THE ATTITUDES OF OBSTETRICAL NURSES TOWARD THE USE OF ELECTRONIC FETAL MONITORING IN LABOUR

by

KATHLEEN PERRON

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- Européenne 0335
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- Cellule 0379
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- Microbiologie 0410
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- PolymÈres 0495
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- Électronique et électricité 0607
- Fluides et plasma 0759
- Météorologie 0608
- Optique 0752
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- Physique de l'état solide 0611
- Physique moléculaire 0609
- Physique nucléaire 0610
- Radiation 0756

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THE ATTITUDES OF OBSTETRICAL NURSES TOWARD THE USE OF ELECTRONIC FETAL MONITORING IN LABOUR

BY

KATHLEEN PERRON

A Thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF NURSING

Dedication

To my parents Laurent and Dorilla,

my brothers Ron and Ray,

and their families

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Abstract

The purpose of this descriptive study was to examine the attitudes of obstetrical nurses toward the use of electronic fetal monitoring (EFM) in labour. Nurses who worked in the labour and delivery units of fourteen Manitoba hospitals were asked to complete a 38-item Attitudes Toward Fetal Monitoring Questionnaire (AFMQ), four open-ended questions, and a demographics sheet. One hundred and seventeen nurses participated in the study.

Overall, nurses' attitudes toward EFM varied. Total scores on the AFMQ ranged from 51 to 158 with a mean total score of 114.1 or 50.1 percent. Nurses estimated using EFM for a major portion of labour for 55 percent of all labouring patients. When nurses used EFM for most of the patient's labour, their decisions to use the monitor were influenced by hospital policy in over half of all situations. Nurses in rural settings had higher total scores on the AFMQ, indicating more positive perceptions of EFM, than nurses in urban community settings. Nurses in tertiary settings estimated using EFM more than nurses in either urban community or rural settings. Nurses in urban settings were more likely to use EFM primarily because of hospital policy than nurses in rural settings.

A weak negative correlation was found between the number of years of labour and delivery experience nurses had and the frequency with which they estimated using EFM. Many nurses saw EFM as valuable for determining a baseline strip on admission and for high risk pregnancies. Nurses' views on the effect that EFM has on the care the patient receives varied. Some nurses perceived that EFM had no effect on the care of labouring

patients. Some stated that care could be improved or that the monitor allowed them to spend more time with patients, while others believed that, with EFM, nurses focused more on the monitor than the patient. Several expressed the belief that EFM had no effect on their role in caring for patients; others believed that, with the use of EFM, nurses become more technical.

Based on the findings of this study, it is recommended that hospital policies be reexamined to allow nurses more flexibility in choosing intermittent auscultation as a method of assessing fetal heart rate during labour. As well, nurse administrators should investigate measures to encourage nurses to view intermittent auscultation as an acceptable method of fetal heart rate monitoring. Further research is needed to investigate what nurses view as barriers to the use of intermittent auscultation during labour and to determine what factors influence nurses' decisions to use EFM in their care of labouring patients.

Table of contents

Figures

Tables

CHAPTER ONE

Introduction

Statement of the problem

In the early 1970s, researchers believed that the introduction of electronic fetal monitoring (EFM) would improve obstetrical care (Eganhouse, 1991; Freeman, 1990; Lumley, 1982; Luthy, Shy, vanBelle, Larson, Hughes, Benedetti, Brown, Effer, King, & Stenchever, 1987; Snydal, 1988a). Several studies have since shown that the use of EFM during labour increases the incidence of caesarean section (Haverkamp, Thompson, McFee, & Cetrulo, 1976; Haverkamp, Orleans, Langendoerfer, McFee, Murphy, & Thompson, 1979; Kelso, Parsons, Lawrence, Arora, Edmonds, & Cooke, 1978; Leveeno, Cunningham, Nelson, Roark, Williams, Guzick, Dowling, Rosenfeld, & Buckley, 1986; MacDonald, Grant, Sheridan-Pereira, Boylan, & Chalmers, 1985) or total operative delivery--forceps delivery **and** caesarean delivery--(Wood, Renou, Oats, Farrell, Beischer, & Anderson, 1981). Several studies also have shown that intrapartum EFM has not been associated with an improvement in neonatal outcome (Haverkamp et al., 1976; Haverkamp et al., 1979; Kelso et al., 1978; Leveeno et al., 1986; Luthy et al., 1987; MacDonald et al., 1985; Shy, Luthy, Bennett, Whitfield, Larson, vanBelle, Hughes, Wilson, & Stenchever, 1990; Wood et al., 1981). Despite the lack of evidence that EFM is superior to intermittent auscultation (IA) in evaluating fetal heart rate during labour, the use of EFM continues to increase (Canadian Task Force on the Periodic Health Examination, 1989; Oakley, 1983). A retrospective study of three Ontario hospitals compared the incidence of use of EFM between two

periods of time--April, 1985 to March, 1986 and May to September, 1988. The study showed that the use of EFM increased significantly when patients were under the care of an obstetrician (Ruderman, Carroll, Reid, & Murray, 1993). Another recent survey of Canadian hospitals showed that 76.3 percent of the 549 hospitals that responded to the survey had at least one electronic fetal monitor. In 71.8 percent of hospitals that had monitors, almost all labouring patients were monitored electronically during some portion of their labour (Davies, Niday, Nimrod, Drake, Sprague, & Trepanier, 1993).

Studies examining patient responses to EFM during labour have shown that, although most patients respond favourably to EFM, some patients feel that the monitor produces anxiety, is uncomfortable, and restricts activity (Garcia, Corry, MacDonald, Elbourne, & Grant, 1985; Shields, 1978; Snydal, 1988b).

Inherent in the increase in caesarean section rate associated with EFM is an increased incidence of maternal mortality (Petitti, Cefalo, Shapiro, & Whalley, 1982; Sandmire, 1990) and morbidity (Petitti, 1985; Sandmire, 1990). As well, the negative psychological consequences of caesarean delivery on some patients have been documented (Affonso & Stichler, 1978; Bradley, Ross, & Warnyca, 1983; Culp & Osofsky, 1989; Erb, Hill, & Houston, 1983; Marut & Mercer, 1979).

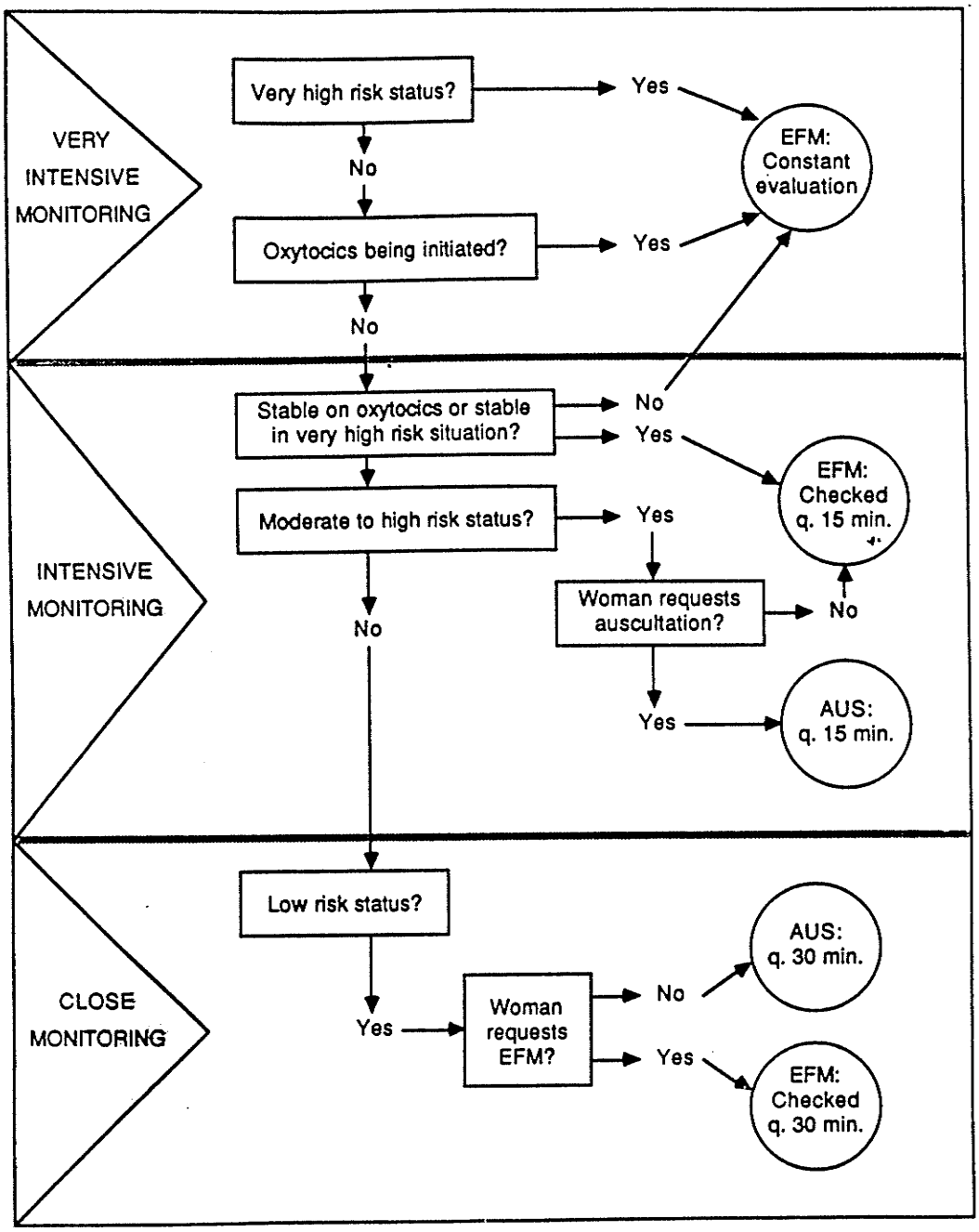
Another consequence of caesarean section delivery associated with EFM is an increase in health care cost. A study by Albers and Savitz (1991) revealed that the use of EFM and primary caesarean section in low risk women are more prevalent in large teaching hospitals where perinatal technology is more readily

available. In 1990-1991, the incidence of caesarean sections in six Manitoba hospitals ranged from nine percent in one institution, to 18 percent in two Manitoba hospitals (Manitoba Health, 1992). In 1992, the Minister of Health suggested that criteria and guidelines were needed to lower the incidence of caesarean sections in some Manitoba hospitals (Manitoba Health, 1992). One way to accomplish this is by using EFM only when it is indicated. Snydal (1988a) developed a decision tree to assist in determining the method of monitoring indicated during the first stage of labour (See Figure 1). Snydal proposed that continuous evaluation of the fetal heart rate by EFM is indicated for patients with a very high risk status, where oxytocin is being established, or for patients who are unstable on oxytocics or in a very high risk situation. For patients with low, moderate, or high risk, EFM should be carried out at the patient's request. If the patient does not request EFM, IA of the fetal heart rate is indicated (Snydal, 1988a).

Nurses often are responsible for determining the method of monitoring to be used during labour (Davies et al., 1993). Why nurses continue to use EFM when its use is not supported by the literature requires further investigation. No studies have been reported that show that nurses' attitudes toward EFM affect the use of this technology. It is important to explore whether nurses' attitudes influence nursing practice and decisions to adopt the use of technology in their care of patients. As a first step, this study will examine the attitudes of obstetrical nurses toward the use of EFM in labour. Subsequent studies need to be carried out to determine if attitudes do, indeed, influence

Figure 1

Decision tree for choosing a method of fetal heart rate monitoring



Note: From "Methods of fetal heart rate monitoring during labour: A selected review of the literature" By S. H. Snydal, 1988, Journal of Nurse-Midwifery, 33(1), p. 12.
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nurses' decisions about the use of this method of technology.

The purpose of this study was to explore the attitudes of nurses who work in labour and delivery units toward the use of EFM during labour.

Research questions

The following research questions guided the study:

1. What are the attitudes of obstetrical nurses toward the use of electronic fetal monitoring during labour?
2. What is the relationship between selected demographic variables and nurses' attitudes toward the use of electronic fetal monitoring in labour?

Conceptual framework

No studies were identified that examined the relationship between nurses' attitudes and the frequency of use of EFM during labour. The impact of EFM on nursing practice also has received little attention. To develop a framework for this study, it is necessary to look at related areas of nursing. The impact of technology on nursing practice has received somewhat greater attention.

The work of Braun, Baines, Olson, Scruby, Manteuffel, and Cretelli (1984) has been adapted to form a basis for this conceptual framework. Braun et al. (1984) define technology as "the application of highly automated means for meeting practical needs" (p. 13). The authors discuss two frameworks that guide nursing care. Nurses who adopt a humanistic framework recognize a patient's dignity and worth. The nurse works with patients, supports them, empathizes with them, and recognizes their rights

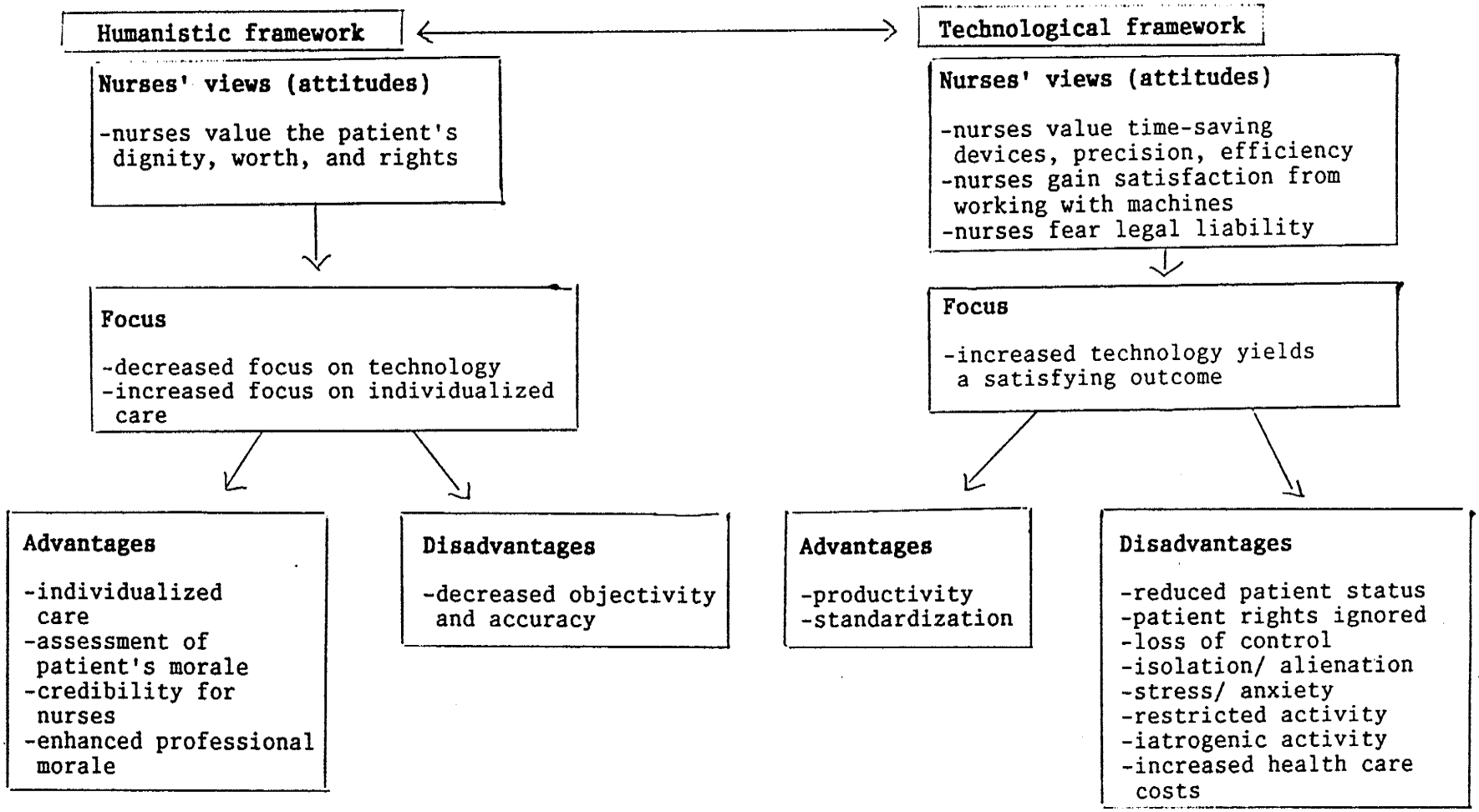
(Braun et al., 1984). In this framework, emphasis is placed on the individual within the system rather than on the system itself. The patient, not the technology, is the focus of nursing care. Braun et al. (1984) see some advantages to the humanistic view of nursing in providing patient care. These include provision of individualized patient care, assessment of patient morale, ability to respond to the patient's psychological and spiritual state, increased credibility for nursing in the health care system, and enhanced morale for the nursing profession. Disadvantages of this view of nursing include decreased objectivity, which may occur if nurses allow themselves to become too involved with one patient. As well, accuracy may decrease because of a lack of standardized, objective criteria to assess, diagnose, and evaluate patients (Braun et al., 1984).

The humanistic framework, as described by Braun et al. (1984), is interpreted and summarized in Figure 2.

At the other end of the continuum is the technological framework (Braun et al., 1984). Nurses who adopt this framework value exactness, knowledge and skills, and precision. Proponents of this framework believe that the use of technology increases productivity and efficiency in nursing. It is believed that technology saves time, thus allowing nurses to spend more time with their patients (Champlin, 1991; Holmes, 1990). Technology also increases precision in assessing patient needs and implementing care (Holmes, 1990). Birckhead (1978) suggests that nurses enjoy the challenge involved in the use of technology and that knowledge of machines gives nurses a sense of power, control, and satisfaction with their ability to work with technology

Figure 2

Humanistic and technological framework continuum



correctly. Sinclair (1988) also suggests that legal pressures encourage nurses to use and accept the data provided by technology. Data provided by machines may prove to be a good defence in a court of law. The emphasis of this view of nursing is on increased use of technology to ensure a satisfactory outcome. The end result is more important than the process (Braun et al., 1984).

Advantages of the use of technology include increased productivity and increased standardization of nursing care (Braun et al., 1984). However, the use of technology also has disadvantages. Braun et al. (1984) argue that a significant effect of technology is "a reduction in the status of the patient" (p. 14). Patients lose their identity as they become an extension of the equipment. Often, the patient's rights and wishes are ignored and patients feel less and less in control (Birckhead, 1978; Lenihan & Abbey, 1978). Communication with patients is impaired as nurses "nurse" the machine rather than the patient (Sinclair, 1988). Denied contact with nurses and family, the patient feels isolated and alienated (Birckhead, 1978; Lenihan & Abbey, 1978). Invasive technology may increase the patient's stress or anxiety (McConnell & Murphy, 1990). As well, technology may impose undue restrictions upon patients (Carnevali, 1988). With technology comes a greater risk of iatrogenic injury (Sinclair, 1988). In addition, the acquisition and maintenance of new technology further increases health care costs (McConnell & Murphy, 1990). The technological framework described by Braun et al. (1984) is summarized in Figure 2.

The framework described by Braun et al. (1984) can be

applied to the care of labouring patients. Nurses who adopt a humanistic framework will consider each patient situation, including the parents' wishes, before deciding upon the method of fetal assessment to be used during labour. The provision of individualized care is the focus for these nurses. Nurses who adopt a technological framework will include EFM as part of their nursing care. These nurses value efficiency and precision (Simkin, 1986). The monitor is seen as a time saving device which accurately identifies instances of fetal distress (Simkin, 1986). Nurses enjoy working with these monitors because they enjoy the challenge of interpreting monitor strips (Simkin, 1986). As well, nurses prefer to use fetal monitors rather than IA because they fear malpractice suits (Simkin, 1986) and believe that EFM offers protection from legal liability (Lumley, 1982; Simkin, 1986).

Some of the negative effects of EFM may include reduced patient dignity (Shields, 1978; Starkman, 1977), isolation/ alienation (Garcia et al., 1985), stress and anxiety (Garcia et al., 1985; Shields, 1978; Starkman, 1977), and decreased mobility (Garcia et al., 1985; Starkman, 1977) for some labouring women. The use of EFM may contribute to the increase in the incidence of caesarean section (Haverkamp et al., 1976; Haverkamp et al., 1979; Kelso et al., 1978; Leveeno et al., 1986; Luthy et al., 1987; MacDonald et al., 1985) which increases health care costs (Institute of Medicine cited in Sandmire, 1990; Simkin, 1987). The use of EFM may lead to a negative birth experience for some women.

Braun et al. (1984) believe that the humanistic and the technological frameworks need not be mutually exclusive. A

blending of both frameworks would "... maximize the advantages and minimize the disadvantages of both" (p. 15). Nurses need to be able to integrate both technological and humanistic views in their patient care. For technology oriented nurses, shifting away from a technological view will result in more individualized, humanistic care. For nurses who adopt a humanistic framework, including technology in their care of patients will result in more accurate, objective nursing care. The conceptual model in Figure 3 illustrates the ideal blending of the humanistic and technological frameworks in providing obstetrical care.

Significance of the study

To assist obstetrical nurses in adopting an optimal blend of values from both the humanistic and technological frameworks, it is necessary to discover exactly what are nurses' attitudes toward the use of EFM in labour. Research in this area could have implications for nursing administration and education. Measures to support a balance of the nurse's humanistic and technological attitudes, measures to teach nurses about the limitations of EFM, and measures to provide adequate staff to implement safe care using IA can be investigated. This could result in the provision of improved patient care and a positive birth experience for patients.

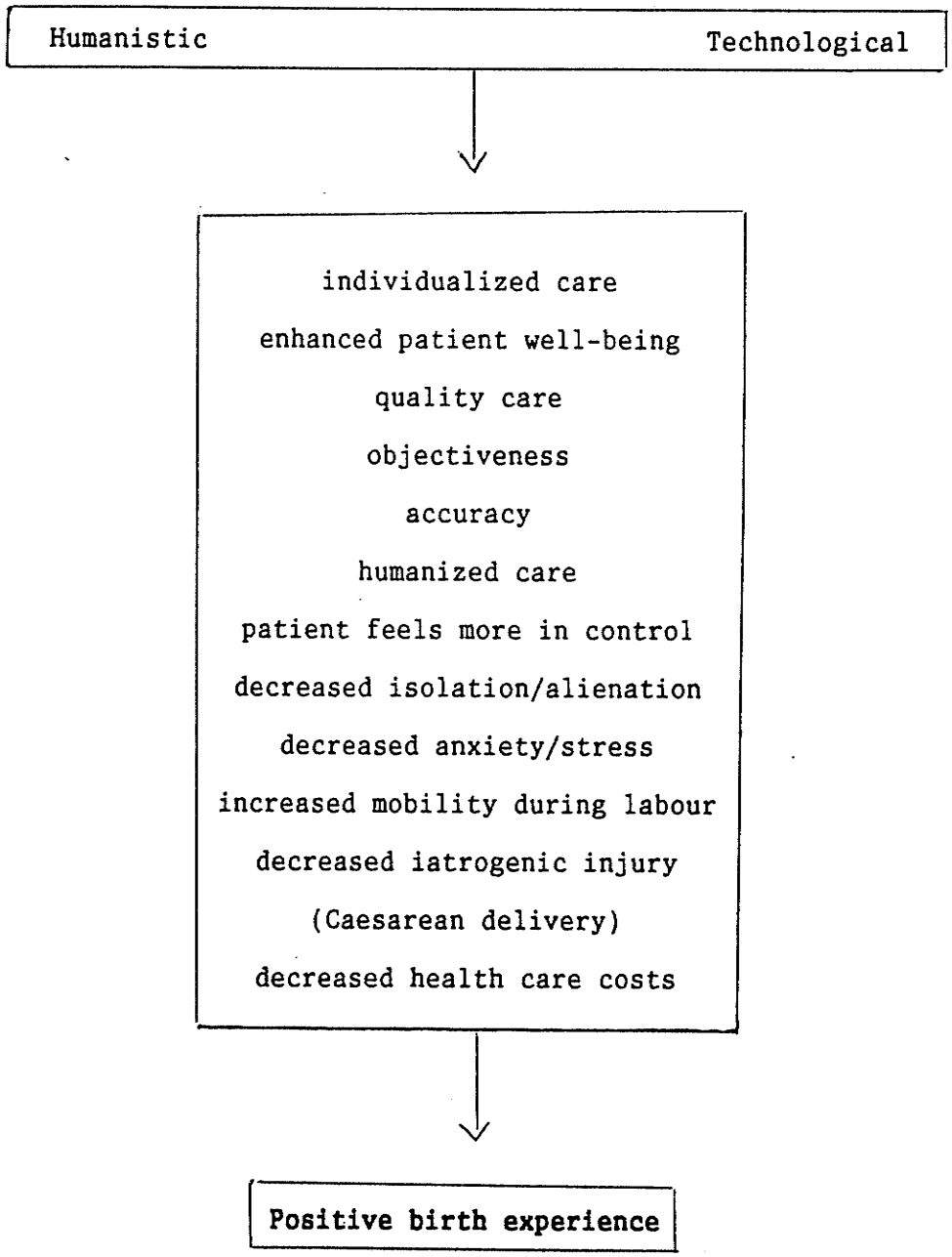
Organization of the thesis

In chapter one, the statement of the problem and the purpose of the study were discussed. A need was identified to examine the attitudes of obstetrical nurses toward the use of EFM in labour.

The conceptual framework that will guide the research was described. The significance of the study and implications for nurse educators and administrators were addressed. In chapter two, relevant literature on EFM and attitudes toward the use of technology in nursing care will be discussed. Cranston's (1980) study, the only study identified on the attitudes of nurses toward the use of EFM, will be examined.

Figure 3

Blending of humanistic and technological frameworks



CHAPTER TWO

Review of the literature

Little research has been done specifically on attitudes of nurses toward the use of EFM in labour. However, related areas of the literature were relevant to this study and were examined. These included:

1. the effect of EFM on delivery and neonatal outcome;
2. mothers' attitudes about the use of EFM during labour;
3. nurses' attitudes toward the use of technology;
4. consumer responses to the use of technology in labour; and, finally,
5. Cranston's (1980) study of obstetrical nurses' attitudes toward the use of EFM.

The effect of EFM on delivery and neonatal outcome

Electronic fetal monitoring was first introduced in the 1960s (Lumley, 1982). In the early 1970s, this new technology was adopted by institutions and professionals (Lumley, 1982). Early studies showed that the use of EFM during labour improved neonatal wellbeing (Freeman, 1990). However, these non-randomized, retrospective studies had methodological limitations (Freeman, 1990). Since 1976, several randomized controlled trials have been carried out which have examined the effect of EFM on delivery and neonatal outcome (Freeman, 1990). These studies are summarized in Appendix B.

One of the first prospective trials on EFM was carried out by Renou, Chang, Anderson, and Wood (1976). A fetal intensive care unit was developed at the Queen Victoria Memorial Hospital in

Melbourne, Australia in 1972 to monitor high risk pregnancies. Monitoring, in this unit, consisted of EFM and scalp blood pH determination. If the fetal heart rate was abnormal during labour, fetal scalp sampling was done; the information was then passed on to the obstetrician who determined the outcome of labour. The purpose of the study was to determine if the fetal intensive care unit had an impact on maternal and fetal outcome.

The trial began in March, 1974 and lasted thirteen months. High risk patients were referred to the trial by obstetricians. Patients were then randomly assigned to the intensive care or control groups. Control group patients were managed by nursing and medical staff without the aid of either EFM or fetal scalp sampling. The control group (n=175) and the intensive care group (n=175) were not significantly different with respect to the mother's age, parity, gestation at delivery, birth weight of infants, length of labour, incidence of induction, or use of epidural anaesthetics (Renou et al., 1976).

The researchers found that significantly more patients in the intensive care group had caesarean section deliveries. However, more patients in this group had a previous caesarean section; this could account for the difference. There were no significant differences in forceps deliveries or maternal infections between the two groups. Fetal outcome, as measured by admissions to the intensive care nursery, time spent in the nursery, and cord gas results, was better in the intensive care group. There was a greater incidence of neurological signs and symptoms in infants from the IA group, including four infants with brain damage. However, in a subsequent study, the authors report

that these four babies experienced difficult forceps deliveries (Snydal, 1988a; Wood et al., 1981). Long term sequelae were not assessed, as these infants were only followed up for a three month period (Snydal, 1988a). There were no differences in the incidence of gavage feedings, neonatal infections, incubator care, Apgar scores, or the incidence of resuscitation between the two groups. Based on the difference in incidence of neurological signs and on cord gas results, the researchers concluded that the presence of the intensive care unit was justified (Renou et al., 1976).

Deficiencies, however, were encountered with this trial. One physician withdrew his patients from the trial; this affected the randomization of subjects (Renou et al., 1976). As well, criteria for the interpretation and treatment of fetal distress were not clearly identified. Snydal (1988a) points out that the authors do not mention how, or how often, the fetal heart rate was checked for the two groups. In addition, the indications for caesarean delivery or forceps delivery are not clearly identified. Renou et al. (1976) argue that the medical and nursing care was probably similar between the two groups. It seems likely, however, that in an intensive care unit, the type of care could differ considerably from the care given in a more normal setting. Standards of care are not adequately described for either group (Snydal, 1988a; Thacker, 1987).

Haverkamp et al. (1976) also compared the effectiveness of EFM versus IA in decreasing perinatal morbidity and mortality, and improving neonatal outcome. Four hundred and eighty-three (483) high risk women were included in the study. This sample included

women who had meconium stained liquor, oxytocin infusions, or abnormal fetal heart tones auscultated on admission. Women were randomly assigned to either the IA group or the EFM group. Although the patients in the IA group also were monitored electronically, the electronic fetal monitor was turned off at the bedside; a remote hall monitor recorded the fetal heart rate tracing. In this group, the fetal heart rate tracings were not considered when determining the outcome of labour. Guidelines for the interpretation and treatment of fetal distress were identified for each group.

Following delivery, fetal heart rate tracings were interpreted by the principal investigator of the study. Umbilical cord arterial and venous samples were taken. Apgar scores were assessed by the pediatric house staff. The newborn's progress was monitored (Haverkamp et al., 1976).

The researchers found there were no significant differences between the two groups in baseline fetal heart rate and beat to beat irregularity during the first and second stages of labour. Significantly more periodic changes were reported in the IA group during the late first stage of labour. There was a decreased incidence of early decelerations, an increased incidence of mild variable decelerations, and an increased incidence of early decelerations with a late component in the IA group during the late first stage of labour. As well, there were significantly more late decelerations and variable decelerations in the EFM group in the early first stage of labour. The authors also found a higher incidence of caesarean section for fetal distress in the EFM group. The incidence of caesarean section delivery for

reasons other than fetal distress was not significantly different between the two groups (Haverkamp et al., 1976). In addition, the postpartum infection rate was significantly higher in the EFM group even when the researchers had corrected for the difference in incidence of caesarean sections (Haverkamp et al., 1976).

At the same time, no benefits to the neonate were evident. There were no differences in mean one minute Apgar scores and mean one minute Apgar scores of seven or less. The mean five minute Apgar score was better in the IA group at a 0.1 level of significance. The number of five minute Apgar scores of seven or less was increased in the EFM group at a 0.1 level of significance. No differences were noted in the need for neonatal intensive care nursing, need for intubation, seizures, lethargy, jaundice, jitteriness in the first 24 hours, and temperature abnormalities between the two groups. The number of infants requiring intermittent positive pressure ventilation was greater in the EFM group at a .1 level of significance (Haverkamp et al., 1976). The investigators concluded that the use of EFM was related to an increased incidence of caesarean delivery without a corresponding improvement in neonatal outcome.

The study by Haverkamp et al. (1976) appears better controlled than the study by Renou et al. (1976) in that the randomization process was not compromised. As well, guidelines for the interpretation of fetal heart rate and identification and treatment of fetal distress are clearly outlined.

Kelso et al. (1978) studied the effects of EFM in low risk patients. Five hundred and four (504) women were randomly assigned to either the EFM group (n=253) or the IA group (n=251)

on admission to the labour suite. Exclusion from the trial was based on the presence of breech presentation, multiple pregnancy, maternal age of 40 years or greater, previous mentally retarded or spastic child resulting from delivery, previous perinatal death, previous severe fetal distress, previous Apgar score of three or less, hypertension with a diastolic pressure of 110 mm. Hg. or 100 mm. Hg. with proteinuria, two consecutive oestrogen estimations less than minus two standard deviations from the norm, anaemia of 8 grams/dL. or less, insulin dependent diabetes, admitted fully dilated and ready for delivery, and missed patients (Kelso et al., 1978).

Patients in the EFM group had a fetal scalp electrode attached as soon as possible following admission. The authors say that "the dip area" (Kelso et al., 1978, p. 527) was used as an indicator of fetal distress (Kelso et al., 1978). It would have been useful for the authors to define what was meant by "the dip area".

Patients in the IA group had the fetal heart rate counted every fifteen minutes for a full minute, during or immediately following a contraction. The decision to interfere with a patient's labour was left entirely with the duty staff (Kelso et al., 1978).

Unlike Haverkamp et al., (1976), Kelso et al. (1978) found that, although there were significantly more caesarean sections in the monitored group compared with the IA group, the difference in caesarean section deliveries for fetal distress between the two groups was not statistically significant. The researchers were unable to offer an explanation for the difference in the incidence

of caesarean sections. They found no significant difference, between the two groups, in the number of forceps deliveries, in the number of newborn admissions to the intensive care unit, number of one minute Apgar scores of six or less, jaundice, meconium aspiration, infants depressed at delivery, or cord arterial or venous blood gas results (Kelso et al., 1978).

Haverkamp et al. (1979) studied the effects of three types of monitoring on neonatal wellbeing and on the outcome of delivery. Six hundred ninety (690) high risk patients were randomly assigned to one of three groups: IA, EFM, or electronic fetal monitoring with fetal scalp sampling (EFM+SS). Women were eligible for the study if there were risk factors associated with their medical history, past obstetrical history, current prenatal course, present labour, or estimated gestational age. Also included in the study were patients with meconium stained liquor, abnormal fetal heart tones by auscultation, arrested labour, significant pre-eclampsia, or need for oxytocin. Only women with fetuses which were estimated to be over 34 weeks gestation and over 2000 grams were admitted to the study. The protocols for assessing fetal status and for the identification and treatment of fetal distress were clearly described for each group. Sociodemographic data were similar for the three groups (Haverkamp et al., 1979).

As in the previous study by Haverkamp et al. (1976), Haverkamp et al. (1979) found that patients who had EFM alone had significantly higher caesarean section rates than auscultated patients (18% and 6% respectively). This applied to the overall number of caesarean sections as well as the number of caesarean

sections done for fetal distress. The total incidence of caesarean sections was lower in mothers from the EFM+SS group compared with the EFM group, but the difference was not significant. There was no significant difference in the total rate of caesarean sections between the EFM+SS group and the IA group. The EFM+SS group had a significantly higher incidence of caesarean sections for fetal distress than the IA group (Haverkamp et al., 1979).

No differences in postpartum infections were found among the three groups. Umbilical cord pH and O_2 values were similar for all groups; venous cord CO_2 was better in the EFM group. Neonatal morbidity, as measured by respiratory distress, pneumonia, seizures, sepsis, meningitis, need for intensive care nursing, need for antibiotics, mean one minute Apgar scores, and mean five minute Apgar scores, was similar for the three groups (Haverkamp et al., 1979).

The researchers concluded that EFM and EFM+SS are not superior to IA in improving perinatal outcome. The incidence of caesarean section was much higher among electronically monitored women. This study strengthens the conclusion reached by the previous research team of Haverkamp et al. (1976) that, although the use of EFM increases the incidence of operative delivery, it does not improve neonatal outcome.

Langendoerfer et al. (1980) then followed up on the study by Haverkamp et al. (1979) and evaluated the infants from the three groups during the newborn period and again at nine months of age. A Brazelton examination was done at two to three days of age. The Brazelton assessment examines interactive process, response to

stress, motor response, and state control. The Bayley scale of Infant Development and the Milani-Comparetti Development Test were done on the infants at nine months of age. As well, at this time, the infants were examined by a physician and a developmental history was obtained from the mother (Langendoerfer et al., (1980). This study is summarized in Appendix C.

During the neonatal period there were three neonatal deaths which the authors believe could not be related to the method of monitoring. No significant difference in Brazelton assessment scores were found between the three groups (n=558). Four infants had neonatal seizures; the authors again concluded that these seizures were unrelated to the method of monitoring. There was no significant difference in the incidence of jitteriness, lethargy, or abnormal tone between the three groups of infants. At nine to twelve months of age, no significant differences were found in the Milani-Comparetti scores or the Bayley scores between the three groups of infants (n=487). Medical examination of the infants showed no significant difference in medical abnormalities, acute illnesses, or use of medications which might have affected the infant's responses to the developmental tests. The authors concluded that infant outcome is not improved in babies monitored electronically compared with babies who are monitored by IA. Careful IA of the fetal heart is a viable alternative to EFM (Langendoerfer et al., 1980).

Wood et al. (1981), like Kelso et al. (1978), studied fetal heart rate monitoring in low risk women. Although 989 patients were admitted to the study and randomly assigned to either the EFM or the IA group, the researchers found that proportionately more

primiparous patients were admitted to the EFM group of one study hospital. The researchers concluded that randomization was affected by having non-sealed envelopes for assigning patients to either group. The discrepancy in parity between the two groups was corrected by randomly eliminating primiparous patients from the EFM group in that hospital; the total sample size was then 927 patients. However, randomization of patients was lost in this study (Shy, Larson, & Luthy, 1987; Snydal, 1988a; Thacker, 1987). The guidelines for the management of patients in both groups were clearly described. The researchers found that incidence of caesarean delivery in the two groups was not significantly different. However, significantly more operative deliveries (caesarean section **and** forceps deliveries) occurred in the EFM group. There were no significant differences in Apgar scores and neurological symptoms between the two groups. Babies in the EFM groups spent more time in an isolette and required phototherapy more frequently than babies in the IA group. One neonatal death occurred; this baby was from the EFM group. However, death was related to the method of delivery and the presence of a prolapsed cord and not to the method of monitoring. These researchers, like Kelso et al. (1978), concluded that the use of EFM in low risk women does not improve neonatal outcome. The use of EFM in labour is, however, associated with an increase in intervention during labour (Wood et al., 1980).

MacDonald et al. (1985) conducted the Dublin trial, which received considerable attention. The sample of patients investigated was considerably greater in the Dublin trial, with 12,964 patients admitted to the study. High and low risk women

were eligible for the trial. Exclusion from the trial was based on gestation under 28 weeks, presence of gross anomalies in the fetus, meconium stained liquor, elective caesarean section, or delivery within one hour from admission to the hospital. Women were randomly assigned to either EFM or IA. Randomization was achieved by opaque sealed envelopes. Fetal scalp sampling was an option for either group. Criteria for the interpretation of fetal heart rate as well as identification and treatment of fetal distress were clearly identified for both groups. Thirteen thousand and eighty four (13,084) babies were delivered: 6530 in the EFM group and 6554 in the IA group (MacDonald et al., 1985).

The trial revealed that more than three times as many fetal scalp samples were obtained for fetal heart rate anomalies in the EFM group as compared with the IA group. Mothers in the EFM group had shorter labours and received less analgesia than mothers in the IA group. Contrary to previous studies by Haverkamp et al. (1976), Haverkamp et al. (1979), and Kelso et al. (1978), MacDonald et al. (1985) found that, although there was a slight increase in the incidence of caesarean sections in the EFM group compared with the IA group, this difference was not statistically significant. However, when examining this difference, significantly more caesarean sections were done for fetal heart rate abnormalities or abnormal fetal scalp samples in the EFM group. There was a significant increase in the number of forceps deliveries in the EFM group. This difference was related to an increase in abnormal fetal heart rates detected in that group (MacDonald et al., 1985).

A higher incidence of postpartum infections was found in

mothers from the EFM group. This difference was greater than could be explained by the difference in operative deliveries between the two groups (MacDonald et al., 1985).

Neonatal outcome--as measured by Apgar scores less than four at one and five minutes, intubation, admission to the intensive care nursery, and neonatal and intrapartal deaths--was similar for both groups. This parallels the findings of previous authors (Haverkamp et al., 1976; Haverkamp et al., 1979; Kelso et al., 1978; Wood et al., 1978). Mean umbilical cord pH was similar for both groups; however, fewer babies in the EFM group had a venous blood pH under 7.10 (MacDonald et al., 1985).

Unlike previous studies, MacDonald et al. (1985) found that neonatal seizures and abnormal neurological signs were twice as frequent in the IA group compared with the EFM group. The investigators concluded, however, that anomalies were related to the length of the labour and possibly the use of oxytocics during labour. Follow-up of infants at twelve months of age revealed three abnormal infants in each group (MacDonald et al., 1985). Snydal (1988a) suggests that the protocol guiding administration of oxytocin in the Dublin trial (MacDonald et al., 1985) was aggressive and that a more gradual approach in administering oxytocin would yield a more favourable outcome.

Following the publication of the Dublin trial (MacDonald et al., 1985), Leveeno et al. (1986) reported the results of their three year study on fetal heart rate monitoring. The methodology in the trial by Leveeno et al. (1986) differs from that of previous trials. In this study, selective monitoring months alternated with universal monitoring months. During the selective

monitoring months, seven electronic fetal monitors were made available on the twelve bed labour unit of the Parkland Memorial Hospital in Dallas. Only selected women experiencing high risk labours were monitored electronically. In descending order of importance, risks included: induction or augmentation of labour with oxytocin, dysfunctional labour, abnormal fetal heart rate, meconium stained liquor, and other complications of pregnancy (hypertension, vaginal bleeding, prolonged pregnancy, diabetes, twins, breech presentation, and preterm labour). During the universal monitoring months, twelve additional fetal monitors were made available on the unit. During these months, the policy was to monitor every labour in which the fetus was viable. Other than the number of monitors available, there were no differences in the standards of care between the universal and the selective monitoring months (Leveeno et al., 1986).

As in the Dublin trial (MacDonald et al., 1985), a strength of the study by Leveeno et al. (1986) was the large sample of women included in the trial. A total of 34,995 women participated in the study. During the selective monitoring months, 17,409 women delivered; 37% (n=6420) were monitored electronically. During the universal monitoring months, 17,586 women were confined; 79% (n=13,956) were monitored electronically. Forty-two percent of the total sample of women in the study were considered to be low risk (Leveeno et al., 1986).

The researchers found that abnormality of the fetal heart rate was diagnosed three times more frequently during the universal monitoring months. A higher incidence of first time caesarean sections occurred in women from the universal monitoring

group. This was related to an increased number of cephalic presentations with fetal distress as well as an increased incidence of breech presentations in those months. A two-fold increase in the incidence of caesarean sections for fetal distress was found in the universal monitoring months. No significant difference occurred in the incidence of induction or augmentation of labour, forceps delivery, or repeat caesarean sections between the two groups (Leveeno et al., 1986).

Perinatal outcome, as measured by the number of intrapartum stillbirths, low Apgar scores, need for assisted ventilation, need for admission to the intensive care unit, or the number of neonatal seizures, was not significantly different between the two groups. The researchers concluded that EFM is not indicated in all labours, especially in low risk labours (Leveeno et al., 1986).

Luthy et al. (1987) studied the effects of monitoring on preterm infants. To date, two of the studies done had shown that infants monitored electronically had less neurological signs and symptoms than infants monitored by auscultation. Follow up of these infants did not reveal a significant difference in neurological abnormalities between infants in the EFM group and infants in the IA group (MacDonald et al., 1985). Renou et al. (1975) also found that more infants in the IA group had neurological abnormalities at birth and that four infants in the IA group were diagnosed as brain damaged. However, the lack of rigour in this trial makes interpretation of findings difficult (Thacker, 1987). No other study revealed a significant difference in critical measures of neonatal outcome between infants monitored electronically and infants monitored by auscultation. It should

be noted that these trials were done on populations with little risk of perinatal mortality or morbidity. The advantage of a study on preterm infants was that there was a greater likelihood of finding a significant difference between the two groups.

The study by Luthy et al. (1987) was carried out in two institutions in Seattle and one institution in British Columbia. Two hundred and forty six (246) patients constituted the sample. Subjects were in preterm labour, between 26 and 32 weeks gestation, with a single fetus in cephalic presentation, and with estimated fetal weight between 700 and 1750 grams. Prior to randomization, patients were placed into one of two groups: 30 weeks gestation and over, and under 30 weeks gestation. Randomization was done at each center with numbered, sealed envelopes, colour coded for gestation. Patients were assigned to the IA group (n=124) or the EFM group (n= 122). Criteria for monitoring fetal heart rate and identification and treatment of fetal distress were described for each group.

Researchers found no significant difference in the incidence of caesarean sections between the two groups. Caesarean section for fetal distress was more frequent for patients in the EFM group than for patients in the IA group although this difference did not achieve statistical significance. As well, no differences were found between the two groups in Apgar scores, umbilical cord pH, neonatal seizures, severe respiratory distress syndrome, or intracranial haemorrhage. The incidence of perinatal or infant deaths was similar for both groups, as were maternal morbidity, as measured by blood transfusion, endometritis, lacerations, wound infection, and urinary tract infections (Luthy et al., 1987).

In addition, unlike the study by MacDonald et al. (1985), Luthy et al. (1987) did not find a relationship between the incidence of neonatal seizures and either the length of labour or the administration of oxytocics. Luthy et al. concluded that EFM and IA produce similar neonatal outcomes.

Shy et al. (1990) then followed up on Luthy's study and evaluated infants at four, eight, and eighteen months of age, corrected for gestational age. (This study is summarized in Appendix C). Of the surviving infants (n=212), 88 percent (n= 189) had at least one follow-up visit and 82 percent (n= 173) were seen at eighteen months. The Bayley Scales of Infant Development were administered to the infants. In addition, at four and eight months, the Movement Assessment of Infants was used to evaluate muscle tone, disappearance of reflexes, automatic reactions, and voluntary movement. A score of fifteen or more on this test suggests a high risk of cerebral palsy. At 18 months, a developmental paediatrician also performed a neurological exam on infants to diagnose cerebral palsy.

Mean scores on the Bayley Scales were found to be higher for infants in the IA group at four, eight, and eighteen months of age. However, the difference was not statistically significant. Scores below 83 on the Bayley scales were significantly more common in infants from the EFM group. The median number of risk points on the Movement Assessment of Infants was higher in the EFM group at four and eight months of age. In addition, the researchers found a 2.9-fold increase in the chance of having cerebral palsy for infants in the EFM group compared with infants in the IA group. In the EFM group, the incidence of cerebral

palsy was increased with the duration of abnormal fetal heart tracings in labour. In the EFM group, the median time between recognition of abnormal fetal heart rate patterns and delivery was 104 minutes. In the IA group, this interval was 60 minutes. The researchers suggest that clinicians caring for patients receiving EFM may be falsely reassured by signs, such as baseline variability, that cannot be measured by IA (Shy et al., 1990).

The follow up study by Shy et al. (1990) differs from that of Langendoerfer et al. (1980) in that Shy et al. (1990) found a significant difference in neurological sequelae between infants in the EFM group and infants in the IA group. However, Shy et al. (1990) were investigating a sample of preterm infants, where the likelihood of morbidity is high (Luthy et al., 1987).

McCusker, Harris and Hosmer (1988), carried out a retrospective study, where data on deliveries were collected from the National Natality Survey in the United States. These data consisted of information obtained from birth certificates, hospitals, married mothers, and attendants at delivery. The study sample excluded births where the gestation was under 28 weeks, where there were major congenital anomalies, multiple births, deliveries outside this hospital, or repeat caesarean sections. The resulting sample consisted of 5,863 deliveries. Authors found that EFM was related to a higher caesarean section rate in pregnancies uncomplicated by placenta previa, transverse lie, or inadequate pelvis. Electronic fetal monitoring was associated with more five minute Apgar scores less than six if delivery was by caesarean section. Electronic fetal monitoring was associated with a slight increase in respiratory distress syndrome; however,

the authors conceded that confounding variables may have accounted for this effect (McCusker et al., 1988).

The non-experimental design of this retrospective study, as compared with the previous randomized controlled trials, limits its usefulness in generalizing to other populations.

Vintzileos, Antsaklis, Varvarigos, Papas, Sofatzis, and Montgomery (1993) studied the effect of EFM on type of delivery and neonatal outcome in two hospitals in Athens, Greece. The study included both high and low risk patients. Patients with a single live fetus over 26 weeks gestation were included in the study. Patients were excluded if their physicians did not wish to participate in the research. The institutions were selected as the setting for the study because of their high perinatal mortality rates. Randomization occurred by coin toss. A total of 1,428 patients were enroled in the study: 746 in the EFM group and 682 in the IA group. Demographic variables were similar for both groups. Patients in the EFM group experienced longer labours and greater use of oxytocics for augmentation of labour than patients in the IA group. The study revealed an increased incidence of caesarean delivery for suspected fetal distress in the EFM group. As well, the incidence of vacuum extraction and of vacuum extraction for fetal distress were higher in the EFM group. Total operative delivery rate was significantly higher for patients in the EFM group compared with that of patients in the IA group.

The study by Vintzileos et al. (1993) differs from other studies in that it revealed a higher incidence of perinatal deaths in the IA group. There were two perinatal deaths in the EFM group and nine in the IA group. Authors concluded that neither of the

deaths in the EFM group was related to hypoxia: one occurred in an infant with congenital heart disease; the other infant died of hemorrhage and disseminated intravascular coagulation resulting from trauma of the tongue which occurred during an attempt to entubate this infant to suction meconium from the airway. In the IA group, three of the nine infant deaths were believed to be unrelated to the method of monitoring. Two infants were severely preterm--one of these infants also had non-immune hydrops. The third infant in the IA group died from complications related to gastroschisis. This left no infants in the EFM group and six infants in the IA group who are believed to have died from fetal hypoxia. This difference between groups is statistically significant ($p = .03$). The study did not reveal any significant differences between the two groups in the following measures: Apgar scores less than 7, cord arterial pH less than 7.10, neonatal resuscitation, assisted ventilation, hospital stay, intrapartum fetal deaths, neonatal deaths, and neonatal complications including hypoxic encephalopathy, intraventricular hemorrhage, seizures, hypotonia, necrotizing enterocolitis, respiratory distress, sepsis, hyperbilirubinemia, hypoglycemia, or congenital anomalies. Data were reviewed every three months. The study was terminated prior to completion because of the increase in perinatal mortality in the IA group. Limitations of the study were addressed. One unavoidable limitation was that it was not possible to study all consecutive patients as some physicians did not wish to participate in the trial. A second limitation was that the study was terminated prior to its completion.

The authors discuss the strength of their study over

previous randomized controlled trials. For example, the study did not use back-up methods, such as fetal scalp sampling, to diagnose fetal distress. There was also no crossing over to another method of monitoring in the event of abnormal heart rate patterns. The authors argue that this study's strength is in comparing the two methods of monitoring used alone. As well, both high and low risk deliveries were studied, including deliveries in which there was thick meconium. The authors point out that a statistical power analysis was performed prior to the study to estimate sample size required to show a significant difference in perinatal mortality rates. They state that the only other study in which this was addressed was the Dublin trial of 1985. Other strengths of the study that the authors identify are a one-to-one nurse-patient ratio, a setting with a high perinatal mortality rate, and pediatricians being blind to the method of monitoring used during labour (Vintzileos et al., 1993).

Although the investigators carried out a power analysis to determine ideal sample size, it should be noted that the trial did not reach its goal of 2,210 patients. It also should be noted that this study was not unique in its one-to-one nurse-patient ratio, inclusion of high risk patients, or in keeping pediatricians blind to the method of monitoring.

Vintzileos et al. (1993) stress that the clinical settings used may not be similar to some settings in North America where scalp pH is used. As well, they believe that neonatal care in some neonatal intensive care units in North American hospitals may be more expert. They believe, however, that the level of care in their hospitals is equivalent to the care in level one hospitals

in the United States. By their own admission the perinatal mortality rate in their settings is usually high at 21 per 1000 total births. It should be noted that a review of the last available statistics for Manitoba for 1988 revealed a perinatal mortality rate of 8.0 per 1000 total births-- ranging from 9.3 in Indian Reservations and Unorganized Territories to 5.7 in the Eastman area. Perinatal death rate for the Norman area and the Thompson area were not calculated due to low incidence (Manitoba Health, 1990). Perinatal mortality rates for Canada for 1991 were 6.8 per 1000 total births (Statistics Canada, 1991; Wadhera & Strachan, 1992). This is well below the mortality rate seen in the study hospitals in Athens. Statistics suggest that perinatal care may differ considerably between hospitals in Athens and in Canada.

Finally, Rosen and Dickinson (1993) reviewed the literature and examined the primary research that focused on fetal heart rate patterns and the development of neurological injury in infants. The purpose of the study was to determine if there were particular fetal heart rate patterns that were associated with neurological damage or perinatal death. The authors hoped that intervention might prevent these outcomes.

Ten research articles were reviewed. To be included in this study, the research reports needed to identify fetal heart rate monitoring patterns and discuss neonatal seizures, brain hemorrhage, acute neurological signs, or cerebral palsy as outcomes (Rosen & Dickinson, 993).

Although some of the studies reviewed showed an association between abnormal fetal heart rate patterns and neurological signs

or intraventricular hemorrhage in infants, Rosen and Dickinson (1993) conclude that there is no specific fetal heart rate pattern that will predict brain damage.

In a second part of this study, clinical data of 55 infants who had neurological injury or who died during the neonatal period were examined. Of the 55 tracings examined, 56% (n= 31) had some abnormality in fetal heart at the onset of monitoring, 51% (n= 28) had some abnormality throughout the tracing, and 16% (n= 9) had no abnormality of fetal heart throughout their tracing. In the fetuses who displayed some abnormality of fetal heart rate pattern during labour, there was no single fetal heart rate patterns present that could be associated with neurological signs and symptoms. The authors recognized the lack of consistency in describing fetal heart rate patterns. They concluded, however, that there is no true way to predict or prevent neurological morbidity using EFM (Rosen & Dickinson, 1993).

In summary, five of the nine prospective randomized controlled trials reviewed showed an increase in the incidence of caesarean sections associated with the use of EFM (Haverkamp et al., 1976; Haverkamp et al., 1979; Kelso et al., 1978; Leveeno et al., 1986; Renou et al., 1976). Five trials found an increase in the incidence of caesarean delivery for fetal distress in the EFM group (Haverkamp et al., 1976; Haverkamp et al., 1979; Leveeno et al., 1986; MacDonald et al., 1985; Vintzileos et al., 1993). Not all trials addressed the incidence of forceps deliveries or vacuum extraction. However, in one study a significant increase in the number of forceps deliveries was found in the EFM group with more forceps deliveries prompted by abnormal fetal heart rate in this

group (MacDonald et al., 1985). Vintzileos et al. (1993) found in increased incidence of vacuum extraction for fetal distress in the EFM group. Wood et al. (1981) found an increase in the incidence of total operative deliveries (caesarean sections and forceps deliveries) in the EFM group.

Most of the trials did not show an appreciable difference in perinatal mortality between the control group and the experimental group (Shy et al., 1987; Snydal, 1988a). Only the study by Vintzileos et al., (1993) showed a significant difference in perinatal mortality in the IA group. However, the high overall perinatal mortality rates in the settings used suggests that neonatal intensive care practices differ between the institutions used and Canadian health care institutions. As well, none of the studies showed patterns of differences in parameters of neonatal assessment, including Apgar scores, the number of days in intensive care, umbilical cord gases, and special procedures. Renou et al. (1976) and MacDonald et al. (1985) found an increase in neurological signs and symptoms in infants from the IA group. However, this was not supported by the other randomized controlled trials (Snydal, 1988a; Thacker, 1987).

While the use of EFM may contribute to an increase in interventions during labour, there is little solid evidence that it improves neonatal wellbeing. Several authors have concluded that the use of EFM is not indicated in all labours (American College of Obstetricians and Gynaecologists, 1989; Canadian Task Force on the Periodic Health Examination, 1989; Freeman, 1990; Haverkamp et al., 1976; Haverkamp et al., 1979; Langendoerfer et al., 1988; Leveeno et al., 1986; Lumley, 1982; Luthy et al.,

1987; McCusker, 1988; Renou et al., 1976; Sandmire, 1990; Simkin, 1986; Snydal, 1988a; Shy et al., 1987; Shy et al., 1990; Thacker, 1987; Wood et al., 1981). Indeed, based on a review of randomized controlled trials, the Canadian Task Force on the Periodic Health Examination (1994) recently recommended that the use of EFM should be excluded in low risk labouring patients. As well, the task force states that there is little evidence to suggest that EFM should be used in high-risk patients. The authors suggest that this does not indicate that EFM may not be beneficial in high-risk situations, only that there is little evidence for recommending either the inclusion or exclusion of EFM in high-risk labouring patients (Canadian Task Force on the Periodic Health Examination, 1994).

Mothers' attitudes toward the use of EFM during labour

Several studies have examined the attitudes of mothers toward the use of EFM during labour. These studies are summarized in Appendix D.

Starkman (1977) interviewed a convenience sample of thirty-five women. In the first sub-sample of 25 women, four had a history of second or third trimester fetal loss; five had a history of first trimester spontaneous abortion; six of the pregnancies were unplanned, and seven of the 25 patients delivered by caesarean section. Since a number of these women had poor obstetrical histories, an additional sub-sample of ten patients was selected. Two of these patients had a history of first trimester spontaneous abortion. Four of the ten pregnancies were unplanned. All ten women delivered vaginally and all newborns

were healthy. The author does not mention at what point in the post-natal course these interviews were carried out other than implying that they were done prior to the mother's discharge from hospital. As well, it is not mentioned if EFM was done externally, internally, or with a combination of methods (Starkman, 1977).

The monitor was seen variously by the women as a protector, an extension of themselves, an aid in communication, an extension of the baby, a positive influence of facilitating the participation of the husband in the labour, a distraction, a competitor for the husband's or physician's attention, a mechanical monster which caused discomfort and enforced immobility, a source of anxiety, and a danger to the baby (Starkman, 1977).

Of the 25 women in the first sub-sample, fourteen women gave positive responses, ten women gave mostly negative responses, and one woman gave neutral responses. All nine patients who had experienced a previous fetal loss gave positive responses; only five of the fifteen women who had not experienced a previous fetal loss gave a positive response. As well, of the four women who gave very positive responses, three women had a history of second or third trimester fetal loss; the other woman had a history of infertility of more than five years (Starkman, 1977).

Of the ten women in the second sub-sample, two women gave mostly positive responses; the other eight women gave mostly negative responses. Nine of these women did, however, mention some benefits of the monitor in terms of telling them when a contraction was at a peak and in involving their spouses in the

labour process. Common difficulties with the monitor involved enforced immobility and lack of privacy (Starkman, 1977).

Shields (1978) also investigated the attitudes of women toward EFM during labour. Shields interviewed 30 patients who had had internal fetal monitoring during labour. Interviews were conducted within 48 hours of delivery. A Mood and Feelings Inventory was used during the interview to determine the women's attitudes toward monitoring. The inventory consisted of eight negative adjectives and six positive adjectives. The women were asked to determine how they had felt during the monitoring experience. They were asked to rate how the adjectives corresponded to their feelings on a range of one (not at all) to six (very much). Open-ended questions also were used in the interview and patients were asked to describe the monitoring experience in detail (Shields, 1978).

Some of the concerns that patients had about monitoring included fear that the scalp electrode would harm the baby, difficulty in getting comfortable and having too little information about the monitor. In addition, women mentioned the discomfort of vaginal examinations and the fact that personnel were more interested in the machine than in the patient. One woman worried that the baby's heart would stop if the machine stopped (Shields, 1978).

Some of the positive responses included a fascination with the monitor, a belief that the monitor was an "exciting idea", and a perception that the monitor was reassuring. Twenty-seven women (90%) felt that they had received enough information about the monitor. Generally, women responded favourably to monitoring

(Shields, 1978).

Many of the feelings expressed by the women in Shield's (1978) study parallel the feelings identified in the study by Starkman (1977). Discomfort, fear of harm, anxiety, feeling secondary to the machine, excitement, and reassurance were common themes in both studies.

In 1977, Beck (1980) determined the responses of 50 women to the use of EFM during labour. The study was carried out in a 350 bed hospital in the United States. A convenience sample of 50 women participated in the study. These women were interviewed some time during the first three days postpartum. The women had been monitored an average of four hours and 42 minutes; the length of time monitored ranged from 30 minutes to 16 hours; the median time was three hours and fifteen minutes. The author does not state if these patients had high or low risk pregnancies.

Women's responses were divided into initial and subsequent responses. Initial responses consisted of the patient's recollection of their initial thoughts when told they would be monitored. Subsequent responses consisted of the patient's recollection of the experience while the electronic fetal monitor was attached. Responses were further categorized as positive, negative, and neutral. Positive responses included responses in which the women perceived the fetal monitor as helpful, favourable, and desirable. Negative responses included responses where the women saw use of the monitor as unfavourable, upsetting, or distressing. Neutral responses included responses that could not be categorized as favourable or unfavourable. The inter-rater reliability of the research instrument, determined by having a

second faculty member categorize the women's responses, was .95 (Beck, 1980).

Twenty-two percent (n=11) of the women had initial positive responses to monitoring. Twenty-two percent (n=11) had initial negative responses and 56% (n= 28) had initial neutral responses. Thirty-one subsequent responses differed from the initial responses. The majority of the women's responses (n= 18) changed from neutral to positive. Eight women's responses changed from negative to positive, two responses changed from negative to neutral, and three responses changed from neutral to negative (Beck, 1980)

The author found that older women initially reacted more positively to fetal monitoring than younger women. In addition, married women initially had more positive responses to monitoring than single women (Beck, 1980).

During the interviews, women were asked if there was anything they especially liked or disliked about the monitoring. Some of the feelings identified are similar to the responses given in the previous studies by Shields (1978) and Starkman (1977). Some women liked the sense of security they had while being monitored. Women believed the monitor helped them and their husbands determine when a contraction started. Things women disliked were the discomfort of the belts pressing on their "stomachs", fear that the monitor would hurt the baby, and anxiety when the monitor became unattached (Beck, 1980).

McDonough, Sheriff, and Zimmel (1981) carried out a similar study. A questionnaire and interviews were used to evaluate the responses of 50 mothers and fathers to the use of EFM during

labour. Twenty-five of the mothers were primiparous, 25 were multiparous. The authors do not say how this sample of women was selected. Thirty-six mothers were familiar with EFM before they entered the hospital. The interviews were done the day following delivery. The researchers admit that the reliability and the validity of the questionnaire had not been tested (McDonough et al., 1981). In addition, from the questionnaire, it appears that items are written in such a way that the mothers were actually responding for the fathers and reporting how they believed the fathers perceived EFM. This, then, was not a first-hand account of the fathers' beliefs.

Most mothers reported not feeling fearful for their babies during labour because of the monitor. Most mothers said they would request EFM during a subsequent labour. Mothers who had caesarean sections believed their babies benefited from use of the monitor. Mothers who had experienced labours where there was fetal distress believed that, without the use of the monitor, their babies might have been born ill or might have died. Most mothers believed that an explanation of the monitor and what it involved helped to decrease their fears of monitoring and the discomfort associated with the internal examinations necessitated by the monitoring (McDonough et al., 1981).

According to the women surveyed, most fathers believed that the mothers and babies received better care during labour because of the monitor. Fathers believed they could coach their wives better because of the presence of the contraction graph on the monitor. A few mothers felt uncomfortable with the monitor, especially during the active phase of the first stage of labour.

Most women did not report any discomfort from the use of the monitor (McDonough et al., 1981). The lack of documentation about the selection of this sample and asking the women to interpret their husbands' beliefs limit its usefulness in generalizing to other labouring couples.

In the study by Molfese, Sunshine, and Bennett (1982), samples of women were randomly drawn from hospitals that routinely used EFM during labour. A sample of 80 women from a university medical center and 100 women from a community hospital was selected. Demographic characteristics were similar for both groups except that the average family income and level of education of women who confined at the medical center were higher. The study consisted of two phases. First, women were interviewed one to two days after delivery and asked to describe, in as much detail as they wished, their reactions to EFM. The subjects also were asked to complete a written questionnaire. The questionnaire contained 61 items which women were asked to rate on a five point, Likert-type attitudinal scale. An obstetric scale, based on maternal health, pregnancy complications, and birth characteristics determined the risk of infant mortality. A higher score meant a more optimal medical history (Molfese et al., 1982).

Interview responses were scored as "three" if the women gave only positive responses, "two", if positive and negative responses were given, and "one" if only negative responses were given. The mean was 2.62 for the medical center sample and 2.60 for the community hospital sample. The mean scores indicate positive responses (Molfese et al., 1982).

Sixty of the 80 women in the medical center sample and 72 of

the 100 women at the community hospital gave responses which scored a three. Eight of the 80 women at the medical center and 12 of the 100 women at the community hospital gave responses which scored a one. Generally, in the medical center sample, women of lower income were more likely to view monitoring as a protector for the baby and to have positive feelings about the monitor. These women were less likely to see the monitor as providing information to nurses and themselves and were less likely to use the monitor to determine the beginning and peak of contractions. Women with a more optimal obstetric scale score, who were older, and who had more education were likely to view the monitor as non intrusive, not as a competitor for their attention but as a source of information (Molfese et al., 1982).

In the community hospital, women whose interview reactions were positive, who were in the upper income groups, or who were lower in parity were more likely to view the monitor as helpful and understandable and not a source of worry. These women saw the monitor as a benefit to the staff and baby but were not likely to use it for contractions (Molfese et al., 1982).

Women in both samples believed they understood the purpose of the monitor. Mothers and their husbands found the monitor useful for coping with the contraction, for involving the husband in the labour, and for providing reassurance about the baby's wellbeing. Women believed that the monitor was there to help, that staff was knowledgeable about the equipment, and that the light of the monitor did not bother them. Women did not see themselves as competing with the monitor for attention. The women did not agree that the monitor provided little information to the

doctor, that the monitor interfered with contractions, and that the monitor was distressing and annoying (Molfese et al., 1982).

Some aspects of monitoring which women disliked included equipment breakdowns, repeated detachment of the scalp clip, and the discomfort of the external monitor strap. Few women gave totally negative responses about monitoring (Molfese et al., 1982).

The previous studies examined women's reactions to "conventional" EFM. The study by Hodnett (1982) differs in that it examined women's responses to two types of monitoring. Thirty low risk primiparous patients were randomly assigned to either the control group (electronic monitoring) or the experimental group (radiotelemetric monitoring). In the control group, the monitor was attached to the patient; patients monitored in this manner were restricted in their activity. In the experimental group, the fetal heart rate was monitored by a portable unit which was attached to the patient. Patients monitored in this manner had more freedom to ambulate and were less restricted in their activities. Included in the study were women who had attended prenatal classes, consented to participate in the study, and had uncomplicated vaginal deliveries in a major teaching hospital in Toronto. For the electronic monitoring group, the decision to use internal or external monitoring was made by the physician. For the telemetry group, monitoring was done by scalp electrode only. Until the membranes became ruptured, women in the telemetry group were monitored electronically. Factors such as medical stimulation of labour, length of time monitored, and length of time from admission to delivery were comparable for both groups.

During labour, each woman kept a record of the amount of time spent out of bed during labour. Within 48 hours of delivery, each woman completed a Labour Agentry Scale. The Labour Agentry Scale is a 28 item scale which measures experienced control during labour. The reliability of the scale in the study was determined to be .98 (Hodnett, 1982).

The author found that the mean time spent out of bed during labour was significantly greater for the experimental group (142.7 minutes) compared with the control group (8.7 minutes). Pain control for these patients was accomplished by the administration of epidural anaesthesia. All women in the control group received an epidural anaesthetic during the first stage of labour. Six of the women in the telemetry group received no anaesthesia during the first stage of labour. Of these six women, four delivered spontaneously with no anaesthesia other than local infiltration for the episiotomy repair (Hodnett, 1982).

The experimental group scored significantly higher in the Labour Agentry Scale than the control group. Eight women in the experimental group stated that their labours were more pleasant than they had anticipated. Only one control subject gave a positive response to this question. The other fourteen women gave more negative responses and said that their labours were more painful, longer, or less satisfying than they had anticipated (Hodnett, 1982).

A significantly greater number of women in the telemetry group believed they had maintained control during labour. One woman in each group said that the fetal monitor had no effect on their labour. Fourteen of the fifteen women in the telemetry

group responded favourably with respect to the influence of the monitor. Most responses focused on the reassurance about the wellbeing of the fetus and freedom to move around. Only five women in the control group believed that the monitor had a positive effect on their labour. Two women in the control group gave totally negative responses; seven gave a variety of responses. Negative responses centred around the discomfort of the belts and the monitor's interference with movement. Two women in the control group said that the monitor produced anxiety about the wellbeing of the baby (Hodnett, 1982).

Some of the positive and negative responses elicited by women in the EFM group are consistent with those obtained by Starkman (1977), Shields (1978), Beck (1990), McDonough et al., (1981), and Molfese et al. (1982). However, all these studies examined the responses of women who were monitored electronically either by the conventional method or by telemetry. The approach of Garcia et al. (1985) differed in that their study also examined responses of women monitored by IA. As well, Garcia et al. (1985) used an experimental design in their study. Between March, 1981 and April, 1983, 13,000 low risk labouring women were randomly assigned to either EFM or IA. A sub-sample of 200 women, 100 from each group, was randomly selected for this study and interviewed during their postpartum stay in hospital. The groups were similar with respect to marital status, parity, mean age, social group, mean birth weight of the baby, and attendance at prenatal classes (Garcia et al., 1985).

The study addressed four hypotheses. The first hypothesis was that women monitored by EFM would feel more restricted in

their movements during labour. This hypothesis was supported by the data. Seventeen women in the EFM group felt too restricted during labour; only six women in the IA group believed that their movement was restricted (Garcia et al., 1985).

The second hypothesis was that the attention of midwives, physicians, and spouses would be divided between the mother and the monitor and that women with EFM would report they received less support. This hypothesis was not supported by the data. The data did suggest, however, that women assigned to EFM were more often left alone for short periods. Of the women who had been left alone, the majority said they did not like that. Thirty-three women in the EFM group reported being left alone while twenty-two women in the IA group reported the same (Garcia et al., 1985).

The third hypothesis, that EFM will provide more reassurance to mothers, also was not supported by the data. Forty-one women in the EFM group and 44 women in the IA group said they had worries and anxieties during labour (Garcia et al., 1985).

The fourth hypothesis, that the electronic fetal monitor would encourage mothers to ask more questions of staff and that the staff would provide more information, also was not supported by the data (Garcia et al., 1985).

Only eight percent of the women who had been monitored electronically said they would prefer IA in a subsequent labour; 32 percent of the women who had had IA would choose EFM next time. Some women who were monitored electronically found this method of monitoring confining. Some found the belts uncomfortable and others found the noise of the monitor distracting. Some women

found IA uncomfortable; this was attributed to the use of the Pinard stethoscope. Some women reacted favourably to the EFM and found the monitor reassuring; others believed that the monitor produced anxiety when it malfunctioned (Garcia et al., 1985).

Killien and Shy (1989) also used an experimental design to determine differences in reactions between women monitored electronically and those monitored by IA. The purpose of this study was to see if mothers' views of their preterm labour differed depending on the method of monitoring. On admission to the labour suite, 246 women were randomly assigned to either EFM or IA. The sample consisted of 135 women who delivered a viable, medically stable baby, between 26 and 32 weeks gestation, with a newborn birth weight between 700 and 1750 grams. Patients on EFM were monitored externally until such time that the membranes ruptured; they were then monitored internally. Patients in the IA group were monitored with either a deLee stethoscope or amplified doppler device. Each patient was assigned a study nurse for the duration of their labour and delivery. During the first or second day postpartum, subjects were asked to answer and return a questionnaire that measured their perceptions of monitoring and of the physician and nurse support they received during labour. The research instrument addressed preparation for labour, personal and infant characteristics, intrapartum characteristics, intrapartum care, perceived control, responses to labour, and evaluation of labour. The sub-scales had a reliability which ranged from .77 to .90. Items on the questionnaire had a fixed response format; items used either a Likert-type attitudinal scale or a semantic differential scale (Killien & Shy, 1989).

Killien and Shy (1989) found that, in general, women in both groups evaluated their labour favourably. Women in the IA group gave slightly more positive responses to the monitoring, nursing support, and support by physicians. However, this difference did not reach statistical significance. Researchers concluded that the method of monitoring did not affect the women's views of labour. The type of support provided by nursing and medical personnel had a greater impact on women's views of labour than infant status, the type of delivery, or the type of technology used (Killien & Shy, 1989).

Most of the studies measuring women's perceptions of EFM during labour have used questionnaires or interviews administered during the early postpartum period. Kruse (1984) suggests that intense emotions associated with becoming a new mother may have had an impact on the women's perceptions of EFM and affected the results of these studies. The aim of the study by Kruse (1984) was to determine attitudes of mothers toward EFM at two to five months postpartum. Seventy-nine out of 110 women (72%) returned the mailed questionnaires. Twenty-four items were rated on a five point Likert-type attitudinal scale. There were four categories of items: information provided by the monitor, comfort and distraction of the monitor, invasion of privacy by the monitor, and reassurance provided by the monitor. Women were excluded from the sample if they had confined prior to the thirty-sixth week gestation or if they had a repeat or elective caesarean section. Seventy-five of the 79 women had been monitored electronically during labour. Most of the women had no complications with either the previous or current pregnancy or delivery. However, eight

percent of women had a history of one or more of the following complications: elevated blood pressure, pregnancy induced hypertension, diabetes, preterm labour, maternal or infant infection, admission of the newborn to an intensive care unit, or fetal or neonatal death (Kruse, 1984).

Most women responded favourably to 23 of the 24 items on the questionnaire. Of the 75 women who had been monitored electronically, 74 gave more favourable responses than negative responses about the fetal monitor. Fourteen women gave all positive responses to all the items. No woman gave only negative responses. Seventy percent of all women believed they had been given enough information about the monitor before labour. Generally women saw the monitor as providing information and reassurance. They did not view the monitor as an invader of privacy or a source of discomfort or distraction. However, 20% of women believed that the monitor caused some physical discomfort, while 24% said that the monitor restricted their activity too much. Black women tended to view the monitor more as a source of discomfort or distraction, an invasion of privacy, and less of a provider of reassurance compared with white women (Kruse, 1984).

In summary, the studies in this area have indicated that, generally, women respond favourably to EFM (Beck, 1980; Garcia et al., 1985; Killien & Shy, 1989; Kruse, 1984; McDonough et al., 1981; Molfese et al., 1982; Shields, 1978; Starkman, 1977). However, several of these researchers only studied one type of monitoring (Beck, 1980; Kruse, 1984; McDonough et al., 1981; Molfese et al., 1982; Shields, 1978; Starkman, 1977). Although Hodnett (1982) studied two methods of monitoring, both methods

involved electronic monitoring. In many of these studies, the opportunity to examine women's responses to IA was omitted (Snydal, 1988b). In addition, the timing of data collection may have had impact on the women's responses. Earlier studies by Starkman (1977) and Shields (1978) were done at a time when EFM was used largely for high risk labours; later studies by Kruse (1984) and Garcia et al. (1985) were done at a time when EFM was becoming more widespread. Standards of care have changed in that time span. Similarly, standards of care then may differ from present standards of care. This might affect the women's reactions and the results of the studies on patients' perceptions to EFM (Snydal, 1988b).

Small convenience samples found in the studies by Beck (1980), Starkman (1977), McDonough et al., (1981), and Shields (1978), limit the generalizability to other populations (Snydal, 1988b) . Although the studies by Molfese et al. (1982), Kruse (1984), Hodnett (1982), and Garcia et al. (1985) mentioned randomized samples, only the study by and Killien and Shy (1989) describe how randomization was accomplished. Kruse (1984) discussed selecting subjects by use of a random numbers table. As well, Snydal (1988b) suggests that, as the study by Garcia et al. (1985) was already part of a larger randomized controlled trial, selection of samples in this trial was likely randomized.

None of the researchers addressed the validity of their research instrument. Reliability of the tool is mentioned in three of the nine studies; Beck (1980) addressed inter-rater reliability. Hodnett (1982) and Killien and Shy (1989) addressed the internal consistency of their questionnaires.

In the studies that used an interview format, the authors did not discuss what steps were used to minimize or prevent interviewer bias (Snydal, 1988b). As well, several researchers used a forced choice scale rather than open ended questions in their research. Snydal suggests that distortion in findings is greater when a forced choice scale is used as compared with open ended questions. Negative responses are voiced more freely when open ended questions are used (Snydal, 1988b).

As well, when interviews are used, Snydal suggests that women may respond by voicing what they believe is socially acceptable. For example, if women believe that the monitor is an acceptable standard of care, they may minimize negative feelings they have about monitoring for fear of being seen as putting their own needs before the needs of their babies (Snydal, 1988b).

Another major difficulty with most studies is the timing of the interview or the questionnaires in relation to the time of delivery. All studies, with the exception of the study by Kruse (1984), examined women's reactions immediately after delivery, prior to discharge from the hospital. Feelings of ecstasy or presence of postpartum blues may influence the responses of these women (Snydal, 1988b). In addition, women were expected to try to recall how they felt at the time of the monitoring experience. These recollections, several days postpartum, may not be accurate.

Snydal (1988b) also suggests that women respond favourably to the method of monitoring to which they were exposed. As the women in most studies were exposed to only one method of monitoring, EFM or IA, Snydal believes that women's responses may

reflect a loyalty to that method of monitoring rather than their true experiences. In a study on antenatal care, Porter and MacIntyre (1984) concluded that patients were generally satisfied with whatever arrangements were made for their care. Snydal (1988b) believes that a similar attitude of "what is, must be best" (Porter & MacIntyre, 1984, p. 1197) prevails with regard to the use of EFM during labour. In addition, Queniart (1992), in a phenomenological study of women during pregnancy, found that many women were willing to undergo procedures associated with risks to ensure that their baby was normal and well. A belief that the monitor is a superior method of assessment, may reinforce this loyalty for women who were monitored electronically (Snydal, 1988b).

In conclusion, studies have shown that although some women find EFM uncomfortable, restricting, and anxiety producing, generally women respond favourably toward EFM. However, the limitations in sampling and the design of these studies cast doubt on some of the results obtained.

Nurses' attitudes toward the use of technology

Little research has been done on the attitudes of nurses toward the use of technology.

Although Brunt's (1985) study did not examine the attitudes of nurses, it did look at the relationship between technology and nurses' empathy. Brunt used a quantitative approach and examined the opinions of nurses who worked in four settings of an acute care hospital. Nurses who worked in a surgical intensive care unit (n=14), cardiac care unit (n=18), medical recovery unit

(n=12), and surgical recovery unit (n=10) participated in the study. Brunt (1985) used a Likert-type scale to measure nurses' perception of technology. Nurses were asked to estimate how often they used different types of equipment in their care of patients. The scale was a five point scale ranging from "never" to "almost always". The number of items in the research instrument is not stated.

The Hogan Empathy scale, consisting of 64 items, measured empathy. Nurses were asked to respond "true" to the items on the scale which reflected their experience and "false" to the items which did not. Brunt (1985) found that there was no relationship between the nurses' perception of how often technology was used and the degree of empathy expressed.

A study carried out in the Netherlands examined the attitudes of Dutch physicians, nurses, and consumers of health care with respect to health care policy and technology (Tymstra & Andela, 1993). A Likert-type attitudinal scale was completed by 72.8 percent of the nurses (n=341), 52.7 percent of the physicians (n=1144), and 95.8 percent of the citizens (n=1624) contacted. Physicians and nurses were selected at random from the Medical Profession Registry and the Dutch Society of Nurses. It is not stated how the sample of citizens was selected.

Physicians rated the "public tendency to consume" (Tymstra & Andela, 1993, p. 2996) as playing a larger role in the increasing health care costs than did nurses and citizens. All groups reported they perceived a relationship between medical technology and increased health care costs. The majority of physicians (82.1%) and nurses (74.1%) believed that the public's expectation

of medical technology was too high; only 49.5 percent of consumers held this opinion. A majority (56%) of consumers believed that new technology made an important contribution to society; 41.8 percent of physicians held this opinion while 22.6 percent of the nurses believed this to be true. Slightly more nurses than physicians and consumers believed that, when decisions were made about the implementation of new treatments, too little attention was paid to the patient's quality of life (67.3%, 52.1%, and 54.7% respectively) (Tymstra & Andela, 1993).

When examining respondents' beliefs about the effect of technology on primary care, 75.8 percent of the nurses believed that the development of new technologies was at the expense of primary care for the handicapped or the sick; 52.8 percent of physicians and 38.7 percent of consumers shared this belief. If individuals had to choose between investing in new technologies or primary care of the handicapped or the sick, 98.5 percent of the nurses, 88.9 percent of the physicians, and 90.4 percent of the consumers would invest in primary care (Tymstra & Andela, 1994).

The authors concluded that health professionals were concerned about the increase in medical technology and believed that this increase in medical technology was at the expense of the care of the sick and handicapped (Tymstra & Andela, 1993).

A study by Schwirian, Malone, Stone, Nunley, and Francisco (1989) compared the attitudes of nurses and nursing students toward the use of computers in nursing practice. The investigators examined the attitudes of 353 nursing students in a baccalaureate program toward computer applications in nursing and toward technology in general, as well as their prior experience

with computers. The study was carried our over a three year period. A 17-item Likert-type scale composed of three sub-scales was used to measure attitudes towards computer application in nursing. Attitudes toward technology in general were measured by an eight item Likert-type attitudinal scale. Students' prior experience with computers was examined by evaluating responses on an eight item, semi-structured questionnaire. For the 358 practising nurses, only their attitudes toward computer application in nursing were examined (Schwirian et al., 1989).

The study revealed that nursing students had little experience with computers. Few students owned a computer, nor did they foresee owning one in the near future. Students' attitudes toward the use of computers in nursing were positive. Students who owned a computer, who planned to own a computer before graduation, or who had a computer in their home, showed more positive attitudes toward the use of computers in nursing. As well, students whose personal work experience and scholastic experience included the use of computers had more favourable attitudes than those who did not (Schwirian et al., 1989).

Nursing students and nurses generally had a positive attitude toward the use of computers in nursing. The nursing students had a more positive attitude than did practising nurses. However, this difference was related to scores in the sub-scale which measured nurses' interactions, patient care, and computer support for nursing care. For the sub-scales that measured personal security and computers and general attitudes toward computers, the nurses' scores were slightly higher than the scores of the nursing students. The difference, however, was not

statistically significant. Nurses' dissatisfaction with the use of computers in nursing was related to computer malfunctioning (Schwirian et al., 1989).

Ngin, Simms, and Erbin-Roesemann (1993) examined work excitement among nurses who use computers. Nurses in three teaching hospitals participated in the study (n=268). Thirty-eight participants stated they has no experience with computers; 216 stated they had some experience. Four respondents did not indicate their level of computer literacy. Of the nurses who had experience with computers, seven believed their skill with computers to be at the expert level, 87 rated their skills at the intermediate level, and 122 rated their skill at the novice level. Work excitement was assessed by examining nurses' responses to a Likert-type scale. Nurses were asked to rate items on a four point scale ranging from "not excited at all" to "very excited". The number of items in the work excitement scale is not stated. Nurses were also asked to rate items to determine which aspects of nursing they believed were interesting, exciting, frustrating, or exhausting. The number of items in these categories ranged from 23 to 35 items (Ngin et al., 1993).

The researchers found a significant relationship between computer usage and work excitement. Nurses with expert computer skills had higher levels of work excitement than nurses who were novices with computers. Nurses with intermediate skill levels also had higher levels of work excitement than novices. Nurses with higher levels of work excitement found the use of computers exciting. Users of computers were found to be more interested in their work than nurses who did not use computers. A high

technology atmosphere, urgent and fast paced situations, interesting or exciting work, autonomy, accountability, and interest in their specialty were factors which made computer user's work interesting (Ngin et al., 1993).

Computer users indicated that new people, a fast pace, technical aspects of computers, high patient acuity, unpredictable and crisis situations, assessment opportunities, and using a computer made their work exciting. Users were less negative about their work. Non-users identified too much written work, low unit morale, high patient acuity, overtime, and dealing with other departments as factors which made their work frustrating. Computer users found fewer nursing activities exhausting than did non-users. Activities that users rated as exhausting were: routine patient care, not being busy, self abusing patients, no time for breaks, negative attitude of staff, staff conflicts, and problems with other departments. Non-users rated mandatory overtime, transferring patients in bed, too many patients, demanding families, debilitated patients, fast pace, paper work, dealing with unhappy/difficult patients, decreased staffing, and families who refuse to accept a diagnosis as exhausting (Ngin et al., 1993).

Fifty-five percent of nurses believed that computers would make their work easier. Seven percent believed that computers along with other equipment would make their work easier. The researchers concluded that computer skills are related to work excitement and that nurses perceive that computers would make their work easier. Overall, nurses have a positive attitude toward the use of computers in nursing (Ngin et al., 1993).

McConnell (1990) used a grounded theory approach and interviewed ten critical care nurses to examine their opinions about the impact of technology in their nursing care. Data were clustered into four categories. First, nurses believed that they needed to be proficient in the use of all equipment with which they worked. An understanding of the machine was essential. Once nurses mastered the machines, they believed that the technology reassured them in their care of patients. As well, technology increased the safety of the patients. Nurses recognized the need to double check the findings of the machine by their clinical observation of the patient.

The second category of responses identified was that nurses believed they had input into the design and use of machines. Decisions to use technology were often made in collaboration with the physician. Patients were seldom included in the decision making process. If decisions were made by patients, the technology involved was usually related to measures of comfort [ie. an air mattress] (McConnell, 1990).

The third theme identified was entitled "competing demands" (McConnell, 1990, p. 50). Nurses reported that machines assisted them in their assessment, diagnosis, implementation, and evaluation of patient care. Technology made it possible for nurses to care for more than one patient at a time. Nurses believed that technology made it possible for patients to have more privacy. Some of the disadvantages of technology were that machines took up as much of the nurse's time as the patient did and that often the patient and machine competed for the nurse's time. Nurses believed that technology made their care of patients

easier. Yet, nurses acknowledged that the use of machines resulted in more nursing time being spent explaining technology to patients. Nurses viewed this time with patients as a positive interaction time. Nurses believed that, as the number of machines used in patient care increased, so did the amount of time needed to interpret data from the machines. Time was also spent investigating machinery malfunction. These incidents deprive the patient of contact with the nurse.

The last theme identified involved ethical issues. Nurses expressed concern at the use of machines which prolonged a patient's life without improving the quality of life (McConnell, 1990).

Watzke and Wister (1993) examined the attitudes of staff working in long term care facilities toward the use of location monitoring devices for patients who had a tendency to wander. A total of 152 staff members including 86 LPNs/RNs and 66 aides responded to the survey. Respondents were selected from ten long term care facilities in the Vancouver area. The response rate was 35 percent. The instrument included a four point Likert-type attitudinal scale and a demographic form.

The Likert-type scale evaluated respondents' beliefs in four sub-scales. The first sub-scale--total value--examined how staff perceived location monitoring devices influenced their work performance, the financial value to the institution, and the effect on the well being of patients. Health care aides, non white staff members, younger staff members, and staff members from institutions with higher levels of technology reported more positive attitudes on location monitoring devices than their

counterparts (Watzke & Wister, 1993).

The second sub-scale--facility liability--measured staff perceptions of whether location monitoring devices prevented wandering and patient falls. As well, this scale measured staff perceptions of how care givers, relatives, and visitors viewed this type of technology. The study revealed that younger, less experienced staff members, and staff members from institutions with increased technology reported more positive attitudes toward location monitoring devices (Watzke & Wister, 1993).

Younger, white staff as well as RNs /LPNs believed that the use of location monitoring devices did not increase the patient's confusion/ agitation and did not decrease the patient's independence or autonomy. As well, although the province of British Columbia had no guidelines in existence which regulated the use of these devices, younger, non white aides and staff members with less experience believed these devices to be more legitimate than did their counterparts (Watzke & Wister, 1993).

Attitudes toward the use of location monitoring devices were mostly positive. The use of these devices did not create much discontent among staff members. Staff members in institutions with more advanced technology had more positive attitudes. Staff members' ethnicity, and to a lesser degree their age and education, had a greater impact in influencing attitudes than did their job description.

Campbell-Heider and Knapp (1988) compared the attitudes of nurses toward two methods of monitoring vital signs in patients: the conventional method and the automated approach. The conventional method consisted of the use of an electronic

thermometer to measure temperature, palpation of the pulse, and a mercury sphygmomanometer to determine blood pressure. The automated approach consisted of the IVAC Vital Check which determined blood pressure, pulse, and temperature and displayed them on a digital panel. The study was implemented in two phases. In the first phase, 60 registered nurses from two medical and two surgical units of a 700 bed hospital took part in the study. In the second phase, 25 registered nurses and 17 licensed practical nurses from three surgical units in a 500 bed hospital participated. The two samples differed in that more nurses in the first sample worked full time and had a baccalaureate degree.

During the first two weeks of the study, nurses participated in an orientation session in which both the conventional method of vital sign determination and the Vital Check monitor were reviewed. This was followed by nurses using both the conventional and automated methods to monitor patient vital signs over a two week period. For the next two weeks, nurses were randomly assigned to use either the automated approach or the conventional approach. During the last two weeks of the study, nurses who had been assigned to use the conventional approach during weeks five and six were now instructed to use the automated approach. Nurses who had used the Vital Check method were asked to use the conventional approach (Campbell-Heider & Knapp, 1988).

The nurses then completed a 37-item questionnaire. The questionnaire measured attitudes about measurement of blood pressure, pulse, temperature, and overall vital sign monitoring in relation to convenience, assessment, reaction of patients, reliability of the approach, and control of infection. Attitudes

were measured by using an analogue scale with scores ranging from zero percent agreement to 100 percent agreement (Campbell-Heider & Knapp, 1988).

The nurses expressed a preference for the automated approach to blood pressure determination. Nurses in the second sample indicated an even stronger preference to automation than did nurses in the first sample. When evaluating the patient's pulse, nurses in the first sample preferred the automated approach because it did not take long and was useful for frequent pulse determination. However, these nurses believed that the conventional approach gave more data to detect heart rhythm abnormalities. Nurses also expressed the opinion that there was less patient questioning when the pulse was evaluated by palpation. In the second sample of nurses, the conventional method of assessment was preferred on five of the eight items although the difference in scores between the conventional and automated approach did not achieve statistical significance. Nurses believed that the automated approach saved nurses' time. Nurses in the second sample believed that the automated approach to temperature determination increased patient anxiety. The first sample of nurses did not express any significant difference in attitudes toward temperature determination using the conventional and automated approaches. Overall, nurses in both samples believed that the automated approach to vital sign measurement was convenient. Evaluating vital signs for a patient on isolation precautions was one limitation of the automated method. Nurses in the second sample believed that the automated approach was a good one. The authors concluded that, generally, nurses prefer the

automated approach to vital sign assessment (Campbell-Heider & Knapp, 1988).

Several authors speculate about nurses' beliefs about technology. Holmes (1990) argued that technology assists nurses in providing holistic care. The use of machines combined with nurses' own assessments of the patient helps nurses make better decisions related to their care of patients.

Champlin (1991) also contended that technology improves efficiency and allows nurses to spend more time in contact with the patient. Champlin states that, by assisting nurses to perform their work more efficiently, machines can help increase the personal aspect of nursing care.

Sinclair (1988) believed that nurses have become too dependent on technology. Often, nurses abandon their own clinical assessments and judgements in favour of data or "judgements" of the machine. Sinclair also believed that legal pressures often result in nurses' decisions to use technology in their care of patients.

Brown (1992) believed that with increasing technology, nurses are assuming more dependent or delegated functions and losing the independent functions which are the essence of nursing practice. Less time is available for nurses to carry out functions which are unique to nursing. The reason for this shift is the boom in technology which has occurred in recent decades. Some nurses willingly give up traditional nursing functions including the provision of basic care and take on functions which will provide greater status. Some nurses choose to work in highly technological settings because they like the challenge of working

with machines or they believe that this type of nursing will increase job satisfaction.

Brown (1992) also believed that some nurses "hide behind technology" (p. 16) and claim to be too busy to attend to all the patient's psychosocial needs. Consequences of technology for some nurses include stress, dissatisfaction, and leaving the nursing profession.

Brown (1992) made several recommendations to ensure that nurses retain their unique function. Nurses need to be clear about what constitutes nursing and must learn to say "no" as more dependent functions are delegated to them. Nursing leaders and educators have a role in determining what constitutes nursing functions and need to help nurses determine their priorities of care. Finally, nursing researchers must attempt to discover the impact of technology on patients and nurses.

In summary, despite advances in technology in recent years, little research has been done to determine how nurses view technology and to explore the impact of technology on nursing practice. Available evidence suggests that nurses' views of technology are generally positive. There has been speculation from some authors about the attitudes of nurses toward the use of technology. However, research is needed to thoroughly investigate this area of nursing.

Consumer responses to the use of technology in labour

Since the beginning of the nineteenth century and with the establishment of maternity hospitals, childbirth has increasingly been perceived as a medical condition (Elkins, 1976; Kitzinger,

1980). The introduction of chloroform to the labour experience and the creation of the first delivery table during the reign of Louis XlV were some of the first medical interventions used to assist the childbearing woman (Elkins, 1976). The last few decades have seen an increasing amount of medical intervention in obstetrics. Epidural anaesthetics, forceps, episiotomies, induction of labour, analgesia, and EFM are commonplace practices in obstetrics today. Dr. Grantly Dick-Read's publication, Childbirth without fear, in 1933, began a "revolution in the delivery room" (Elkins, 1976, p. 68). Dr. Dick-Read theorized that fear, tension, and pain were related and that by decreasing fear and tension associated with childbearing a woman could have a less painful birth experience. Dr. Robert Bradley initiated the concept of the husband as the labour coach and encouraged husbands to be active participants in the labour and delivery. The Lamaze method of childbirth encouraged couples to view childbirth as a natural event. Couples then began taking an active part in labour and asking for the right to make decisions related to their care (Elkins, 1976). Consumers today are questioning many of the practices encountered in labour suites.

Elkins (1976), a physiotherapist and childbirth educator, discusses the "price of managed birth" (p. 37). The admission procedure to the labour suite causes unnecessary interruptions for the labouring patient and the coach. Elkins believed that some admission procedures, including the shave and enema are not only unnecessary but they also cause discomfort for the labouring woman. The practice of establishing intravenous infusions also is not necessary for all patients; as well, the infusion restricts

the woman's mobility and contributes to the belief that childbirth is an unnatural occurrence. Elkins also stated that the practice of withholding foods and fluids in labour is not justified. The author discussed the practice of inducing labour, either by syntocinon infusion or by amniotomy, and claimed that inductions for convenience are performed too frequently. Although inductions for medical reasons may at times be necessary, unwarranted inductions of labour increase the risk of such complications as prematurity, infection, prolonged labour, and cord prolapse (Elkins, 1976).

The use of analgesics and anaesthetics in labour also is questioned. Elkins (1976) did not believe that most patients are given sufficient information about possible side effects of analgesics and anaesthetics to make an informed choice. As well, Elkins believed that epidural anaesthesia can slow the progress of labour and may necessitate the use of syntocinon infusions, as well as the use of forceps delivery, and performance of an episiotomy. Above all, epidural anaesthesia contributes to the idea that labour is unnatural. Adequate preparation for the labour and the use of "verbal anaesthesia" (Elkins, 1976, p. 57) should be stressed; medication should be reserved for difficult labours. The cold delivery room atmosphere, delivery in the supine position, and the use of stirrups at delivery are also practices which should be abandoned.

Elkins (1976) also discussed EFM. Electronic fetal monitoring was viewed by Elkins as unnecessary for most labours and a significant contributor to the increased incidence of caesarean delivery. He perceived that patients monitored by EFM

are restricted with respect to the position they can assume during labour. As well, the use of a scalp electrode necessitates another intervention--the amniotomy. Elkins suggested that monitors are promoted by the companies that manufacture them; these companies stress the possibility of malpractice suits and the risks associated with childbirth. The author, however, recognized the place for EFM of the heart rate in high risk labours. Elkins also argued that what is often lacking with respect to EFM is an accurate explanation to the patient about the need for, and risks of this method of monitoring. Elkins stated that, often, less medication and less equipment are used when the patient is underprivileged and concludes that "poverty may be a blessing in the delivery room" (p. 41).

The title of Arms' (1975) book, Immaculate Deception, summarizes well that author's perception of modern hospital birth. Arms contended that the noise, lights, and flurry of activity in hospitals make a calm and peaceful birth impossible. Arms also denounced the practices of unnecessary induction of labour and administration of pain medications as potentially harmful to the fetus. As well, Arms addressed the issues of routine episiotomies and supine position at delivery. The author believed that far too many episiotomies are performed as a time saving measure for the physician's benefit. Supine position at delivery and the use of stirrups are viewed as unnatural, uncomfortable, and defying the laws of nature.

Arms (1975) argued that EFM may increase the incidence of caesarean section. As well, EFM leads to prolonged immobility of the labouring patient. Arms also addressed the significant cost

of utilizing EFM in almost all labours, given that fetal monitoring has not proven to be precise in detecting fetal hypoxia in all labours. Arms believed that physicians must begin to meet the needs of labouring patients and that women must identify their needs with respect to childbearing and assert their rights to their physicians. Hospital procedures, equipment, interventions, and staff values contribute to what Arms terms, tongue in cheek, "the new, improved, quick-and-easy, all-American hospital birth" (Arms, 1975, p. 51).

Kitzinger's (1980) arguments against intervention in obstetrics parallel those of Arms (1975) and Elkins (1976). Kitzinger (1980), a teacher at the British National Childbirth Trust, believed that the modern perception that childbirth is a pathological state leads to unnecessary and at times damaging interventions which may necessitate even further intervention. For this reason, Kitzinger advocated home births for low risk patients. The author claimed that many women are concerned with new technology leading to the mechanization and dehumanization of hospital birth. Until hospital practices change, a home birth can offer a friendly, intimate, and peaceful environment in which to deliver a baby.

Scully (1980), a medical sociologist, discusses modern obstetrical practices and suggests that current practices such as medication administration during labour, induction of labour, routine use of forceps at delivery, and routine use of EFM "not only distort the childbirth experience but can be damaging to the newborn" (Scully, 1980, p. 55). Scully believes that, although EFM may be beneficial in a small percentage of labours which are

high risk, the use of EFM in normal labours is not necessary. Indeed the use of EFM in uncomplicated labours may be hazardous for the patient and the fetus. EFM can dramatically increase the incidence of caesarean delivery. Scully suggests that obstetricians may be unable to clearly distinguish between fetal distress and a normal response of the baby to labour. The net effect, according to Scully, is caesarean delivery and a transforming of normal childbirth into a "totally surgical procedure" (Scully, 1980, p. 38).

Goldsmith (1984), whose interest is in anthropology, studied childbirth practices in different cultures and compared these to current North American practices. Goldsmith praised the efforts of Dick-Read, Arms, and Kitzinger for questioning the mechanization of childbirth in Western civilization and attempting to "renaturalize" (Goldsmith, 1984, p. 170) childbirth. Goldsmith believed, however, that there is still unnecessary technology in obstetrics. Goldsmith (1984) stated:

> Although fewer women are physically strapped to their hospital bed for childbirth, and compulsory episiotomies, enemas, hormones, and IVs are less common in normal births, still mechanization races on. Its latest addition to the scene includes such impediments as the fetal heart monitor, introduced in the mid-1060s, a piece of equipment whose very presence belies any pretence of a "natural" birth. (p. 170)

Goldsmith (1984) believed that although the effectiveness of EFM in making baby's birth better has not been proved and although the use of EFM carries its own risks, this knowledge will likely have little impact on the medical equipment companies that market this

technology. The author stressed that there is still a lot that medical research can do to make childbirth a more positive experience for women; however, "most of it has little to do with the development of a better machinery" (Goldsmith, 1984, p. 171). Medicine should assist patients in obtaining the best performance from their bodies by counselling them with respect to proper nutrition and avoidance of smoking, drugs, coffee, and alcohol. Birth settings should be made more comfortable and relaxing. Exercise and position changes during labour and delivery should be encouraged.

In summary, consumers are becoming more aware and assertive of their rights to "childbirth with dignity" (Elkins, 1976, p. 187). The introduction of unnecessary rules, practices, and interventions to the childbirth experiences are being questioned. Health care professionals have a responsibility to listen to consumers and ensure that their wishes for a natural, intervention-free labour and delivery are fulfilled.

Obstetrical nurses' attitudes toward the use of EFM in labour

A literature search was done to identify studies on the attitudes of nurses toward the use of EFM. The following data bases were searched for the time periods indicated: Cumulative Index of Nursing and Allied Health Literature, 1975-1994, manual and computer search; Educational Resources Information Center, 1966-1994, computer search; HealthPLAN, 1975-1983, computer search; MEDLINE, 1990-1994, computer search; PsychLIT, 1974-1994, computer search; and Sociofile, 1974-1994, computer search.

Cranston's (1980) study is the only study identified that

examined the attitudes of nurses toward the use of EFM in labour. Cranston (1980) suggested that the nurse's attitude toward the use of EFM will affect the care given to labouring patients.

The sample consisted of 124 nurses who worked in labour and delivery and who had the experience of working with at least one patient who was monitored electronically during labour. Nurses from fourteen hospitals in the greater St. Louis area volunteered to participate in the study. Nurses varied in the number of years of experience, educational background and primary shift worked. The author recognized that this fairly small, non probability sample, from one area of the United States, limits the generalizability of the study (Cranston, 1980).

Nurses responded to 24 items and rated these items on a five point, Likert-type attitudinal scale. Positively and negatively worded items were mixed to avoid response set. Two maternal child nurse specialists and one perinatologist assessed the items for content validity. The internal consistency of the questionnaire was .97 (Cranston, 1980).

Fifty-two percent of nurses is the study agreed that routine EFM of all labouring patients would be ideal. This was the lowest percent of positive responses on any item. On half the items, positive responses were 90 percent or greater. Eighty-eight percent of nurses stated that the fetal surveillance achieved by EFM cannot be matched by IA. Sixty percent of nurses expressed the opinion that the use of EFM allowed for more patient teaching. Ninety percent of nurses said that the patient was reassured by the use of EFM and the presence of the nurse. The majority of nurses did not believe that EFM placed any restrictions on the

patient or that it was intrusive. Ninety-eight percent of nurses believed that the purpose of EFM was to improve fetal outcome. Most nurses believed that EFM could be a useful tool for labour coaches. Over 90 percent of nurses believed that, with proper explanation, most patients willingly accept the fetal monitor.

Cranston (1980) concluded that the majority of nurses appear to have a positive attitude toward EFM; for each item, over fifty percent of the responses were favourable. Primary shift worked, basic nursing education, and experience in nursing were not related to the nurses' attitudes about the use of EFM.

Additional reasons have been suggested for the continued and widespread use of EFM. Simkin (1986) suggested that staffing in many hospitals plays a role in the nurse's decision to use electronic fetal monitors. IA during labour is best accomplished if there is a one to one nurse-patient ratio. Simkin (1986) suggested that it often is not possible for hospitals to provide this standard of care; EFM is more acceptable than neglecting labouring women for long periods of time. A study by Morrison, Chez, Martin, Roberts, Martin, and Floyd (1993) supports Simkin's (1986) claim. In Morrison et al.'s (1993) study, nurses were taught IA according to the American College of Obstetricians and Gynecologists' guidelines. The purpose of the study was to see how feasible it was to perform IA for patients on a very busy obstetrical unit. Eight hundred and sixty two patients in labour were available for fetal heart rate monitoring. Of these patients, it was not possible for nurses to initiate IA for 420 women because of time or staffing restraints. Of the 423 patients who had IA initiated on admission, only 31 women received IA

during the entire labour. IA was not possible for 19 patients because of obesity or patient refusal. Morrison et al. (1992) concluded that IA is not feasible on busy obstetrical units unless a one to one nurse-patient ratio is available.

Simkin (1986) also suggested that nurses use EFM because monitoring provides greater freedom for the nurse. The monitor permits the continuous recording of the fetal heart rate which allows the nurse more time to do other things and to care for other patients (Simkin, 1986).

Simkin (1986) also proposed that many nurses enjoy technology and "take pride in their ability to read and interpret monitor tracings" (p. 219). The use of technology is more challenging for some nurses than the auscultation of the fetal heart (Simkin, 1986).

Simkin (1986) also suggested that health care professionals believe that EFM is superior to IA in assessing fetal condition. Despite evidence presented in the randomized controlled trials on EFM, some professionals continue to believe that EFM can predict brain damage before it occurs. These professionals do not believe that the resulting caesarean sections are unnecessary; rather caesarean sections are seen as timely interventions. This belief outweighs the evidence presented in the randomized controlled trials (Simkin, 1986).

Authors also advance the argument that health care professionals use EFM because they fear legal liability (Lumley, 1982; Simkin, 1986). Many courts of law make decisions based upon the belief that EFM is the acceptable standard of care and that the use of EFM can prevent complications. The myth that EFM is a

requisite in the care of patients is perpetuated by the manufacturing companies (Lumley, 1982; Simkin, 1986).

In summary, Cranston's (1980) study was carried out at a time when EFM was still fairly new. Nurses' attitudes may have changed since this study was carried out. Cranston's (1980) study needs to be replicated to determine current attitudes toward EFM. As well, it should be expanded to determine a greater range of attitudes toward EFM in labour. Including some open-ended questions in the questionnaire would be useful in generating richer data than can be obtained by a strictly quantitative design.

Summary

In conclusion, the review of the literature has shown that the use of EFM during labour may lead to an increased incidence of operative deliveries. EFM has not, however, been shown to improve neonatal outcome. Although studies have shown that many women respond favourably to electronic fetal monitoring, some women believe that the monitor is restricting and uncomfortable. Consumers are becoming increasingly vocal in their requests for natural childbirth, free from unnecessary interventions.

In spite of the evidence that EFM is not indicated in all labours, the use of this method of monitoring continues to be prevalent. Nurses are often responsible for deciding upon the method of monitoring used during labour. The reason for their decisions have not been investigated. Indeed, very little is known about the attitudes of nurses toward the use of technology in general. Also, little is known about the relationship between

nurses' attitudes toward technology and their use of technology in nursing practice.

It is important to determine if there is a relationship between nurses' attitudes toward EFM and their use of this method of monitoring. If a relationship is found, nursing educators and administrators can implement strategies to assist nurses to view IA as a standard of care which is as acceptable as the use of electronic monitoring of the fetal heart rate. As a first step in this investigation, this present study will examine the attitudes of obstetrical nurses toward the use of EFM.

The following chapter will discuss the research design.

CHAPTER THREE

Research design

This chapter describes the research design. The method of sample selection, the research instrument, and human subject issues are discussed. Limitations of the research design are identified.

Level of inquiry

The major aim of this exploratory descriptive study was to determine the attitudes of nurses toward the use of EFM in labour. A level 1 design was appropriate for this research question as little was known about the variable under study and this research investigated only one concept--attitudes of nurses toward EFM (Brink & Wood, 1988).

A descriptive study provides a description of the variables under investigation. Although descriptive studies do not seek to determine relationships between variables, they do seek to determine the presence of relationships between the variables under study and the demographic characteristics (Brink & Wood, 1988). In this study, the second research question addressed the presence of relationships between demographic data--years of experience, work setting, educational preparation, employment status, years spent working with labouring patients, availability of educational resources on EFM--and the independent variable "attitudes of nurses".

Descriptive studies often use a structured method of data collection. This may involve a structured questionnaire; however, some open-ended questions may be used to obtain information not

included in the structured questions (Brink & Wood, 1988). In this study, the data collection instrument involved a forced choice questionnaire accompanied by open-ended questions.

Some of the assumptions inherent in a descriptive design applied to this study. A first assumption was that the variable under study was present in the population being studied and that the variable could be described. The second assumption was that there was little current literature which described the variable at the time. The third assumption was that there was no existing theoretical framework for the study; the rationale for the research was based upon the review of the literature (Brink & Wood, 1989).

Sample and setting

A list of all Manitoba hospitals was obtained from the Canadian Hospital Association (1993). The statistics for each hospital were examined and a list was compiled of all Manitoba hospitals that were listed as having deliveries during the 1992/1993 fiscal year. The sixteen Manitoba hospitals that had, on the average, more than ten deliveries per month for the 1992/1993 fiscal year were included in the study. One hospital reported that it did not utilize EFM during labour; this institution therefore was eliminated from the study.

Approval to carry out research in the institutions was obtained. The head nurses of the labour and delivery units of each hospital then were approached. In consultation with the head nurses, times were arranged to meet with obstetrical nurses to present the study. This occurred either at a unit meeting, at

changes of shift, or both. The presentation to the nurses lasted one to five minutes. The purpose of the study was explained to potential participants. A covering letter, the questionnaire, and a pre-addressed, stamped envelope were distributed to interested nurses. Data collection was carried out between September and December, 1994.

Limitations of the sampling process

One of the limitations of this approach to sampling was that it was not possible to meet with all the nurses of these institutions and request their participation in the study. Secondly, it was not possible to determine the attitudes of nurses who work in smaller rural hospitals which, on average, had less than ten deliveries per month. The findings of this study, therefore, can not be generalized to all Manitoba nurses who work with labouring patients (Brink & Wood, 1989).

Description of the variables

The concept "attitudes of nurses toward EFM" was measured by examining the nurses' scores on a Likert-type attitudinal scale as well as their responses to four open-ended questions.

To decrease ambiguity, the terms EFM and IA were defined on the questionnaires. The definitins were as follows:

Electronic fetal monitoring [EFM]: EFM includes the use of either a toco-transducer or an intrauterine pressure catheter to measure uterine contractions and the use of an ultrasound device or a scalp clip to monitor fetal heart rate. The monitor is attached to the patient. This definition refers to situations

where EFM is carried out for the major portion of the patient's labour. Telemetry units are included in this definition of EFM.

Intermittent auscultation [IA]: IA refers to listening to the fetal heart rate at intervals, using either a fetoscope or doppler device, where the device is not attached to the patient. This definition refers to situations where this method of monitoring is carried out for the major portion of the patient's labour.

Procedure

Data collection was accomplished using three measures. Participants were asked to complete the "Attitudes Towards Fetal Monitoring Questionnaire (AFMQ), four open-ended questions, and a demographic sheet (Appendix E). Participants were asked to complete the questionnaires and return them in pre-addressed, stamped envelopes.

Instruments

Attitudes toward fetal monitoring questionnaire [AFMQ]

Cranston's (1980) study served as a starting point to the development of the AFMQ. Permission to use Cranston's attitudinal scale was obtained from the author (Appendix F). Fifteen of the 24 items utilized by Cranston were incorporated into the AFMQ, with some modifications. Appendix G lists the items incorporated from Cranston's study and the changes made in these item.

The AFMQ contained 38 items which respondents were asked to score on a five point scale. The AFMQ contained a similar number of positive and negative items (Brink & Wood, 1989; Burns & Grove,

1987; Polit & Hungler, 1991). The five-point scale included an "uncertain" category. Some Likert-type scales contain an even number of choices with no room for uncertainty, i.e., they exclude the option "undecided" or "uncertain". The absence of an "uncertain" category forces respondents to make a choice. Some respondents may find having to decide objectionable or they may not have a strong feeling about an issue (Burns & Grove, 1987; Polit & Hungler, 1991). On the other hand, the "uncertain" category may encourage fence-sitting. As well, if an "uncertain" option is included and a large number of subjects choose that option, the data may not be meaningful (Burns & Grove, 1987). Some of the nurses in the pilot group stated that they were undecided on whether they agreed or disagreed with some of the items and would have selected the "uncertain" option had it been available. Although the uncertain category was omitted initially, it was reinstated following feedback from participants in the pilot study who recommended including this category as a possible choice.

The principles of item construction were considered as the items were developed. Items were fairly short and familiar words were used (Oppenheim, 1966). To prevent ambiguity, the definitions of the terms EFM and IA were included in the research instrument. Double negatives and double barrelled items were avoided, as were jargon, proverbs, and complicated terminology (Oppenheim, 1966).

Qualitative research.

Four open-ended questions also were included in the questionnaire. Open-ended questions allow participants to express themselves freely and to phrase their thoughts in their own words. Participants can be more spontaneous in their responses. In this way, open-ended questions can provide a wider scope of data than forced choice questions (Oppenheim, 1966; Polit & Hungler, 1991). Combining open-ended questions and forced choice questions in a research instrument is recommended by some authors as the two types of questions complement each other and yield richer data (Polit & Hungler, 1991).

Participants were first asked to state their opinion of the use of EFM during labour. In the second and third questions, participants were asked to comment on the effect they believed EFM had on patient care and on their nursing responsibilities. Finally, respondents were asked to identify under what circumstances, if any, they believed the use of EFM to be appropriate.

Demographics

Participants also completed a demographics sheet. Participants were asked how many years of nursing experience they had as well as how many years of experience they had caring for labouring patients. Participants also stated their level of education, the number of educational sessions they had attended on EFM, and the number of resources on EFM to which they have had access to the last ten years. Finally, they were asked to estimate for what percentage of labouring patients they actually

used EFM, and of those labours, for what percentage they used EFM primarily because hospital policy demanded it.

The AFMQ, open-ended questions, and demographics sheet were compiled in a booklet form. Questionnaires were colour-coded according to each institution.

Validity.

Validity refers to how well a research instrument measures what it is intended to measure (Burns & Grove, 1987; Polit & Hungler, 1991). Measures taken to enhance the validity of an instrument will reduce systematic error (Burns & Grove, 1987). Although results from instruments used in Level 1 studies characteristically have low levels of validity (Brink & Wood, 1988), some measures were taken to enhance the validity of the research instrument.

Face validity, the least scientific type of validity (Brink & Wood, 1988) was ensured by examining each of the items to determine if, at face value, they indeed measured "attitudes of nurses toward EFM". Another check of validity of the instrument was done by eliciting the assistance of experts in the content area. A panel of expert judges was asked to determine if the instrument measured what it was intended to measure (Brink & Wood, 1988). The three members of the thesis committee, a faculty member at the University of Manitoba whose area of expertise is maternal child nursing, and a clinical nurse specialist in maternal child nursing were asked to review the questionnaire to determine how well the items examined the concept "attitudes of nurses toward EFM" (Appendix H).

Content validity refers to the extent to which an instrument measures the expected content (Polit & Hungler, 1991). Content validity can be enhanced by comparing the instrument to the literature (Brink & Wood, 1988). For this study, items reflected concepts from the review of the literature and conceptual framework. The AFMQ was developed from the conceptual framework and review of the literature including Cranston's (1980) study. It was intended to reflect five main themes: 1) medical/legal issues, 2) patient/family responses to EFM, 3) effect of EFM on patient care, 4) effect of EFM on nursing roles and responsibilities, and 5) individual nurses' use of EFM. The panel of expert judges was asked to examine the questions to see if each of these themes was adequately tested (Appendix I). As well, they were asked to examine items for clarity (Appendix J).

Threats to validity.

A major problem with determining the validity of the instrument is the lack of predefined criteria or comparative group (Oppenheim, 1966). Groups of nurses who are known to have either a positive or negative attitude toward EFM have not been identified. It also was not possible to compare this instrument with a similar tool as there was no similar tool known to be valid in evaluating nurses opinions about EFM.

Reliability.

Reliability refers to how consistently the research instrument measures the concept under study (Burns & Grove, 1987). There are three aspects to reliability. Stability refers to the

ability of the tool to give a consistent result over time. The difficulty in determining the stability of an instrument that measures attitudes is that attitudes may change between two testing periods (Burns & Grove, 1987). Equivalence refers to the ability of a similar instrument to give similar results when administered at the same time (Burns & Grove, 1987). There also is difficulty in determining equivalence of a scale that measures attitudes. Oppenheim (1966) believes that it is difficult to test the reliability of a question by asking that question in a different form. If a question is asked in a different form, it becomes a different question. It would be difficult, therefore, to develop alternate forms of the AFMQ. Internal consistency reflects to what extent items of an instrument measure the same concept (Burns & Grove, 1987; Brink & Wood, 1988). The most frequently used measure of internal consistency is Cronbach's alpha coefficient. The alpha coefficient should be 0.7 or higher for a new scale and 0.8 or higher for a previously used scale (Brink & Wood, 1989). For this study, the SAS computer program was used to compute Cronbach's alpha coefficient after the data were collected. Cronbach's alpha coefficient for the AFMQ was 0.95.

Enhancing the truth of qualitative research

Data obtained from open-ended questions were compared to the data obtained from the AFMQ to ensure that attitudes of nurses were similar between the two questionnaires. Opinions expressed on the forced choice items should be similar to opinions expressed on open-ended questions. This process of methodological

triangulation allows a researcher to determine the truth of qualitative research (Polit & Hungler, 1991). For this study, the variety of responses on the AFMQ paralleled the variety of responses to the open-ended questions.

Pilot study

A pilot study was carried out prior to the study. Twelve nurses who worked in a labour and delivery unit completed the questionnaire. Responses were examined to see if like items were answered in a similar fashion. No changes were made in the items of the AFMQ. The questionnaire was discussed with six of the nurses who responded. Two of the nurses said they had misread the fifth question on the demographic sheet. In consultation with a statistician, the word "primarily" was added, highlighted, to the question on the demographic sheet that asked nurses to estimate the percentage of situations where EFM is used because of hospital policy. The wording of the fourth question of the demographic sheet was changed and the words "actually use" was added and highlighted by using boldface type and underlining the phrase. Following discussion with the participants in the pilot group, an uncertain category was incorporated into the AFMQ. Data obtained from participants in the pilot study will, therefore, not be incorporated into the findings of the study.

As a result of the pilot test, a need also was identified to colour code the questionnaires according to each institution. Respondents of the pilot test were asked to identify their work setting in terms of urban teaching hospital, urban community hospital, and rural hospital. There was discrepancy in the way

nurses from the same institution classified their work setting. It was therefore decided to colour code the questionnaires so that classification of work setting could be accomplished with more consistency.

Finally, the item on the pilot test that asked nurses to identify the type of hospital in which they were employed was deleted as this could be determined by the colour coding of the questionnaires. As well, the item that asked nurses the number of years they were employed in that setting was deleted as, in deleting the previous item, this question would have lacked context.

Data processing

Data from the AFMQ were entered into the Epi-Info statistical analysis computer program. In processing items for the AFMQ, when participants circled two responses, the response to be used for data analysis was selected by coin toss. This occurred in three instances (Participants 43, 61, and 96). For participant 76, where the response to the question "years of experience caring for labouring patients" was stated as one to two years, an average of 1.5 years was selected as the final response. For the demographic questions that asked participants to identify the percentage of labouring patients for whom EFM is used and the percentage of labours where EFM is used primarily because of hospitals policy, where two consecutive numbers were selected, an average was taken of the two answers. This occurred in eight instances (Participants 7, 10, 21, 27, 65, 81, 86). One participant circled two responses for both questions.

When processing the data to obtain the total scores, the scoring of the negative items was reversed. On the positive items, items indicating a preference for EFM, strongly disagree scored a 1, disagree scored 2, agree scored 4, and strongly agree scored 5. A response of uncertain scored 3. On the negative items, items indicating that nurses do not favour EFM, strongly agree, agree, uncertain, disagree and strongly disagree scored one to five respectively (Burns & Grove, 1987; Oppenheim, 1966; Polit & Hungler, 1991).

Data analysis

The Epi-Info and Statistical Analysis System (SAS) computer programs were used to analyze the data from the AFMQ. Epi-Info was used to compute frequencies for each item on the AFMQ as well as frequencies for the demographic variables, setting, and level of care of the hospital in which nurses were employed. The SAS computer program was used to determine total scores on the AFMQ and to calculate the Wilcoxon tests, Kruskal Wallis tests, Duncan groupings, and Spearman correlation coefficients. The SAS computer program was also used to carry out regression analyses of variables and principal component analysis of the AFMQ.

Total scores on the AFMQ were determined by summing responses to the 38 items on the AFMQ after negative items were reversed. The score was then converted to a percentage for easier interpretation of data. Burns and Grove (1987) state that although scores for each item on a Likert-type scale are "technically ordinal level data, the summed score is interval

level data" (Burns & Grove, 1987, p. 319). Total AFMQ scores will then be treated as interval level data.

The Shapiro Wilk test determined that distributions for the variables years caring for labouring patients, use of EFM, total AFMQ scores, and use of EFM because of hospital policy were not normally distributed (p= .0005, .0001, .0035, and .0001 respectively). The only variable that showed a normal distribution was the variable "number of years in nursing" (p= .53).

The Wilcoxon two sample test was used to determine when two sample rank means were different. The Wilcoxon test is a non-parametric test used with two samples (Vogt, 1993). It does not require normal distribution of samples (Freund & Walpole, 1987; Weimer, 1987). The Wilcoxon test was appropriate to determine differences for the variables educational education, EFM education, EFM resources, and EFM information.

The Kruskal Wallis test was used to determine differences between three or more independent samples (Vogt, 1993). It is also a non-parametric test that does not require a normal distribution of samples (Shott, 1990). The test was appropriate to determine differences for the variables setting, level of care, employment status, and education. The Duncan grouping was then used to determine which sample means, if any, were different.

The Pearson correlation coefficient assumes that both measurements are at least interval level data and that variables are normally distributed (Burns & Grove, 1987; Polit & Hungler, 1991). As the assumptions of pearson's r were not met, the non-parametric spearman rho was used to determine relationships

between the variables years caring for labouring patients, use of EFM, total AFMQ scores, and use of EFM primarily because of hospital policy. For all data analyses, a significance level of .05 was used.

Regression analyses also was performed on selected variables. A regression analysis is a method of "predicting the variability of a dependent variable using information about one or more independent variables" (Vogt, 1992, p. 192). As well, principle component analysis was performed on the Likert-type items of the AFMQ. Principle component analysis is an empirical method to "determine how many dimensions (underlying constructs) account for most of the variance on an instrument scale" (Stevens, 1986, p. 340). With principle component analysis it is possible to identify which items on an instrument, for example a Likert-type scale are clustered together (Stevens, 1986).

Data from the open-ended questions were transcribed. Margin notation were made of major themes identified in the responses. Phrases and sentences pertaining to each theme were underlined using coloured pens. Data were grouped and re-written according to the themes identified.

Human subject issues

In this study, subject rights were protected in accordance with the Canadian Nurses' Association (1983) Ethical guidelines for nursing research involving human subjects. The guidelines consider the scientific merit of the research, human subject issues, and the research setting. Approval of the University of Manitoba Faculty of Nursing Ethical Review Committee was obtained

prior to proceeding with the research (Appendix K). A follow-up request to colour code the questionnaires according to each institution was granted (Appendix L).

The research setting.

As this study involved requesting the cooperation of participants from different institutions, agency protocols were followed to obtain permission to access participants in these institutions. Some agencies were contacted by phone and permission to access participants was obtained by telephone. These were followed up by a written letter of permission. Some agencies requested that a proposal be submitted prior to accessing participants. A written letter of approval was then provided.

The participants.

The researcher met with nurses from each institution and explained the purpose of the research. Interested participants were given a copy of the research instrument, a pre-addressed stamped envelope and a covering letter which explained the study. The covering letter to the participants (Appendix M) contained a disclaimer. It also clearly explained the purpose of the research and the methods of data analysis and reporting. The covering letter also informed participants that questionnaires were colour-coded according to different institutions.

Summary

The research design for this study has been described. Methods for recruiting participants and for accessing institutions were explained. Limitations of the sampling process and ethical issues were addressed. The following chapter summarizes the findings of the study.

CHAPTER FOUR

Findings

In this chapter, quantitative and qualitative findings that address the following questions are presented:

1. What are the attitudes of obstetrical nurses toward the use of EFM in labour?

2. What is the relationship between selected demographic variables and nurses' attitudes toward the use of EFM in labour?

One hundred seventeen nurses who worked in labour and delivery units comleted the "Attitudes Toward Fetal Monitoring Questionnaire", a 38-item Likert-type attitudinal scale scored on a five point scale ranging from "strongly disagree" to "strongly agree". Four open-ended questions allowed respondents to express their views on EFM more fully.

The following findings will be presented: 1) demographic profile of respondents, 2) results of the AFMQ, 3) relationships between demographic variables and results of the AFMQ, and 4) findings from the open-ended questions will be discussed. As well, results of additional statistical analyses of the data will be addressed. Relationships between demographic variables and nurses' use of EFM during labour as well as use of EFM because of hospital policy will be described. Relationships between the variables total scores on the AFMQ, use of EFM, and use of EFM primarily because of hospital policy will be examined. Results of a principal component analysis of the AFMQ, stepwise multiple regression analyses on the three independent variables, and characteristics of nurses who support EFM will be discussed.

Demographic profile

One hundred ninety-eight (198) questionnaires were distributed. A total of 117 nurses responded for a response rate of 59.09 percent. Descriptive data analysis methods were used to analyze demographic data. These data are summarized in table 1.

When the institutions were visited, the head nurses were asked to identify the level of obstetrical care provided by each institution. Level one hospitals provide obstetrical care for women whose pregnancies were normal and where labour was progressing normally. Level two hospitals meet regional needs and accept referred patients. These institutions provide obstetrical care "sufficient for most of the contingencies that arise in an obstetrical newborn service" (College of Physicians and Surgeons of Manitoba, 1978). Level three hospitals provide services for high risk maternal and newborn care. (College of Physicians and Surgeons of Manitoba, 1978). Level 1a classification arose to distinguish those institutions that were operating above the criteria for level one hospitals but that could not achieve a level two classification (Written communication, R. Wartman, March 27, 1995). (See appendix N for a description of the levels of care). Five of the hospitals surveyed provided level one care, five provided level 1a care, two provided level two care, and two provided level three care. Respondents were fairly evenly distributed among level 3 hospitals (n= 39, 33%); level 1a hospitals (n=33, 28%); and level 1 hospitals (n= 32, 27%). A smaller number of nurses (n=13, 11%) were employed by level 2 hospitals. (Appendix O details the number of respondents from each hospital by level of care provided).

Nine of the hospitals surveyed were located in rural settings--that is, outside the city of Winnipeg. Three of the hospitals were urban community hospitals--hospitals within the city of Winnipeg excluding those that provided tertiary care. Two of the hospitals surveyed were tertiary settings within the city of Winnipeg. There were an equal number of respondents from each of the three settings (n= 39). (Appendix P details the number of respondents from each hospital by setting).

Nurses were asked to identify the number of years of experience they had in nursing. The mean number of years in nursing for all respondents was 17.5 years (range= .4-40 years, median= 18 years, mode= 22 years, S.D.= 7.8 years). Nurses were also asked to identify the number of years of experience they had caring for labouring patients. The mean number of years nurses had worked in obstetrics was 12.7 years (range= .4-33 years, median= 12.5 years, mode= 10 years, S.D.= 7.6 years).

Most of the participants were employed full-time (44%) or part-time (54%). Only 2.6 percent (n=3) of nurses were employed on a casual basis. All respondents were registered nurses (n=117). Twelve percent (n=14) had a baccalaureate degree in nursing, 22 percent (n=26) had midwifery education, and six percent (n=7) had another degree excluding a baccalaureate degree in nursing. Of the seven participants who said they had another degree, these degrees included a Bachelor of Arts (n=5), Bachelors of Arts, Theology, and Music (n= 1), and a Bachelor of Science (n=1). Two nurses were studying for a Bachelor of Nursing. Sixteen percent (n= 19) of nurses indicated that they had other educational preparation. These included: nursing management/

nursing unit administration courses (n=7), courses on EFM (n=3), neonatal/ pediatric intensive care courses (n=3), obstetrical certification (n=2), childbirth educator (n=1), intensive care nursing course (n= 1), master's degree (n=1), EFM instructor (n=1), psychiatric nursing (n=1), post diploma courses (n=1), and senior elective (n=1).

Educational preparation was then regrouped according to the following classifications: RNs (diploma education), midwives, and degree nurses (having any baccalaureate degree and excluding nurses who were midwives). Sixty-six percent (n=77) of nurses had diploma education only, twelve percent (n=14) had a degree (excluding nurses who had midwifery education), and 22 percent (n=26) had midwifery education.

Nurses were also asked to identify if they had attended educational sessions on EFM or had access to resources on EFM in the last ten years. Eighty-one percent (n=95) of nurses indicated that they had attended educational sessions on EFM in the last ten years. These included: sessions by the Association of Women's Health, Obstetric, and Neonatal Nurses [AWHONN] (n=28), conferences (n=29), information from the Hewlett-Packard distributor (n=23), inservices (n=11), information from the Corometrics distributor (n=10), monitoring certification (n=4), information from obstetricians/physicians (n=4), course work (n=2), and monitoring rounds (n=2). Other educational sessions listed were books and review of monitor strips. As well, one participant was an instructor in EFM. EFM resources mentioned by the nurses included videos (n=59), journal articles (n=36), books (n=23), seminars/workshops/inservices (n=17), monitoring rounds

(n=10), information from physicians (n=3), and EFM testing/certification (n=2), information from monitor distributors (n=1), inservices from monitor distributors (n=1). Other sources of information included written information (brochures, pamphlets, books, manuals), discussions with other nurses, physicians, inservice co-ordinators, or nurse educators, course work, nursing audits, and resources from AWHONN. Ninety-seven percent of participants (n= 114) indicated having some additional information on EFM--either educational sessions or resources--in the last ten years.

Nurses were asked to estimate for what percentage of all labouring patients they used EFM for a major portion of the patient's labour. Ninety-seven percent of nurses (n=113) responded to this question. Respondents also were asked to estimate in what percentage of the above labours they used EFM primarily because of hospital policy. Ninety-two percent (n=108) of nurses responded to this item. They estimated using EFM for a major portion of patients' labours in slightly over half of all patients. They estimated using EFM primarily because of hospital policy for 53.7 percent of all monitored labours. Data are summarized in tables 2 and 3.

In summary, the average respondent was a registered nurse who was employed on either a part time or full time basis, had 18 years of experience in nursing and thirteen years of obstetrical experience, had attended educational sessions and had access to other sources of information on EFM within the last ten years. The average respondent used EFM for a major portion of a patient's labour in 55 percent of all cases and, in these labours, was

guided by hospital policy 54 percent of the time.

Table 1

Summary of demographic variables: hospital level of care, setting, employment status, educational preparation, EFM education, EFM resources, and EFM information by frequency and percentage

Variable	Frequency	Percentage
Hospital level of care		
Level 1	32	27.4
Level 1a	33	28.2
Level 2	13	11.1
Level 3	39	33.3
Setting		
Rural	39	33.3
Urban community	39	33.3
Tertiary care	39	33.3
Employment status		
Full time	51	43.6
Part time	63	53.8
Casual	3	2.6
Educational preparation		
RN	117	100
BN	14	12
Midwifery	26	22.2
Other degree	7	6
Other	19	16.2
EFM education	95	81.2
Access to resources on EFM	106	90.6
EFM information	114	97

Table 2

Nurses' estimates of the percent of labours for which they use EFM in a major portion of labour by frequency and percentage

Percent of labours for which nurses estimated using EFM for a major portion of the patient's labour	number of nurses	percentage of nurses
0	0	0
10	4	3.5
15	2	1.8
20	11	9.7
30	11	9.7
40	10	8.8
45	2	1.8
50	18	15.9
55	2	1.8
60	13	11.5
65	1	0.9
70	10	8.8
80	11	9.7
90	14	12.4
100	4	3.5

Note:

Mean= 54.9%, range= 10-100%, mode= 50%, standard deviation= 25%

Table 3

Nurses' estimates of the percent of labouring patients for which they use EFM for a major portion of the patient's labour primarily because of hospital policy by frequency and percentage

Percent of labours in which nurses estimated using EFM primarily because of hospital policy	number of nurses	percentage of nurses
0	9	8.3
10	11	10.2
20	12	11.1
30	4	3.7
40	10	9.3
50	10	9.3
60	5	4.6
65	1	0.9
70	7	6.5
80	11	10.2
90	11	10.2
100	17	15.7

Note:

Mean= 53.7%, mode= 100%, range= 0-100%, standard deviation= 34%

Quantitative data

Research question # 1

Responses to the AFMQ were examined to answer the first research question: "What are the attitudes of obstetrical nurses toward the use of EFM in labour?" (Data from the AFMQ are summarized in appendix Q).

When analyzing the results of the AFMQ, the scoring of negatively worded items on the AFMQ was reversed. Possible scores on the AFMQ ranged from 38 to 190. A score of 38 would indicate being completely opposed to the use of EFM. A score of 190 would indicate being completely in favour of EFM. Respondents' scores ranged from 51 to 158. The mean of the distribution was 114.1 and the mode was 139. The standard deviation was 24.3 indicating that the majority of scores were clustered fairly close to the mean score. The Shapiro-Wilk test revealed that the distribution of raw total scores was not a normal distribution.

Raw scores were then converted to a percentage to facilitate comparison and interpretation of the data. Findings will be reported as percentage scores. The mean total score on the AFMQ was 50.1 percent indicating that, overall, nurses recognized positive and negative aspects of EFM. Total scores ranged from 8.6 to 78.9 percent. The standard deviation was 16 percent. The majority of nurses, therefore, did not have strong views either for or against EFM.

Responses to the AFMQ were examined for items with either strong agreement or strong disagreement. Only two items were found to which more than 25 percent of the nurses expressed either strong agreement or disagreement. Twenty-six percent of nurses

strongly disagreed with the item: "Routine EFM of all patients in labour would be ideal". Thirty-five percent of nurses strongly disagreed with the item: "EFM is one of the worst developments of modern obstetrics". No other item elicited such strong responses from participants.

The five items with which there was greatest total agreement (strongly agree or agree) were identified. These items are listed in table 4. Most nurses (70%) were in favour of the use of EFM and 54 percent believed that EFM is superior to IA in monitoring the fetal heart rate. Sixty-nine percent of nurses perceived that EFM can decrease perinatal mortality and morbidity; 67 percent were of the opinion that the greatest value of EFM is in improving fetal outcome while 66 percent believe that EFM is one of the best developments of modern obstetrics.

The five items with which there was greatest total agreement (strongly disagree or disagree) were examined. These items are listed in table 5. Eighty-three percent of nurses disagreed that EFM is one of the worst developments of modern obstetrics. Eighty percent disagreed that the use of EFM decreases the nurse's workload and 77 percent disagreed that the use of EFM adversely affects the quality of care that nurses give labouring patients. Most nurses did not agree with the concept that they like to use EFM because they either find it challenging or like interpreting monitor tracings.

Responses were also examined for items which yielded the most "uncertain" responses. These items are summarized in Table 6. Several nurses were unsure that the use of EFM was reassuring to either labour coaches (29.9%) or that patients in labour

preferred to be monitored electronically (29.1%) although most nurses disagreed with these statements. Several nurses (28.2%) also were uncertain that the use of EFM ensured protection from legal liability although slightly more nurses disagreed with this statement than agreed (43.6% and 28.2% respectively). Some nurses (24.8%) also were uncertain if the use of EFM was reassuring to patients although more nurses agreed with this statement than disagreed (58.2% and 17.2% respectively). Many nurses (22.2%) were uncertain whether the use of EFM contributed to increased medical interventions. The numbers of nurses who agreed and disagreed with this item were fairly similar (37.6 percent and 40.1 percent respectively).

Finally, responses were examined for items with which there was a similar percentage of total agreement and total disagreement. These items are summarized in Table 7. There was little consensus as to whether the use of EFM caused patient anxiety and stress for obstetrical nurses. As well, there were differences of opinion as to whether the use of EFM increased the incidence of medical intervention in labour and whether EFM contributes to increased caesarean section. Responses to the item stating that the use of EFM decreased the patient's control over her labour were also fairly evenly divided between the agreement and disagreement categories. Finally, nurses differed in their opinion as to whether they would choose to have EFM in labour. Forty-three percent of nurses would not wish to have EFM if they were in labour while 50 percent of nurses would opt to be monitored in this manner.

Table 4

Items on the AFMQ with which there was the greatest total agreement

Item	% SD	D	U	A	SA
1. I am in favour of the use of EFM in labour.	6.8	16.2	6.8	50.4	19.7
2. I believe that the use of EFM can decrease perinatal mortality and morbidity.	8.5	11.1	11.1	53.0	16.2
3. I believe that the greatest value of EFM is in improving fetal outcome.	7.8	11.2	12.9	47.4	20.7
4. EFM is one of the best developments of modern obstetrics.	7.7	13.7	12.8	53.8	12.0
5. Fetal surveillance achieved by IA is not as accurate as that achieved by EFM.	9.4	21.4	5.1	47.9	16.2

Table 5

Items on the AFMQ with which there was the greatest total disagreement

Item	% SD	D	U	A	SA
1. EFM is one of the worst developments of modern obstetrics.	35.0	47.9	12.0	4.3	0.9
2. The use of EFM decreases the nurse's workload.	15.4	64.1	5.1	14.5	0.9
3. The use of EFM adversely affects the quality of care that nurses give labouring patients.	21.4	55.6	5.1	14.5	3.4
4. I like to use EFM because I find it challenging.	13.8	62.1	6.9	17.2	-
5. I like to use EFM because I like interpreting EFM tracings.	14.7	58.6	12.1	14.7	-

Table 6

Items on the AFMQ with the highest percentage of "uncertain" responses

Item	% SD	D	U	A	SA
1. The use of EFM is reassuring to labour coaches.	6.0	33.3	29.9	25.6	5.1
2. Most labouring patients prefer to be monitored electronically.	10.3	43.6	29.1	17.1	-
3. The use of EFM protects nurses from legal liability.	7.7	35.9	28.2	26.5	1.7
4. The use of EFM is reassuring to labouring patients.	1.7	15.4	24.8	55.6	2.6
5. I believe that IA is preferable to EFM because EFM contributes to increased medical interventions.	5.1	32.5	22.2	33.3	6.8

Table 7

Items on the AFMQ with a similar percentage of total agreement and total disagreement

Item	% SD	D	U	A	SA
1. The use of EFM causes more patient anxiety than IA of the fetal heart rate.	5.1	37.6	17.1	32.5	7.7
2. I believe that IA is preferable to EFM because EFM contributes to increased medical interventions.	5.1	32.5	22.2	33.3	6.8
3. The use of EFM contributes to increased stress for obstetrical nurses.	12.0	35.0	10.3	30.8	12.0
4. I believe that the use of EFM can lead to unnecessary caesarean sections.	4.3	38.8	18.1	31.0	7.8
5. If I were in labour I would wish to have EFM.	12.0	30.8	7.7	37.6	12.0
6. The use of EFM decreases the patient's control over her labour.	8.5	38.5	12.8	28.2	12.0

Research question # 2

The second research question was addressed by examining relationships between demographic variables and total scores on the AFMQ. Data are summarized in tables 8, 9, and 10.

Data analysis revealed that respondents' total scores on the AFMQ varied depending on the setting in which nurses worked ($p = .02$). There was a difference in total scores between nurses in rural areas and nurses in urban community hospitals. Nurses in rural hospitals had significantly higher mean rank scores on the AFMQ than nurses in urban community hospitals. Nurses in rural areas had similar total scores to nurses in tertiary care settings. There also was no significant difference in total scores between nurses who worked in tertiary care settings and nurses who worked in urban community hospitals.

There was no significant difference in total scores based on the level of care provided by the institutions in which nurses were employed. No significant relationships were found between employment status, educational preparation, educational sessions on EFM, access to resources on EFM, and total educational information on EFM and nurses' total scores on the AFMQ. As well, the number of years of nursing experience and the number of years of experience caring for labouring patients were not related to nurses' attitudes on EFM as determined by responses on the AFMQ.

Qualitative data

Qualitative data obtained from the open-ended questions will be examined.

Question # 1

Data obtained in response to the question: "What is your opinion about the use of electronic fetal monitoring during labour?" are clustered into the following themes:

1. The use of EFM
2. Positive statements about EFM
3. Negative statements about EFM
4. Effects of EFM on patients
5. Recommendations for the use of EFM
6. Why doctors and nurses use EFM
7. Decision making about the use of EFM

The use of EFM

Thirty-two of the 117 nurses who responded to the questionnaire advocated the use of the monitor to obtain an initial assessment strip on admission. The initial assessment strip was viewed as necessary, valuable, important, a helpful tool in telling wellbeing of baby and important as a baseline for continued assessment. It also was perceived as providing information on the status of the fetus and whether there are indications for continuous monitoring. One nurse, however, voiced a different opinion: " I think we over-use it. Our policy is

[a]* 20 [minutes] monitor strip with every [obstetrical patient's] admission, that's too much".

Many nurses perceived the use of the fetal monitor to be valuable in high risk labours or labours with complications. Use of EFM in high risk labours was described as "valuable"/ "invaluable", "reassuring", "a good tool", "necessary", "essential", "of great value", and "helpful". Some nurses believed that the use of EFM contributes to a healthier outcome in the high risk situation. As one nurse stated: "...in a high risk pregnancy, where the fetal well-being is already compromised (or could be) EFM is one extra way of helping us to ensure the delivery of a healthy baby...what every [patient] wants".

Many nurses commented on their beliefs about the use of EFM in low risk labours. Several stated that the use of EFM is not indicated in normal, uncomplicated labours. Some nurses discussed their preference for the use of IA. They stated: "I prefer to do a 20 - 30 [minute] strip on admission and then I.A. for [the] duration of labor. Often I'll hold the monitor in place by hand for a few [contractions] to make sure all is well." and "Certain conditions warrant it [EFM] but the average obstetrical patient [with] an uneventful pregnancy and labour should only require I.A."

Several nurses advocated use of intermittent monitoring in low risk situations although they did not define what they meant

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*Brackets [ ] are used to provide complete words when the original responses contained abbreviations;
Brackets and underlining [___] indicate where words were added by the author to complete sentences and provide the appropriate context for the reader.

by the term "intermittent monitoring". Preferences for monitoring the low risk obstetrical patient varied. Some advocated the use of the monitor to determine a 20 or 30 minute tracing every two or three hours during labour. Two nurses believed that intermittent tracing every three to four hours was satisfactory. Others preferred to use EFM during the last stages of labour or believed low risk patients should only be monitored intermittently with assessment strips when warranted, for example, after analgesic administration or following rupture of membranes. Three nurses stated that either intermittent monitoring or IA were appropriate in low risk labours.

Positive statements about EFM

Many of the participants made positive statements about the use of EFM in labour. Nurses believed that EFM is a useful tool to assess the wellbeing of the fetus and that babies "are generally being delivered less distressed with EFM". One participant stated:

> I believe that EFM has saved the lives of many babies. And given the choice, [patients] and their families would rather deal with a labour on a monitor than a child who has problems later in life [due to] the fact that no monitoring was done to assess [and] deal [with] a problem.

EFM is also described as "worthwhile", "absolutely necessary", "helpful", "valuable", "effective in detecting fetal distress", "an integral part of labour", and "a useful adjunct for the care of obstetrical patients". Some nurses saw EFM as superior to IA in monitoring fetal heart. The following excerpt summarizes this

viewpoint:

> Trying to auscultate [with] a stethoscope is a poor quality of monitoring. It is definitely superior to listen during a contraction. The understanding of decels, accels, etc. enable a more educated [assessment] of auscultated FHR.

Two participants addressed the value of antepartum non-stress testing (NST). NST was seen as a useful, cost effective test, especially beneficial in rural areas where ultrasound is not readily available. NST was believed to detect fetal problems early.

The speculated link between the use of EFM and caesarean delivery also was addressed. One nurse stated that the notion that EFM contributes to unnecessary caesarean sections was unfounded. She said:

> If this [notion] is based on the numbers of babies sectioned for distress noted on EFM with good apgars, who knows if those good apgars are just telling us we did the right thing by sectioning before the fetus showed more grave signs. Who would want to take the chance? I've seen too many poor outcomes (babies distressed [and] poor apgars) that were detected by EFM [and] acted upon to want a [decrease] in EFM use.

Another participant appeared to be in a dilemma with respect to the use of EFM and wrote:

> One of the greatest inventions! It's saved probably millions of babies lives. When I [first] started [nursing] in OBS [approximately] 20 [years] ago, we only had 1 monitor and we did much more "hands-on" [nursing]. As more

technology came, [the number of deliveries increased] as years went by. I'm a [nurse] caught [between] 2 worlds, so to speak because I've been present [with] no EFM and now we use it on all [patients]. I try to [decrease] use in [normal] patients, but it is difficult as new nurses and some obstetricians are almost zeroed in to the machine. Our unit now only has 2 horns that I can find [and] no fetoscopes.

Negative statements about EFM

Although some nurses recognized value in the use of EFM, some also saw limitations in its use. Some believed that EFM is not necessary in every labour. Others stressed that the use of EFM was acceptable as long as it was not abused. One participant stated: "I feel it is a very useful tool as long as it is not abused such as continuous monitoring if [the] patient feels like remaining in bed in early labour, if not a high risk patient". Several nurses believed that the monitor is overutilized. One nurse wrote: "Many people, especially inexperienced L & D nurses, overuse EFM". Others stated: "...with low risk patients we probably overmonitor"; "It is overused. A good tool in high risk situations; otherwise used wrongly", "It is a piece of technology that is widely overutilised", and "I feel EFM is used far too much in labour".

Two nurses discussed the impact of technology in childbirth: "[Using EFM] made having a baby more of a medical illness like have a [myocardial infarct] where you have to be monitored also"; and "Labour is a natural process. The use of electronic gadgets

makes it look like a scientific production..." Some nurses discussed the advantages of IA over EFM. They saw IA as being just as accurate as EFM. In addition, they believed that use of EFM allows the patient to be ambulatory. The labour, then, is faster and easier. Labour, for the most part, becomes a positive experience.

Some nurses expressed an even stronger opinion: "It would be nice if we could lock up the EFM [and] not use them any more", "...during normal labour it is useless, or better yet, detrimental", and "For all normally labouring women, they should be stored outside of the room". One nurse listed her objections clearly: "[EFM] gives us grey hairs! Too many caesarean sections Too costly...Sometimes [the] monitor does not work properly. (Break down)."

Effects of EFM on patients

Nurses discussed what they perceived to be the positive aspects of EFM from the parents' point of view. These included being able to hear the heart beat and watch the strength of contractions on the tracing, being reassured by the monitor, and providing the opportunity for the husband to watch the monitor.

The negative effects of the monitor on patient care and comfort received greater attention. Monitors were described as restricting and uncomfortable. Other disadvantages included: "...some patients feel violated by their use", "can cause increased intervention and anxiety for everyone concerned", "too many caesarean sections", "cause worry for the nurse and patient", "increase workload", "increased intervention such as epidurals,

syntocinon, forceps, and mega-episiotomies", and "partner unable to help". Some nurses also believed that, with EFM, nurses and doctors spend less time with the patient. The following comments depict this concern: "Some nurses tend to send [sic] [spend] less time [with patients]- just put monitor on and leave the room, rather than sitting [with patient] and really assessing contractions and using intermittent auscultation." and "Also, MDs and nurses spend to [sic] much concentration on the tracing and the machine and not enough on the patient. In 20 years, EFM has not changed outcomes of L & D except to increase [caesarean section] rates".

Recommendations for the use of EFM

Recommendations were made regarding how nurses believed IA and EFM should be used during labour. EFM was seen by some nurses as only one assessment parameter to be used during labour. Nurses perceived that it should be used with other assessment tools or with clinical experience, "for full interpretation of patient's condition". Reassurance and good communication between the nurse and the patient were seen as essential in the use of EFM. One nurse suggested that the nurse also should use the fetoscope to auscultate fetal heart rate with the use of EFM because "...our ears are much better and gives me confidence of a healthy baby". The need for careful and accurate interpretation of the fetal monitor strip prior to intervention also was discussed. Nurses wrote: "It is imperative that physicians and nurses be proficient at interpreting tracings correctly, otherwise this may lead to unnecessary interventions, [for example caesarean sections]" and

"Most importantly the nurse must know how to read them effectively, if she/he cannot do this, the EFM is virtually useless".

Why doctors and nurses use EFM

Some respondents offered possible reasons for the frequent use of EFM. Fear of legal liability was suggested as a factor. Some nurses believed that this fear applied to nurses as well as to physicians. Nurses stated: "Over the years has made nurses paranoid of not using EFM as if something will go wrong if [patient] not being monitored" and "Medical staff (Doctor) definitely are focus [sic] on law suits and I feel they feel they would be nelegent [sic] [negligent] if a strip had not [been done]".

The monitor was also seen as convenient as it "saves having to run in [to the patient's room] with a doptone every fifteen minutes". One nurse suggested that EFM is used out of habit. Another nurse offered candidly: "I sometimes use them too often, because I'm too busy or too lazy to [discontinue] [them]". Finally, one nurse suggested that nurses and patients have come to expect the use of fetal monitoring in labour.

Decision making about the use of EFM

The last theme identified in the responses reflected how nurses make decisions about the use of the fetal monitor. Opinions varied on the presence and effectiveness of present policies directing the use of EFM. One nurse perceived that policies are not stringent enough and said: "Not every mom/ babe

needs [to be] auscultated. We need strict guidelines on who does". Another said that: "Policies tend to promote the use of EFM and do not allow for flexible individualized care". Some nurses expressed satisfaction at their institutions' present policies. One participant believed that present policies advocate monitoring "too much". Others preferred to individualize the use of EFM according to the patient's needs.

In summary, opinions on the use of fetal monitoring in labour were diverse. Some nurses perceived that initial strips on admission are valuable; as well, several stated that EFM has a place in the care of high risk labouring patients. Many nurses, however, perceived that EFM is not necessary in low risk labours. Beneficial and adverse effects of EFM on the care of labouring women were identified. Suggestions were made on how EFM and IA should be utilized. Finally, some nurses valued the right to make their own decisions on the use of EFM based on patient condition.

Question # 2

The second open-ended question: "How do you feel the use of electronic fetal monitoring affects the care the patient receives?" also also drew a range of responses. Data were grouped into the following themes:

1. No effect on care
2. Better care with EFM
3. Less care with EFM
4. Care can be good and bad
5. Negative effects of EFM

No effect on care

Many nurses believed that EFM has no effect on the care the labouring patient receives. Nurses stated:

> The care that I give to a [patient] involves many factors, ie: stage of labour, level of preparation the [patient] and coach have gone through, ability to cope with pain, as well as how the fetus is coping according to what the monitor tells me. I care for my [patients] as a whole being- not just a "body attached to a machine".

and:

> Personally, I try not to allow it to affect the care. I try to remember there is a [patient] not a machine present and work with the [patient], explaining everything I am doing etc.... If we try to personalize our care to each [patient] and situation (work with the [patient]) EFM shouldn't affect the care the [patient] receives.

Some nurses believed that the care the patient receives is usually not affected. However circumstances may alter the care of the labouring woman. For example, if the unit is busy, if the nurse is inexperienced, or if the monitor is used continuously, nursing care may be less. Other respondents perceived that the monitor does not affect the care the patient receives; at the same time, they recognized limitations of the use of EFM. One limitation mentioned is the restriction in patient activity. Another is that the nurse may focus on the monitor instead of the patient. A nurse expressed this viewpoint as follows:

> I think because I'm fairly new in L & D that I tend to focus a lot on EFM and not as much on my [patient]. I do believe

> when I become more comfortable [with] EFM, that it won't be that way. I don't think the care the [patient] receives lacks any!

Some nurses believed that although the care that most patients receive is not affected by monitoring, some patients receive more attention if they are monitored, especially if constant monitoring is required. In some cases, the monitor can be beneficial to patients. EFM can decrease patient anxiety because the patient knows how the baby is coping with labour. Nurses stated: "Most [patients] are anxious to know how the baby is doing and ask for the volume to be increased so they can hear the heart rate" and "[Patients] [are] reassured. [They] expect monitoring. [They] often request for it to be continued when R.N. wishes to take monitor off. It does not affect the care [the patient] receives adversely at all".

Better care with EFM

Several nurses believed that the care a patient receives is better when EFM is used. Some nurses thought this to be the case especially if the monitor was used continuously: "In our hospital I feel the [patient] gets more attention during labor is she is on EFM".

Nurses also discussed the benefits of EFM for the patients in terms of nurses having more time to teach and explain the monitor, to develop a relationship with the patient, and to reassure the labouring woman. As well, there is less need to disturb the patient to listen to the fetal heart rate and there is better detection of fetal problems. The effect of EFM on the

physical care the patient receives also was addressed. One nurse stated that patients receive closer attention to hydration, temperature, and positioning with EFM:

> It is my opinion that my patients receive additional care- anyone who requires continuous monitoring should require continuous observation of that monitoring. It is easy to rub backs, assist with breathing techniques etc. while you observe the monitor readings. Because the [patient] is unable to be as mobile as she might be because of the monitor, you find yourself looking for alternative methods to provide comfort.

Participants also discussed the benefits of EFM in allowing the nurse more time to provide care. With less time spent auscultating the fetal heart rate, there is more time to provide comfort measures and hold the patient's hand. One nurse believed that an advantage of EFM is being able to monitor the patient's progress even though the nurse may not be in the room with the patient: "There are times when staff are not able to be with the patient at all times, and the monitor helps to provide [the] nurse and patient with valuable information about the fetus".

The advantage of EFM over IA in assessing fetal wellbeing also was addressed. A nurse stated: "I feel the monitor improves care to labouring patients as we have a better idea what's happening to [the fetal heart] before, during and immediately following contractions which is sometimes difficult to assess with the fetoscope or doppler".

The care the labouring patient receives also was described as: "improved", "safe and competent", "better", and "more

individualized".

Less care with EFM

Other nurses discussed their beliefs that a labouring patient monitored with EFM receives less care. The nurses found that nurses provide less personalized care when a woman is monitored; while nurses focus on the fetal monitor, they forget to encourage ambulation and position changes during labour. As one nurse explained:

> Too many times I've seen [patients] positioned for the machine to trace properly and not for their comfort. Believing that the machine can tell "how strong" the contractions are and not listening to the [patient]. Most of the bedside care is focused on the tracing and not "hands on" care of the [patient] in labour.

Nurses also believed that when EFM is used, the machine becomes the focus of nursing care at the expense of the patient. One stated: "The monitor becomes the focus of the labour, for [patient], family, medical staff, and nursing staff, so it takes away from the mother".

Nurses also referred to the decreased mobility experienced by labouring patients monitored by EFM. Positioning of the patient is done "to accommodate the machine and not the [patient]". EFM "restricts showering, walking, and backrubbing for comfort levels". A nurse said: "[The patient] seems to become more dependent and wants to stay in bed. I feel [patients] have a better labour (they cope better) if not strapped down. Then you can have them up in shower, walking, squatting or in

rocking chairs".

Participants also discussed the stress created by the use of the monitor. Monitoring not only increases anxiety in the inexperienced nurse but also in patients as "they end up watching the monitor constantly".

Some nurses believed that communication with labouring patients monitored with EFM can be impaired. They said: "There is less touch involved in the care", "[EFM] creates distance between nurse [and the] labouring [woman]", and "Often times the [patient] receives less care due to the fact that the EFM is giving the information we would get if we did IA because there would be more interaction with the [patient]".

Some respondents believed that the use of EFM in labour may also result in increased medical intervention. One nurse wrote: "More medical intervention can occur and invasive procedures are performed due to "physician anxiety" by watching the tracing". Another stated: " It [EFM] increases the amount of technology involved in childbirth". Nurses also perceived that the monitor provides a false sense or security for labouring women, is uncomfortable for the patient, and hampers the normal progress of labour.

Care can be good or bad with EFM

Other nurses believed that the care the patient receives can be either good or bad with EFM depending on the situation. They perceived that while some patients are comforted by the monitor, others find it annoying. Similarly, although in some instances, fetal distress is diagnosed more quickly, patients may be

forgotten in favour of the machine or restricted in their movement:

> If the tracing is bad, the [patient] gets [one on one] nursing care, perhaps to the detriment of a [second] patient if the assignment is to two patients, and no help is available. If one is very busy, a [patient] can be put on the monitor "because one can keep half an eye on the tracing", and get less personal care than a laboring woman deserves.

Negative effects of EFM

Although some nurses did not comment of the quality of care they believed labouring patients received with EFM, they identified what they believed to be negative consequences of the use of the monitor. It is uncomfortable for patients, restricts activity, and can be intimidating for patients and their support persons:

> Use of EFM without consideration of the consequences encourages [patients] to become bed-ridden so to speak. Discourages position change and ambulation. So, in theory, the woman may ask for analgesia sooner- being more focused on her pain. Also may slow down labour and proper progress- rotation, descent. Takes "control" away from [the] woman of her body. Labour destroys the intuition the woman may have about how she needs to move and change positions.

In summary, while some nurses believed that the use of EFM during labour did not affect the care a patient receives, others believed that the monitor may have either positive or negative

consequences on nursing care. Care may be improved by better assessment of fetal wellbeing and more attention to the mother. On the other hand, care may be less individualized, involving less "hands on", and may become more mechanical as the nurse's attention is diverted toward the monitor.

Question # 3

In response to the third question: "How do you feel the use of EFM affects the nurse's role in caring for labouring patients?" the following themes were identified:

1. No major impact on the nurse's role
2. The nurse's role varies
3. The nurse's role changes with EFM
4. Other consequences of EFM
5. Recommendations on how EFM should be used

No major impact on the nurse's role

Some nurses perceived that EFM has no impact on the nurse's role in caring for labouring patients. They stated: "Most [patients] are monitored on admission and intermittently during a long labor so I don't feel it has a large impact on patient care here" and "I don't feel the care is any different basically. More time is often needed in positioning patient comfortable [sic] and adjusting monitor".

The nurse's role varies

Four respondents indicated that the role of the nurse varies when the EFM is used. At times, nurses spend more time with the

patients and at other times, less. At times, the monitor is an asset and at other times it "complicates the nurse's role". As one nurse stated: "I find it very beneficial if you're well informed about monitor strip reading. Otherwise you are forever panicky or tense because you don't want to interpret it poorly or miss [sic] the proposed nursing diagnosis".

Change in the nurse's role with EFM

Nurses addressed a change in the nurse's role brought about by the use of EFM in labour. Some believed that the monitor takes away from the "hands on" aspect of nursing; the focus of nursing becomes the monitor and there is less time spent with the patient. The nurse is described as "less involved and more detached from the mother and her support person", "more technical", "more clinic-like", "looking after machines, not people", and "very mechanical". In addition "nurses may be seen by the patient as more technologically oriented". Some believed that the monitor takes attention away from the patient, decreases personal touch, and decreases interaction with the patient. Less time is spent at the bedside which reduces "the whole reassuring presence a nurse can bring". A nurse wrote: "Nurses concentrate on machines and not on the patient and her feelings or experience. I think machines often dehumanize us as caregivers". Other nurses elaborated on these themes:

> Sometimes we worry more about the monitor and getting a good tracing, than about patient comfort. Sometimes I feel a good (complete) tracing is identified as good nursing care, with hands on stuff like back rubs, effleurage, foot massage

being of no account.

and

> Some nurses may watch the machine. There is not that constant contact with [the patient] at all times, feeling the contractions, timing them, and giving support one to one.

Nurses also perceived that the use of EFM in labour increases the nurse's workload and responsibility and that more time is spent on documentation. More time is required to adjust and remove the monitor for bathroom trips and to re-connect the machine, to reassure the patient, to interpret the tracing, and to keep the machine printing and tracing. A nurse added: "[the monitor is] one more piece of equipment to clean once [the] case [is] finished".

Another change in the nurse's role that respondents identified was increased reliance on machines. They stated: "We tend to depend more on the strip than on hands on techniques and [patient's] expression as far as contractions" and "We depend less on our assessment skills and more on what the machine says".

Participants also discussed the need for nurses to possess certain knowledge when caring for patients monitored by EFM. They must be able to correctly interpret monitor tracings and trouble shoot problems if the monitor does not work properly.

Some nurses believed that nursing skills are lost because of the presence of the monitor. The monitor replaces the nurses' skills of providing comfort. The art of palpating contractions, auscultating fetal heart rate, palpating for fetal position, and listening to the patient diminishes. As one nurse stated, EFM

"hastens the erosion of hands on skills".

The EFM was seen by some nurses as a time saving device. It saves nurses time, allows them to monitor the fetal heart rate "at a glance" if they are busy, "frees the nurse to do other things for the patient, and allows nurses to look after more than one patient at a time", and one nurse said: "It makes my role easier-because if I'm gone from the room for a while and then return I know what has happened in that period of time".

The monitor also was perceived as a source of reassurance for nurses. EFM provides "peace of mind", information on the status of the baby, early detection of problems and early intervention, and reassurance for the nurse that intervention was appropriate.

In contrast, other nurses saw the monitor as a source of stress. Sources of stress included interpreting readings and acting upon them. One nurse stated: "It [EFM] can increase the stress level for the nurse as one almost always looks out for major problems like fetal distress".

Some nurses viewed their role more as that of interpreting the monitor tracing and intervening. In addition, the role of the nurse involves waiting for complications to occur and reporting abnormalities to physicians.

For some nurses the monitor was seen as an instrument that enhances communication between the nurse and patient. The nurse functions to reassure patients, to teach patients and their coaches about the tracing, and to advocate for patient rights by encouraging physicians to adopt a wait and see attitude instead of intervening too quickly. Some believed that the role of the nurse

is diminished as physicians rely more on the tracing than the nurse's findings. One wrote:

> The nurse is called upon to interpret the strip for [the] patient and partner. The nurse becomes an extension of the monitor in their eyes. And because of nurses' different interpretations of EFM the [patient] may receive conflicting messages therefore making the nurse look "stupid"- there may be discomfort in the nurse/[patient] relationship.

Other consequences of EFM

In addition to the monitor's effect on nurses' roles, some participants identified other consequences of EFM. Nurses perceived that the use of EFM in labour can lead to unnecessary caesarean sections for questionable fetal distress, "override [patients] decisions and expectations" about their labour, decrease patient mobility, and "detract from the normal birthing experience". On the other hand, some nurses identified positive consequences of EFM including: it buys more time to observe the fetus before intervening unnecessarily, is less intrusive, reassures parents, enhances the care of labouring patients, and allows the nurse to be more in tune with what is happening with the baby.

Recommendations on how EFM should be used

Some nurses expressed thoughts on how the fetal monitor should be utilized. Participants stressed that the nurse must remember to focus on the patient instead of the machine. One nurse suggested that if the patient is being monitored

electronically, the nurse must be aware of the tracing at all times. Monitoring needs to be carefully explained to patients and nurses should use their judgement as to which patients need to be monitored and which do not.

In summary, although some respondents did not believe that the role of the nurse changes when a patient is monitored by EFM, many identified changes in some aspect of their role. Nursing was seen by some as being more technical. The monitor was perceived by others to be more work, a time saver, and a source of either reassurance or stress for the nurse. Nurses also believed that they become more dependent on machines and that some clinical skills become lost as a result of the presence of the monitor. Nurses need to be more knowledgeable in evaluating monitor tracings; at times, their role focuses on attaining and evaluating monitor tracings. Nurses also play a role in educating parents about the monitor, reassuring them, and at times, advocating their rights.

Question # 4

In response to the last open-ended question: "Under what circumstances, if any, is the use of electronic fetal monitoring appropriate?" some nurses listed specific patient conditions that justify the use of EFM. "High risk pregnancies/complicated pregnancies" were frequently listed as indications to EFM. One respondent stated: "For "high risk" or suspected high risk labours- at least to rule out a problem. If no problem, go to IA.... Should be backed up if a problem with fetal scalp sampling.

Many participants listed specific risk factors which

indicated the use of EFM. Meconium stained amniotic fluid was perceived to be an indication. Some nurses specified moderate, thick, or particulate meconium as an indication for monitoring. Other nurses believed that post maturity was an indication and some advocated the use of EFM for antepartum non-stress testing if the fetus was post-mature. Pregnancy induced hypertension/pre-eclamptic toxemia/and the HELLP syndrome also were identified as indications for monitoring. One nurse advocated daily non-stress tests for patients with pregnancies complicated by pregnancy induced hypertension. Pregnancies where the fetus is growth retarded also were listed as indications.

Many nurses viewed the monitor as beneficial in labours that were induced or augmented with syntocinon. Pregnancy complicated by diabetes or gestational diabetes also were identified as factors warranting EFM as was the use of epidural analgesia/anaesthesia. One nurse elaborated on the use of EFM with epidural medications: "Continuous EFM should be used in all patients with epidurals. It allows us to be instantly allerted [sic] to problems such as variable decels which can in some cases easily be corrected by a change in position. At allows us to let the [patient] sleep without many disturbances as you have with IA".

Respondents also listed the following indications: grand multiparity, oligohydramnios, trial of labour/vaginal birth after caesarean, fetal anomalies, decreased fetal movement, prematurity, antepartal hemorrhage/placenta previa/placenta abruptio/ bleeding, malpresentation/breech presentation, previous stillbirth/fetal demise, prolonged rupture of membranes, placental insufficiency,

multiple pregnancy, and the large for gestational age fetus.

Many participants identified the need to use EFM for an initial baseline strip upon the patient's admission. As well, the presence of fetal distress/a compromised fetus/the presence of an ominous fetal heart rate pattern (including poor variability, late decelerations, variable decelerations, bradycardia, tachycardia, nuchal cord pattern) were frequently listed indications. Included in these were situations where fetal hypoxia could exist, for example, if a fetus is compromised antenatally by hypoxia or if there is a risk of hypoxia during labour. One nurse advocated that fetal scalp sampling also should be utilized if fetal distress is suspected.

EFM was seen as necessary in the second stage of labour to assess for bradycardia while some advocated its use in prolonged second stage. Others saw it as valuable following medication administration, following artificial rupture of membranes, if cord prolapse is likely as in polyhydramnios or unstable lie, and for antepartal non stress testing. Maternal conditions were also identified as indications of EFM. Some nurses elaborated on this and specified conditions such as epilepsy, maternal trauma, maternal fever, and maternal hypertension. Infection and sepsis also were identified.

Some nurses perceived that EFM was warranted in most or all circumstances. They believed that EFM was indicated in "normal labouring patients" and "during active labour". Nurses also thought it was indicated when it is difficult to assess the fetus by IA or when the patient requests it. One nurse believed that it is not indicated under any circumstances.

Nurses discussed how staffing situations may necessitate the use of EFM and state: "...with the [decreased] amount of staff with the same [number] of labor [patients], EFM (intermittently) does help whether we like to use it or not. Sometimes it is our only source of control on quality of care" and "[The use of EFM is appropriate] in the instance of low staffing, when the nurse is responsible for up to 15 other patients on night shift....One nurse caring for two laboring patients simultaneously".

Some nurses spoke positively about the use of monitoring in low risk labours and advocated either IA or intermittent monitoring for these situations.

Nurses also made the following comments:

> Perhaps there could be [decreased] EFM in more [normal patients]. We do a 20 minute strip and then q 3-4 [hours] another strip. Is this really necessary? Do we need to rearrange our standards?

and

> In [circumstances other than high risk], the decision to use EFM should be based on the entire picture. Consider all variables. No automatic rules for the use of EFM. All situations individual. This does require very experienced staff.

Summary

In summary, the data revealed that nurses' attitudes toward EFM varied. The mean raw total score on the AFMQ was 114 or 50.1 percent indicating that overall, nurses recognize positive and negative aspects to the use of EFM.

Over 25 percent of nurses disagreed that routine EFM of all labouring patients would be ideal. Over one-third of respondents disagreed that EFM is one of the worst developments of modern obstetrics. Seventy percent of nurses were in favour of the use of EFM in labour. The setting in which nurses worked was the only variable that had a significant association with the attitudes of nurses toward EFM. Nurses from rural settings have more positive perceptions of EFM than nurses in urban community settings; neither differed significantly from nurses in tertiary settings.

In response to the open-ended questions, several nurses advocated the use of EFM to obtain an initial strip on admission. Many nurses also discussed their preference for intermittent EFM every two to three hours during low-risk labours. While some participants stated that EFM has no effect on the care the labouring patient receives, others perceived that care was affected by EFM. Some perceived that care was better with EFM, that nurses had more time to teach, to relate with patients, and to provide comfort measures. Others believed that with EFM, some nurses nurse the machine instead of the patient. Similarly, while some participants perceived that the use of EFM has no impact on their role in caring for labouring patients, others believe that EFM affects the nurse's role. Some nurses believe that EFM takes away from the hands-on aspect of nursing as nurses become more technologically oriented. EFM increases the nurse's workload as more time is spent on documentation. Others view EFM as a time saving device that makes the nurse's role easier. EFM was seen as both a source of reassurance and a source of stress for nurses and patients. EFM can either enhance communication with the patient

or hinder it. Finally, most nurses believed that EFM was indicated in high-risk labours. Some believed that it was warranted in most circumstances; one nurse believed that it was not indicated under any circumstances. Many indicated that staffing situations may necessitate the use of EFM.

Additional analyses

Additional analyses also were performed on the data. Relationships were examined between demographic variables and nurses' estimates of their use of EFM for the major portion of the patient's labour as well as their estimates of use of EFM primarily because of hospital policy. As well, Spearman correlation coefficients were determined for the variables total scores on the AFMQ, use of EFM, and use of EFM primarily because of hospital policy. Characteristics of nurses who support EFM were identified. Estimates were made of the percentage of all labouring patients for whom nurses use EFM for a major portion of the patient's labour primarily because of hospital policy. A principal component analysis of the AFMQ was performed. Finally, regression analyses were performed for the three variables: a) total scores on the AFMQ, b) use of EFM, and c) use of EFM primarily because of hospital policy.

Nurses' estimates of their use of EFM for a major portion of the patient's labour (percent use)

Data analysis revealed that there was a significant difference in percent use of EFM depending on the nurse's work setting ($p = .0003$). Nurses in tertiary care settings had higher

mean rank scores than nurses in urban community hospitals. Nurses in urban community settings, in turn, had higher mean rank scores than nurses in rural areas. There also was a significant difference in mean rank scores depending on the level of care of the institution in which nurses worked (p= .0054). Nurses working in level 3 institutions had higher mean rank scores than nurses in other hospitals. There was no significant difference in percent use between nurses in level 1, level 1a, and level 2 institutions. Data analysis did not reveal any difference in mean rank scores based on the nurse's employment status (p= .17). As well, there was no difference in mean rank scores between midwives, diploma RNs, and nurses with baccalaureate degrees (p= .14).

Educational preparation, educational sessions on EFM, resources on EFM, and information on EFM did not influence nurses in their use of EFM in labour. Data analysis also did not show a significant relationship between years in nursing and percent use of EFM (p= .26). There was a weak negative correlation (-.19) between labour experience and percent use of EFM (p= .049). Nurses with more years of experience in caring for labouring patients estimated using EFM less frequently, for a major portion of the patient's labour, than nurses with less years of experience. The data are summarized in tables 11, 12, and 13.

Use of EFM for a major portion of the patient's labour primarily because of hospital policy (policy use)

Use of EFM primarily because of hospital policy varied depending on the setting in which nurses were employed (p= .0276). Nurses in urban community hospitals had higher mean rank scores on

the policy use scale than did nurses in rural settings indicating that nurses in urban community settings use EFM more, primarily because of hospital policy, than nurses in rural settings. There was no significant difference in mean rank scores between nurses in urban community settings and nurses in tertiary settings, or between nurses in tertiary settings and nurses in rural settings. Other demographic variables: level of care, employment status, educational preparation, educational classification, EFM education, EFM resources, and EFM information did not influence policy use scores. As well, no relationships were found between either the variables years in nursing and labour experience and policy use scores. The data are summarized in tables 14, 15, and 16.

Spearman correlations

Correlation coefficients were determined to see if there were any significant relationships between nurses' attitudes towards of EFM and a) the use of EFM and b) use of EFM primarily because of hospital policy. As well, the relationship between use of EFM and use of EFM because of hospital policy was investigated. The spearman correlation coefficient did not reveal a significant relationship between the variables use of EFM for a major portion of the patient's labour and total scores on the AFMQ ($p= .11$). A weak negative correlation (-.30) was found between the variables use of EFM primarily because of hospital policy and total scores ($p= .0014$). As well, a weak positive relationship (.38) was found between the variables use of EFM for a major portion of a patient's labour and use of EFM primarily because of hospital

policy (p= .0001). The data are summarized in table 17.

Characteristics of nurses who support EFM

Finally, the characteristics of nurses who support EFM were determined. Nurses who support EFM were defined as nurses whose total scores on the AFMQ were over 50 percent. Nurses who do not support EFM were defined as nurses whose total scores on the AFMQ were less than or equal to 50 percent.

The variables setting, educational classification, and policy use (use of EFM for a major portion of the patient's labour primarily because of hospital policy) are relevant in identifying nurses who support EFM. Data are summarized in tables 18, 19, and 20.

Of the nurses in a rural setting, 72 percent (n= 28) supported EFM while only 44 percent (n=17) of nurses in urban community settings and 59 percent (n= 23) of nurses in tertiary settings supported EFM (p= .041).

A larger percentage of nurses who had a diploma education in nursing were supporters of EFM compared with nurses who had midwifery education or a baccalaureate degree (66%, 42% and 43% respectively). This difference was significant at a .05 level of significance. Nurses who were EFM supporters use EFM less because of hospital policy than nurses who were non-supporters (p= .0015).

The variables labour experience, years in nursing, and use of EFM for a major portion of the patient's labour were not significant in determining the characteristics of nurses who support EFM. As well, the chi-square test revealed that the variables employment status and level of care provided by the

institution were not associated with nurses' support of EFM (p= .33 and .99 respectively)

In general, then, nurses who support EFM are diploma registered nurses from rural settings who are not guided primarily by hospital policy when deciding upon the method of monitoring to be used during labour.

Percent use of EFM primarily because of hospital policy

The percentage of nurses who used EFM for a major portion of all patients' labours primarily because of hospital policy was determined. The mean percentage use for EFM primarily because of hospital policy was 33 percent with a standard deviation of 29 percent, a median of 27 percent, and a mode of zero. The range of this distribution was 0-100 percent. The Shapiro Wilk test determined that this distribution was not a normal distribution.

Principal component analysis

A principal component analysis is a method of determining which items or variables on a research tool "go together" or are clustered together (Stevens, 1986). With principal component analysis, it is possible to determine which items on a scale "fit together" to measure the concept under study. Factor analysis, a subsequent step to principal component analysis, assists in determining any existing subscales of a measurement tool (Stevens, 1986).

Principal component analysis transforms the original items in a research scale into a new set of linear combinations called principal components (Stevens, 1986). The first principal

component accounts for the greatest amount of variance for a set of variables. The second principal component "accounts for the next largest amount of variance (after the variance attributable to the first component has been removed) in a system" (Stevens, 1986, p. 338). First, a correlation matrix of the scores on all items of the AFMQ was developed. The Kaiser measure of sampling adequacy was .88 suggesting that the dataset was well conditioned for principal component analysis (Personal communication, Dr. Sloan, March 2, 1995). The principal component analysis determined eigenvalues as well as the weight (factor loading) for each variable on each factor. Eigenvalues are "the sum of the squared weights for each factor" (Wilson, 1989, p. 579). Eigenvalues were examined to decide how many factors would be included in the principal component analysis. The scree test was used to determine the number of factors to be retained (Burns & Grove, 1987; Stevens, 1986). Two principal components were identified underlying nurses' attitudes to the use of EFM in labour.

Factor loadings, the extent to which each item in that principal component was related to other items in that principal component were examined (Stevens, 1986). A cut off point of .45 was used to prevent secondary loading--that is, variables loading high on two principal components (Stevens, 1986). As well, Wilson (1989) suggests that there must be a .20 spread between loadings on two consecutive factors for a variable to be considered. This rule was followed. Table 21 summarizes the items with high factor loadings for the second principal component. Other factor loadings were high for the first principal component. The

exception is item 35, with factor loadings of .319 and .439 on principal components one and two respectively. Factor loadings for the two principal components identified are listed in Appendix R.

One commonality in the items that had a high factor loading for the second principal component was the small percentage of agreement with each statement. The first principal component was interpreted as items that are relevant in influencing nurses' attitudes toward EFM. The second principal component was interpreted as those that are not central to the issue of nurses' attitudes toward the use of EFM. These items represent concepts that are likely irrelevant in influencing nurses attitudes about the use of EFM in labour (Personal communication, Dr Sloan, March 2, 1995).

Issues that are not relevant to nurses' attitudes toward EFM include beliefs that a) EFM protects nurses from lawsuits/legal liability, b) EFM decreases the nurse's workload and allows nurses to care for more patients at the same time, and c) EFM is challenging and nurses like to interpret monitor tracings.

These results must be viewed as preliminary. The purpose of the principal component analysis was to investigate the reliability of the instrument and determine the dimensions underlying the AFMQ (Personal communication, Dr. Sloan, March 23, 1995). The principal component analysis revealed that most of the items of the AFMQ "hung together" as an instrument that measured the attitudes of nurses toward EFM. Only six of the items on the AFMQ appear to contain concepts that are not central to the issue of "nurses' attitudes toward EFM".

The next step of principal component analysis, factor rotation, allows for easier interpretation and clearer distinction of the variables for each factor (Stevens, 1986). The SAS computer program used the Varimax rotation method. Following factor rotation, loadings were examined to identify which variables were associated together. A cut-off point of .5 was used. Again, variables were selected if there was at least a .20 spread between loadings on two consecutive factors. The eight items that had high factor loadings for the first factor are summarized in table 22. The five items that had a high loading for the second factor are summarized in table 23. Factor loadings for the two factors are listed in Appendix S.

The final step to principal component analysis is the interpretation of the factors identified (Wilson, 1989). "The purpose is to identify the broad construct of meaning that has caused these particular variables to be so strongly intercorrelated" (Burns & Grove, 1987, p. 547). A common theme of the items in the first factor is that most of these items refer to nurses' perceptions of the effect of EFM on the labouring patient. The exception to this is item seven which addressed the effect of EFM in increasing stress for obstetrical nurses. It is unclear how this item relates to the other items that had high factor loadings for this factor. All other items reflect effects of EFM on the patient in terms of patient anxiety, the care patients receive, their perception of the birth experience, and the risk of unnecessary caesarean sections. Items that had high factor loadings on factor two deal with nurses' perceptions of the use of EFM as a tool that detects problems with the fetus. These items

address the value of EFM over IA in accurately obtaining fetal heart rates, reassurance for the nurse when EFM is used, and the use of EFM in detecting complications, improving fetal outcome, and preventing perinatal mortality and morbidity.

The principal component analysis therefore revealed two sub-scales for the AFMQ. The first sub-scale contains items that pertain to the effects of EFM on the labouring patient. The second sub-scale contains items that reflect the value EFM is believed to have in improving the neonatal outcome.

This principal component analysis must be interpreted with caution. Stevens (1986) recommends that in a principal component analysis, the observation/variable ratio must be at least 5:1. A principal component analysis of a 38-item scale would require over 190 subjects. An observation/variable ratio of 3:1, as found in this study, should be used with caution (Personal communication, Dr. Sloan, March 2, 1995) as the results are not likely to be replicated (Stevens, 1986). No scores for the sub-scales were determined due to the small observation/variable ratio.

Regression analysis

Regression analysis also was performed for the variables total scores, use of EFM for a major portion of the patient's labour (percent use), and use of EFM primarily because of hospital policy (policy use). Regression analysis is a method of predicting the effects of two or more independent variables on the dependent variable (Polit & Hungler, 1991). Data for the regression analyses are summarized in tables 24-26. The two variables that had a statistically significant relationship with

total scores were policy use and tertiary setting. When both variables were entered into the regression equation, only the variable policy use was statistically significant in predicting total scores (p= .0018). The following model equation was selected by the stepwise regression approach:

total scores = 57.5 - .14 (policy use)

The adjusted R-square value was .09. That is, nine percent of the variation in total scores can be attributed to the relationship between policy use and total scores. The remaining 81 percent is attributed to error.

The five variables that had a statistically significant relationship with the variable percent use were urban setting, tertiary setting, hospital level of care, labour experience, and policy use. When entered into the regression equation, only the variables setting and policy use were statistically significant in predicting percent use of EFM (p = .0001). The following model equation was selected by the stepwise regression approach:

Percent use = 33.62 + 19.04(tertiary setting) + .27(policy use)

Contributions to the predictive value of the equation for setting and policy use are fifteen percent and fourteen percent respectively. Therefore, 29 percent of the variation in percent use scores can be attributed to the relationship between the independent variables and percent use. The remaining 71 percent

can be attributed to error.

The three variables found to be significantly related to policy use were percent use, tertiary setting, and total scores. When these variables are entered into a regression equation, only the variables percent use and total scores had a significant predictive ability for the variable policy use ($p < .05$). The following model equation was selected by the stepwise regression approach:

Policy use = 58.37 + .72(percent use) - 14.44(tertiary setting) - .78(total scores)

The independent variables percent use, tertiary setting, and total scores each contribute 16 percent, twelve percent, and 3.5 percent respectively to the value of the dependent variable policy use. Therefore 32 percent of the variation in policy use can be attributed to the independent variables percent use and total scores. Sixty-eight percent can be attributed to error.

The regression equations for the variables total scores, percent use, and policy use do not have a strong predictive ability. It is therefore not possible to predict nurses' attitudes, use of EFM, or use of EFM because of hospital policy with any accuracy based on the data obtained from the study.

Summary

In summary, the setting in which nurses worked was the only variable that had a significant association with the attitudes of nurses toward EFM. Nurses from rural setting have more positive

perceptions of EFM than nurses in urban community settings; neither differed significantly from nurses in tertiary settings with respect to total scores on the AFMQ.

Nurses estimated using EFM for a major portion of the patient's labour in 54.9 percent of all labouring patients. Setting, level of care, and the number of years of experience in labour and delivery were the three demographic variables that were associated with the use of EFM. Nurses in tertiary settings estimated using EFM more than nurses in urban community settings; nurses in urban community settings estimated using EFM more than nurses in rural settings. Nurses in hospitals that provide level three care estimated using EFM more than nurses in hospitals offering levels 1, 1a, and 2 care. As nurses in tertiary settings provide care to more high risk labouring patients, it is understandable that their use of EFM would be greater than nurses from other institutions. The use of EFM did not differ between nurses who worked in level 1, level 1a, and level 2 hospitals. Nurses with more years of experience working with labouring patients used EFM significantly less than nurses who had less years of experience working with labouring patients although the correlation was a weak one.

Setting was the only variable that was associated with nurses' decisions to use EFM because of hospital policy. Nurses in urban community hospitals used EFM for a major portion of a patient's labour more because of hospital policy than nurses in rural settings. As with the use of EFM, the use of EFM because of hospital policy was not associated with the institution's level of care. Data analyses revealed that nurses with more positive

perceptions of EFM (higher AFMQ scores) used EFM less because of hospital policy.

Data also showed that the more nurses use EFM for a major portion of a patient's labour, the more they used EFM primarily because of hospital policy. Data also revealed that nurses use EFM for a major portion of the patient's labour primarily because of hospital policy in 33 percent of all labours.

Data revealed that nurses in rural settings have more positive perceptions of EFM, although they use it less frequently for a major portion of patients' labours and use it less because hospital policy demands it. Nurses in urban community hospitals have the least positive perceptions of EFM and use it more because hospital policy demands it.

Typically, the nurse who supports EFM has a diploma education in nursing, works in a rural setting, and is not guided primarily by hospital policy when determining the method of fetal heart rate monitoring to be used during labour.

Data analysis also revealed that variables for which data were collected in this study are not predictive of nurses' attitudes on EFM, their use of EFM, and use of EFM because of hospital policy.

A principal component analysis revealed that beliefs that EFM saves nurses' time, offers protection from lawsuits, and is challenging, and that nurses like to interpret tracings do not account for nurses' attitudes toward the use of EFM in labour. Two sub-scales were identified in the AFMQ. The first sub-scale related to items that reflect nurses' perceptions of the effect of EFM on labouring patients and the second sub-scale related to

items that reflect the nurses' perceptions of EFM as an instrument that accurately evaluates the fetal heart rate.

In this chapter, data obtained from quantitative and qualitative research were presented and demographic data and quantitative variables were examined. Findings of the study and its implications for nursing practice and research will be discussed in the next chapter.

Table 8

Kruskal Wallis test and Duncan grouping for the variable total AFMQ scores and the variables setting, level of care, employment status, and educational classification

Variable	n	Rank means	Duncan grouping *	
Setting (p= .02) **				
Rural	39	70.42	A	
Tertiary	39	58.15	A	B
Urban community	39	48.42		B
Level (p= .94)				
1	32	62.14	A	
2	13	58.19	A	
3	39	58.15	A	
1a	33	57.27	A	
Employment status (p= .31)				
casual	3	80.17	A	
full time	51	62.20	A	
part time	63	55.40	A	
Educational classification (p= .07)				
Diploma RN	77	64.19	A	
Degree ***	14	49.68	A	
Midwifery education	26	48.65	A	

Note

* Means with the same letter are not statistically significant ($p < .05$).
** Highlights results significant at .05 alpha level
*** Indicates nurses with any degree education, excluding nurses who also have midwifery education

Table 9

Wilcoxon test for the variable total AFMQ scores and the variables educational preparation, EFM education, EFM resources, and EFM information

Variable	n	Rank means	p
Educational preparation			
BN			
no	103	60.59	.17
yes	14	47.29	
Midwife			
no	91	61.96	.08
yes	26	48.65	
Other degree			
no	110	59.73	.36
yes	7	47.57	
EFM education			
yes	95	61.18	.15
no	22	49.59	
EFM resources			
no	11	60.05	.92
yes	106	58.89	
EFM information			
yes	114	59.53	.30
no	3	38.83	

Table 10

Spearman correlation coefficients for the variable total AFMQ scores and variables "years in nursing" and "labour experience"

Variable	n	Spearman rho	p
years in nursing	117	.0247	.79
labour experience	116	.0035	.97

Table 11

Kruskal Wallis test and Duncan groupings for the variable percent use of EFM and the variables setting, level of care, employment status, and educational classification

Variable	n	Rank means	Duncan grouping *
Setting (p= .0003) **			
tertiary	39	71.99	A
urban community	36	56.57	B
rural	38	42.03	C
Level (p= .0054)**			
3	39	71.99	A
1	29	50.14	B
2	12	48.46	B
1a	33	48.42	B
Employment status (p= .17)			
casual	3	73.00	A
full time	49	62.31	A
part time	61	51.95	A
Educational classification (p= .14)			
degree ***	13	69.88	A
midwife	25	62.68	A
diploma RN	75	52.87	A

Note

* Means with the same letter are not significantly different ($p < .05$).
** highlights results significant at .05 alpha level
*** Indicates nurses with any degree education, excluding nurses who also have midwifery education

Table 12

Wilcoxon test for the variable percent use and the variables educational preparation, EFM education, EFM resources, and EFM information

Variable	n	Rank means	p
Educational preparation			
BN			
yes	12	63.04	.50
no	101	56.28	
Midwife			
yes	25	62.68	.33
no	88	55.39	
Other degree			
yes	6	68.33	.38
no	107	56.36	
EFM education			
no	22	65.18	.19
yes	91	55.02	
EFM resources			
yes	102	58.02	.31
no	11	47.50	
EFM information			
no	3	65.33	.66
yes	110	56.77	

Table 13

Spearman correlation coefficients for the variable percent use and the variables "years in nursing" and "labour experience"

Variable	n	Spearman coefficient	p
years in nursing	113	-.108	.26
labour experience	112	-.19	.049*

Note

* highlights results significant at .05 alpha level

Table 14

Kruskal Wallis test and Duncan groupings for the variable policy use and the variables setting, level of care, employment status, and educational classification

Variable	n	Rank means	Duncan grouping*	
Setting (p= .0276)**				
urban community	37	64.45	A	
tertiary	37	53.57	A	B
rural	34	44.69		B
Level (p= .82)				
1a	31	58.76	A	
2	12	54.17	A	
3	37	53.57	A	
1	28	51.16	A	
Employment status (p= .18)				
Casual	3	66.67	A	
Full time	47	59.97	A	
Part time	58	49.44	A	
Educational classification (p= .297)				
Midwife	25	62.96	A	
Degree ***	13	53.35	A	
RN	70	51.69	A	

Note

* Means with the same letter are not significantly different ($p < .05$).
** highlights results significant at .05 alpha level
*** Indicates nurses with any degree education, excluding nurses who also have midwifery education

Table 15

Wilcoxon test for the variable policy use and the variables educational preparation, EFM education, EFM resources, and EFM information

Variable	n	Rank means	p
Educational preparation			
BN			
no	95	55.50	.37
yes	13	47.19	
Other degree			
no	101	54.92	.60
yes	7	48.50	
Midwife			
yes	25	62.96	.12
no	83	51.95	
EFM education			
no	21	59.86	.38
yes	87	53.21	
EFM resources			
yes	99	55.26	.41
no	9	46.17	
EFM information			
yes	105	54.75	.63
no	3	45.67	

Table 16

Spearman correlation coefficients for the variable policy use and the variables "years in nursing" and "labour experience"

Variable	n	Spearman coefficient	p
years in nursing	108	-.03	.80
labour experience	107	-.06	.55

Table 17

Spearman correlation coefficients for the variables total scores, percent use, and policy use: Spearman rho/ p value/ n

Variable		Total scores	Percent use
Percent use	(Spearman rho)	.1535	
	(p value)	.1047	
	(n)	113	
Policy use	(Spearman rho)	-.3045	.3830
	(p value)	.0014*	.0001*
	(n)	108	107

Note

* highlights results significant at .05 alpha level

Table 18

Contingency table of EFM supporters for the variable setting (Frequency/ Column Percent)

	Rural	Urban Community	Tertiary	Total
EFM supporters (AFMQ total scores > 50%)	28 71.79	17 43.59	23 58.97	68 58.12
EFM non supporters (AFMQ total scores ≤ 50%)	11 28.21	22 56.41	16 41.03	49 41.88
Total	39 100	39 100	39 100	

Statistics for contingency table of EFM support by setting

Statistic	DF	Value	p
Chi-square	2	6.391	.041*

Note

* highlights results significant at .05 alpha level

Table 19

Contingency table of EFM supporters for the variable educational classification (Frequency/ Column Percent)

	Diploma Education	Midwifery Education	Degree	Total
EFM supporters (AFMQ total scores over 50%)	51 66.23	11 42.31	6 42.86	68 58.12
EFM non supporters (AFMQ total scores ≤ 50%)	26 33.77	15 57.69	8 57.14	49 41.88
Total	77 100	26 100	14 100	

Statistics for contingency table of EFM support by educational classification

Statistic	DF	Value	p
Chi-square	2	6.093	.048*

Note

* highlights results significant at .05 alpha level

Table 20

Wilcoxon test for the variable EFM supporters and the variables policy use, percent use, years in nursing, and labour experience

Variable	n	Rank means	p
Policy use			
Non supporters	45	65.76	.0015*
Supporters	63	46.46	
Percent use			
Supporters	67	60.27	.199
Non supporters	46	52.24	
Years in nursing			
Supporters	68	59.71	.79
Non supporters	49	58.02	
Labour experience			
Supporters	67	59.17	.80
Non supporters	49	57.58	

Note

* highlights results significant at .05 alpha level

Table 21

Items on principal component analysis that had high factor loadings for the second principal component

17. I like EFM because it allows nurses to care for more patients at the same time

24. The use of EFM protects the nurse from legal liability.

26. I like to use EFM because I like interpreting EFM tracings.

28. The use of EFM decreases the nurse's workload.

31. I like to use EFM because I find it challenging.

37. I like to use EFM because it protects me from lawsuits.

Table 22

Variables on principal component analysis that had high factor loadings for factor one

5. The use of EFM causes more patient anxiety than intermittent auscultation of the fetal heart rate.
7. The use of EFM contributes to increased stress for obstetrical nurses.
8. I believe that nurses spend less time with patients who are monitored electronically than they do with patients who are monitored by intermittent auscultation.
18. I believe that the use of EFM can lead to unnecessary caesarean sections.
22. With EFM, nurses provide less individualized patient care.
27. The use of EFM adversely affects the quality of care that nurses give labouring patients.
30. When the patient is monitored electronically, nurses focus their attention on the machine instead of the patient.
36. I believe that patients who are monitored by IA have a more positive birth experience than patients monitored by EFM.

Table 23

Variables on principal component analysis that had high factor loadings for factor two

14. Fetal surveillance achieved by IA is not as accurate as that achieved by EFM.
16. I feel reassured when the patient is monitored by EFM.
19. I believe that the use of EFM can decrease perinatal mortality and morbidity.
21. I believe that the greatest value of EFM is in improving fetal outcome.
32. EFM is indicated for normal labours because complications can occur at any time.

Table 24

Stepwise multiple regression analysis for the dependent variable total scores with urban setting, tertiary setting, and policy use as predictor variables

Step	Variable entered	Partial R-2	prob>F
1	policy use	.09	.0018

Note

p< .05 Adjusted R-2= .09

Table 25

Stepwise multiple regression analysis for the dependent variable "percent use" with urban setting, tertiary setting, level of care, labour experience, and policy use as predictor variables

Step	Variable entered	Partial R-2	Prob> F
1	policy use	.15	.0001
2	tertiary setting	.14	.0001

Note

$p < .05$ Adjusted R-2= .29

Table 26

Stepwise multiple regression analysis for the dependent variable "policy use" with percent use, urban setting, tertiary setting, and total scores as predictor variables

Step	Variable entered	Partial R-2	Prob> F
1	percent use	.16	.0001
2	total scores	.12	.0001
3	tertiary setting	.035	.0240

Note

$p < .05$ Adjusted R-2= .32

CHAPTER FIVE

Discussion of findings

In this chapter, the findings of the study will be discussed. The research findings will be summarized and compared with previous research in this area. Limitations of the study will be discussed and recommendations made for nursing practice, education, and research.

Summary of the study

The purpose of the study was to investigate the following research questions:

1. What are the attitudes of obstetrical nurses toward the use of EFM in labour?

2. What is the relationship between selected demographic variables and the attitudes of obstetrical nurses toward the use of EFM in labour?

A convenience sample of nurses who worked in the labour and delivery units of fourteen Manitoba hospitals was recruited to participate in the study. Subjects were contacted either at change of shift, at unit meetings, or both. One hundred ninety-eight questionnaires were distributed. One hundred seventeen nurses responded to the study, for a response rate of 59 percent. Nurses completed a 38-item Likert-type attitudinal scale, four open-ended questions, and a demographics sheet. The internal consistency of the AFMQ was .95.

Descriptive data analysis techniques were used to analyze the demographic data. Respondents were evenly distributed among the three settings of the study--rural hospitals, urban community

hospitals, and tertiary hospitals. One third of the respondents worked in institutions that provided level three care; twenty-seven percent in institutions providing level one care; twenty-eight percent in institutions providing level 1a care; and eleven percent in institutions providing level two care. Typical respondents were registered nurses, employed on a full-time or part-time basis, with an average of 18 years of experience in nursing, and thirteen years of experience caring for labouring patients. They had attended educational sessions on EFM within the last ten years, and had been in contact with educational resources on EFM within the last ten years. The average respondent estimated using EFM for a major portion of the patient's labour in 55 percent of all situations. Of those labours, EFM was used primarily for hospital policy in 54 percent of situations.

Discussion of the findings

The study revealed that nurses' attitudes toward the use of EFM varied. In general, nurses were in favour of the use of EFM in labour and believed that it has value in improving fetal outcome and decreasing perinatal mortality and morbidity. Sixty-four percent of nurses viewed EFM as superior to IA in evaluating fetal heart rate during labour. Fifty-four percent of nurses stated they were reassured when the patient was monitored by EFM. Overall, nurses disagreed that EFM can lead to unnecessary caesarean sections and many disagreed that EFM should be restricted to high-risk labours. Studies have shown that EFM does increase the incidence of caesarean sections for fetal distress

without improving fetal well being (Haverkamp et al., 1976; Haverkamp et al., 1979; Leveeno et al., 1986; MacDonald et al., 1985; Renou et al., 1976). Nurses, then, are either unaware of recent randomized controlled trials or choose not to believe the results of these trials.

Many nurses are aware that some patients prefer not to have EFM during labour and recognize the restrictions imposed by the monitor. As well, many nurses recognize the monitor's adverse effects on patient comfort. Forty-seven percent of nurses agreed that EFM is intrusive to the normal childbirth experience. Fifty-nine percent of nurses disagreed that patients monitored by EFM can be just as comfortable as patients monitored by IA. Sixty-one percent of nurses agreed that the use of EFM places too many restrictions on patients. The effect of EFM on the patient's comfort and activity was addressed in the studies by Kruse (1984), Garcia et al. (1985), and Starkman (1977). In these studies, women monitored by EFM identified the monitor as a source of discomfort and restriction. Perceptions of nurses in this study of the effects of monitoring on patient comfort are therefore congruent with women's reports of the monitor as a source of discomfort and activity restriction.

Responses to the open ended questions also were varied. Many nurses indicated that the use of EFM for an initial assessment strip and for high risk or complicated pregnancies was valuable. Some perceived that EFM was superior to IA in predicting fetal distress; other nurses reported that IA was equally effective. Also, some nurses saw EFM as improving fetal outcome, while others stated that they believed EFM increased the

incidence of caesarean sections. In response to the open-ended questions, many nurses agreed that EFM was overutilized and not necessary in low risk labours. This is consistent with nurses' disagreement on the item of the AFMQ which states that routine EFM of all patients in labour would be ideal.

The variety of nurses' responses to the open-ended questions parallels that of responses to the AFMQ and lends support to the research instrument. Data from open-ended questions differ however, from responses to the AFMQ in some respects. Nurses tended to disagree with the items on the AFMQ that suggested that the care that patients receive is adversely affected by the presence of the monitor. However, in the open-ended questions, several nurses stressed that nursing care of patients monitored by EFM was less involved, more technical, more distant and that nurses and coaches focused more on the monitor. It is possible that nurses who believe that care of the labouring patient is affected by the use of EFM were more vocal in expressing their opinions in the open ended questions.

Nurses in rural settings had more positive perceptions of EFM than nurses in urban community settings. The perception of EFM among nurses in both rural and urban community settings was similar to that of nurses in tertiary settings ($p < .05$). No other demographic variable was found that related to nurses' overall attitudes toward the use of EFM. Of the hospitals providing level one, level 1a, and level two care, one of the hospitals from each level was in an urban setting. Therefore, four hospitals providing level one and level 1a care were from rural settings. One hospital providing level two care was from a

rural setting. It is not clear why the setting in which nurses work influences their attitudes toward EFM while the level of care the institution provided had no effect on the nurses' attitudes. Several factors may influence nurses' attitudes. It is possible that literature on EFM, including the results of randomized controlled trials on EFM, are not readily available to nurses in rural settings. It is also possible that nurses do not read nursing research reports and are therefore unaware of the lack of evidence that EFM improves neonatal outcome. As well, it is likely that nurses continue to have faith in technology and rely on machines despite a lack of evidence that technology improves the care the patient receives.

It also would be valuable to investigate the type and content of educational sessions on EFM available to nurses in the different settings to see if this is a factor influencing nurses' attitudes. As well, it would be helpful to examine what information is taught to nurses in their basic nursing education programs to see if this influences nurses' perceptions of EFM as a valuable tool in preventing neonatal complications.

Nurses who had attended educational sessions on EFM had more favourable opinions of EFM than nurses who had not. Although this difference did not achieve statistical significance, it would be useful to examine the content of the educational sessions attended by nurses and the impact of these sessions on influencing nurses' attitudes toward EFM.

Another possible reason for the difference in nurses' attitudes between the settings may be related to the type of patient seen in each setting. For example, it may be that more

patients in urban settings have developed birthing plans and requested not to have EFM during labour which has had impact on nurses' attitudes. Similarly, it may be that more patients in rural settings accept the use of EFM without questioning it.

There was a weak negative correlation between total scores on the AFMQ and nurses use of EFM for a major portion of the patient's labour primarily because of hospital policy. Nurses with more positive attitudes toward EFM used it less primarily because of hospital policy rather than for personal reasons. It is possible that a belief among nurses that EFM in a valuable tool to monitor fetal heart rate influences them to use EFM more than hospital guidelines.

The total sample of nurses estimated using EFM for a major portion of the patient's labour in 55 percent of all situations. Nurses in tertiary settings estimated using EFM more than nurses in urban community settings and nurses in urban community settings estimated using EFM more than nurses in rural settings. It is possible that more monitors are available to nurses in tertiary settings; this may lead to more frequent use of monitors in these settings. Nurses in institutions providing level three care estimated using EFM more than nurses in other institutions ($p < .05$). It is likely that nurses who work in institutions that provide level three care work with more high risk patients and therefore use EFM more frequently. It is not clear why there is a difference between rural and urban community settings in the use of EFM while there is no significant difference in EFM use between nurses who work in institutions providing either level one, level 1a, or level two care. It should be noted that respondents were

evenly distributed among each of the three settings while the distribution of nurses among the hospitals that provided different levels of care was not symmetrical. It would be valuable to repeat the study with a larger sample of nurses, including more nurses from institutions providing level two care to see if data yields similar results.

There was a weak negative correlation between nurses' use of EFM for a major portion of the patient's labour and the number of years of experience nurses had in caring for labouring patients. Nurses with more experience caring for labouring patients may have had experience working before the use of EFM became so widespread and may feel more comfortable monitoring labouring patients using other methods of assessment--that is, intermittent auscultation or intermittent electronic fetal heart rate monitoring.

There was also a weak correlation (.38) between nurses use of EFM for a major portion of labour and the use of EFM primarily because of hospital policy. In 33 percent of <u>all</u> labours, nurses in this study use EFM for a major portion of a patient's labour primarily because of hospital policy. Hospital policy, then, has some influence in nurses' decisions to use EFM. Nurses in urban community hospitals used EFM for a major portion of the patient's labour more because of hospital policy than nurses in rural settings ($p < .05$). It is possible that policies guiding the use of EFM are more stringent in urban hospitals than they are in rural settings. Nurses who did not support the use of EFM in labour estimated using EFM more, because of hospital policy, than nurses who were EFM supporters. It is possible that nurses who do not support EFM view hospital policy as a deciding factor

determining the use of EFM in labour.

Statistical models for predicting nurses' attitudes toward the use of EFM, their use of EFM for a major portion of a patient's labour, and use of EFM primarily because of hospital policy were developed. None of the models had a strong predictive ability. It is not possible, therefore, to accurately predict nurses' attitudes toward EFM or use of EFM based on the data generated from the study. Other factors, then, must be influencing nurses' attitudes toward EFM and their decisions to use EFM when caring for labouring patients.

In a qualitative study on the opinions of critical care nurses toward the impact of technology in nursing, McConnell (1990) found that nurses believed they needed to be proficient in the use of all equipment with which they worked. Similarly, in this study, several nurses expressed the view that health care professionals need to be proficient in the interpretation of fetal monitor tracings, otherwise monitoring was of no value. McConnell also found that the use of technology was reassuring to nurses in their care of patients. A majority of nurses in this study agreed that the use of EFM reassured them. However, several nurses also perceived that monitoring increases stress for obstetrical nurses. McConnell's findings, therefore, are partly supported by the findings of this study.

McConnell (1990) also found that nurses believed that often, the machine and patient compete for the nurse's time. The findings of the present study are not consistent with those from McConnell's study in that a majority of nurses disagreed that they spend less time with patients who are monitored by EFM than they

do with patients who are monitored by IA. It would be valuable to observe the quality of nurse-patient interactions when a patient is monitored by EFM and compare this to the quality of nurse-patient interactions when a patient is monitored by IA. This investigation would support or refute nurses' claims that nurses spend as much time with patients who are monitored by EFM as they do with patients monitored by IA.

Simkin (1986) suggested that nurses use EFM during labour because the use of the monitor gives the nurse greater freedom to do other things. Some nurses identified that the monitor does, at times, make the nurse's work easier. The monitor allows nurses more freedom to care for more than one patient at a time. In contrast, however, many nurses also identified that the monitor increases the nurse's work load as more time is needed for documentation and to adjust monitor belts. As well, 79 percent of nurses disagreed with the item on the AFMQ that stated that EFM decreases the nurse's work load. Overall, nurses do not agree that the monitor is a time saving device. As the monitor often allows the nurse to care for more patients at the same time, it is likely that nurses view this technology as increasing their workload. Simkin's claim, therefore, is not supported by the data in this study.

Simkin (1986) suggested that nurses use EFM because they enjoy the challenge of working with and interpreting monitor tracings. The nurses' responses to the open-ended questions did not reflect this viewpoint. As well, 73 percent of nurses disagreed with the statement: "I like to use EFM because I like interpreting EFM tracings". Similarly, 76 percent of nurses

disagreed with the statement: "I like to use EFM because I find it challenging".

Lumley (1982) and Simkin (1986) also proposed that nurses use EFM because they fear legal liability. Although this reason was mentioned in the responses to the open-ended questions, it was not a frequent theme. This also was not reflected in the responses to the AFMQ. Forty-three percent of nurses disagreed with the statement that the use of EFM protects the nurse from legal liability while 28 percent of nurses agreed with this statement. Sixty-three percent of nurses disagreed with the item: "I like to use EFM because it protects me from lawsuits", fourteen percent agreed with this statement. This finding can likely be explained by the fact that lawsuits occur less frequently in Canada than they do in the United States where these studies originated.

Simkin (1986) also suggested that nurses use EFM because they believe it is superior to IA in evaluating fetal heart rate. This was reflected in responses to items on the AFMQ. Sixty-eight percent of nurses agreed that the greatest value of EFM is in improving fetal outcome. Sixty-four percent indicated that fetal surveillance achieved by IA is not as accurate as that achieved by EFM. Sixty-nine percent reported that they believed the use of EFM can decrease perinatal mortality and morbidity. Many responses to open-ended questions also paralleled this belief.

Simkin (1986) also proposed that nurses believe that caesarean sections associated with EFM are necessary and timely. Nurses in this study were divided in their perception of whether or not EFM leads to unnecessary caesarean sections. Forty-three

percent of nurses disagreed with the item on the AFMQ that EFM can lead to unnecessary caesarean sections. Thirty-nine percent agreed with this statement. In addition, opinions expressed in the open-ended questions support the view that caesarean sections may be the necessary outcome of fetal distress identified by the monitor. One nurse stated: If the notion that EFM contributes to unnecessary caesarean sections "is based on the number of babies sectioned for distress noted on EFM with good apgars, who knows if those good apgars are just telling us we did the right thing by sectioning before the fetus showed more grave signs". Therefore some nurses' responses supported Simkin's (1986) belief while others did not.

Some authors also speculated about why nurses use technology in their care of patients. Holmes (1990) proposed that technology helps nurses make better decisions related to patient care. This was supported by the responses in the open-ended questions as some nurses believed that with EFM we have a better idea of what is happening to the fetal heart rate.

Champlin (1991) believed that the use of technology allows nurses to spend more time with patients and increases the personal aspect of nursing care. Some nurses corroborated this view as they stated that with the monitor there was more time to teach, develop a relationship with patients, and reassure labouring women. Some nurses believed that attention to physical care could be improved with EFM. Other nurses did not support this view, however, as they saw the monitor as interfering with the hands-on aspects of patient care.

Sinclair (1988) stated that nurses become dependent on

technology and abandon their own judgement in favour of the machine. Brown (1992) proposed that, with increased technology, nurses lose some of the independent functions of nursing as they take on more delegated functions. Although these concepts were not examined in the AFMQ, some nurses expressed these views in responses to open-ended questions. Some stated that nurses rely on the monitor to assess the fetus and the labouring woman at the expense of their own assessment skills and that aspects of the art of nursing were lost. As one nurse stated: "it hastens the erosion of nursing skills".

Brown (1992) also suggested that nurses use technology as an excuse for being too busy to attend to the patient's psychological needs. Although this theme was not reflected strongly in the responses, one nurse did offer that at times, the monitor was used too often "because I'm too busy or lazy to [discontinue it]". Several nurses spoke of using the monitor as an adjunct to nursing care and stressed that the care of the patient is not altered by the use of the monitor.

In general, nurses who support EFM are typically diploma nurses who work in rural settings and are not guided primarily by hospital policy when determining the method of fetal heart rate monitoring to be used during labour. It is possible that nurses who supports EFM are unsure of their skills in monitoring fetal heart rate using IA.

Discussion of findings in relation to the Cranston's (1980) study

The measure used in this study, the AFMQ, was adapted from a study carried out by Cranston (1980). Cranston examined the

attitudes of 124 nurses who worked in 14 hospitals in St. Louis toward the use of EFM in labour. A 24-item Likert-type attitudinal scale was used. Cranston's study revealed that the majority of nurses who responded to the study had a positive attitude toward EFM. Fifty-two percent of respondents believed that routine EFM of all labouring patients would be ideal. This was the lowest percent of favourable responses on all items included in the study. In this study, as well, 90 percent of participants voiced favourable responses about EFM in half of the items in the study.

Cranston's (1980) study did not reveal any significant correlations between attitudes toward EFM and the demographic variables under investigation including primary shift worked, basic nursing education, and experience in nursing.

Cranston's (1980) study was the only study identified that examined the attitudes of obstetrical nurses toward the use of EFM in labour. Indeed, several of the items used in Cranston's likert-type attitudinal scale were adapted and included in the AFMQ. It therefore is important to compare the findings of Cranston's study to those of this present study to see if there has been a change in the overall attitudes of nurses toward the use of EFM in labour over the last fifteen years.

The findings of this study differ from those obtained by Cranston (1980) in several key respects. For the item: "Routine EFM of all labour patients would be ideal", 52 percent of respondents in Cranston's study agreed or strongly agreed with this statement. In contrast, 65 percent of the respondents in the present study disagreed or strongly disagreed with the statement.

Similarly, for the item: "The use of EFM places too many restrictions on patients", 68 percent of respondents in Cranston's study disagreed or strongly disagreed with the statement; in this study, 61 percent of the nurses agreed or strongly agreed with the statement. It is possible that, as nurses have more exposure to EFM than they did when Cranston's (1980) study was carried out, nurses are recognizing the effect of EFM in terms of restrictions of patient activity and are realizing that not all patients require monitoring.

Differences between the responses in the two studies were less dramatic in some of the items. Most nurses (76%) in Cranston's (1980) study agreed or strongly agreed that EFM is indicated in normal labours because complications can occur at any time. Only 52 percent of nurses in the present study agreed with this statement. For the item: "A labouring patient monitored by EFM can be just as comfortable as a patient monitored by IA", nurses' agreement dropped from 78 percent, in Cranston's study, to 58 percent in the present study. Again, it is likely that some nurses have begun to recognize that EFM is not required in all cases. Nurses may be becoming more aware of the attitudes of some comsumers toward the use of intervention in obstetrics and this, in turn, may be influencing their attitudes.

As in Cranston's (1980) study, most nurses agree that fetal surveillance achieved by IA is not as accurate as that achieved by EFM and that EFM can decrease perinatal mortality and morbidity (96% and 69% respectively). The majority of nurses in both studies agreed that the greatest value of EFM is in improving fetal outcome although nurses in this study voiced less agreement

than nurses in Cranston' (1980) study (67% and 98% respectively). Similarly, for the statement: "EFM is one of the best developments of modern obstetrics" agreement decreased from 73 percent agreement to 66 percent. Nurses continue to believe, therefore, that EFM can detect complications with the fetus and decrease perinatal mortality and morbidity. Although many randomized controlled trials on EFM have shown that IA is as effective as EFM in monitoring fetal heart rate, many nurses are either unaware on these trials or doubt their results. Other items were too dissimilar in wording and content to compare to Cranston's (1980) study.

No significant relationship was found in either study between the number of years of experience in nursing and nurses' attitudes toward EFM. Other demographic variables included in Cranston's study were basic nursing education and primary shift worked. With respect to educational preparation, Cranston compared attitudes of associate degree nurses, diploma nurses, and baccalaureate degree nurses. The present study compared attitudes among diploma nurses, baccalaureate degree nurses, and nurses with midwifery experience. It is not possible, therefore, to compare the two studies with respect to the relationship between nurses' attitudes toward EFM and educational preparation.

Cranston (1980) found no relationship between attitudes of nurses toward EFM and a nurse's primary shift worked. Primary shift worked was not identified as a demographic variable in the present study, thus it is not possible to compare the two studies in this regard.

The lowest percentage agreement of any item in Cranston's

(1980) study was 52 percent. Many of the items in this study showed a wider range of responses. One possible reason for the change in scores may be the length of time between the two studies. As nurses have worked more with EFM, some nurses may begin to recognize some limitations in its use as well as its effect on patients. It is recognized that the samples of nurses in the two studies are likely not similar because of different work settings and nursing experiences.

Conceptual framework

The work of Braun et al. (1984) provided the basis for the conceptual framework guiding this study. Braun et al. proposed that two frameworks guide nursing care. At one end of the continuum is the humanistic framework. Proponents of this framework value the patient's dignity and worth and believe that the patient, not the technology, is the focus of nursing care. At the other end of the continuum is the technological framework. Nurses who support this framework value precision, accuracy, and efficiency. Their focus is on providing a satisfying outcome. The conceptual framework is illustrated in figure 4.

In the conceptual framework it was proposed that nurses would adopt the use of EFM because they value precision, view the monitor as a time saving device, gain satisfaction from working with machines, and believe that the use of the monitor offers protection from legal liability.

Nurses in this study agreed that fetal surveillance achieved with EFM was superior to that achieved by IA. However, most nurses in this study did not view EFM as a time saving device as

79 percent of nurses disagreed that the monitor decreases the nurse's workload. Seventy-five percent of nurses also did not agree with statements that the monitor was used because it provided challenge and 73 percent disagreed that they like to use EFM because they like interpreting monitor tracings. As well, 63 percent of nurses did not believe that EFM offered protection from lawsuits. A principal component analysis on the AFMQ determined that fear of legal liability, use of EFM as a time saving measure, a view that EFM is challenging, and liking to interpret fetal monitor tracings were factors that were not relevant in determining nurses' attitudes toward the use of EFM in labour for this sample of nurses. The findings, therefore, do not support the conceptual framework. Although most of the ideas identified in the conceptual framework may still apply to nurses who care for labouring patients, the conceptual framework would need to be amended to reflect the findings of the study. The revised model of the humanistic and technological frameworks are depicted in figure 5. Further research is needed to support or further expand upon the revised framework.

Figure 4

Humanistic and technological framework continuum

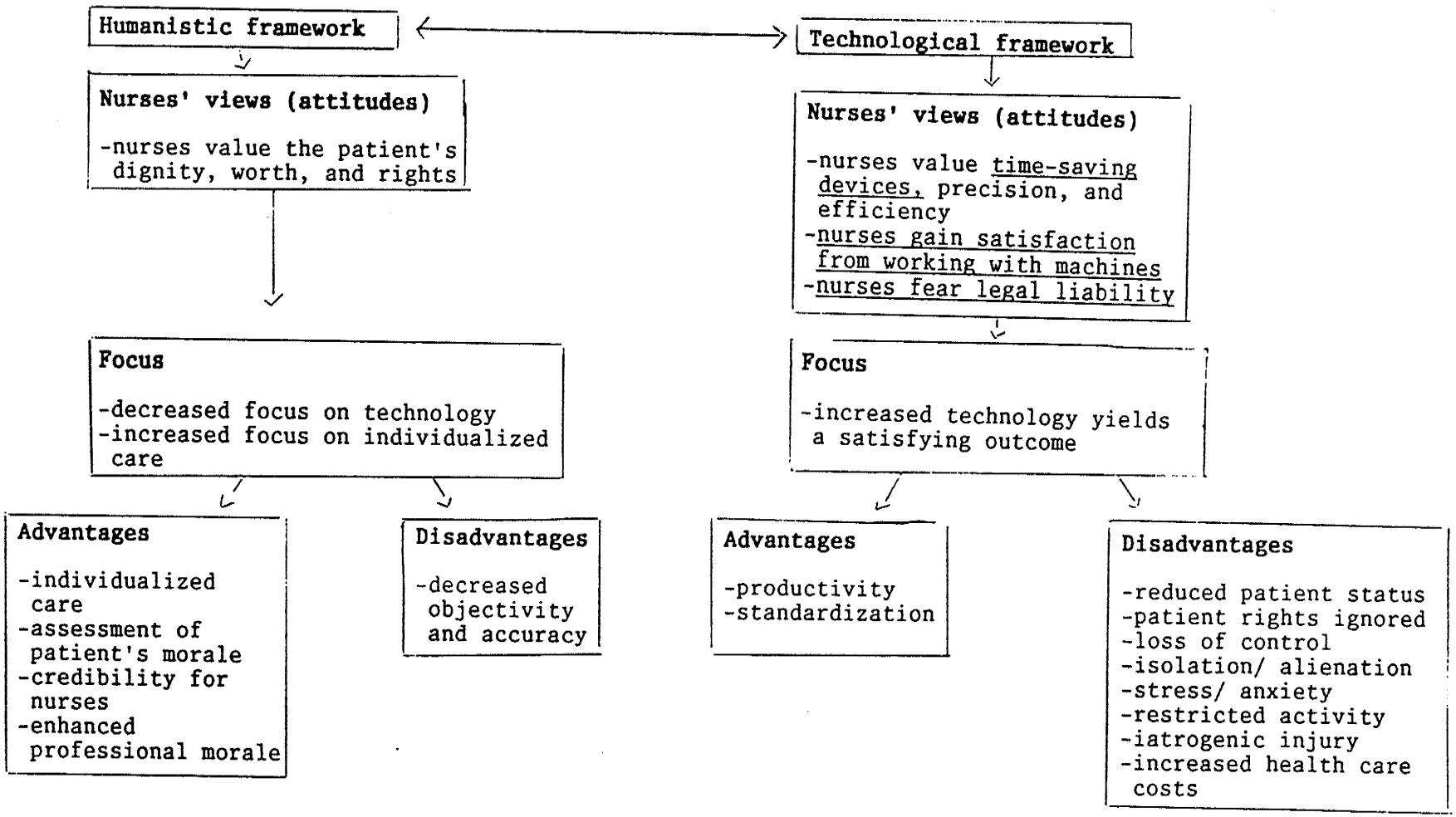
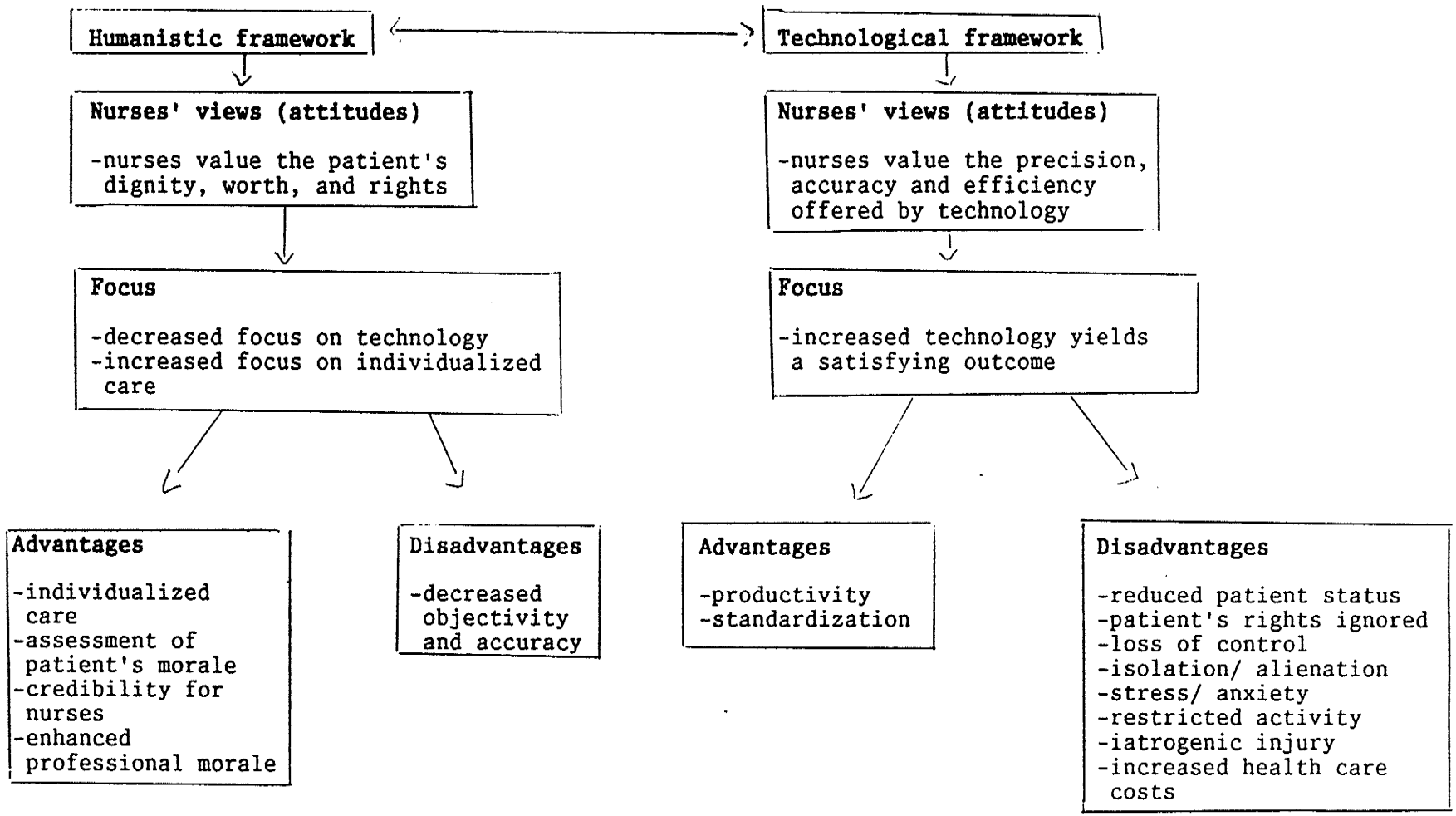


Figure 5

Revised model of the humanistic and technological framework continuum



Study strengths and limitations

One of the study's strengths is that it included nurses from Manitoba hospitals in the northern, western, and southern portions of the province in addition to the major urban hospitals. It was possible, therefore, to contact nurses in many different settings and with varied nursing experience and determine their attitudes toward EFM. Another strength is that the variability of responses to the AFMQ suggests absence of response set bias. A third strength was that the internal consistency of the AFMQ was .95 indicating that, overall, items on the scale were fairly homogenous in measuring the same concept.

Time constraints, however, presented some limitations; although some hospitals were visited several times, others were visited only once. As contact with potential participants was made at change of shift or at unit meetings, it was not possible to access many of the nurses from the institutions surveyed. It is therefore not possible to generalize the findings of this study to all nurses who work in these institutions. The design of the study also did not allow access to nurses in smaller rural settings, i.e. those having less than ten deliveries per month. The findings of this study can, therefore, not be generalized to all nurses in Manitoba who work with either EFM or with labouring patients.

Participation in the study was voluntary. Information about the nurses who were approached but did not volunteer to participate in the study is not known. It is not possible, therefore, to say whether the nurses who responded to the questionnaire were representative of the nurses who were

approached to participate in terms of employment status, educational preparation, number of years in nursing, and number of years of labour experience. It is possible that the nurses who responded to the study have more interest in the topic or stronger opinions about the use of EFM in labour than the nurses who did not respond. It is also not possible to determine if nurses who were asked to participate in the study were representative of the nurses who worked in these institutions. Finally, some institutions were visited over a time span of several weeks. Therefore, discussion of the questionnaire among nurses may have influenced some nurses' attitudes and responses.

A questionnaire format is one method of eliciting information from participants. Interpretation of the data is then left to the researcher. It is not possible, using this design, to clarify unclear responses on the open-ended questions with participants. Personal interviews with nurses might have overcome this difficulty.

Implications for nursing

Nursing practice and education

Nurses' beliefs that EFM is superior to IA in evaluating fetal heart rate during labour are not consistent with findings of randomized controlled trials on EFM . This study revealed that some nurses believe that EFM is superior to IA in monitoring fetal heart rate, that EFM can decrease perinatal mortality and morbidity, and that EFM can improve fetal outcome. As well, some nurses do not believe that the use of EFM in labour increases caesarean section rates. Nurse administrators and educators must

play a role in providing nurses and student nurses with factual information about the limitations and consequences of EFM to ensure that IA is seen as a viable alternative in evaluating fetal heart rate. Nurses should be encouraged to use EFM only when it is indicated; this may lead to a decrease in the rate of intervention in labour.

Findings also revealed that nurses use EFM primarily because of hospital policy in one third of all labours. Hospital policy, then, has some influence over nurses' decisions as to the method of monitoring to be used in labour. Nurse administrators should review existing policies on EFM to ensure that nurses are given flexibility in deciding upon the method of monitoring to be used during labour. The decision tree developed by Snydal (1988a) [figure 1] could serve as a starting point in developing policies for the use of EFM.

In response to the question: Under what circumstances, if any, is the use of EFM appropriate? few nurses stated that it should be at the patient's request. Nurses should be encouraged to consider many factors, including the patients' wishes, before decision upon a method of fetal heart rate evaluation during labour. Snydal (1988b) suggests that even in moderate or high risk situations, where intensive monitoring is required, IA every fifteen minutes is an acceptable method of monitoring if this is the patient's choice. In low risk situations, IA every 30 minutes is acceptable if this is the patient's request. Consideration of the woman's wishes will allow for a more positive birth experience for labouring patients.

Data from the open-ended questions also revealed that some

nurses use EFM as the lesser of all evils, when caring for several patients at the same time. Despite cost constraints and cutbacks in most institutions, measures should be investigated that will allow nurses to use IA safely, when appropriate, instead of EFM. The increased cost of staffing labour and delivery units to ensure that IA can be used safely may be offset by a decrease in the cost of equipment and interventions associated with use of EFM.

Nurses also should be reminded or taught the technique of IA to achieve a method of surveillance equivalent to EFM. The guidelines for fetal heart rate auscultation identified by the Nurses' Association of the American College of Obstetricians and Gynecologists [NAACOG] (1990) should be followed when using IA to monitor fetal heart rate. These guidelines are listed in Appendix T.

In summary, nurse administrators, managers, and educators could play a role in implementing measures that will promote the safe use of IA during labour.

Nursing research

In this study, nurses' attitudes toward the use of EFM in labour were investigated. Further studies need to be carried out to corroborate or expand upon the present study. The AFMQ could be expanded to include additional concepts from the conceptual framework. For example, items such as the following could be included: "I believe that the use of EFM in labour causes patient isolation"; "I believe that when EFM is used in labour patients' rights are ignored". These themes were supported by responses to the open-ended questions by were not included in the AFMQ.

If this study were replicated, it might be useful to clarify the term "for a major portion of the patient's labour". This may be changed to: over 50 percent of a patient's active phase of labour. In addition, it would be useful to survey more nurses from each institution to obtain a more complete picture of nurses' attitudes. It would also be valuable to compare nurses' attitudes toward the use of EFM in high risk labours as opposed to low risk labours.

As setting was a factor influencing nurses' total scores on the AFMQ, the use of EFM for a major portion of the patient's labour, and the use of EFM due to hospital policy, it would be useful to expand the study to examine also the attitudes of nurses who work in smaller rural areas. It was speculated earlier that nurses in rural settings might have positive attitudes toward EFM because of lack of access to current literature on EFM, exposure to patients with different views on monitoring than found in other settings, and exposure to different types of educational sessions and materials than nurses in other settings. Expanding this line of investigation to include nurses in smaller rural settings may help to clarify why nurses in rural Manitoba view EFM favourably.

Several research questions can also be investigated with respect to nurses' use of EFM. A social desirability response set may have influenced nurses' estimates of the use of EFM for a major portion of the patient's labour. Collecting data using observational techniques might reveal more accurately the extent to which nurses use EFM. In addition, research could be done to determine what nurses perceive are the barriers to the use of IA during labour and what factors influence nurses to use EFM. It

would also be useful, therefore, to determine the learning needs of obstetrical nurses with respect to the uses and limitations of EFM.

From an educational standpoint, it also is necessary to determine to what extent students and beginning graduates are exposed to, and able to use IA as a method of fetal heart rate monitoring during labour. As well, a study could generate information on what nursing students view as the advantages and disadvantages of EFM and IA in monitoring fetal heart rate.

Data from the open-ended questions revealed that, although some nurses do not use EFM continuously during labour, they may use it intermittently to run strips on a periodic basis. Studies are needed to identify how prevalent this practice is and to determine the consequences of this on the patient's childbirth experience.

It is interesting that, in response to the open ended question: "Under what circumstances, if any, is the use of EFM appropriate", only one nurse answered that EFM was appropriate if the patient requested it. It is necessary, therefore to investigate to what extent the patient's requests influence the nurses' decisions about the method on monitoring to be used during labour.

In summary, this study has examined the attitudes of nurses toward the use of EFM. Further studies are needed to determine how attitudes influence nurses' decisions to use EFM in their care of patients. As well, further studies are needed to identify to what extent other factors, for example staffing, influence nurses decisions to adopt technology in their care of labouring patients.

Summary

The data collected in this study revealed that nurses' attitudes toward the use of EFM are varied. Most nurses stated that they believed that EFM improves fetal outcome, decreases perinatal morbidity and mortality, and is superior to IA in monitoring fetal status. Most nurses were in favour of the use of EFM in labour. Findings also suggested that nurses use EFM for a major portion of labours with more than half of all labouring women.

A review of the literature revealed that the use of EFM in labour increases caesarean section rates without improving neonatal outcome. In present times of cost containment, the practice of spending money on interventions and equipment that do not improve the outcome of labour should be examined. The practice of using EFM in labours, when it is not indicated, should be reexamined. Further research into factors that influence nurses' attitudes about EFM as well as their use of EFM during labour should be carried out. Measures to promote the use of IA should be investigated. Policies that allow nurses more flexibility to choose IA as a method of monitoring should be developed.

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Appendix A

Permission to replicate Snydal's (1988a) Decision Tree for Fetal Heart Rate Monitoring

Susan H. Snydal

San Jose, California

This confirms that I allow Kathleen Perron, master's student in nursing at the University of Manitoba, to duplicate the "Decision tree for choosing a method of fetal heart rate monitoring during the first stage of labour" in her master's thesis entitled: The attitudes of obstetrical nurses toward the use of electronic fetal monitoring in labour. The decision tree was published in the Journal of Nurse-Midwifery, January/February issue, 1988

Signature: _____

Date: 2/6/95

Appendix B

Summary of prospective trials on electronic fetal monitoring

Author	RCT	Randomi-zation described	Sample	Risk	Location
Renou et al. (1976)	yes	no	N=350 IA=175 FICU=175	high risk	Melbourne
Haverkamp et al. (1976)	yes	yes- sealed envelopes	N=483 EFM=242 IA=241	high risk	Denver
Kelso et al. (1978)	yes	yes- sealed envelopes	N=504 EFM=253 IA=251	low risk	Sheffield
Haverkamp et al. (1979)	yes	yes- sealed envelopes	N=690 EFM=230 IA=231 EM+SS=229	high risk	Denver
Wood et al. (1981)	yes	yes-	N=927 EFM=445 IA=482	low risk	Melbourne
MacDonald et al. (1985)	yes	yes- sealed envelopes	N=12964 EFM=6474 IA=6490	high and low risk	Dublin
Leveeno et al. (1986)	no	N/A	N=34995 Selective =17409 Universal =17586	high and low risk	Dallas
Luthy et al. (1987)	yes	yes- sealed envelopes	N=246 EFM=122 IA=124	high risk	Seattle & Vancouver
Vintzileos et al. (1993)	yes	yes- coin toss	N=1428 EFM=746 IA=682	high and low risk	Athens, Greece

Legend on next page

(continued)

Appendix B: continued

Author	C/S	AD	Total operative delivery	C/S for fetal distress	AD for fetal distress
Renou et al.	^ in FICU because of previous C/S	NSD	NS	NSD	NS
Haverkamp et al.	^ in EFM	NS	NS	^ in EFM	NS
Kelso et al.	^ in EFM	NSD	NS	^ in EFM but NSS	NS
Haverkamp et al.	^EFM>IA	NS	NS	^EFM>IA ^EFM+SS> IA	NS
Wood et al.	NSD	NS	^C/S & F/D in EFM	NS	NS
MacDonald et al.	NSD	^FD in EFM	^ in EFM	^ in EFM	^ FD in EFM
Leveeno et al.	^ in Universal group	NSD	NS	^ in Universa l Group	NS
Luthy et al.	NSD	NS	NS	NSD	NS
Vintzileos et al.	NSD	^ VE in EFM	^ VE & C/S in EFM	^ in EFM	^ VE in EFM

Legend
C/S= caesarean section
IA= intermittent auscultation
EFM= electronic fetal monitoring
FICU= fetal intensive care unit
NSD= no significant difference
^= increased
RCT= randomized controlled trial
F/D= forceps delivery
NSS= not statistically significant
NS= not stated
NA= not applicable
VE= vacuum extraction
AD= assisted delivery (forceps or vacuum)
EM+SS= electronic fetal monitoring and scalp sampling

(continued)

Appendix B: continued

Author	Significant Findings
Renou et al.	- need for intensive care, cord gas results, and time spent in the nursery better in FICU group - more neurological signs and symptoms in IA group
Haverkamp et al.	- mean 5 minute Apgar and 5 minute Apgar scores < 7, better in IA group at a .1 level of significance - need for intermittent positive pressure ventilation better in IA group at a .1 level of significance - increased incidence of maternal postpartum infection in the EFM group
Kelso et al.	- NSD in maternal or neonatal morbidity
Haverkamp et al.	- venous cord CO_2 better in the EFM group
Wood et al.	- EFM babies spent more time in the isolette and required phototherapy more often
MacDonald et al.	- more neurological signs and seizures in the IA group - less babies in the EFM group had venous cord pH less than 7.10 - increased postpartal maternal infection in the EFM group
Leveeno et al.	- NSD in neonatal morbidity
Luthy et al.	- NSD in neonatal and maternal morbidity
Vintzileos et al.	- decreased perinatal mortality in EFM group

Legend:
NSD= no significant difference
FICU= fetal intensive care unit

Appendix C

Follow up studies on fetal monitoring and neonatal outcome.

Author	Author of initial trial	Findings
Langendoerfer et al.	Haverkamp et al.	Brazelton examination: at 48-72 hours:NSD Bayley Scale scores at nine months: NSD Milani Comparetti scores at nine months: NSD
Shy et al.	Luthy et al.	Bayley indices of mental mental and psychomotor development: NSD Movement Assessment of Infants: NSD Incidence of cerebral palsy higher in the EFM group. Time of onset of abnormal fetal rate pattern to delivery was longer in the EFM group.

Legend

EFM= electronic fetal monitoring
NSD= no significant difference

Appendix D

Studies on mothers' attitudes toward electronic fetal monitoring

Author	Sample	Experimental design	Interview/ Question-naire	Location
Starkman	N=25+10	no	open ended interview	Michigan
Shields	N=30	no	forced choice + open ended questions	Toronto
Beck	N=50	no	open ended interview	Boston
McDonough et al.	N=50	no	forced choice questions	Cincinnati
Molfese et al.	N= 80 + 100	no	open ended interview	Illinois
Hodnett	N=30 EFM=15 Tel=15	yes	forced choice question-naire	Toronto
Garcia et al.	N=200 EFM=100 IA=100	yes	semi-structured interview	Dublin
Killien and Shy	N=135 IA=51% EFM=49%	yes	forced choice questions	Seattle & Vancouver
Kruse	N=79 EFM=75	no	forced choice questions	Missouri

Legend:
EFM= electronic fetal monitoring
IA= intermittent auscultation
Tel= radio telemetric monitoring
NS= not stated

Appendix D: continued

Author	Timing of interview	Findings
Starkman	prior to discharge	generally positive, monitor seen as helpful, reassuring, uncomfortable and restricting
Shields	within 48 hours of delivery	generally positive, common complaints of discomfort and annoyance with vaginal exams
Beck	1-3 days postpartum	generally positive
McDonough et al.	1 day postpartum	generally positive
Molfese et al.	1-2 days postpartum	generally positive, most women saw the monitor as helpful
Hodnett	within 48 hours of delivery	patients on telemetry perceived labour and monitoring more favourably
Garcia et al.	prior to discharge	women in the EFM group felt more restricted in their movements
Killien and Shy	1-2 days postpartum	method of monitoring had no influence on perceptions of labour
Kruse	2-5 months postpartum	generally positive; 20% of women mentioned physical discomfort of monitor; 24% mentioned restricted activity

Legend: NS= not stated

Appendix E

Research instrument

Attitudes about fetal monitoring questionnaire (AFMQ)

For this study, electronic fetal monitoring (EFM) includes the use of either a toco-transducer or an intrauterine pressure catheter to measure uterine contractions and the use of an ultrasound device or a scalp clip to monitor fetal heart rate. The monitor is attached to the patient. This definition refers to situations where electronic fetal monitoring is carried out for a major portion of the patient's labour. Telemetry units are included in this definition of electronic fetal monitoring.

Intermittent auscultation (IA) refers to listening to the fetal heart rate at intervals, using either a fetoscope or doppler device, where the device is not attached to the patient. This method of monitoring is carried out for the major portion of the patient's labour.

It is recognized that few of the items will apply to all circumstances and to every patient situation you have seen. I am asking for your opinion about the use of electronic fetal monitoring in general.

AFMQ Part 1: Listed below are some statements that describe how individuals might feel about electronic fetal monitoring (EFM). Please circle the letters which best describes how you feel about each statement.

SD = Strongly disagree D = Disagree

A = Agree SA = Strongly agree

U = Uncertain

There are no right or wrong answers to these questions. Your response will simply indicate how you feel about electronic fetal monitoring.

In general:

1. I favour the use of electronic fetal monitoring during labour.	SD	D	U	A	SA
2. Electronic fetal monitoring (EFM) is one of the best developments of modern obstetrics.	SD	D	U	A	SA
3. I do not like to use EFM unless I have to due to hospital policy.	SD	D	U	A	SA
4. Routine EFM of all patients in labour would be ideal.	SD	D	U	A	SA
5. The use of EFM causes more patient anxiety than intermittent auscultation (IA) of the fetal heart rate.	SD	D	U	A	SA
6. A labouring patient monitored by EFM can be just as comfortable as a patient monitored by IA.	SD	D	U	A	SA

In general:

7. The use of EFM contributes to increased stress for obstetrical nurses.	SD	D	U	A	SA
8. I believe nurses spend less time with patients who are monitored electronically than they do with patients who are monitored by IA.	SD	D	U	A	SA
9. The use of EFM places too many restrictions on patients.	SD	D	U	A	SA
10. The use of EFM is reassuring to labouring patients.	SD	D	U	A	SA
11. If I were in labour I would wish to have EFM.	SD	D	U	A	SA
12. The use of EFM is intrusive to the normal child-bearing experience.	SD	D	U	A	SA
13. I believe that IA is preferable to EFM because EFM contributes to increased medical interventions.	SD	D	U	A	SA
14. Fetal surveillance achieved by IA is not as accurate as that achieved by EFM.	SD	D	U	A	SA
15. EFM should be restricted to high-risk patients.	SD	D	U	A	SA
16. I feel reassured when the patient is monitored by EFM.	SD	D	U	A	SA
17. I like EFM because it allows nurses to care for more patients at the same time.	SD	D	U	A	SA
18. I believe that the use of EFM can lead to unnecessary caesarean sections.	SD	D	U	A	SA

In general:

19. I believe that the use of EFM can decrease perinatal mortality and morbidity.	SD	D	U	A	SA
20. I believe that the use of EFM contributes to increased health care costs.	SD	D	U	A	SA
21. I believe that the greatest value of EFM is in improving fetal outcome.	SD	D	U	A	SA
22. With EFM, nurses provide less individualized patient care.	SD	D	U	A	SA
23. I believe that EFM is used too often.	SD	D	U	A	SA
24. The use of EFM protects the nurse from legal liability.	SD	D	U	A	SA
25. The use of EFM decreases the patient's control over her labour.	SD	D	U	A	SA
26. I like to use the EFM because I like interpreting EFM tracings.	SD	D	U	A	SA
27. The use of EFM adversely affects the quality of care that nurses give labouring patients.	SD	D	U	A	SA
28. The use of EFM decreases the nurse's workload.	SD	D	U	A	SA
29. Most labouring patients prefer to be monitored electronically.	SD	D	U	A	SA
30. When the patient is monitored electronically, nurses focus their attention on the machine instead of the patient.	SD	D	U	A	SA

In general:

31. I like to use EFM because I find it challenging.	SD	D	U	A	SA
32. EFM is indicated for normal labours because complications can occur at any time.	SD	D	U	A	SA
33. I believe that we have too many policies which tells us that we have to use EFM.	SD	D	U	A	SA
34. If my relative (daughter, sister, niece) were in labour I would wish for her to be monitored by IA.	SD	D	U	A	SA
35. The use of EFM is reassuring to labour coaches.	SD	D	U	A	SA
36. I believe that patients who are monitored by IA have more positive birth experience that patients monitored by EFM.	SD	D	U	A	SA
37. I like to use EFM because it from lawsuits.	SD	D	U	A	SA
38. EFM is one of the worst developments of modern obstetrics.	SD	D	U	A	SA

AFMQ Part 2: Now that you have completed the first section of this study, please answer the following questions:

1. What is your opinion about the use of electronic fetal monitoring during labour?

2. How do you feel the use of electronic fetal monitoring in labour affects the care the patient receives?

3. How do you feel the use of electronic fetal monitoring affects the nurse's role in caring for labouring patients?

4. Under what circumstances, if any, is the use of electronic fetal monitoring appropriate?

AFMQ Part 3: Thank you for completing the second section of the study. Please proceed to the following questions.

1. Number of years experience in nursing_____

2. Number of years experience caring for labouring patients_____

3. Presently employed

   1) Full time_____ 2) Part time_____

   3) Casual_____

4. Please circle the approximate percentage of labouring patients for whom you <u>actually use</u> electronic fetal monitoring for a major portion of the patient's labour:

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

5. For approximately what percentage of the above labours do you use electronic fetal monitoring <u>primarily</u> because hospital policy demands it:

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

6. Educational preparation (please check all that apply):

   1) LPN_____

   2) Diploma in nursing_____

   3) Bachelor in nursing_____

   4) Other degree (please specify)_____

   5) Midwifery education_____

   6) Other (please specify)_____

7. Have you attended any educational sessions on fetal monitoring in the last ten years (for example: sessions presented by Hewlett Packard, AWHONN [NAACOG], etc.)

1) yes_____ 2) _____

If yes, please list the type of sessions attended:

_____

_____

_____

_____

8. Have you had access to other sources of information on electronic fetal monitoring in the last ten years (for example, videos, articles):

1) yes_____ 2) _____

If yes, please list the sources of information:

_____

_____

_____

_____

Thank you for taking time to complete the questionnaire.

Appendix F

Permission to utilize Cranston's Likert-type scale

Christine Sullivan

Coronado, CA

Kathleen Perron

Brandon
Manitoba, Canada
R

Dear Kathleen,

I am please to provide my permission for you to use the Likert scale I developed in 1977 to measure the attitudes of nurses toward electronic fetal monitoring.

I wish you the best in your research endeavors.

Regards,

Christine Sullivan
RN, MSN, CNM, CNAA

Previously known as Christine S. Cranston

Appendix G

Revisions to items utilized by Cranston (1980)

Items from Cranston's study	**Revisions made**
1. Fetal monitoring is one of obstetric's best inventions.	Electronic fetal monitoring (EFM) is one of the best developments of modern obstetrics.
2. Fetal monitoring places too many restrictions on the patient.	The use of EFM places too many restrictions on patients.
3. Routine continuous monitoring of all patients in labor would be ideal.	Routine EFM of all patients in labour would be ideal.
4. The fetal monitor causes more patient anxiety.	The use of EFM causes more patient anxiety than intermittent auscultation (IA) of the fetal heart rate.
5. With proper nursing care, the laboring patient can be just as comfortable while on the fetal monitor.	A labouring patient monitored by EFM can be just as comfortable as a patient monitored by IA.

Appendix G continued

Items from Cranston's study	Revisions made
6. I feel more comfortable when the patient is on the fetal monitor.	I feel more reassured when the patient is monitored by EFM.
7. The fetal surveillance achieved by fetal monitoring cannot be matched by intermittent auscultation.	Fetal surveillance achieved by IA is not as accurate as that achieved by EFM.
8. Fetal monitoring can be helpful tool for labour coaches.	The use of EFM is reassuring for labour coaches.
9. Fetal monitoring should be restricted to high risk patients only.	EFM should be restricted to high-risk patients.
10. If I were in labor, I would refuse to be placed on a fetal monitor for any reason.	If I were in labor I would wish to have EFM.
11. Fetal monitors are intrusive to a normal childbearing experience and should not be used.	The use of EFM is intrusive to the normal child-bearing experience.

Appendix G continued

Items from Cranston's study	Revisions made
12. The fetal monitor can decrease perinatal mortality and morbidity.	I believe that the use of EFM can decrease perinatal mortality and morbidity.
13. The purpose of fetal monitoring is to improve fetal outcome.	I believe that the greatest value of EFM is in improving fetal outcome.
14. Fetal monitoring can be reassuring to the patient because she can see and hear her baby's heartbeat.	The use of EFM is reassuring to labouring patients.
15. Fetal monitoring is indicated for normal labours because potential complications can occur at any time.	EFM is indicated for normal labours because complications can occur at any time.

Appendix H

Pilot group assessment of items for validity.

Each of the items below will be scored of a four point scale: strongly disagree, disagree, agree, and strongly agree. Please look each of the questions below and think about whether or not the items examine "attitudes of nurses toward the use of electronic fetal monitoring in labour". If you believe that the item determines "attitudes of nurses toward electronic fetal monitoring", check off "yes". If you do not believe that the item examines attitudes check off "no". In the space below that item, indicate how this item should be changed so that it examines nurses attitudes.

	yes	no
1. I favour the use of electronic fetal monitoring during labour.	____	____
2. Electronic fetal monitoring is one of the best inventions of obstetrics	____	____
3. I do not like to use the electronic fetal monitor unless I have to because of hospital policy.	____	____
4. Routine continuous electronic fetal monitoring of all patients in labour would be ideal.	____	____
5. The use of electronic fetal monitoring causes more patient anxiety than intermittent auscultation of the fetal heart.	____	____

	Yes	No
6. A labouring patient monitored by electronic fetal monitoring can be just as comfortable as a patient monitored by intermittent uscultation.	____	_____
7. The use of electronic fetal monitors contributes to increased stress for obstetrical nurses.	____	_____
8. Nurses spend less time with the patients who are monitored with electronic fetal monitor than they do with patients who are monitored by intermittent auscultation.	_____	_____
9. The use of electronic fetal monitors places too many restrictions on patients.	_____	_____
10. The electronic fetal monitor is reassuring to mothers and their labour coaches.	_____	_____
11. If I were in labour I would not wish to have continuous electronic fetal monitoring.	_____	_____

	Yes	No
12. The electronic fetal monitor is intrusive to the normal child-bearing experience.	____	____
13. The use of electronic fetal monitoring contributes to increased medical intervention in obstetrics.	____	____
14. Fetal surveillance achieved by electronic fetal monitoring cannot be matched by intermittent auscultation.	____	____
15. Electronic fetal monitoring should be restricted to high risk patients.	____	____
16. I feel more reassured when the patient is monitored by electronic fetal monitoring.	____	____
17. I like the electronic fetal monitor because it gives nurses more free time.	____	____
18. The use of electronic fetal monitoring can lead to unnecessary caesarean sections.	____	____

	Yes	No
19. The use of electronic fetal monitoring can decrease perinatal mortality and morbidity.	____	____
20. The use of electronic fetal monitoring contributes to increased health care costs.	____	____
21. I believe that the greatest value of electronic fetal monitoring is in improving fetal outcome.	____	____
22. With electronic fetal monitoring, nurses provide less individualized patient care.	____	____
23. Electronic fetal monitoring is indicated for normal labours because complications can occur at any time.	____	____
24. The use of electronic fetal monitoring protects the nurse from legal liability.	____	____
25. The use of electronic fetal monitoring decreases the patient's control over her labour.	____	____

	Yes	No
26. I like to use the electronic fetal monitor because I like interpreting electronic fetal monitor tracings.	____	____
27. The use of electronic fetal monitoring adversely affects the quality of care that nurses give labouring patients.	____	____
28. The use of electronic fetal monitoring saves nurses time.	____	____
29. Most labouring patients prefer to be monitored electronically.	____	____
30. When the patient is monitored electronically, nurses focus their attention on the machine instead of the patient.	____	____
31. I like to use the electronic fetal monitor because I find it challenging.	____	____
32. I believe that the patient should be the one to decide how she should be monitored during labour.	____	____
33. I believe that the electronic fetal monitor is used too often.	____	____

	Yes	No
34. I believe that we have too many policies which tell use when we have to use electronic fetal monitors.	_____	_____
1. How do you feel about the use of electronic fetal monitoring during labour?	_____	_____
2. How do you believe the use of electronic fetal monitoring in labour affects patient care?	_____	_____
3. How do you believe the use of electronic fetal monitoring affects the nurse's role in caring for labouring patients?	_____	_____

Appendix I

Pilot group assessment for item clustering

This task involves examining seeing if all aspects of nurses' attitudes are adequately tested. In this task I will ask out to look at the following items to determine in which category each item fits best:

1. medical/legal issues
2. patient/family responses to fetal monitoring
3. effect of electronic fetal monitoring on patient care
4. effect of electronic fetal monitoring on nursing roles/responsibilities
5. individual nurses' use of electronic fetal monitoring
6. other

Indicate the number of the category for each item in the space provided after the item.

	Category of attitude
1. I favour the use of electronic fetal monitoring in labours	_____
2. Electronic fetal monitoring is one of the best inventions of obstetrics.	_____
3. I do not like to use the electronic fetal monitor unless I have to because of hospital policy.	_____
4. Routine continuous electronic fetal monitoring of all patients in labour would be ideal.	_____

1. medical/legal issues
2. patient/family response to electronic fetal monitoring
3. effects of electronic fetal monitoring on patient care
4. effects of electronic fetal monitoring on nursing roles/ responsibilities.
5. individual nurses' use of electronic fetal monitoring.
6. other

5. The use of electronic fetal monitoring causes more patient anxiety than intermittent auscultation of the fetal heart. _____

6. A labouring patient monitored by electronic fetal monitoring can be just as comfortable as a patient monitored by intermittent auscultation. _____

7. The use of electronic fetal monitoring contributes to increased stress for obstetrical nurses. _____

8. Nurses spend less time with patients who are monitored with the electronic fetal monitor than they do with patients who are monitored by intermittent auscultation. _____

9. The use of electronic fetal monitoring places too many restrictions on patients. _____

10. The electronic fetal monitoring is reassuring to mothers and their labour coaches. _____

11. If I were in labour I would not wish to have continuous electronic fetal monitoring. _____

1. medical/legal issues
2. patient/family responses to electronic fetal monitoring
3. effects of electronic fetal monitoring on patient care
4. effects of electronic fetal monitoring on nursing roles/ responsibilities
5. individual nurses' use of electronic fetal monitoring
6. other

12. The electronic fetal monitor is intrusive to the normal child-bearing experience. _____

13. The use of electronic fetal monitoring contributes to increased medical intervention in obstetrics. _____

14. Fetal surveillance achieved by electronic fetal monitoring cannot be matched by intermittent auscultation. _____

15. Electronic fetal monitoring should be restricted to high risk patients. _____

16. I feel more reassured when the patient is monitored by electronic fetal monitoring. _____

17. I like the electronic fetal monitor because it gives nurses more free time. _____

18. The use of electronic fetal monitoring can lead to unnecessary caesarean sections. _____

19. The use of electronic fetal monitoring can decrease perinatal mortality and morbidity. _____

20. The use of electronic fetal monitoring contributes to increased health care costs. _____

1. medical/legal issues
2. patient/family responses to electronic fetal monitoring
3. effects of electronic fetal monitoring on patient care
4. effects of electronic fetal monitoring on nursing roles/ responsibilities.
5. individual nurses' use of electronic fetal monitoring
6. other

21. I believe that the greatest value of electronic fetal monitoring is in improving fetal outcome. _____

22. With electronic fetal monitoring, nurses provide less individualized patient care. _____

23. Electronic fetal monitoring is indicated for normal labours because complications can occur at any time. _____

24. The use of electronic fetal monitoring protects the nurse from legal liability. _____

25. The use of electronic fetal monitoring decreases the patient's control over her labour. _____

26. I like to use the electronic fetal monitor because I like interpreting monitor tracings. _____

27. The use of electronic fetal monitoring adversely affects the quality of care that nurses give labouring patients. _____

28. The use of electronic fetal monitoring saves nurses time. _____

29. Most labouring patients prefer to be monitored electronically. _____

1. medical/legal issues
2. patient/family responses to electronic fetal monitoring
3. effects of electronic fetal monitoring on patient care
4. effects of electronic fetal monitoring on nursing roles/ responsibilities.
5. individual nurses' use of electronic fetal monitoring
6. other

28. The use of electronic fetal monitoring saves nurses time. _____

29. Most labouring patients prefer to be monitored electronically. _____

30. When the patient is monitored electronically, nurses focus their attention on the machine instead of the patient. _____

31. I like to use the electronic fetal monitor because I find it challenging. _____

32. I believe that the patient should be the one to decide how she should be monitored during labour. _____

33. I believe that the electronic fetal monitor is used too often. _____

34. I believe that we have too many policies which tell us when we have to use electronic fetal monitoring. _____

Please tally the items that belong to each of the categories:

1. medical/ legal issues _____
2. patient/family responses _____
3. effects on patient care _____
4. effects on nursing roles/ responsibilities_____
5. individual nurses' use of electronic fetal monitoring_____

Appendix J

Pilot group assessment of the questions for clarity

Please look at each item and consider if the meaning of the item is clear or ambiguous. Place a check beside each item indicating if the item is clear or not clear. In the space provided below each item, please write any suggestions you might have as to how to change unclear items.

	Clear	Not clear
1. I favour the use of electronic fetal monitoring in labour.	_____	_____
2. Electronic fetal monitoring is one of the best inventions of obstetrics.	_____	_____
3. I do not like to use the electronic fetal monitoring unless I have to because of hospital policy.	_____	_____
4. Routine continuous electronic fetal monitoring of all patients in labour would be ideal.	_____	_____
5. The use of electronic fetal monitoring causes more patient anxiety than intermittent auscultation of the fetal heart.	_____	_____
6. A labouring patient monitored by electronic fetal monitoring can be just as comfortable as a patient monitored by intermittent auscultation.	_____	_____
7. The use of electronic fetal monitoring contributes to increased stress for obstetrical nurses.	_____	_____

	Clear	Not clear
8. Nurses spend less time with patients who are monitored with the electronic fetal monitor than they do with patients who are monitored by intermittent auscultation.	_____	_____
9. The use of electronic fetal monitors places too many restrictions on patients.	_____	_____
10. The electronic fetal monitor is reassuring to mothers and their labour coaches.	_____	_____
11. If I were in labour I would not wish to have continuous electronic fetal monitoring.	_____	_____
12. The electronic fetal monitor is intrusive to the normal child-bearing experience.	_____	_____
13. The use of electronic fetal monitoring contributes to increased medical intervention in obstetrics.	_____	_____
14. Fetal surveillance achieved by electronic fetal monitoring cannot be matched by intermittent auscultation.	_____	_____
15. Electronic fetal monitoring should be restricted to high risk patients.	_____	_____
16. I feel more reassured when the patient is monitored by electronic fetal monitoring.	_____	_____
17. I like the electronic fetal monitor because it gives nurses more free time.	_____	_____

	Clear	Not clear
18. The use of electronic fetal monitoring can lead to unnecessary caesarean sections.	_____	_____
19. The use of electronic fetal monitoring can decrease perinatal mortality and morbidity.	_____	_____
20. The use of electronic fetal monitoring contributes to increased health care costs.	_____	_____
21. I believe that the greatest value of electronic fetal monitoring is in improving fetal outcome.	_____	_____
22. With electronic fetal monitoring, nurses provide less individualized patient care.	_____	_____
23. Electronic fetal monitoring is indicated for normal labours because complications can occur at any time.	_____	_____
24. The use of electronic fetal monitoring protects the nurse from legal liability.	_____	_____
25. The use of electronic fetal monitoring decreases the patient's control over her labour.	_____	_____
26. I like to use the electronic fetal monitoring because I like interpreting electronic fetal monitor tracings.	_____	_____
27. The use of electronic fetal monitoring adversely affects the quality of care that nurses give labouring patients.	_____	_____
28. The use of electronic fetal monitoring saves nurses time.	_____	_____

	Clear	Not clear
29. Most labouring patients prefer to be monitored electronically.	_____	_____
30. When the patient is monitored electronically, nurses focus their attention on the machine instead of the patient.	_____	_____
31. I like to use the electronic fetal monitor because I find it challenging.	_____	_____
32. I believe that the patient should be the one to decide how she should be monitored during labour.	_____	_____
33. I believe that the electronic fetal monitor is used too often.	_____	_____
34. I believe that we have too many policies which tell us when we have to use electronic fetal monitors.	_____	_____

1. How do you feel about the use of electronic fetal monitoring during labour?	_____	_____
2. How do you believe the use of electronic fetal monitoring in labour affects patient care?	_____	_____
3. How do you believe the use of electronic fetal monitoring affects the nurse's role in caring for labouring patients?	_____	_____

Appendix K

Ethical approval

The University of Manitoba

FACULTY OF NURSING
ETHICAL REVIEW COMMITTEE

APPROVAL FORM

Proposal Number N/94/16

Proposal Title: "THE ATTITUDES OF OBSTETRICAL NURSES TOWARD THE USE OF ELECTRONIC FETAL MONITORING IN LABOUR."

Name and Title of Researcher(s): KATHLEEN PERRON
MASTER OF NURSING GRADUATE STUDENT
UNIVERSITY OF MANITOBA FACULTY OF NURSING

Date of Review: JUNE 06, 1994

APPROVED BY THE COMMITTEE: JUNE 06, 1994.

Comments: APPROVED WITH SUBMITTED REVISIONS OF JUNE 10TH, 1994.

Date: June 10/94

Linda J. Kristjanson, PhD, RN — Chairperson
Associate Professor
University of Manitoba Faculty of Nursing

Position

NOTE:
Any significant changes in the proposal should be reported to the Chairperson for the Ethical Review Committee's consideration, in advance of implementation of such changes.

Appendix L

Second approval letter from the Ethical Review Committee

THE UNIVERSITY OF MANITOBA

FACULTY OF NURSING

Room 246 Bison Building
Winnipeg, Manitoba
Canada R3T 2N2

Tel: (204) 474-8202
Fax: (204) 275-5464

September 14, 1994

Kathleen Perron
Brandon, Manitoba
R7

Dear Ms. Perron:

Thank you for your letter of September 14, 1994 informing me of necessary changes to the data collection plan for your study, "The attitudes of obstetrical nurses toward the use of electronic fetal monitoring in labour".

The changes outlined (colour coding of questionnaires) are acceptable from an ethical perspective, as the rights of subjects will not be effected. Your covering letter to participants describing this change is appropriate. Therefore, the original ethical approval granted for your study remains in effect.

Good luck with your project.

Sincerely,

Linda J. Kristjanson, RN, PhD
Chair, Ethical Review Committee

cc Dr. Ina Bramadat, Thesis Chair

Appendix M

Covering letter to participants

Dear colleague,

I am a master's of nursing student at the University of Manitoba and would appreciate your assistance in a research project. The study I am doing is entitled: The attitudes of obstetrical nurses toward the use of electronic fetal monitoring in labour. In this study, I am trying to identify how nurses feel about electronic fetal monitoring and how nurses believe electronic fetal monitoring has influenced care of labouring patients.

I am approaching nurses in the fifteen Manitoba which have the highest delivery rates. If you agree to participate, I ask you to complete the following questionnaire. As well, I ask you to complete a short form which gives some background information about yourself. Completing the questionnaire should take approximately 20 minutes. Once the questionnaire and form are completed, please return them to me in the pre-addressed, stamped envelope. You do not need to sign the questionnaire. By completing and returning the questionnaire you will be giving consent to participate in the study.

The data from the survey will by analyzed by examining patterns of responses and their relationships to hospital type, level of education, and number of years of experience in caring for labouring patients. The questionnaires are colour coded according to different institutions. This coding will be used to identify the type of hospitals in which nurses work-- urban teaching hospitals, urban community hospitals, and rural

hospitals. Specific information about you or your hospital will not be reported. Your answers will remain anonymous. All answers will be stored securely and confidentiality will be maintained. The study has been approved by the Faculty of Nursing Ethical Review Committee at the University of Manitoba.

You are not obligated to participate in this research. There are no risks of participating in the study. There are also no benefits to you other than the knowledge that you have helped to increase our understanding of nurses' opinions about electronic fetal monitoring.

The results of the study can be made available to you if you request it. I will retain the questionnaires, securely stored, for a period of ten years. Following this period of time, the questionnaires will be destroyed.

If you have any questions about the research please feel free to contact me at . You may also contact my thesis advisor, Dr. Ina Bramadat, at the University of Manitoba, at 474-6375.

Thank you for your cooperation in taking time to complete the questionnaire.

Yours truly,

Kathleen Perron.

Appendix N

Levels of obstetrical care

Level 1, Primary care- Community Hospital

-Primary responsibility for delivery of women whose pregnancies have been normal and in whom labour is progressing normally

-Should be equipped and staffed to supervise labour adequately and to cope with emergencies, in both mother and babe, which will occur on an unpredictable basis (almost 40% of problems are unanticipated).

-Consultation with a regional or tertiary care centre with a view to transfer should occur when a primary care facility is faced with an infant who:

-is preterm	-is small for dates
-is large for dates	-displays cyanosis
-has expiratory grunting	-has costal retractions
-has tachypnea	-has early jaundice

-Immediate transfer should be considered for very small infants or those depressed at birth with low apgars. Consultation with the receiving hospital on measures to be taken prior to and during transport would be appropriate and essential.

-A primary care facility should develop a close affiliation with a Level II or regional centre and should be able to call on consultants from this area.

Appendix N continued

Standards Level I (A) Hospital Obstetric and Newborn

Introduction

The criteria for selection of any hospital as a Level I (A) should be related to relative geographic isolation and/or annual deliveries that provide continued, rather than sporadic experience with operative deliveries, interpretation of F. H. R. monitoring tracings, and neonatal resuscitation and transfer. Geographic isolation is defined as a distance of 50 miles from the nearest regional tertiary center and an adequate number of deliveries is defined as 250 or greater per year.

In addition there must be a commitment on the part of some of the medical and nursing staff to have some of their colleagues gain additional expertise in the field of obstetrics and neonatal care with willingness to consult and use this additional knowledge to maintain standards.

A Level I (A) facility has the same requirements as a Level I, particularly the obligation to transfer cases that could be more safely managed in a larger centre. Because there will be instances when climate or other circumstances preclude safe maternal or neonatal transfer, a Level I (A) facility differs in degree in the following areas from Level I.

Physician facilities

(in addition to Level I)

Caesarean section facilities should be provided within the general delivery room area.

Appendix N continued

Laboratories

(in addition to Level I)

Facilities for microelectrolyte, pH and blood gas determinations, X-ray facilities, and EKG equipment with newborn leads.

Blood bank facilities

(in addition to Level I)

Organized walking blood donor bank to allow one to two hour group and cross match service independent of weather conditions. This must be done in consultation with the Red Cross.

Medical Personnel

A level I (A) should have at least two physicians delivering 25 babies per year in order to maintain expertise and allow for consultation. A physician chosen at the local level should be responsible for standards related to the labour floor and the introduction of policies and guidelines for obstetrics.

A physician should be in charge of the nursery and neonatal facilities with responsibilities for standards. Consideration of an informal/formal rotation through an I.C.N. should be given if the physician's experience does not include a formal one month post graduate rotation in a neonatal nursery.

At least one of the designated physicians should spend a minimum of one week at a tertiary centre each year to attend rounds, discussions, update on techniques, etc. It should be required that physicians attend one of the formal recognized post graduate courses on perinatology (obstetrics or neonatology).

Appendix N continued

Nursing personnel

(as for Level I)

There should be one experienced nurse with recognized obstetric training available for duty if a patient is admitted to the labour floor.

In addition there should be nurses trained in the use of fetal electronic monitoring techniques - sufficient to offer 24 hour coverage.

Total numbers of nursing staff should be adequate to cover requirements as suggested in the Advisory Committee's revision of College Obstetric and Newborn Standards (1978).

Equipment

(as for Level 1)

An electronic fetal monitor could be an additional item PROVIDED there is the commitment of personnel, both physicians and nurses, to take the necessary courses to interpret tracings. It is strongly recommended that nurses and the laboratory should develop the additional expertise to perform scalp sampling and obtain fetal pH values. Failing this, the possibilities of tracings for interpretation by "telex" should be explored. In the event that neither of these possibilities are feasible, then consideration should be given to the transfer of all patients with abnormal FHR tracings.

A good transport incubator and staff trained in its use and able to cope with some of the emergencies that might occur during transport.

Appendix N continued

Funding

The expenses of attendance, involving accommodation, travel and loss of income should be recognized and funded by their institutions or M.H.S.C.

Level II, Intermediate or Secondary Care - Regional Centre

-Responsibility to meet community and regional needs, which means the acceptance of referred patients.

-Would provide the standard of care sufficient for most of the contingencies that arise in an obstetrical newborn service.

-Ideally a minimum number of deliveries is essential to form a viable economic unit and maintain medical and nursing expertise. Less than 1,000 deliveries may be justified when the hospital, by its geographic character, supplies special services to adjacent rural or community hospitals.

-Should be equipped and staffed to supervise medical inductions, perform oxytocin challenge tests, perform elective caesarean sections and to cope with obstetrical and newborn emergencies.

-Should be capable of specialized care of the newborn at least on a short term basis.

-Should have the capability of maintaining a rapid infant transport system.

-Should have a role in the continuing education of in-hospital staff personnel and rural staff.

-Should maintain close contact with the tertiary centre for discussion on obstetrical and neonatal problems.

Appendix N continued

Level III, Tertiary Care - Referral Centre

-Responsibility for providing services for obstetric high risk and maternal surgical and medical problems.

-Would provide services for neonatal high risk and the neonate needing specialized medical and surgical treatment.

-Responsible for continuing any current community service component with respect to normal obstetrical services.

-Expected to provide or have access to a complete range of genetic services involving both the obstetrical component and pediatric component.

-A pediatric follow-up component for the at-risk neonate involving child development, and specialized neurological, ophthalmological and auditory services should be available.

-Should have Rh isoimmunization diagnostic and treatment facilities.

-Should play a major role in the coordination and staffing of a physician nurse team for organized transport of infants and mothers between hospitals and should probably involve ground and air travel- available 24 hours a day, 7 days a week.

-Should organize educational programs in cooperation with other interested bodies both for physicians and nurses from referring hospitals and for staff within the tertiary centre in order to assist and develop new skills related to current developments.

-Data collection and statistical analysis should be an on-going process to monitor and evaluate the standards and methods of care and to define mortality and morbidity rates.

-Should have an on-going program of research at a tertiary centre

Appendix N continued

which would include both basic research and a more clinical application of approved methods of obstetrical and neonatal care. The results from these investigations could then be disseminated to the peripheral regional centres and community hospitals thereby helping to increase their awareness of new developments and standards of care.

(College of Physicians and Surgeons of Manitoba. 1978. pp. 2-4, appendix VIII)

Appendix O

Number of respondents from each hospital

by hospital level of care

Hospital	Level of care			
	1	1a	2	3
#1	2			
#2			5	
#3	4			
#4		5		
#5	2			
#6		4		
#7		9		
#8	4			
#9		4		
#10				31
#11		11		
#12				8
#13	20			
#14			8	

APPENDIX P

Number of respondents from each hospital by setting

Hospital	Setting		
	Rural	Urban Community	Tertiary
#1	2		
#2	5		
#3	4		
#4	5		
#5	2		
#6	4		
#7	9		
#8	4		
#9	4		
#10			31
#11		11	
#12			8
#13		20	
#14		8	

Appendix Q

Results of the AFMQ

Legend: SD = strongly disagree (%) D = disagree (%)
U= Uncertain (%) A = agree (%)
SA = strongly agree (%)
n= number of respondents

Question	n	SD	D	U	A	SA
1. I am in favour of the use of EFM during labour.	117	6.8	16.2	6.8	50.4	19.7
2. EFM is one of the best developments of modern obstetrics.	117	7.7	13.7	12.8	53.8	12.0
3. I do not like to use EFM unless I have to due to hospital policy.	117	16.2	56.4	6.0	19.7	1.7
4. Routine EFM of all patients in labour would be ideal.	116	25.9	41.4	7.8	19.8	5.2
5. The use of EFM causes more patient anxiety than IA of the fetal heart rate.	117	5.1	37.6	17.1	32.5	7.7
6. A labouring patient monitored by EFM can be just as comfortable as a patient monitored by IA.	116	17.2	41.4	4.3	33.6	3.4

Appendix Q continued

Results of the AFMQ

	n	SD	D	U	A	SA
7. The use of EFM contributes to increased stress for obstetrical nurses.	117	12.0	35.0	10.3	30.8	12.0
8. I believe that nurses spend less time with patients who are monitored electronically than they do with patients who are monitored by IA.	116	14.7	46.6	4.3	25.9	8.6
9. The use of EFM places too many restrictions on patients.	117	1.7	23.1	13.7	46.2	15.4
10. The use of EFM is reassuring to labouring patients.	117	1.7	15.4	24.8	55.6	2.6
11. If I were in labour I would wish to have EFM.	117	12.0	30.8	7.7	37.6	12.0
12. The use of EFM is intrusive to the normal child-bearing experience.	116	5.2	30.2	18.1	34.5	12.1
13. I believe that IA is preferable to EFM because EFM contributes to increased medical interventions.	117	5.1	32.5	22.2	33.3	6.8

Appendix Q continued

Results of the AFMQ

	n	SD	D	U	A	SA
14. Fetal surveillance achieved by IA is not as accurate as that achieved by EFM.	117	9.4	21.4	5.1	47.9	16.2
15. EFM should be restricted to high-risk patients.	116	6.9	43.1	9.5	27.6	12.9
16. I feel more reassured when the patient is monitored by EFM.	117	6.0	28.2	12.0	48.7	5.1
17. I like EFM because it allows nurses to care for more patients at the same time.	117	17.1	49.6	12.8	17.1	3.4
18. I believe that the use of EFM can lead to unnecessary caesarean sections.	116	4.3	38.8	18.1	31.0	7.8
19. I believe that the use of EFM can decrease perinatal mortality and morbidity.	117	8.5	11.1	11.1	53.0	16.2
20. I believe that the use of EFM contributes to increased health care costs.	117	1.7	31.6	15.4	37.6	13.7

Appendix Q continued

Results of the AFMQ

	n	SD	D	U	A	SA
21. I believe that the greatest value of EFM is in improving fetal outcome.	116	7.8	11.2	12.9	47.4	20.7
22. With EFM, nurses provide less individualized patient care.	117	12.8	57.3	1.7	20.5	7.7
23. I believe that EFM is used too often.	117	1.7	29.1	8.5	47.9	12.8
24. The use of EFM protects the nurse from legal liability.	117	7.7	35.9	28.2	26.5	1.7
25. The use of EFM decreases the patient's control over her labour.	117	8.5	38.5	12.8	28.2	12.0
26. I like to use EFM because I like interpreting EFM tracings.	116	14.7	58.6	12.1	14.7	-
27. The use of EFM adversely affects the quality of care that nurses give labouring patients.	117	21.4	55.6	5.1	14.5	3.4
28. The use of EFM decreases the nurse's workload.	117	15.4	64.1	5.1	14.5	0.9

Appendix Q continued

Results of the AFMQ

	n	SD	D	U	A	SA
29. Most labouring patients prefer to be monitored electronically.	117	10.3	43.6	29.1	17.1	-
30. When the patient is monitored electronically, nurses focus their attention on the machine instead of the patient.	117	7.7	48.7	9.4	29.1	5.1
31. I like to use EFM because I find it challenging.	116	13.8	62.1	6.9	17.2	-
32. EFM is indicated in normal labours because complications can occur at any time.	117	14.5	37.6	14.5	28.2	5.1
33. I believe that we have too many policies which tell us that we have to use EFM.	117	4.3	57.3	9.4	26.5	2.6
34. If my relative (daughter, sister, niece) were in labour, I would wish for her to be monitored by IA.	116	4.3	30.2	13.8	42.2	9.5

Appendix Q continued

Results of the AFMQ

	n	SD	D	U	A	SA
35. The use of EFM is reassuring to labour coaches.	117	6.0	33.3	29.9	25.6	5.1
36. I believe that patients who are monitored by IA have a more positive birth experience than patients monitored by EFM.	117	4.3	41.0	23.1	22.2	9.4
37. I like to use EFM because it protects me from lawsuits.	117	12.0	51.3	23.1	12.8	0.9
38. EFM is one of the worst developments of modern obstetrics.	117	35.0	47.9	12.0	4.3	0.9

Appendix R

Factor loadings for principal components

Variable	Principal component one	Principal component two
1	0.75461	0.10820
2	0.70023	0.11106
3	0.69790	-0.19874
4	0.66021	0.22688
5	0.72889	-0.06875
6	0.59684	-0.04481
7	0.58815	-0.07338
8	0.63886	-0.27471
9	0.66288	-0.21180
10	0.67069	0.26466
11	0.80597	0.16172
12	0.73736	0.05090
13	0.75700	-0.21873
14	0.59315	0.16367
15	0.64453	-0.13204
16	0.63443	0.42370
17	0.18373	0.53370
18	0.71948	-0.20134
19	0.63597	0.11782
20	0.64756	-0.15954
21	0.67988	0.14950
22	0.80201	-0.17229
23	0.73457	-0.06380
24	-0.12455	0.63376
25	0.62741	-0.22429
26	0.18806	0.59369
27	0.63625	-0.29616
28	-0.14980	0.45602
29	0.51115	0.32081
30	0.64520	-0.15519
31	0.29642	0.49697
32	0.69986	0.28281
33	0.54006	-0.25334
34	0.58027	0.01201
35	0.31190	0.43969
36	0.78914	-0.14630
37	-0.07217	0.69897
38	0.65850	0.11406

Appendix S

Factor loadings for rotated factors

Variable	Factor one	Factor two
1	0.29661	0.44813
2	0.42055	0.56714
3	0.40487	0.17114
4	0.15196	0.35305
5	0.63138	0.14114
6	0.09153	0.05294
7	0.76951	0.19371
8	0.66566	0.21437
9	0.39720	0.00372
10	0.32119	0.36413
11	0.20091	0.45546
12	0.25349	0.25331
13	0.38679	0.34850
14	0.06401	0.75015
15	0.12688	0.13228
16	0.16024	0.58834
17	-0.10125	0.35109
18	0.54854	0.33011
19	0.34939	0.71183
20	0.36578	0.28226
21	0.31844	0.74522
22	0.61616	0.28569
23	0.31189	0.27923
24	-0.06845	-0.02575
25	0.24019	0.07274
26	0.10130	0.15186
27	0.56143	0.05496
28	-0.12929	-0.08609
29	0.05575	0.13677
30	0.63310	0.13815
31	0.00897	0.13469
32	0.11397	0.53122
33	0.44553	0.00994
34	0.12772	0.44723
35	0.15646	-0.08546
36	0.52177	0.17939
37	-0.03269	0.01668
38	0.52109	0.44262

Appendix T

NAACOG (1990) guidelines for auscultation of fetal heart rate

- palpate the maternal abdomen to identify fetal presentation and position (Leopold's maneuvers).
- place the bell of fetoscope or Doppler over the area of maximum intensity of fetal heart sounds (usually over the fetal back).
- place a finger on mother's radial pulse to differentiate maternal from fetal heart rate.
- palpate for uterine contractions during period of FHR auscultation in order to clarify relationship between FHR and uterine contraction.
- count FHR during a uterine contraction and for 30 seconds thereafter to identify fetal response.
- if distinct differences are noted between counts, recounts for longer periods are appropriate to clarify the presence and possible nature of periodic FHR changes, such as abrupt versus gradual changes.
- in clarifying accelerations, recounts for multiple brief periods of 5-10 seconds may be particularly helpful (NAACOG, 1990, p. 4).