviation was termed "appropriate". Where no reason was apparent, the deviation was termed "inappropriate". The management protocol most specifically applies to the "normal" group defined in Chapter 4 and only this group is studied here.

Of the 863 correctly completed and assessable partographs in this group, the protocol was accurately followed in 8151 (93.0%). Of the remaining 612 (7.0%), deviation from the protocol was assessed as appropriate in 231 (2.6% of all cases studied) and inappropriate in 381 (4.3%). The deviations could be further divided into those occurring in the latent or active phase of labour. There were 127 cases where deviations occurred in the latent phase, comprising 5.3% of all "normal" women with a latent phase; 52 of these were appropriate and 75 inappropriate. In the active phase, deviations occurred in 485 cases (5.6% of all "normal" women with an active phase); 179 were appropriate and 306 inappropriate.

The outcome of labour dependent on adherence to the labour management protocol is presented in Table 15.3. As previously discussed in Chapter 4, neonatal deaths were too inaccurately recorded for any conclusions to be drawn; intrapartum stillbirths in this group were also too few to be of significance. No significant conclusions can be drawn from the few babies with low 1-minute Apgar scores.

The best results in terms of lowest caesarean section rates were achieved when the protocol could be adhered to throughout. Operative delivery rates rose with deviation from the protocol. Many of these cases, however, developed complications, such as fetal distress, where it would clearly be appropriate to depart from the protocol. When there was inappropriate protocol deviation, operative delivery rates tended to be lower than when the deviation was appropriate. Appropriate deviation tended to occur in cases developing complications and the highest operative delivery rate would be expected in this group. Inappropriate deviation often took the form of unnecessary interventions (e.g. oxytocin augmentation) in uncomplicated cases. This would reduce the incidence of operative delivery in these cases. Conversely, delayed intervention when indicated (such as failure to perform any action at the action line) also occurred. In some cases, a non-operative delivery may have resulted, whereas protocol management would have led to an earlier operative delivery. This did not necessarily mean that the failure to intervene was appropriate.

15.6 Subjective Impressions by Participants

After some inevitable initial teething difficulties, many caused as much by language interpretation difficulties as anything else, doctors and midwives in all the participating centres embraced partography with enthusiasm. No new interventions were advocated and there were no difficulties encountered in performing procedures when indicated. The encouragement to perform earlier ARM than had hitherto been practised (especially in Indonesia) did cause some initial anxiety. This was to some extent counterbalanced by the less active management of labour which resulted from the implementation of the partograph in the Malaysian and Thai centres which had previously practised very early intervention with both ARM and oxytocin augmentation.

The most frequent difficulty encountered was that of the decision of when to start the partograph on women in early labour. Clear teaching of the agreed definition of labour (see Chapter 2) was important. Understanding of this increased as the study progressed and improved both the quality of the partographs and the enthusiasm for the method.

There were no strong arguments from the participants for significant alterations to the design of the WHO partograph. The words "latent phase" at the upper part of the cervicograph should be moved to the lower part to clarify to which part of the cervicograph they belong. In addition, the heavy line at 8 hours should not extend above 3 cm.

Difficulty was observed from time to time over the interpretation of a 3 cm VE after 8 hours, the cross for which sits at the beginning of the alert line, i.e. the start of the active phase. This also represents the top of the action line for the latent phase. Confusion sometimes arose at this point and careful teaching is needed.

The most positive points to emerge were the improved use of labour ward beds and of midwifery time. The criteria for starting partography based both on contraction frequency and cervical dilatation reduced the number of women waiting unnecessarily in early labour wards and freed midwives to concentrate on those women in established labour. The reduction in augmented labours also freed midwives to provide more personalised care to women in labour.

Medical and nursing staff, as well as the women themselves, welcomed the reduction in vaginal examinations.

Paediatricians appreciated the improved condition of neonates and midwives could effect more bonding between mothers and newborn.

Partography also improved comprehension of labour among midwives, medical students and resident medical staff. The quality of communication with consultant obstetricians was improved and management discussion and decisions became more rational.

15.7 Commentary

This chapter presents evidence that the partograph was embraced effectively and enthusiastically by the participating centres. This was expected as no partographic reports have described difficulty with use of the partograph provided teaching in its use is effective. Maternal and Child Health Aides have been taught effective use of a partograph,[14] although difficulties have been experienced with its introduction into health centres.[16] This further emphasises the need (discussed in Chapter 13) for further research into the use of the WHO partograph as a management and referral tool in peripheral centres.

The partograph was not correctly completed in all cases, but the quality of the partographs improved with familiarity as the study progressed. The faults noted in the completion of 8.3% of partographs were mostly minor with little bearing on the use of the partograph to aid labour management. All centres reported that the quality of labour observation improved with the introduction of the partograph. The 3.7% of cases where the fetal heart was inadequately recorded on the partograph probably represents a considerable improvement on the proportion of cases among whom fetal heart recording was poor before implementation of the partograph.

The overwhelming majority of cases (in the "normal" group) were managed according to the agreed protocol and this probably contributed to the excellent outcome. Where there was appropriate deviation from the protocol, complications had arisen which inevitably led to high intervention rates in this group. Inappropriate deviation occurred in only 4.3% of cases, many of these at an early stage of the study. This inappropriate deviation may have resulted in increased intervention rates, albeit lower than the understandably high rates when complications requiring appropriate deviation occurred.

No modifications to the design of the partograph were suggested other than the minor points described in Section 15.6. The critical importance of clear criteria for the diagnosis of labour and commencement of a partograph have been emphasised throughout this report. Partograph screening in Geneva also revealed the importance of an assessment of cervical dilatation 8 hours after admission in the latent phase. If this examination was delayed, difficulties arose in the use of the partograph once the active phase was reached as the alert and action lines could not be applied and appropriate management decisions were jeopardised. This was a particular problem early in the trial and was one of the main reasons for rejecting partographs as unassessable in the screening process.

To the participating centres, the positive attractions of partography far outweighed any criticism of the method. All centres elected to continue to use the partograph after the trial was completed and obstetricians in all three countries are extending the use of the device to many other centres. The overwhelming impression was of a simple technique which allows better use of labour ward resources and personnel, improves maternal neonatal outcome, and results

in improved bonding between mother and child. The importance of this has been emphasised elsewhere.[60]

TABLE 15.1

ACCURACY OF PARTOGRAPH COMPLETION
(All centres)

Accuracy of partograph	No.	%
All elements correct	11 118	91.7
Latent phase only incorrectly recorded	49	0.4
Fetal heart inadequately recorded	449	3.7
Head descent incorrectly recorded	221	1.8
Other faults	286	2.4
Total partographs assessed	12 123	100.0

TABLE 15.2

ADHERENCE TO CORRECT FREQUENCY OF VAGINAL EXAMINATION IN LABOUR ON PARTOGRAPH

Frequency of vaginal examination	In latent phase		In active phase	
	No.	%	No.	%
VEs performed at correct interval	3 245	91.2	10 896	92.9
Change in interval justified*	91	2.6	279	2.4
Change in interval not justified*	201	5.6	478	4.1
Plotting too faulty to assess	23	0.6	70	0.6
Total	3 560[1]	100.0	11 723[2]	100.0

** See text for explanation.*

[1] Total partographs with an assessable latent phase.
[2] Total partographs with an assessable active phase.

TABLE 15.3

FETAL OUTCOME AND MODE OF DELIVERY DEPENDENT ON ADHERENCE TO LABOUR MANAGEMENT PROTOCOL

(Normal group, all centres)

Protocol management	Total[1]		Fetal outcome						Mode of delivery					
			Stillbirth		Neonatal death		Apgar <4		SVD		Operative vaginal		Caesarean section	
	No.	%.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Correct protocol management throughout	8 151	100.0	3	0.1	5	0.1	40	0.5	7 215	88.5	717	8.8	209	2.6
Protocol deviation latent phase														
- appropriate[2]	52	100.0	0		0		0		44	84.6	6	11.5	2	3.8
- inappropriate	75	100.0	0		0		0		64	85.3	9	12.0	2	2.7
Protocol deviation active phase														
- appropriate	179	100.0	0		1	0.6	4	2.2	109	60.9	25	14.0	45	25.1
- inappropriate	306	100.0	0		0		3	1.0	218	71.2	51	16.6	37	12.1

[1] *Partograph not adequately assessable in 367 cases.*

[2] *These women either had no active phase or correct protocol management in the active phase.*

16. BREECH LABOUR ON THE WHO PARTOGRAPH

16.1 Summary

There were 1740 singleton breech presentations in this trial. The total caesarean section rate among these women was 29.7% (nullipara 38.6%; multipara 23.4%). One quarter of all caesarean sections were elective.

Only 346 out of 816 women with a singleton breech after implementation had a partograph completed. The remaining women had either an elective or "immediate" caesarean section or were admitted in advanced labour. Despite this, similar overall improvements in labour and fetal outcome were achieved among breech presentations and cephalic presentations after implementation of the partograph. Labour duration and oxytocin usage fell and caesarean sections fell from 31.9% to 27.3% of deliveries. All of this drop occurred among multipara whose caesarean section rate fell from 27.1% to 19.3%. There was no change among nullipara. The fetal outcome was improved after implementation but throughout the trial the best fetal outcome was achieved when the mode of delivery for breech presentations was by caesarean section.

Labour on the partograph was slower among breech than among cephalic presentations. 24.9% of breech labours reached the referral zone (but no further) and 16.8% reached or moved beyond the action line. Parity had little influence on these rates. The caesarean section rate was 2.5% on or left of the alert line, 5.8% in the referral zone and 32.8% at or beyond the action line. Admission in the latent phase and nulliparity were both independently associated with an increased likelihood of caesarean section.

Artificial rupture of membranes (ARM) in the active phase of breech labour and the commencement of oxytocin if the action line was reached (or crossed) appeared to be appropriate and useful actions. The analysis suggests that the same labour management protocol used in cephalic presentation (Chapter 2) can be applied to a breech labour on the partograph.

In view of the improved fetal outcome with caesarean section delivery, careful consideration must always be given to this mode of delivery but, where labour is allowed to progress, the WHO Partograph is a useful management tool.

16.2 Introduction

The preceding chapters of this report have particularly concentrated on the identified "normal" group of women. The WHO Partograph was, however, used in all labouring women and the results presented in Chapter 4 suggested that there was an overall improvement in the outcome of labour with the introduction of the partograph regardless of the presence of risk factors. Controversy remains over the ideal mode of delivery and management of labour in breech presentation.[57,58] The large numbers in this study provided an opportunity to evaluate the role of partography in the management of singleton breech labour. The numbers involved are first presented, followed by a description of the impact of the WHO Partograph on the outcome of breech labour and an analysis of the course of labour on the partograph and of the recommended protocol. The presentation of the results follows a similar pattern (but in abbreviated form) to those in Chapters 4, 6, 9, 10 and 14.

16.3 Breech Presentations and Labour

Of the 35 484 women, 1740 (4.9%) presented by the breech at the time of entry to the study. The distribution of these cases by parity, partograph, implementation, group (as defined in Chapter 4), mode of delivery, perinatal mortality and birth weight is shown in Table 16.1. The total caesarean section rate was 29.7%. Among nullipara, the total caesarean section rate was 38.6% (275/712), 67 (9.4%) of caesarean section being elective. The caesarean section rate for multipara was 23.4% (240/1024), 65 (6.3%) being elective.

16.4 The Impact of Partograph on the Outcome of Breech Labour

The impact of the introduction of the partograph on the outcome of labour was studied in the same way as in Chapter 4. All singleton vaginal breeches were studied together to ensure that a similar group before and after implementation was compared. In theory the group for whom a partograph could not be completed and those induced could have been eliminated from the comparison, leaving only those spontaneously labouring breeches who were eligible for partography. In practice, it was found that a significant number (113) of breeches in the high risk group after implementation did not have a partograph, usually (it appears) because a decision was made soon after admission for delivery by caesarean section. These cases should probably have fallen into the "excluded from partography" group but, by definition, this group only included those who were delivered by caesarean section within one hour of admission. If the caesarean section took place more than one hour after admission, they fell out with the "excluded from partography" group and were classified as in the high risk group and eligible for partography. As these cases inevitably had a high caesarean section rate this distorted (and potentially underestimated) the capacity of the partograph to modify intervention rates. The numbers of induced breech labours were small and it is uncertain whether all the cases were correctly categorised as inductions. To overcome these problems of definitions, the outcome among all singleton breech presentations before and after implementation of the partograph was studied in order to assess the overall impact of the introduction of the partograph.

The results are presented in a similar way to the tables in Chapter 4.

16.4.1 Labour duration, management and complications

Table 16.2 shows the impact of the introduction of the partograph among singleton breech presentation labours from the high risk group on the duration of labour, oxytocin usage, vaginal examinations, puerperal sepsis and postpartum haemorrhage. Tables 16.3 and 16.4 present the same information for nulliparous and parous breeches respectively. The results are very similar to those achieved among women from the normal group, as presented in Chapter 4. The mean length of labour was shortened (from 5.88 hours to 4.32 hours) with fewer labours lasting over 18 hours (down from 7.7% to 2.7%) and fewer vaginal examinations in labour (mean reduced from 1.54 to 1.26). Fewer labours were augmented (12.4% to 7.0%), and the mean duration of oxytocin usage fell from 4.44 to 3.96 hours. This was the one difference seen in the results compared to "normal" women among whom the duration of oxytocin use rose. Rates of postpartum haemorrhage and puerperal sepsis also fell. The observed changes occurred among both nulliparous and parous women (Tables 16.3 and 16.4).

16.4.2 Mode of delivery

When the mode of delivery is examined (Table 16.5), again the changes brought about by the introduction of the partograph were similar among breech labours to those among the

normal group studied in Chapter 4. The rate of vaginal breech delivery (spontaneous or assisted) rose from 67.0% to 72.3% while the rate of caesarean sections fell from 31.9% to 27.3% When this analysis is made by parity groupings, it is seen that all of the reductions in caesarean sections occurred among parous women (27.1% to 19.3%). There was no change in the caesarean section rate among nulliparous women (38.5% before and 38.7% after implementation). It must be borne in mind that complications other than the breech presentation alone may have been present (unlike the defined "normal" group of women). Indeed (as is discussed later in this chapter), only 346 women with a singleton breech presentation after implementation of the partograph actually had a partograph completed (42.4% of all singleton breeches after implementation). Of all the caesarean sections performed for breech presentation, 132 were carried out electively (25.5% of all singleton breech presentation caesarean sections).

16.4.3 Fetal outcome

The fetal outcome improved after implementation of the partograph (Table 16.6). As previously discussed (Chapter 4), neonatal deaths were certainly under-reported and little attention should be paid to the figures. Intrapartum stillbirths fell from 1.7% to 1.0%, there were fewer Apgars <4 (7.0% to 5.7%) and fewer infants required ventilation (4.9% to 3.8%) and admission to a neonatal special care nursery (24.8% to 20.0%) or intensive care unit (1.2% to 0.7%). Tables 16.7 and 16.8 make the same comparisons among nulliparous and multiparous women. The same trends (i.e. slightly improved fetal outcome) are apparent with the exception of a small rise in babies with Apgars <4 at 1 minute among nullipara after implementation of the partograph (6.0% to 6.7%), offset by a greater fall in severely asphyxiated babies born to multipara (7.7% to 5.0%).

In view of this slightly improved fetal outcome in conjunction with a small reduction in caesarean sections (at least among parous women), it is worth noting that there was no change in the mean birth weight after implementation; indeed there was a small (non-significant) rise of birth weight among parous women.

16.4.4 Fetal outcome and mode of delivery

The fetal outcome dependent on the mode of delivery and by parity before and after implementation of the partograph is shown in Tables 16.9, 16.10 and 16.11. The most striking finding was the improved outcome for all babies born by caesarean section as compared to vaginal delivery regardless of implementation of the partograph. There was only 1 intrapartum fetal death when delivery was by caesarean section but 22 when delivery was vaginal. There was, however, a reduction in all intrapartum fetal deaths after implementation of the partograph (Table 16.6). In addition Apgar scores after vaginal delivery were poorer than after caesarean section. There was, however, a reduction in the proportion of babies with severe asphyxia (Apgar <4) after implementation of the partograph regardless of the mode of delivery.

Of further interest (not shown in Table 16.9) was the finding that the mean birth weight of babies born by caesarean section was higher than those born by vaginal delivery regardless of implementation of the partograph. The mean birth weight of vaginal deliveries before implementation was 2735 g (SD 689) and after implementation 2800 g (SD 634). The corresponding figures for caesarean section deliveries were 3047 g (607) and 3074 g (511).

Tables 16.10 and 16.11 present the same results for nullipara and multipara. The differences described above were consistent for the different parity groups

The fetal outcome in relation to mode of delivery is explored further in Tables 16.12 (all parities) 16.13 (nullipara) and 16.14 (multipara) where oxytocin usage is also considered. Many of the unaugmented caesarean section deliveries were those delivered by elective or immediate caesarean section and did not therefore continue in observed labour after admission. They cannot therefore be compared accurately with those who received augmentation. This fact may well, for example, explain the lower proportion of babies with Apgar scores <4 in the unaugmented group when compared to augmented labours. On the other hand, those from the augmented group who had Apgar scores <4 did not have long mean durations of oxytocin usage compared to the whole augmented group, particularly before implementation when there was a higher overall proportion of babies with Apgars <4. The figures do not suggest that there is added hazard to the fetus from using oxytocin in breech labour.

Tables 16.12-14 can be compared with Tables 14.10-12 which show the same information for women from the normal group.

16.4.5 Course of breech labour on the WHO partograph

This section examines the course of labour in singleton breech presentations as plotted on the partograph in order to ascertain that this design of partograph is appropriate to breech presentation and that the alert and action lines identify labours with an increased likelihood of caesarean section delivery, as was found to be the case in the normal group of women (Chapters 7 and 8). As described in Section 16.2, a large number of breech presentations did not have a partograph, even after implementation, because of the high incidence of elective and immediate caesarean section. In addition, breeches admitted at 9-10 cm cervical dilatation did not have a partograph. Of the 816 singleton breeches in the trial after implementation, 346 (42.4%) had a partograph completed and are studied here.

16.4.6 Course of labour

Of the 346 singleton spontaneous breech labours with a partograph 63 (18.2%) were admitted in the latent phase and 283 (81.8%) in the active phase. Only 2 women were delivered (by caesarean section) within a normal (8 hour) latent phase; 3 were delivered by caesarean section after a prolonged latent phase.

Of those who had an active phase (other than after a prolonged latent phase), 197 (56.9%) remained on or to the left of the alert line, 86 (24.9%) reached the referral zone (between the alert and action line) but no further and 58 (16.8%) reached or moved beyond the action line.

The course of labour among singleton breeches is compared to that among women from the normal group in Tables 16.15-17. All cases with an active phase, regardless of the phase of labour on admission, are counted together. Labour progress is clearly slower with breech labour. When nullipara and multipara are examined separately (Tables 16.16 and 16.17) it is of interest that very similar proportions of nulliparous and of multiparous breeches reached the referral zone and the action line. This was not true in cephalic presentations where fewer multipara than nullipara reached these zones of the partograph. Breech labour appears to be equally "inefficient" regardless of parity.

16.4.7 Course of labour and mode of delivery

Table 16.18 shows the caesarean section rates related to progress on the partograph and dependent on the phase of labour on admission. Only women with an active phase of labour

plotted on the partograph are included. It is of note (though not surprising) that the overall caesarean section rate among those 341 women was (at 8.5%) much lower than among the total group of singleton breeches. The women studied here had already been selected as being appropriate to continue in labour. Among these, there was a steady rise in caesarean section rates with slowing progress on the partograph. Caesarean section became necessary in 2.5% of those remaining on or to the left of the alert line, 5.8% of those moving beyond the alert line but not to the action line, and 32.8% of those reaching the action line. As with cephalic singleton presentations (Chapters 7 and 8) the caesarean section rate was higher when admission was originally in the latent rather than the active phase of labour. Among latent phase admissions, 61.5% of those reaching the action line were delivered by caesarean section. It was also more likely that latent phase admissions would reach the action line; 29.6% of latent phase admissions reached the action line, compared to 18.7% of active phase admissions.

These differences are partly explained by the higher proportion of nullipara (23%) than multipara (13%) admitted in the latent phase (Tables 16.19 and 16.20). The total caesarean section rate among nullipara was 13.0% and among multipara 5.7%. Despite similar rates of progress on the partograph (Tables 16.16 and 16.17), the caesarean section rate for multipara was lower at all points on the partograph. The rising trend of caesarean section rates with slower progress on the partograph was apparent for both parity groupings (Tables 16.19 and 16.20)

16.5 Breech Presentation and Labour Management Protocol

While the same demands for adherence to the agreed labour management protocol were not made in cases of breech presentation, breech labours were plotted on the partograph and suggested guidelines for labour management were agreed by WHO consultants. These were as follows:

a. Management of latent phase as per protocol for cephalic presentation.

b. Caesarean section may be indicated if the 8 hour latent phase "action line" is reached.

c. In the active phase, dilatation slower than 1 cm/hour is a worrying sign.

d. Consider oxytocin if dilatation moves to right of alert line.

e. Reaching the active phase action line is normally an indication for caesarean section.

This section examines the actions taken at different points on the partograph and relates these to the subsequent course of labour and mode of delivery in an attempt to evaluate the recommended protocol.

The number of breeches delivered in the latent phase (2) or after a prolonged latent phase (3) was too small to merit detailed examination.

16.5.1 Oxytocin augmentation

The changes in oxytocin augmentation and the impact on mode of delivery brought about by the implementation of the partograph on women of all parities has already been shown in Tables 16.12 to 16.14, with comments under Section 16.2.4.

16.5.2 Action in the referral zone

Once breech labour moved to the right of the alert line, oxytocin augmentation was encouraged in the recommended protocol. In this respect, the protocol differed from that recommended for cephalic presentations. Possible actions among breech presentations depended on the state of the membranes on reaching the referral zone. For those with membranes intact, the options were ARM, ARM with oxytocin, oxytocin alone, none, or delivery by caesarean section. With membranes already ruptured, ARM was not an available option. These various options related to subsequent course of labour and the ultimate mode of delivery are shown in Tables 16.21 and 16.22. Parities are not presented separately because of the small numbers involved, but there were no outstanding differences between nullipara and multipara.

The high proportion of those reaching the referral zone with intact membranes (58/135 = 43.0%) probably reflects a reluctance to perform ARM in breech presentation. By contrast 473/1846 (25.6%) of cephalic presentations from the normal group reached the referral zone with intact membranes (Chapter 14). The majority of those with intact membranes had an ARM performed on arrival at the referral zone (36/55 = 65.5%). 8 of those reached the action line and 2 were delivered by caesarean section. Despite the encouragement in the breech management protocol to start oxytocin in the referral zone, this only occurred in 12 cases (3 with membranes intact and 9 with membranes already ruptured on arrival at the referral zone). This represents only 9.2% of all breeches reaching the referral zone and continuing in labour. The outcome (as measured by subsequent course of labour and caesarean section rates) was better among those arriving at the referral zone with intact membranes than when the membranes were already ruptured. Regardless of the action taken, 25.5% of the former group reached the action line and 10.9% were delivered by caesarean section. When the membranes were already ruptured, 33.8% ultimately reached the action line and 13.8% were delivered by caesarean section.

While this information does not clarify the role of ARM in breech labour, it confirms that ARM is an appropriate and helpful action if labour reaches the referral zone. The figures do also confirm that all breech labours reaching the referral zone should be transferred to a central unit if not already in one, particularly if the membranes are already ruptured. If labour is well advanced and the membranes are intact however ARM followed by a short period of observation may well be safe.

16.5.3 Action at the action line

The recommendations for breech labour stated that reaching the action line was normally an indication for caesarean section. Alternative actions were augmentation (if oxytocin had not already been started), or supportive conservative therapy (see Chapter 14). If none of these were carried out, no action was deemed to have been taken.

Table 16.23 relates those alternative actions once labour reached or moved beyond the action line to the mode of delivery. Labours which moved straight from the alert to the action line and reached the action line via the referral zone are considered together, and all parities

are combined. Twenty-three nullipara and 36 multipara reached the action line. Despite the recommendation that caesarean section was the appropriate action at the action line, only 3 out of 59 women had a caesarean section at this point. 21 received augmentation and had a relatively low caesarean section rate of 14.3%. Both "conservative" and "no" action were associated with higher caesarean section rates (66.7% and 35.5% respectively). Of the 21 who received oxytocin, 13 were multipara (caesarean section rate 15.4%) and 8 were nullipara (12.5% caesarean sections). There seem to be no particular added hazards or difficulties in augmenting multiparous as opposed to nulliparous breech labour.

16.6 Commentary

This multicentre trial was not designed to specifically address the management of breech presentation and firm conclusions cannot be drawn from the data presented here. As with other studies of breech presentation[57,58] it is clear from the singleton breeches analysed here that case selection is important in the decision to attempt vaginal or caesarean delivery. Those babies born vaginally were in poorer condition than those born by caesarean section. An awareness of this was presumably a major factor in the high overall caesarean section rate among breeches (29.7%). The precise indicators for caesarean section have not been studied but after implementation of the partograph (when more information was available) there were 34 caesarean sections (9.8%) out of 346 women who laboured with a partograph (and therefore there was presumably an intention to deliver vaginally), and 189 caesarean sections (40.1%) out of 471 women who had no partograph; 227 (48.1%) of these women with no partograph were admitted at 9-10 cm in advanced labour. Breech labour on the partograph can therefore only be studied among the minority of women who were not admitted in very advanced labour and for whom there was no indication for elective or immediate caesarean section.

Despite these limitations to the use of a partograph, there was an overall improvement in the outcome of labour in all breech presentations after implementation. As among cephalic presentations (Chapter 4), prolonged labour (>18 hours) was reduced despite a reduction in the proportion of labours augmented and in the mean duration of oxytocin use. There was an increase in vaginal breech deliveries and a reduction in caesarean sections after implementation but this occurred solely among parous women who had a substantial drop from 27.1% to 19.3%.

Overall there was a relatively poor fetal outcome compared to uncomplicated pregnancies with cephalic presentations. 8.7% of singleton breech deliveries were stillborn although in the majority (7.4%), the fetus was already dead on admission. The intra-partum fetal loss was 1.4%. The fetal outcome also, however, improved after implementation of the partograph, both among babies delivered by caesarean section and vaginally.

Breech labour progressed more slowly than when the presentation was cephalic, and the rate of progress was similar regardless of parity. The significance of the alert and action lines in the active phase appeared similar, however, to when the presentation was cephalic. Apart from progress beyond the alert line, a high caesarean section rate was also associated with admission in the latent phase and with nulliparity. All of these factors should be taken into account when considering the management of breech labour and the referral of such cases to a central unit.

The results suggest that the guidance for referral in the referral zone of the partograph outlined in Chapter 14 (Section 14.5.2) can be applied to cephalic or breech labour. If the membranes are intact when the referral zone is reached and there are no other complications,

ARM and a short period of observation may well be reasonable. In all other circumstances, arrival in the referral zone is an indication for transfer to a central unit as caesarean section rates in such cases are high.

Only 56 women received oxytocin augmentation after implementation but there seemed to be no particular hazards associated with this, regardless of parity. Fetal condition at birth was more closely related to the mode of delivery than oxytocin usage. The use of oxytocin, whether at the referral zone or at the action line, was associated with a lower caesarean section rate than the avoidance of oxytocin. Provided the fetal condition is good, and no contra-indications exist, the use of oxytocin in breech labour appears worthwhile and could probably (as with cephalic presentation) be postponed until the action line is reached.

The use of the WHO partograph in the management of breech labour appears a useful and effective way of monitoring progress and timing decisions. Given, however, that the fetal outcome was better overall where delivery was by caesarean section, careful consideration must be given to the correct selection of women with breech presentation allowed to labour.

TABLE 16.1

BREECH PRESENTATIONS

Total women in study	=	35 484 (100%)
Singleton breech presentations	=	1 740 (4.9%)

Distribution of singleton breech presentations

Nullipara*	=	712 (5.1% of all nullipara)
Para 1-4	=	858 (4.7% of all para 1-4)
Para 5+	=	166 (5.2% of all para 5+)
Before implementation	=	923 (5.1% of all women before)
After implementation	=	817 (4.7% of all women after)

Distribution by group (Chapter 4)

Partograph not completed	=	650
Induced labour	=	91
High risk	=	999

Delivery (1 740 = 100%)

Elective caesarean section	=	132 (7.6%)
Emergency caesarean section	=	376 (21.6%)
Unclassified caesarean section	=	9
Total caesarean sections	=	517 (29.7%)
Laparotomy for uterine rupture	=	4
Destructive delivery	=	10
Vaginal delivery	=	1 209 (69.5%)

Fetal outcome (1 740 = 100%)

Intra-uterine deaths on admission	=	128 (7.4%)
Intrapartum fetal deaths	=	24 (1.4%)
Total stillbirths	=	152 (8.7%)
Perinatal deaths (stillbirths and first week deaths)	=	181 (10.4%)
Mean birth weight (g) (standard deviation)	=	2 856 (650)

* *Parity unrecorded in 4 cases.*

TABLE 16.2

LABOUR DURATION, LABOUR MANAGEMENT, COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION

(Singleton breeches)

Maternal outcomes	Before implementation		After implementation	
Total women	**923**	**(100.0)**	**817**	**(100.0)**
Mean no. of VEs[1] in labour	1.54	(1.31)[2]	1.26	(1.15)[2]
Mean duration of labour (hrs)[2]	5.88	(8.08)[2]	4.32	(5.59)[2]
Labour ≤12 hours[4]	797	(86.3)	743	(90.9)
Labour >12-18 hours[4]	46	(5.0)	39	(4.8)
Labour >18 hours[4]	71	(7.7)	22	(2.7)
Labour augmented	114	(12.4)	57	(7.0)
Mean duration of oxytocin use (hrs)	4.44	(3.71)[2]	3.96	(2.84)[2]
Postpartum haemorrhage (caesarean section)[3]	144	(15.6)	109	(13.3)
Postpartum haemorrhage (vaginal)[3]	20	(2.2)	13	(1.6)
Puerperal sepsis	9	(1.0)	3	(0.4)

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Blood loss ≥500 ml.*
[4] *Labour duration not recorded in 9 cases before and 13 cases after implementation.*

TABLE 16.3

LABOUR DURATION, LABOUR MANAGEMENT, COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION

(Nulliparous singleton breeches)

Maternal outcomes	Before implementation		After implementation	
Total women[4]	**379**	**(100.0)**	**333**	**(100.0)**
Mean no. of VEs[1] in labour	1.65	(1.32)[2]	1.26	(1.14)[2]
Mean duration of labour (hrs)	6.70	(8.70)[2]	4.39	(5.26)[2]
Labour ≤12 hours[5]	320	(84.4)	306	(91.9)
Labour >12-18 hours[5]	26	(6.9)	19	(5.7)
Labour >18 hours[5]	31	(8.2)	7	(2.1)
Labour augmented	50	(13.2)	19	(5.7)
Mean duration of oxytocin use (hrs)	4.62	(3.66)[2]	3.39	(2.95)[2]
Postpartum haemorrhage (caesarean section)[3]	66	(17.4)	66	(19.8)
Postpartum haemorrhage (vaginal)[3]	5	(1.3)	2	(0.6)
Puerperal sepsis	2	(0.5)	1	(0.3)

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Blood loss ≥500 ml.*
[4] *Parity not known in 2 cases.*
[5] *Labour duration not recorded in 2 cases before and 1 case after implementation.*

TABLE 16.4

LABOUR DURATION, LABOUR MANAGEMENT, COMPLICATIONS AND AUGMENTATION BEFORE AND AFTER IMPLEMENTATION

(Parous singleton breeches)

Maternal outcomes	Before implementation		After implementation	
Total women[4]	**542**	**(100.0)**	**482**	**(100.0)**
Mean no. of VEs[1] in labour	1.47	(1.31)[2]	1.25	(1.16)[2]
Mean duration of labour (hrs)[2]	5.32	(7.59)[2]	4.26	(5.82)[2]
Labour ≤12 hours[5]	475	(87.6)	435	(90.2)
Labour >12-18 hours[5]	20	(3.7)	20	(4.1)
Labour >18 hours[5]	40	(7.4)	15	(3.1)
Labour augmented	64	(11.8)	37	(7.7)
Mean duration of oxytocin use (hrs)	4.30	(3.76)[2]	4.31	(2.79)[2]
Postpartum haemorrhage (caesarean section)[3]	77	(14.2)	42	(8.7)
Postpartum haemorrhage (vaginal)[3]	15	(2.8)	11	(2.3)
Puerperal sepsis	7	(1.3)	2	(0.4)

Results show number of women (percentages in parentheses).

[1] *VE = vaginal examination.*
[2] *Standard deviation.*
[3] *Blood loss ≥500 ml.*
[4] *Parity not known in 2 cases.*
[5] *Labour duration not recorded in 7 cases before and 12 cases after implementation.*

TABLE 16.5

MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION AMONG SINGLETON BREECHES

Parity and mode of delivery	Before implementation		After implementation	
All women[1]	923	(100.0)	817	(100.0)
Vaginal breech	618	(67.0)	591	(72.3)
Destructive vaginal	8	(0.9)	2	(0.2)
Caesarean section	294	(31.9)	223	(27.3)
Laparotomy	3	(0.3)	1	(0.1)
Nullipara	379	(100.0)	333	(100.0)
Vaginal breech	229	(60.4)	204	(61.3)
Destructive vaginal	4	(1.1)	0	
Caesarean section	146	(38.5)	129	(38.7)
Multipara	542	(100.0)	482	(100.0)
Vaginal breech	388	(71.7)	386	(80.1)
Destructive vaginal	4	(0.7)	2	(0.4)
Caesarean section	147	(27.1)	93	(19.3)

Percentages in parentheses.

[1] *Parity not recorded in 2 cases before and 2 cases after implementation.*

TABLE 16.6

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(Singleton breeches)

Fetal outcome	Before implementation		After implementation	
Total[1]	**922**	**(100.0)**	**815**	**(100.0)**
Still births				
total	88	(9.5)	64	(7.9)
intra-partum	16	(1.7)	8	(1.0)
dead on admission	72	(7.8)	56	(6.9)
Neonatal deaths				
total	18	(1.9)	11	(1.4)
<24 hours	17	(1.8)	7	(0.9)
1-7 days	1	(0.1)	4	(0.5)
1 min. Apgar[2]				
0-3	58	(7.0)	43	(5.7)
4-7	256	(30.7)	279	(37.2)
8-10	520	(62.4)	429	(57.1)
Resuscitation				
bagging	125	(13.7)	113	(13.9)
ventilation	45	(4.9)	31	(3.8)
Admitted				
neonatal special care	228	(24.8)	163	(20.0)
neonatal intensive care	11	(1.2)	6	(0.7)
mean birth weight (grams with standard deviation)	2 836	(677)	2 878	(617)

[1] *Fetal outcome not known in 1 case before and 2 cases after implementation.*
[2] *Apgar scores not recorded in 88 cases before and 64 cases after implementation.*

TABLE 16.7

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(Nulliparous singleton breeches)

Fetal outcome	Before implementation		After implementation	
Total	**379**	**(100.0)**	**333**	**(100.0)**
Still births				
total	27	(7.2)	20	(6.0)
intra-partum	4	(1.1)	2	(0.6)
dead on admission	23	(6.1)	18	(5.4)
Neonatal deaths				
total	5	(1.3)	9	(2.7)
<24 hours	5	(1.3)	5	(1.5)
1-7 days	0		4	(1.2)
1 min. Apgar[1]				
0-3	21	(6.0)	21	(6.7)
4-7	111	(31.5)	116	(37.1)
8-10	220	(62.5)	176	(56.2)
Resuscitation				
bagging	52	(13.8)	50	(15.1)
ventilation	18	(4.8)	16	(4.8)
Admitted				
neonatal special care	102	(27.0)	59	(17.7)
neonatal intensive care	5	(1.3)	4	(1.2)
mean birth weight (grams with standard deviation)	2 777	(561)	2 765	(537)

[1] *Apgar score not recorded in 27 cases before and 20 cases after implementation.*

TABLE 16.8

FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION
(Parous singleton breeches)

Fetal outcome	Before implementation		After implementation	
Total[1]	**541**	**(100.0)**	**480**	**(100.0)**
Still births				
total	61	(11.3)	44	(9.1)
intra-partum	12	(2.2)	6	(1.2)
dead on admission	49	(9.1)	38	(7.9)
Neonatal deaths				
total	13	(2.4)	2	(1.1)
<24 hours	12	(2.2)	2	(0.4)
1-7 days	1	(0.2)	0	
1 min. Apgar[2]				
0-3	37	(7.7)	22	(5.0)
4-7	144	(30.0)	162	(37.2)
8-10	299	(62.3)	252	(57.8)
Resuscitation				
bagging	73	(13.6)	63	(13.2)
ventilation	27	(5.0)	15	(3.1)
Admitted				
neonatal special care	126	(23.4)	104	(21.6)
neonatal intensive care	6	(1.1)	2	(0.4)
mean birth weight (grams with standard deviation)	2 879	(745)	2 954	(656)

[1] *Fetal outcome not known in 1 case before and 2 cases after implementation.*
[2] *Apgar score not recorded in 61 cases before and 44 cases after implementation.*

TABLE 16.9

FETAL OUTCOME BY MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Singleton breeches)

Fetal outcome	Mode of delivery			
	Before implementation		After implementation	
	Vaginal delivery	Caesarean section	Vaginal delivery	Caesarean section
All babies (N)	**617**	**294**	**589**	**223**
Intrapartum fetal death	14 (2.3)	1 (0.3)	8 (1.4)	0
Apgar 0-3*	44 (8.2)	13 (4.4)	38 (7.1)	5 (2.3)
Apgar 4-7*	184 (34.1)	68 (23.5)	207 (38.8)	72 (33.0)

** Numbers in parentheses are percentages of total.*

TABLE 16.10

FETAL OUTCOME BY MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH

(Nulliparous singleton breeches)

FETAL OUTCOME	MODE OF DELIVERY			
	Before implementation		After implementation	
	Vaginal delivery	Caesarean section	Vaginal delivery	Caesarean section
All babies (N)	**229**	**146**	**204**	**129**
Intrapartum fetal death	3 (1.3)	0	2 (1.0)	0
Apgar 0-3*	15 (7.3)	6 (4.2)	18 (9.7)	3 (2.4)
Apgar 4-7*	78 (37.9)	32 (22.2)	74 (39.8)	42 (33.1)

** Numbers in parentheses are percentages of total.*

TABLE 16.11

FETAL OUTCOME BY MODE OF DELIVERY BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Parous singleton breeches)

Fetal outcome	Mode of delivery			
	Before implementation		After implementation	
	Vaginal delivery	Caesarean section	Vaginal delivery	Caesarean section
All babies (N)	**387**	**147**	**384**	**93**
Intrapartum fetal death	11 (2.8)	1 (0.7)	6 (1.6)	0
Apgar 0-3*	29 (8.7)	7 (4.9)	20 (5.8)	2 (2.2)
Apgar 4-7*	106 (31.9)	35 (24.3)	133 (38.4)	29 (32.2)

* *Numbers in parentheses are percentages of total.*

TABLE 16.12

IMPACT OF OXYTOCIN USAGE ON MODE OF DELIVERY AND FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Singleton breeches)

Oxytocin augmentation, mode of delivery and fetal outcome	Before implementation		After implementation	
	Number (percentage)	Mean duration of oxytocin[1]	Number (percentage)	Mean duration of oxytocin[1]
Augmented	114 (100.0)	4.44 (3.71)	56 (100.0)	4.00 (2.86)
Vaginal	92 (80.7)	3.93 (3.47)	49 (87.5)	3.60 (2.40)
Caesarean section	19 (16.7)	6.89 (4.08)	7 (12.5)	6.76 (4.29)
Intrapartum fetal death	4 (3.5)	5.25 (2.50)	1 (1.8)	5.00 (-)
1 minute Apgar <4	12 (10.5)	3.24 (1.66)	6 (10.7)	4.94 (2.98)
Not augmented	807 (100.0)	-	759 (100.0)	-
Vaginal	525 (65.0)	-	541 (71.3)	-
Caesarean section	274 (34.0)	-	215 (28.3)	-
Intrapartum fetal death	12 (2.3)	-	7 (1.3)	-
1 minute Apgar <4	46 (8.8)	-	37 (6.8)	-

[1] *Number in parentheses = standard deviation.*

TABLE 16.13

IMPACT OF OXYTOCIN USAGE ON MODE OF DELIVERY AND FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Nulliparous singleton breeches)

Oxytocin augmentation, mode of delivery and fetal outcome	Before implementation		After implementation	
	Number (percentage)	Mean duration of oxytocin[1]	Number (percentage)	Mean duration of oxytocin[1]
Augmented	50 (100.0)	4.62 (3.66)	19 (100.0)	3.39 (2.95)
Vaginal	39 (78.0)	3.98 (3.41)	15 (78.9)	2.80 (1.99)
Caesarean section	10 (20.0)	6.81 (4.00)	4 (21.1)	5.63 (5.06)
Intrapartum fetal death	0	-	0	-
1 minute Apgar <4	6 (12.0)	3.92 (1.47)	3 (15.8)	4.56 (2.31)
Not augmented	329 (100.0)	-	314 (100.0)	-
Vaginal	190 (57.8)	-	189 (60.2)	-
Caesarean section	136 (41.3)	-	125 (39.8)	-
Intrapartum fetal death	4 (1.2)	-	2 (0.6)	-
1 minute Apgar <4	15 (4.6)	-	18 (5.7)	-

[1] *Number in parentheses = standard deviation.*

TABLE 16.14

IMPACT OF OXYTOCIN USAGE ON MODE OF DELIVERY AND FETAL OUTCOME BEFORE AND AFTER IMPLEMENTATION OF PARTOGRAPH
(Parous singleton breeches)

Oxytocin augmentation, mode of delivery and fetal outcome	Before implementation				After implementation			
	Number (percentage)		Mean duration of oxytocin[1]		Number (percentage)		Mean duration of oxytocin[1]	
Augmented	64	(100.0)	4.30	(3.76)	37	(100.0)	4.31	(2.79)
Vaginal	53	(82.8)	3.90	(3.55)	34	(91.9)	3.96	(2.51)
Caesarean section	9	(14.1)	6.97	(4.41)	3	(8.1)	8.27	(3.29)
Intrapartum fetal death	4	(6.3)	5.25	(2.50)	1	(2.7)	5.00	(-)
1 minute Apgar <4	6	(9.4)	2.57	(1.67)	3	(8.1)	5.33	(4.04)
Not augmented	478	(100.0)	-		445	(100.0)	-	
Vaginal	335	(70.1)	-		352	(79.1)	-	
Caesarean section	138	(28.9)	-		90	(20.2)	-	
Intrapartum fetal death	8	(1.7)	-		5	(1.1)	-	
1 minute Apgar <4	31	(6.5)	-		19	(4.3)	-	

[1] *Number in parentheses = standard deviation.*

TABLE 16.15

COURSE OF LABOUR AMONG SINGLETON BREECH PRESENTATIONS AND CEPHALIC PRESENTATIONS (Normal group)

Course of labour	Cephalic presentation		Breech presentation	
Delivered in latent phase (<8 hours)	9	(0.1)	2	(0.6)
Delivered after prolonged latent phase (>8 hours)	103	(1.3)	3	(0.9)
Remained on or left of alert line	6 331	(71.8)	197	(56.9)
Between alert and action lines but not to action line	1 503	(17.1)	86	(24.9)
Reached action line	864	(9.8)	58	(16.8)
All women	8 810	(100.0)	346	(100.0)

Percentages in parentheses.

TABLE 16.16

COURSE OF LABOUR AMONG SINGLETON BREECH PRESENTATIONS AND CEPHALIC PRESENTATIONS
(Normal group, nullipara)

Course of labour	Cephalic presentation		Breech presentation[1]	
Delivered in latent phase (<8 hours)	8	(0.2)	2	(1.49)
Delivered after prolonged latent phase (>8 hours)	73	(1.9)	1	(0.75)
Remained on or left of alert line	2 427	(64.0)	74	(55.2)
Between alert and action lines but not to action line	771	(20.3)	34	(25.4)
Reached action line	514	(13.6)	23	(17.2)
All women	3 793	(100.0)	134	(100.0)

Percentages in parentheses.

[1] *Parity unknown in 1 case.*

TABLE 16.17

COURSE OF LABOUR AMONG SINGLETON BREECH PRESENTATIONS AND CEPHALIC PRESENTATIONS
(Normal group, multipara)

Course of labour	Cephalic presentation		Breech presentation[1]	
Delivered in latent phase (<8 hours)	1	(0.1)	0	
Delivered after prolonged latent phase (>8 hours)	30	(0.6)	2	(1.0)
Remained on or left of alert line	3 904	(77.8)	122	(57.8)
Between alert and action lines but not to action line	732	(14.6)	52	(24.6)
Reached action line	350	(7.0)	35	(16.6)
All women	5 017	(100.0)	134	(100.0)

Percentages in parentheses.

[1] *Parity unknown in 1 case.*

TABLE 16.18

CAESAREAN SECTION DELIVERIES AMONG SINGLETON BREECH LABOURS BY COURSE OF LABOUR IN ACTIVE PHASE AFTER ADMISSION IN LATENT OR ACTIVE PHASE

Admission phase and delivery	On or left of alert line		Between alert and action line		Reached action line		All	
All women	**197**	**(100.0)**	**86**	**(100.0)**	**58**	**(100.0)**	**341**	**(100.0)**
Caesarean section	5	(2.5)	5	(5.8)	19	(32.8)	29	(8.5)
Admitted in latent phase	31	(100.0)	14	(100.0)	13	(100.0)	58	(100.0)
Caesarean section	3	(9.7)	2	(14.3)	8	(61.5)	13	(22.4)
Admitted in active phase	166	(100.0)	72	(100.0)	45	(100.0)	283	(100.0)
Caesarean section	2	(1.2)	3	(4.2)	11	(24.4)	16	(5.7)

Percentages in parentheses.

TABLE 16.19

CAESAREAN SECTION DELIVERIES AMONG SINGLETON BREECH LABOURS BY COURSE OF LABOUR IN ACTIVE PHASE AFTER ADMISSION IN LATENT OR ACTIVE PHASE
(Nullipara)

Admission phase and delivery	On or left of alert line		Between alert and action line		Reached action line		All	
All women	**74**	**(100.0)**	**34**	**(100.0)**	**23**	**(100.0)**	**131**	**(100.0)**
Caesarean section	4	(5.4)	3	(8.8)	10	(43.5)	17	(13.0)
Admitted in latent phase	14	(100.0)	6	(100.0)	5	(100.0)	25	(100.0)
Caesarean section	3	(21.4)	2	(33.3)	4	(80.0)	9	(36.0)
Admitted in active phase	60	(100.0)	28	(100.0)	18	(100.0)	106	(100.0)
Caesarean section	1	(1.7)	1	(3.6)	6	(33.3)	8	(7.5)

Percentages in parentheses.

TABLE 16.20

CAESAREAN SECTION DELIVERIES AMONG SINGLETON BREECH LABOURS BY COURSE OF LABOUR IN ACTIVE PHASE AFTER ADMISSION IN LATENT OR ACTIVE PHASE
(Multipara)

Admission phase and delivery	On or left of alert line		Between alert and action line		Reached action line		All	
All women	**122**	**(100.0)**	**52**	**(100.0)**	**35**	**(100.0)**	**209**	**(100.0)**
Caesarean section	1	(0.8)	2	(3.9)	9	(25.7)	12	(5.7)
Admitted in latent phase	16	(100.0)	8	(100.0)	8	(100.0)	32	(100.0)
Caesarean section	0		0		4	(50.0)	4	(12.5)
Admitted in active phase	106	(100.0)	44	(100.0)	27	(100.0)	177	(100.0)
Caesarean section	1	(1.0)	2	(4.6)	5	(18.5)	8	(3.8)

Percentages in parentheses.

TABLE 16.21

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT REFERRAL ZONE WHEN MEMBRANES INTACT
(Singleton breeches)

Action	Course of labour	Mode of delivery					
		All		Vaginal		Caesarean section	
Total group[1] (55)	**Did not reach action line**	**41**	**(100.0)**	**39**	**(95.1)**	**2**	**(4.9)**
	Reached action line	**14**	**(100.0)**	**10**	**(71.4)**	**4**	**(28.6)**
ARM (34)	Did not reach action line	27	(100.0)	27	(100.0)	0	
	Reached action line	7	(100.0)	5	(71.4)	2	(28.6)
ARM+Oxytocin (2)	Did not reach action line	1		1		0	
	Reached action line	1		1		0	
Oxytocin only (1)	Did not reach action line	0		-		-	
	Reached action line	1		0		1	
None (15)	Did not reach action line	11	(100.0)	11	(100.0)	0	
	Reached action line	4	(100.0)	4	(100.0)	0	

[1] *In 3 cases, caesarean section was performed as an immediate action.*

TABLE 16.22

COURSE OF LABOUR AND MODE OF DELIVERY BY ACTION AT ARRIVAL IN REFERRAL ZONE WHEN MEMBRANES ALREADY RUPTURED
(Singleton breeches)

Action	Course of labour	Mode of delivery					
		All		Vaginal		Caesarean section	
Total group[1] (65)	**Did not reach action line**	**43**	**(100.0)**	**40**	**(93.0)**	**3**	**(7.0)**
	Reached action line	**22**	**(100.0)**	**16**	**(72.7)**	**6**	**(27.3)**
Oxytocin (9)	Did not reach action line	7	(100.0)	7	(100.0)	0	
	Reached action line	2	(100.0)	2	(100.0)	0	
No Action (54)	Did not reach action line	34	(100.0)	33	(97.1)	1	(2.9)
	Reached action line	20	(100.0)	14	(70.0)	6	(30.0)

[1] *In 2 cases, caesarean section was performed as an immediate action.*

TABLE 16.23

MODE OF DELIVERY BY ALTERNATIVE ACTIONS AT ACTION LINE AMONG SINGLETON BREECH LABOURS
(Nullipara)

Mode of delivery	Action at action line*							
	Caesarean section		Augmentation		Conservative		None	
All women (23)	**1**		**8**	**(100.0)**	**2**	**(100.0)**	**12**	**(100.0)**
Vaginal (13)	-		7	(87.5)	0		6	(50.0)
Caesarean section (10)	1		1	(12.5)	2	(100.0)	6	(50.0)

* *See text for definition of actions.*

17. MATERNAL DEATHS AND UTERINE RUPTURE

17.1 Summary

There were 47 maternal deaths and 55 cases of uterine rupture during the trial. The partograph played little or no role in any of these cases, most of which occurred as a result of late presentation of neglected problems. Eclampsia was the commonest cause of maternal death but infection, uterine rupture and postpartum haemorrhage accounted for 13 deaths; these problems may be associated with prolonged labour. In 43 of the cases of uterine rupture, the uterus was already ruptured on admission. The other cases were associated with operative vaginal delivery.

The partograph was not able to influence the incidence of maternal death or uterine rupture in this study but should be of benefit if it leads to the early referral of the prolonged and obstructed labours which caused many of the problems described in this chapter. Management in the referral centre must, however, then be optimal.

17.2 Introduction

The aim of the Safe Motherhood Initiative (of which this study was a part) is to reduce maternal mortality. The study would therefore not be complete without an examination of the maternal deaths which took place in the study population. An important cause of maternal death in prolonged labour is uterine rupture; this serious complication is studied separately as the partograph is primarily a tool to prevent prolonged labour and its sequelae.

17.3 Maternal Deaths

Forty seven maternal deaths were reported during the study (0.13%) of women admitted in labour. Only intrapartum deaths and those postpartum deaths occurring in the unit after delivery were recorded for the purpose of the study. The total maternal mortality rate is certainly higher. Most of the deaths (38) occurred in Indonesia, reflecting that country's poorer socioeconomic condition and probably poorer access to obstetric care.

Twenty-three maternal deaths occurred prior to implementation of the partograph and twenty-four afterwards. The partograph had no influence on maternal mortality as most of the deaths were admitted with severe complications already and the partograph could not have played a role in the management of these cases. Some cases admitted in advanced labour might have been referred earlier if the partograph had been used in labour management in a peripheral centre. Only five women had a partograph. Their cause of death was pulmonary embolism (2), eclampsia (2) and postpartum haemorrhage and/or anaesthetic death (1).

The mean age of those dying was 29 years (range 18-45 years) and the mean parity 3.1. Eleven (24%) were nullipara and 8 (18%) grand multipara. The mean gestation at delivery was 36.8 weeks, seven cases being under 34 weeks.

The majority (82%) of cases had had a minimum of two antenatal visits. Twenty-five (53%) came directly from home, the remainder being referred from domiciliary midwives (9), traditional birth attendants (3), maternity homes (4), health centres (3) or other hospitals (3). Three cases were induced, one went into spontaneous labour after admission and one had an elective caesarean section. The remainder were admitted in spontaneous labour.

Two deaths occurred intrapartum and were undelivered. The method of delivery of the remainder is shown in Table 17.1. The mean time spent in the unit before delivery was 9.0 hours (range 15 minutes to 44 hours) and the mean time from admission to the unit until death was 64 hours (range 1 hour to 7 days).

Twenty four babies were liveborn, at least two of these dying in the early neonatal period. Of the twenty-two stillbirths, 16 were fresh stillbirths.

The causes of maternal death are recorded in Table 17.2. Most of the deaths due to eclampsia occurred in a single centre and this may reflect a management problem there. The other most avoidable element among the deaths was the delayed transfer or admission to hospital of women with prolonged labour.

17.4 Uterine Rupture

During the study, there were 55 cases of uterine rupture; 3 of these women died. Most cases (50) occurred in Indonesia, probably reflecting the poorer socioeconomic and educational levels when compared to Thailand and Malaysia. Twenty-six occurred before the partograph was implemented and 29 afterwards. In 43 cases (78%) the uterus was already ruptured on admission. The majority were referred by another health worker but it is not known whether these women arrived already with a uterine rupture at their health facility.

The mean age of women was 30 years (range 17-45) with a mean parity of 4.0. Seventeen cases (31%) were grand multipara and there were three apparent cases in nullipara. Forty-two women (75%) had had antenatal care and 91% were admitted already in labour. Only 4 cases had definitely had a previous caesarean section though there may have been more where this information was not recorded.

The mean interval from admission to delivery in all cases was 3.2 hours (range 0.5-12). Of the 29 cases which occurred after implementation of the partograph, only one had a partograph completed; the remainder were admitted at 9-10 cm dilatation or were delivered immediately.

Although precise details of the surgical management of each uterine rupture was not available, the majority appear to have been managed by laparotomy with delivery of the fetus and hysterectomy. In only about a quarter of the cases did it appear that the uterus could be conserved. Forty-seven babies (84%) were stillborn (36 were fresh stillbirths). Of the 11 live births, at least one died in the neonatal period. The mean birth weight was 3240 g (range 2200-4300 g). There were 3 maternal deaths (5.4%).

17.4.1 Admitted with uterus ruptured

Among the 43 cases admitted with the uterus already ruptured, the diagnosis was usually made on or shortly after admission but there were frequently delays until laparotomy could be performed. The mean interval from admission to surgery was 2.3 hours but was in some cases 6 hours. All 3 maternal deaths due to uterine rupture occurred among women admitted with the condition. Laparotomy and hysterectomy was virtually universal management and all the babies were stillborn.

Two of the women apparently in this category were confirmed as nullipara.

17.4.2 Uterine rupture after admission

Among the 12 women who suffered uterine rupture after admission, oxytocin was used in 2. In one case, induction was performed with oxytocin alone at 41 weeks gestation for "bad obstetric history". Five hours later, ARM was performed. The baby died during labour and the uterus ruptured after 2 hours at full dilatation. A further case was admitted at 9 cm dilatation and delivered by craniotomy after 9 hours of oxytocin. The uterus was found to be ruptured following the craniotomy.

Ten of these cases were delivered vaginally, though none spontaneously. There were 4 embryotomies, 2 forceps, 2 vacuum extractions and 2 breech deliveries, one being an internal version and breech extraction. In all cases, uterine rupture was recognised either at or shortly after delivery and was doubtless often a direct consequence of the delivery method. Hysterectomy appears to have been the almost universal management.

Four babies were stillborn and there was at least one neonatal death.

17.5 Commentary

The 47 recorded maternal deaths represent a maternal mortality rate of 1.3/1000 in the study population. This cannot be said to be a true measure of the problem because of the selected nature of the women studied. This was not a community study. Even within the hospital, one maternal death occurred in a women admitted with a ruptured uterus while a WHO consultant was present but no record was made of this in that centre's returns; there may have been others. In addition, this study only requested information on intrapartum and postpartum deaths. Many antepartum deaths may not have been reported.

The pattern of causation of the 47 deaths is unusual with a preponderance of eclampsia, but most of the deaths from that cause occurred in a single centre where there may have been a management problem. Most of the direct deaths were probably preventable with early and appropriate use of anticonvulsants, antibiotics, and blood transfusion. However, most women presented with severe and advanced complications after delay in presentation or referral. Once in hospital, the partograph had little role to play in preventing these deaths. It is, however, encouraging that no deaths occurred among all women in the study population presenting at an appropriate stage of labour and who were managed with the use of a partograph. Such management at health centre level may encourage more timely referral.

In a similar way, the partograph could have little influence on the cases of uterine rupture. Most were admitted with the uterus already ruptured. Correct use of a partograph in a peripheral centre should have a major role in preventing such disasters by indicating when referral is indicated (see Chapter 9) although this trial could not address this issue directly.

Most of the cases of uterine rupture which occurred after admission were probably caused by poor management, particularly by inappropriate or unsafe vaginal delivery. The partograph is a tool for first stage management only but may indicate when caesarean section in the first stage is more appropriate than a later traumatic second stage delivery.

Three cases of uterine rupture apparently occurred in nullipara. Details of each case were not always complete but rupture of the primigravid uterus does appear to be a possible hazard in this population.

The partograph was not able to influence the incidence of maternal death or of uterine rupture in this trial but it should be of benefit in the timely referral of women with prolonged labour. Management in a central unit must, then, however, be optimal.

TABLE 17.1

MODE OF DELIVERY AMONG MATERNAL DEATHS
(All centres)

	No.	%
Spontaneous vertex	13	27.7
Operative vaginal	11	23.4
Caesarean section	16	34.0
Laparotomy (ruptured uterus)	3	6.4
Embryotomy	2	4.3
Undelivered	2	4.3

TABLE 17.2

CAUSES OF MATERNAL DEATHS

Direct		
Eclampsia/severe pre-eclampsia	18	(38.3%)
Infection	7	(14.9%)
Pulmonary embolism	4	(8.5%)
Postpartum haemorrhage	3	(6.4%)
Uterine rupture	3	(6.4%)
Amniotic fluid embolism	1	
Placenta praevia (APH/PPH)	1	
Placental abruption	1	
Indirect		
Hepatitis	2	
Myocardial infarction	1	
Haematemesis	1	
"Cardio-pulmonary shock"	1	
Rabies	1	
Breast cancer	1	
Unknown	2	
TOTAL	**47**	**(100%)**

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APPENDIX A:

TABLES FOR THE IMPACT OF PARTOGRAPHY ON INDIVIDUAL CENTRES (see Chapter 4 for details)

CENTRE INFORMATION

Subjects

Centre 1942: Kuala Pilah

Group	Before (%)		After (%)		Total (%)	
Normal	893	(52.3)	1 986	(60.2)	2 879	(57.5)
High risk	277	(16.2)	413	(12.5)	690	(13.8)
Excluded	261	(15.3)	570	(17.3)	831	(16.6)
Induction	276	(16.2)	330	(10.0)	606	(12.1)
TOTAL	1 707	(100.0)	3 299	(100.0)	5 006	(100.0)

Centre 1943: Muar

Group	Before (%)		After (%)		Total (%)	
Normal	2 751	(56.9)	1 235	(55.8)	3 986	(56.6)
High risk	732	(15.1)	407	(18.4)	1 139	(16.2)
Excluded	876	(18.1)	434	(19.6)	1 310	(18.6)
Induction	475	(9.8)	138	(6.2)	613	(8.7)
TOTAL	4 834	(100.0)	2 214	(100.0)	7 048	(100.0)

Centre 1944: Sawanpracharak

Group	Before (%)		After (%)		Total (%)	
Normal	1 733	(65.9)	812	(61.7)	2 545	(64.5)
High risk	352	(13.4)	197	(15.0)	549	(13.9)
Excluded	468	(17.8)	269	(20.4)	737	(18.7)
Induction	76	(2.9)	39	(3.0)	115	(2.9)
TOTAL	2 629	(100.0)	1 317	(100.0)	3 946	(100.0)

Centre 1945: Buddhachinnarag

Group	Before (%)		After (%)		Total (%)	
Normal	1 025	(54.6)	2 210	(58.1)	3 235	(56.9)
High risk	175	(9.3)	527	(13.9)	702	(12.4)
Excluded	531	(28.3)	851	(22.4)	1 382	(24.3)
Induction	147	(7.8)	215	(5.6)	362	(6.4)
TOTAL	1 878	(100.0)	3 803	(100.0)	5 681	(100.0)

Centre 1946: Medan

Group	Before (%)		After (%)		Total (%)	
Normal	799	(53.0)	1 215	(44.9)	2 014	(47.8)
High risk	333	(22.1)	491	(18.1)	824	(19.5)
Excluded	288	(19.1)	832	(30.7)	1 120	(26.6)
Induction	88	(5.8)	169	(6.2)	257	(6.1)
TOTAL	1 508	(100.0)	2 707	(100.0)	4 215	(100.0)

Centre 1947: Palembang

Group	Before (%)		After (%)		Total (%)	
Normal	675	(39.0)	296	(41.0)	971	(39.6)
High risk	506	(29.3)	208	(28.8)	714	(29.1)
Excluded	349	(20.2)	185	(25.6)	534	(21.8)
Induction	199	(11.5)	33	(4.6)	232	(9.5)
TOTAL	1 729	(100.0)	722	(100.0)	2 451	(100.0)

Centre 1948: Tangerang

Group	Before (%)		After (%)		Total (%)	
Normal	518	(42.6)	632	(33.1)	1 150	(36.8)
High risk	268	(22.0)	417	(21.8)	685	(21.9)
Excluded	393	(32.3)	831	(43.5)	1 224	(39.1)
Induction	38	(3.1)	31	(1.6)	69	(2.2)
TOTAL	1 217	(100.0)	1 911	(100.0)	3 128	(100.0)

Centre 1949: RSB Kemuliaan

Group	Before (%)		After (%)		Total (%)	
Normal	1 655	(60.1)	744	(59.2)	2 399	(59.8)
High risk	553	(20.1)	235	(18.7)	788	(19.7)
Excluded	360	(13.1)	187	(14.9)	547	(13.6)
Induction	184	(6.7)	91	(7.2)	275	(6.9)
TOTAL	2 752	(100.0)	1 257	(100.0)	4 009	(100.0)

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1942: Kuala Pilah

	Before (%)		After (%)	
Total women	**1 707**	**(100.0)**	**3 299**	**(100.0)**
Mean VEs	1.44	(2.59)*	1.49	(2.01)*
Mean labour duration	4.01	(4.66)	4.36	(5.12)
Labour >18 hours	32	(1.9)	71	(2.2)
Augmented	274	(16.1)	260	(7.9)
Duration oxytocin	3.94	(3.35)	3.59	(2.88)
PPH (caesarean section)	28	(1.6)	52	(1.6)
PPH (vaginal delivery)	28	(1.6)	27	(0.8)
Puerperal sepsis	23	(1.3)	11	(0.3)
Singletons				
SVD	1 392	(81.5)	2814	(85.3)
Breech	40	(2.3)	69	(2.1)
Ventouse	74	(4.3)	146	(4.4)
Forceps	96	(5.6)	122	(3.7)
Other vaginal	2		3	
Caesarean section	91	(5.4)	122	(3.7)
- elective	19	(1.1)	28	(0.8)
- emergency	72	(4.3)	94	(2.8)
Multiple	9		21	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1943: Muar

	Before (%)		After (%)	
Total women	**4 834**	**(100.0)**	**2 214**	**(100.0)**
Mean VEs	1.38	(1.04)*	1.38	(1.17)*
Mean labour duration	4.49	(5.69)	4.15	(4.98)
Labour >18 hours	134	(2.8)	40	(1.8)
Augmented	534	(11.0)	186	(8.4)
Duration oxytocin	5.17	(3.97)	4.06	(3.77)
PPH (caesarean section)	310	(6.4)	126	(5.7)
PPH (vaginal delivery)	40	(0.8)	16	(0.7)
Puerperal sepsis	2	(0.0)	0	
Singletons				
SVD	3 742	(77.4)	1 717	(77.6)
Breech	109	(2.3)	60	(2.7)
Ventouse	66	(1.4)	44	(2.0)
Forceps	105	(2.2)	23	(1.0)
Other vaginal	2		0	
Caesarean section	765	(15.8)	336	(15.2)
- elective	119	(2.5)	57	(2.6)
- emergency	646	(13.4)	277	(12.5)
Multiple	44		30	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1944: Sawanpracharak

	Before (%)		After (%)	
Total women	**2 629**	**(100.0)**	**1 317**	**(100.0)**
Mean VEs	2.33	(1.46)*	1.62	(1.24)*
Mean labour duration	6.46	(8.07)	6.31	(6.85)
Labour >18 hours	253	(9.6)	90	(6.8)
Augmented	1 583	(60.2)	161	(12.2)
Duration oxytocin	2.08	(2.24)	3.19	(2.54)
PPH (caesarean section)	338	(12.9)	179	(13.6)
PPH (vaginal delivery)	39	(1.5)	21	(1.6)
Puerperal sepsis	15	(0.6)	0	
Singletons				
SVD	1 599	(60.8)	841	(63.9)
Breech	44	(1.7)	16	(1.2)
Ventouse	307	(11.7)	161	(12.2)
Forceps	184	(7.0)	71	(5.4)
Other vaginal	1		0	
Caesarean section	469	(18.3)	222	(16.9)
- elective	168	(6.4)	80	(6.1)
- emergency	313	(11.9)	142	(10.8)
Multiple	24		5	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1945 : Buddhachinnarag

	Before (%)		After (%)	
Total women	**1 878**	**(100.0)**	**3 803**	**(100.0)**
Mean VEs	1.70	(1.39)*	1.55	(1.34)*
Mean labour duration	4.68	(6.21)	5.09	(5.28)
Labour >18 hours	88	(4.7)	121	(3.2)
Augmented	273	(14.5)	236	(6.2)
Duration oxytocin	5.08	(4.32)	5.23	(3.46)
PPH (caesarean section)	125	(6.7)	365	(9.6)
PPH (vaginal delivery)	84	(4.5)	231	(6.1)
Puerperal sepsis	3	(0.2)	10	(0.3)
Singletons				
SVD	1 415	(75.3)	2 885	(75.9)
Breech	29	(1.5)	67	(1.8)
Ventouse	114	(6.1)	285	(7.5)
Forceps	83	(4.4)	89	(2.3)
Other vaginal	1		1	
Caesarean section	216	(11.8)	436	(11.8)
- elective	85	(4.5)	171	(4.5)
- emergency	138	(7.3)	279	(7.3)
Multiple	18		38	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1946: Medan

	Before (%)		After (%)	
Total women	**1 508**	**(100.0)**	**2 707**	**(100.0)**
Mean VEs	2.23	(1.51)*	1.73	(1.43)*
Mean labour duration	7.27	(8.20)	6.00	(6.22)
Labour >18 hours	135	(9.0)	102	(3.8)
Augmented	294	(19.5)	289	(10.7)
Duration oxytocin	5.35	(4.22)	5.20	(3.90)
PPH (caesarean section)	112	(7.4)	150	(5.5)
PPH (vaginal delivery)	18	(1.2)	32	(1.2)
Puerperal sepsis	3	(0.2)	3	(0.1)
Singletons				
SVD	899	(59.6)	1 698	(62.7)
Breech	93	(6.2)	151	(5.6)
Ventouse	229	(15.2)	323	(11.9)
Forceps	5	(0.3)	1	(0.0)
Other vaginal	9		9	
Caesarean section	215	(14.7)	428	(16.1)
- elective	18	(1.2)	49	(1.8)
- emergency	202	(13.4)	385	(14.2)
Multiple	33		68	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1947: Palembang

	Before (%)		After (%)	
Total women	**1 729**	**(100.0)**	**722**	**(100.0)**
Mean VEs	2.11	(1.69)*	1.44	(1.08)*
Mean labour duration	5.61	(7.43)	4.51	(6.06)
Labour >18 hours	71	(4.1)	17	(2.4)
Augmented	198	(11.5)	57	(7.9)
Duration oxytocin	4.52	(3.25)	4.13	(2.08)
PPH (caesarean section)	149	(8.6)	61	(8.4)
PPH (vaginal delivery)	33	(1.9)	18	(2.5)
Puerperal sepsis	24	(1.4)	7	(1.0)
Singletons				
SVD	1 153	(66.7)	468	(64.8)
Breech	93	(5.4)	44	(6.1)
Ventouse	80	(4.6)	22	(3.0)
Forceps	119	(6.9)	74	(10.2)
Other vaginal	36		14	
Caesarean section	188	(11.2)	77	(10.8)
- elective	26	(1.5)	6	(0.8)
- emergency	167	(9.7)	71	(9.8)
Multiple	43		14	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1948: Tangerang

	Before (%)		After (%)	
Total women	**1 217**	**(100.0)**	**1 911**	**(100.0)**
Mean VEs	1.30	(1.03)*	1.15	(1.01)*
Mean labour duration	5.07	(7.29)	3.95	(5.64)
Labour >18 hours	69	(5.7)	42	(2.2)
Augmented	135	(11.1)	171	(8.9)
Duration oxytocin	5.13	(5.22)	3.89	(2.38)
PPH (caesarean section)	31	(2.5)	67	(3.5)
PPH (vaginal delivery)	29	(2.4)	27	(1.4)
Puerperal sepsis	1	(0.1)	3	(0.2)
Singletons				
SVD	866	(71.2)	1 297	(67.9)
Breech	77	(6.3)	134	(7.0)
Ventouse	97	(8.0)	163	(8.5)
Forceps	20	(1.6)	20	(1.0)
Other vaginal	24		23	
Caesarean section	93	(7.8)	214	(11.5)
- elective	3	(0.2)	12	(0.6)
- emergency	90	(7.4)	207	(10.8)
Multiple	37		52	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (MATERNAL)

Group: all women

Centre 1949: RSB Kemuliaan

	Before (%)		After (%)	
Total women	**2 730**	**(100.0)**	**1 254**	**(100.0)**
Mean VEs	1.98	(1.28)*	1.78	(1.28)*
Mean labour duration	8.44	(9.78)	6.87	(8.05)
Labour >18 hours	365	(13.3)	106	(8.4)
Augmented	494	(18.0)	213	(16.9)
Duration oxytocin	5.77	(5.60)	4.64	(3.84)
PPH (caesarean section)	137	(5.0)	34	(2.7)
PPH (vaginal delivery)	209	(7.6)	104	(8.3)
Puerperal sepsis	56	(2.0)	3	(0.2)
Singletons				
SVD	2 120	(77.0)	984	(78.3)
Breech	133	(4.8)	50	(4.0)
Ventouse	203	(7.4)	96	(7.6)
Forceps	11	(0.4)	9	(0.7)
Other vaginal	9		4	
Caesarean section	241	(8.8)	91	(7.3)
- elective	28	(1.0)	28	(2.2)
- emergency	208	(7.6)	64	(5.1)
Multiple	32		19	

* *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1942: Kuala Pilah

	Before		After	
Total babies	**1 715**	**(100%)**	**3 320**	**(100%)**
Stillbirths				
- total	9	(0.6)	1	
- intra-partum	1	(0.1)	1	
- dead on admission	8	(0.5)	0	
Neonatal deaths				
- total	4	(0.2)	1	
- <24 hours	4	(0.2)	1	
- 1-7 days	0		0	
1 min. Apgar*				
- 0-3	3	(0.2)	7	(0.2)
- 4-7	54	(3.2)	110	(3.3)
- 8-10	1 647	(96.7)	3 202	(96.5)
Resuscitation				
- bagging	54	(3.2)	92	(2.8)
- ventilation	18	(1.1)	35	(1.1)
Admitted				
- neonatal special care	97	(5.7)	178	(5.4)
- neonatal intensive care	18	(1.1)	20	(0.6)
Mean birth weight[+] (g)	3 048	(463)[++]	3 077	(441)[++]

* *Apgar missing in 11 cases before and 1 case after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1943: Muar

	Before		After	
Total babies	**4 877**	**(100%)**	**2 243**	**(100%)**
Stillbirths				
- total	60	(1.2)	20	(0.9)
- intra-partum	9	(0.2)	5	(0.2)
- dead on admission	51	(1.0)	15	(0.7)
Neonatal deaths				
- total	12	(0.2)	14	(0.6)
- <24 hours	6	(0.1)	9	(0.4)
- 1-7 days	6	(0.1)	5	(0.2)
1 min. Apgar*				
- 0-3	28	(0.6)	13	(0.6)
- 4-7	206	(4.3)	97	(4.4)
- 8-10	4 580	(95.1)	2 113	(95.1)
Resuscitation				
- bagging	166	(3.4)	61	(2.7)
- ventilation	39	(0.8)	15	(0.7)
Admitted				
- neonatal special care	895	(18.4)	433	(19.3)
- neonatal intensive care	15	(0.3)	10	(0.4)
Mean birth weight[+] (g)	3 149	(502)[++]	3 144	(506)[++]

* *Apgar missing in 63 cases before and 20 cases after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1944: Sawanpracharak

	Before		After	
Total babies	**2 653**	**(100%)**	**1 322**	**(100%)**
Stillbirths				
- total	34	(1.3)	21	(1.6)
- intra-partum	8	(0.3)	4	(0.3)
- dead on admission	26	(1.0)	17	(1.3)
Neonatal deaths				
- total	4	(0.2)	0	
- <24 hours	4	(0.2)	0	
- 1-7 days	0		0	
1 min. Apgar*				
- 0-3	56	(2.1)	19	(1.5)
- 4-7	369	(14.1)	216	(16.6)
- 8-10	2 194	(83.8)	1 065	(81.9)
Resuscitation				
- bagging	156	(5.9)	93	(7.0)
- ventilation	11	(0.4)	6	(0.5)
Admitted				
- neonatal special care	65	(2.5)	26	(2.0)
- neonatal intensive	3	(0.1)	4	(0.3)
Mean birth weight[+] (g)	3 037	(464)[++]	3 079	(476)[++]

* *Apgar missing in 34 cases before and 22 cases after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1945: Buddhachinnarag

	Before		After	
Total babies	**1 896**	**(100%)**	**3 839**	**(100%)**
Stillbirths				
- total	17	(0.9)	26	(0.6)
- intra-partum	5	(0.3)	9	(0.2)
- dead on admission	12	(0.6)	17	(0.4)
Neonatal deaths				
- total	4	(0.2)	8	(0.2)
- <24 hours	0		4	(0.1)
- 1-7 days	4	(0.2)	4	(0.1)
1 min. Apgar*				
- 0-3	21	(1.1)	68	(1.8)
- 4-7	101	(5.4)	283	(7.4)
- 8-10	1 756	(93.5)	3 460	(90.8)
Resuscitation				
- bagging	60	(3.2)	82	(2.1)
- ventilation	23	(1.2)	67	(1.7)
Admitted				
- neonatal special care	144	(7.6)	355	(9.3)
- neonatal intensive care	6	(0.3)	11	(0.3)
Mean birth weight[+] (g)	2 989	(445)[++]	2 987	(450)[++]

* *Apgar missing in 18 cases before and 28 cases after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1946: Medan

	Before		After	
Total babies	**1 540**	**(100%)**	**2 770**	**(100%)**
Stillbirths				
- total	80	(5.8)	143	(5.2)
- intra-partum	11	(0.7)	13	(0.5)
- dead on admission	79	(5.1)	130	(4.7)
Neonatal deaths				
- total	1	(0.1)	5	(0.1)
- <24 hours	1	(0.1)	4	(0.1)
- 1-7 days	0		1	
1 min. Apgar*				
- 0-3	76	(5.3)	76	(2.9)
- 4-7	436	(30.1)	738	(28.1)
- 8-10	935	(64.6)	1 813	(69.0)
Resuscitation				
- bagging	172	(11.3)	324	(11.8)
- ventilation	13	(0.9)	4	(0.1)
Admitted				
- neonatal special care	164	(10.7)	357	(12.9)
- neonatal special care	15	(1.0)	7	(0.3)
Mean birth weight[+] (g)	3 105	(590)[++]	3 140	(545)[++]

* *Apgar missing in 93 cases before and 43 cases after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1947: Palembang

	Before		After	
Total babies	**1 770**	**(100%)**	**736**	**(100%)**
Stillbirths				
- total	145	(8.2)	47	(6.3)
- intra-partum	21	(1.2)	4	(0.5)
- dead on admission	124	(7.0)	43	(5.8)
Neonatal deaths				
- total	35	(2.0)	7	(0.9)
- <24 hours	30	(1.7)	4	(0.5)
- 1-7 days	5	(0.3)	3	(0.4)
1 min. Apgar*				
- 0-3	69	(4.3)	11	(1.6)
- 4-7	222	(13.7)	87	(12.6)
- 8-10	1 332	(82.1)	591	(85.8)
Resuscitation				
- bagging	94	(5.3)	50	(6.8)
- ventilation	44	(2.5)	5	(0.7)
Admitted				
- neonatal special care	60	(3.4)	4	(0.5)
- neonatal intensive care	6	(0.3)	0	
Mean birth weight[+] (g)	2 894	(588)[++]	2 910	(515)[++]

* *Apgar missing in 147 cases before and 47 cases after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1948: Tangerang

	Before		After	
Total babies	**1 250**	**(100%)**	**1 956**	**(100%)**
Stillbirths				
- total	118	(9.4)	148	(7.6)
- intra-partum	29	(2.3)	17	(0.9)
- dead on admission	89	(7.1)	131	(6.7)
Neonatal deaths				
- total	6	(0.5)	12	(0.6)
- <24 hours	6	(0.5)	10	(0.5)
- 1-7 days	0		2	(0.1)
1 min. Apgar*				
- 0-3	31	(2.7)	62	(3.4)
- 4-7	177	(15.7)	306	(16.9)
- 8-10	920	(81.6)	1 439	(79.6)
Resuscitation				
- bagging	53	(4.3)	99	(5.1)
- ventilation	6	(0.5)	17	(0.9)
Admitted				
- neonatal special care	4	(0.3)	17	(0.9)
- neonatal intensive care	0		3	(0.2)
Mean birth weight[+] (g)	3 048	(571)[++]	3 056	(569)[++]

* *Apgar missing in 122 cases before and 149 cases after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

IMPACT OF PARTOGRAPHY (FETAL)

Group: all women

Centre 1949: RSB Kemuliaan

	Before		After	
Total babies	**2 782**	**(100%)**	**1 275**	**(100%)**
Stillbirths				
- total	43	(1.5)	7	(0.5)
- intra-partum	9	(0.3)	3	(0.2)
- dead on admission	34	(1.2)	4	(0.3)
Neonatal deaths				
- total	23	(0.8)	3	(0.2)
- <24 hours	15	(0.5)	3	(0.2)
- 1-7 days	8	(0.3)	0	
1 min. Apgar*				
- 0-3	28	(1.0)	11	(0.9)
- 4-7	338	(12.3)	143	(11.3)
- 8-10	2 371	(86.6)	1 112	(87.8)
Resuscitation				
- bagging	129	(4.7)	52	(4.1)
- ventilation	75	(2.7)	24	(1.9)
Admitted				
- neonatal special care	545	(19.6)	256	(20.1)
- neonatal intensive care	24	(0.9)	3	(0.2)
Mean birth weight[+] (g)	3 076	(505)[++]	3 109	(471)[++]

* *Apgar missing in 45 cases before and 9 cases after implementation.*
[+] *Singletons only.*
[++] *Standard deviation.*

STUDY FORMS

WORLD HEALTH ORGANIZATION

PROJECT 89909 — APPLICATION OF THE WHO PARTHOGRAPH IN THE MANAGEMENT OF THE LABOUR

Form code: A D M | Centre number | Patient's hospital number

ADM
Page 1

MOTHER

1. Date of admission to labour ward — day | month | year
2. Time of admission to labour ward (00:00 - 24:00) — :
3. Age — years
4. Current marital status
   1 = Married
   2 = Stable union, not married
   3 = Single
   4 = Other, specify .....
5. Highest educational level achieved
   0 = Never attended school
   1 = Less than primary
   2 = Primary
   3 = Junior secondary
   4 = Full secondary
   5 = Vocational/technical
   6 = University or higher
   9 = Unknown
   a) Patient
   b) Husband/partner
6. Occupation (to be coded by centre)
   a) Patient .....
   b) Husband/Partner .....
7. Height — cm
8. Weight — kg
9. Gravidity (including current pregnancy)
10. Parity (excluding current delivery)

ANTENATAL CARE

11. Duration of amenorrhoea (in completed weeks) — weeks
12. Has patient had minimum of two antenatal visits to a health centre?
    1 = No 2 = Yes
13. a) Has patient been referred since the beginning of labour?
    1 = No 2 = Yes

    IF 'YES'

    b) Source of referral
    1 = Self referred
    2 = TBA at patient's home
    3 = Midwife at patient's home
    4 = Maternity home
    5 = Health centre
    6 = Hospital

    c) Reason for referral
    .....

14. a) Any maternal complications during antenatal period
    1 = No 2 = Yes

    IF 'YES'

    b) Anaemia
    c) Pregnancy hypertension
    d) Eclampsia
    e) Hepatitis
    f) Diabetes
    g) Ante-partum haemorrhage
    h) Other, specify
    .....

LABOUR AT ADMISSION

15. Type of labour
    1 = Spontaneous
    2 = Induced
    3 = Not in labour
16. a) Abdominal examination performed
    1 = No 2 = Yes

    IF 'NO'

    b) Reason .....

    GO TO QUESTION 17

    IF 'YES'

    c) Presentation
    1 = Cephalic 2 = Breech
    3 = Other, specify .....

    d) IF 'CEPHALIC', descent of head (in fifths)
17. 'Show' reported by patient
    1 = No 2 = Yes
18. a) Number of contractions in 10 minutes

    b) Duration in seconds
19. Fetal heart rate in beats per minute
    (If irregular code 888,
    no fetal heart code 000)
20. a) Vaginal examination performed?
    1 = No 2 = Yes

    IF 'NO'

    b) Reason .....

    GO TO QUESTION 22

    IF 'YES'

    c) Date of first vaginal examination — day | month

    d) Time of first vaginal examination (00:00 - 24:00) — :

    e) Cervical effacement
    1 = No effacement 3 = 2/3 effaced
    2 = 1/3 effaced 4 = fully effaced

    f) Cervical dilatation — cm

WORLD HEALTH ORGANIZATION

PROJECT 89909 — APPLICATION OF THE WHO PARTHOGRAPH IN THE MANAGEMENT OF THE LABOUR

Form code: A D M

Centre number: ____

Patient's hospital number: ____

ADM
Page 2

g) Presentation
1 = Vertex - occipito anterior
2 = Vertex - occipito posterior
3 = Vertex - occipito lateral
4 = Face
5 = Brow
6 = Complete breech (flexed)
7 = Frank breech (extended)
8 = Shoulder, compound

IF 'VERTEX' PRESENTATION

h) Moulding
0 = None 2 = ++
1 = + 3 = +++

21. a) Membranes on first vaginal examination
1 = intact 2 = already ruptured

IF MEMBRANES INTACT, GO TO QUESTION 22

b) Approximate time of rupture (00:00 - 24:00) __ : __

c) Colour of liquor
1 = Clear
2 = Not clear
3 = None seen

IF 'NOT CLEAR'
(1 = No 2 = Yes)

1) Yellow

2) Meconium stained

3) Blood stained

PROGRESS OF LABOUR (FIRST AND SECOND STAGES)

22. Total number of vaginal examinations in first stage of labour

IF MEMBRANES RUPTURED PRIOR TO ADMISSION, GO TO QUESTION 24

23. Rupture of membranes

a) Time of rupture (00:00 - 24:00) __ : __

b) Type of rupture
1 = Spontaneous 2 = Artificial

c) Colour of liquor
1 = Clear
2 = Not clear
3 = None seen

IF 'NOT CLEAR'
(1 = No 2 = Yes)

1) Yellow

2) Meconium stained

3) Blood stained

24. a) Any oxytocin used in first or second stages of labor

1 = None in first or second stages of labour
2 = Yes, during first and/or second stages only
3 = Yes, for induction

IF NO OXYTOCIN USED

b) Reason
1 = Adequate progress of labour
2 = Labour managed conservatively
3 = Malpresentation
4 = Major cephalo-pelvic disproportion
5 = Other reason, specify

..... ___ . _

GO TO QUESTION 25

IF 'YES'

	day	month
c) Date oxytocin started		

d) Time oxytocin started (00:00 - 24:00) __ : __

e) Cervical dilatation at start of oxytocin ____ cm

f) Number of units of oxytocin per 500 ml

g) Maximum infusion rate achieved (drops/minute)

h) Duration of oxytocin infusion

1) Prior to labour (hh:mm) __ : __

2) In first stage (hh:mm) __ : __

3) In second stage (hh:mm) __ : __

i) Maximum contractions achieved

1) Number in 10 minutes

2) Duration in seconds

j) Was oxytocin withdrawn
1 = No 2 = Yes

IF 'NO', GO TO QUESTION 25

k) Time oxytocin withdrawn (00:00 - 24:00) __ : __

l) Reason for withdrawal

..... ___ . _

m) Cervical dilatation when oxytocin was withdrawn ____ cm

25. Fetal monitoring
1 = Auscultation only
2 = Doppler with or without auscultation
3 = Electronic fetal monitoring

26. Time of full cervical dilatation (00:00 - 24:00) __ : __

27. Any pain relief given during labour
1 = No 2 = Yes

IF 'YES'

a) Pethidine

b) Pethidine and phenergan

c) Nitrous oxide/oxygen

d) Epidural

e) Other, specify .....

WORLD HEALTH ORGANIZATION

PROJECT 89909 — APPLICATION OF THE WHO PARTHOGRAPH IN THE MANAGEMENT OF THE LABOUR

Form code: A D M | Centre number | Patient's hospital number

ADM Page 3

DELIVERY

28. Total number of infants

29. Date of delivery — FIRST: day / month; SECOND: day / month

30. Time of delivery (00:00 - 24:00)

31. Presentation
1 = Vertex - occipito anterior
2 = Vertex - occipito posterior
3 = Vertex - occipito lateral
4 = Face
5 = Brow
6 = Complete breech (flexed)
7 = Frank breech (extended)
8 = Shoulder, compound

32. Episiotomy performed
1 = No 2 = Yes

33. Type of delivery
1 = Spontaneous
2 = Assisted (Complete Question 34)
3 = Caesarean section (Complete Question 35)
4 = Laparotomy for ruptured uterus (GO TO Q 36)

34. Type of assistance
(1 = No 2 = Yes)

a) Manual rotation
b) Vacuum
c) Forceps
d) Assisted breech
e) Breech extraction
f) Internal version and extraction
g) Other, specify .....

GO TO QUESTION 36

IF 'CAESAREAN SECTION'

35. a) Type of Caesarean section
1 = Emergency
2 = Elective

b) Indication for Caesarean section
1 = Fetal distress
2 = Failure to progress, specify
3 = Breech
4 = Other malpresentation, specify
5 = Other reasons, specify

c) If 2, 4 or 5 give details

.....

.....

d) Stage of labour when Caesarean section performed (Code 0 if not in labour)

THIRD STAGE OF LABOUR

36. Date of delivery of placenta — day / month

37. Time of delivery of placenta (00:00 - 24:00)

38. Method of delivery
1 = Controlled cord traction
2 = Maternal effort
3 = Fundal pressure
4 = Manual removal
5 = Other, specify .....

39. Estimated total blood loss ml

40. a) Any oxytocic given before delivery of placenta
1 = No 2 = Yes

IF 'YES', type of oxytocic
(1 = No 2 = Yes)

b) Ergometrine i.m.
c) Ergometrine i.v.
d) Methergin
e) Syntometrine
f) Oxytocin i.m.
g) Oxytocin infusion
h) Other, specify

.....

i) If ergometrine and oxytocin both used, give reason

.....

41. a) Any oxytocic given after delivery of placenta
1 = No 2 = Yes

IF 'YES', type of oxytocic
(1 = No 2 = Yes)

b) Ergometrine i.m.
c) Ergometrine i.v.
d) Methergin
e) Syntometrine
f) Oxytocin i.m.
g) Oxytocin infusion
h) Other, specify

.....

i) If ergometrine and oxytocin both used, give reason

.....

PRINCIPAL INVESTIGATOR

Signature ..... Date .....

WORLD HEALTH ORGANIZATION

PROJECT 89909 — APPLICATION OF THE WHO PARTHOGRAPH IN THE MANAGEMENT OF THE LABOUR

Form code: A D M | Centre number | Patient's hospital number

ADM Page 4

NEONATE

	FIRST	SECOND
42. Neonatal outcome 1 = Live birth 2 = Fresh stillbirth 3 = Macerated stillbirth		
IF 'LIVE BIRTH'		
43. a) 1 min Apgar score		
b) 5 min Apgar score		
c) 10 min Apgar score		
44. Birth weight gm		
45. a) Any assisted ventilation required 1 = No 2 = Yes		
IF 'YES'		
b) Type of ventilation 1 = Bagging 2 = Intubation 3 = Other, specify		
c) Reason for assisted ventilation		
.....		
.....		
46. a) Admitted to neonatal special care unit 1 = No 2 = Yes		
b) If yes, reason		
.....		
.....		
47. a) Admitted to neonatal intensive care unit 1 = No 2 = Yes		
b) If yes, reason		
.....		
.....		

DISCHARGE FROM HOSPITAL

48. Date of discharge — day | month

49. Time of discharge (00:00 - 24:00) : :

50. If hospital stay more than 24 hours, reason for delayed discharge

.....

MATERNAL COMPLICATIONS

51. a) Any maternal complications during or following labour
1 = No 2 = Yes

IF 'YES'

b) Third degree perineal tear

c) Uterine rupture

d) Obstructed labour

e) Postpartum haemorrhage

f) Retained placenta

g) Inversion of uterus

h) Eclampsia

i) Puerperal sepsis

j) Other infection, specify

.....

k) Other complication, specify

.....

INTERVENTIONS

52. a) Any blood transfusion given
1 = No 2 = Yes

IF 'YES'

b) Number of units blood given

c) Reason

.....

53. a) Any antibiotic given
1 = No 2 = Yes

b) Reason .....

54. a) Any other intervention
1 = No 2 = Yes

b) Specify .....

55. a) Maternal death
1 = No 2 = Yes

IF 'YES', cause of death

b) .....

c) .....

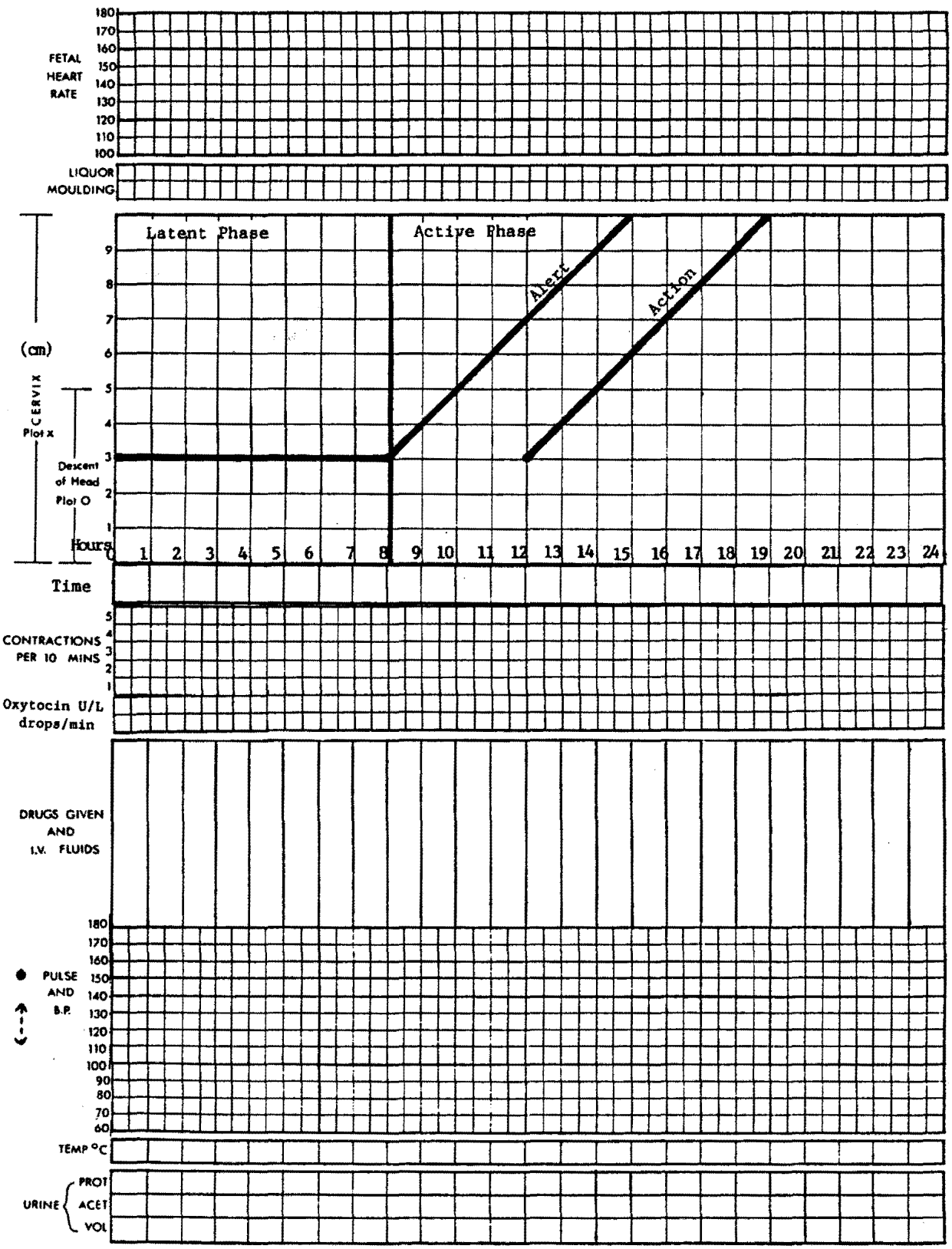
d) Date of death — day | month | year

PROJECT 89909: APPLICATION OF THE WHO PARTOGRAPH IN THE MANAGEMENT OF LABOUR

Centre number | Patient's hospital number | Date of admission (day / month / year)

PAR

At start of Partograph: Time (00:01-24:00) [ ][ ] : [ ][ ] Cervical dilatation (cm) [ ]



WORLD HEALTH ORGANIZATION

PROJECT 89909
APPLICATION OF THE WHO PARTOGRAPH IN THE MANAGEMENT OF LABOUR WITHIN THE SAFE MOTHERHOOD INITIATIVE
LABOUR WARD LOG
TO BE USED AFTER INTRODUCTION OF PARTOGRAPH

APL

Centre number ☐☐☐☐

Principal Investigator ____________________

Log sequence number ☐☐☐

Date of despatch ___/___/___

Patient's Hospital Number	Patient's name	Date of admission	Forms completed 1 = No 2 = Yes ADM	PAR	PTG	If PAR or PTG not completed, reason 1 = 9 or 10 cm dilatation 2 = Immediate emergency CS 3 = Elective CS	REMARKS
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PROJECT 89909: APPLICATION OF THE WHO PARTOGRAPH IN THE MANAGEMENT OF LABOUR

Centre number | Patient's hospital number | Date of admission (day / month / year)

PTG

VAGINAL EXAMINATIONS

IN LATENT PHASE

1. a) Were vaginal examinations performed more frequently than every 4 hours in the LATENT PHASE?
   1 = No 2 = Yes
   3 = Did not come in latent phase

   b) IF 'YES', Reason .....

IN ACTIVE PHASE

2. a) Were vaginal examinations performed more frequently than every 4 hours ON OR TO LEFT OF ALERT LINE?
   1 = No 2 = Yes
   3 = Not applicable

   b) IF 'YES', Reason .....

3. a) Were vaginal examinations performed more frequently than every 4 hours BETWEEN ALERT AND ACTION LINES?
   1 = No 2 = Yes
   3 = Not applicable

   b) IF 'YES', Reason .....

4. a) Were vaginal examinations performed more frequently than every 4 hours BEYOND ACTION LINE?
   1 = No 2 = Yes
   3 = Not applicable

OXYTOCIN INFUSION

5. Was oxytocin started in latent and/or active phase?
   1 = No
   2 = Yes, in latent phase
   3 = Yes, in active phase on or to left of alert line
   4 = Yes, in active phase between alert and action lines
   5 = Yes, at action line
   6 = Yes, beyond action line

   IF 'NO', GO TO QUESTION 8

6. Reason for starting oxytocin
   1 = No 2 = Yes

   a) Diabetes

   b) Pre-eclampsia

   c) Post-maturity

   d) Meconium stained fluid

   e) Primary uterine inertia

   f) Secondary uterine inertia

   g) Prolonged latent phase (over 8 hrs)

7. At start of oxytocin infusion:

   a) Number of contractions in 10 mins

   b) Duration of contractions secs

   c) Descent of head (in fifths)

   d) State of membranes
      1 = already ruptured
      2 = artificially ruptured
      3 = left intact

PROGRESS OF LABOUR

	Cervical dilatation (cm)	Descent of head (fifths)
8. a) At time of artificial or spontaneous RUPTURE OF MEMBRANES in labour ward		
b) At first vaginal examination at or beyond ACTION LINE		
c) At CAESAREAN SECTION		

CATEGORIZATION OF DELIVERY

9. a) Delivery
   1 = in latent phase
   2 = after prolonged latent phase (over 8 hrs)
   3 = on or to left of alert line
   4 = between alert and action lines
   5 = at action line
   6 = beyond action line

   b) If delivery occured beyond action line, number of hours beyond hrs

PROTOCOL

10. Was there any deviation from the protocol?

    a) In latent phase
       1 = No 2 = Yes

    b) IF 'YES', reason

       .....

       .....

    c) In active phase
       1 = No 2 = Yes

    d) IF 'YES', reason

       .....

       .....

WHO USE ONLY