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Effect of using Paperless Partogram on the Management and Outcome of Labour and the Nurses' Opinion

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Abstract
The paperless partogram refers to monitoring progress of labour and arriving at an accurate decision for intervention to ensure safe delivery. It needs no graph paper, no extra time to do it and uses the routine that the nurses are already used to. The study **aimed** to evaluate effect of using paperless partogram on the management and outcome of labor and to assess nurses' opinion about using it. **Setting:** Labor ward at Maternity Hospital affiliated to Ain Shams University, Egypt. **Subjects:** Purposive sample of 100 women who met the criteria of; gestational age from 37 to 42 weeks, singleton pregnancy and with cephalic presentation. The data were collected by using the paperless partogram model. **Results**: Mean age of the participants was 25.6 years and mean of gestational age 39.1 weeks and 87% were multipara. Mean Apgar score of the new-born after 5 minutes was 9.4. Mean duration for delivery after Alert ETD was 3.5 ±2.1 hours in primigravida and 3.3 ±2.1 hours in multipara. Also 76.7% of nurses prefer new partogram over traditional one. **Conclusion:** Paperless partogram was found to be effective positively on the management and outcome of labor and the nurses prefers it over traditional partogram.
Keywords: Management of labor, paperless partogram, labor outcome, nurses.

1. Introduction

Monitoring of the woman and fetus during labor is to ensure early identification and timely management of problems to prevent short- and long-term morbidity and mortality (Lavender, Hart, & Smyth, 2008). Monitoring labor can be undertaken in various ways. One method commonly used in developing countries is the partogram (or partograph), which help in the timely identification of obstructed labour, providing enough time for referral to a higher level health center. It is defined as a graphical representation of the changes that occur in labour, and a preprinted paper form that assists in identifying unsatisfactory progress in labor in a timely manner by charting cervical dilatation against time (Ogwang, Karyabakabo & Rutebemberwa, 2009; World Health Organization, 1994).

In addition to cervical dilatation, most partograms also contain a fetal and maternal record. The fetal record may track fetal heart rate, descent of the fetal presenting part, condition of amniotic fluid, and molding of the fetal skull. The maternal record includes temperature/heart rate/blood pressure/urine (for protein and ketones), uterine contractions, and use of medications (such as oxytocin). This form allows health care providers to record, interpret, analyze, and use data to make decisions on labor management. Alert and action lines are printed on the partogram for the active phase of labor. An alert line starts at 4 cm of cervical dilatation and extends to the point of expected full dilatation at the rate of 1 cm per hour. In the active phase of labor, plotting of the cervical dilatation will normally remain on or to the left of the alert line. When dilatation crosses to the right of the alert line, it is a warning that labor may be prolonged. An action line is parallel and four hours to the right of the alert line. When cervical dilatation crosses this line, action must be taken immediately (WHO, 2007; Mitchell, 2010). Despite the proven effectiveness of these tools, some members pointed out they are not frequently used at all health care facility level (Debdas, 2008).

Continuous monitoring of labor and provision of rapid care to deal with problems are most crucial for preventing adverse obstetric outcomes related to childbirth. The conventional partogram is an excellent concept, but is technologically inappropriate. WHO defines appropriate technology as methods, procedures, techniques and equipment that are scientifically valid, adapted to local needs, acceptable to those who use them and to those for whom they are used, and that can be maintained and utilized with resources the community and country can afford (WHO, 1994; WHO, 2007).

Debdas (2008) argues that the partogram of WHO fails to meet the organization’s own requirements for appropriate technology. The partogram has not been adapted to local needs, is not acceptable to those who use it, and cannot be used given the available resources. Also he believes the partogram is simply too time-consuming for overburdened clinicians and too complicated for many skilled birth attendants and many of whom have not received higher education (Debdas, 2008; Elizabeth, 2014). Many factors that were found to contribute to this low rate of partogram use include lack of awareness and lack of proper training, lack of guidelines on partogram use, lack of availability of partograms, negative perceptions of the partogram, high patient load, low staffing at the facilities, lack of supervision, and negative attitudes among some of the health workers (Ogwang, Karyabakabo & Rutebemberwa, 2009; Tsu & Coffey, 2009). These challenges highlight a need for strengthening

providers' skills and/or developing new technologies that are suitable for low-resource countries and promote consistent, correct use of the partogram as well as identification of labor monitoring systems that could be used at the community level (Technologies for Health Consultative Meeting, 2015).

Paperless partogram needs no graph paper, no extra time to do it and uses the routine that the nurses are already used to. It gives the two basic data on which the partogram works namely: The Alert line and The Action line. This method involves only finding Expected Time of Delivery (ETD) and then adhering to that without any recurrent plotting of data and its interpretation. Providers calculate alert and action times by adding six hours to the time when a woman reaches 4 cm of dilatation (alert line) and adding four hours to the alert time (action line); based on rational that cervix should dilate 1 cm per hour between 4 cm and 10 cm. If there is no birth at alert time, refer to care and if no birth by action line, immediate delivery (Technologies for Health Consultative Meeting, 2015; Agarwal K, Agarwal L, Agrawal V, Agarwal A & Sharma, 2013).

Paperless partogram tells the provider about the place to go, number of hours, time to terminate labor and exact time to transfer a woman to some higher center with Caesarean capability (Debdas, 2008). It is a technique used for monitoring the progress of labor before delivery, and arriving at the accurate time to intervene for ensuring a safe delivery. Contrary to the current practice of writing down the expected date of delivery (EDD) and other parameters that prolong labor and delivery time, the technique only records the expected time of delivery (ETD), the alert ETD and action ETD for accurate and precise intervention (Dangal, 2007).

Preventing prolonged labor is a key strategy for reducing maternal and neonatal death. Once cervical dilation reaches 4 centimeters and contractions happen every ten minutes, a woman is considered to be in the active stage of labor. If this stage lasts too long, the woman faces higher risk of postpartum hemorrhage, sepsis, uterine rupture, and death. Likewise, prolonged labor places neonates at higher risk for anoxia, infection, and intra-partum death (Debdas, 2008).The present study is carried out to find out the effectiveness of paperless partogram in the management of labor and its effect on maternal and neonatal outcomes and to assess the nurses' opinion about using of it.

2. Aims of the study

2.1. To evaluate, prospectively, the effect of using the paperless partogram on the management and outcome of labour.

2.2. To assess the nurses' opinion about using of paperless partogram.

3. The study hypothesis

3.1. The use of the paperless partogram will be more easy and effective design for labor management and outcome.

3.2. The use of the paperless partogram will be preferable method from nurses view of point**.**

4. Subjects and Methods

4.1. Design: A quasi experimental design was utilized for this study.

4.2. Setting: The study was carried out at labor ward of Maternity Hospital that affiliated to Ain Shams University.

4.3. Subjects: Purposive random sample of 100 women. The sample size was calculated according to the assuming a precision level of 10% of total annual deliveries (990) of maternity hospital and confidence level of 95%. Women who met the criteria of; gestational age 37- 42 weeks, singleton pregnancies with cephalic presentation, a living fetus, and in active phase were recruited. Women were **excluded** from the study if had mal-presentations, previous history of cesarean delivery or other form of uterine surgery, non-reassuring fetal heart tracings, women with pathological cardiotocography [CTG] at the time of admission. Sample was recruited within the period of 6 months, from 1st March to last of August 2014.

4.4. Tools of data collection: Data collection was obtained by using the following tools:

4.4.1. A Structured interviewing questionnaire: Developed by the researchers and used to collect the socio-demographic data, obstetric history.

4.4.2 Paperless partogram model is a simple tool developed by Debdas 2008. It needs no graph paper, no extra time to do it and uses the routine that the nurses are already used to. It gives the two basic data on which the partogram works namely (The Alert line &The Action line). This method involves only finding Expected Time of Delivery (ETD) and then adhering to that without any recurrent plotting of data and its interpretation. It used by internship nursing students for labor management**.** The labor was followed from the active phase when

cervical dilatation reach 4 cm or more until delivery.

Description of the intervention: The paperless partogram is a simple, inexpensive tool to provide a continuous pictorial overview of labour. It is a technique used for labor management, only after the cervical dilatation reach 4 cm or more for monitoring the progress of labour until delivery, and arriving at the accurate time to intervene for ensuring a safe delivery. It used by clinicians or nurses through calculation of two times, an ALERT ETD (estimated time of delivery) and an ACTION ETD. The ALERT calculation uses Friedman's widely accepted rule that the cervix dilates 1cm per hour while a woman is in active labor (Friedman, 1955). Once cervical dilation reaches 4 centimeters and contractions happen every ten minutes, a woman is considered to be in the active stage of labor. The clinician simply adds 6 hours to the time at which the woman becomes dilated to 4cm to find the ALERT ETD (when cervical dilation is at 10cm). The clinician adds 4 hours to the ALERT ETD to get the ACTION ETD. Both ETDs should be written in big letters on a woman's case management sheet, the ACTION ETD circled in red .This technique only records the expected time of delivery (ETD), the alert ETD and action ETD for accurate and precise intervention. It also makes the application of 'Friedman formula' simple and easy to understand so that even auxiliary nursing midwives (ANMs) can ensure safe delivery.

4.4.3. Maternal and Neonatal outcomes assessment: To assess the outcome of maternal and newborn condition as mode of delivery, birth outcome, birth weight, Apgar score, and any complication may raise for mother or baby.

4.4.4. Nurses opinion about the use of paperless partogram: A 3- point Likert Scale was used, to answer the question of "Do you prefer new partogram over the traditional partogram for labor management?" Where the overall level of acceptance where 1= not agree, 2= Uncertain, and 3= Agree (Mohamed, 2011).

4.5. The field of work

Before data collection, the 30 of internship nursing students (Research assistants) were prepared to use the tools of data collection by explanation and clarification of all items of the tools and participated in pilot study to ensure the perfect using of the tools. Each internship nurse was visit the delivery ward three days /week to obtain the study sample. The internship nurse introduced herself to each woman and explained the aim of the study to the woman and obtaining the oral consent before the enrollment in the study. Women who agree to participate in the study and meeting inclusion and exclusion criteria were recruited in the study. Data pertinent to the study variables were collected from the study sample through questionnaire sheet provided by the researchers to collect the basic data and the paperless partogram model was used in labor management and outcome of labor was detected. Each woman was individually interviewed using the previously mentioned study tools from active phase until delivery and all data recorded in the paperless partogram model.

4.6. Administrative and ethical considerations

An authorized permission was obtained by submission of an official letter from the Faculty of Nursing -Helwan University to the responsible authorities of the study setting (Maternity Hospital - Ain Shams University) to obtain the authorization for data collection. The aim of the study was explained to every woman before participation, and voluntary participation was emphasized and an oral consent was obtained, however; they had the right to withdraw from the study at any time. Data collection was anonymous, and confidentiality of the data was secured.

4.7. Pilot study

A pilot study was done on 10 women (10% of total sample); those who participated in the pilot study were not included in the main study sample. The purposes of the pilot study were to ascertain the relevance and content validity of the tools, estimating the exact time needed for each case and detect any problem peculiar to data collection tools that might face the researchers or their assistant and interfere with data collection. After conducting the pilot study, the necessary changes were performed and the tools were reconstructed and made ready for use.

4.8. Statistical analysis

The statistical analysis of data was done by using SPSS program (statistical package for social science) version 20.0. The data was tabulated and presented. The description of the data was done in form of mean and standard deviation for quantitative data, frequency and proportion for qualitative data.

5. Results

Table 1. Baseline characteristics of the participants

Variable	Range	Mean ±SD
Age (years)	18 – 35	25.6 ±5
Parity	0 – 5	2 ±1.3
Gestational age (weeks)	37 – 42	39.1 ±1.86
Temperature	36.9 – 37.2	37.1 ±0.1
Pulse (bpm)	61 – 88	76.6 ±7.5
Diastolic blood pressure (mmHg)	60 – 90	75.1 ±9.8
Systolic blood pressure (mmHg)	90 – 120	107.5 ±9.9
Number of uterine contractions /10 minutes	3 – 7	4.6 ±1.2
Urine output	500 – 800	662.5 ±84.3
FHR (bpm)	120 – 160	142.6 ±12.3
Time from rupture of membranes to delivery (minutes)	30 – 210	55 ±42.2

Table 1 demonstrates the characteristics of the study participants. The present study enrolled 100 laboring women, their ages ranged from 18 to 35 years with average 25.6 ±5 years and their average parity was 2 ±1.3. Regarding the gravidity 13% of participants were primigravida. The gestational age at onset of labor ranged from 37 to 42 weeks with mean ±SD = 39.1 ±1.86. Assessment of the women at onset of labor revealed that their average temperature was 37.1 ± 0.1, their average heart rate was76.6 ±7.5 beats per minute, and their average diastolic blood pressure was 75.1 ±9.8 mmHg, their average systolic blood pressure was 107.5 ±9.9 mmHg. Uterine contractions had an average of 4.6 ±1.2 contractions per 10 minutes, the fetal heart rate ranged from 120 to 160 with average 142.6 ±12.3 beats per minute. The maternal urine output ranged from 500 to 800 ml with the mean of 662.5 ±84.3 ml. The time elapsed from the rupture of membranes to the delivery was ranged from 30 – 210 minutes with average 55 ±42.2 minutes.

Table 2. Characteristics of the new-born

Variable	Range	Mean ±SD
Neonatal weight (gm)	2865 – 4100	3631.9 ±344.4
Apgar score after 1 minute	5 – 8	7.3 ±1
Apgar score after 5 minutes	7 – 10	9.4 ±0.9
Sex		
Female (%)	51%	
Male (%)	49%	

Regarding the neonatal outcome; table 2 shows the average weight of the new-born was 3631.9 ±344.4 gm and 51 % of them were females and 49 % males. The average Apgar score after 1 minute and 5 minutes are (7.3 ± 1 & 9.4 ±0.9 respectively).

Table 3. Time taken after ALERT ETD (Hours)

Variable	Range	Mean ±SD
Primigravida	1 – 7	3.5 ±2.1
Multipara	0.25 – 6	3.3 ±2.1
All women	0.25 – 7	3.4 ±2.1

As regard to the average time for delivery among the primigravida women after the Alert ETD was 3.5 ±2.1 hours (ranged from 1 to 7 hours), while the average time for delivery among the multiparous women after the Alert ETD was 3.3 ±2.1 hours (ranged from 15 minutes to 6 hours) (Table 3).

Table 4. Distribution of study participants according to mode of delivery N=100

Mood of delivery	Primigravida=13		Multipara= 87		All women= 100	
	N	%	N	%	N	%
Normal vaginal	10	76.9	78	89.7	88	88
Caesarean section	3	23.1	9	10.3	12	12

Table 4 illustrates that most of the women 88 (88%) in the present study had normal vaginal delivery (10 primigravida and 78 multiparous women) whereas 12 (12%) had Caesarean section (3 primigravida and 9

multiparous women). Thus; 76.9% and 23.1% of the primigravida women had normal vaginal delivery and Caesarean section respectively and 89.7% and 10.3% of the multiparous women had normal vaginal delivery and Caesarean section respectively.

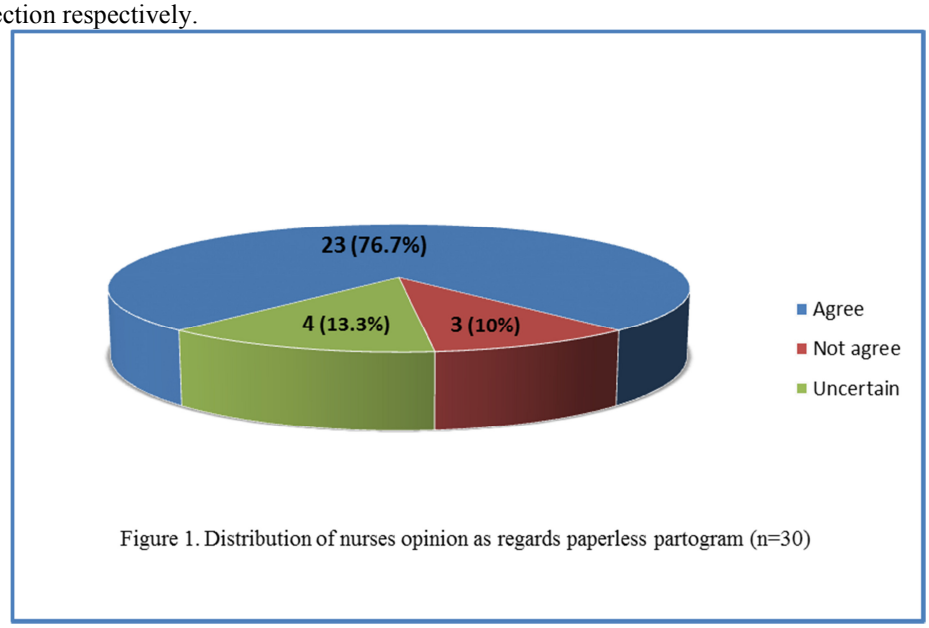

Figure 1. Distribution of nurses opinion as regards paperless partogram (n=30)

Figure 1 clears distribution of nurse's opinion as regard to paperless partogram. The responses of 30 nurses as regard to the paperless partogram were evaluated using the Likert scale. More than three quarter of nurses (76.7%) prefer the use of paperless partogram over the traditional partogram. On the other hand 13.3% of nurses were uncertain and only 10 % of nurses were not prefer the use of it.

6. Discussion

Monitoring labor can be undertaken in various ways. One method commonly used in developing countries is the partograph (or partogram). The partogram is a tool that enables midwives and obstetricians to record maternal and fetal observations. WHO has recommended universal use of a partogram during labor to aid in clinical decision-making (Banerjee & Sharma, 2015). This WHO recommendation has not changed despite a 2009 Cochrane review of five randomized controlled trials (including both high- and low-resource countries) which found that using a partogram had no benefit on reducing cesarean section rates, instrumental vaginal delivery, or Apgar scores of less than seven at five minutes post-birth (WHO, 2014). In addition the evidence to support this recommendation is limited; even after the WHO simplified the partogram model to make it more user-friendly, it is still rarely used in low-resource areas, and when actually used, it is rarely interpreted correctly (WHO, 1994).
The paperless partogram is a low-skill method for preventing abnormal labor (Agarwal K, Agarwal L, Agrawal V, Agarwal A & Sharma, 2013). It is designed to monitor not only the progress of labor, but also the condition of the mother and the fetus during labor. Paperless partogram needs no graph paper, no extra time to do it and uses the routine that the nurses are already used to. It gives the two basic data on which the partogram works namely (The Alert line and The Action line). This method involves only calculate alert and action times by adding six hours to the time when a woman reaches 4 cm of dilatation (alert line) and adding four hours to the alert time (action line); based on rational that cervix should dilate 1 cm per hour between 4 cm and 10 cm. If there is no birth at alert time, refer to care and if no birth by action line, immediate delivery (Technologies for Health Consultative Meeting, 2015). Very little researches done to test the effectiveness of paperless partogram in the management of labor and its acceptance from heath care providers (Nurses midwives and Obstetricians); so it is important to conduct the present study that aimed to evaluate, prospectively, the effect of use the paperless partogram on the management and outcome of labor and to assess the nurses' opinion about using it.

In the present study, the paperless partogram was used for the management of labor, out of 100 laboring women. The base line data of women revealed that; the most of them were multipara compared to 13% primipara, their average diastolic blood pressure was 75.1 ±9.8 mmHg, their average systolic blood pressure was 107.5 ±9.9 mmHg. Uterine contractions had an average of 4.6 ±1.2 contractions per 10 minutes. These results is slightly similar to the finding conducted in a tertiary care hospital of Uttar Pradesh -India which used the paperless partogram for out of 91 women who participated in the study which revealed that the mean systolic BP of the participants was 124 mmHg. The mean diastolic BP of the participants was 73 mm of Hg (Agarwal K, Agarwal L, Agrawal V, Agarwal A & Sharma, 2013).

Regarding, the average time for delivery after the Alert ETD; the study revealed that the total mean

duration for delivery after Alert ETD was 3.4±2.1 hours, the average time for delivery among the multiparous women after the Alert ETD was 3.3 ±2.1 hours (ranged from 15 minutes to 6 hours). These results were nearly corresponding to the study findings conducted by Agarwal et al (2013) which used the paperless partogram for the management of labor, out of 91 participants, the study revealed that the mean duration for delivery after Alert ETD was 4.3 hours, The mean duration for delivery after Alert ETD was 4.7 ± 1.9 hours in primigravida and 3.7 ± 1.8 hours in multipara, however, these differences were not statistically significant (Agarwal K, Agarwal L, Agrawal V, Agarwal A & Sharma, 2013), and was similar to the WHO recommendation for partograms with a four-hour action line denoting the timing of intervention for prolonged labor (Banerjee & Sharma, 2015).

The present study revealed that the most of the women had normal vaginal delivery (88%), whereas only 12 % of them had caesarean section. These findings were nearly corresponding with other study which used the paperless partogram for the management of labor; labor was induced only in 13% of the cases (Agarwal K, Agarwal L, Agrawal V, Agarwal A & Sharma, 2013). Fortunately, in the current study there was uncomplicated labor, in contrast with finding of a study used the WHO partogram; in which 51.3% of women were diagnosed as being in prolonged labor (Lavender, Alfirevic & Walkinshaw, 2006). These results had been interpreted as; the use of paperless partogram was highly effective during the management of labor which shown to be effective in preventing prolonged labor, in reducing Cesarean Section. The most of cases in the current study not reach to action line and those who reach to it were given the appropriate care in suitable time, so no one of them complicated by prolonged labor. As regard to the neonatal outcome; all the new-borns weights were within normal. The average Apgar score after 1 minute and 5 minutes are 7.3 ± 1 & 9.4 ±0.9 respectively; this result was interpreted by there was no newborn need to admit to Neonate Intensive Care Unit (NICU) or need ventilation. This result revealed the positive effect of paperless partogram on neonatal outcome but this result need to be proved by other researches; as minor studies focused on the effect of paperless partogram on labor outcome, unfortunately; no one study effect of using it on neonatal outcome (Debdas, 2008; Elizabeth, 2010; Mitchell, 2010; Agarwal K, Agarwal L, Agrawal V, Agarwal A & Sharma, 2013). So the findings of present study are support the research hypothesis which hypothesized that the use of the paperless partogram will be easy and effected design for the management and outcome of labor.

Also the present study findings are support the second research hypothesis which hypothesized that the use of the paperless partogram will be preferable method from nurses view of point. The use of paperless partogram in labor management was acceptable for the most of nurses who shared in this study, it was found that more than three quarter of nurses prefer the use of paperless partogram over the traditional partogram, because of the use of paperless partogram in labor management very simple and not needs graph paper or extra time to do it, but the WHO partogram is very complicated and require more training before using it. This finding was supported by Debdas (2008) which argues that the partogram of WHO fails to meet the organization's own requirements for appropriate technology and has not been adapted to local needs, is not acceptable to those who use it and too complicated for many skilled birth attendants - many of whom have not received higher education. Also it was reported that despite the proven effectiveness of traditional partogram, members pointed out they are not frequently used at all health care facility level (Debdas, 2008). One study found that less than 10 % of providers (nurses, midwives, and community health care workers) routinely use the partogram in peripheral centers in Nigeria (Oladapo Daniel & Olatunji, 2006). Additionally; some argue that use of the partogram is complex and too time consuming for effective use in low-resource countries that have inadequate health care staffing (Technologies for Health Consultative Meeting, 2015).

Understanding barriers facing partograph use, and the limitations facing low-resource areas, is an essential first step in effectively addressing the low rates of partograph completion and use. Effective partograph initiatives need to be cost-effective, intuitive, need to promote training and ongoing education, and must work within the complex set of issues contributing to staff and supply shortages in developing countries. The Paperless partogram attempts to provide a low-cost, intuitive solution to many of the barriers facing effective partograph use in the developing world.

7. Conclusion and recommendations

Based on the study findings; it is concluded that; the paperless partogram was found convenient and effective in the management of labor and shown to be effective in preventing prolonged labor, in reducing Cesarean section intervention and in improving the neonatal outcome. Regarding the nurses opinion about the simplicity of use paperless partogram as a new method for labor management, it was found that more than three quarter of nurses prefer the use of paperless partogram over the traditional partogram. This method should be implemented as essential part of care in all health facilities, and used by all clinical training sites to give trainees (doctors and nurses midwives) an opportunity to use it. Ministry of Health should encourage to actively participating in activities to increase use of this tool. Further studies should be done in large different health facilities for focusing on the perceptions of nurses about the use of the paperless partogram.

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