Chapter 1

INTRODUCTION

1. Background

The Maternal death rate is still very high in developing countries. In the world in 1990 an estimated 585,000 women, 99% from developing countries, died from causes related to pregnancy and childbirth. In too many countries, maternal mortality is a leading cause of death for women of reproductive age.\(^{(1)}\) Most maternal and neonatal deaths are preventable (World Health Organization [WHO]/ UNICEF 1996), with 60–80 percent due to five direct causes: hemorrhage (25 percent of all maternal deaths), sepsis (15 percent), hypertensive disorders of pregnancy/eclampsia (12 percent), obstructed labor (8 percent), unsafe abortion (13 percent) (WHO 1994b). Many of the 4.3 million newborn deaths each year also are preventable, particularly those caused by birth asphyxia (21 percent of all neonatal deaths), pneumonia (19 percent), tetanus (14 percent), birth trauma (11 percent), sepsis (7 percent) and diarrhea (2 percent) (WHO 1994b). It is estimated that some 53 percent of maternal deaths and 38 percent of newborn deaths could be averted through a small number of relatively low technology interventions. \(^{(2)}\)

The Maternal mortality ratio (MMR), the number of maternal deaths per 100,000 live births, varies widely. An average of 450 women die for every 100,000 live births in developing countries, whereas only 10 women die out of the same number of live births in developed
countries. As in other developing countries, maternal mortality is the leading cause of death among women of reproductive age in Indonesia. *(3)*

Maternal mortality and morbidity are major health problems in Indonesia. Studies vary on the maternal mortality ratio (MMR) for Indonesia, from 450 per 100,000 live births (or about 20,000 deaths per year) in the National Household Health Survey known as *Survei Kesehatan Rumah Tangga* (SKRT) in seven provinces (1985); to 404/100,000 live births in the SKRT in 27 provinces (1992); and 384/100,000 live births as per SKRT 1995, and 390/100,000 live births in the Indonesia Demographic and Health Survey (IDHS) 1994.*(4)* The surveys show that in a 10-year period, there has been only a small change in maternal mortality ratios (MMR). There is wide variation in the MMR among provinces, from 130 to 750 per 100,000 live births. This figure is three to six times the MMR in other ASEAN (Association of Southeast Asian Nations) countries, and 60 times that in developed countries. The Government of Indonesia has targeted a decrease in the maternal mortality ratio (MMR) from 450 per 100,000 live births in 1995 to 225 per 100,000 live births by the year 2000, and to 125 by the year 2010 as a part of the Safe Motherhood Initiative (SMI). *(5)*

There was a sharp decline in Indonesia’s infant mortality rate from 142 infant deaths per 100,000 live births in 1968 to 57 per 100,000 in 1992. The total fertility rate also has declined steadily since the early 1970s. The 1994 level of 2.85 children per woman of childbearing age is about half the 1971 rate of 5.61. Fertility has declined in all age groups in Indonesia. The pattern of age-specific fertility is the same as in the past, except that the peak in fertility has shifted from age 20–24 to age 25–29. The contraceptive prevalence rate (CPR) has been rising steadily since the 1980s. The CPR attributed to modern contraceptive methods was 48 percent in 1991.
and rose to 52 percent in 1994 (Central Bureau of Statistics [Indonesia] 1995).

1.1 Complications leading to maternal morbidity and death

An estimated 75% of maternal deaths result from direct obstetric causes (WHO, 1985). Over 90 percent of maternal deaths are directly caused by various obstetric problems: hemorrhage (42 percent), preeclampsia/eclampsia (13 percent), unsafe abortion (11 percent), infection/sepsis (10 percent) and prolonged labor (9 percent). It is estimated that 80-98% of pregnancy related death are preventable.

Sarimawar and Agus, (1997) found the rates of prolonged labor in West Java, Central Java, Maluku, East Nusa Tenggara and Irian Jaya were quite high, from 6.2% to 17.2%. Similar studies in other South-East Asia countries have found the incidence of prolonged labor to range from 5.8% to 13.5%. Many cases of prolonged labor have been found to be due to a narrow or disproportionate pelvis. Many factors, such as genetic, physical, environmental and nutritional influence the growth of women. Malnutrition and diseases such as malaria, diarrhea and measles can delay pelvic growth and, as a result, prevent pelvis from growing properly. Prolonged labor due to narrow pelvis can cause hemorrhage and rupture of the uterus. The most frequently occurring maternal morbidity symptoms during purpureum were low abdominal, hip and waist pain, and bad-smelling discharge, which might indicate postpartum infections. Infectious agents could enter the reproductive tract many ways, including unclean hands of the birth attendant or the use of unsterilized equipment. Infections could also come from airborne organisms, or from the anus. Putting herbs, leaves or oil in or around the vagina may also cause infections.
In rural areas of Indonesia, births are often not reported, and many maternal deaths may also go unrecorded, making it difficult to derive accurate estimates of maternal mortality either from communities or hospitals. Using hospital information might lead to a non-representative sample or selection bias, while inaccurate information may be obtained from a community. To differentiate death from childbearing causes or from other causes can be difficult. Furthermore, it depends upon community perceptions and the socio-cultural background whether everything is reported truly. For example, death from abortion may go under-reported or falsely reported because it is illegal and religiously a sin.\(^{(11)}\)

1.2 Risk factors for maternal mortality in labor

Antenatal care in Indonesia is showing a promising pattern. Based on the WHO Country Progress Report 2001, 92.7% of pregnant women received antenatal care and 70% received antenatal care at least four times.\(^{(5)}\) However, antenatal care can only detect morbidity during pregnancy; it could not detect obstetric complications that occur during delivery. Rosenfield and Maine (1985) conclude that antenatal screening has only a small and insignificant contribution to preventing bleeding and prolonged obstructed labor, which are the major causes of maternal mortality. Obstetrical complications can occur during delivery and cause maternal death. Which are 90% unpredictable and sudden in onset.\(^{(12)}\) Although a majority of pregnant women receive antenatal care from health providers, many women still rely on midwives for their home deliveries. This condition creates a double risk for women: the risk of obstetric complications that are difficult to predict, and the risk of death because of inadequate treatment of these complications.\(^{(13,14)}\) Approximately 60 percent of
pregnant women suffer from anemia. In 1995, 80 percent of births occurred at home, and 60 percent of births were delivered by traditional birth attendants or family members (Central Bureau of Statistics (Indonesia) 1995)\(^{(4)}\)

One study that involved 12 teaching hospitals in Indonesia (1977-1980) revealed that the average MMR was 390 maternal deaths per 100,000 live births. The highest rate came from Dr. Pirngadi hospital, Medan, 1164 per 100,000 live births. Of the 108 women for whose deaths detailed information was given, in this study, 92% were admitted as emergency cases; 37% were moribund, 18% had a ruptured uterus, 28% had various degrees of bleeding, 30% experienced prolonged labor, 35% were in shock, coma or convulsion, and 40% died on the day of admission. It can be concluded that they came too late to the hospital. \(^{(15)}\)

Three delayed factors contributing to maternal death are the :

1. Late detection of complications of pregnancy and delivery;
2. Delay in referring the patient to the hospital; and
3. Delay in adequate treatment and management in the hospital.

According to WHO, much of the unnecessary suffering and loss of life as described above can be prevented by using an inexpensive, simple chart called a partograph. WHO carried out a 15 month long study published in the current issue of more than 35,000 women delivering in eight hospitals in Indonesia, Thailand and Malaysia. The research was focused on improving labor management and reducing maternal and fetal morbidity. It showed that the partograph successfully distinguished labors requiring intervention from those that did not, permitting appropriate management, and reducing unnecessary interventions and complications of labor. Introduced into each
hospital, part way through the study so that results "before and after" could be compared, the partograph showed that the number of prolonged labors was halved, the rate of postpartum infection (sepsis) was cut by over half and the number of stillbirths fell by almost half, from 5 to 3 per thousand babies. In addition, the number of unnecessary interventions was reduced, fewer drugs were needed, and caesarean sections carried out on women without complications were avoided, with no adverse impact on the condition of the fetus. 

(17,18)

1.3 Health care system and strategy on maternal health in Indonesia

Concerning the seriousness of maternal health problem, Indonesia initiated a Safe Motherhood Initiative (SMI) in June 1988. To address the strong Indonesian preference for home delivery, and given the low availability of hospitals and usually large distance between the people in rural areas and the nearest hospital, the government trained and posted 38,000 midwives to thousands of villages from 1989-1999. By the year 2000 each village in Indonesia will have access to at least one trained midwife (19). Even around Medan city, North Sumatera it is estimated that 70% of deliveries are conducted by midwives at the birthing home.

The modern midwives (MW) initially acquire their skills and knowledge from 3 years of study in a school of nursing followed by 1 more year in a school of midwifery. During there learning, apart from studying midwifery, they also obtain training in counseling pregnant women and conducting prenatal, delivery, post natal and neonatal care; increasing their awareness and understanding of abnormal delivery and thinking of solutions; and community health education. The midwives
then usually work birthing homes near their own residences. If they encounter women with complications of pregnancy or delivery, they refer them to the nearest hospital.\textsuperscript{(20-22)}

The theory behind placing midwives is to decrease the problems of access to safe birth. It is known that the physical distance between people and medical care in developing countries is a problem that takes a substantial amount of time, money and political will to solve. Beyond distance, there are other substantial barriers - for instance, the process of obtaining medical care by women with obstetric complications should begin early detection, which requires access to information about and understanding of early signs and symptoms that can help the women and her family to get timely treatment.\textsuperscript{(23)}

2. Statement of the problem

Prolonged and/or obstructed labor account for about 8% of direct maternal deaths in developing countries. This is most likely to occur if a woman’s pelvis is not large enough for her baby’s head to pass through or if a woman’s uterus does not contract sufficiently. If her labor does not progress normally, the woman may experience serious complications such as prolonged labor or obstructed labor. If a woman with prolonged and/or obstructed labor does not receive timely and effective management, she may die from rupture of the uterus or infection/ sepsis. Maternal morbidity increases; dehydration and ketoacidosis cause alterations in cellular chemistry which lead to hypotonia and potential postpartum hemorrhage. Furthermore, obstructed labor may lead to severe disabilities such as obstetric fistulae.\textsuperscript{(9,24,25)} Many women, more than a million in Africa alone, according to some estimates, survive obstructed and prolonged labor
only to suffer obstetric fistulae. A condition causing incontinence which often leads to a woman's rejection by her partner, family and society, leaving her destitute and ashamed. In the infant, prolonged/obstructed labor may cause asphyxia, brain damage, infection and/or death. Fetal deaths are common if prompt treatment for obstructed labor is not undertaken. The baby usually dies if obstructed labor is not dealt with promptly and if it lives, it is likely to suffer asphyxia with the risk of brain damage and developmental difficulties in later life.\textsuperscript{(3,14)}

Despite the fact that the partograph has been described and available since the early 1970s, it is still not used worldwide. One primary reason for this is a lack of conviction about its usefulness by some decision-makers and leaders in health care. Another main obstacle to widespread use is the existence of so many varieties of the partograph; the potential new user is at loss as to which set of conflicting guidelines to follow.\textsuperscript{(26)}

During home delivery almost all midwives did not use the partograph for monitoring the progress of labor and also there is not complete delivery recording for every woman who delivers the baby. Although the midwives around Medan city had been trained using the partograph, during practically none of them used it regularly with complaining many details to complete it.\textsuperscript{(27)} They help the mothers to deliver her baby based on their experience that they have got as long as their job. Therefore, they did not know how many women that undergone delivery complications were referred to the hospital in late condition threatening the women’s life. With this setting we proposed that a refresher course for the midwife on WHO partograph use, which followed by advocacy and supervision by an obstetrician, would reduce delayed referral and its complications.
3. Literature review

3.1 Progress of labor

The progress and final outcome of labor are influenced by 5 “P-factors” (1) the passage (the bony and soft tissues of maternal pelvis), (2) the powers (the contractions or forces of the uterus), (3) the passenger (the fetus), (4) the psyche, and (5) the provider. Abnormalities in any these components, singly or in combination, may result in dystocia. \(^{(7,8,28)}\)

Labor is a dynamic process characterized by uterine contractions that increase in regularity, intensity and duration to cause progressive effacement and dilatation of the cervix and permit descent of the fetus through the birth canal. \(^{(29)}\) Estimated cervical dilatation and descent of the fetal presenting part have been used to evaluate the progress of labor. When a decision is made to intervene, it must be made carefully, because each intervention carries not only potential benefits but also potential risk. The best management in the majority of the cases is close observation, and when necessary, cautious intervention \(^{(30)}\).

3.2 Normal progress of labor

Labor is a sequence of uterine contractions that result in effacement and dilatation of the cervix and voluntary bearing down efforts leading to the expulsion through the birth canal of the product(s) of conception. Normal labor is a continuous process which has been divided into three stages for the purpose of study. The first stage of labor is the interval between the onset of labor and full cervical
dilatation. The second stage is the interval between full cervical
dilation and delivery of the infant. The third stage of labor is the
period between the delivery of the infant and delivery of the
placenta \((8,28)\).

The greatest impediment to understanding normal labor is recognizing
the onset of labor. The strict definition of labor is the sequence of
uterine contraction that results in effacement and dilatation of the
cervix. This does not easily aid the clinician in determining when
labor has actually begun, because this diagnosis is confirmed only
after the event. Several options may be used to deal with this
dilemma. One is for the woman to quantify her contractions for some
specified period, and define labor onset as the clock time when
painful contractions become regular. This is very subjective and
frequently causes considerable frustration for both obstetrician and
patient. The best option may be to define labor onset based on the
time of admission to the labor unit accompanied by regular uterine
contraction and any progress of effacement and cervical dilatation
\((8,31)\).

### 3.2.1 First stage of labor

Assuming that the diagnosis of labor has been confirmed, then what
are the expectations for progress of normal labor? Historically, this
was usually described by simple elapsed time, with the realization
that normal labor could be diagnosed only after the fact. A
scientific approach was begun by Friedman (1954), who described a
characteristic sigmoid pattern for labor. This graphic approach,
based on statistical observations, eventually resulted in changes in
labor management. As shown in Figure 1, Friedman developed the
concept of labor into a latent phase and an active phase. The latent
phase reflects the preparatory division and the active phase the dilatational division. Friedman further subdivided the active phase into the acceleration phase, the phase of maximum slope, and the deceleration phase \((8, 28)\).

**LATENT PHASE.** The onset of latent labor is defined according to Friedman (1972) as the point at which the mother perceives regular contractions. During this phase, orientation of uterine contractions, changes take place in the connective tissue component of the cervix, resulting in cervical softening and effacement. The latent phase of labor begins with the onset of regular uterine contractions and extends to the beginning of the active phase of cervical dilatation. Its mean duration was 8.6 hours \((8, 28)\).

**ACTIVE PHASE.** The curves by Friedman and others reveal a rapid change in the slope of cervical dilatation between 3 and 4 cm. That is the active phase of labor, in terms of most rapid rates of cervical dilatation, which consistently begins when the cervix is 3 to 4 cm dilated. Thus cervical dilatation of 3 to 4 cm or more, in the presence of uterine contractions, can be taken to reliably represent the threshold for the active phase of labor. According to Friedman, the mean duration of active phase in nullipara was 4.9 hours with standard deviation of 3.4 hours. Rates of cervical dilatation ranged from 1.2 to 6.8 cm/hour. Thus the rate of dilatation considered normal for active phase in nullipara is 1.2 cm/hour and for multipara 1.5 cm/hour, this is the minimum normal rate. According to the WHO partograph, the cervical dilatation rate is 1 cm/hour in the active phase. Hendricks and co-workers (1970) reported that cervical dilatation rates were similar for nullipara and multipara after 4 cm dilatation \((8, 32, 33)\).
3.2.2 Second stage of labor

This stage begins when cervical dilatation is complete and ends with fetal expulsion. At the beginning of the second stage of labor the mother usually feels a desire to bear down with each contraction. The second stage generally takes from 30 minutes to 3 hours in primigravid women and from 5 - 30 minutes in multigravid women. The median duration is 50 minutes in primipara and 20 minutes in multipara. These times may vary depending on the pushing efforts of the mother, the cephalopelvic disproportion appearance, the quality of uterine contractions and the type of analgesia \(^{(8,28)}\).

3.2.3 Duration of labor

Kilpatrick and Laros (1989) reported that the mean length of the first and second stages of labor together was approximately 9 hours in nullipara women without regional analgesia, and that the 95\(^{th}\) percentile upper limit was 18.5 hours. Corresponding times for multipara women were a mean of about 6 hours with a 95\(^{th}\) percentile of 13.5 hours. They defined labor onset as the time when the woman felt
regular painful contractions every 3 to 5 minutes leading to cervical change.

Labor and delivery times did not follow a normal distribution, indicating that use of parametric statistics (means) might falsely lengthen the perception of labor duration. Parity (nullipara versus multipara) and cervical dilatation at admission were significant determinants of the length of spontaneous labor \(^{(8,28)}\).

### 3.3 Abnormal progress of labor

Abnormal progress of labor represents a dystocia, which literally means difficult labor, characterized by abnormally slow progress. It may be associated with various abnormalities that occur or deviate from the normal course of labor. These abnormalities are classified into 3 general categories:

1. Abnormalities of the powers (uterine contractility and maternal expulsive effort);
2. Abnormalities involving the passenger (the fetus); and
3. Abnormalities of the passage (the pelvis).

The abnormalities are often interrelated; e.g. a contracted pelvis may increase the likelihood of fetal mal-presentation. Fetal mal-presentation or large fetal size may be related to ineffective uterine contractions.\(^{(8,34)}\)

The overall incidence of dystocia in women in labor is difficult to determine, perhaps because of unclear generally applied definitions. The diagnosis of dystocia in vertex presentation is often retrospective.\(^{(7,34)}\) Dystocia reflects an abnormal pattern in the first stage of labor, which are classified into 3 general categories:
a prolonged latent phase, protraction disorders, and arrest disorders.\(^{(8,29)}\)

### 3.3.1 Prolonged latent phase

Factors that affect duration of the latent phase include excessive sedation or conduction analgesia, labor beginning with an unfavorable cervix, uterine dysfunction, ineffective uterine contractions, fetopelvic disproportion and false labor. Friedman and Sachtleben (1963) defined a prolonged latent phase to be greater than 20 hours in the nullipara woman and 14 hours in the multipara, counted from when the woman feels regular uterine contractions. According to the WHO partograph, a prolonged latent phase is “cervix not dilated beyond 4 cm after 8 hours from time of admission and which any changes in cervical effacement or dilatation” \(^{(8,34,35)}\).

### 3.3.2 Protraction disorders

Protracted cervical dilatation and/or protracted descent of the fetus in the active phase of labor constitute a protraction disorder. The protraction disorder is characterized by an abnormally slow rate of cervical dilatation or descent, which for nullipara women was less than 1.2 cm dilatation per hour or less than 1 cm descent per hour. For multipara women, protraction is defined as less than 1.5 cm dilatation per hour or less than 2 cm descent per hour. The underlying pathogenesis of protracted labor is probably multifactorial. Fetopelvic disproportion is encountered in about one-third of cases of protracted labor. Protraction disorder is less well described. The time interval necessary before diagnosing slow progress is undefined. Said another way, how many hours must elapse before deciding that less than 1.2 cm/hr of cervical dilatation has
occurred? The World Health Organization (1994) has proposed a labor management partograph in which protraction is defined as less than 1 cm/hr cervical dilatation for a minimum of 4 hours \(^{(8,33)}\).

### 3.3.3 Arrest disorders

The four patterns of arrest in labor may be characterized as follows: (1) prolonged deceleration, with the deceleration phase lasting more than 3 hours in nullipara or more than 1 hour in multipara women, (2) secondary arrest of dilatation, with no progressive cervical dilatation in the active phase of labor for 2 hours or more, (3) arrest of descent, with descent failing to progress for 1 hour or more, (4) failure of descent, with descent failing to occur during the deceleration or second stages. Before the diagnosis of arrest during the first stage labor is made, two criteria should be met:

1. The latent phase has been completed, with the cervix dilated 4 cm or more.
2. Adequate uterine contractions (three contractions in 10 minutes, each lasting more than 40 seconds).

About 50% of patients with arrest disorder demonstrate fetopelvic disproportion. Other causative factors include various fetal malpositions (e.g., occiput posterior, occiput transverse, face or brow presentation), inappropriately administrated anesthesia, or excessive sedation \(^{(7,8,33)}\).

### 3.3.4 Prolonged labor

Prolonged labor is a retrospective diagnosis. The problem is to decide after what time labor should be considered prolonged. By the time 18 hours have passed between 85-95% of nullipara women and between 95-98% of multipara women will have given birth, and it is
thus the practice to define labor as being prolonged if its duration has exceeded 18 hours. \((8,9,35)\)

### 3.4 Partograph

#### 3.4.1 History of the partograph

The normal pattern of labor, including two phases (latent and active) of cervical dilatation, was first documented on a graph by Friedman in 1954. Friedman's partogram was based on observations of cervical dilatation and fetal station against time elapsed in hours from onset of labor. The time of onset of labor was based on the patient's subjective perception of her contractility. Plotting cervical dilatation against time yielded the typical sigmoid or 'S' shaped curve and station against time gave rise to the hyperbolic curve. Limits of normal were defined. Friedman divided labor functionally into two parts. The early part was the latent phase, extending over 8-10 hours and up to about 3 cm dilatation. This was followed by an active phase, characterized by acceleration from about 3-10 cm at the end of deceleration occurred. This work has been the foundation on which others have built. In 1969 Hendricks et al. demonstrated that in the active phase of normal labor, the rate of dilatation of the cervix in nulliparas and multiparas was almost the same \((26)\).

In 1972 Philpott and Castle introduced the concept of "ALERT" and "ACTION" lines. Their aim was to fulfill the needs of paramedical personnel practising obstetrics in Rhodesian African primigravidae women. The alert line represented the mean rate of progress of the slowest 10% of patients in the African population whom they served. The line was drawn straight with a slope of 1 cm/hr and cervical
dilatation was already 3 cm or more for nullipara women starting at zero time i.e. time of admission. This slope was only slightly lower and more simple than Friedman, and also it could separate efficiently the majority of normal from abnormal labors. The action line was drawn four hours to the right of the alert line, indicating that if the patient crosses the alert line, active management should be instituted within 4 hours, enabling the transfer of the patient to a specialised tertiary care centre. 

Studd's labor stencils were introduced in 1972. These stencils predicted the expected pattern of progression of labor based on the extent of dilatation achieved by the time the patient is admitted (zero time). Curves showing the average course of cervical dilatation were constructed for various dilatations on admission. Five separate patterns of curves representing normal labor progression were constructed. The curves were transcribed onto acrylic stencils, and on admission in labor, the cervical dilatation was assessed and a stencil was used to draw the relevant pencil line of expected progress on the patient's cervicograph, which was then completed. Those crossing the nomogram line were found to have a three-fold increase in instrumental delivery. Since then, various authors have developed similar nomograms in other geographical areas. None of these have shown significant differences between ethnic groups. It has been found to be inexpensive, effective and pragmatic in a variety of different settings, including developed and developing countries. It has shown to be effective in preventing prolonged labor, in reducing operative intervention and improving the neonatal outcome.
Table 1 illustrates the results that can be achieved using a partograph. Prolonged labor, perinatal mortality and caesarean section rates all dropped considerably in these two African studies after the partograph was introduced.

Table 1. Rates of prolonged labor, caesarean section, and perinatal mortality before and after the introduction of the partograph in labor management (26)

<table>
<thead>
<tr>
<th></th>
<th>Zimbabwe</th>
<th>Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before partograph (%)</td>
<td>After partograph (%)</td>
</tr>
<tr>
<td>Prolonged labor</td>
<td>13.0</td>
<td>0.6</td>
</tr>
<tr>
<td>Perinatal mortality</td>
<td>5.8</td>
<td>0.6</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>9.9</td>
<td>2.6</td>
</tr>
</tbody>
</table>

These early partographs formed the foundation for the WHO partograph model, which was developed as an international standard in 1988 following the launch of the worldwide Safe Motherhood Initiative. In 1990-1991, to evaluate the impact of the WHO partograph, WHO conducted a multi-center trial involving more than 35,000 women in Indonesia, Malaysia and Thailand. Table 2 summarizes the improvement in labor outcome that were achieved as prolonged labor, augmented labor, caesarean section and intra partum fetal deaths rates all fell (18).
Table 2. Rates of prolonged labor, augmented labor, caesarean section and intra partum fetal death in a multi-center trial of the WHO partograph (18)

<table>
<thead>
<tr>
<th></th>
<th>Before partograph (%)</th>
<th>After partograph (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged labor</td>
<td>6.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Augmented labor</td>
<td>20.7</td>
<td>9.1</td>
</tr>
<tr>
<td>Emergency caesarean section</td>
<td>9.9</td>
<td>8.7</td>
</tr>
<tr>
<td>Intra partum fetal death</td>
<td>0.5</td>
<td>0.3</td>
</tr>
</tbody>
</table>

All of the above studies were hospital-based, and all concluded that when the partograph was introduced into clinical practice along with management protocol, labor outcomes were greatly improved.

Leigh, et al. (1986) conducted a study to assess how effectively the Maternal and Child Health Aids (MCH-aids) could use the partograph in the management of patients in labor. The MCH-aides and midwives had been trained to use a partograph as modified by Philpott. They found 77% of MCH-aides and 93% of midwives were correctly using the partograph, 83% of MCH-aides and 90% of midwives made correct transfer according to the partograph. The proportion of patients who were referred to the hospital by MCH-aides with required caesarean sections were reduced after introducing the partograph (42).

In 2000 a new version of the WHO partograph was introduced following the launch of Integrated Management of Pregnancy and Childbirth (IMPAC) in Managing Complication in Pregnancy and Childbirth: A guide for midwives and doctors (33). However there has not yet been any
study on using the new version of the WHO partograph for monitoring labor conducted at a hospital or at the birthing home.

### 3.4.2 The WHO partograph model

**Principles** \(^{(33, 43)}\)

The WHO model partograph was devised by an informal working group, who examined most of the available published work on partographs and their design. It represents in some ways a synthesised and simplified compromise, which includes the best features of several partographs (Figure 2). It is based on the following principles:

- The latent phase of labor should not be longer than 8 hours, however in the new model the latent phase has been removed and plotting on the partograph begins in the active phase when the cervix is at least 4 cm dilated to make it simpler and easier to use.

- During the active phase, the rate of cervical dilatation should be not slower than 1 cm/hr.

- A lag time of 4 hours between a slowing of labor and the need for intervention is unlikely to compromise the fetus and the mother. This enables patients to be transferred from peripheral clinics to the hospital in sufficient time to avoid risk to mother or fetus.

- Vaginal examinations should be performed as infrequently as is compatible with safe practice (once every 4 hours is recommended)

**Components** \(^{(33)}\)

Figure 3 shows the modified WHO partograph. It consists of four components:
Patient information

- Patient information: Name, gravida, para, hospital number, date and time of admission and time of ruptured membranes.

The fetal condition

Fetal heart rate: Recorded every half hour.

Amniotic fluid: The colour at every vaginal examination:

- I: membranes intact;
- C: membranes ruptured, clear fluid;
- M: meconium-stained fluid;
- B: blood-stained fluid.

Moulding:

- 1: sutures apposed;
- 2: sutures overlapped but reducible;
- 3: sutures overlapped and not reducible.

The labor condition

Cervical dilatation: Assessed at every vaginal examination and marked with a cross (X). Begin plotting on the partograph at 4 cm.

Alert line: A line starts at 4 cm of cervical dilatation to the point of expected full dilatation at the rate of 1 cm per hour.

Action line: Parallel and 4 hours to the right of the alert line.

Descent assessed by abdominal palpation: Refers to the part of the head (divided into 5 parts) palpable above the symphysis pubis; recorded as a circle (O) at every vaginal examination. At 0/5, the sinciput (S) is at the level of the symphysis pubis.
**Hours**: Time elapsed since onset of active phase of labor (observed or extrapolated).

**Time**: Actual time.

**Contractions**: Charted every half hour; by palpating the number of contractions in 10 minutes and their duration in seconds.

- Less than 20 seconds: 
- Between 20 and 40 seconds: 
- More than 40 seconds: 

**Oxytocin**: The amount of oxytocin per volume IV fluids in drops per minute every 30 minutes when used.

**Drugs given**: Records any additional drugs given.

- **The maternal condition**
  
  **Pulse**: Recorded every 30 minutes and marked with a dot (●).
  
  **Blood pressure**: Recorded every 4 hours and marked with arrows.
  
  **Temperature**: Recorded every 2 hours.
  
  **Protein, acetone and volume**: Recorded every time urine is passed.
The progress of labor

This part of the graph has as its central feature a graph of cervical dilatation against time. It is divided into a latent phase and an active phase.

- **The latent phase**

  The latent phase is from the onset of labor until the cervix reaches 4 cm dilated. If this phase is delayed for longer than 8 hours with the cervix not dilated at least 4 cm in the presence of regular uterine contractions and there has been a change in cervical effacement or dilatation, the women may be in prolonged latent phase. The labor is more likely to be problematical and therefore, if the woman is in a peripheral clinic, she should be referred to the hospital. In the hospital she needs critical assessment and a decision about subsequent management\(^{33,43}\).

- **The active phase**

  The alert line drawn from 4 cm to 10 cm represents the rate of dilatation. Therefore, if cervical dilatation moves to the right of the alert line, it is slow and an indication of delay in labor. If the woman is in a peripheral clinic, she should be referred to a hospital to receive critical assessment depending on labor, fetal and maternal conditions. If the cervical curve reaches or crosses the action line, there should be a critical assessment of the cause of delay and a decision about the appropriate management to overcome this delay\(^{33,43}\).
ANNEX 2: Partograph

Figure 2. The old model WHO partograph
Figure 3. The modified WHO partogram
3.5 Summary of the literature review

Numerous factors contribute to the maternal mortality situation in a country. Resolving only one or two problems will do little to reduce mortality if other significant problems remain untouched. As soon as all of the essential problems are dealt with in a coordinated fashion, a decrease in mortality will be seen. Once the initial essential problems are under control, steps can be taken to resolve the other ones that have less impact on mortality. It is important from the outset, however, to know just what the problems are and which ones require immediate attention.\(^{11,44}\)

Recognizing the unacceptably high maternal mortality ratio, the preventable nature in the majority of cases, and the social consequences of a mother’s death to her family and children, the Safe Motherhood Conference organized jointly by the World Bank, WHO and the United Nations Population Fund held in Nairobi in February 1987 concluded with a “Call to action”. This call demanded that health workers involved in the care of mothers and children take positive action (now) to reduce maternal mortality and morbidity.\(^{45}\) Among the actions called for were: to ensure that all pregnant women are screened by supervised and appropriately trained non-physician health workers where appropriate, with relevant technology (including partographs as needed), to identify those at risk; and to provide prenatal care and care during labor, as expeditiously as possible.\(^{2}\)

Results of research from some developing countries has shown that three factors that could reduce maternal and fetal mortality are: \(^{16,23}\)

1. Early detection of abnormal cases
2. A good referral system
3. Adequate coping and treatment

Postpartum hemorrhage and sepsis are the most common causes of maternal death in developing countries, but obstructed labor and ruptured uterus may cause as many as 70% of all maternal deaths in some situations. Early detection of abnormal progress of labor and the prevention of prolonged labor would significantly reduce the risk of postpartum hemorrhage and sepsis, uterine rupture and its sequelae (21,44,46).

The major factor in the prevention of prolonged and obstructed labor is the accurate and early recognition of possible cephalopelvic disproportion (CPD) either before or during labor. Particularly in the developing world, all labors should be considered potentially problematic. In many societies, in the majority of primigravidae, the fetal head is not engaged at the onset of labor even though the pelvis is adequate. (41) For this reason all labors should be monitored closely in order to identify delay at an early stage. Protracted labor is more common in primipara women than in multipara and the complications and effects of CPD differ between them. In countries where CPD is not prevalent, abnormal progress of labor is often due to inefficient uterine contraction. Commonly, less direct consequences of prolonged labor include maternal sepsis, postpartum hemorrhage and neonatal infection. (8,31)

The WHO recommends that the partograph and its management protocol should be used in all labor wards that have facilities for managing complications of labor. In health centers without such facilities, the WHO partograph can also be used to rapidly identify labors progressing abnormally slowly, in which case referral may be required. The impact of the use of the partograph in such settings is being evaluated in other research sponsored by WHO. (17,18)
The partograph is a graphic recording of the progress of labor and salient conditions of the mother and fetus, which can serve as an “early warning system” and assist in making timely decisions on transfers (referrals), intervention (augmentation) and/or termination of labor. It also increases the quality and regularity of all observations on the fetus and the mother in labor, and aids in early recognition of problems with either.\(^{47-49}\)

4. Rationale

The implementation of the partograph implies a functional referral system with essential obstetric function in place. Its use should improve the efficiency and effectiveness of maternity services. It is essential to ensure that health workers who use the partograph have adequate training in midwifery and are able to: \(^{42,50}\)

1. Observe and conduct normal labor and delivery
2. Perform vaginal examinations in labor and assess cervical dilatation accurately
3. Plot cervical dilatation accurately on a graph against time.

Specialist obstetricians, general medical officers, nurses, midwives, or medical assistants or nurse aides can therefore use it with training in midwifery. It can be used in health centers or hospitals, but cannot be used by birth attendants who cannot perform vaginal examinations or plot the course of labor graphically.\(^{17,21,22}\)

The partograph has no place, therefore, in delivery at home conducted by attendants other than those trained in midwifery. Whether used in health centers or maternities or in hospitals, a program of training
in its use must accompany the introduction of a partograph with appropriate supervision and follow up.\(^{(51,52)}\)

One of the key challenges facing the Indonesian government is how to sustain an extensive, village-based midwifery program. Although every midwife has had training and acquired knowledge of midwifery in a school of nursing for 3 years, they still occasionally face confusion on how to manage a birth, or which guidelines to follow and under what time/conditions the woman should be referred to a hospital. To help improve these problems, the WHO partograph should be introduced, with training for midwives using it on how to manage the labor for standardization to identify the women who are at risk of prolonged labor\(^{(53)}\).

5. Research Question

Can midwives WHO use the partograph correctly during home delivery reduce the incidence of prolonged/obstructed labor and maternal-perinatal complications?

6. Objectives

6.1 General objective

To evaluate the effectiveness of using the WHO partograph by midwives on labor management and outcome during home delivery.
6.2 Specific objectives

1. To assess whether a training program for midwives will result in correct application of the partograph.

2. To determine what effect using the partograph in home delivery has on the rate of referral of women in labor.

3. To determine the effect of using the partograph on the incidence of prolonged/obstructed labor, augmented labor and operative delivery.

4. To determine whether appropriate interventions based on the partograph will reduce maternal and perinatal complications.

5. To determine the hamper when pregnant women whose labor has progressed beyond the alert line are not transferred to a hospital.