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Taming chance and taking chances: the electronic fetal heart monitor in a rural Canadian hospital and community

Ken L. Bassett Department of Anthropology McGill University, Montreal

February, 1993

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfiliment of the requirements of the degree Doctor of Philosophy

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The electronic fetal monitor and obstetrics in a rural Canadian hospital and community

> Department of Anthropology McGill University

> > Montreal, Quebec February, 1993

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ABSTRACT

In this thesis, I examine the use of medical technology as the product of, among other things, value systems and individual and collective needs; technological use therefore is shown to be culturally influenced and subject to change according to historical and social context.

I describe and discuss the use of the Electronic Fetal Heart Rate Monitor (EFM) -- a state of the art form of electronic information technology -- in obstetrical care in a rural Canadian hospital and community. The central issue I examine is why this technology was obtained and repeatedly used despite local medical opinion and scientific evidence that it was ineffective as a tool to improve obstetrical outcome, and also had been shown to put pregnant women at considerable risk of unnecessary and potentially harmful interventions during birth.

I describe how EFM use appeared contradictory because medical understanding of EFM use was limited to what I define as "case centered" research; research limited to measuring the impact of the EFM on individual patient outcome. Case centered studies were not examinations either of the EFM itself, or of its associated technical regimens. Moreover, case centered studies were not used to relate the EFM to women's experiences during birth, hospital traditions, or community expectations. These latter relationships, which are ignored in case studies, form the focus of this research and explain why an EFM was used in this community.

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SOMMAIRE

Dans cette thèse, j'examine l'utilisation d'une technologie médicale comme étant le produit de sytèmes de valeur et de besoins collectifs et individuels; l'utilisation technologique est donc vue comme étant culturellement influencée et sujet à des changements associés à un contexte historique et social.

Je décrie et discute l'utilisation du Moniteur Electronique pour déterminer le rythme cardiaque du Fétus (MEF) - une forme d'art dans la technology de l'information électronique - dans le contexte de soins obstétriques offerts par un hôpital et une communauté rurale canadienne. La question centrale que j'examine est pourquoi cette technologie a été acquise et utilisée de façon répétitive en dépit de l'opinion médicale locale ainsi que de preuves scientifiques regardant son inefficacité comme outil qui améliore le résultat obstétrique. Il a aussi été démontré que le moniteur occasionne un plus grand risque d'interventions non nécessaires et potentiellement douloureuses durant le processus de l'accouchement.

L'utilisation du MEF semble être contradictoire due au fait que la compréhension médicale associée à son utilisation était limitée à une recherche que je définie "centered case"; une recherche qui se restraint à mesurer l'impact du MEF sur seulement le résultat individuel du patient. Les études centrées sur les cas individuels ne disent rien sur le MEF lui-même, ou sur les régimes techniques associés à son utilisation. De plus, ce genre d'études n'a pas été utilisé pour relier le MEF avec les expériences de la femme durant son accouchement, les traditions de l'hôpital. ou les attentes de la communauté. Ces dernières relations lesquelles sont ignorées par les études de cas, constituent le point central de cette recherche. De plus, elles expliquent pourquoi le MEF a été utilisé dans cette communauté.

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Guidance for, and above all, inspiration to continue with this project both were provided by Margaret Lock and her colleagues in the Department of Humanities and Social Studies in Medicine at McGill University, particularly historians Don Bates and George Weiss.

I am also indebted to the doctors and nurses in Invermere with whom I shared medical practice, both for their tolerarice and support, as well as for their candid and honest appraisal of their professional activities. And, I am grateful to the hospital administration for permitting this research, and to the various hospital staff for their extra hours of work on my behalf.

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An abstract is provided and the EFM is defined. This study of the EFM is related to the work of social scientists interested in the study of medicine in Western Europe and North America. Case centered versus technology centered approaches are defined and their theoretical perspectives outlined. The researcher and the research perspective are described, as well the setting and methods. A detailed chapter outline is provided.

Part I. BACKGROUND

Chapter 1. The EFM: Historical, Biological, and Cultural Perspectives

Continuous electronic monitoring of labour began in the 1950s. Devices similar to the EFM were developed in the 1960s. The modern EFM combines non-recorded, auditory and visual, productions with records called EFM strips. The EFM contains sophisticated electronics which use time parameters for data reduction. Data reduction demonstrates and records biological patterns; patterns analysed by basic scientists and obstetricians to produce obstetrical knowledge on the condition of the fetus. Despite use on pregnant women, the EFM is characterized as a <u>fetal</u> monitor. Researchers and obstetricians characterize birth as a time of fear.

Chapter 2. Acquiring an EFM in Invermere

The EFM acquisition story is used to provide further details of community, hospital, and professional history. Local doctor interest in the EFM was a necessary, although not sufficient, condition for EFM purchase; sufficient conditions included an expanded patient role in obstetrical care, increased obstetrical interest in anticipating problems during birth, and community interest in equipping the hospital with the latest technology. Social scientists and historians are shown to have ignored the important role of community members in shaping hospital care and technological accumulation.

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Part II. WHY WAS AN EFM USED IN INVERMERE OBSTETRICAL CARE?

Chapter 3. Screening Uses of the EFM

Nurses are described as the professionals involved in and responsible for screening uses of the EFM. Doctors neither asked for nor were present to interpret these EFM recordings. Nurses used the EFM for three reasons, none of which were simply a matter of assessing fetal health status. First, they applied the EFM because it was useful in maintaining the autonomy of nursing care from doctors. Second, screening EFM uses fit with an emerging nursing professionalism that involved, for the first time, explicit diagnostic roles. Third, once the EFM was available and once fetal screening began, it became increasingly difficult for nurses to withhold this type of examination from subsequent patients. Nurse initiated screening use of the EFM are shown to be the result rather than the cause of change in obstetrical care.

Chapter 4. Inductions, Augmentations, Intensive Care Treatments and the EFM

EFM use is described in three doctor directed, active management procedures: inductions, augmentations, and intensive care treatments. Understanding why these interventions occurred and why the EFM was central to them is necessary to understanding why the EFM was used in Invermere. Doctors used active management procedures in order to impose normative time frames onto individual patients. An EFM was used to minimize the risk of these procedures to a fetus. EFM use during these interventions is best thought of not as screening for fetal problems, but as an implementary technology to assist in task completion. The EFM was used continuously to ensure that these procedures caused the fetus no harm. EFM use during these procedures accounted for most hours of EFM use in this hospital.

Chapter 5. The Non-Stress Test (NST)

Nonstress Tests were a third type of EFM use in obstetrical care. They occurred prior to the onset of birth and were used to predict future fetal health in the womb. NSTs became common in Invermere because they fit with a growing tendency in obstetrical care to appear to be managing pregnancy in terms of fetal needs. Managing pregnancy in terms of fetal needs, in turn, was the product of several converging trends, including various forms of technologically mediated fetal exposure, advances in care of premature infants, increased women's self confidence, and expanding community expectations regarding women's behavior during pregnancy. NSTs, therefore, became, not only a way to test fetal health in the womb, but also an opportunity for doctors and patients to display their concern for fetal health and fetal health ideals.

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Part III. DISCUSSION

Chapter 6. Beyond Obstetrics: EFM use in Invermere Hospital and Community Context

Each of the three EFM uses -- screening, intervening, and testing - is contextualized within a different context; namely, 1) screening tests fit within sexual and territorial negotiations and divisions of labour found throughout community institutions; 2) interventions fit within highly rationalized treatment routines for bodily contact and control of bodily processes; and 3) performance tests fit within a regional system for making and processing fetal information. Contextualization of the three obstetrical traditions involving the EFM leads to a more fragmented, rather than to a more coherent understanding either of EFM use or of obstetrical care. This fragmented view of obstetrical care and the EFM is contrasted with the coherent vision of obstetrics that doctors and nurses present through their case constructions.

Part IV. CONCLUSION

Chapter 7. Technology and the Application of Medical Knowledge and Practice

The almost complete absence of studies of the use of medical technology has left unchallenged at least two important assumptions regarding its relationship to medical knowledge and practice. In keeping with the interests of social scientists studying the social construction of medical knowledge and practice, both of these assumptions were examined and challenged in this research. The first is the assumption that technology has primarily shaped medical care in Western countries, rather than the other way round. The second is the assumption that medical technology can be adequately understood through measurement of its impact on patient outcome.

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<u>Title</u>



Introduction

The Problem of the Electronic Fetal Heart Monitor

Medical knowledge and practice is the product of, among other things, value systems and individual and collective needs; it is therefore culture-bound and subject to change according to historical and social context. As explanations for health and illness change with the capabilities and priorities of the time, actual medical knowledge and practice changes, and this in turn has an effect on definitions of health and disease.

In this thesis, I examine the relationships between the Electronic Fetal Heart Rate Monitor (EFM), a state of the art form of electronic information technology, and obstetrical knowledge and practice in a rural Canadian hospital and community. At issue is why this technology was obtained and repeatedly used despite local medical opinion and scientific evidence that it was not only ineffective as a tool to improve obstetrical outcome¹, but also it had been shown to put pregnant women at considerable risk of unnecessary and potentially harmful operative interventions during birth. EFM use therefore is remarkable considering that patients and practitioners, who were often neighbours and friends, shared the same goals of minimizing unnecessary interventions in birth.

The findings of this research suggest that, while EFM use may at first seem

¹ Outcome is medical jargon for the ultimate state of a patient following a treatment or surgical procedure. Ideally, outcome is expressed in quantifiable parameters such as life expectancy or illness duration. In obstetrics, for example, outcome is often used to refer the neurological condition of the newborn baby. In keeping with medical convention, outcome will be used in the singular form, although it refers to multiple parameters or outcomes.

contradictory both to the wishes of patients and to the rigor of professionals, it was in fact consistent with the beliefs and values shared by medical and non-medical members of this community. These beliefs and values, I will show, have been part of this community from the time of its origin and have been built into the series of local hospitals and hospital routines throughout this century.

It is argued that use of the EFM in obstetrics appears contradictory, because current medical understanding of its use is limited to what I will define as a "case centered" view of obstetrics. In a "case centered" view, research is limited to measuring the impact of the EFM on individual patient outcome. Case centered studies are not examinations either of the EFM itself, or of its associated technical regimens. Moreover, in case centered studies, researchers do not relate the EFM to women's experiences in birth, hospital traditions, or community expectations. These latter relationships, which lay outside of strict professional management schemes, explain why an EFM was used in this community.

EFM introduction, therefore, far from forming the leading edge of change, was actually centered in and shaped by many of this community's oldest and most fundamental traditions and values. Understanding the EFM became more a matter of understanding what was old and recurrent in a particular hospital and community than what was new and innovative about this device.

I. Definitions

I(i). The Electronic Fetal Heart Monitor

The Electronic Fetal Heart Monitor (hereafter EFM) is an electronic data gathering and data processing device. The data it gathers include both the frequency

and duration of uterine contractions, as well as the frequency and variability of heart beats of the fetus. It was developed during the 1960s and was introduced into hospital obstetrics during the 1970s.

By 1979, according to Banta and Thacker (1979:627), virtually every major obstetrical unit in the United States at least had a monitor, and 70% of all women in labour in the United States were monitored. Canadian data, while more sparse, suggests that EFM use was also widespread by the early 1980s. Mackenzie et al (1987), for example, reported that the EFM had been used in over 75% of hospital births between 1985 and 1987.

I(II). A Case

Doctors and nurses define a medical case as the professional care of an individual patient. In other words, they take an individual patient as the central focus to which professionals, techniques, and outcomes are related. In this view, medicine becomes long lines of patients bringing themselves forward to meet and perhaps receive treatment from healers.

Medical cases traditonally take two forms: first, empirical cases; cases personally experienced by an individual professional. These cases form the basis of a professional's expert knowledge. And second, exemplary cases; cases learned from texts or from colleagues that are known as "classical" or prototypical cases.

Professionals formally represent both types of cases in case histories. Case histories almost always begin with basic personal information such as age, sex, racial origin, marital status, as well as past illnesses and current conditions and complaints. These accounts unfold over time as a patient undergoes a series of medical

encounters for diagnosis and/or treatment.

Professionals also less formally represent cases in their daily discussions regarding work experiences. In this sense doctors and nurses are often noted to be "talking" cases when they share professional knowledge.

II. Obstetrical Interest in the EFM

Throughout this century, obstetricians have been interested in monitoring

during birth, with or without the EFM, because they have seen birth as a dangerous

time for the fetus, particularly due to the risk of oxygen deprivation.

It is likely that most, if not all, stillborn fetuses die of hypoxia, and most newborn depression is also the result of this problem. Observations in the past (before the widespread use of fetal heart rate monitoring) showed that one in three stillbirths actually occurred in the intrapartum period, thus demonstrating the hazard of this period for the fetus (Parer 1983:1).

Obstetricians justified the EFM form of monitoring because they assumed that

it could be used to detect otherwise unsuspected fetal demise and precipitate

necessary interventions earlier than non-electronic, usually stethoscopic, monitoring

methods.

Continuous, combined monitoring of fetal heart rate and uterine activity during labor have become widely applied adjuncts to intrapartum assessment and care. These technologic refinements often can predict deteriorating fetal status, presumably at a time when appropriate measures can be taken to prevent damage. Most clinicians using this technology believe that its regular use is the primary factor responsible for the fact that intrapartum fetal demise and unexpected neonatal depression have become uncommon in (the United States) (Huddleston 1990:449).

The EFM, therefore, has become known as a tool to improve professional

awareness of fetal biological needs. Improved awareness of fetal needs, in turn, has become seen as a way to improve the precision of decisions to intervene in labour and birth.

In this project, I examined all of these obstetrical attitudes and assumptions related to the EFM. I asked why obstetricians were willing and often eager to apply EFM technology when scientific evidence weighed against its usefulness? Why did they consider EFM information as information on "fetal status", as opposed to maternal status? And, why did they characterize themselves as making obstetrical management decisions based on assumed "fetal" needs, as opposed to maternal or maternal-fetal needs? I am contending that the popularity of the EFM among obstetricians and its characterization as a "fetal" monitor cannot be understood strictly in terms of "natural"² physiological distinctions or proven fetal biological needs. In fact, as I will describe in detail, there is nothing "natural" about characterizing fetal oxygen needs separate from maternal needs.

III. Relevance of the EFM to Social Science Interests

In this research, I follow a growing number of anthropologists and sociologists who examine medicine in Western European and Industrialized North American countries. I take medicine to be a complex engagement between scientific knowledge and human biological needs, set in a particular social and historical context.

² The term natural is placed in quotations to indicate that biological categories used in obstetrics, while assumed by professionals to be derived from nature, are in fact the product of a complex dialectic between the physical world and human conception of that world. This point will be returned to throughout the dissertation.



Wright and Treacher explain that social scientists started studying industrial medicine in the 1960s when assumptions regarding its "scientific enlightenment and disinterested benevolence" (1982:1) began to be called into question. Prior to that time, as Lock (1984) explains, social scientists resisted examining this form of medicine.

Because contemporary medicine in industrialized societies is based upon a scientific foundation, certain assumptions have been made about this type of medical knowledge which have led to its exemption from social analyses. In the first place, it has been assumed that the biomedical model is <u>the</u> representation of reality, clearly not complete, but nevertheless slowly but surely moving towards a final explanation of the causes, diagnosis, and treatment of disease (1984:121).

Several important early works emerged. Although written for a variety of different reasons and from a variety of different theoretical perspectives, they shared an interest in examining the active processes whereby Western medicine is constructed, shaped, or determined, by its social and historical context.

Sociologists beginning with Freidson (1970) and Zola (1972) contributed important examinations of medicalization, and medicine as an institution of social control. These studies showed how social forces moved certain problems into the medical field, and ceded medical professionals the power to label these problems as diseases, and determined appropriate behavior, often including treatments, in light of these definitions and roles. Medicalization research grew into a substantial field that remains rich and active today (see summaries, Conrad and Schneider 1980, and Conrad 1992). Political-economic writers, usually following a Marxist theoretical perspective, examined Western medicine as a capitalist institution. They pointed out that capitalist economic and political structures, which guarantee inequities of class, power, and wealth, shape industrial medicine into a capitalist medicine (Navarro 1976). As a capitalist medicine, it helps to maintain these inequities through its unequal distribution favoring the needs of the upper classes, at the expense of the lower classes. Capitalist medicine is seen to maintain its power through its ideological ability to "reify" medical conceptions and patient experiences as facts of nature (Taussig 1980). This group of autnors established and have maintained a sharply critical perspective on Western medicine both historically (particularly, Stark 1982) and trans-nationally (Navarro 1984, also McKinlay 1984 edited volume).

Philosopher-historians showed that medical perception is also determined by historical and social context. This was presented most provocatively by Foucault (1975), through his powerful concept of the medical "gaze". He demonstrates how, beginning around 1800, doctors learned for the first time to locate disease in the body of an individual patient, rather than in a socio-environmental setting:

For us, the human body defines, by natural right, the space of origin and of distribution of disease: a space whose lines, volumes, surfaces, and routes are laid down, in accordance with a now familiar geometry, by the anatomical atlas. But this order of the solid, visible body is only one way - in all likelihood neither the first, nor the most fundamental - in which one spatializes disease. There have been, and will be, other distributions of illness (1975:3).

Anthropologists, although beginning to study Industrialized medicine a few years later than sociologists, contributed important studies of the social and cultural causes of distress and disorders. Anthropologists used their cross cultural experience to show that focussing on an individual patient as the seat of illness and as the focus for treatment is a peculiarly Western phenomena (Lock 1978, Frankenberg 1980, Young 1976). Disorders may equally well be seen to lay in the social group, rather than in the individual. Young (1981b and 1982), takes this argument further by showing that, even when individual biological conditions are considered, biological factors need not necessarily be the primary determinants of the disorder. Social relations with their associated social conditions equally can be implicated in disease etiology. Frankenberg (1980), similarly to Young, argues that social conditions and relations can cause individual biological conditions: "In all class divided society, but especially in advanced capitalist society, making conflicts social is too threatening. Sickness is therefore pushed back through psychological illness to biological disease" (1980:200).

Feminist authors showed that medical care, particularly medical care directed at women, women's health, and pregnancy, reflected gender relationships and male dominated assumptions regarding female biology. Ehrenreich and English (1979), for example, describe 150 years of this medical advice for and expert care given to women. In relation to obstetrics they wrote:

> Perhaps most shocking was the feminist dissection of professional obstetrical care: the routine use of anesthesia, and common resort to forceps, chemical induction of labor, and Cesarian sections turned out to be hazardous for mother and child, though convenient and probably gratifying to the physician. "Scientific" childbirth, for the sake of which the midwives had been outlawed, was revealed by the feminist critics as a drama of misogyny and greed (1979: 316).

Many authors writing from a feminist perspective contributed exposés of wide areas of the human biological sciences (see particularly Haraway 1979, 1985).

Numerous books and articles followed in all of these fields. In addition, inter-

disciplinary collections also appeared (see particularly, Wright and Treacher eds.

1982, Hahn and Gaines eds. 1985, Lock and Gordon eds. 1988). Steps also were

taken towards establishing a common theoretical framework, most notably by various authors contributing to Medical Anthropology Quarterly (MAQ), (see particularly Scheper-Hughes and Lock 1987, and the entire issue MAQ 2(4) December 1988). The theoretical framework that has emerged combines "micro" analysis, meaning ethnographic examinations of personal and experiential aspects, with "macro" analysis, meaning examination of political and economic dimensions. Combining these "micro" and "macro" analyses does not resolve the differences present in these theoretical positions. Rather, these remain as competing positions used to provide different perspectives on medical events. With or without a common theoretical framework, this group of authors remains connected by common interest in the study of medicine in industrial countries.

The Application of Medical Knowledge and Practice

Social science researchers, while paying considerable attention to the social production of medical knowledge and practice, have paid relatively little attention either to its application to individual patients, or to its success in dealing with pain and suffering (similarly, Conrad 1992:36, Lock 1988:5).

As a result entire areas of medicine have been almost completely ignored. Surgery, for example, an area of medicine dominated by the application of medical knowledge and practice, has not been studied as a social and historical product. The only exceptions have been studies of operating room "rituals" (Katz 1981) and surgical decision-making activities (Bosk 1979). Katz (1981), in her study of operating room "rituals", typifies the limitations of existing studies of the application of medical knowledge and practice. She examines activities related to surgery but only considers

the cognitive structures of doctors, and their decision-making activities. She does not consider surgical techniques or their relationship to the physical body, the hospital institution, or to the culture of a social group.

The study of the application of medical knowledge and practice points to at least two additional issues not specifically discussed, to-date, in the social production of medical knowledge and practice literature: first, the problem of applying statistical knowledge; second, the role of technology in medicalization and change.

Practicing Medicine: Taming Chance or Taking Chances?

The application of statistical laws to human sickness rates and patterns began in the first half of the 1800s (Hacking 1990:47-54). It was at this time, according to Hacking, that political will and bureaucratic mechanism became established such that populations and population characteristics could be efficiently counted. It was not until this century, however, that practitioners learned that while individual sickness could have clearly deterministic causes, sickness patterns in a population followed statistical or non-deterministic laws (Hacking 1990).

Other authors have described the explosion of public health information in this century and the resulting industry measuring all aspects of population characteristics (for example, Armstrong 1983 for England, Arney and Bergen 1984 for America). Medicine in general and obstetrics in particular (Arney 1982) have been at the leading edge of these statistical developments.

Few authors, however, have examined the problems of applying population data to individual patient care. Exceptions include the work of Kaufert and McKinlay (1985), O'Neil (1986, 1987) O'Neil and Kaufert (1990), Kaufert and O'Neil (1991).

These authors examine the cost to individual Inuit women of an obstetrical management program determined by group risk. The risk of problems occurring during birth has resulted in the evacuation of all Inuit women to the south. Another example of the problems associated with applying statistical data to individual patient care is found in Lock (1992). She describes the various risks women face in taking and not taking estrogen replacement therapy, and the dilemmas associated with this type of information.

The general problem faced by patients and practitioners is how to reconcile probabilities, which apply to a series or group, with the care of an individual patient. This problem arises because group characteristics provide little or no information as to which member of the group has a particular characteristic or acts in a particular way.

This study of the EFM centers on the problem of applying group probability to individual instance. That is, an EFM, as a monitoring device, is designed to eliminate chance by continually scanning a population and identifying the individuals at risk. As described in detail shortly, the success or failure of the EFM in this regard remains open to depate.

Applying Technology: Medicalizing or Demedicalizing?

Over the past century, medicine in industrialized countries has accumulated technology at an ever increasing rate; technology which is increasingly seen to have medicalized and technologized more and more of human experience. For example, this view is captured in the title of a book by the historian Reiser: "Medicine and the

Reign of Technology" (1978), also Reiser (1986). This view is particularly common among authors writing about obstetrical care. The sociologist Oakley, for example, writes of the period 1960-1980 as the "Reign of Technology" (1984:153-209) in obstetrical care. She goes as far as to say that obstetrics was "revolutionized" by technological developments which provided professionals with "a window on the womb" that allowed them to "dispense with mothers as intermediaries" (ibid:153).

To date, however, social scientists, including those interested in the social production of medical knowledge and practice, have been very reluctant to study medical technology at all let alone its application to patient care. As Koenig (1988) explains, aside from one or two rare exceptions including her own study cited here, in the study of medical technology, "the field is barren" (1988:468).

Sociologists occasional: y have studied medical events involving technology. Barley (1988), for example, studied the introduction of new technology, a CAT scanner, into a radiology department. He showed the complex and evolving social relationships between technicians, clinicians, and the machine which formed a mysterious "black box". He did not, however, consider the application of the CAT scanner to patient care. This approach by Barley, which avoids studying technology in relationship to actual patient contact is typical of other social scientists working in applied medical roles. Instead, they count the number of machines, measure their effects on medically defined "outcomes", and calculate their cost/benefit (see summary, Petersdorf 1981)³.

³ The lack of interest in medical technology on the part of social scientist is made up somewhat by a growing group of multi-disciplinary fields for health care assessment (see Aiken and Freeman 1984 for summary). These fields include: 1) a growing industry of popular books, Rachlis and Kushner (1989) is a currently debated Canadian example; 2) government sponsored projects and institutes for health care

To date, little is known therefore about the relationships between technology, patients, healers, and technicians. It is not known, for example, whether technology is actually used by professionals to control patients. Are there times in medicine, particularly in obstetrics, when medical responsibility is too great for professionals to bear, and they use technology in order to cede responsibility and control back to patients? That is, is the technology and its information products primarily constituted by patients or by professionals? Is technology, at times, used by professionals to cover their retreat from direct responsibility?

More generally, the question is whether medicine is always growing. That is, following Conrad (1992), is it medicalizing and controlling more and more of daily life? Or, at times, is it shrinking? How can it do this and remain responsible and retain its image?

A second related general issue is the relationship between technology and change; does technology drive change or does change select and promote certain technology?

Interest in this question of technological determinacy derives in large part from the work of various authors studying the sociology of science and scientific knowledge (Mulkay 1979, Latour and Woolgar 1979, Barnes 1983, Latour 1983) including changes in medical knowledge (Yoxen 1987, Pasveer 1989). These researchers study how scientists use technology to construct reality or to produce knowledge. In the end they wish to better understand knowledge, particularly

^{(1985),} in Canada, the current Royal Commission on Reproductive Technologies; and 3), a growing academic interest in health care assessment, particularly measuring the cost/benefit of medical technology (summaries in Koenig 1988 and Aiken 1984).



moments of scientific "discovery".

The application of technology in medicine, however, seldom resembles that of experimental science either in terms of uniformity of use or interpretation of its information products. This is not true for all technology used in medicine. Some technology, for example, heart pacemakers, which do things directly to patients, rather than gather information for professionals, are used in very standardized ways. They therefore permit characterization as to their impact on medical care. However, information technology such as the EFM is not a tool that has direct effects on patients outside of data gathering techniques. Rather, it is something used by professionals and for professionals; professionals who's interpretation of EFM productions may or may not, in turn, result in effects on a patient. Determinacy can be, and often is, assigned to any place in this data collection/data interpretation/intervention cycle, depending on political perspective.

IV. The Technology Centered Approach: An Alternative to the Case Centered Approach to Understanding the EFM

IV (i). Case Centered Studies

To date, case centered studies are the primary method of self examination used by obstetricians. They therefore fill most pages of most periodic obstetrical journals related to patient care. Also, a great deal of most obstetrical texts are devoted to presenting and discussing cases and studies based on this organizational unit. In keeping with these traditions, almost all research to date on the EFM have been studies relating it to cases. The specific case centered results relating to the EFM will be described in the section that follows. The general features of a case centered versus a technology centered approach are outlined here. Case centered studies vary in size, duration, and scientific legitimacy. The smallest and simplest are descriptive accounts of an individual patient and a particular condition or treatment. Most studies of cases are larger. They include either a series of patients or a comparison of two or more patient subgroups. More sophisticated studies follow an experimental format. In these, patient groups are not only formed and described, but also, for example, a particular uniform treatment is applied to one group and its effects measured. If possible, bias is further reduced by randomization of patient allocation to the experimental and control groups, as well as maintenance of practitioner ignorance of patient allocation.

Case centered studies that are considered to provide scientific evidence on treatment effectiveness use statistical analysis to rule out the null hypothesis. The null hypothesis refers to the possibility that a difference found between two groups of patients, matched according to as many parameters as possible, could be due to chance, rather than due to the factor under study.

Case centered studies share several characteristic features. First, they are designed to eliminate psychological and cultural elements as well as institutional setting. Second, researchers seek single, objectifiable (meaning measurable and replicable) parameters through which to assess patient conditions or treatment effectiveness. Third, patients are studied, not professionals. It is assumed that professionals are interchangeable in the course of care or, in other words, that they can be factored out in the analysis of research findings.

The case centered method, while an important source of information for medical practitioners -- particularly regarding treatment effectiveness, offers no information on medical events beyond the measurements in question.

The case centered approach is particularly important to this discussion, not because of the information they produce -- although this information on the EFM will be considered throughout the dissertation, rather, because of the problems they create for researchers trying to examine medicine any other way. The main problem in this regard, is that studies of cases are so commonly performed and frequently discussed, professionals and critics alike assume that cases are a simple reflection of lived experience rather than complex constructions derived as much from medical assumptions and projections as from passively experienced reality⁴.

Cases are theoretical constructions, perhaps the most common constructions produced by medical professionals in industrialized countries. Showing the cost and benefit of case constructions and demonstrating an alternate anthropological way of understanding obstetrical care and the EFM are the central tasks of this thesis.

IV (II). A Technology Centered Approach for the Study of the EFM

Obstetrical professionals are correct in talking cases and recording cases, because to some extent their work actually involves enacting cases. After all, day after day, month after month, year after year, women go into hospital and give birth. Professionals attend to these women, at times providing only advice and moral support, while other times providing direct aid to facilitate birth. After a short stay women leave the hospital only to be replaced by others.

⁴ While practitioners recognize that they think, talk and enact cases, they seldom, if ever, reflect on "the case", as a theoretical structure. In fact, in this research practitioners were surprised by the suggestion that "the case" is a theoretical structure at all, and not simply a representation of lived events. This is reflected in the fact that cases are not defined anywhere in the medical literature.

In a case centered approach to studing the EFM, in contrast, an individual pregnant woman is on center stage. The EFM is related to her as one form of professional assessment. That is, EFM productions are interpreted in management decisions regarding her professional care.

In an EFM centered approach, in contrast, relationships are inverted, so that the EFM is on center stage and multiple individuals, both patients and professionals, are related to the single technology and its associated techniques.

The difference between the approach used here and the case study approach can be seen in Figure 1.

Figure 1. Case centered versus EFM centered approach

Case Centered Approach



EFM Centered Approach



Each approach focuses on different relationships. A case construction is centered on the relationships between professionals and patients. A technology centered approach, in contrast, is centered equally around two relationships, one between patients and the technology and the other between professionals and the technology.

Applying a technology centered approach emphasizes different aspects of hospital birth than those emphasized using a case centered approach. Generally speaking, a technology centered approach emphasises continuities that cut across the care of individual patients. For example, analysis focuses on places and equipment, professionals and professional characters, as well as community developments and expectations. Individual patients are considered only in as much as they shed light on understanding the technology.

Applying a technology centered approach over time results in a different view of hospitals. Hospitals become seen not only as places through which flows an endless series of cases, but also as a place to house professional activities.

A technology centered approach is not presented as a substitute for a case centered approach. Both approaches provide useful perspectives through which professionals, patients, and analysts can understand complex medical events.

IV(iii). Terminology

A technique is defined as the rationalized and normalized routine that professionals learn to perform on particular patients at particular times for particular reasons. An EFM technique includes both the professional activities of attaching and manipulating EFM sensors in a particular hospital room with a patient placed in a

particular position. An EFM technique also includes the lived experience and personal understanding of a patient, such as hearing sounds of internal organs and restricting normal bodily functions and movements.

Medical professionals use the term technique similarly to the way it is used in this dissertation. At times, the term procedure is used synonymously.

The term technology will be used to refer to the EFM itself. The term practice is avoided as much as possible, except in relationship to anthropological theory, because of its multiplicity of meanings both in medicine, anthropology, and popular culture.

IV (iv). Theoretical Perspectives used in the EFM Centered Approach

1) Knowledge and Practice

In this research, medicine is seen to contain an inseparable blend of knowledge and practice. That is, on the one hand, knowledge is not taken as a disembodied representation of practice. Instead, it is seen as a form of action on the ground. On the other hand, practice is not taken as a collection of instrumental activities. Instead, it is recognized for its symbolic significance. Medicine therefore includes theoretical action as well as practical action; action being a common category of thoughts, deeds, and interchanges in which practical and theoretical action compete in the world.

Understanding medicine as a dialectic between theoretical and practical action follows on two convergent theoretical trends. On the one hand authors, such as Foucault (1977, cited in Arney 1982) and others (for example, Rorty 1986 and 1989, Derrida 1982 (quoted by Hoy 1985)), have shown that knowledge is not a

passive structure for the storage of ideas and information. Rather, its possession and use has practical influences on events in the world. For example, it can serve to make practical actions possible, strategic positions seem legitimate, and hierarchies of relationships seem natural. Several anthropologists, following these themes, have taken a "processional view" (Young 1981a:380, 1982) of knowledge, including medical knowledge (see particularly Wright and Treacher 1982). This means that they understand knowledge to be best understood, not in relation to abstract cognitive structures or textualizations, but rather within the ongoing context of its production and reproduction. Moreover, they apply this processional view of knowledge to their own knowledge products. This very important step of developing self-awareness of knowledge production has become known, in cultural anthropology, as the "interpretive moment" (Clifford and Marcus 1986, Marcus and Fisher 1986).

On the other hand, while the authors mentioned above are interested in grounding knowledge in its context, several other authors have shown that habitual action, non-formalized routine, and mundane objects in the world all involve complex and often ideologically rich knowledge, known both consciously and semi-consciously by adept practitioners. Bourdieu (1977), for example, demonstrates the resemblances between objects and activities within a Kabylian dwelling and those of Kabylian politics and ideology. The disposition of objects and the distribution of tasks are shown to implicitly mark these dwellings despite lack of formal representation in language. Bourdieu concludes that words and their meanings must be weighed against the meanings embodied by adept professionals and patients performing habitual activities, and against the historical continuities contained in inanimate objects such as equipment and buildings.

Other authors, similarly to Bourdieu, have shown how bodily states, known only unconsciously or semi-consciously, reflect social and political conditions. Bryan Turner (1984:180-185) describes, for example, the historically specific origins of anorexia nervosa in young women facing irreconcilable pressures to be both consumers and resisters of temptation, while torn between becoming mothers and career women. In another example, Comaroff (1985), shows how the body and its states of "affliction" have come to represent general conditions of oppression in a tribe on the fringe of white South African influence. The body, among this group of people, was an idiom of distress and resistance to domination not merely a repository for disease.

Following these authors, I examined words, attitudes, and concepts in relationship to medical practices and medical care. I paid particular attention not so much to the way events were represented or to the way representations were used in events, but to whether representation in words occurred at all. In other words, I paid attention to representational silences as well as to representational products. Paying attention to silences is what I understand De Certeau (1984) to mean when he situates the work of Bourdieu and Foucault, within a common meta-theoretical framework.

A particular problem arises when, instead of being a discourse on other discourses, as is usually the case, theory has to advance over an area where there are no longer any discourses. There is a sudden unevenness of terrain: the ground on which verbal language rests begins to fail....

Foucault and Bourdieu situate their enterprises on this edge by articulating a discourse on non-discursive practices. They are not the first to do so. Without going back to ancient times, we can say that since Kant every theoretical effort has had to give a more or less direct explanation of its relationship to this non-discursive activity, to this immense 'remainder' constituted by the part of human experience that has not been tamed and symbolized in language (1984:61). The theoretical approach taken in this project, following De Certeau above, "articulates a discourse on non-discursive practices" and it deliberately rests on this "edge" between discursive and non-discursive territory.

2) Symbols and signals

Machine signals, similar to human symbols, are a translation of reality into a code. In the words of McLuhan, they are a "mechanization" or "translation of nature, and our natures, into amplified and specialized forms" (1964:63).

The presence of electronic technology therefore does not lessen the need for an interpretive approach to human events called for by Rabinow (1986). In fact, it brings to the delivery room the "problem of representation" that has become an important topic in cultural anthropology.

For example, EFM productions associate a fetus, known through its heart rate, to a pregnant women, known through her uterine contraction activity, thus evoking one of the most significant relationships found in this or in any social group, the relationship between a mother and her (future) child. At these times, birth can be seen to contain two overt visceral systems within one body. Thus, not only are these events transfixed by how a social group understands and manages the woman's body and the emerging fetal body, they are also centered in how a social group handles the mother-fetus opposition made manifest through EFM productions. These disturbing, complex and innovative circumstances are associated with intense reflection on the part of patients and professionals as well as considerable public interest. Vital cultural issues arise and are continuously reworked, including definitions of body sovereignty, the rights of the unborn, and public health policy.

Studying machine signals is an opportunity to fulfill the project called for by

Comaroff, namely, to study the tacit union of fact and value.

.....[T]he manner in which social interest becomes seamlessly incorporated in the set of tacit assumptions about reality is the key to the social significance of knowledge. This requires that we explore how interests become associated with the symbolic forms which give shape and coherence to our system of implicit knowledge. And, to date, this project has received relatively little attention (Comaroff 1982:50).

Machine signals are not "closer to" or better representations of biological reality, than human representations, that is, language. In fact, with machine signals, biological reality is more obscure because the machine's mechanization must in turn be interpreted by professionals and patients. Moreover, interpretations of machine signals, unlike non-mechanized or directly human translations of biology, are open to endless debate.

V. Results of Case Centered Studies of the EFM

V(i). Effectiveness

In almost all case centered studies related to the EFM, researchers assessed whether EFM use actually helped practitioners to help the fetus. Despite a massive amount of research, involving larger and larger studies, using more and more sophisticated methods, there is still no evidence that EFM use improves any measurable aspect of fetal outcome (Banta and Thacker 1979; Thacker 1987, Shy et al 1987, 1990; A. Grant 1992).

Researchers have faced several problems in trying to prove EFM effectiveness. First, there has been continual disagreement as to what constitutes a diagnosis of significant fetal problems called "distress". Second, there had been no

reliable measure of fetal outcome, near the time of birth, that has been shown to be a valid predictor of future neurological problems. Third, studies showing EFM benefit need to be extremely large. This latter point requires some elaboration.

The EFM is being used to try to discover and to help practitioners to eliminate a rare event: infant death or permanent neurological abnormalities.

Supervision of active labour alone might reduce perinatal mortality rates by only 3 per 1000 live births, assuming the ability to effectively diagnose and intervene in all cases"....

....[T]he maximum number of cases of cerebral palsy and severe mental retardation potentially preventable through universal EFM would be 1 per 1000 live births in all categories of risk (Banta and Thacker 1979: 633-634).

That is, all the obstetrical efforts to assess the fetus, including efforts involving the EFM, are directed at trying to reduce the death rate of babies (in and around the time of birth) by 3 per 1000, and the rate of seriously brain damaged babies by 1 per 1000. In other words, if no fetal surveillance was carried out at all, over ninety-nine percent of births would have the same rate of infant deaths and serious neurological complications⁵. This knowledge, which is commonly discussed in the obstetrical literature, raises several issues, not the least of which is, Why is birth characterized as dangerous? This issue and others, will be discussed in detail during the course of the dissertation. At this point, I will limit the discussion to studies of the EFM.

In order to achieve statistical significance, studies of the effects of the EFM, on an event that only occurs one percent of the time need to be very large. It is

⁵ Practitioners may discover more problems with the fetus than the one percent noted here. Stating that birth outcome could only be changed for one percent of fetuses reflects the fact that most fetal problems discovered during birth are not the result of birth, nor can they be influenced by obstetrical practices carried out during birth.
estimated that they would need to involve at least 100,000 women (Banta and Thacker 1979).

Study size is growing toward that number. MacDonald et al (1985), for example, conducted a randomized trial comparing two groups, each comprised of over 6000 women, matched for all characteristics except use of the EFM. They found, other than a difference in the rate of neonatal seizures the significance of which remains unclear, almost no evidence that using an EFM benefitted women or the fetus. Levino et al (1986), in a study which included almost 36,000 pregnancies, reached a similar conclusion, namely, that EFM use could not be shown to have any benefit on any measurable parameter of the fetus.

V(II). Other Case Centered Study Results

Case centered studies, while not demonstrating that EFM use improves fetal outcome, have shown various other effects. EFM use has been shown repeatedly to be associated with a higher rate of obstetrical interventions in birth, most significantly with a rise in the number of Cesarian section operations.

The first five trials (randomized controlled) of EFM from 1976 to 1981 showed a consistent significant excess (approximately two-fold) of Cesarean section for the EFM group. The excess Cesarean sections were attributable to an increased diagnosis of fetal distress in three trials (Shy et al 1987:181).

The reason for this is that, while the EFM is very sensitive to fetal problems, meaning it reliably detects almost all of these problems, its specificity is only fifty percent. In this instance, specificity refers to whether or not a diagnosis of fetal problems actually means that fetal problems are occurring.

In order to be effective in diagnosing a rare event such as significant fetal

distress, the EFM must not only be sensitive to the condition of the fetus, but also it must be very specific in identifying which fetus needs interventions.

Even if perinatal asphyxia were to cause a preventable disability in 5 percent of infants, and the susceptible fetuses could be detected by a diagnostic test with a sensitivity and specificity of 95 percent, the PV (predictive value) of an abnormal test would still be only 50 percent, meaning that half of abnormal tests would provoke inappropriate anxiety or unnecessary intervention (Banta and Thacker 1979:630).

EFM information, therefore, presents clinicians with a difficult problem of interpretation. They know that in about one half of cases where they interpret EFM information as showing fetal problems, no fetal problems are actually occurring.

To summarize, by the end of the 1970s, the time when EFM use was growing rapidly and spreading beyond university teaching centers in Canada, its use had been shown not only to be ineffective in helping obstetricians to help the fetus, but also it had been associated with a significant increase in unnecessary and potentially harmful interventions in birth, primarily a doubling of the number of cesarean section operations.

V (iii). Professional Awareness of Case Centered Studies of the EFM

In this research, professional interest in and awareness of case centered study results related to the EFM was found to vary greatly. The details of and justifications given for use or avoidance of these case centered results will be described throughout the course of this dissertation. For these introductory remarks, it is only important to note that having this EFM related knowledge available in the obstetrical literature did not necessarily mean that professionals either knew about it or believed it relevant to their particular practice circumstances. For example, in the

rural hospital setting in which this dissertation research was conducted, doctors and nurses routinely dismissed case centered studies of the EFM as only relevant to large urban hospitals similar to those in which the studies were conducted. The rural physicians therefore seldom read the studies, opting instead to pattern themselves on what other rural hospitals did or on what the obstetrical specialists to whom they referred said they ought to do.

VI. An EFM in Invermere Hospital Obstetrics

VI(i). The Setting

Research was primarily conducted in Invermere, British Columbia. With about two thousand full time residents, it is the largest village among various tiny communities surrounding the lakes at the headwaters of the Columbia River.

Invermere is a mixture of traditional ranch homes on a few acres of land, working class dwellings concentrated near lumber mills, and newer subdivisions with more elaborate homes for local professionals and second homes for wealthier urban tourists. The various subsections share a four block "down-town" area, consisting of grocery, hardware, and clothing stores, as well as civic buildings such as a community center and hockey arena. However, what can be called the core of the village is still not concentrated enough nor is it congested enough to warrant installation of the first traffic light in the area.

Many tourists and people building permanent second homes are attracted to this community not only because of its location on a warm clear lake, but also by the recreational opportunities both in Kootenay National Park, in the adjacent Rocky Mountains to the east, or in the Purcell Wilderness, in the Selkirk Mountains directly

to the west.

Located near the center of Invermere, surrounded on two sides by large vacant fields, is a thirty to thirty-five bed acute care cottage hospital. It is a "T" shaped, one storey building, with a partial basement where, among other things, a laboratory is located. The partial basement is significant to the village because the two floors are connected by the only elevator in the community.

Patient areas consist of a mixture of private, semi-prinate and ward rooms as well as separate rooms designated for labour, delivery, and post-delivery care. In addition, there is a fully equipped operating room. The remainder of the hospital consists of emergency and x-ray departments, a physiotherapy room, and administration offices.

Adjacent to the hospital is a public health unit staffed by a mixture of public health nurses, health inspectors and visiting counsellors.

One block east of the hospital, on the main street, is the only medical clinic in the community. It is owned and operated by the five senior doctors and one of the local dentists. All four or five general practitioners and the general surgeon see patients in the clinic on weekdays. They also care for hospital patients, perform hospital procedures, and take turns providing twenty-four hour a day emergency medical services. Virtually all of this work is paid on a fee for service basis by the provincial health insurance plan.

This small, basically-equipped hospital, in conjunction with the medical clinic, provides health care services to roughly 6000 to 7000 people. When out-of-town referrals occur they are either to an intermediate hospital (staffed by various specialists including an obstetrician) in Cranbrook, 140 kilometers south, or to a

tertiary referral hospital (with a neonatal intensive care unit) in Calgary, 350 kilometers east.

The Researcher

Six years ago I was a general medical practitioner who knew nothing about anthropology, and never imagined that it could cast light on many aspects of daily medical care, above all, on the powerful and exhausting events of hospital birth.

In the summer of 1986, following my first university winter session as an anthropology student, I returned home to take up general practice and to begin anthropological research. At that time, no one knew whether simultaneous medical practice and anthropological research was possible or whether the information produced would be of interest to anthropology. Nevertheless, my own medical practice and community were what I knew best and what I was the most interested in studying.

From the beginning, the arrangement proved productive. Studying anthropology at the university during winter sessions fueled my interest in understanding medicine as a cultural product, while returning to medicine in the summer raised new questions driving me back to anthropology.

In the summer of 1986, I began studying obstetrical care in my home hospital, community, and regional district. Obstetrics was chosen because, from the time I began medical practice in 1978, I cared far more about obstetrics than any other area of medicine. For example, it was the only area of medicine in which I was concerned enough to actively support patients in their fight to gain a more active voice in decisions regarding their care.

In practice, I was no better, nor worse, at obstetrics than at other areas of medicine. Pregnant women neither flocked to my care nor did I seek out more obstetrics than came my way. I did my share which was often more than enough when combined with the other demands of my work situation in an isolated rural village.

No one seemed surprised or offered resistance when I began to study obstetrical care. Doctors and nurses already recognized that obstetrics was the area of medicine about which I was most concerned. Patients were quite willing to talk about their birth experiences. The hospital administration, although puzzled by my absences, felt that the hospital had nothing to hide.

Having chosen obstetrics because I cared, and the EFM because it seemed relevant to social science interests, I discovered, even in the first summer, that studying practices as a full practitioner meant doing something other than traditional anthropological research.

Practicing Medicine, Writing Anthropology

Working as a medical practitioner at the practices under study differs from traditional anthropological fieldwork. Fieldwork usually involves studying what "others" are doing or thinking, thus creating "strangers" for anthropological inquiry (Rabinow 1977).

As a medical practitioner, the people under study were rarely strangers or "the other", therefore, the inter-personal strangeness found in traditional fieldwork was not often present. In fact, at times, I was the subject of my own inquiries. The problem with this type of research was not overcoming strangeness or understanding strangers, rather the problem was familiarity and how to make the familiar strange.

The tension in full practitioner research was between the world routinely represented in the accounts of practitioners and patients and the world as seen through the eyes of the anthropologist. In this instance, the tension was between my insider versus outsider views of obstetrics.

This research approach, while unusual, is not unheard of in anthropology. In her study of witchcraft in the Bocage region of France, Favret-Saada began her work by herself becoming a witch. From the vantage point of a full practitioner, she wrote an account that included both insider and outsider perspectives of witchcraft.

Favret-Saada showed that anthropological accounts of witchcraft suffered from only studying witches' words as representational forms rather than as the witchcraft actions themselves. Favret-Saada, in contrast, describes witchcraft practices as the "deadly words" used by witches and that witches provide no objectified accounts of these practices to outsiders; the accounts with which anthropologists begin their studies (1977:11).

She concluded that the words witches spoke to outsiders reveal nothing about their witchcraft practices. Therefore, there was no other way to enter this world than through participation in the witchcraft practices. Practicing witchcraft reveals the meaning of the witch's words. The opposite was not found to be true.

Similarly, the written or spoken accounts that professionals or patients say to outsiders were found to reveal very little about obstetrical events and practices. Also similarly, medical words often are themselves the medical practices, not merely representational products.

Medical practice, unlike witchcraft in the Bocagè, involves more than words. It also involves complex and highly rationalized techniques. Participating in these techniques, however, resembles witchcraft, in that understanding the techniques reveals the meaning of

the words used to represent these techniques, if any words are used at all. The opposite is not true, medical words reveal very little regarding these medical activities.

To date, studies of Western obstetrical care have rarely moved beyond collecting and analysing the words or statements of patients and practitioners. They have not studied obstetrical practices or hospital births themselves (see Oakley 1980:Introduction, for a similar criticism). Arney (1982), for example, in a potentially valuable study of the obstetrical profession, in the end only studied texts, medical journals, and related books. He did not study patients or professionals, nor did he examine hospitals or clinics. Similarly, in an entire issue of Medical Anthropology Quarterly (September, 1987), subtitled Obstetrical event: Leavitt studied historical records; Hahn studied medical textbooks; while Irwin and Jordan studied court rulings. Davis-Floyd actually made contact with obstetricians, however, even here obstetrics were interviewed about training without watching training itself.

Anthropologists have examined birth practices in non-Western societies (see summaries in Cosminsky 1982, Jeffery et al 1989, Jordan 1983, Kay 1982, Laderman 1983, McLain 1982). Various authors are beginning to examine women's experiences with Western hospital birth (Michaelson 1988) as well as with other reproductive medical practices (Katz-Rothman 1986, Oakley 1986, Rapp 1988). However, this research, for the most part, has been conducted outside hospitals and clinics, isolated from machines, technicians and/or medical professionals.

Lichtman (1988) is the first author to move beyond patient and professional words to study actual obstetrical events. While not providing much detail on any single obstetrical practice, she at least outlined actual obstetrical care.

Similarly, while various authors (Arms 1975, Kitzinger 1982, Haire 1978) recognize cultural influences on hospital practices, they have not, as yet, examined how hospital activities are actually affected by cultural factors. Instead, they opt to name an often valid cultural trait and an equally real childbirth practice, then assume, uncritically, that these two are casually linked in the shaping of obstetrical biotectric. Haire (1978), for example links American prescription drug taking popularity with analgesic "abuse" for pain control during childbirth.

Full practitioner research is not necessary to understand medical concepts and accounts and to put practices into words. Any researcher following traditional anthropological methods of participating and observing events, could accomplish this task. Then, once the practices are described, observers and participants would be better able to understand the words used in the lived events, or the objectified accounts participants present.

The one advantage of full practitioner research is that it allows, in fact it facilitates, a "first person" subjective account of events. Such an account allows the practitioner/writer to reveal the ambiguities, contradictions, and paradoxes that are often left out of a more formal interview account. Nevertheless, doctor or anthropologist, the principle goal is ultimately to put events into words.

Methods

Three different methods were employed in this study. First, recorded information was gathered and analysed. This included local archival material which was used to construct a historical account of the local hospital. It also included the obstetrical literature that was used to construct a historical account of the EFM. The obstetrical literature was

also used to understand what is known through case centered studies of the EFM. In addition, local hospital records of all births from 1980 to 1989 were reviewed primarily to record the incidence and types of EFM uses.

The second method used was to gather interview material from colleagues and patients regarding recent and past obstetrical, hospital, and community events. Mainly three types of material were collected: 1) birth stories of patients and professionals, and often in the case of nurses, their own experiences as obstetrical patients giving birth in this hospital; 2) exemplary stories, particularly births repeatedly cited by staff members and/or generally known in the community⁶. As often as possible, the people cited in these exemplary stories were interviewed regarding their recollections of events; 3) historical material regarding professional careers, evolving hospital trends, and community relationships. A number of local residents provided material as far back as the 1930s.

The third and principle method of data gathering employed was to involve myself in obstetrical events, as a medical and an anthropological professional, and to put events, particularly those involving the EFM, into words.

The central focus of this participant/observational material was on the relationships between the EFM and pregnant women, the fetus, partners, birth professionals, as well as to other equipment, the hospital, and the community. All of these relationships were considered in terms of their duration and their association with obstetrical knowledge and birth success or failure.

⁶ By the time I returned for the second summer of research, patients and professionals were waiting with their latest obstetrical stories. At staff meetings, I was greeted with "We all knew you'd want to hear about this one". Alone with a colleague, I would hear "You know, I never told anyone this, but when we had our first child...". From patients, I would be told "I've been waiting to tell you about what happened to me..."

Physical relationships of and objects associated with the EFM were closely examined because they seemed to contain potent symbolic and political influences. In other words, following Bourdieu (1977), physical relationships were seen as socially constructed components of obstetrical knowledge and practice related to the EFM.

While most research was conducted in Invermere, some research was was also carried out in Golden, the village immediately north of Invermere; Cranbrook, the intermediate level referral center directly south; and Calgary, the tertiary referral center for Southeastern British Columbia and Southern Alberta. Anthropological research was conducted in all of these centers, while medical practice outside Invermere only occurred in Cranbrook.

No recording devices were used for anthropological research other than pen and paper. Therefore, records were primarily written after events occurred.

All doctors, nurses, hospital workers, and patients were aware of this research and of its potential use in this thesis. No attempt has been made to hide the location of this research nor the identity of health professionals, although I do not use their names. In a small community, individuals involved in the study knew and accepted that my descriptions would likely reveal the professionals involved. However, cases that revealed patient identity were omitted.

Written accounts of sensitive events were given to colleagues who were free to veto their use. Although no one used this power of veto, for the most part, I chose not to include those cases where antepartum or intrapartum fetal deaths occurred.

Overview

In Part I, I present background material. Chapter 1 is a detailed description of the

EFM, including its auditory and printed productions, as well as its internal and external attachments to pregnant women. Chapter 2 is an explanation of why an EFM was purchased for Invermere hospital despite the scepticism of most and the opposition of some local doctors. I explain that understanding EFM purchase primarily involves understanding changing community economics and demographics, as well as expanding patient influences on hospital care during birth.

In Part II, I situate the EFM in hospital obstetrics in Invermere from its introduction in 1983, to the end of the decade. In each of the three chapters in this part, I explain a different use of the EFM.

Chapter 3 is a description of EFM use by Invermere nurses as a screening device. It is explained that, in as much as the EFM was used for screening or to search for unsuspected fetal problems, it was nurses who instigated this type of EFM use. The reasons why nurses applied the EFM were, at first, to learn EFM technique itself, while later it was in part to enhance their expanding professional roles as diagnosticians, as well as to defend their professional territory in obstetrics against the influence of doctors.

In Chapter 4, EFM use in doctor directed intervention techniques is described. It is explained that, at these times, the EFM was not used to screen patients for fetal problems, rather it was used as a fetal health maintenance technology. That is, during these interventions, doctors, who took on the role of fetal champions, used EFM demonstrated fetal health to prove that these interventions were safe. The reason the interventions were performed in the first place, depended primarily on doctors imposing normative time frames onto pregnancy or the birth process.

Chapter 5 is a description of EFM use during Nonstress tests; tests involving twenty minute recordings of fetal heart rates and fetal activity patterns. Nonstress tests differ from

screening and intervention uses of the EFM in that they were performed prior to the onset of labour and they were used not so much to assess the current condition of the fetus, but to predict fetal health in the future. It is explained that, the reason Nonstress tests became popular in this community is that professionals, especially doctors, and to some extent patients became involved in schemes in which pregnancy was managed to optimize fetal, as opposed to maternal health.

In all three chapters in Part II, I explain why the EFM was used despite its perceived lack of local success in improving obstetrical outcome.

Part III is a discussion of the material presented in Part II and a comparison of this material with case centered studies and representations of the EFM. The point of the discussion is to situate both the case centered approach and all three EFM uses described using my technology centered approach in broader historical and cultural contexts. The case centered approach is situated among various "tenacious assumptions" regarding individualism and naturalism found in medicine in Industrialized countries (Gordon 1988). Screening uses of the EFM are situated among sexual and territorial divisions of labour found in various community institutions such as the hospital and the home (following Bourdieu 1979). Intervention uses of the EFM are situated among longstanding traditions related to bodily contact and physical alterations of the body. These body altering procedures are associated with various authors interested in the relationship between body severeignty and political power (Scarry 1985, Foucault 1977). Nonstress tests are shown to fit within a growing industry for establishment and management of obstetrical information on the fetus. The obstetrical information industry is analysed following Young (1981a, 1982) who showed the importance of studing, not only medical knowledge products, but also the context of its production and use. The reason for these contextualizations is to show that

further contextualization of the three obstetrical traditions involving the EFM leads to a more fragmented, rather than to a more coherent understanding either of EFM use or of obstetrical care.

Part IV, or Chapter 7, is a summary of conclusions relevant to medical anthropology.

PART 1. BACKGROUND

Chapter 1

The Electronic Fetal Heart Monitor

Introduction

In the first part of this chapter, I describe the EFM, including the attitudes and assumptions associated with it both during its laboratory development and its introduction into obstetrical care. Two central themes are presented: first, the relationship between the EFM and obstetrical needs for precise reliable knowledge; and second, the relationship between the EFM and obstetrical fears for the health of the fetus during the birth process.

In the second part of the chapter, I describe what an EFM is detecting and representing. This may at first seem straight forward: an EFM is detecting and representing fetal heart beats, uterine contractions, and their relationships. The problem is that fetal heart beats and uterine contractions, far from fundamental biological activities, are themselves complex biochemical and physiological processes dependent on ever more c_{\sim} .nplex influences and forces. Furthermore, their relationships are multifaced and multifactorial.

The complexities of human biology are not dwelt upon, although some biological background will be provided for readers unfamiliar with anatomy and physiology. Such information is intended to provide an appreciation for the complexity of issues involved, and to help readers to understand the ambiguities of the parameters an EFM detects and relates.

Throughout this chapter, I describe obstetrical characterizations of the EFM and EFM productions as arbitrary. In discussing these characterizations as arbitrary, I am not implicitly criticizing obstetrics or obstetricians. That is, I do not wish to imply that obstetricians have "got it wrong" and my job is to "set things right". Instead, I wish only to describe what obstetricians thought and did. A thorough description of what obstetricians thought and did necessarily includes its social and cultural content. This social and cultural content is best revealed, in my opinion, by showing alternate ways of understanding human biology and obstetrical care.

I. A Description of the EFM

I(I). Detection

An EFM detects contractions of the fetal heart (hereafter FH) and the uterus. In the case of the FH, EFM sensors detect either the initiating electrical energy or the subsequent mechanical energy of contraction. In the case of the uterus, the EFM sensors detect only muscle contractions.

Obstetrical professionals have detected the FH and uterine contractions during late pregnancy and labour for over 100 years (Freeman and Garite 1981:1-61). Prior to EFM introduction, however, FHR detection involved using a modified version of a stethoscope, and "the clinical evaluation of FHR [was] based on data obtained by sampling the fetal heart beat in the intervals between contractions" (Hon 1973:7).

FH rate monitoring during the uterine contraction phase is difficult using a stethoscope because the FH is obscured by confounding maternal energy productions:

No listening apparatus yet designed has the same ability of the human ear and brain to discriminate satisfactorily between a number of

sounds of similar frequencies such as those produced by maternal and fetal movements, maternal circulation and digestive noises, friction between the microphone and skin, blankets, or clothing, and by happenings in the vicinity of the patients. Furthermore, noise in the amplifying system and acoustical feedback between the microphone and loud-speaker are troublesome (Corner and Stran, 1957:190).

In the 1950s and early 1960s, a breakthrough occurred so that both electrical and acoustical forms of fetal output were isolated during uterine contractions. As a result, researchers became confident that they were able to both accurately and continuously detect the FH rate. It was simply a matter of connecting these outputs to a ratemeter to create a continuous recording¹.

Uterine contractions, in contrast to FH contractions are slower, last longer,

and are easier to detect and record on a continuous basis. Technology capable of

collecting these records, although not adopted to clinical use in obsetrical care, was

readily available from early in this century².

The EFM detects FH and uterine contractions by means of either external or internal sensors.

External Sensors or External Monitoring

External monitoring, (see Figure 2), involves firmly attaching two EFM sensors to the anterior abdominal wall of a pregnant woman adjacent to uterine and fetal structures.

¹ Recording of the fetal heart was nothing new. Since the turn of the century, it had been possible to record both fetal heart electricity (1906) and phonographs of fetal heart mechanical activity (1908). Continuous records, however, were less common and of poor quality. (Complete history in Goodlin 1979:327-328).

² Goodlin (1979:341), for example describes various methods of continuous monitoring of uterine activity dating from the late 19th Century.

The external FH sensor, called a Doppler ultrasound motion sensor, is a circle of small flat ultrasound transducer and receiver heads, all contained in a hard plastic shell. The sensor contacts the abdomen via connecting jelly. The jelly eliminates air between the ultrasound sensor heads and the skin of a patient.

The external ultrasound FH sensor is located on the abdominal wall at the point nearest to the fetal heart. This usually means placing it below the woman's umbilicus because most fetuses are positioned head down in the uterus. Head up, known as breech babies, have the external sensor attachment much higher on the abdominal wall.



<u>Figure 2</u> External Fetal Monitoring. The upper detector strapped to the abdomen senses uterine contractions from the change in the curvature of the abdomen. The lower one detects fetal heart rate action using the Doppler principle and ultrasound (after Cunningham et al, Williams Obstetrics 1989:290).

Doppler ultrasonic motion sensors were perfected and adapted to most

commercially available EFMs in the late 1960s. Bishop, an obstetrician experimenting

with this technology at the time, describes its features:

A transmitting crystal in the transducer emits ultrasonic signals.... Those ultrasonic waves reflected back to the transducer from any moving object are altered in frequency. This frequency change is detected in the receiving probe, subsequently amplified, and after suitable filtration, converted into an audible output. Accessory outputs permit utilization of oscilloscope, magnetic tape, or paper as alternate methods of recording (1966:712-13).

The external uterine sensor closely resembles the external FH sensor in size, colour, materials, and attachment strap. It differs only in the actual contact point with the abdominal wall. The uterine sensor's contact point is a 2 cm diameter white button-like structure which is applied directly to the skin.

The external uterine sensor, called a tocodynamometer, is usually placed uppermost on the abdomen because it is positioned over the top, or fundus, of the uterus. This portion of the uterus is best for detecting contractions because the uterus moves forward against the upper abdominal wall during contractions and therefore pushes hardest against the pressure-sensitive tocodynamometer.

For external monitoring, a woman is typically in bed, and usually supine. Otherwise, the FH sensor slips down, thereby disrupting contact with the FH. The uterine sensor stays in place much better than the FH sensor because it is not attached with lubricant jelly and it sits more or less on top of the uterus. External monitoring is sometimes possible with the patient lying on her side. However, as is the case for sitting or standing positions, the FH sensor usually slips away from the proper point of contact.

External Monitoring Technique

In Invermere and all other hospitals in my experience, external monitoring occurs in the obstetrical area in either the labour or delivery room; the EFM being easily rolled from one room to the next. Most often, more routine monitoring occurs in the labour room, and more serious monitoring, for example monitoring near the time of birth, occurs in the delivery room.

External monitoring typically begins with a nurse attaching the straps to the patient laying supine in bed. The uterine sensor is usually attached first with minimal difficulty. The sensor's wire is then attached to the back of the EFM. Next, the EFM is turned on so that the FH ultrasound sensor can be used to identify its own optimal location on the abdomen. To do this, the nurse applies a liberal amount of connector jelly to the sensor and then places it on the abdomen starting where her palpations suggest as the nearest point to the fetal heart. The sensor is moved around to find the point which produces the clearest and most consistent FH sounds. Finally, the nurse tightens the strap to keep the sensor in place and waits for an EFM record to be produced.

If a pregnant woman remains still and the fetus does not move significantly within her womb, then monitoring will proceed without further interventions from the nurse. Depending on why the monitoring was instigated in the first place, recording could continue for the enty minutes to an hour or more. Fifteen to twenty minutes is generally considered the minimum time to adequately assess the fetal condition. The length of monitoring depends on both prior and discovered concerns regarding maternal and fetal health, as well as the personal attitudes of the professionals involved.

Internal Detection or Internal Monitoring

Internal monitoring uses a different means for detecting FH and uterine activity than external monitoring described above. Internal monitoring involves connecting an electrode directly to the fetal scalp and inserting a pressure sensitive catheter into the uterine cavity.

To achieve a direct connection to the fetal electrical activity, the amniotic membrane surrounding the fetus must be naturally or artificially ruptured, and a wire must pass from the EFM, through the vagina and onto the fetus.

Similarly, internal monitoring of uterine activity is achieved by inserting a pressure sensitive catheter through the vagina into the uterine cavity. A rubber tube extending from the catheter then passes out through the vagina and is connected directly to the EFM.

The word "internal" therefore refers both to EFM attachments passing through the mother's "internal" areas (vagina) and to the detecting of "internal" fetal heart electricity or internal uterine pressures.

Attaching internal sensors requires a doctor, using a sterile gloved hand, to insert his/her fingers into the vagina until they touch the scalp of the fatus through the cervical opening of the uterus. The fetal membranes (amniotic sac) are ruptured at this time if they are intact. A spiral probe is then attached firmly to the fetal scalp or a catheter is inserted into the uterine cavity between the fetus and the membranes and the uterine wall (see Figure 3).



<u>Figure 3</u> Internal Monitoring. Schematic representation of internal monitoring wire attachment using a sagittal cross section to view relationships.

Aside from the internal sensors, the EFM looks and operates the same for "internal" monitoring as it does for "external" monitoring.

In Invermere, the internal pressure catheter was never used. Instead, only the external uterine contraction sensor was attached. "Internal" monitoring in the cases described here therefore means using the internal (FH) electrode and title external uterine sensor.

The main advantage of internal monitoring for a woman is that, with a wire firmly attached to the fetal scalp, she can move about in bed or sit in a chair without disrupting the EFM sensors.

The main advantages of internal monitoring for professionals is that it provides more precise, more replicable, and more reliable information about fetal heart activity. Information is more precise because direct electrical detection allows exact measurement of FH rate intervals and exact calculation of beat-to-beat variations. An external ultrasound sensor recording fetal heart wall movement detects only crude variations in the fetal heart rate -- i.e. changes in rate over three to five second intervals (six to ten beat variations). The internal electrode information is more replicable because it is traced onto recordings as definite lines. This makes it much easier to replicate it in photocopiers and telecopiers. The alternative records

collected from an external monitor sensor often included blurry lines that make replication more difficult. The internal monitor strips are also considered more reliable than external monitor records as a diagnostic tool. Without going into too much detail, the internal records are considered to reflect the condition of the fetal nervous system that controls heart activity. Therefore, internal records can be used to confirm, more accurately than external monitor records, that fetal neural oxygenation is adequate.

I (ii). Data Reduction

The technological advances of the 1950s, which made continuous FH

monitoring possible through FH detection during contractions, resulted in a new

problem for researchers, namely, the need for data reduction.

Edward Hon, an obstetrician and research scientist who was important in EFM

development, explains why data reduction was necessary^a.

In order to provide the most accurate definition of the normal fetal heart rate during labor, it is desirable to record it continuously and relate it graphically to the amplitude of the uterine contractions. Experimentally, this is a laborious task. In a 10- to 15-hour labor there are about 100,000 to 150,000 pulse intervals to be measured and plotted against about 150 uterine contractions. Currently it takes about 150 hours of technicians' time to process one complete labor. If any reasonable number of labors are to be studied, some type of semiautomatic data-reduction system must be used (Hon and Hess, 1957:124).

Complex electronic data processing therefore became a necessary component

³ This discussion of data reduction sets aside, at least at this stage in the discussion, the obvious fact that a great deal of data reduction has already occurred in getting to this point. For example, an entire fetus is being assessed through interpretations of its heart rate, while a pregnant woman is being assessed through her uterine activity.



of EFM technology. In fact, the electronics involved in data processing are so important to these machines, that these electronics are what is referred to in the name "Electronic" fetal monitor. The name is not derived from electricity recorded from pregnant women. That is, on the one hand, fetal electricity is important only in as much as it is detected, at times, to indicate that a fetal heart contraction has occurred; fetal heart electricity is not itself measured or recorded. On the other hand, maternal electricity associated with the uterus is not detected at all.

The first step in data reduction occurs when an EFM converts detected FH and uterine contractions into rates and durations. In other words, it quantifies these mechanical events both in time and over time.

An EFM uses time to calculate FH rates. It takes the interval between successive heart contractions, as indicated by heart wall movement or electrical events, and extrapolates from this to determine how many of these intervals could occur in a minute. It therefore establishes a FH rate at an instant in time⁴.

In contrast to FH rates, an EFM simply traces uterine contraction activity over time. It does not convert uterine contractions into a rate per time interval. Uterine contractions therefore have a starting time and an ending time as well as a duration, usually 30 to 90 seconds. They also have changing strengths or intensities which are measured and graphed at continuous points in time.

In addition, an EFM relates FH rates to uterine contraction activity at particular moments in time, and plots this almost immediately on an x-y recorder. The second to second, widely fluctuant fetal heart rates and their relationship to the strength and

⁴ Hon explains: "In contradistinction to an average FHR which displays the average interval t between a series of successive fetal heart beats, the instantaneous FHR is a continuous 1/t plot of this interval" (1973:14).

periodicity of uterine contractions are codified as a co-ordinated pair of lines on a time calibrated piece of paper.

The continuous strip of graph paper moves at a designated, although changeable, rate per minute. Usually, the choices are to have the paper move at one or three centimeters per minute. With EFM time flow coordinated with real time, an EFM strip captures a piece of time, and, if the start time is recorded as it almost always is, it captures a specific piece of real time.

An EFM record then accumulates these FH/uterine activity relationships to show patterns of how these two physiological processes correlate over time. The timing of FH rate changes in relation to the onset and duration of a uterine contraction is very important to obstetrical knowledge based on the EFM.

To summarize to this point, an EFM builds its productions from what are taken as the same, or very similar, mechanical events and relates them to various time parameters: rates, durations, sequences, and patterns. That is, an EFM is essentially a "time" machine⁵ because it both fixes mechanical events <u>in</u> time and accumulates them <u>over</u> time. An EFM then associates processes in time to emphasize particular patterns and relationships.

⁵ An EFM is also a time machine in that it does not detect or record spatial relationships. An EFM therefore would record the same fetal heart tracing whether the fetus was in the womb or fully delivered. Practitioners detect spatial, or anatomical relationships, almost exclusively through direct, non-technologized visualization and palpation.



Fetal Heart Rate Patterns in "Nature": The Key to Rational Obstetrical Care

The search for what are seen as key underlying biological facts, or patterns, in nature, is common to most areas of industrialized medicine⁶ and is called the "ontological" approach (after Dubos 1965:319). It involves focussing on one small aspect of a complex set of processes and seeing this particular aspect as deterministic of overall performance. For example, using an ontological approach, the tuberculous bacillus is conceptualized as the cause of tuberculosis.

An ontological approach can best be understood in opposition to what Dubos called the "physiological" approach; an approach which situates structures and events in a "holistic" context. Continuing with the tuberculosis example, when using a physiological approach, tuberculosis can be understood as a different problem in a developing country -- the result of poverty, malnourishment and possibly economic exploitation -- than in the industrialized world -- the result of mining practices, for example. Both models are correct.

Most of western medicine has taken an ontological approach for most of this century. Lock explains:

Since the seventeenth century in Europe, and the emergence of the mechanistic and reductionistic approach to biology and medicine under the influence of Newton and Descartes, the ontological theory has held considerable but not exclusive sway. Toward the end of the nineteenth century when the doctrine of "specific etiology of disease" (Dubos 1959,p.101) came to the fore, ontological theory seemed destined to be the final answer to disease causation. The discoveries of Pasteur and Koch in the realms of bacteriology are of the greatest relevance during this period, and they led to the notion that all infectious disease could be controlled by means of specific drugs and

⁶ Lock 1980:3, for example, in her discussion of broad trends in the history of Western medicine, points out that the ontological type of thought dates back to the Hippocratic corpus.

vaccines. This belief was reinforced with the discovery of the sulfa drugs in the 1930s and antibiotics in the 1940s. It continues to dominate our approach to clinical research to today when, for example, we look for <u>the</u> cause of cancer (Lock 1980:3).

By analogy, taking an ontological approach to pregnancy meant seeing it as a biological process commencing with conception, made up of parts and stages, ending with mechanical expulsion of the products of conception.

With pregnancy as a mechanistic biological process, researchers sought to delineate <u>the</u> fundamental parameter, the measurement of which could guide overall care given to women, particularly at the time of birth. FH rates and patterns were seen, and to a large extent still are seen, as <u>the</u> key to labour management.

Using a characteristically ontological approach, obstetricians were not only seeking to get in touch with the fetus, they were also trying to bypass pregnant women -- patients they saw as resembling any other patients, (i.e) clouding medical work with emotional states, personal preferences, and social expectations; making medical events difficult to predict or control.

Various authors have written about forms of technology such as the EFM in the overall context of this ontological approach to pregnancy and birth. Oakley (1984:155-186) explains that devices such as the EFM were immensely successful in providing "hard" or "objective" biological facts free of maternal "noise". This ushered in what Oakley terms an ontological "revolution" in obstetrical care. As Oakley explains, technology did not cause the revolution, it only facilitated it:

The obstetrical pursuit of more and more knowledge about the fetal condition and life-style **In utero** is integral to the obstetrical claim to expertise in general. The desire for knowledge **preceded** the antenatal care revolution; as necessity is the mother of invention, so it has been only the technical **capacity** for knowledge that is truly new (1984:183, emphasis in original).

The womb with its contents, represented another black box medicine could not resist

opening to view.

[The technological interventions] are revolutionary because, for the first time, they enable obstetricians to dispense with mothers as intermediaries, as necessary informants on fetal status and life-style. It is now possible to make direct contact with the fetus, and to acquire a quite detailed knowledge of her or his physiology and personality before the moment of official transition to personhood - the time of birth (Oakley 1984:156).

The rush to know the fetus through uncovering FH and uterine contraction patterns using the EFM, was fueled by the obsession of western medical professionals with this type of knowledge.

I (III). EFM Productions

An EFM produces a co-ordinated, instantaneous, or "live" audio-visual

package along with its graphic recordings.

Visual displays include a variety of electronic indicators: for example, a small red light flashes with each fetal heart beat and a display window continuously indicates the quality of the EFM sensor contact with fetal heart movements.

Auditory productions include the sounds of fetal and maternal movements, maternal blood flow through the placenta and great vessels, as well as contractions of the fetal heart. EFM sounds closely resemble the sounds heard when the abdomen of a pregnant woman is auscultated either directly by the human ear or indirectly through a stethoscope.

EFM productions resemble stethoscopic sounds because the fetal heart and blood vessel wall movements produce a Doppler shift in the audible range. A Doppler shift is the alteration in ultrasonic waves resulting when they bounce off

moving blood vessels or herat walls. To explain briefly, the difference between the outgoing and returning ultrasound wave frequencies, unlike the inaudible ultrasound waves themselves, are easily heard by the human ear. Moreover, coincidentally, this "shift" resembles the sound waves produced directly by heart wall and blood flow movements.

EFM sounds contrast with the sounds produced by an adult electrocardiographic (ECG) monitor. The ECG monitor, which detects and represents adult cardiac contractions, makes a distinctive "bleep". The "bleep" sound is clearly an electrical sourid associated with the ECG machine. The ECG, unlike the EFM, does not produce the dramatic sounds of heart valves snapping shut or of blood shooting out of the heart to the rest of the body. Only with internal monitoring does the EFM produce "bleeps" or machine sounds.

There is no need for the EFM to produce an audible version of internal noise. It could just as easily, in fact probably more easily, produce an electrical sound similar to the ECG.

While the reason manufacturers chose these EFM sounds remains obscure, the fact that patients and professionals considered these as reminiscent of "fetal life" sounds, was very significant to this discussion and will be returned to in detail later.

Recorded EFM productions are continuous records of fetal heart rates as well as the intensity and duration of uterine contractions. An electronically stimulated stylus makes the record almost instantaneously on a continuously moving strip of graph paper (Figure 4).

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<u>Figure 4</u> Fetal Monitor Strip. The upper line on the graph indicates the instantaneous fetal heart rate per minute. The lower line indicates uterine contractions. Note that the fetal heart rate does not vary significantly at the time of uterine contraction.

EFM strips are of primary importance to obstetricians and they are the items

centrally focussed on in obstetrical texts, journals, and education manuals.

Describing and analysing them will occupy the remainder of this chapter.

II. EFM Records: Ambiguous Facts, Precise Fictions

Before presenting examples of EFM records and explaining their interpretations, I will outline the context in which their interpretations occur. The context includes obstetrical assumptions regarding the dangers faced by the fetus during the birth process.

Obstetrical Concerns

Obstetricians have long been concerned regarding the condition of the fetus during birth. Dixon, for example, explains that this concern has been expressed in the obstetrical literature for over 100 years:

The idea that the delivery period represents a time of extreme danger to the baby, and that at any moment disaster might occur in the form of acute hypoxia, preceded by changes in the heart rate and followed by death or significant neurological deficits, is an old one. It was in 1862 that William Little suggested that such defects as cerebral palsy resulted from the circumstances of birth, and by 1893 Winkel had established the criteria for the clinical diagnosis of fetal distress.

The concept of fetal distress, and the fear that intrapartum hypoxia has significant and long-lasting neurological effects on the fetus, has had a powerful influence on the development of obstetric techniques and patterns of practice (Dixon 1990:1667).

Edward Hon, a leader in the development of the EFM during the 1950s and

1960s, echoes these concerns regarding the effects of birth on the fetus, and used

these concerns to justify his work on the EFM:

During the past two decades maternal mortality has been progressively reduced. With the same standard of pediatric care, the reduction in stillbirths and neonatal mortality has been only a small fraction of the gain made in maternal mortality. In addition to the 160,000 infant deaths associated with the birth process each year, there are a large number of infants afflicted with cerebral palsy and mental retardation. It is possible that these problems find a common basis in fetal anoxia.

If significant gains are to be made in this area, a reliable means of accurately determining reversible "fetal distress" must be found (1957 125:553).

Hon, along with his obstetrical research colleagues, were proposing that

obstetrics must improve fetal health "directly", by intervening on behalf of the fetus,

rather than "indirectly", by continuing to improve maternal health. Indeed, they were

going as far as to say that, if obstetrics was to progress, it must identify "fetal"

distress.

In taking this stance, Hon, along with his fetal monitoring colleagues, were challenging a general obstetrical credo that a healthy mother meant a healthy fetus. They were saying, in contrast, that behind a mother who appears healthy there may lurk a dying fetus; in this view, obstetricians must learn to be more distrusting of appearances and vigilant towards fetal health.

Following on this, Hon and his colleagues were proposing that obstetrical care must be built from a second focus. Obstetricians could no longer simply focus on women's needs or women's assessments. Obstetricians must step back and start again from the point of view of the fetus.

The reason why, and the extent to which, obstetricians or other professional birth attendants actually employed a polarized view of pregnant women or acted in the name of the fetus in obstetrical events is one of the central issues examined in this research. I ask, for example, if the fetus has been isolated and cared for separate from a pregnant woman? or, Is obstetrical care the same, only now performed in the name of the fetus?

By the mid 1960s, two types of continuous electronic FH monitors were commercially available: a German model developed by Hammacher and Hewlett-Packard, which used phonocardiographic methods of FH detection; and an American model, developed by Hon and Epsco, which used electro-cardiographic methods of FH detection. Both models related instantaneous FH rates to uterine activity and recorded them on time calibrated graph paper (Freeman and Garite 1981:3-5). Both models were strongly associated with a movement to remedy what were seen as unnecessary fetal deaths, what Hon later terms fetal "wastage". They believed that the answer was to continuously monitor the fetus during birth and to intervene early

on its behalf.

Isolating the Fetus, Championing its Needs

Prior to the 1960s, a typical obstetrical text described pregnancy and birth as something that only the mother faced. In this view, the birth process was the physiological process by which women expelled their fetus. The fetus was a "passenger" in a woman's body and "passively" affected by her "powers" and her birth "passage". The fetus, as a popular obstetrical text describes, was "but another, albeit transient, maternal organ" (Pritchard et al 1985:267). EFM researchers, followed by obstetrical writing in general, began to describe birth as something the fetus "faced". As a result, the fetus became a reactive being struggling to overcome recurrent demands of a contracting "environment", in order to make its way through a difficult passage towards life.

Taking up this theme, researchers began characterizing the fetus longitudinally, during its "life" in the womb. They assessed its environment and its fitness to face birth. They advocated longitudinal monitoring of its "life". The obstetrician Weingold, for example, presents a program to monitor the fetus throughout pregnancy and not simply at the time of delivery. In his view, delivery reflects prior events in pregnancy, therefore practitioners must learn the entire "history" of the fetus.

Careful analysis of pertinent data on perinatal mortality and morbidity leads one to some observations which serve as a basis for much of the present work on the problems of fetal wastage. 1) The fetus is affected more by factors present during its in

utero development, than those during pregnancy....

2) Similarly, the course of neonatal events rest, in great measure, on antepartum factors....

3) What is needed are studies of the fetus in utero...." (Weingold 1968:1067).

The fetal perspective reached its most purified form in various books devoted entirely to the fetus. For example, Freeman and Garite, in their book on Electronic Fetal Heart Rate Monitoring, characterized the fetus as a full patient on a par with a pregnant woman. They considered fetal heart rates to be fetal "language" and that the fetus must be treated as an "individual" with rights (1981:vii) (see also Eden and Boehm 1990, a text greater than a thousand pages devoted to the fetus).

Pritchard et al., authors of a popular obstetrical text wrote that, by the 1970s, the fetus had "achieved the status of the second patient" in obstetrics; a patient "who usually faces much greater risks of serious morbidity and mortality than does the mother" (1985:267). Furthermore, they say that, within a generation, the fetus was moved from the "inviolate sanctuary of the womb" (ibid:267) to a central place in obstetrical care.

Various authors also describe that, not only did the fetus take on a central place in obstetrical care, but also patient and professional expectations regarding its condition at birth rose greatly:

.....[i]he 1970s introduced technological "miracles" that made diagnosis of problems in pregnancy first possible, then routine. Sophisticated techniques of intervention soon followed, with ever more successful efforts to thwart an unhappy outcome. Thus developed the rising expectation that every birth could be - must be -perfect. If it were not, then there must be fault to be found with the practitioner (Jonas 1990:XV).

By the late 1970s, when fetal monitoring, fetal testing, and fetal treatments had became universal at least in urban hospitals in America (Banta and Thacker 1979), specifying activities as care of the "fetus" had become programmatic. For example, in many centers obstetrics was being re-named "fetal-maternal" care and obstetrical text were written as if birth was something that the fetus "faced" as much as the "mother".

The EFM as a Fetal Monitor

In keeping with the emerging fetal perspective, researchers characterized the EFM as a device to help obstetricians help the fetus. That is, while the EFM was strapped to pregnant women and used to assess maternal organs as much as fetal organs, it was considered to be a "fetal" monitor, not a "maternal" monitor, a "maternal-fetal monitor", or a "labour" monitor.

There is nothing inherently incorrect with obstetricians designating their work with an EFM as "fetal" monitoring and their knowledge products as "fetal" facts. These labels are as accurate as any other in satisfying an ontological approach.

However, it must be borne in mind that declaring these new techniques to be "fetal" techniques and their knowledge products to be "fetal" knowledge represents only one view of pregnant women and obstetrical care. As I will repeat many times throughout this dissertation, dividing pregnant women into a fetal pole and a maternal pole is not a reflection of "nature" or of biological "facts". It is a point of view, at times pushed to an extreme, by researchers who claim to have discovered <u>the</u> answer to problems they see in obstetrics.

II (II). Interpreting EFM Records

Proper interpretation of EFM records is the stated goal of most teaching related to the EFM. EFM manuals and courses, for example, present professionals with the series of obstetrical case examples, each with EFM monitoring strips. The

specifics of each case are presented along with the obstetrical specialist's interpretations of the EFM record, along with a description of what was done and eventual outcome. The teaching goal is to build up a collection of case examples from which professionals can learn and to which they can refer.

Professionals learn to interpret EFM patterns in terms of two pattern types and one coneral characteristic. The first pattern type, called "baseline" changes, reflects FH patterns between contractions; the second pattern, called "periodic changes" reflects patterns of FH rates in relationship to uterine contractions. The general characteristic is called variability and refers to the beat to beat variations of the FH rate.

Baseline patterns

The FH rate changes continuously in response to various factors. Figure 5 shows, a typical example, the response of the FH rate to a stimulus. The stimulus represented is a fetal movement (a kick) followed by a change in its heart rate.

The mechanisms controlling baseline fetal heart rates are extremely complex and touch on every aspect of fetal biochemistry, neurology, and physiology. The complexity of factors determining baseline FH rates can be appreciated by comparing them with the far more familiar factors operating during extra uterine life. The adult heart rate, for example, changes in response to actions, reactions, or interactions with stimuli both internal and external to the body. Similarly for the fetus, almost any movement or change in position either by itself or a pregnant woman will affect its heart rate. Even stimuli such as the EFM's ultrasound transducer itself often results in an increase in the fetal heart rate.
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Figure 5 The Fetal Heart Rate and Stimulus Relationship. Note where a nurse recorded "fetal movement" on the fetal strip.

Obstetricians are also interested in whether the fetal heart rate stays within normal limits, between 120 and 160 beats per minute. Rates above or below these numbers are considered in need of explanation or further assessment.

Periodic Changes

Medical professionals are also interested in what they call periodic changes in FH rates, particularly those associated with uterine contractions.

It is widely known among medical professionals that, when uterine contractions occur, they alter conditions in the womb, including fluid pressures and the oxygen supply which is carried from the circulation of the mother through the placenta to the fetus. The fetal heart rate increases or decreases in response to these altered conditions. Figure 6 shows a typical relationship between FH rate and uterine contraction activity.



Figure 6 The FH Rate and Uterine Contraction Relationship. Note that the fetal heart rate changed at the onset of a contraction, indicated with an arrow.

Knowledge of the relationship between the FH and uterine contractions did not

begin with EFM research. Goodlin (1979) for example, in his history of fetal

monitoring, describes the work of one author near the turn of the Century:

Seitz stressed in 1903 that no sharp delineation existed between pathologic and physiologic FHR decelerations during uterine contraction. However, he was perhaps the first to distinguish three stages (or types) of FHR deceleration. The first two were related to vagal activity (head or cord compression?) and the third to complete paralysis of all extra-cardiac nervous activity (uteroplacental insufficiency?). In keeping with modern concepts, Seitz suggested that the FHR served as an indicator of fetal oxygenation (1979:324).

From the early 1950s, however, obstetrical researchers, lead by Hon, used

the continuous recordings of FHR to intensely study the relationship between

contractions and the FHR.

Figure 7 demonstrates three of the most important EFM patterns. This figure

is reproduced in virtually every obstetrical text and EFM manual published during the

past 20 years.

In all three patterns, the key to their interpretation is the timing of FHR

changes in relationship to the onset and duration of uterine contractions.



PERIODIC FHR

<u>Figure 7</u> Fetal Heart Rate Decelerations. The upper deceleration pattern is thought to be due to head compression. The middle deceleration pattern is thought to be due to decreased blood flow to the uterus and the placenta during the contraction phase of the uterine cycle. The difference between the upper and middle diagrams is the timing of onset of the deceleration. The onset in the upper diagram is "earlier" than in the middle diagram. The lower pattern is thought to be due to umbilical cord occlusion. These decelerations are much more variable in onset and appearance (after Hon 1973:28-29).

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Uterine contractions became seen as a type of "stress test" for a fetus. Therefore, watching the FH in response to a contraction, instead of between contractions, became the primary way to identify problems of fetal oxygenation.

Uterine Contractions as Tests of Feral Status

Prior to the development of EFM technology and research into FHR patterns, uterine contractions were seen exclusively in terms of their mechanical effects on the fetus during birth. They were not seen as recurrent fetal stressors that could be used in fetal assessments.

Awareness of uterine contractions as a way of "testing" the fetus led to the development of a technique called "stress testing". In these tests, uterine contractions are artificially induced using a synthetic hormone, then FHR changes are recorded and interpreted in relationship to these contractions. These EFM tests are an important use of the EFM and are discussed at length in Chapter 5 of this thesis.

Variability

Variability refers to the variation of the interval between both successive FH beats and a series of heart beats. A normal fetal heart rate (FHR) will fluctuate over both these shorter and longer intervals. Various normal standards were developed for how much the FHR should vary in both instances. A monotonous FHR is associated with insufficient oxygen supply to the portions of the fetal brain that regulate the FHR. Assessments of variability are considered more reliable tests of fetal oxygenation because variability actually assesses cells (in this instance brain cells) receiving fetal blood and therefore oxygen supply. The baseline and periodic

changes mentioned above are considered more indirect methods of assessing cellular oxygenation because they only assess FHR changes; changes which can only be more loosely assumed to be associated with decreased oxygenation.

Problems of Interpretation

There are various problems with interpretation of EFM records. One problem is that FH rates, uterine contractions, and their relationships are gross and superficial biological events. Contained within FH or uterine contractions are many intra- and inter-cellular processes; from the linking and shrinking of smooth muscle contractile elements, to the most basic biochemical and electrochemical reactions.

Changes in fetal heart rate, for example, similarly to changes in adult heart rate, may or may not indicate that something is wrong. Heart rates, both at rest and at times of normal physiological activity, are known to vary widely. Knowing only the heart rate makes it very difficult to assess the overall condition of the fetus.

The list of possible causes of fetal heart rate changes, other than the primary concern -- oxygen deprivation, is immense. In Williams obstetrical text they are categorized as follows:

- 1) Intrinsic fetal disease
- 2) placental disease
- 3) cord compression
- 4) maternal disease
- 5) drugs administered for analgesia and anaesthesia
- 6) maternal hypotension from the supine post on, conduction anaesthesia, or both" (Cunningham et al 1989:298).

Some of these problems require obstetrical interventions on behalf of the fetus. However, the difficulty is that it is impossible to differentiate among them knowing only the FHR. Other methods of assessing the fetus were also available and widely used, at times, to try to differentiate among worrisome FHR changes. One of the most commonly used was the analysis of a blood sample taken from the scalp of a fetus. This technique, which was not employed in Invermere, had a number of difficulties of interpretation itself, and its use remains very controversial (Eden and Boehm 1990:459-464).

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A second problem with EFM pattern interpretation is that patterns considered indicative of problems are often difficult to find on actual EFM records.

The problem is not learning the basic patterns themselves or the physiological principles that they are seen to reflect. This knowledge is relatively straight forward. The problem is that, with actual tracings, it is often impossible to characterize them as tending towards problems or towards the normal physiological effects of birth.

A third problem is that, even if EFM productions are interpreted correctly, they are being used to detect a rare event, namely, significant reversible fetal hypoxia during birth. This event occurs in perhaps one or two percent of births. That is, by not using the EFM at all, a practitioner will be correct in not finding significant fetal problems ninety-eight to ninety-nine percent of the time.

At the same time, EFM interpretations are known to have a fifty percent false positive rate. That is, half of the time that practitioners interpret EFM productions as suggesting fetal problems, no significant problem actually exists.

Reading Nature: The EFM and Obstetrical Stress

Obstetricians and obstetrical researchers write as if EFM productions reveal

part of nature's code. By this these professionals mean that, on the one hand, fetal heart beats, uterine contractions, and their relationships are part of naturely and therefore reflect natural laws, forces, and conditions. On the other hand, they see the EFM as passively tracing these natural events making them available for interpretation. Correct interpretation of the patterns captured on EFM recordings is seen to lead to proper understanding of biological events. For example, Freeman and Garite, in their obstetrical textbook on fetal heart rate monitoring, see an EFM as revealing "the language of the fetus as expressed through its heart rate" (1981:vii). The role of medical science, in their view, is the systematic "reading" of nature as revealed through this language; they see a unidirectional movement of information from nature, through the EFM to medical practitioners.

At the same time, obstetrical professionals are taught to be critically concerned about oxygen supply to the fetus. As Huddleston explains, a continuous supply of this nutrient is known to be needed:

Because of storage capacity for nutrients, the fetus may be able to tolerate brief interruptions in the provision of glucose, the primary source of energy, or amino acids, the primary anabolic sources. On the other hand, oxygen must be provided essentially continuously, as the fetus has no ability to store this element (1990:449).

For obstetricians, who believe that an EFM is tracing nature's messages and who are critically concerned about second to second oxygen supply, abnormal EFM tracings are difficult to ignore. Those interviewed in relationship to this research say that an abnormal tracing resembles an "S.O.S." signal in that it indicates something is seriously wrong and that emergency measures need to be taken. The problem for these practitioners is their knowledge that half the time a worrisome tracing is a false alarm.

The sociologist Oakley has noted these obstetrical fears and dilemmas related the fetus in the various metaphors obstetricians use in their texts and journals (1984:175). These include viewing the fetus as an underwater "marine" animal to a "cosmonaut"; "beings" linked by a precarious life line to the mother (ship). That is, the fetus is seen as something in a hostile environment, in need of constant evaluation, and instantaneous response to its needs.

III. Summary

The EFM is a coding device that converts ongoing physiological processes into a dramatic audio-visual package complete with precise rate calculations and complex pattern displays.

The EFM was developed in an effort to improve the precision of obstetrical care by grounding obstetrics in the proven biological needs of the fetus. In developing and promoting this technology obstetricians took on the roll of fetal champions against the problems it faced in the uterine environment. The uterine environment, particularly the recurrent uterine contractions were considered the focal point of the problems the fetus faced.

Interpretations of EFM productions are extremely problematic, even for obstetrical specialists very familiar with EFM records.

Chapter 2

Acquiring an EFM

Introduction

In this chapter, I examine why an EFM was acquired for Invermere hospital. I explain that local doctor interest in EFM purchase was a necessary, although not sufficient, condition for EFM purchase; sufficient conditions included an expanded patient role in obstetrical care, increased obstetrical interest in anticipating problems during birth, and community interest in equipping the hospital with the latest technology.

EFM acquisition therefore was a complex process in which doctors and the hospital administration carefully weighed and reacted both to individual patient opinion and to community pressures. Doctors did not believe, nor did they publicly imply, that an EFM would help them to provide better care for an individual woman during birth.

Sociological accounts of hospital growth, particularly with regard to their accumulation of technology (for example Starr 1982:145-179), ignore the link between local people and hospital activities. For example, Starr describes how hospitals, at least in America, became the center of community medical concerns:

.....[R]oughly between 1870 and 1910, hospitals moved from the periphery to the center of medical education and medical practice. From refuges mainly for the homeless poor and insane, they evolved into doctor's workshops for all types and classes of patients. From charities, dependent on voluntary gifts, they developed into market institutions, financed increasingly out of payments from patients. What drove this transformation was not simply the advance of science, important though it was, but the demands and example of an industrializing capitalist society, which brought larger numbers of people into urban centers, detached them from traditions of selfsufficiency, and projected ideals of specialization and technical competence (1982:146).

For Starr, professions, bureaucracies, institutions, and social movements, rather than

people, determined the "(re)constitution of the hospital" (ibid:145).

The historian Rosenberg similarly discusses the rise of professional attention

on hospitals, again in America, separate from immediate patient input and pressure.

One can hardly understand the evolution of the hospital without some understanding of the power of ideas, of the allure of innovation, of the promise of healing, of the amelioration of painful and incapacitating symptoms through an increasingly hospital-based technology. This was the ethos of a medical community as eager to establish its own legitimacy as a profession with formalized standards as to increase its wealth (1979:348).

For both of these authors, hospitals evolved because of "professional"

investment in their development and patient interest in the things that hospitals

"offered". With regard to obstetrics, for example, Starr writes:

The hospital offered what many considered to be the safest application of the newest technological and scientific methods of birth. Furthermore, the environment, the food, the total care from the nurses all made the hospital stay seem like a vacation from domestic chores and greatly to be desired (1986:171).

Starr does not consider the extent to which local people built, staffed, and equipped a

hospital, or to what extent they hired professionals and determined the practices that

they performed.

Historians specifically focussed on obstetrical history have been far more

willing to include a role for individual patients in the shaping of hospitals and hospital

care. Leavitt (1986), for example, in her chapter "Birth Moves to the Hospital" (p.171-

194) describes how individual women helped shape actual birth practices.

In this chapter, Invermere community members, particularly community

women and the Ladies Aid Society, are shown to have had an active role in building,

furnishing, stating, and to a large extent shaping hospital care related to birth. In fact, local women directly supported acquisition of and members of the Ladies Aid ultimately paid for an EFM.

I. An EFM is Proposed for Invermere

In 1976, 7 years before actual EFM purchase, a newly graduated doctor who had used an EFM in training, moved to Invermere to practice, joining two other general practitioners and a general surgeon. Soon after arrival, he began proposing an EFM as an inexpensive way to improve the quality of obstetrical care.

The experiences of this new doctor are described in some detail in order to both review his attitudes towards the EFM, and to show how these attitudes compared with those found in Invermere at the time of this doctor's arrival. His initial attitudes and the hospital's existing birth practices both serve as starting points for later discussions.

From this new doctor's perspective, improving the quality of obstetrical care meant improving the precision of medical interventions in birth, particularly interventions designed to help the fetus.

I was taught to be concerned about the fetus in labour far more than the mother. The mother really does quite well most of the time. I think that the fetus is at considerable risk of hypoxic damage if I don't do my job. The EFM is a lot better at assessing the fetus than just a stethoscope.

Consistent with his teaching, a precise intervention is the correct intervention at the correct time to maximize obstetrical "outcome".

He had learned that doing his job meant, on the one hand, remaining vigilant toward fetal oxygenation status and, on the other hand, that technology, specifically an EFM, was the best way of assessing that status. If an EFM showed problems, then he needed to act. This meant, if possible, facilitating birth through use of forceps, or, if all else failed, performing a cesarean section operation. If an EFM showed the fetus to be healthy, then labour could be "allowed" to continue.

His arguments in favor of an EFM echoed three of the dominant themes found in the obstetrical literature at the time: 1) The EFM provides accurate, state of the art information on the condition of the fetus; 2) Birth is a time when significant fetal damage can occur; 3) Physicians are responsible for maintaining fetal oxygenation. The strong EFM/fetal orientation he received in training, he admits, was in part due to the fact that a member of the obstetrical teaching staff at his post graduate training hospital was an international leader in obstetrical research on the EFM.

His initial efforts to have an EFM purchased received very little attention:

No one listened to me. The doctors saw no need for it. The hospital administrator said we should wait and see what other hospitals are doing. No one had one at the time, including Cranbrook [the nearest regional center offering Level II, meaning specialist, obstetrical care].

Nevertheless, his request for an EFM became duly recorded in hospital records and known among hospital staff as the first EFM request. And, even if people forgot which doctor actually initiated discussions on the EFM, which in fact most did, it was remembered that it was a physician who initiated these discussions.

Therefore, from the mid 1970s, local health professionals were aware of the EFM both from the literature and from the explanations given to them by a new colleague. Despite this awareness, and the new doctor's continued pressure -- both in back room discussions and in formal medical staff meetings -- his requests for EFM purchase were denied.

Taking up Practice

Despite the absence of an EFM and no prospect of obtaining one in the foreseeable future, this physician began practicing obstetrics in Invermere. He discovered that, not only did he have little or no opportunity to assess the status of the fetus, no one particularly wanted him to assess it either:

When I started here, I had little occasion to get to know a fetus; or a mother in labour for that matter. Actually, we did a lot less in prenatal check ups in the clinic as well. The nurses pretty well took care of the fetus. I would visit the patient during the day - at noon or after the clinic if I had time - but usually the nurses took care of things and would call me if they needed me. This was certainly the case at night. I didn't have much time or energy to worry about labours at night.

The nurses got to know the fetus and mother, not us. We were just around if things went wrong or to assist in the second stage¹....

The new doctor began to learn about and to adopt the strict doctor/nurse divisions of

labour found in this hospital; divisions of labour which essentially eliminated him from

involvement in fetal assessments. His fears for fetal health and enthusiasm for the

EFM therefore came into direct conflict with local traditions of obstetrical care.

The EFM/fetal orientation of the new doctor was the opposite of the

orientation of established doctors and nurses. The established approach of doctors

and nurses to birth, including their attitude to the condition of the fetus, was succinctly

summarized by one of the two other Invermere general practitioners -- one who had

trained in the late 1960s and who had worked in Invermere since the early 1970s:

In my training, we were taught to practice "benign neglect" of the whole delivery process. It wasn't just that we were taught to ignore the fetus, but we were led to believe that we should leave it and the whole labour business

¹ Obstetricians divide birth into various stages. The first stage is defined as the time between onset of regular contractions and full dilatation of the cervix. The second stage, or pushing stage, is the time between full dilatation of the cervix and birth of the fetus. The third stage is the delivery of the placenta.

alone.

In other words, this doctor had been taught, not only that doctors could, but also that

they should, leave women alone during labour.

The "benign neglect" philosophy of physicians towards women in labour,

although not voiced by the community's third general practitioner, a doctor who began

practice in Invermere in the 1950s, was certainly epitomized by his style of practice.

He seldom intervened in birth unless definite problems had arisen and he almost

never interfered with nursing care.

The head nurse in Invermere from 1965 to 1990 reiterated these attitudes to

women, the fetus, and obsetrical care:

Obstetrics has changed a lot since the 1970s. Back then we had 15 babies per month. A lot of women having their second or third baby, mind you. The fetus wasn't even considered. We never asked women if the baby was kicking or moving. We looked after the mother and that was about all.

Professionals seldom intervened in the birth process to try to make it better for the mother or for the fetus.

Maternity patients never had IVs unless we were transfusing them after delivery. Postpartum² hemorrhages were the main problem with maternities back then. Length of labour was never considered to be a problem. Most were women in their second pregnancy or more and were too quick, actually.

We hardly even considered the fetus. We listened to its heart rate once in a while, however, we assumed if a mother was healthy, then the fetus was healthy as well. Even being aware of the fetus is very new, taking care of it is even newer.

Obstetrical texts written in the mid 1970s also reflected this "avoidance of

labour" philosophy:

Until relatively recently, the intrauterine sancturary of the embryo

² The term "partum" occurs in many of the quotations included in this dissertation. Medical professionals use this term to refer to both the process and the time period during which delivery occurs. It is often preceded by the prefexes "ante", "intra", or "post" to define other related time periods.

and fetus was held to be inviolate. The mother was the patient to be cared for; the fetus was but another, albeit transient, maternal organ. The philosophy prevailed that 'good maternal care' would automatically provide what was best for the products of conception (Pritchard et al, 1985:267).

In looking back on these early years in practice, the new doctor advocating the EFM remembered as most remarkable, not so much the competence of nurses in handling obstetrical care, but rather the attitude of pregnant women to the birth process. He had left training charged with enthusiasm and feeling "omnipotent" in dealing with any situation in obstetrical care. All he needed was an opportunity to use his knowledge and skill. Instead of an enthusiastic welcome, he found pregnant women largely suspicious of his motives and beliefs. Pregnant women doubted that he could make birth better for them or for their baby, with or without an EFM.

He believed that the attitude of local women to birth reflected their general suspicions of "urban" ideas. He saw their attitude to be in keeping with the self contained way of life in this mountain valley. At no time did he consider that perhaps part of the problem lay with his medical knowledge and training perspective, rather than with the attitude of local women. He considered his medical knowledge, especially his knowledge regarding the EFM and fetal oxygenation, to be sound and progressive. Furthermore, he saw that it was just a matter of time until local people came around to his way of thinking.

In the meantime, he followed established patterns of care; he attended women when asked to by nurses, and accepted nurses' stethoscopic assessments of the fetus.

Relearning Obstetrical Care, Rethinking the EFM

The new doctor gradually began to learn a different approach to obstetrical

care. His primary role was no longer to remain vigilant regarding fetal oxygenation.

Instead, it was to be available when nurses needed him, to do what needed to be

done when things went wrong; and the remainder of the time, to stay away. In other

words, while his training had emphasized that he should anticipate problems before

they arose, in Invermere he learned to stay ignorant and to stay away until he was

called on for assistance.

I remember, at tirst, that the nurses would just shoo me away from women in labour. It was their territory. I was never sure whether it was nursing territory, woman's territory, or both. Anyway, I new where I wasn't wanted and as it always seemed to turn out, where I wasn't needed either.

Things seemed to go well, so I gradually got used to not having the EFM around and to not being around myself. The nurses always seemed to know when trouble arose.

In many ways he came not only to resemble the two senior doctors in his

patterns of practice, but also he began to think like them as well.

After a while, it [his obstetrical training] seemed farther and farther away, pair of another world. It became harder and harder to see where an EFM would fit into my daily care.

He learned that the obstetrical cases managed in Invermere either went well, and he

was not needed, or they went badly and he was needed. Both circumstances were

obvious. An EFM was not needed to distinguish between the two.

He retained his knowledge of the EFM, fetal physiology and state of the art

obstetrical care oriented to assumed fetal needs. However, this knowledge became

less and less relevant to his day to day obstetrical care. After a few years he no

longer advocated obtaining an EFM.

II. The Movement to Acquire an EFM

By the end of the 1970s, about the time that the doctor who had been advocating EFM purchase lost interest in the EFM, he found himself discussing it more and more, rather than less and less. In addition, he found that the discussions involving the EFM were different. Unlike in the past, where he had stood alone proposing an EFM, now a wide range of people, from the hospital administrator to patients in his practice seemed to know about the EFM and wish to consider acquiring one for the local hospital.

To understand why these new discussions took place and how they were ultimately related to EFM purchase, it is necessary to understand several historical precedents as well as a number of changes that were occurring in the community and hospital at the time.

Hospital Birth and Community Women

Throughout Invermere hospital history, care of women, particularly care related to pregnancy and birth, has been different from the remainder of hospital care. This is primarily because, unlike other areas of hospital care, birth involves women acting in multiple roles of nurses, mothers, and patients.

The point is not that the community or its active women citizens were only involved in shaping activities related to birth. Rather, the point is that, hospital activities related to pregnancy and birth were connected with the community in a particular way, namely, birth involved women in shared personal experiences and often mutual care; meaning that many nurses nursed one-another as well as neighbours and friends during birth.

Community women were involved in the hospital both informally and formally throughout its history. Most historical records refer to formal associations, therefore, their description will occupy most of this discussion. However, judging from my personal experiences with current events, informal associations probably have been far more influential over the course of Invermere hospital history; connections formed among lifelong friends, mothers, care givers, nurses, and wives.

The informal connections established through birth are particularly strong.

They are captured in an account of hospital birth taken from an interview with a

women who has lived in Invermere since the late 1920s.

My first baby was born here in 1933. Dr. Coy was the doctor then. I was the only patient in the hospital except for one gentleman. He was in the men's ward where there was a gramophone. I'll never forget he only had two records and he played them over and over again all day long. One was "I'll never see My Darling Again", and the other was "I Wish I'd Died in the Cradle". It was unnerving.

Miss Thatcher took care of both of us. She was the only nurse at the time. We knew nothing about C-sections back then. No one seemed to know about this form of birth. I laboured for days and days.

After the baby was born -- I hardly remember the birth -- I spent two weeks flat in bed. The baby was brought to me only for feedings and then taken away. Miss Thatcher did absolutely everything for it and for me.

At the end of 2 weeks I was handed the baby and sent home. I still remember nearly fainting at the hospital door. I was lucky that my mother was at home to help me. I would never have made it or known what to do" (from W. Weir, interview material).

Simpkin (1991) analyses women's long term memory of their birth

experiences. She similarly concludes that these experiences mark women, and their

attitudes to medicine and medical institutions, for life. In a small community,

subsequent, often daily, contacts facilitate frequent reliving of these roles and

relationships established during birth.

A formal role for community women in shaping hospital events in Invermere began towards the end of the first decade of this century, when a major movement for hospital reform and hospital investment was underway.

Among the leaders in this reform movement were members of the Ladies Aid

Society, or Ladies Auxillary, formed in 1911. The first president of the Ladies Aid

describes those early days:

When I arrived in Wilmer [1910], (which was then the active Village), I found that the only place used as a hospital was without any of the fundamental necessities and only through the goodness of some of the pioneer women had patients even obtained food. There were two broken bedsteads doing duty, and, naturally, no woman could be attended to. Calling a meeting of the ladies then resident in the district, a Ladies Aid was duly formed and incorporated....

The Ladies Aid attended to all the furnishings, linen, blankets and other comforts that [could] be obtained for the nurses and patients (Invermere newspaper Jan. 31, 1963. Originally printed, September 1932).

The Ladies Aid soon became involved in a community-wide movement to

upgrade and expand local hospital facilities. As the result, the old hospital was

replaced by a new hospital constructed in Invermere in 1914. The new building could

accommodate 12 patients, had a operating room, an x-ray machine³ and other

surgical equipment.

At first, hospital use remained limited mainly to the poor, the transient, or the severely injured. Seeing this, local women insisted on establishing "conditions suitable for the proper care of women: private areas, clean enough and decent enough for women to occupy". Once the hospital was made suitable, then women

³ Accounts differ as to whether the hospital had an x-ray machine, could accommodate one, or had one that was of such poor quality that it remained unused. During the late 1920s, the community campaigned for funds and eventually acquired an x-ray machine; a machine that was clearly used.

could use the facility.

The Ladies Aid continued to be very active in supporting the new institution.

For example, in the first six years, they were:

the almost sole supplier for the furnishing of bedding and such articles for the upkeep of the Hospital in addition to which they came forward on many occasions with hard cash to tide over a temporary emergency or in order to get some article specially needed (Hamilton, Invermere Archives, 1932).

The Ladies Aid therefore did much more than support the work of the nursing staff.

They actually physically worked in, raised funds for, and promoted the use of the

hospital as the proper place for the care of the sick and injured.

In addition, the Ladies Aid helped to shape hospital standards, to determine

which patients were appropriate for institutionalization, and at times, to dictate

hospital policy:

During the First World War in 1915 the directors of the hospital association decided that it was necessary to close the hospital. The ladies of the district said "No". Although the institution was in debt and unable to pay the wages of the two nurses, Miss Watt and Miss Mcintyre agreed to work for board alone (Windermere Valley Echo, Jan. 1, 1963; original Sept. 1915).

The involvement of community women to create and support a place for

communal care of the sick seems in keeping with descriptions of other hospitals at

this time. Coburn describes the involvement of women in Ontario hospitals in the

early 20th Century:

..... a large number of hospitals continued to be financed by charitable organizations, mostly composed of women. Women, with their traditional responsibilities in the area of health care, were to prove very useful to the state. In their roles as inexpensive benefactors, organizers and health-care workers, as well as mothers, they were to provide the state with a healthy labour force (1987:445).

Local men also supported the hospital by, for example, supplying wood for the

stove, donating a portion of their hunted game to the hospital food supply, or providing hospital maintenance. Men also worked on the hospital board throughout its history. However, this support seems far less important either through informal shared experiences or formally through organized activities. For example, a Mens Aid society was never formed, nor have men organized themselves to provide care in times of need. In fact, as a longtime local resident described, from the beginning and throughout her 60 years in the community, men clearly recognized the hospital as women's terrain, deferring immediately to the will of the Matron: "being careful not to swear, spit or disobey her instructions" (interview material).

The Ladies Aid Society changed as the hospital and community changed. For example, it provided fewer direct contributions to the hospital such as food, tableware, or linen, and members did not continue to scrub floors. Nevertheless, the society continued to provide funds for renovations and equipment, and its members continued to be closely involved with hospital affairs, particularly those related to obsetrical care.

More recent examples of Ladies Aid influences on obstetrical care includes their involvement in acquiring special anaesthetic equipment for pain control in labour, and their role in establishing an "obstetrical area" in the hospital constructed in the 1950s.

Self Care

The most recent movement by women to shape hospital birth activities, and the one most relevant to the EFM, was the movement towards self care. Self care became increasingly important to obstetrics in the late 1970s and throughout the

1980s, as many women, along with their partners, took over areas previously exclusively nursing work.

Self care fits with a more active, educated, and critical stance of many women towards medical care in general, but particularly directed at professional management of birth. Numerous authors have situated this current involvement of women in birth within broader trends related to the women's movement and women's health (see summary Olesen and Lewin 1985:1-24). Barbara Ehrenreich (1989), for example, presents probably the best explanation for current activities and attitudes of women towards birth when she situates developments in childbearing and childrearing within what she defines as the "Middle Class" in America, the class she sees as wielding enormous power from the 1960s to today:

Two decades later (1980s), no one could complain that women were insufficiently engaged in the 'battle', dazeo' noncombatants in the world of men. A new problem had arisen in the middle class: whether anyone would have children at all. To the individual professional woman, the problem was experienced as the inexorable ticking of the 'biological clock': How would she find a husband before her fertile years ended, and find time from her career for childbearing (1989:221).

The Director of Nursing in Invermere from the early 1960s to 1990 situates self care within her nursing and personal experience. Worth noting is that, when asked to describe hospital birth, she includes, in the same discussion, both her professional work in Invermere, as well as her own experiences giving birth in this hospital.

I took my (nurse's) training in the early 1950s. How was obstetrics handled back then? There was a wide variety of approaches. There always have been, and I suspect there always will be. I remember in training, for one obstetrician I had to use open drop ether or heroin to completely anesthetize women for birth. The obstetrician would scream at the nurse if he found out that the woman had felt any pain. There was another obstetrician who felt labour was a natural process and he didn't hurry anything. He was very kind. 1 liked him.

In general, women were treated as if they were sick and dirty. They were considered too sick to care for their babies except to feed them, and we scrubbed their perineum (the area around the vagina) four times a day with Detol. I can't stand the smell of Detol to this day.

We pioneered self care of babies here in Invermere. Actually, we were so busy that mothers simply had to care for their own babies. We were always short of nurses, and the hospital was always full. I remember doing everything for my own daughter when I had her here.

Back then all of obstetrics was handled locally. We could do cesarean sections. This was about all that was offered in bigger centers like Cranbrook, anyway. There was very little discrepancy between hospitals at the time. The difference between hospitals is what has changed over the years.

Local women, women's groups, and particularly women fitting Ehrenreich's "middle

class" description came to strongly influence EFM purchase and patterns of its use.

Their role in EFM purchase is returned to shortly. First, I will describe changes in the

community, hospital, and medical staff relevant to EFM purchase.

A Time of Change

Beginning gradually in the mid 1970s, then increasing rapidly towards the end of the decade, Invermere underwent an economic boom period. Various major urban corporations created both world class winter ski resorts and summer lakeside developments. Real estate prices soared, fueled especially with speculative buying by oil company executives from Calgary, the nearest urban center and the hub of Canada's oil wealth.

The population grew rapidly, in part due to an influx of young families moving to the area from urban centers, but primarily due to regular visitors using their second homes on weekends and during holidays. The hospital, with a fixed budget and limited physical size -- designed to deal with a stable population of 5000 - 7000

people, suddenly had to serve a weekend population of double or triple that number. Nurses and doctors had to work harder and spread themselves thinner in order to complete their daily tasks. A few minor adjustments were made, such as adding a larger emergency room and switching staff to weekend duty, but these changes were nowhere near satisfactory given the limited hospital facilities, and the referral center expectations of the visitors and newcomers.

Much has been written by health providers, recipients, and analysts about the 1970s, with the rise of consumer awareness and the rationalization and regionalization of health care. Many general trends were involved including the rise of the welfare state, improved education, and further bureaucratization of most government agencies. These issues are left aside until Chapter Three because they are much more important to EFM introduction than EFM purchase. EFM purchase, for example, predated regionalization of obstetrics in this area. Regionalization therefore is more the result, than the cause of EFM purchase.

In an effort to deal with the sudden increase in work load, between 1978 and 1980 the number of general practitioners in Invermere doubled. A newly graduated physician began in 1978, with two more added in 1980, one of which was myself⁴. Adding the three new doctors reflected both the rapid growth that had occurred as well as the anticipated further growth in the near future.

Adding An Attitude of Fear

Adding three newly trained doctors had several effects relevant to this

⁴ I began part time work in 1978. 1980 was when, after completing further training, I began full time work.



discussion. Most importantly, it added a significant attitude of fear to local obstetrical care. This was for two reasons. On the one hand, the new doctors, especially the two that arrived in 1980, increased obstetrical fears because they were very insecure about their obstetrical skills. On the other hand, the two senior doctors, who were confident of their obstetrical skills, both took the opportunity to reduce their obstetrical practices, with an eye to stopping these practices altogether in the near future.

The two new doctors who arrived in 1980 will be described in some length because their attitudes and approaches to obstetrics were typical of several other new doctors that followed. These attitudes and approaches became the dominant ones of doctors in Invermere throughout the 1980s, the time of this research. In addition, some of the initial experiences of the new doctors will be presented to explain why neither actively supported the purchase of an EFM.

The two new doctors who arrived in 1980, as did the doctor who began advocating an EFM in 1976, feared obstetrics because, on the one hand, their training had included a much greater emphasis on fetal biochemistry and physiology than doctors who had graduated 5 years earlier. This meant that they had both been trained to use an EFM and had been taught to place a greater emphasis on fetal surveillance, more active management of women for fetal needs, and an earlier transfer of women to specialist care if they had a "high risk" fetus.

On the other hand, while their knowledge of the fetus and its potentially urgent needs in labour had risen markedly, they had been taught few of the hands on skills for handling these difficult obstetrical problems. For example, handling forceps to manipulate or to extract a fetus had been very difficult for either doctor to learn. This was in part because specialty residents and general practice residents alike fought

over fewer and fewer learning opportunities⁵. In addition, as non-specialty students, these two new doctors were far down on the training hospital pecking order where teaching them interventionist skills was a low priority. Nevertheless, both doctors did learn to apply forceps. Neither doctor, however, considered themselves skilled in these practices.

Both doctors learned that the best strategy to deal with problems in obstetrics was to anticipate problems and to refer women to specialists prior to or at the time the intervention was needed. They learned that a "good" general practitioner was one who had the obstetrician arrive at, or immediately prior to, the precise moment when interventions were needed. As a result, the newly graduated doctors were greatly motivated to anticipate fetal problems. They believed that their best strategy to help the fetus was to avoid situations altogether that required forceps application, manual rotation, or surgical interventions.

In a rural setting such as they found themselves in in Invermere -- without an obstetrician, and often without a surgeon to perform a cesarean section operation -- these two new doctors had grave concerns about their ability to practice obstetrics at all.

Avoiding obstetrical practice was not an option in this community at this time. Indeed, a willingness to practice obstetrics had been a necessary condition of their employment. This was primarily due to the need of established doctors to share heavy work demands. Therefore, despite reservations, and with the encouragement

⁵ The decreased use of forceps likely reflects the decrease in number of births in general, availability of alternate means of treating the obstructed labour, and an increased concern on the part of the obstetricians regarding law suits for damaged infants.



and support of other doctors, both new doctors took up obstetrical practice along with their other general practice duties.

Both doctors soon learned that, despite the promised help of local colleagues and the possibility of telephone advice from distant specialists, obstetrical care was sometimes difficult and often unpredictable.

An example will be used to illustrate the limitations of EFM use to help

anticipate problems in obsetrics. Later examples will be used to show the limitations

of an EFM to help in the management of problems after they had occurred.

I quote from my personal diary, the summer of 1978, when I worked as a

summer replacement doctor in Invermere. This was my first job after finishing

training, my first night on duty, and my first obstetrical case:

I met a patient and her husband for the first time in the emergency room around 11:00 p.m. They were from Alberta, on a camping trip in the area. They came to the hospital because the woman had been having pains in her stomach all evening.

I remember thinking, as I looked at her lying on the bed, she is much further than 30 weeks⁶, she looks full term. In any case, she was clearly in labour, nearing full dilation and was about to have a baby out here "in the woods" whether she liked it or not. I knew a 30 week baby would be very difficult to handle out here, but this woman's size proved that she was clearly a lot further along than 30 weeks.

About an hour later, I was called to the delivery room just in time for the birth of a three and a half pound infant. The first of the twins was born.

While the nurse and I struggled to get the first baby breathing, the practical nurse, the only other staff that night, worked with the mother, listening for the second baby's heart, and convincing her not to contract her abdominal muscles (which may speed the birth of the second baby). The second baby's only chance was to remain in the womb while we worked on the first.

The entire hospital staff that night was in the delivery room and

⁶ A full pregnancy is 40 weeks. Babies born at thirty weeks often have immature lungs requiring ventilatory support. This was usually routinely provided in a neonatal intensive care unit, but very difficult without the right equipment and special experts.

too busy to leave and call for help.

It so happened that both babies survived. This was primarily because, in both cases, their lungs were sufficiently mature to breathe largely on their own. We were also lucky that the birth of the second baby occurred after 20 minutes, allowing enough time to work on the infants sequentially.

The woman had a life threatening post delivery hemorrhage. However, by then we had had time to call a second doctor, who started an intra-venous intusion and gave an anaesthetic while I manually removed the retained placenta. The mother also survived.

Two pediatricians and a respiratory technician arrived at dawn to take the family back to Calgary.

I was shattered by this experience, not because I did anything wrong except mis-diagnose the presence of a twin pregnancy prior to delivery (but previous doctors checking this woman had missed them too). I was shattered because of how little we actually were able to do, and how much more could have gone wrong. I knew then as I know now that what determined whether those babies lived or died depended solely on their size and maturity. We had neither the equipment nor the expertise to do much for them -- a situation presumably repeated in all rural areas in Canada.

If an EFM had been used, the attending nurse or I might have detected two heart beats and the presence of twins might have been diagnosed prior to delivery. More doctors and nurses could have been present for the birth. However, extra help would not significantly have affected the impact of this birth. The problem was that the hospital had no equipment to allow doctors to help these premature infants to breath; equipment such as small ventilators or masks. Therefore, what was feared, whether one doctor was present or all six, was a circumstance in which nothing could be done locally when it was known that others elsewhere with the right technology and skills could have saved these babies.

In contrast, relatively little fear was associated with care of the pregnant women in this case. For the most part, this hospital was adequately equipped for,

and as physicians we were confident of our ability to deal with this and other maternal problems. This is born out by the fact that no woman in living memory had died as the result of giving birth in this hospital.

The point of this example is to show that, while in theory EFM use should help Invermere doctors to anticipate obstetrical problems and to arrange for assistance or early transfer, the limited personnel and equipment, as well as community isolation, made this use of the EFM impractical. In fact, before EFM arrival, Invermere doctors all admitted at least to one another that they did not expect an EFM to help them anticipate fetal problems. And even if the EFM did reveal hidden fetal problems the risks of transfer were too great. The nearest hospital with "high risk" obstetricians, neonatal pediatricians, and nurses specialized in newborn problems was over 300 kilometers away on the far side of two mountain passes.

The other new doctor, who's obstetrical training in interventionist skills had been even weaker than my own, was involved in a series of cases that were equally damaging to professional confidence. They were damaging because, similarly to my own, they showed that there was no way, with or without an EFM, to anticipate many obstetrical problems. In addition, the experiences showed that, even if problems were anticipated, there were often times when circumstances made transfer of the patient to specialist care impossible.

III. Self Care Meets Medical Fears: Doctor-Patient Relationships and the Issue of EFM Purchase

The self care movement did not become evident in Invermere obstetrics as the result of any formal public activity. That is, no self help societies were formed, nor were any public gatherings held. Instead, this movement became apparent

through the actions of individual women and their partners in two spheres: first, during routine prenatal visits to the doctor's clinic, and second, during the time of birth.

The latter, where pregnant women questioned and in some cases resisted specific treatment activities in the course of giving birth, will be discussed in the chapter that follows. They will be discussed there because actions by individual pregnant women during birth were far more important in shaping the introduction of the EFM than the decision regarding its purchase.

The primary opportunity for pregnant women to meet with and to make their wishes and expectations known to doctors occurred during the course of regular clinic appointments. For most women, these opportunities included an initial hour long visit early in pregnancy for a "complete" check up, followed by a series of regular monthly appointments lasting from five to twenty minutes. During the final month of pregnancy, clinic visits usually occurred weekly.

There was wide variation in the amount of time made available for and the reception given to women wishing to discuss their anticipated care in the local hospital. Generally speaking, the doctors divided into two extremes: the two senior doctors who would not discuss these matters at all, and the four junior doctors who were willing to discuss them at considerable length. (To review, the four junior doctor who arrived in 1978, and the two newest doctors who arrived in 1980).

The contrasting approaches of the senior and junior doctor groups reflected their different educational and social experiences. The older group followed, what Szasz and Hollander classically called, the "parent-infant" model of "activity-passivity"

in patient interactions. The younger group, in contrast, followed the "adult-adult" model of "mutual participation" (1956:585-592). Many authors have analysed the changes in doctor-patient interactions over the past thirty years particularly in relationship to medical eduction (Atkinson 1983, 1988).

The EFM issue was raised in regular clinic visits in three instances. First, it was raised by a growing number of women who had recently moved to the area from urban settings. Some or these women had experienced the EFM during earlier pregnancies. Others had heard about it from relatives or friends. Awareness of the EFM was particularly common among women who had moved from Eastern Canada where it was already in common use. In my own experience, which was confirmed through interviews with my three colleagues a few years later, these women were not necessarily pushing for EFM purchase or necessarily wanting to have an EFM during their birth. Rather, these women were raising the issue more as a way of assessing whether or not Invermere obstetrical care was "up-to-date". Women admitted this openly, at least to me and to the colleagues that I later interviewed. Women explained that, assessing whether or not to give birth in Invermere hospital. These inquiries were meant to reassure both themselves and concerned relatives often remaining in urban centers.

The three junior Invermere colleagues and I took the EFM issue seriously when raised by these patients, in part due to professional pride regarding staying abreast of developments, but also because we were very worried about how we would look if something went wrong for one of these patients and we did not have an EFM available. Many of these women were prominent in the community because of

their association with the new recreational developments and we sensed that their decision whether or not to give birth locally could significantly affect the hospital reputation. None of the physicians were interested in enhancing the hospital reputation in order to encourage more obstetrics. In fact, all four of the junior doctors would have been happier if they did not have to practice obstetrics at all. The doctors were concerned about hospital reputation because, given that women were going to continue to give birth there, these women needed to have confidence in the hospital and staff. We all knew that one of the key factors in a successful birth was patient self confidence and confidence in their birth attendants. If acquiring an EFM provided an atmosphere of confidence for at least some women, we considered it worth purchasing for this reason alone.

The second instance in which pregnant women raised the EFM issue was when they had experienced the EFM during a previous birth. These women, which included as many long-time local residents (who had given birth elsewhere) as newly arrived residents, were not concerned about whether local facilities were up-to-date, rather they were concerned about <u>their</u> ability to produce a healthy baby. For a variety of reasons, most of these women had failed to give birth on their own and doctors had intervened to deliver their baby. Generally speaking, these women believed that, in future pregnancies, they could only give birth on their own if doctors could prove that the fetus was safe. This meant using the EFM. These women, who were usually considered "high risk" by Invermere doctors, were transferred to urban hospitals for subsequent births. Therefore, an EFM was not sought after in order to provide local care of these women. However, discussing these cases made local doctors recognize that the EFM was becoming the standard of care in larger hospitals

and, if they were to continue to practice obstetrics knowing that "high risk" cases

could unexpectedly and suddenly occur, they should acquire an EFM to provide

state-of-the-art care.

The third instance where the EFM issue was raised by clinic patients occurred

only to the senior doctor. He explains in his own words:

I think that Mrs. [a member of the Ladies Auxiliary] comes in [to the clinic] every few weeks just to talk to me about buying things for the hospital. I have the worse time getting rid of her. Her latest thing is that we should buy a fetal monitor. I'm not sure where she got the idea. She thinks its a perfect item for the Auxiliary to buy: its not very expensive and its used to help babies. She says that one of the charity clubs also wants to buy the hospital the [EFM], but she wants the Auxiliary to have the first chance.

If having Mrs.__ come in is not enough, this visek a member of the [Hospital] board cornered me in the office as well. She says that she thinks the board would be in favor of an EFM, if the medical staff approves it (reconstructed from a conversation among doctors, Summer, 1980).

While none of the other doctors were directly confronted by the hospital board

members or by members of the Ladies Aid, they were all acutely aware of hospital

image and the importance of new technology to that image.

While EFM purchase was not driven by assumed deficiencies in existing

Invermere obstetrical care, or by expectations that it would help solve obstetrical care

difficulties in the future, Invermere doctors recognized that an EFM would help them

to practice obstetrics. An example will be used to explain this statement.

The EFM in Obstetrical Case Management: An Example

While this example occurred in 1985, it demonstrates the attitudes of doctors to the EFM at the time of EFM purchase. Another doctor and I have met casually in the doctor's lounge at the hospital. The doctor had been awake most of the night attending a woman giving birth to her first child. The doctor knew that I was

interested in discussing this case for my research.

How do you feel (Doctor) C.?

Just awful. This woman is in trouble and I can't do anything.

What bothers you more, the fact that she is in trouble or that you can't do anything?

Both. But I just couldn't live with myself if something happens to this mother and baby because I neglected to do something.

Well, O.K., lets go over it all again. What could you do?

I could transfer her, but she is near the second stage and therefore she is likely to deliver in the next hour or two, which could mean an ambulance delivery.

Right, far too risky. What else could you do?

I can't try pulling the baby out because it is too high?

I see. So the only way to justify trying that is if there is a lot of fetal distress. Is there any?

No, the FH has been fine, even through the hard contractions. What else could you do?

Well, she needs an epidural, but no one here can do that. And, its too late for other analgesics.

What else could you do?

I can't think of anything. Can you?

No. I agree with you, there is nothing you can do.

So, what should I do?

Nothing.

Nothing?

Why does it bother you so much to do nothing?

This is what you are always getting at, isn't it. Your right, it drives me crazy to do nothing. I have to do everything I can to help this child. I just couldn't live with myself if something happened while I was just sitting here doing nothing.

It seems to me that you're particularly concerned about a damaged baby.

Yes, I am.

Well, there is little evidence that medical management has any effect on the incidence of brain damage. Sooner or later you will deliver a child with cerebral palsy no matter what you do and no matter how much you worry about it. You might as well start getting used to the inevitability of that right now.

No wonder I've decided to go into anaesthesia!

The doctor was present because this woman had exhausted herself while

trying for several hours to deliver her baby. The problem, to the doctor, was that

labour had "obstructed"; that is, no "progress" or movement of the baby towards birth

was occurring or had occurred for several hours. Standards of obstetrical care dictated that, after a certain period of time, various problems could occur, so it was appropriate to intervene. The intervention could consist of either using forceps to assist in vaginal birth, or to perform a cesarean section operation.

Doctors used the EFM in these situations to determine if and when to intervene in birth on behalf of the fetus. Fetal status assessments in these circumstances, however, were satisfactorily accomplished using a stethoscope. The EFM was largely redundant in the obstetrical management decisions in this case.

EFM use, however, served various other functions. It allowed the doctor to demonstrate his concern for and awareness of fetal biological needs. EFM use also helped the doctor to feel satisfied that he had done all that he could to gather information for his management decisions. At the same time EFM use reassured this pregnant woman and her husband that labour was not harming their baby.

In the end, this patient delivered a healthy baby on her own soon after her doctor and I finished the conversation recorded above.

In summary, Invermere doctors did not expect the EFM to demonstrate fetal problems of which doctors and nurses were unaware, nor did they expect it to necessarily help doctors to deal with the problems once they arose.

IV. Agreement

By the end of 1980, all the local doctors and the hospital administrator agreed to purchase an EFM. The doctor who originally sought an EFM in 1976 remembers this period and why he supported EFM purchase. His reasoning was similar to the four other junior doctors.

I remember saying that I thought the EFM is a very useful tool because it provides a great deal of information on fetal health that cannot be obtained any other way. It provides a great deal more information than a stethoscope. There is certainly no harm in having one around.

He did not say that an EFM was needed in Invermere. Rather, he said that an EFM provided a great deal of information; information that he saw as doing no harm to obstetrical care. He continues:

Reading EFM strips makes you think. Once you decide about a strip you feel like you know something. I knew better than to think that it would actually help me in hard decisions in obstetrics. I just liked this kind of information.

Banta and Thacker, doctors who studied the cost/benefit of the EFM in the United States, describe this attitude as prevalent throughout the obstetrical literature and commonly associated with the EFM (1979::637; see also discussion of the ontological approach in Chapter 1 of this dissertation).

In addition, the four junior doctors in Invermere supported EFM purchase

because they hoped that perhaps they could beat-the-odds and EFM use would help them to deal with even one difficult case.

Neither senior doctor, who were at best ambivalent towards an EFM, delayed EFM purchase. They likely could have delayed purchase indefinitely by asking for studies showing its effectiveness, or by asking to wait for precedence to be set in other small hospitals. Other community hospitals were not moving towards acquiring an "intensive care" fetal monitor option at this time. In fact, Invermere's hospital was one of the first rural non-specialist hospitals in British Columbia to try to acquire an EFM.

In the end, neither senior doctor opposed EFM purchase. One doctor had suffered a series of personal tragedies and was beginning semi-retirement. The
other was planning to stop obstetrical practice in the near future.

The obstetrical specialists from the University of Calgary who were consulted for advice regarding EFM purchase neither promoted nor objected to an EFM for Invermere. They readily acknowledged the limitations of the EFM and the potential problems associated with its use in small rural communities with low risk populations and small case loads. I quote from their annual report:

The monitoring of low risk patients remains controversial since in controlled studies it has been associated with an increased cesarean section rate without significantly reducing fetal morbidity or mortality. However, family physicians and nurses practicing in small obstetrical units in rural communities must be capable of managing patients with unexpected intrapartum complications such as fetal distress (The Annual Report of the Southern Alberta Perinatal Education Program 1987-88, p.20).

These specialists recognized that rural physicians needed to manage unexpected problems, therefore they saw the EFM as a way to potentially help rural physicians in these difficult circumstances.

Invermere doctors did not consult the obstetrical literature in making their decision regarding the EFM. They viewed this literature as based on studies carried out in urban centers, in circumstances that could not be compared to those found in a rural hospital such as the one in Invermere.

The medical staff unanimously recommended the purchase of an EFM in 1980. Soon after, the local hospital board also approved its purchase without opposition. Funds were provided by the Ladies Auxiliary.

Local approval and local funding did not automatically result in EFM purchase. The hospital needed to apply to the British Columbia Hospital Service Commission for approval. Provincial government policy determined which equipment was allowed in a provincially funded institution as well as it allotted funds to pay for ongoing equipment maintenance and supplies.

The initial request to purchase an EFM was turned down. This was because

this technology was considered suitable only for hospitals staffed by an obstetrician

and containing other facilities suitable for "high risk" obstetrics.

A second request was made in which it was argued that an EFM could help

local practitioners to avoid "high risk" cases. The local administrator who wrote the

letters explains:

.....I remember fighting for the fetal monitor. It wasn't easy, but I think hospital programs were persuaded by my argument that the doctors only wanted to use it to detect fetal stress early in order to arrange transfer at a safe time in labour. I said it was not to manage more complicated problems here, but rather to transfer more high risk cases to Cranbrook.

It was a tricky negotiation because, while Cranbrook had just got its obstetrician, they only had a old form of fetal monitor. They hadn't managed to get one like the one we were applying for.

The Hospital Services Commission approved EFM purchase in June of 1981.

An additional year was required for bureaucratic procedures before an EFM was

ultimately delivered in December of 1982.

V. Other Communities, Other EFM Acquisition Stories

Other villages in this area, while not studied in nearly as great detail as Invermere, were considered with regard to, among other things, how and when they acquired an EFM. These communities, although differing greatly in the timing of and the circumstances surrounding EFM acquisition, all had at least as long and complex processes leading either to EFM purchase or to ongoing discussions to this day.

In the community directly to the north, for example, a community similar in size with a similar sized hospital and medical staff, EFM purchase was an actively

debated issue for at least a decade. While the length of time was not that much greater than in Invermere, the intensity of debate was astounding. Professional careers of administrators and doctors were put on the line over the EFM issue. Angry confrontations dominated medical staff meetings for a number of years. Accusations of deceit and inappropriate use of power flew from both sides. Expert advice was solicited to support predetermined views. In the end an EFM was only obtained after a wholesale change of senior doctors and hospital administrators.

In another similar sized community and hospital directly to the south, doctors began requesting EFM purchase in the late 1970s, at the same time as in Invermere. As of 1992, an EFM still had not been purchased.

The regional hospital in Cranbrook, staffed by an obstetrician, obtained a state of the art EFM two years after Invermere. This was only because the obstetricians insisted on it as a condition of employment. The hospital administrator in Invermere recalls the struggle:

Hospitals shouldn't compete for equipment, but, you know, they sure do. I know that once we got a new EFM, the administrator in Cranbrook used that fact to argue for EFM purchase for their hospital. They didn't get theirs until 1984, almost 2 years after us.

The region needed an obstetrician so we all helped support the application in order to keep an obstetrician in the area.

The point is not to suggest that economic boom periods or senior staff retirements are necessary for EFM purchase. Rather, I am arguing more generally that doctors, hospital administrators, and communities seem to struggle long and hard over technological innovations. Invermere, with only a 7 year debate as well as major economic and personal changes, far from an extreme case of local intransigence, actually represented the quickest, quietest, and smoothest transition to having this new technology of which I am aware.

VI. Summary

EFM acquistion by hospitals has been judged by critics and supporters alike as part of the presumed recent rapid expansion of obstetrical technology at the expense of pregnant women and their experience of birth. Whether considered for the good of pregnant women or of the obstetrical profession, technological acquisition has been seen to represent the rise of obstetrical power and to anchor new dimensions of obstetrical expertise.

No one, however, has studied actual instances of EFM acquisition.

EFM acquisition in Invermere demonstrates the complexity of the technological accumulation process. This instance of technological accumulation involved economic development, professional transitions, doctor-patient negotiations, expanding community expectations regarding and scrutiny of obstetrical care, as well as an emerging need for local management of the fetus during birth.

Part II. An Electronic Fetal Heart Monitor in Invermere Obstetrical Care

Chapter 3

The Electronic Fetal Monitor as a Screening Device

Introduction

In this and the following two chapters, I describe the introduction and implementation of the EFM in Invermere obstetrical care. In each chapter, I describe a different way the EFM was used: 1) as a screening device; 2) as part of obstetrical interventions in birth; 3) as a way to predict future fetal health. The three EFM uses are discussed separately for explanatory purposes, however, in actual obstetrical care, the EFM was used, at times simultaneously in more than one of these ways. The goal of each chapter is to relate the EFM to relevant obstetrical knowledge and practice in Invermere and to explain why it was used despite scientific evidence against, and local professional scepticism regarding, its effectiveness in improving obstetrical outcome.

In this chapter, I describe the EFM as a screening device. I explain that, in as much as the EFM was used for screening, nurses were the professionals involved in and responsible for this application. Doctors neither asked for nor were present to interpret these EFM recordings. Nurses used the EFM for three reasons, none of which were a simple matter of assessing fetal health status. First, they applied the EFM because it was useful in maintaining the autonomy of nursing care from doctor intervention. Second, intermittent, screening EFM use fit with an emerging nursing professionalism that involved them in, for the first time, an explicit diagnostic role. Third, once the EFM was available and once fetal screening began, it became

increasingly difficult for nurses to withhold this type of examination from subsequent patients. In other words, nurses found themselves justifying, not why they had used the EFM, but rather, why they had withheld its use from a particular patient.

In this chapter, I explain that nursing uses of the EFM, similarly to the other two EFM uses described in the following two chapters, were the result, rather than the cause, of changes in obstetrical care.

Almost all writing regarding obstetrical care in industrialized countries characterizes the relationship between technology and change the other way round; namely technology is seen as the principle cause of change. This view dominates orthodox obstetrical writing:

During the past 20 years, obstetrics has grown into a highly specialized, complex, and demanding profession. To a large degree, this is because of new technologies that have allowed for an everincreasing understanding of fetal life. Electronic fetal monitoring and ultrasound are examples of such technologies, which have opened doors to the world of the fetus (Eden and Boehm 1990:XVII).

And, this is the view of obstetric's critics. The sociologist Oakley, for example, writes of the period 1960-1980 as the "Reign of Technology" (1984:153-209) in obstetrical care. She goes as far as to say that intranatal care along with antenatal and postnatal care were "revolutionized" by technological developments. While she is not suggesting that technology causes change by itself, she does imply that care of pregnant women evolves as it races along from one new technology to the next (similarly, Reiser 1978, 1986, for medicine in general; Oakley 1984, 1986, and Poland 1986, for obstetrics in particular).

In the latter section of this chapter, I also explore the extent to which screening uses of the EFM result in medicalization, meaning "the process and outcome of human problems (entering) the jurisdiction of the medical profession" (Conrad 1992). Although this topic is centrally at issue in the chapter that follows, I introduce the discussion here. I show that, contrary to social science assumptions, screening uses of the EFM are only minimally medicalized. This was because, on the one hand, nurses, who were the professionals present, were reluctant to interpret EFM recordings. Interpretations were almost always left to the physician. On the other hand, doctors who were almost always absent during the birth process, only interpreted the EFM records half of the time, and this was almost always hours later when the information was irrelevant. However, while professional interpretations were minimal, patients and nurses continually listened to and discussed EFM productions, often for twenty minutes to an hour or more. These discussions reflected cultural values regarding women, their health and needs, as well as care of the fetus as a future child and citizen with rights.

Conrad is therefore correct characterizing childbirth in the U.S. as medicalized:

Childbirth in the U.S. has been medicalized for more than a century. The medical monopoly of childbirth is more recent (Wertz and Wertz 1989). In the last 15 years, the childbirth feminist and consumer movements have challenged medicine's monopoly of birthing. This has given rise to "natural childbirth," birthing rooms, nurse-midwives and a host of other reforms. But it has not resulted in the demedicalization of childbirth; childbirth is still defined as a medical event and medical personnel still attend it (Conrad 1992).

He is also correct in noting that "Even after nearly two decades of writing, we know rather little about the extent of medicalization" (1992:36). By this he means that few studies have been conducted at what Conrad calls the "doctor-patient level", to determine whether or not medicalization actually occurs. In this chapter, I discuss my study of screening EFM use, and conclude that these hospital activities result more in socialization than medicalization.

I. EFM Arrival

In December 1982, an EFM was delivered to invermere hospital. After a company representative briefly introduced the machine to the nursing staff -- telling them how to replace paper and to adjust straps -- the EFM was placed on top of a mobile metal cabinet, resembling a tea trolley, and its straps and supplies were neatly tucked into the pabinet drawers.

In size and outward appearance, the EFM resembled a stereo cassette player. In front, its complex display panel consisted of various dials and light indicators, as well as a graph paper recording device. In back was a speaker along with numerous wires and connector outlets.

As a state of the art monitor, it included all of the latest features: internal and external FH and uterine activity sensors; electronics which processed FH rates by calculating the contraction interval; and a ratemeter which indicated FH numerically and recorded it almost instantaneously on standardized, time calibrated, continuous graph paper.

Learning to Handle the EFM

Almost all initial uses of the EFM in Invermere were to allow Invermere nurses to become familiar with the EFM itself. In 1983, for example, the EFM was used on 38 out of the total of 113 women admitted to the hospital in labour. In almost all cases, nurses gathered these recordings at the start of labour in order to learn EFM technique.

At the time of EFM arrival, only two of the roughly twenty-four full or part-time nurses had worked with an EFM either in training or in other hospitals.

All nurses were expected to learn to operate the EFM because their nonspecialized work in a hospital of this size meant that any nurse at any time could be called upon to perform any nursing duty. On night shift, for example, two nurses cared for all ward patients as well as whoever might suddenly arrive at the emergency department.

The only significant technical difficulty with external monitoring, the only type of monitoring that nurses initiated, was making recordings clear. For example, if a sensor lost contact with the fetal heart, as it often did, the recording needle on the EFM swung wildly making unintelligible lines. If this happened half way through a recording, then, ideally, the recording should begin again. EFM recording clarity was one of the items regularly reviewed by local and external "standard of care" audits. The audits are described in detail in a later chapter.

While learning EFM techniques was relatively simple, exposing the entire nursing staff to the EFM was quite difficult. Two-thirds of the nurses on staff worked on a part-time or casual basis, so that an entire year could lapse without their involvement in a birth at all, let alone one where an EFM happened to be used.

With almost no training courses available to them, nor any money provided to supplement lost wages or travel expenses, they primarily had to learn to use the EFM among themselves, practicing on and in front of their obstetrical patients.

Nurses accepted that they had to use patients to learn to operate the EFM. Learning a new technique while caring for patients was typical of their prior training experiences in this hospital, other hospitals, and in school. In addition, they knew that doctors almost always learned new techniques the same way.

Nurses limited learning EFM technique to patients who were otherwise coping

well with birth and who agreed to be monitored. Most patients were willing to have this done, some were enthusiastic, while only a few declined.

Subsequent EFM Use During Routine¹ Nursing Care

Invermere nurses initially used the EFM to learn EFM technique. Subsequent nurse initiated EFM use was for a variety of more complex reasons including struggles over sexual and professional divisions of labour, attempts to expand nursing professional roles, and redefining of the place of obstetrics in hospital and community affairs.

Subsequent nurse initiated EFM use was not because nurses were following doctors' orders. In fact, the opposite was the case. All local Invermere doctors at the time were satisfied with established nursing assessment practices which relied on intermittent stethoscopic examinations of the fetal heart rate. That is, local doctors, supported by the obstetrical literature, did not ask for "routine" use of the EFM on patients during the birth process. The only expectation that local doctors had regarding nurses and the EFM was that any nurse should be capable of gathering a clear recording.

Invermere nurses consulted other nurses in other hospitals in the region to learn standards regarding use of the EFM. They learned that diverse patterns of practices existed ranging from no monitoring unless the doctor ordered it, to regular EFM use every few hours on all women in labour. Obstetrical specialists in the tertiary care center with which Invermere was connected, confirmed that there were

¹ "Routine", in obstetrical jargon, means that birth is proceeding at a normal rate in an otherwise healthy patient and no medical interventions are required.

no provincial or national guidelines for routine EFM use in a healthy patient population. These specialists could only describe nursing activities in their own hospitals, and why these routines seemed reasonable.

A few standards did exist which Invermere nurses could follow. For example, most hospitals in the region followed a policy that a twenty minute EFM recording was the minimum length recording for an adequate fetal assessment. In addition, in many hospitals, nurses gathered a "baseline" record soon after a woman entered hospital in labour. This "admission test" was seen as a way to screen for unsuspected fetal problems.

Beyond basic recording length and an admission test, little consensus existed. In particular, little guidance was provided for EFM use during the remainder of labour.

Invermere nurses never really resolved this routine monitoring issue at a policy level. Individual nurses therefore were left to apply the EFM whenever they doemed it appropriate.

In the end, Invermere nursing policy was limited to declaring that, if a nurse decided to use the EFM, then she should use it for a minimum of twenty minutes. Anything less than this was discouraged and, for the most part, was not carried out. There were occasions where nurses left the monitor attached to a pregnant woman after a recording session had ended. These were usually cases when nurses were concerned regarding the FH rate and they wished to turn the EFM back on intermittently to listen briefly to the FH. In addition, at other times, the EFM ultrasound sensor, which was by far the community's most sensitive detector of fetal heart activity, was used to prove fetal viability if this was of concern and standard methods of FH detection had failed.

Despite nursing policy which permitted nurses to use the EFM almost

whenever they wished, none of the nurses in Invermere used it with any enthusiasm

or interest. In fact, the opposite was the case. The nursing staff was bitter and

angry about EFM purchase and resentful that they were forced to handle an EFM at

all. A nurse explains her resentment regarding the EFM:

No one asked us if w_0 vanted it or if we thought it was necessary. Here we are, the ones who have to use it every day and we're the ones left out of deciding whether it's appropriate. The administration and most of the doctors who wanted it never see an obstetrical case. Doctors think that they know everything even though they only rush in at the end. They don't know what the EFM is like to use or what it does to women.

Other senior and junior nurses concurred. For example:

As nurses we are told what to do and when to do it. The EFM isn't the first machine to be shoved down our throats. Over and over again we have been handed someone else's idea of a 'clever' new answer to our, or the patients' problems. We become responsible for it, for using it, and for justifying it to patients. They won't hire more staff but they sure keeping buying these dumb machines.

Another nurse explains why they were against EFM use in Invermere hospital:

The monitor doesn't belong here. Its a specialist's machine. If a case is bad enough to need a monitor, then the case doesn't belong here in the first place.

This nurse was not criticizing the EFM itself. She accepted that the EFM had an

important, perhaps a life saving role, in "high risk" hospital obstetrics. However, in

Invermere hospital, she saw EFM use as irreconcilable with other aspects of

obstetrical care. By this she meant that, on the one hand, nurses present during

EFM monitoring were not expected to interpret its recordings. On the other, she

recognized that the EFM records were either left uninterpreted by doctors or

interpreted by doctors but not acted upon.

The almost unanimous rejection of the EFM by Invermere nurses was due, at

least in part, to almost all of these nurses having trained prior to EFM introduction, and because most of them had worked quite successfully in Invermere without an EFM present. In other centers that I studied, the EFM had mixed receptions by nurses. Obstetrical specialty trained nurses, such as those found in Cranbrook, were far more favorable towards the EFM.

Individual Invermere nurses, therefore, were left more or less on their own to determine if and when to apply the EFM. This resulted in a wide variety of uses. Some nurses avoided the EFM altogether, while others applied it regularly, for example, once on patient arrival in hospital. Other nurses only applied it when specific problems arose. Table 1 lists the incidence of nurse initiated EFM use.

TABLE 1					
Nurse	Initiated	EFM	Use		

	total monitored	nurse monitored	other indications	cases total
1983	38	25	16	113
1984	29	26	5	92
1985	25	11	14	84
1986	26	19	10	69
1987	20	15	12	45
1988	19	9	10	64
1989	18	10	8	54

Note: several women each year were monitored for more than one reason.

In order to understand why the EFM was used at all -- given nursing attitudes towards it, and lack of standards requiring its use -- it is first necessary to understand the hospital and nursing traditions in which this use occurred.

II. EFM use in Defence of Autonomy

Beginning in 1983, soon after the EFM arrived, four of the full-time and three of the part-time nurses describe using the EFM in attempts to maintain their autonomy from physicians. They noted that an EFM record could be used to further reassure doctors that labour was proceeding well and that interventions in birth were not necessary. To understand this use of the EFM it is necessary to understand both the longstanding doctor/nurse divisions of labour in this hospital, and the precarious nature of obstetrical nursing care with a doctor present.

Doctors' Workshops and Nurses' Homes

From the time of hospital origin in Invermere, around the turn of this century, professional patient care consisted of two types of work. First, full-time work, which included feeding, washing, and comforting patients, as well as cleaning, tidying, and maintaining equipment. This work was previously performed by women in the home, but taken over by live-in nurses paid for by the hospital institution. Second, part-time work, which included performing tests and surgery, as well as conducting examinations; all performed by male physicians and primarily paid by means other than hospital funds.

Coburn explains why physicians, starting at the turn of this century, became interested in working in hospitals. For physicians, hospitals provided both a place to house new equipment, as well as a needed work force to prepare patients for and care for them after diagnostic or treatment activities.

The (late nineteenth century) developments in medical science created a demand for hospital workers with basic training who could assist in the increasingly sophisticated medical procedures... Medical knowledge came to be monopolized by those educated in medical schools, and medical services came to be increasingly centralized in hospitals (Coburn 1987:446).

Reverby explains why women were willing to take up full-time nursing work, live in the hospital, remain unmarried, and devote full attention to hospital duties, all

for minimal pay:

Despite the rigors and drudgery of training, nursing remained an occupation that attracted women searching for a way to serve both humanity and themselves. In the cultural matrix of late nineteenth- and early twentieth-century womanhood, nursing appeared to link altruism to autonomy. It also offered young women geographic mobility. Because most schools were located in cities, nursing seemed to be a way for a woman to participate safely in the excitement, independence, and opportunity of the urban working world (1987:77).

From their earliest and most rudimentary days to the present, the series of

hospitals built in Invermere have combined these two types of work: nurses working

in and for the hospital, and doctors using the hospital to house their equipment and to

provide service staff for their professionally defined needs.

Over time, Invermere hospital grew to include several new sub-divisions of

labour: 1) professional divisions of labour beyond doctors and nurses, such as

nurses' aides, housekeepers, technicians, maintenance personnel, and

administrators; 2) disciplinary divisions into pediatrics, obstetrics, surgery,

anaesthesia, and internal medicine; 3) administrative divisions into in-patient, outpatient, short- and long-term care.

Professional activities also changed dramatically over the years. Nurses examined patients more frequently and took more active roles in providing treatments. Technicians took over various tasks from gathering blood samples to taking x-rays. Physicians adopted a wider array of diagnostic techniques and treatment skills. However, professional activities related to patient care retained a fundamental division of labour between nursing and doctor work. That is, nurses continued as full-time hospital employees working only in the hospital institution, while physicians remained as self-employed, part-time workers visiting the hospital for specific reasons.

Divisions of Labour Related to Birth

Throughout hospital history, birth has remained as one of the areas where patient care activities were most consistently separated into nursing and doctor work.

Most of the time, outside of the actual moment of birth, nurses provided all professional care for women, while doctors stayed away. Doctors became involved when procedures were needed, for example, to perform episiotomies and forceps deliveries.

Doctors and nurses changed and exchanged activities over time. For example, nurses gradually came to examine patients more and to administer more medications. Meanwhile, doctors became more attentive to the physiological needs of the mother and fetus. However, what did not change was that, when obstetrical care occurred, it was <u>either</u> directed by a nurse alone or by a doctor, if he was present.

The most remarkable feature of obstetrical care therefore is the isolation of doctor from nursing care. For example, in 1978, in my diary I compared my new experience in practice in Invermere with my recent experience in an urban teaching hospital:

Obstetrics is different out here. The nurse called during the evening to inform me that I had a woman in labour so I went to the

hospital to examine her. I got as close as the end of the bed before the nurse took over and sent me home. It was obvious that I was not only not needed, but I was not welcome either. I felt like I'd wandered into the woman's washroom. They called me in at 0700 the next morning. I arrived as the baby arrived.

In my experience in this community, when doctors and nurses both tried to manage the same case the result was almost always chaos. On the one hand, doctors asserted their long established authority to give orders and to control proceedings. At the same time, nurses maintained their equally long established place as professional labour managers available to assist women on a continual basis day and night. The problem for doctors was that their already long hours of work and their limited numbers forced them to be largely absent from, and therefore unable to actively direct obstetrical care. In contrast, the problem for nurses was that they had to defer to the authority of the doctor, regardless of his experience, when he was present.

EFM Use in Defence of Autonomy: A Case Example

An example, that occurred in 1986, will be used to demonstrate why nurses, at times, applied an EFM in order to manage <u>doctors</u>, not patients. A nurse and I are talking in my private office.

I wanted to ask you about that delivery the other day with Dr. K. I am including it in my project. Yes, I wanted to talk to you as well. Wasn't it a disaster? Tell me C., why did Dr. K. intervene in this labour? You know, I just couldn't understand it. As far as I could tell when I came on shift at 4:00 p.m. she was approaching the end of labour. She was having good, strong, frequent contractions with which she was coping well. We started the augmentation² and she had the same thing. The contractions were the same as they had been before.

So, I guess the augmentation was for slow progress.

Well, I gathered that she had been in and out of the hospital, in and out of labour, for about three days. You know that she was having her first baby and was a scared teenager, to boot. I guess she was pretty exhausted by the time she was getting ready to push. Although, she seemed fine to me.

So, you didn't think the augmentation altered the character of her labour at all.

No, not as far as I could tell. It may have increased her discomfort a bit.

So, why was it done then?

I think Dr. K. just wanted to get it over with. He had been called at 3:00 p.m. to say she was ready for delivery, but when he found that she wasn't quite ready, he decided to get something done. I wish that he would have just relaxed and left her alone, she was doing just fine. I put the monitor on and gathered a strip for him. I knew that he would be nervous. I hoped that if he saw that the baby was fine, he would leave her alone.

It sounds like the two of you were trying to manage the same labour. Yes, except I was being told what to do and not asked what I thought should be done. We didn't discuss the management. If this had been a night labour it would have been managed completely different. No doctors would have been around and she would have been left to labour on her own. Things started to go bad once we started the augmentation.

How do you mean?

Well, once we had her all hooked up to the intravenous line, pumps, and monitors, the next thing was to give her narcotics³ intravenously. I would never give narcotics this late in labour. It's bound to depress the baby. Anyway, we had to follow the mainline narcotics with mainline Narcan [its antidote].

It sounds like Drs. are getting to be pests in labour management.

Some are. Dr. D. used to come to the delivery room and just sit, or just watch. He was fine. Actually, I remember one case with a Hippy couple from Edgewater who wanted to do everything on their own and Dr. K. behaved just like Dr. D. used to do: he just sat and watched. He did very well. He was a completely different person when he decides to leave things alone.

In your experience, have doctors become more involved in labour management in the past few years?



² An augmentation is a complex procedure where an artificial hormone is infused intravenously in order to increase the strength or frequency of uterine contractions. They are described in detail in Chapter 7.

³ "Narcotics" refers to opiate based medications, such as morphine, commonly administered during birth to relieve pain.

Yes, and no. Labours at night are completely managed by us. That hasn't changed. Convenient day labours where the doctor can come up at lunch and after the clinic are where they get involved. Like today, we moved the patient to the delivery room early because it was a bigger room in which to fit all the machines and people together in one place. With the monitor and I.V. pumps in that labour room and her two labour coaches, we actually had to climb over one another to do anything. Anyway, there we were in the delivery room using the birthing bed when Dr.K. arrives and checks t.er⁴. He found that she was not ready for delivery, which I knew, so he ordered us all back to the labour room. He said she wasn't "ready for the delivery room yet."

Do other doctors meddle as well?

Yes, but some are getting better. Actually, the game is knowing when to call them. If, for example, we called Dr. L. too early then we would get the whole works. If we waited to call him until after a woman was pushing for awhile, then nothing would get messed up.

Yes, Dr. L. and I talked about that. I've asked him about pushing labours along. He says at least, that as long as the monitor strip is normal, he is less aggressive in managing labours these days.

Yes, I think that's true, he does seem better able to keep his hands off.

That's what he says and what we have talked about. Watching him lately he leaves if he can't figure out what to do, instead of just doing something because he feels he should do anything to justify his presence. The last couple of years he has been a lot better.

Just going back to Dr. K. it was interesting to me to hear the way he speaks of women in labour. Its like other doctors I have been talking to. They all speak as if they alone are managing woman in labour. They don't speak specifically of a nurse being involved.

I see. As if there were only two people involved, not three. Of course, that seems to be the case once we get the doctors involved, at least some of them. The trick is to know when to call them and how to keep them from coming in when you do call them.

This birth contained a bizarre sequence of events. The woman, complete with an

intravenous line, pumps, monitors and support group was moved back and forth between

labour room and delivery room. Analgesics were ordered and then not administered, then

⁴ "Checks her" refers to an assessment of the dilatation of the cervix and the movement of the baby towards birth.

administered and counteracted. In the meantime, the labour support team physically surrounded the pregnant woman making it difficult for the doctor or nurse to see, let alone examine, the patient.

The problem faced by this nurse was that, by having a doctor involved, her authority and management approach were both undermined, and to a large extent, abandoned altogether. She applied the EFM hoping that a normal record would delay the doctor from taking over management of the case.

The management scheme imposed by the doctor, which involved attempts to speed the labour, were incompatible with nursing management. Nursing management of routine labour in Invermere, which comprised about seventy-five percent of patients, therefore, was not the carrying out of doctor directed management schemes. In fact, quite the opposite was the case. Nursing care was distinct and required autonomy from doctors. This requires further explanation.

Obstetrical Nursing Care

Nursing management of women during the birth process, as I have observed it in Invermere, was a very complex and subtle art centered on what I will call, for lack of a better term, the stall tactic⁵. As much as possible, nurses maintained an air of confidence and understanding while simultaneously stalling in two directions: 1) manipulating women to continue through labour with continually receding landmarks; 2) manipulating doctors to stay away unless all else failed, or until they were needed close at hand at the time of birth.

⁵ Nursing care during labour has been extensively studied as to its benefits to women's experience of birth (Reverby 1987) and to measurable obstetrical outcome (Hodnett and Osborn 1989). Efforts have also been made to describe and to document this work (McNiven et al 1992).

The main tactic nurses used on pregnant woman was delaying as long as possible judgments of where women "were" in the labour process. A woman was told she was doing well or making progress without ever being told exactly how much progress. In particular, she was not given any time estimate of how much longer her labour would likely last. In other words, the emphasis was on how far the woman had come, not how far she had left to go. Women were distracted from judging their place in labour so that they would not anticipate a specific goal and risk collapse if an expectation failed.

If a doctor became involved other than casually near the onset of labour, regardless of what they said, their presence could potentially imply that things are not going well. If a doctor visited during the course of labour, nurses took great care to reassure patients that the doctor's involvement was routine, and not because problems had arisen or because the doctor did not trust the nurse's assessment. A great deal of nursing work and patient momentum could be lost if patient self confidence was jeopardized or if nursing ability was questioned or if their authority was undermined.

Nurses used various tactics to stall the involvement of doctors in birth. These tactics included: not informing doctors of patient admission -- especially at night; reassuring doctors that all was well through telephone conversations; or, showing outright hostility towards doctors if they came to the hospital to examine a woman at a time that nurses considered inappropriate.

Invermere nurses knew that doctors had been taught, and their professional standards required, that they impose time limits on the birth process. The only hope nurses had of avoiding the imposition of these time frames was to avoid having doctors involved in birth at the time when these time frames were likely to be imposed.

Use of the EFM

Nine of the nurses most active in obstetrical care, who attended almost two-thirds of the births each year, admitted that they gathered EFM records in order to manipulate doctors, primarily to keep them away. They reasoned that, by having a normal EFM record, they could better reassure doctors that all was well. This strategy was only marginally successful largely due to the difficulties associated with nursing roles, which precluded actual diagnosis of the fetal condition, and due to the ambiguity of EFM records. Both of these problems are developed in detail in the section that follows.

Two nurses explained that the EFM was also useful to persuade doctors to come to the hospital when nurses considered their presence necessary. They explained:

Its a lot more forceful, if you are trying to get a doctor out of bed, to be able to say that the EFM record looks odd. In the past we could only say that we suspected that things were not going too well. Depending on the doctor, if you are vague, he may try to talk his way out of coming. Saying you are concerned about the strip gets them here every time.

These two nurses explained that they were more comfortable "letting women go" in labour because they new that the EFM could be used to bring doctors quickly if problems arose.

III. Dealing With Their Doubts: Using the EFM to Sample Fetal Status

The second reason Invermere nurses applied the EFM -- beyond learning to gather

a clear EFM record -- was that they were asserting a new professional identity, one that

involved explicit diagnosis, rather than passive data gathering for doctor interpretation.

Throughout living memory in this hospital nurses had been expected to gather

information, but not to make a diagnostic conclusion. One of the senior nurses in

Invermere explains:

We were taught in nursing school <u>never</u> to draw a diagnostic conclusion; diagnosing was what doctors did. Our job was to care for

patients, carry out orders and occasionally to gather information. If the information was odd, then we were to call the doctor, not to decide what the information meant.

Until 3 or 4 years ago [1980-81] we could not write in charts anything that indicated a diagnosis or implied a specific therapy, (i.e.) we would not be expected to write interpretations of an ECG, only that it was <u>done</u>. Using machines like the cardiac monitor forced us to change all that. Now we are expected to diagnose, and at times, to act.

This nurse was not implying that ECG monitoring forced nurses to do anything new.

She readily recognized that nurses had always diagnosed and treated patients⁶. The

difference with, first the ECG, and then the EFM was that it provided opportunities for, and

it became reasonable that, all of these nursing opinions should be made explicit.

The reasons for this changing nursing role involved two convergent social and

historical processes. On the one hand, it meant changes in what nurses actually learnt; in

this instance interpretations of EFM records. On the other hand, it meant nurses had to

move out from behind the shadow of physicians and to state their diagnostic conclusions.

Learning to Interpret EFM Records

With EFM record gathering, new information, particularly regarding FH rates, variations, and patterns of rates became available to nurses during the long hours that doctors were absent. Nurses recognized that, while ultimate responsibility for EFM record interpretation remained with physicians, their role as front line labour monitors required them to make an initial interpretation at the time of collection. In addition, an interpretation

⁶ It became a running joke between us. Over and over again, during my early years in this community as a new graduate, she (a nurse) handed me the correct drug or piece of equipment to deal with what was to me a completely novel and unmanageable situation, while saying, 'Nurses cannot diagnose, doctor, but what about giving this a try?" (personal diary, 1982).



was often pushed for by anxious patients.

Nurses faced with interpreting EFM records -- even if this only meant a preliminary interpretation to patients -- turned to doctors, the local experts in this area, for help. Doctors encouraged nurses to interpret EFM strips and spent considerable time informally teaching them basic pattern recognition. They did not set, nor did they try to maintain a standard of knowledge. This was because, on the low risk patient population in Invermere, doctors were satisfied with nurse surveillance of the fetal heart rates without the EFM.

Many of the nurses, especially the few younger and less experienced ones, pushed for more training in EFM interpretation because they recognized the absurdity of collecting an EFM record if they were unable to interpret it. They pointed out, not only the potential danger of missing problems but also their anxiety at having a record that could retrospectively show them negligent in not calling the doctor.

Formal Learning Begins

Learning obstetrical knowledge associated with the EFM, unlike learning EFM record gathering technique, involved formal teaching sessions. These included refresher courses, apprenticeships at regional hospitals, visiting lecturers, home study, and tele-conferences.

Almost all formal teaching focussed on learning to interpret EFM recordings.

Three of the senior nurses in Invermere admitted that they never really learned to interpret EFM strips. That is, they used the EFM to count fetal heart rates, not to provide patterns. Therefore, they interpreted the EFM almost exclusively through their established knowledge of fetal heart rates and their meanings.

Almost all of the remaining nurses became more adept at interpreting EFM recordings. They learned to look for patterns indicating things of interest to physicians;

conditions like fetal "distress", "health", or "reactivity". However, while learning EFM strip interpretation to some degree, none of them described themselves as even minimally comfortable with their overall interpretation ability.

Learning basic knowledge of fetal heart rate patterns, including variability⁷, was relatively simple. For example, a three page summary from Foothills Hospital, the tertiary care university center to which Invermere doctors referred patients, provided most of this information⁸.

Learning EFM patterns, however, proved much easier than finding these patterns on actual EFM strips. Often, the patterns seemed somewhere between reassuring and dangerous, creating significant anxiety. Ambiguous interpretations usually resulted in more monitoring or consultations either with other nurses or local doctors.

In an effort to improve their ability at finding EFM patterns in actual EFM strips, most Invermere nurses as well as all the doctors practicing obstetrics there attended regular teleconference sessions. Nurses and doctors both admitted that, beyond personal study, these were the primary sources for learning EFM associated obstetrical knowledge.

These conferences, implemented in 1983 by obstetrical specialists at Foothills Hospital in Calgary, usually occurred four times each winter, and eventually connected about twenty rural communities through a conference telephone call. The format was a

⁷ Variability, it may be recalled from Chapter 1, refers to the variation in FH rate from beat to beat. It was seen to reflect the oxygen supply of the brain cells neurologically controlling the heart. Variability was clearly defined and quite easy to recognize, therefore, it was routinely interpreted by local doctors. Less than half of the nurses assess EFM strips for this characteristic.

⁸ Starting in the early 1970s entire manuals devoted to EFM interpretations were published. By 1975 most Obstetrical texts included a least a few pages on EFM strips.

twenty to thirty minute presentation by an obstetrical specialist, followed by discussion of a series of pre-distributed obstetrical cases each with EFM strips. A moderator presented and discussed the case as well as EFM strip interpretations. Questions and answers flowed freely between all communities.

These conferences were valuable to local practitioners because they showed them actual EFM records and described actual obstetrical actions based on these records.

Nurses and doctors in Invermere, however, often left the conferences less confident than ever of their ability, or of anyone's ability, to interpret EFM strips, let alone know how and when to apply this knowledge in obstetrical case management. They heard specialists argue over interpretations and their interpretations prove incorrect. They also heard specialists describe their obstetrical management which at times followed, while at other times ignored, what seemed to Invermere doctors and nurses to be the same EFM information. Moreover, at other times they saw actions taken that either could not be or would not be performed in Invermere.

For three of the more senior nurses, listening to the ambiguities of EFM interpretations and the inconsistencies of its application to obstetrical management was the final straw condemning the EFM. They were already sceptical because, in the local Invermere experience, the EFM had not yet discovered a single unsuspected fetal problem. In addition, they observed that few, if any, recordings were read by local doctors before birth, and, even if they were read, the information was seldom, if ever, acted upon.

Most nurses, similarly to all of the doctors, were less willing to condemn the EFM because its "information appeared like important information". That is, the fetal heart rate was seen to critically reflect the condition of the fetal circulation, similarly to the way the adult heart rate along with temperature and blood pressure were considered "vital signs" of

bodily health. All nurses saw this type of biological knowledge as forming the foundation of rational patient management decisions and of sound medical care. In addition, EFM information stood out as important when compared to the relatively infrequent and often short fetal assessments using a stethoscope. EFM information stood out because of its relative clarity, replicability, and volume.

In general, though, the nurses found that the ambiguity of EFM interpretations resulted in greater rather than less certainty regarding the status of the fetus. In other words, EFM use undermined rather than contributed to nursing confidence. In this respect, younger nurses, who often had the least obstetrical experience and therefore the least self confidence, found EFM use the most troubling.

For two nurses, the tele-conferences actually fueled their interest in the EFM. They believed, along with most of the obstetrical specialists in the region, that EFM information was of value to obstetrical care. For them, the problem limiting EFM success was unskilled interpreters. More monitoring and study was seen as the ultimate solution to this problem.

Coming on Line

In part through tele-conferences and in part through discussions and courses, local nurses gradually came on line with centralized obstetrical thinking and goals related to the EFM. Invermere nurses, for example remember wondering if their assessments of women during labour were too focussed on pregnant women and negligent of the fetus. They began wondering how often paradoxical situations occurred where the mother seemed well, intermittent stethoscopic assessments were considered normal, while EFM use would demonstrate the fetus to be in distress.

By late 1984, Invermere nurses, whether sceptical of the EFM or not, were all writing

in charts and discussing the EFM similarly to practitioners at all levels in the regional system, ranging from other rural communities to the tertiary referral center in Calgary. That is, EFM information was described as <u>fetal</u>, and its interpretations were used to assess <u>fetal</u> biological needs.

In addition, Invermere nurses were coming on line with nurses in regional hospitals by making their EFM interpretaions explicit to patients and in hospital records. Making an explicit diagnosis of the fetal condition, required nurses not only to learn obstetrical knowledge regarding EFM interpretations, but also to be willing to express these interpretations both to patients and in hospital records. To understand why nurses were willing to make their interpretations explicit, it is necessary to understand various other changes that were occurring at this time in this hospital, community, and country.

Expanded Professionalism, Bolder Interpretations

Towards the end of the 1970s, nurses and nursing care in Invermere was moving steadily out from the shadow of doctors. This increased visibility of nursing care reflected major shifts in various aspects of hospital and community affairs.

The reason nursing work was hidden in the shadow of doctors in the first place extends back to the origins of hospitals themselves. Reverby (1987), for example, explains that nursing work was hidden, at least in the United States, because hospital reformers of the late nineteenth century, when following the example of Florence Nightingale in Great Britain, intentionally promoted sexual inequality and naturalized women's nursing roles:

Nightingale accepted as "natural": a sexual division of labour based on biological characteristics used to justify the employment of women in occupations close to domestic labours. These reformers shared the assumption that a woman's nature and moral superiority destined her for a special role in society (1987:41-42).

Nightingale and her followers institutionalized hospital work as proper work for women outside of the home. They rationalized it as a higher calling for which women were particularly suited and they romanticized it as a professional activity on par, both morally and economically, with physicians.

Throughout most of this century, hospital work in Invermere has maintained this sexual division of labour, described b; Reverby, both physically and ideologically. On the one hand, until 1980, all nurses were female and all doctors were male. In the 1980s, the community acquired its first female doctor and the hospital hired its first, and to date only, male nurse. On the other hand, hospital records as well as local archives and newspapers, repeatedly attest to the tireless work of the local nurse or nurses, as well as to their strict maintenance of hospital order, cleanliness and standards of care. Doctors, in contrast, are described for what they did, or what they were willing to do, or the new medical techniques which they introduced to the area.

Beginning in the 1970s, nursing professionalism and professional activities were on the rise locally and provincially. Provincially, there was a rising militancy among nurses resulting in demands for higher wages and also greater public recognition of nursing work. The first provincial nursing unions were formed.

Numerous authors have associated the recent increased awareness of women's roles with the rise of feminism beginning in the 1960s. This includes the more recent history of women's participation as health providers both in the public as well as the domestic sphere (see Olesen and Lewin 1985:1-24 for summary, also Graham 1985).

In Invermere, changes in actual nursing activities involved nurses more and more in an autonomous, as opposed to dependent, professional role. A more autonomous role for nurses in hospital events began with techniques such as adult cardiac monitoring after a

heart attack. These activities, established in Invermere a decade earlier than EFM techniques, involved nurses for the first time in direct patient assessment and treatments; assessments and treatments which, because of their urgency, were largely independent of doctors. The head nurse in Invermere describes this trend in relation to nursing work with the ECG.

With the ECG we started to use IVs (intra-venous infusions) for cardiac patients. They (cardiac patients) never had IVs before this. It was with cardiac patients that nurses began to learn to start and maintain IVs.Gradually nurses learned to do ECGs so that now they are taken routinely by all nurses.

After 1965, nurses gradually learned to establish and monitor with the ECG. Doctors had to listen to our diagnoses and trust directly in our skill at reading the ECG monitor.

In the late 1970s, as Invermere nurses emerged from the shadow of physicians,

took up autonomous roles, and began to make their diagnoses explicit, there was an increasing recognition that nurses were the ones ultimately responsible for establishing and

maintaining many hospital techniques.

More Recognition, More Criticism

Invermore nurses explained that, as late as the end of the 1970s, they were not challenged directly as autonomous professionals setting and maintaining standards on their own. If patients asked about their work, nurses easily explained to them that the (usually) absent doctor was responsible for a certain practice. In other words, questioning of nursing activities were taken as questioning of doctors, through their surrogates.

Actual nursing care in Invermere hospital bore little resemblance to this doctor dependent image. From the earliest days, nurses set and maintained many hospital routines in various areas of patient care. As described earlier in this chapter, doctors were only marginally involved in the institutionalization of many of these routines and techniques. Recognition of this nursing autonomy in maintaining certain hospital techniques became evident during the late 1970s and early 1980s, and nowhere did this become more evident than in obstetrics.

More and more, obstetrical patients pressured both doctors and nurses to abandon, or at least to justify their obstetrical techniques. As detailed in Chapter 2, the local hospital and community were undergoing several changes: hospital facilities were strained by rapid population growth and rising patient expectations; the local hospital was changing from the center of patient care to the margin of a regional system of care; and there was an influx of new doctors and the semi-retirement of the senior doctor and head nurse -- both dominant and stabilizing figures.

By the 1980s, patients and doctors interested in obstetrical reforms came to realize that most of routine obstetrical care was out of the hands of doctors and in the hands of nurses. The three youngest and newest doctors, for example, while all quite prepared to forego most of their established medical techniques -- such as routine episiotomy or analgesic administration -- found that nurses were unwilling, or at least very reluctant, to act similarly and to change or at least to modify their established techniques.

The doctors began working for change by directing patients to pressure nurses at the time of birth. Whether or not this was an effective strategy to promote change, it served to highlight to patients that nurses were autonomous professionals who did not necessarily do what doctors wanted.

In summary, Invermere nursing work was changing in at least two ways when the EFM arrived. First, nurses were making more explicit diagnosis of a patient's condition and they were in a more overtly autonomous role needing to directly defend their practices to patients.

An EFM in Routine Nursing Care: An Example

An example will be used to demonstrate how explicit nursing diagnoses and a more

self defensive stance came to influence nursing use of the EFM. The description happens

to contrast two women who were undergoing labour at the same time. The same points

could be made by contrasting a single woman during birth with and without an EFM.

Women similar to the two described below, who proceed through labour without

major medical interventions⁹, constitute 75 to 80% of births occurring in Invermere hospital.

It was a midsummer evening in 1984. I was working late in the hospital emergency room, when I was notified that a pregnant woman under my care had been admitted to the hospital. When I had a few free minutes, I joined the woman, her husband and the admitting nurse in the hall next to the nursing station.

The admitting nurse, who had already examined the woman, reported that everything was fine. The woman's cervix was already dilating and the fetal heart tones, which the nurse had listened to with a stethoscope, were strong and regular. After a few more minutes of discussion, I returned to work in the emergency room while the parents moved off down the hall for a walk.

Over the next two hours I saw the couple through the open emergency room doors as they made their way around the hospital halls. I noticed, for example, that as the evening progressed, this women more frequently paused during her walk to lean on her husband or the wall. I assumed that the labour was intensifying.

The nurse was also assessing the woman regularly including auscultating the fetal heart with a stethoscope. She continued to reassure me that everything was fine. At one point, I joined the couple and a number of their relatives on the hospital patio for tea.

What I remember most vividly about this labour was the women's flowing "tent" dress with a print of red summer flowers, and how the dress swayed rhythmically from side to side as she made her way around the halls. The loose moving dress seemed so appropriate to this woman and to her labour on this warm still summer night.

⁹ Major interventions are defined as techniques designed to actively alter the birth process: for labour these include hormone infusions to speed or slow the rate of contractions; for delivery these include use of forceps or performing a cesarian section operation. Minor interventions are defined a techniques designed to help a woman through birth her own way at her own pace; for labour these include administering analgesics, for delivery these include positioning and coaching.



Meanwhile, another pregnant woman, a colleague's patient who happened to be a neighbour of mine, was also in hospital in labour. The woman had been in labour, by then, for about twelve hours and had been "progressing well". The nurse knew that her doctor encouraged nurses to use the EFM to "check the fetal status" as a "routine precaution". The nurse decided to "do a strip on the patient", and then show the strip to me, since I was at the hospital anyway.

When I had a few minutes free I hurried down to the labour room. The atmosphere was tense when I arrived. I quietly said hello but no one seemed to hear me. Naked on the bed in the center of the room, the labouring woman was busy rolling onto her side with the start of a contraction. The father and nurse were occupied with the EFM, staring at its screen and listening to its awful sounds as its sensors lost contact with the fetal heart. The woman's new position on her side and her slippery, sweat soaked abdomen were making it difficult for the nurse to relocate the fetal heart and to keep the EFM sensor in contact with it.

The fetal heart was relocated within a few moments and the machine started flashing its light and rhythmically reproducing fetal "heart sounds" once again. Everyone relaxed. A few seconds later, as the contraction ended, the woman flopped onto her back, exhausted. In a surprisingly energetic voice she apologized for having shed her hospital gown, explaining that it was too hot in this windowless room to even tolerate a gown. An industrial size fan propped on a chair was providing some relief. The nurse and parents wanted to know how much longer we were going to try for an EFM recording. They had been at it an hour now without much success.

The nurse seemed a bit embarrassed as she handed the fetal heart strip to me. It was not what one would call a good tracing. The EFM missed recording the fetal heart as the woman changed positions during the critical contraction phase of the uterine cycles. I read the fetal strip and waited through the next contraction to listen to the fetal heart. Everything seemed fine so I said it was alright to stop the EFM. I left the labour room to continue my work in the emergency department and said I'd be next door if they needed my help.

Discussion:

Both women in the above example were typical of women giving birth in Invermere

hospital. They were generally confident of their ability to give birth, however, they were

reassured by having the hospital staff around, if needed. For the most part, though, they

preferred doctors and nurses to "stay out of the way".

Neither woman wanted to have the EFM attached. The woman walking in the hall

was a bit unusual in that she made it very clear that she would physically resist anyone who

tried to attach the monitor. Most women, such as the woman in the labour room, agreed to the monitor because "she wanted to make sure the baby was well".

The nurse in the above example was typical of about two-thirds of the Invermere nurses in her attitude to the EFM¹⁰. She was greatly torn between performing EFM technique on a woman who was otherwise proceeding well through labour and her need to learn and maintain her skill with an EFM. However, with the EFM present, she felt obligated to apply it "in case a fetus was in trouble." She noted that, in the example above, the father had asked what the EFM was, as well as when and if it would be used.

The problem for the nurse in using the EFM was that, while applying the EFM and making an explicit assessment expanded her professional role, in doing this she made herself vulnerable to later scrutiny. She was open to later scrutiny because instantaneous EFM recordings ignored the constraints of any human consciousness and opened up obstetrical events to infinite interpretations. For example, by reading the fetal tracing, I was able to judge the nurses judgement of the fetus without ever entering the labour room. In turn, distant obstetrical specialists or hired legal experts could have used this EFM record to judge my interpretations as the local attending doctor.

Without EFM use, in contrast, nursing judgments of pregnant women, rightly or wrongly, ended with the private opinion of a nurse. This was because, without an EFM record, her clinical judgement could not effectively be challenged; her assessment was the final word. That is, her nursing assessments took a private or embodied form.

Depending on a nurse's confidence and attitude therefore, she may or may not use

¹⁰ The other one-third of the nursing staff, primarily the older more self confident and experienced nurses, did not use the EFM for routine monitoring unless specifically asked to do so by the attending doctor.



the EFM. Senior nurses confident of their obstetrical skills did not use the EFM for screening tests at all. Several nurses who had worked for at least ten years and were interested in an expanded professional role applied the EFM and explicitly interpreted EFM records. Junior nurses or senior nurses insecure regarding their obstetrical skills avoided EFM use both because of the ambiguities they saw in EFM records and their fear of having an EFM record open to later scrutiny.

IV. Discussion

IV(I). The EFM and Change in Obstetrical Care

Continuing with the above example, it shows quite clearly that the EFM has direct effects on obstetrical care while monitoring is in progress. The un-monitored woman was free to walk throughout the hospital, socialize with her relatives, make independent decisions regarding dress and satisfaction of bodily needs, as well as meet with her birth attendants at least socially as peers.

In marked contrast, the other woman involved in EFM technique was lying naked in bed, spending a lot of energy to repress her bodily urges -- such as the need for positional changes -- and learning that, at these times, she was expected to take a passive background position for the good of her fetus.

However, although the EFM monitoring session in the example above lasted almost an hour, this represented only a small portion of this woman's thirty-six hours of labour. In most other cases, nurse initiated use of the EFM was often shorter and performed earlier in labour when positional restrictions were less painful to pregnant women. In addition, EFM interpretations by nurses, or later by doctors, did not result in any change in the obstetrical care this woman received. In fact, the example above is unusual because I interpreted the

EFM record soon after it was completed. Doctors did not make a point of visiting the hospital to interpret a "routine" EFM strip. For example, only 25 to 50% of routine EFM records gathered by nurses as part of their patient assessment routines were even read by physicians prior to birth, let alone near the time of collection. As an invermere nurse active in obstetrical work explains, nurses were very aware of when EFM interpretations occurred.

Doctors hardly ever interpret EFM records. Most of the time they don't even know that they have been done. We (nurses) soon quit bothering to phone them when we gathered a strip. They always asked us what we thought of it and left it at that. I have never learned to interpret the strips except by using my usual ways of assessing patients. If I am worried for other reasons, I usually assume that the EFM pattern is not very healthy either.

Therefore, with short intermittent use of the EFM and without operationalizing EFM records in management schemes, it is difficult to attribute any change in obstetrical care to the EFM, outside of the effects of the techniques themselves. The point is not to minimize the effects of EFM techniques on women, rather, the point is to relate the EFM to changes in obstetrical knowledge and practice.

In other hospitals, where continuous EFM monitoring occurs as part of routine nursing care, the effects of the EFM on obstetrical care could be more significant.

IV(II). The EFM and Medicalization

Continuing with the example above, the woman involved in EFM technique had aspects of her physiology translated into a code. This provided the opportunity for collective ordering in keeping with both daily clinical discussion and professional discourse. At issue, is the extent to which EFM use resulted in specifically medical, as opposed to simply collective, translation? This is a complex question that will be returned to throughout this dissertation. The example presented above will be used to introduce some of the
issues discussed in detail later.

In the example, the pregnant woman and her partner interpreted EFM sounds in many intense personal ways, such as the sounds of their future child "struggling for life", or "happily playing in the womb." The nurse involved shared in these collective translations, personifying the fetus and projecting onto it her own hopes and fears. In a later interview, the nurse went as far as to say that, in her opinion, nurses not only interpreted but actually used the EFM because of personal inadequacies, not medical needs:

The extensive worry by medical attendants over management of labour and birth is due to the problems of birth attendants with their own mortality. They are unsettled in their view of life and death which confuses their own spirituality with the needs of the patient.

The modern version of obstetrics is an attempt to save everyone. At least, it is an attempt to appear to be trying to save everyone. In doing this, we (professionals) express our own need to control life and death matters by believing in the hospital institution and applying medical technologies.

The extent to which authoratative professional interpretations of EFM records

represent medicalization versus collectivization is also very problematic. For example, fetal records are interpreted as representing time flowing linearly forward; that is, the ongoing instantaneous relationships between the fetus, as seen through its series of heart beats, and the mother, as seen through her series of uterine contractions. No one considers that fetal heart beats and uterine contractions are the same activities occurring over and over again as repeating cycles, rather than new contractions "coming along". The point is not to suggest that a repeating cycle view is a better way to understand EFM records. Rather, the point is that these productions are interpreted with profound cultural meanings that are at least as important as those associated with strict medical translations.

V. Screening use of the EFM: the Latter Years

Screening use of the EFM by nurses occurred at about the same rate for the first

two years, then fell off as use of the EFM during the birth process declined. The reason EFM use during the birth process declined was a combination of regionalization of obstetrical care, a marked local recession, a number of hospital staff changes, and lessening of patient pressures for obstetrical reform. All of these changes will be described in detail in the chapter that follows.

Generally speaking, the three of four nurses who were most interested in expanding and defending nursing professional roles and identity, used the EFM for these reasons throughout the period of this study. These nurses accounted for most of the nurse initiated EFM use in the final four years.

VI. Summary

From the time of its arrival in 1983, the EFM was delivered into the hands of nurses. No doctor was present when the EFM arrived or gathered a routine EFM record. Furthermore, on occasions when doctors happened to arrive while routine monitoring was in progress they would almost always leave to return when it was complete. Doctors stayed while the EFM was in use if they were present for other reasons.

The absence of doctors during screening EFM use was not unusual. Doctors, for the most part, stayed away from the hospital during the birth process. When they did visit, their activities were goal oriented and time limited, usually in order to complete a specific task. Nurses, on the other hand, provided most of the professional care of women, from the time of patient's arrival in hospital until problems arose or birth was imminent, at which time the doctor was called in.

From the time of its arrival, the EFM was used by nurses to assess the status of the fetus during routine labour. While nurses did not discover an unsuspected fetus in

distress through use of the EFM, they used the EFM for various purposes. The most frequently cited purpose was to assist them in convincing a doctor that they should either come in to, or remain absent from the hospital. Nurses also used the EFM out of an expanded sense of their professional role in diagnosing the fetal condition, rather than gathering information for doctors to interpret.

EFM use as a screening device was far more the result of changes occurring in this hospital and community than the cause of changes. In addition, outside of the physical effects of EFM use itself, screening uses of the EFM only marginally resulted in medicalization of obstetrical care.

Chapter 4

Inductions, Augmentations, Intensive Care Treatments and the EFM Introduction

In this chapter, I describe EFM use in three doctor directed, active management procedures found in Invermere obstetrical care -- inductions, augmentations, and intensive care treatments. I explain that, unlike nurse initiated screening use of the EFM which doctors usually ignored, during active management procedures doctors took EFM use very seriously. By taking EFM use seriously, I mean that doctors were present to interpret the EFM records most of the time, or they were at least closely at hand. And, they were prepared to act depending on, among other things, immediate interpretation of these records.

Inductions, augmentations, and intensive care treatments were not times when the EFM was employed as a screening device -- to discover fetal problems in an obstetrical patient population. Instead, the EFM was used after patients had already been diagnosed; in these instances diagnosed as needing obstetrical interventions. EFM use in these interventions is best thought of not as case finding but as an implementary technology to assist in task completion.

The EFM was used in these procedures in order to take control of "fetal health" and to eliminate any chance that these procedures caused harm to the fetus.

I begin by describing induction and augmentation procedures¹, the doctor

Invermere doctors and nursses consider inductions and augmentations as procedures, as apposed to techniques. Techniques are usually shorter, less complex, activities involving one machine or a single technical duty and one professional. Gathering an ECG record or an twenty minute EFM admission test are typical examples of hospital techniques. The term procedure, on the other hand, usually

directed intervention procedures used to start or alter the birth process through administration of uterine stimulating hormones. I then describe the various times where patients were subjected to what I will call "intensive care" treatment; treatment for unexpected fetal and/or maternal problems that arose usually late in the birth process.

Obstetricians have primarily discussed and described the EFM as a monitoring or surveillance device; a general term used for a device that detects and displays ongoing biological processes.

To monitor means simply to watch or check on a person or thing. In the minds of many people in obstetrics, however, the word "monitor" has come to mean specifically surveillance of the fetal heart and uterine activity by some sort of an electronic detecting and recording device (Pritchard et al 1985:284).

Obstetrical texts and the obstetrical literature do not diferrentiate between screening and intervention uses of the EFM. Instead, they discuss the EFM as a single technology impacting on obstetrical cases.

Obstetrical texts and the obstetrical literature discuss intervention procedures

involving the EFM, such as inductions and augmentations. However, the EFM is

taken for granted in these descriptions and its use is neither discussed nor studied.

In this research, EFM use in doctor directed interventions was considered

important and worthy of study in themselves for three reasons: 1) EFM use during

interventions accounted for most hours of EFM use in Invermere hospital.

refers to longer, more complex activities involving multiple machines and more than one professional. An appendectomy is a typical example. The term hospital practice tends to be non-specific referring to both techniques and procedures. Therefore, it will be avoided as much as possible.



Understanding why these interventions occurred and why the EFM was central to them will help explain why the EFM was used in this hospital; 2) induction and augmentation procedures, as well as the intensive care treatments, represented a class of medical activities, namely treatments or instrumental activities, which were usually overlooked by medical professionals in their case constructions. In fact, they were scarcely written about or spoken about by professionals at all. Therefore, their discussion further demonstrates the limitations of a case centered view of hospital obstetrics; 3) these doctor directed interventions provided an opportunity to understand the EFM as a tool used to mediate between normative obstetrical knowledge and individual patient care. This final statement requires a few introductory remarks.

Medical practitioners in the industrialized West have long assumed that any information is better than no information and that more information is better than less information (Lock 1988, 1992 and Gordon 1988). Banta and Thacker describe this assumption with regard to obstetrics and the EFM:

The obstetrical literature reflects the commonly held belief in medicine that more information will lead to a better outcome. The technical advances required and the demonstration that reliable recording could be done seems to have blinded most observers to the fact that this addditional information will not necessarily produce better outcomes (1979:637).

Medical practitioners in the industrialized West, including obstetricians, have been particularly interested in gathering information that is population based and statistically described. For example, normative frameworks related to pregnancy and birth have been present at least from the time that statistical methods were applied to human conditions in the middle of the last century (Hacking 1990:47-55). In addition, as Arney explains, statistical information and the concept of "normal" have been

central both to the formation of obstetrics (1982:20-50), and to the conduct of obstetricians today (ibid:51-85). Moreover, as Oakley describes, in her chapter "Controlling Labour" (1984:187-209), normative time frames are routinely used to justify many obstetrical interventions including the inductions and augmentations of labour described here.

In becoming part of obstetrical intervention procedures, the EFM became part of obstetrical activities designed to deal with pregnant women in whom pregnancy or the birth process had moved outside established normative time frames. Obstetricians assumed that these women needed to be dealt with because pregnancies lasting more than two weeks longer than average had been shown to have an increased chance of fetal problems, including unexpected stillbirth (Cunningham et al 1989:759-760). Similarly, obstetricians intervened in birth because of other evidence that showed the potential problems, particularly for the fetus, that arose if the birth process, or any of its stages, lasted longer than established norms (Cunningham et al 1989:341-348).

The problem that practitioners continually faced and the problem examined in this chapter related to EFM use was how to manage individual patients, who were increasingly demanding individualized care, in the face of enormous pressure to normalize birth and obstetrical care. The pressure to normalize birth and obstetrical care was particularly acute in relation to EFM use because these normalizing action imperatives were strongly associated with fetal health or fetal needs.

Therefore, there are definite costs as well as benefits to individual practitioners of knowing EFM information, especially EFM information associated with both normative time frames for pregnancy and birth and obstetrical intervention imperatives.

I. Induction and Augmentation Procedures: Background

Inductions and augmentations are procedures designed to manage labour by taking control of uterine contractions; inductions to "initiate" contractions,

augmentations to "stimulate" them.

In controlling uterine contractions, professionals effectively take over what they see as the delivery process, or labour, from a pregnant woman. Labour, according to medical texts and medical professionals -- both in Invermere and elsewhere in my experience, is composed of the ihree "p"s: powers, passenger, and passage. Labour proceeds, according to this view, when the powers or "expulsive forces" push the fetal passenger out through the passage or birth canal. The uterus and abdominal muscles form the expulsive forces, while the vagina and the surrounding pelvic muscles and bones, form the birth passage. The birth passage is seen as the resistance against which the expulsive forces operate.

Mechanically, work is the generation of motion against resistance. Labor is work. The forces involved in labor are those of the uterus and the abdomen, which act to expel the fetus, and those that must overcome the resistance offered by the cervix to dilatation and the friction created by the birth canal during passage of the presenting part (Cunningham et al 1989:217).

Neither the size of the mass to be moved (the fetus), nor the amount of resistance (the size and configuration of the birth canal) can be controlled, therefore, professionals intervene at the only available point, the expulsive forces acting on the fetus.

For most of labour, the uterus is the only expulsive force acting on the fetus. Abdominal muscles are added to uterine contractions only for "bearing down" near the actual moments of birth. Therefore, managing uterine contractions takes control of most of the "forces" for most of labour. of most of the "forces" for most of labour.

Numerous methods to induce and to augment contractions have come and gone throughout obstetrical history (Oakley 1984:187-209, for example, summarizes many of these methods in her chapter "Controlling Labour"). Of interest here are procedures involving the administration of a synthetic hormone called oxytorin; procedures central to obstetrical care throughout my medical training in the 1970s and my practice during the 1980s. In fact, by the 1980s the terms induction and augmentation of labour had become synonymous with these hormonal infusion procedures².

Hormonal inductions and augmentations involve administering a metered amount of synthetic uterine stimulating hormone via an intravenous line.

If uterine contractions increase slowly and the FH remains stable, the oxytocin infusion rate is increased in small increments at prescribed intervals. Actual increases vary widely depending on the attending nurse's judgement of labour intensity and effectiveness; effectiveness meaning contractions that cause cervical dilatation and/or fetal "descent" towards birth.

The end points of the procedures vary. Generally, the immediate goal is to produce distressful contractions, lasting forty-five to sixty seconds, and occurring not more often than every two minutes.

The hormone is discontinued if a prolonged contraction or fetal "distress"

² Dating from early in this century uterine contractions were known to be influenced by pituitary extracts, later purified as a small simple hormone called oxytocin. This polypeptide, released by the posterior pituitary gland in increasing amounts as labour approaches and progresses, was chemically synthesised, making it relatively inexpensive and readily available for practitioners to use in labour management.



occurs, or if "effective" labour begins on its own. Women's discomfort is not a reason to stop the procedure. Instead, discomfort is treated with analgesics and the procedures continue.

At the same time as professionals wish to control the delivery process, they do not wish to harm the oxygen supply to the fetus. Professionals consider fetal oxygenation particularly critical to maintain in order to prevent neural cellular damage. Neural collular damage during the birth process is associated with permanent disabilities such as cerebral palsy.

Professionals know that oxygen delivery to the fetus follows a complex path. It starts with a pregnant women breathing in air or, if needed, special gas mixtures enriched with oxygen. From women's lungs, red blood cells carry the oxygen through her heart to the womb, where it diffuses passively across the placenta to the waiting fetal blood cells. Fetal blood cells then carry the oxygen through the fetal circulation to fetal tissues. The weak link in this system is known to occur in the placenta where oxygen transfers from maternal to fetal circulation. Further, the most stressful time at this weak link is known to occur when the uterus contracts, limiting blood flow to the uterus from both the fetal and maternal circulations. Limiting blood flow is synonymous with limiting oxygen transfer from the mother to the fetus (Cunningham et al 1989:60-61).

Inducing or augmenting uterine contractions therefore requires great care. If contractions are not stimulated enough, labour will not be altered. If contractions are greatly over-stimulated, the uterus potentially can rupture; a catastrophe potentially resulting in maternal and fetal death. And, even if contractions are not overstimulated, they remain as a direct threat to fetal oxygenation because they may

restrict oxygen flow at its most vulnerable point.

Oxytocin Inductions and Augmentations and the EFM

An EFM is very useful during induction and augmentation procedures because it can be used to make certain that oxygen delivery to the fetus is maintained despite the oxytocin stimulated uterine contractions. This is because an EFM record, especially one produced using internal monitoring, is known as a reliable way to detect fetal hypoxia. In fact, if anything, the EFM is overly sensitive to fetal hypoxia so that practitioners have difficulties determining whether or not the fetal hypoxia they see indicated on an EFM recording is actually occurring. The sensitivity of the EFM to hypoxia is useful in inductions and augmentations, however, because it means that, if the EFM tracing is considered normal, then doctors and nurses can be confident that fetal hypoxia is not occurring.

Invermere doctors and nurses almost always used an EFM continuously throughout induction and augmentation procedures. In addition, if they interpreted EFM records as showing significant fetal problems, then the procedures were stopped. This was, in part, because doctors and nurses were concerned that their interventions could harm the fetus, but also they knew that, if an EFM record showed even inarginal fetal problems, any newborn problems that may occur for unknown reasons could be blamed on them and their procedures.

Fetal health demonstrated by an EFM therefore was a necessary, although not sufficient, condition prior to the start of, and throughout, induction and augmentation procedures. Sufficient conditions included: 1) numerous possible problems or potential problems attributed to the mother or to the fetus; 2) a doctor

willing to intervene in birth; 3) a nurse willing to carry out and a patient willing to undergo the procedure.

In the section that follows, I will explore EFM use during inductions and augmentations, focussing on how the EFM was used by professionals to reduce the risk of these procedures to the fetus. In addition, I will discuss why control of <u>fetal</u> risk was associated with an increase in the incidence of these procedures in Invermere.

II. Beyond Screening: The EFM as an Intervention Technology

Inductions and augmentations stood apart from the remainder of obstetrical care in invermere because the activities were standardized obstetrical procedures applied, as much as possible, in exactly the same for every patient.

The incidence of oxytocin inductions is shown in Table 2. The reasons why inductions stopped in Invermere will be explained later in the chapter.

year	oxytocin inductions	total births
1983	9 (8%)	113
1984	10 (11%)	92
1985	10 (12%)	84
1986	7 (10%)	69
1987	1 (2%)	45
1988	0	64
1989	0	54

TABLE 2 Incidence of Inductions in Invermere

EFM use in inductions and augmentations also stood apart from EFM use in the remainder of the birth process because, at these times, the EFM became a health maintenance rather than health sampling technology. An example of an induction will be used to introduce the EFM as a health maintenance technology.

The example presented here is taken from research material gathered in 1986, the first year of research and the third year an EFM was present in Invermere. I was the attending doctor. The induction was being performed because the woman was considered to be three weeks past her due date. She was otherwise well and had had a medically unremarkable pregnancy. She was anxious to have the pregnancy ended but was quite apprehensive about undergoing the induction.

The EFM was not involved in the decision to perform this induction. As 1 explain, I decided that the procedure was necessary for other reasons.

The day before, I had explained to this patient that, while it was her decision whether or not to be induced, I was worried about the fetus, and the ability of the placenta to continue to provide enough oxygen and nutrients to it. While I had no evidence that this particular fetus was undergoing hardship, I quoted statistical evidence that placentas tend to "get old" and diminish their functioning after 42 weeks gestational age.

Besides, I explained: 'The fetus is now fully grown and it need not stay in you any longer. Why put it at risk of placental failure? We know it is well. We know from dates and ultrasound examinations that it is at least 42 weeks old, so why take the risk of letting the pregnancy continue?

In Invermere and other hospitals in which I have worked and studied,

inductions usually were scheduled activities starting at 0800 hours on a weekday to

take advantage of the increased number of nursing staff during the day and to

provide enough time for their completion before nurses went off duty 8 to 12 hours

later. Inductions usually occurred in the smaller labour rooms, despite crowding,

while the larger delivery room was kept free for other patients.

Inductions began with a nurse making a general assessment of a patient,

which included measuring blood pressure, pulse, and temperature. Next, usually the

same nurse attached the EFM and started it running to obtain a record of "baseline"

fetal heart rate activity. Then, while the EFM was gathering a record, the nurse inserted an intra-venous needle into a forearm vein and administered a nonmedicated fluid. A second intra-venous infusion containing oxytocin was passed through an infusion pump and connected to the original intra-venous site. As a result, the intra-venous infusion could be maintained while the hormone was increased, decreased, or stopped altogether. In keeping with hospital policy, once everything was ready, the woman's docter attended the start of the procedure, and remained present, or at least close at hand in the hospital, for the first 30 to 60 minutes. The doctor was present to ensure that the uterine contractions began safely.

By 8:15 a.m. we are ready to begin. The patient, now three weeks past her due date, is laying on her back in bed, her exposed abdomen surrounded by the two EFM straps and her left arm attached to an intravenous line. Her right arm is outstretched on the other side of the bed as the nurse takes a blood pressure measurement.

I remain silent so that the nurse can hear the blood pressure with her stethoscope. Sitting on the side of the bed, I study the EFM strip that had been gathered earlier.

The patient spoke, as the blood pressure cuff is released: "How is he? It must be nice for him in there, he sure doesn't want to come out."

I answer, "You're still sure its a he?... The strip seems fine to me. What do you think of the strip, J. (the nurse)?

I think the baby is fine. It feels fine, it acts fine, the mother thinks its fine, so its fine. I don't read your strips.

Never? Never have so far. I haven't done an induction with the monitor yet, though. This is the first one. I may have to read those things before this is over. These staps are a nuisance because I can't examine the mother properly".

By 9:15 a.m., regular contractions are occurring every three minutes, some of which are becoming moderately uncomfortable for the patient. The EFM is continuously recording both the contractions and the fetal heart rate. The monitor strip now extends from the monitor to the floor and is beginning to gather in a pile.

Reading the monitor strip, I ask: "Does the monitor reassure either of you that the baby is fine?

The patient replies first, "Of course its reassuring. I know this

induction isn't hurting him. Its nice to hear he's doing O.K. It's nerve wracking if the lead comes off or if I roll over and we lose him, but it helps me feel we are doing the right thing."

It takes half an hour before the nurse replies: "Well Ken, I don't think we are talking about the same thing. You are always assuming things about nurses while we are always assuming things about doctors. Now that you are sitting here with us and doing your research you are starting to get an idea of what we do during labour. Otherwise, you wouldn't know what we are talking about when we talk about our concerns in obstetrics.

For example, we spend a lot of time with a pregnant woman in labour, and assess her and her fetus many, many times. We end up caring about the fetus as if we know it. The EFM is only a small part of that overall awareness".

By noon, the hormonal infusion is no longer needed as labour is continuing on its own. The EFM is still running continuously.

Looking down at the growing pile of monitor strips, I realize that the last four hours are represented on these linear graphs. I ask the nurse if the EFM helped her to manage the induction?

"Its made management more difficult because I have to spend so much time fiddling with the machine. The machine doesn't tell me a thing about the labour. She could have delivered for all that thing knows. I still have to examine her to find out where the baby is and how the cervix is doing."

I turn to look at the patient who is obviously distressed during a strong contraction. She asks: "Can that thing tell you how much longer I'll be?"

"No it can't" I replied "but it can tell you exactly how long everything has taken so far."

Discussion:

This induction example demonstrates two characteristics of EFM use as an

obstetrical intervention technology.

1) The EFM was used in a continuous and rigorous fashion. This was in

keeping with intervention procedures in general which were performed as much as

possible, in keeping with strict local and regional standards. For example, this

induction began at the correct time, in the correct place, in the correct sequence, with

both the nurse and I in attendance. A standardized, carefully monitored amount of

oxytocin was administered at carefully measured rates. The EFM was used continuously prior to, during, and after the oxytocin infusion was administered. Its records were carefully labelled and stored in the patient's chart.

Properly performing this procedure provide the nurse and 1 with some comfort because we knew that proper performance would likely provide safety from legal recourse if the baby was born with any problems.

The nurse and I also gained reassurance from the EFM records. The almost five hours of continuously recorded FH rates had not demonstrated any changes in the FH rate that we considered indicative of fetal problems.

2) In this intervention procedure, the EFM was used continuously in what the nurse and I saw as a "man" made situation: (i.e.) labour controlled by a hormonal infusion. We no longer saw the woman in a "natural" state (pregnancy) or proceding "naturally" through the birth process.

As a result, we subverted the individual woman and her particular needs to the needs of the procedure. For example, she was allowed "time out" to visit the washroom, otherwise the procedure was continued uninterrupted. In addition, we allowed the procedure to continue if and only if the EFM proved fetal health.

Inductions and the EFM

If the EFM seems obscure in the above example and in the discussion that followed, it is because the EFM is, in fact, deeply buried in these obstetrical procedures. The obscurity of the EFM in these instances demonstrates the difficulties of answering the question: Why was the EFM used in Invermere? Answering this question involves answering further questions such as, Why were



doctors and patients willing to interrupt pregnancy at a certain stage? Why do they believe certain statistical information?

EFM use during inductions was popular among Invermere nurses because it helped them to eliminate a great deal of the tedious work of these procedures -- monitoring uterine contractions and the FH rate. This freed nurses, who still needed to remain with patients continuously, to perform various other tasks which now included monitoring machines.

Although EFM use during inductions was popular among Invermere nurses, almost all of the nurses were intensely against inductions themselves. This can be seen in the above example where the nurse was hostile towards me, this procedure, and the EFM. This was typical of nursing attitudes in Invermere. Some nurses refused outright to perform inductions. Others, while not directly refusing to perform them, instead, refused to come to work at all if an induction was planned. Most nurses had practiced obstetrics quite successfully without these procedures and wondered why they had suddenly become necessary. Nurses particularly challenged doctors who wished to induce women considered "overdue". These women, the nurses believed, would start labour "on their own". Doctors interested in starting labour were seen as "impatient", at best, and "meddlesome", at worst.

After witnessing a complete induction, such as the one in the example above, I understood why Invermere nurses were so reluctant to perform these procedures. As a doctor, normally I would not have remained in attendance, but I was also observing this particular procedure as an anthropologist. The above example was the first complete induction that I had witnessed. I had been in attendance at the

start of many other inductions. However, after about twenty minutes, I had always left to complete other work elsewhere in the hospital.

Similarly to Invermere nurses, I found it very difficult to watch a pregnant women undergoing an artificially induced labour, even if I considered it necessary to induce the labour for the patient's own good. EFM use, while continuously providing reassurance regarding fetal health, did not diminish my dislike of myself for ordering this procedure. In some ways EFM use made matters worse because its application was another thing "done to" a pregnant woman; a pregnant woman who would not be in this situation at all if I did not apply a normative framework to the length of her pregnancy. Moreover, EFM use also seemed to make matters worse because it captivates the attention of patients and professionals making women and women's needs more obscure.

In summary, from the time of its arrival, the EFM became an intricate component of hormonal induction procedures. In as much as these procedures were performed the EFM was used continuously to monitor and record these activities. EFM use helped to reduce some of the tedious aspects of these procedures and to make them safe for the fetus. Despite EFM use, inductions remained as distinctly unpopular procedures in this hospital.

III. Augmentations of Labour and the EFM: Taking Hold of the Fetus, Manipulating a Pregnant Woman

Augmentations occurred in Invermere if there was a diagnosis of "failure" or impending "failure" of the delivery process to progress at a normal rate, called "failure to progress".

"Failure to progress" had always been by far the most common reason for Invermere doctors to intervene during birth. In the past, however, interventions were limited to forceps or operative delivery usually in the final moments of birth. Until the first augmentation in 1983, there were no systematic attempts to intervene earlier in labour to get the labour process going if stalled, or to get it going better if considered too slow. A few things were tried, for example position changes, or encouraging a patient to walk. For the most part, though, without hormonal augmentations, labour was largely beyond medical control.

With the introduction of oxytocin infusions and infusion pumps, doctors in this community were able to impose time limits on all parts of labour including rates of cervical dilatation and fetal descent. This framework, shown in Figure 8 as Friedman Curves, was based on statistical description of labour length averages.

Starting in late 1984, two of the three Invermere doctors working in obstetrics at this time, took on a more "active" role in the management of labour; meaning they were increasingly willing to force labour to conform to obstetrical time frames. This active management of labour approach, which became increasingly common throughout the regional district at the time, reflected what was considered very successful obstetrical care in an Irish Obstetrical Center, and associated with an obstetrician named O'Driscol. One of the invermere doctors called O'Driscol's "active management scheme" his "bible".



<u>Figure 8</u> Friedman Curves. Labour course divided functionally on the basis of expected evolution or the dilatation and descent curves three divisions: a prepatory division, a dilatation division, and a pelvic division when birth actually occurs (after Cunningham et al, Williams Obstetrics 1989:221).

Once a definition for proper length and rate of progress for labour was established, and if a "safe" -- meaning safe for the fetus" -- tool was available to make labour conform to that definition, it became malpractice to "allow" women to drift outside that framework. The major risk seen to women was that they could become "unnecessarily exhausted" and possibly need operative delivery. The major risk seen to the fetus was that "too long in labour" meant an increased likelihood of fetal hypoxic damage. The major risk to professionals was lawsuit if a baby was born with problems considered to result from the "stress of prolonged" labour.

During augmentations, doctors and to a lesser extent nurses differentiated fetal "performance" from that of a pregnant woman. For example, the fetus could be seen to "succeed" or to be healthy even when a pregnant woman, specifically her delivery process, was seen to have "failed".

Augmentations were started on a highly variable basis within this community

and throughout the regional district³. For the most part, in Invermere, two of the four doctors practicing obstetrics there at the time, accounted for most of the augmentations of labour. One augmentation occurred early in 1983, and then no others until late 1984 when the frequency suddenly increased. Table 3 shows the augmentation incidence.

TABLE 3

Incidence of Augmentations in Invermere

Year	Augmentations	Births
1983	1 (1%)	113
1984	9 (10%)	92
1985	14 (17%)	84
1986	5 (7%)	69
1987	2 (4.5%)	45
1988	6 (13%)	64
1989	2 (4%)	54

Once a diagnosis of "failure to progress" was made and an augmentation was to commence, then the same procedure was followed as with inductions. The only difference was that, with augmentations, the EFM was usually attached using the internal monitor wire, whereas with inductions the external sensor was usually used. In both cases, the procedure occurred if, and only if, the EFM demonstrated a healthy fetus.

Augmentation continued as long as needed to keep labour progressing within normal limits or until delivery occurred. Occasionally, an augmentation would restart

³ My experience was that the most rigid framework was imposed by obstetrical specialists in tertiary care centers, followed by general practitioners in these major centers, then followed by doctors in regional centers such as Cranbrook. In Invermere and the other peripheral or primary care institutions, the young doctors were the most rigid and the more senior doctors the least rigid.



a stalled labour and it could be discontinued as labour proceeded on its own.

In the following example, a woman was augmented during the final moments

of birth. The patient and doctor were both aware that I was studying this case as an

anthropologist. It occurred in 1986, the third year an EFM was used in

Invermere.

Only the husband notices that I have entered the already crowded delivery room. He turns and looks at me from behind his mask as I slip in the door, move behind the head end of the birthing bed, duck under several suspended electrical cords and anaesthetic hoses, and slip between the EFM and the incubator to get nearer to the patient. The woman on the birthing bed, both nurses, and the doctor are all looking the other way towards the foot of the table. I arn met by a loud chorus of voices:

> That's it. Hold it. Push hard. Don't waste it.

Come on T., push. I can feel the baby's head now. You can see the baby's hair if you come around here and look. Good push T., hold it, hold it, take a big breath in and push again".

I notice T.'s face is swollen and bright red from the strain of pushing. Her lips turn a bit blue before she finishes pushing and loudly exhales the air from her bursting lungs.

The contraction ends. Everyone relaxes. T. lets go of her shins which she has been pulling against and lowers her legs onto the birthing bed. Meanwhile her husband, who has been holding her forward, lets her roll back against the pillows. One nurse applies a damp cloth to T.'s forehead, while the other nurse switches on the EFM.

The room is silent now except for T. sipping from a cup of icewater. The room is suddenly filled with the steady loud EFM productions of fetal heart contractions. The EFM sounds accelerate from 120, to 150, to 165 beats per minute before settling back down to 12O/minute.

No one says a word. The pregnant woman and her husband glance at one another. The nurses and doctor go about their work separately, while listening to the EFM.

The silence is broken by the doctor: "That's enough. Turn that thing [EFM] off please". He continues: "O.K. T., you've got to listen to me now. I'm going to tell you how to push. You're doing great but we just can't waste any more contractions. When the next contraction comes, let it build up until its really strong, then, take a big breath and push as long and as hard as you can. If you still have some contractions left after that, take another big breath and push until its over. I think you are starting to push too soon so you aren't getting the maximum amount out of a contraction."

A few more contractions occur over the next twenty minutes, all much the same. The EFM is run through a couple of contractions to check for FH decelerations. An internal monitor wire makes intracontraction recording possible. An intravenous infusion of oxytocin hormone is augmenting uterine contractions.

Eventually the doctor leaves the delivery room. I join him down the hall at the nursing station.

The doctor exclaims "We're not getting anywhere. I've had her pushing for over 2 hours now. At least the fetus is doing fine. What did you think of the tracings?

Seem fine to me. Tell me, do you often stay in the delivery room and coach women to push?

Sometimes I do. I don't make a habit of it, if I can help it. They called me when she was fully (dilated) and I came over after the clinic, so I was here anyway. Why?

I was just wondering how you learned to tell a woman to push? I guess it was from watching the way deliveries were handled when I was a student.

Do you think women themselves might know how to push?

No, I don't. They don't know anything about mechanics and physics. I know physics. I know about the mechanics of labour.

Do you mean that you see delivery as a process of applying a linear force against a set resistance, such that the greater the force, the better?

That is certainly how I see mechanics, but I know that labour isn't that simple. I think, the shorter the labour, the better it is for the woman. I know that resistance changes. What are you getting at?

Do you ever wonder if labour works differently? For example, have you ever tried to compress a pneumatic cylinder quickly?

I see, you are asking if a longer steadier force may be more effective than a sudden explosive force. I'll think about it. I hate it when you ask me these questions. I'm starting to doubt if I know anything."

We continue to casually chat about clinic business for another half hour. Then, one of the nurses pokes her head around the corner:

We need you now, she is ready to deliver." I couldn't help but notice the twinkle in her eye and her smug grin.

A healthy baby was born a few minutes later. The doctor and I both noticed that the augmentation had been s^{+} opped. We both wondered how long it had been off, but neither of us bothered to ask.

Discussion:

This doctor and I returned to this conversation and discussed the management of this case several times over the next four years. While his astonishment over his arrogance grew over time, more striking was his use of this case over and over again not only to confront his assumptions about obstetrics, but also his assumptions about other areas of medicine as well.

He managed this case correctly according to local and national professionals standards. According to those standards this woman had been in the "pushing or delivery" stage of birth too long and something needed to be done.

The attending doctor reasoned that: "the mother's mechanical system has failed, however, her life support system is still functioning adequately so let's push the labour to continue" (but at his pace, and at his command). Furthermore, he reasoned that, if the EFM showed the fetus was "OK", then the mother must "endure" the increased pace and intensity of the augmented labour. She must endure this because the alternative was for the woman to face either an operative delivery or, if the surgeon was out of town or unavailable, an ambulance transfer to another hospital.

As the augmentation continued, with the EFM showing a healthy fetus, this doctor found himself asking "how much longer can I allow this to go on? Should I let the baby stay in there and continue to risk damage?"

This doctor explained that this procedure was "for the good of the mother and the fetus". He said to this woman: "your labour has quit. The baby is getting tired. It cannot wait any longer to be born. Your labour is too slow. You have tried your best, now we have to give nature a hand."

Therefore, this woman was not only seen to be separable from her fetus, and that she could be manipulated for the good of her fetus, she was being characterized as a threat to her fetus as well. This practitioner, taught to fear for the fetus in labour and held responsible for its future health very easily turned against this woman, seeing her as the problem: as weak, or inadequate, or failing her child.

No one asked this women whether she wanted to be augmented. This was in part because, as this doctor knew, her answer would be πo.

It is very difficult to imagine a circumstance where a woman would ask for labour to intensify. I believed that I knew what was best for this woman, and more importantly, for the fetus.

An augmentation was begun and continued for about an hour. When it was seen to be ineffective, the doctor left the room. There was nothing else he could do at the time. It so happened that the surgeon was out of town and the baby was too high for forceps application, therefore he had done all that he could under the circumstances, and in the end, all he could do was wait.

The conversation between this doctor and myself therefore permitted him to discuss and to justify his case management decisions and activities. He was very comfortable and familiar with this portion of our conversation. The point at which he began to doubt himself and to doubt if he knew anything was when I began to ask him about his assumptions regarding birth and the delivery process. At this point he recognized that he did what he did because he had seen others doing it this way during training. The specific question regarding the "mechanics" of birth similarly exposed other long held assumptions.

Later in the day he made a point of finding me and talking more about augmentations. He was no longer talking about this case or his decisions in it.

Instead, he was eager to talk about these procedures and how they made him feel.

He was extremely dismayed and discouraged.

I felt brutal, inhumane. She was exhausted and frightened. Believe it or not she is also a friend of my wife. I felt like I was whipping a dying horse.

He explained his dilemma in these procedures:

I never think that the fetus is in any real danger. In fact, the EFM always shows it to be healthy. The problem usually is that a woman is in the second stage [the time of delivery] for too long. I have to act even though I don't think it is necessary. If I phone a specialist, ne would tell me the same thing: get on with it, get it over with. We would all be better off if the nurse didn't call me. Once I'm involved, I have to act.

All Invermere's doctors and most of the nurses had practiced obstetrics without augmentations and they all knew that many labours would proceed successfully if they left the labouring woman alone.

The problem for this doctor was that, during these procedures, he was taking direct action as the fetal champion. He was taught to characterize labour as a struggle between a mother and a fetus over scarce resources like oxygen supplies and space. He was also taught a certain amount of fetal biology, at least enough so that, as a doctor, he was one of the local experts in this regard. As fetal champion, armed with EFM mediated fetal biological facts, he saw himself as holding the high ground around which this pregnant woman was manipulated. Any difficulty between himself and this woman, or between his concerns and standards of obstetrical care were easily translated into this assumed struggle between a woman and her fetus.

I know from my own medical experience, that augmentations were almost irresistible opportunities for doctors and nurses to behave badly: to assert themselves, to be arrogant or cruel, to be impatient, to project their fears onto patients, to take out their general job frustrations on a particular individual. For example, in the middle of the night, overwhelmed with exhaustion and growing responsibility, it was almost impossible not to reason: if the EFM proves the fetus is healthy, then "let's augment this woman and get this labour over with."

I know that augmentations were performed, at times, for the needs of doctors, not patients. Invermere doctors fully recognized this, and while not liking themselves for what they did to women, they justified their actions as necessary to their own survival in rural general practice.

Invermere nurses also hated to perform these procedures. Nurses had no voice in deciding whether or not they were necessary and they had little effect on how the procedures were carried out once they had began. Their only option in preventing augmentations was to refuse to call the doctor until after the time when an augmentation could be performed, which some nurses did.

Invermere nurses hated augmentations because they saw themselves as acting against pregnant women. They saw augmentations as "cruel", "unjustified", manipulations of pregnant women. Nurses angrily accused doctors: "We are the ones who turn up a valve and make women suffer. We have to sit for hours with women in pain, not you (doctors)."

Nurses did not believe the reasons doctors used to justify augmentations. They argued from their own experience in which no women or fetuses had ever been seen to suffer because an augmentation was not performed. They said: "Mothers and babies know what they are doing. Leave them alone. Babies will come when they are ready." In contrast, whenever they performed an augmentation they often spent hours with a woman that they saw unnecessarily suffering.

Similarly to inductions, EFM use in these procedures did not make them any more popular among nurses. For many nurses, who disliked the EFM as well as these procedures, EFM use actually made matters worse.

In summary, continuous EFM use became a central feature of complex, emotion filled procedures, which often lasted many hours. Understanding the EFM and its place in obstetrical cases, obstetrical care, and hospital events, requires careful study of these prolonged and difficult procedures, not simply the effects of the EFM on measurable case outcome.

IV. The EFM and Intensive Obstetrical Care

Invermere doctors initiated EFM use in an additional ten to fifteen percent of obstetrical cases each year. In these cases, serious problems had arisen with the health of the mother or the fetus, or the labour process itself had developed difficulties.

In many of these instances, doctors were poised to intervene in birth, through either forceps application or performing a cesarean section operation, and the EFM was used continuously to monitor the status of the fetus. At times, the condition of the fetus was the primary determinant of the timing of an intervention. At other times, different problems had developed making interventions necessary.

The EFM in intensive obstetrical care, similarly to its place in inductions and augmentations, was found to lay deep within hospital obstetrical traditions. Two examples will be used to show the place of the EFM in intensive obstetrical care.

Both examples are relevant to the discussion regarding the costs as well as the benefits of EFM information. Both examples show how the EFM, at times,

becomes part of what I will call an "intervention paradox"; a situation where EFM demonstrated fetal health encourages rather than discourages interventions in birth. This paradox is shown to worsen over time, as patients and practitioners recognize continuous EFM demonstrated fetal health, and wonder why they are allowing the "healthy" fetus to face "the perils of birth".

The first case occurred in Cranbrook where I conducted anthropological research in 1988. Because of a shortage of doctors that day and because I had also worked in this hospital, I became directly involved as a doctor in this case. My

primary activities, however, were as an anthropologist.

Dr. K. and I leave the doctor's lounge where we are having a morning cup of coffee and make our way toward the obstetrical ward. An obstetrical nurse called moments before and asked Dr. K. to come to the ward to read an EFM strip she was concerned about.

As we climb the stairs, Dr. K. explains that he doesn't know the patient we are about to see at all. He happens to be "on-call" today. Her doctor is out of town. He tells me she is having her first baby and came into hospital shortly after midnight. She had an EFM recording on admission that was "reactive", or normal. Now, at 0900 hours she is two centimeters dilated, [still very early in the labour process].

Arriving at the second floor we walk directly to the nursing station and pick up the EFM strips. The head nurse meets us at the desk, out of earshot of the labouring woman, 40 or 50 feet along the corridor in a labour room.

The head nurse says: "It looks bad to me. Every time she has even a moderate contraction the rate dips again. I think she will have worse decelerations once she gets going."

Dr. K. and I look at the strips. The worrisome pattern includes a monotonous fetal heart rate and some slowing of the heart following contractions.

Dr. K. says he isn't sure about the monitor strips, especially because it is recorded using an external sensor. He asks the local obstetrician to attach an internal monitor wire to the fetal scalp.

I notice the pregnant woman and her family peering at us from the labour room. They see that we are reading the EFM strips. Looking at them, Dr. K. whispers sternly, "You wouldn't believe it Ken, her doctor told her all along that she has a small pelvis and that she likely would need a cesarean section. Then he leaves town with me in charge. I mean, it is his day off, but what am I supposed to do? They are already asking me why I'm delaying the operation?" Shortly after this conversation Dr. K. and I leave for the clinic a few blocks away. The obstetrician successfully attaches an EFM wire at about 1000 hrs. He does not recommend a C-section based on the subsequent EFM tracings.

At noon the patient was given an epidural anaesthetic to control her pain. The family remained vigilant and very concerned about the fetus. They had to be constantly reassured, using EFM recordings, that the fetus was doing well. They continued to question why an operation was not being done, especially in light of the woman's slow progress. While constantly reassuring the family, Dr. K. and the nurses both continued to be concerned about the EFM tracing and their ability to defend themselves in court, if the baby was born damaged. For example, they noted some decreased variability on the EFM tracings, [considered an indication of fetal distress]. It was not, however, significant enough to warrant a C-section.

Between 1300 and 1500 hours an augmentation procedure was performed. The EFM continued to be interpreted as equivocal, until about 1500 hrs., when some definite and prolonged decelerations occurred. At this point, the augmentation was stopped and a C-section was ordered.

Two more hours passed before the operation actually occurred. In the doctor's change room just prior to surgery, we discussed the case.

Dr. K.: "What can you do? I resisted a C-section all day. The family was driving me crazy. They think I'm an idiot for not doing the operation this morning like their doctor predicted. I feel like I've gone way out on a limb just trying to get this woman to have her baby vaginally. What could I do this morning, just order a C-section because the family thought that they needed one? I guess I should have just done it earlier. The tracings weren't great, but they weren't bad either.

The Surgeon: "Its just a bunch of little things. The tracings, the family's expectations, the failure to progress. The biggest thing is this family will sue us if anything is wrong with this baby. We just have to act. The EFM records had one or two decelerations, but most of the tracing has been reassuring, if anything. This family was just waiting for something to go wrong. If anything goes wrong we're cooked."

We move into the operating room where the surgery proceeds in silence. The pregnant woman is awake and alert, anaesthetized through her epidural catheter. Her husband is sitting by her side next to the anesthetist. The operation proceeds uneventfully. The mother remained awake throughout and heard her baby's first cry. The baby is found to be alert, healthy and active. No resuscitation was required.

Discussion:

The doctor, nurse, and family were all tormented by and angry about many aspects

of this case and the care this woman received. I will discuss one issue: the attempts by the

doctor and nurse to control the various risks to themselves and to this patient by applying more and more procedures ending finally in a cesarean section operation. The point is not to justify medical actions or inactions, rather, of interest is recognizing the multiple ways that the EFM was used by both patients and practitioners.

In an attempt to control his fear of lawsuit, to appease this family, and to help structure the nurse's ongoing patient contact, the doctor ordered and the nurse administered a number of procedures. These included EFM monitoring, augmentation of labour with a artificial hormone, epidural anesthesia, and finally a cesarean section operation.

Almost from the time of arrival of this patient on the obstetrical ward, she was part of activities designated as obstetrical procedures. She was not left to "go through" labour "on her own". Instead, she was taken up into timed, ordered, routines, where she could be measured and carefully situated within normative obstetrical frameworks. This doctor and nurse followed the protocols because they knew that, while they may not necessarily be able to deliver a perfect child, their best defence was to enact, as much as possible, a sequence of perfect procedures.

The EFM was used continuously to demonstrate fetal health. Similarly to inductions and augmentations, fetal health, particularly fetal neural oxygenation, was established as a necessary condition prior to and during these procedures.

The obstetrical care of this patient was determined by various obstetrical time frames, procedural routines, and action imperatives; action imperatives derived from national and to some extent international standards of care. The implementation of these profession-wide standards were balanced against this woman's personal expectations and local constraints. The local constraints included the absence of the woman's own doctor

and the presence of doctors prepared to perform a cesarean section operation.

EFM use helped to create a paradox in this case because, aside from a few moments when the FHR decreased, the EFM continually demonstrated that the fetus was healthy. As a result, the patient and her family, who were already concerned regarding this woman's ability to give birth, continually insisted that a cesarean section should be performed. Similarly, the doctor recognized a growing responsibility for the ultimate condition of the fetus, in part, because the EFM demonstrated a healthy fetus facing the repeated stress of the birth process. The doctor expressed his dismay near the end of the example when he asked rhetorically, if his job was to perform a cesarean section whenever patients thought that they would have problems in birth?

The longer the doctor waited to intervene, the more likely he could be blamed by the family if the baby had neurological problems. The mounting pressure to intervene was paradoxical because the EFM was demonstrating that the fetus was healthy. In other words, the longer the doctor waited from the time that fetal health was proven, the more vulnerable he was to blame for inaction. The argument is that the doctor "allowed" the birth process to continue jeopardizing the health of the fetus.

In the end, a cesarean section was performed more because of mutual exhaustion both on the part of the patient and the professionals involved. What determined care in this instance was confrontation, anger, fear, and frustration on everyone's part. The EFM was part of this whole process. However, its interpretations neither dominated nor largely determined the course of events. Instead, a far more complex mixture of personality, and deeply felt emotions determined professional and patient conduct.

The EFM in Intensive Care: A Second Example

A second example of EFM use in intensive care is presented because, unlike the first example, it situates these difficult cases within the professional career of a doctor. The professional career of a doctor, similarly to patient expectations, was found to be an important determinant both of whether or not an EFM was used and of how its productions were interpreted and applied in obstetrical care.

The point is not to dwell on the details of this case or on a professional career. Rather, of interest is that, even in intensive care situations where EFM information is considered critical, its interpretation often comes down to whether or not the practitioner involved "believes" that the fetus is healthy or not. His or her belief, in turn, is a reflection of self confidence and whether or not he or she is willing to "take a chance" and to allow the birth process to continue.

This example is reconstructed from my personal diary and discussions with this family in the weeks and years subsequent to this birth.

In the mid-afternoon in the early fall, I was working on the wood pile near the back shed when I noticed a friend ride up the driveway on his

bicycle.

"Doctor Ken, I'm glad I found you home. It looks like this is it. J. has been having regular contractions for a few hours now".

"How about that. How is she handling it?"

"Fine, so far. Some friends are staying with us. They are with her now. We were wondering what to do. Could you drop over?"

"Sure. I'll clean up and get my things."

Arriving at their home, I noticed that they only had a few finishing touches to add to their new addition; I had watched the addition's progress, even helped a bit with some of the work. I found J. upstairs in the bedroom of this new part of the house.

"Hi Doc. So this is labour, huh? Here comes another one." I rub her back, as directed by her, through the duration of the contraction.

"You sure look like someone in labour. Are they getting stronger?" "Off and on. They were stronger right after lunch, then they eased off. They're building up again now. They were strong enough to keep me up all last night, though."

After talking a few minutes more, I check various things including blood pressure, fetal heart rate and cervical d'latation. We then head downstairs and out to meet the others on the back patio.

"Doc. says I'm just started. What a jerk. Anyone want to take over from me for a while?"

After some lemonade I return home promising to return after supper.

I returned after supper and again near midnight noting no particular problems, but little progress towards delivery either. J. refused my offer of coming into the hospital. She said she would come in during the night if the pain got too severe.

I awoke early the next morning surprised at not being disturbed. After checking with the hospital to see if J. had come in during the night, I drove to their home to find J. snoozing on the couch, her husband asleep upstairs in the bed. and their friends absent (home getting some rest).

J. appeared tired and discouraged. She still felt the baby kicking and her contractions seemed about the same. She didn't feel like she was getting anywhere and wanted to give the hospital a try. Her husband, who nad wandered downstairs, seemed relieved at the idea of hospitalization.

An hour later in the hospital, I sat on the side of the bed with J. sitting beside me and her husband in the chair opposite. I had interpreted an EFM record which showed a healthy or "reactive" pattern.

"What now, Doc?"

"More waiting. Its up to you. How is your strength?"

"I'm bagged. Give me a shot and let me sleep."

By mid-afternoon, no progress had been made but J. was more energetic, so we agreed to reassess things in the evening.

By early evening, there was still no progress. The contractions had become markedly more painful, but no more effective in causing dilatation or descent. The EFM was used to check the fetal status every hour or so. The father and I leave the labour room.

"She is hurting, Doc. She is really hurting. She is the toughest person I know, and I know a lot of tough people, so she must be really hurting. She is crying in pain."

As the general practitioner in charge, I gave J. a general anaesthetic, while the local surgeon performed a cesarean section operation. At 9:00 p.m. a healthy baby was born.

In the end, through my exhaustion all I could feel was relief that both mother and child were healthy. There was no satisfaction at a job well done. Rather, I felt that I had gotten away with something; things had turned out, but not because of anything that I had done.

What I remember most vividly from this case were the first few moments in the recovery room, when J. was still semi-conscious and her husband and I were silently standing together at her side. I remember an



overwhelming, an almost intolerably strong, feeling of responsibility; a feeling so strong that I thought I would begin to physically shake. It was then, or shortly thereafter in similar, often obstetrical, circumstances that I realized I would not last long in rural general practice. It was just too much. One case like this a month would be OK. One or two a week, or sometimes in one day, was too exhausting.

In almost every respect, this birth process had extended beyond obstetrical time frames; time frames associated with action imperatives. For the final seven hours, for example, this patient was in what is termed in obstetrics, the delivery or second stage of birth, normally limited to a maximum of two hours. I did not intervene because, on the one hand, I believed that the fetus was healthy, a belief confirmed using the EFM. On the other hand, I believed that this patient and her partner would never hold me responsible for fetal outcome. That is, they recognized that the obstetrical care they received was care that they had agreed upon. I could easily have initiated interventions earlier if I had cited evidence that the length of a portion of the labour process could be potentially harmful to the fetus. I was confident at the time, and both the patient and ner partner admitted later, that they would have accepted my advice and agreed to an earlier cesarean section. Instead, I decided that it was particularly important for this patient to continue the birth process until she decided that she had given her full effort. The EFM fit into my orientation to this birth because I was able to use it to show this woman that the fetus was healthy.

The EFM was interpreted in keeping with, among other things, my attitude to obstetrical care at that point in my career. Earlier in my career when I practiced obstetrics more in keeping with obstetrical standards learned in training, I would have intervened in this birth, perhaps using the EFM as justification. The point is that, while changes in my approach to obstetrical care clearly reflect obstetrical knowledge and local standards, my personality and personal experiences are also a factor shaping EFM use.

V. Inductions, Augmentations, and Intensive Care: the later years

Inductions and augmentations both diminished rapidly by the end of 1986 largely because obstetrical teaching throughout this regional district had swung to a different framework for pregnancy and birth; a framework more flexible temporally but more restrictive in its insistence on maintaining fetal health; fetal health demonstrated through EFM testing.

Regional obstetrical specialists taught and Invermere practitioners learned that, with an EFM record interpreted as normal, it was unnecessary to intervene either to start labour or to push labour along more quickly. For example, an EFM test could be performed once a week on a patient considered past the expected date of birth, and, if the test was considered normal, she could be "left" to continue pregnancy without concern for "harming" her fetus. I describe these prognostic uses of EFM techniques in detail in the next chapter.

Hormonal inductions stopped altogether in part because inductions of any kind became less often necessary, but also an alternate means of inducing labour became more popular⁴.

An augmentation occasionally was tried if: 1) delivery was imminent; 2) a woman seemed exhausted; 3) the EFM showed a healthy fetus, and 4) vaginal birth seemed likely. Most often, though, in keeping with the new laxer obstetrical time frames for the birth process, if a woman's labour stopped or slowed, she was left to restart labour on her own, at her own pace, as long as the EFM showed fetal health.

Intensive obstetrical care continued at approximately the same rate each year - ten

⁴ This other induction method involved applying a material directly to the cervix and leaving the women to go into labour on her own. These procedures did not involve the EFM.


to fifteen percent. By 1988 and 1989, the primary difference in these cases was that

doctors often actively avoided EFM use unless they believed it would help substantiate their

planned obstetrical management.

An example will be used to demonstrate why doctors tried to avoid the EFM.

I joined Dr. J. to examine the patient at around noon, the 5th hour this patient had been in labour. The nurse was already in the room trying to help the patient cope with the contractions. The patient was in bed positioned on her side screaming with every contraction. After a few contractions, Dr. J. tried and failed a vaginal examination because the contractions were only a few seconds apart.

When Dr. J. finally examined her he found that she was nearing the delivery phase of birth and that the baby was quite far down in the birth canal.

Returning to the desk, Dr. J. says: "I haven't asked for the monitor, Ken. [to the nurse] Have you used the monitor?"

"No, only my ears".

Dr. J. explains: "I wouldn't want to look at an EFM strip right now the way her labour is going. She is having so many contractions that I would be surprised if she isn't having variable decelerations [considered indicative of fetal distress]. A baby can go for two hours with variable decelerations without having any damage. I'll check her again in a few minutes. I don't want to use the EFM, I just know that I would have to order a [cesarean] section. She is young and healthy and doing well and shouldn't need a C-section. We had a case on the tele-conference where the contractions were coming so close and so hard that the fetal heart actually stopped. That baby did very well.

A few minutes later the nurse joins us at the nursing station. Dr. J. asks: "How is she doing?"

"Fine, except she is scared, really scared. I haven't seen anyone like her that is so scared of what will happen. Her vagina is very tight. It will take her hours to have this baby.

A few hours later the contractions have slowed. The nurse was working very hard with the patient. Dr. J. returned and attached the EFM using the internal sensor. Everyone stared at the monitor or at least listened to it's sounds.

The EFM demonstrated only mild slowing of the FH with contractions. Dr. J. was reassured and no interventions were ordered. A spontaneous birth occurred about an hour later.

Discussion:

In this example the doctor only applied the EFM when he wanted to know EFM

information. That is, early in the birth process, when he was not prepared to intervene, he refused to have the EFM attached. Later, when he was prepared for more minor interventions such as the application of forceps, he gathered EFM information.

Avoiding the EFM altogether became a common strategy used by Invermere doctors. The reasons for avoiding the EFM are multiple. Generally speaking, the doctors became more confident that, if a mother and fetus had been healthy throughout pregnancy, then they are likely to do well during birth process. Invermere doctors had also become more aware that gathering EFM information was not always beneficial. This information could have a cost as well. In the example, the information could have "forced" the doctor to intervene in birth on behalf of the fetus. In many ways, avoiding use of the EFM was a return to the thinking that dominated Invermere obstetrics in the 1970s. At that time doctors believe that healthy women would have healthy labours and healthy babies. They preferred not to know the moment to moment condition of the fetus.

VI. Summary

During inductions, augmentations, and intensive care procedures, the EFM was used to establish and demonstrate fetal health. In other words, EFM use to demonstrate fetal health was a necessary condition for these procedures to occur.

The reasons for performing these intervention procedures and the roles of EFM demonstrated fetal health in these procedures were complex and varied over time. Examples were used to demonstrate how doctors and nurses used EFM demonstrated fetal health to justify both interventions and avoiding interventions in birth. Particular attention was paid to the problems professionals faced balancing their knowledge of obstetrical norms with individual patient expectations and wishes.

Chapter 5

The Nonstress Test: EFM Assessment of Fetal Health Prior to the Onset of the Birth

Introduction

In this chapter, I examine Nonstress Tests (hereafter NSTs), a third type of EFM use in Invermere obstetrical care. Unlike the first type of EFM use examined in Chapter 3 -- in which nurses occasionally used the EFM during birth as a screening device -- for NSTs doctors ordered EFM use prior to the onset of birth to assess specific problems in individual cases. Use of the EFM during NSTs also differed from EFM use during obstetrical interventions, described in Chapter 4. In the latter instance, the EFM was used to monitor the immediate effects of obstetrical interventions on fetal health. During NSTs, in contrast, the EFM was used prior to birth to predict the future effects of intra-uterine "life" on the fetus.

NSTs were, at first, limited to a few instances in which pregnant women had sensed problems with, and had approached their doctor regarding, the health of their baby. While NSTs continued to be used roughly once a month in response to these maternal concerns, NSTs also became much more commonly used as part of a new dimension of obstetrical care designed to manage the fetus during pregnancy.

Managing the fetus during pregnancy was different than "knowing" the fetus. Managing the fetus meant, in part, that doctors, nurses, and pregnant women became involved in public (that is, hospital based) activities where they created and interpreted information on the fetus. In addition, both professionals and patients took these activities as times when they were acting in relationship to the fetal "object" and

its needs. In other words, during NSTs, they saw the fetus as forming an independent practice variable around which activities were seen to operate, and for which they were demonstrating increasing responsibility. At the same time, during these tests, pregnant women became the dependent variable; meaning that patients and practitioners were equally willing to push women into a background position and to suspend their needs in the interest of fetal health ideals. In short, NSTs became oportunities to hold the fetus above all else, and to publicly assess the adequacy of a uterine environment to fulfill fetal needs.

The goal in this chapter, similarly to the goal of the previous two chapters, is to explain why NSTs were used in Invermere obstetrical care. The answer for NSTs. similarly to the answer for screening and intervention uses of the EFM, involves much more than the success on NSTs in either discovering hidden biological problems or helping professionals to improve obstetrical outcome. For example, during the seven years of this study only one NST was interpreted as abnormal, and no obstetrical interventions were initiated because of this one abnormal test or any other NST. The reason why NST became more common in Invermere was because they fit with a growing tendency in obstetrical care to appear to be managing pregnancy in terms of fetal needs. Managing pregnancy in terms of fetal needs, in turn, was the product of several converging trends, including various forms of technologically mediated fetal exposure, advances in care of premature infants, increasing women's self-confidence, and expanding community expectations regarding women's behavior during pregnancy. The NST therefore became, not only a way to test fetal health in the womb, but also an opportunity for doctors and patients to display their concern for fetal health and fetal health ideals.

NSTs are important to this discussion for several reasons. First, understanding why NSTs were instigated completes the explanation of why an EFM was used in Invermere obstetrical care. Second, similarly to screening and intervention uses of the EFM, understanding why NSTs were established further refutes authors who see technology such as the EFM as the cause, rather than the result, of changing historical and social processes. Third, understanding the historical and social processes leading to NSTs will shed further light on various issues discussed to this point, particularly the problem of medicalization and its relationship to social control.

In this discussion of NSTs, I further problematize the notion of medicalization by examining the extent to which NSTs were "medicalized", or considered by patients or professionals to be part of a medical domain. In Chapter 3, I introduced the idea that EFM use during screening primarily resulted in "translation", rather than medicalization of women's physiology. For example, I showed that pregnant women and nurses predominantly interpreted screening EFM use in terms of collective understanding, rather than authoritative obstetrical knowledge. In this chapter, I similarly explore NSTs to see the extent to which Invermere patients and professionals were operating in what they saw as a collective versus a medical domain. I explain that NSTs, rather than strictly medical events, were times for personal, professional, and community displays of concern for the fetus.

In problematizing the extent to which NSTs are part of an exclusive medical domain, I raise several issues. The most important point is to challenge those authors, for example the sociologist Arney (1982), who follow a Foucaultian vision of medicine, and assume that authoritative knowledge plays a key role in determining

the meaning of medical events or the course of medical care.

Arney claims, for example, that obstetrics, along with all other medical specialties, went through a wholesale transformation in thought and action following the second World War; a "new logic and a new metaphor changed the conceptual basis of medicine" (Arney 1982:8). The old system: of understanding, based on professional assessments of normal and abnormal, was replaced by the "monitoring" era; an era Arney sees as remaining active today, in which professionals are seen to emphasize gathering ongoing information on the condition of patients, rather limiting patient contact to times when doctors diagnose and treat. Arney understands the EFM as fitting within and promoting this new medical order, resulting in expanded professional knowledge and power (1982:99-154).

Arney perhaps correctly identifies radical changes in the basic metaphors and concepts that were used in obstetrical writing following the second world war. However, the extent to which these writings reflect actual obstetrical care is highly questionable (see also Hahn 1987). In particular, Arney nowhere examines the making or using of knowledge in hospital birth with respect to relationships of power. In examining NSTs, I found that the EFM and its productions were not used to expand medical knowledge and power over pregnant women. In fact, NSTs were used in the opposite role, to justify decreases rather ihan increases in obstetrical care. The importance of NSTs, as I will explain, was not in their contribution to, or invoking of, authoritative obstetrical knowledge. Rather, NST importance lay in their establishment of public (that is, collective and shared) contact with the fetus during pregnancy. In other words, NSTs represents more what Foucault (1979) describes as the pre-Modern era (before 1800), where public displays demonstrated sovereign

(collective) power over the body of subjects, rather than collective power hidden with professional knowledge of the body.

I. The Nonstress Test (NST)

The Nonstress Test (NST) is at a minimum a twenty minute recording of fetal heart (hereafter FH) rates and fetal movements. The FH rates are recorded by the EFM using the external ultrasound sensor. Fetal movements are indicated on the same EFM records either, most often, by pregnant women triggering a switch when movements are felt, or by the attending nurse writing on the EFM record. Uterine contractions are not recorded because, by definition, these tests are performed prior to labour onset.

Obstetricians developed the NST in the 1970s and introduced it into regular North American obstetrical training and practice in the late 1970s and early 1980s (Devoe 1990:365). Initially, obstetricians were interested in NSTs to aid in the management of the most difficult obstetrical cases; for example, pregnant women with diabetes mellitus or severe elevation of their blood pressure. By the mid 1980s, however, obstetricians had developed a greatly expanded role for the NST including, for example, its use with many women considered healthy and at low risk for obstetrical complications. In this chapter, I primarily discuss these latter, "low risk", NST uses.

The term "non" stress refers to the absence of medically induced stress. Medically induced stress occurs in another related technique where oxytocin hormone is administered in order to stimulate mild uterine contractions; contractions which are seen to "stress" the fetus and therefore change the FH recorded by the EFM. The

test involving medically induced uterine contractions predated the NST and was called the oxytocin challenge test or "stress" test (ST). Obstetricians therefore distinguish between the ST and the NST, because the latter, NST, is seen to gauge fetal responsiveness or reactivity to "natural", as opposed to "man-made", stress. The ST, while remaining in use today, was never used in Invermere, and therefore it will not be considered in this discussion.

Despite the lack of medically induced stress and contrary to what the name implies, the obstetrical literature and medical professionals in Invermere described and discussed the NST in terms of "stress": fetal stress and distress, as well as maternal and "environmental" stressors. Examples presented shortly will clarify the various local, regional, and national uses of the term "stress" in relation to the NST.

Interpreting a NST Record

Obstetricians taught, and Invermere doctors and nurses learned, that a healthy fetal heart increases and decreases, or varies, over time, especially in response to fetal movements (first, Hammacher 1967; and many authors since). For example, when a "healthy" fetus moves, the movement results in an increased heart rate for a few seconds. Then the heart rate returns to a baseline rate. A "distressed" fetus, in contrast, produces a monotonous, "unresponsive" heart tracing.

The criteria for a normal test, accepted in Invermere and taught throughout the regional district, are summarized by an American textbook of Obstetrics:

The (NST) is generally considered normal when two or more fetal movements are accompanied by acceleration of the fetal heart rate of 15 beats per minute for at least 15 seconds duration within a 20 minute period. A nonreactive tracing is one without acceptable fetal heart rate accelerations over a 40 minute period (Cunningham et al 1989:292). A normal NST recording is shown in Figure 9.



Figure 9 The normal Nonstress Test. Notice the increase of fetal heart rate to more than 15 beats per minute for longer than 15 seconds following fetal movements, indicated by the vertical marks on the lower part of the recording (after Cunningham et al, Williams Obstetrics, 1989:293).

Invermere doctors and nurses seldom found NST interpretation difficult,

especially when compared with the difficuities they experienced interpreting fetal

distress using EFM records gathered during birth. EFM records during birth included

a variety of patterns that were often difficult to identify with confidence. NST records,

in contrast, usually contained easily recognized heart rate patterns. All Invermere

doctors practicing obstetrics and those nurses who routinely performed NSTs,

therefore, were confident of their ability to interpret NST records.

NST interpretation, however, was not free of controversy. As pointed out in

Williams Obstetrics, for example: "at least 15 and possibly more variations of the (normal) definition have been reported (Cunningham et al 1989:292). Medical professionals in Invermere, similarly to virtually all other doctors and nurses in the regional district of which I became aware, followed the criteria presented above and therefore remained distant and largely unaware of these controversies in normal test definition.

A Normal NST and Future Fetal Health

Obstetricians in general and ultimately local doctors in Invermere ordered NSTs not only to diagnose the <u>current</u> fetal condition, but also to judge the ability of the fetus to tolerate <u>future</u> demands on its "vital functions". The future "demands" included anything from simply acquiring and distributing oxygen within its organ systems, to withstanding labour, once labour began.

Devoe explains how obstetricians related NST results to future obstetrical management schemes:

The NST has been shown to be predictive of fetal health, when it is reactive or normal, allowing continuation of the majority of high risk pregnancies and preventing unnecessary and premature interventions (1990:371).

Controversy exists over the period of time over which a normal NST has prognostic value. The general rule in the literature and followed in Invermere was one week, if no other compounding problems arose. "The likelihood of a fetus dying within 1 week of a normal or reassuring [NST] has been low, and generally is less than 1 per 1,000" (Cunningham et al 1989:295).

In summary, my argument thus far is that doctors in Invermere took NSTs as a means to assess current fetal heart activity in order to predict future fetal health; a "healthy" fetus was one that had a reserve of strength to tolerate future "life" within a pregnant woman.

Benefits of NSTs to Obstetrical Outcome: Case Centered Studies of the NST

Nonstress Tests have been extensively examined using case study methodology. The aspects of NSTs that have been studied are listed by Devoe:

...(1) establishment of interpretive criteria; (2) evaluation of its screening and diagnostic potential; (3) application to particular obstetric conditions; (4) use of fetal stimulation techniques; and (5) improved signal processing and test interpretation techniques, that is, computerized nonstress testing (1990:365).

Obstetricians have shown that, similarly to other uses of the EFM, NSTs have a low false-negative rate (averaging less than ten percent); meaning that a NST is a sensitive means to discover fetal problems. However, obstetricians have further shown that NSTs, also similar to other uses of the EFM, have a high false positive rate (averaging more than iifty percent); meaning that half of the fetuses that are interpreted as having difficulties are, in fact, without any problems. A NST interpreted as showing fetal difficulties therefore requires further evaluation which may include a longer NST, a repeat NST later the same day or on a subsequent day, or, in hospitals where they are performed, a Stress Test mentioned above or a fetal Biophysical Profile¹.

Doctors in Invermere, including myself, did not read these case centered EFM studies, nor did we understand the concepts of sensitivity or specificity mentioned above. Instead, we learned -- through tele-conferences, courses, and discussions

¹ Fetal Biophysical Profiles are another common fetal assessment procedure used to assess abnormal NSTs. They combine EFM with ultrasound technology to score various parameters linked to fetal health.

with regional obstetricians -- a more pragmatic, practice oriented set of facts related to NSTs. On the one hand, we learned that a NST interpreted as normal meant that fetal problems were very unlikely. This was not very useful information to us, however, because we already knew that fetal problems were rare in the patient population that we dealt with. On the other hand, we learned that a NST interpreted as indicating fetal problems could easily be misleading and need further investigation. We considered the risks to pregnant women of discovering these false positive results to be low because, unlike EFM testing during the time of birth, NSTs were associated with less urgent intervention imperatives. In other words, time was available to sort out false from true problems suggested by NST interpretation.

Four randomized controlled case centered studies of NST effectiveness were completed during the time of this research in Invermere. None of these studies were sufficiently large to draw any conclusion regarding the benefits of the NST with respect to obstetrical outcome. Invermere doctors remained largely unaware of any controversy regarding NST effectiveness; effectiveness referring to proof that NSTs improve obstetrical outcome. Instead, Invermere doctors limited themselves to, on the one hand, learning to interpret NSTs properly, and on the other hand, patterning their practice activities after regional standards of obstetrical care.

II. Nonstress Tests in Invermere

NSTs began to be used in Invermere soon after the EFM arrived in 1983. These initial tests, unlike most of the tests that followed, were conducted because a pregnant woman or her attending doctor suspected that a problem had occurred with the fetus.

Table 4 lists the yearly NST incidence. NST incidence grew steadily each

year until 1988, when they became the most common use of the EFM in Invermere.

	total NSTs	total women	total births
1983	11	10	113
1984	19	14	92
1985	30	19	84
1986	35	21	69
1987	46	17	44
1988	24	13	64
1989	33	16	54

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 TABLE 4

 Incidence of Non-stress Tests In Invermere

Note: various women underwent more than one NST. Some women had as many as four of these tests during a single pregnancy.

Starting in 1984, NSTs were used beyond these specific instances where fetal viability was in question. To understand this expanded use of iNSTs, it is first is necessary to understand the movement toward establishing a polarized -- fetal versus maternal -- view of all of pregnancy (not only of the time of birth); and second, it is necessary to understand the nature of, and why a NST was categorized along with, hospital "performance" tests.

II (I) Becoming Sensitive to Fetal Needs During Pregnancy

Throughout this century, obstetrical writing has expressed concern for and

obstetrical practices have been directed at helping the fetus in pregnancy prior to the onset of birth - called the prenatal or antenatal period. Until recently, these practices were limited to rescue operations for the surgical removal of the fetus from the womb (Cunningham et al, Williams Obstetrics, 1989).

Management schemes to assess and treat the fetus while it remained in the womb are quite new. The sociologists Oakley (1984) and Arney (1982) date the origins of this fetal oriented care to the 1940s and 1950s when, having solved many of the "maternal" problems of pregnancy, obstetricians turned to the fetus as a new "structure" for study and management.

Oakley (1984), for example, in her chapter "Getting to Know the Fetus", describes the explosive growth of obstetrical knowledge related to the fetus during the 1960s and the diffusion of various new technologies for fetal assessment, such as the EFM and ultrasound, during the 1970s. By the end of the 1970s, she describes the formation of fetal medicine, the widespread performance of fetal care, and the establishment of fetal specialists.

Obstetrical care in Invermere remained distant from many of these developments until late in the 1970s, as the head nurse since the 1960s explains:

During the 1970s, we did not even consider the fetus during birth, let alone during the remainder of pregnancy. If women were healthy, we assumed the fetus was healthy. And besides, the doctors had no way to assess the fetus anyway.

In Invermere, obstetrical care considered as care of <u>the fetus</u> began with changes in the care doctors provided during the antenatal period. Antenatal care directed at care of the fetus became much more common in Invermere beginning in the 1980s as the four newly arrived doctors took up practice in the area; all four of whom had been trained to direct at least part of prenatal care specifically at care of

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the fetus. As a result, routine prenatal clinic visits changed in that the new doctors specifically measured fetal growth and activity, and determined a fetal "risk" score². Many of the same or similar assessments were carried out in the past by the two senior doctors, however, these were not seen as fetal assessments. For example, during regular antenatal office visits, the senior doctor assessed the size of the uterus the same as the junior doctors. The senior doctor, however, primarily interpreted uterine size as an indicator of the health of the pregnancy and of the pregnant woman. The junior doctors were far more orientated towards equating uterine growth with fetal growth and discussing this growth in terms of fetal health.

In addition to the new doctors gradually reorienting prenatal care to explicitly include fetal care, in 1982 -- the year before the EFM arrived, prenatal fetal care grew suddenly in Invermere for two separate reasons, one regional and one local.

Regionally, fetal awareness and fetal management changed dramatically when "real-time" ultrasonography became available in Cranbrook hospital, the closest intermediate level facility to Invermere.

The impact of seeing the fetus in utero and being able to measure its growth and development cannot be over-emphasized. For example, shortly after ultrasound imaging became available, a Cranbrook radiologist brought a video tape of ultrasound fetal images to show to doctors and nurses in Invernere. The surgeon in Invermere explains his background and the impact of seeing real-time ultrasound images for the first time:

I left India 30 years ago to take an Internship in America. As

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² Fetal risk scoring involves assigning quantitative measures to various parameters considered relevant to fetal heath. These include prior or current maternal problems in pregnancy as well as fetal problems such as growth rate.

long as I can remember, I dreamed of the West, and of Western things. I always wanted a car, and a gun for hunting.

I followed the Allopathic path in India because these doctors are the most respected. You can tell these things easily in India, the Allopathic doctors get to charge the most. You go to the Ayurvedic doctor, then the homeopathic doctor, and then if you really need help you go to the Allopathic doctor - they have all the respect.

I chose my residency based on which chief I had. At first, I was going to be an internist because of the way the chief held himself. He was short and round, but clever and important and spent his time making clever diagnoses. Then I met a surgeon who was even more impressive. I became a surgeon.

India is so different from here. I like to visit India, my home and my friends. I visited my friend who is an important Internist there. He has 40 or 50 people waiting to see him at any time. He sees 5 of them at a time. Here we have such a relaxing life. I just sit and chat to people a lot of the time. Only a very rich country like Canada can afford the luxury of having doctors take your blood pressure and treat your warts.

.... I started here in 1972. Yes, its hard to be a local surgeon. A local surgeon always gets criticised a lot. I'm used to it. I live on a knife edge. I do what I believe is right and accept the criticism.

.... I used to do abortions. I didn't like it, but I did them when the committee passed them. I didn't like them because women were so demanding and they often lied to me about how far along they were. When they lie and you find fingers and arms when you are doing the procedure, it is really upsetting.

One day [1982], the radiologist came up with his video of his new ultra-sound machine. He wanted to show us what it showed. I remember sitting and watching the fetal heart beat. That was it. I quit. I've never done another abortion.

I don't criticize other doctors for doing them and I don't criticize women for having them done, but I couldn't stand doing them anymore. I still see women who want abortions and I help them get in touch with people who will help them.

Don't get me wrong, the ultrasound was not the only reason for my quitting abortions. I didn't like the procedure already. I didn't like all the lying and deceit by women -not all, but enough to make me feel abused and resented.

The other thing about abortions is that they aren't like a medical problem, a disease. If you do an abortion, you don't cure anyone of a problem. Its not like taking an appendix out and curing a disease. I didn't feel right about myself as a doctor.

.... No, I don't mind if you use this. Its the truth. If someone identifies me from your thesis, I'll say that this is how it happened. This isn't something I am concerned about hiding.

No abortions have occurred in Invermere to this day.

At the same time, pregnant women and their partners were exposed more and more to ultrasound images of their fetus. The following example illustrates some of

the various potential effects of ultrasonic fetal images on pregnant women and their

behavior.

This wasn't your first ultrasound, was it?

No, I had one earlier to tell my dates. This one was much more interesting because the baby was bigger. My husband really got into it. He was really thrilled....

You know, I do everything right. I eat better than I have ever eaten, I exercise and I rest a lot. I still have to waitress, but that is OK, except for my hip. But I still smoke, I just can't stop. I've tried everything! I'm hooked, completely!"

(Sensing her anxiety, I sympathize): Oh well, your baby is growing well. It will be fine. Don't worry about it. If you smoke, you smoke. I won't condone it, but many, many women who smoke have had healthy babies. Just smoke as little as you can.

I wish you'd tell some of my friends and family that, to get them off my back. My husband is after me all the time. My visits with my brothers are the worse, though. They accuse me of hurting the baby every time I light up. The whole family gets after me.

Their latest maneuver has been to tell me over and over again about a video-tape from an ultrasound that they all saw, where a baby is shown reacting to a woman smoking. The woman is shown to inhale a cigarette and then the baby bends forward in jerking movements like it is convulsing and gasping for air. The baby is choking on the smoke. It sounds really horrible.

(After a pause). You know that the fetus does not breathe.

What? Of course it does. How else does the baby live?

The baby does not take air into its lungs until after it's born. In the womb it moves its chest wall around, sort of limbering up for birth, but it gets its oxygen from your circulation, much like your liver."

(Holding onto my arm and staring at me in disbelief): So when I breathe in cigarette smoke, it doesn't go directly into the baby's lungs.

No. It is filtered out in your lungs and again in the placenta. Some parts of tobacco smoke make their way to the baby through the blood, but not as a gas.

My God! You don't know how difficult it has been for me thinking that the smoke is hitting the baby. I've been constantly

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worried about it all along. I know smoking is bad, don't get me wrong, and I would quit if I could, but I just can't. Why would those people keep telling me about this baby choking on the cigarette smoke if it wasn't? Don't they know what its like to feel you are choking your own baby? They kept describing this baby nodding forward and making jerky movements and making breathing movements.

You've had two ultrasounds haven't you? Do you remember what the fetus was doing during those examinations?

You're right. The baby often did those sorts of movements. The technician even showed me the baby's practice breathing movements. It moved around suddenly all the time. It moved a lot when she tried to use the sensor. Of course, that is what baby's do, when they are irritated.

And when they're not.

Of course, it jumps all over the place once you lay down. You don't know how much you have helped me. Wait until I tell them. They had no right to treat me like this.

Petchesky, in her analysis of "The Silent Scream" -- the notorious anti-

abortion video showing a fetus during an abortion procedure -- sets ultrasound fetal

images within "Western visual culture". In her view the popularity and importance of

fetal images extend to the very roots of Western civilization:

For the autonomous, free-floating foetus merely extends to gestation the Hobbesian view of both human beings [mother and foetus] as disconnected, solitary individuals. It is this abstract individualism, effacing the pregnant woman and the foetus' dependence on her, that gives the fetal image its symbolic transparency, so that we can read in it our selves, our lost babies, our mythic secure past (1987:63).

The second reason that prenatal fetal care suddenly expanded in Invermere in

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1982 was that a normally developed and previously healthy fetus died in late

pregnancy. The baby died, not through fault of any doctor or nurse, but rather

because of a lack of facilities in this small rural hospital. The difficulty was that,

because a cesarean section operation could not be carried out locally, the patient

needed to be transferred to another hospital for the operation. The doctor and

patient involved recognized that the delay in performing the operation likely contributed to the death of the fetus.

Although this baby died during birth rather than during the antenatal period, this case resulted in much greater local scrutiny of all aspects of Invermere hospital and obstetrical care facilities. For example, a concerned citizens group, which included a hospital board member, was formed to investigate the case in which the infant death occurred and to make recommendations to prevent a recurrence in the future. The committee directed its concerns, not at the specifics of this case, rather, they asked if and when obstetrics should occur in Invermere hospital at all. In addition, this committee directed a great deal of attention at emergency care of the fetus, not care of pregnant women. Pregnant women, they observed, rarely suffered permanent damage as the result of pregnancy or birth. Indeed, the woman involved in the case in question survived with no physical problems.

The committee argued that improvements in all aspects of "fetal care" were needed. They suggested that Invermere obstetrical care may not be safe for the fetus if the surgeon was absent. The committee recommended that patients should be told if the surgeon was planning to be away at the time of their anticipated due date. Then patients, as responsible parents, could decide what was safe for their (future) child.

A patient committee and public criticism was not needed to heighten medical concern for the safety of the fetus during the antenatal or birth periods. For example, the attending doctor in the case mentioned above describes his feelings at the time:

I nearly quit after that case. Quit obstetrics? No, quit medicine. I looked into other jobs, but nothing came up. I would have quit if something was available.

Why did you want to quit?

I lost my nerve. To practice obstetrics out here you have to believe things will go well, or if not, that you can deal with whatever happens. I didn't believe either things anymore. I wanted out.

Why did you keep going?

Everyone's support. I just gradually got back on my feet. I became very interested in preventative health. I began doing a lot more screening of obstetrical cases. I did everything to make sure that that didn't happen to me again.

Invermere doctors practicing obstetrics, while irritated by a citizen's committee

trying to tell them what to tell patients (such as the surgeon's work schedule) were

mostly relieved to have these discussions regarding the fetus and fetal care. In

common with the committee and many parents, they were feeling increasing concern

for the fetus and for the adequacy of local fetal care. An Invermere doctor describes

the almost overwhelming responsibility that she felt towards the fetus:

The problem with obstetrics is my expectations. I know that I have got to do everything for this kid. I can't live with myself if something happens to this kid, its got to be perfect or I would just go crazy...I just can't keep my hands off if I am around. I am so worried about not doing what can be done for that baby. I would just quit medicine if anything happened to a baby in my hands.

This doctor, in common with others feeling responsibility for the fetus, were quite

willing, and in fact found it therapeutic, to openly share their concerns regarding the

fetus with patients and concerned citizens groups.

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In summary, the fetus emerged as a central focus in antenatal obstetrical care

in Invermere as the result of a complex blend of local events and national trends,

including an increased obstetrical attention to fetal physiology, greater community

scrutiny of fetal care in hospital, and the development of fetal images which became

commonly used in medicine and entered into public experience.

II (II). NSTs as Performance Tests

NSTs became commonly used in Invermere, despite their lack of observed local success in improving obstetrical outcome, not only because they fit with a growing concern with fetal care, but also because these tests became known as "fetal" performance tests. That is, NSTs became associated with a growing number of hospital based, nurse or technician administered, tests of organ "performance", rather than "static" condition.

Various performance tests were well known in Invermere by the time the EFM arrived in 1982. These included, for example, lung function tests (respirometry), heart function tests (treadmill tests), and gall bladder function tests (oral cholecystogram).

Performance tests all shared a number of features: 1) they had an experimental format where, ideally, they were repeated the same way under the same conditions; 2) they were seen to isolate, measure parameters of, and usually record automatically single body organ function; and 3), they were a way to assess a local individual's bodily performance against standards of performance established elsewhere in medicine.

NSTs were learned as one of these quasi-experimental performance assessments. As a result pregnant women were seen to be taken up into these experiments where the fetus became analogous to the gall bladder, the heart, or the lungs; (i.e.), the thing under scrutiny. Pregnant women other than the fetus became seen as background conditions, an "environment" to assess under experimental conditions.

In keeping with these tests, doctors and nurses used fetal performance in

order to categorize pregnant women. For example, if a fetus proved healthy and performed well during a NST, then a pregnant woman was considered as normal, or healthy, or a safe environment for a fetus.

The one principle difference between a NST and other performance tests, for example a cardiac stress test, was that NST results were associated with the fetus and not given to a pregnant woman as an independent adult. That is, in heart performance tests, professionals informed patients of test results, including an interpretation of test meaning, then left decisions regarding implementation of these results to the patients involved. For the NST, in contrast, professional test interpretation and advice was given in the name of the fetus and associated with a wide variety of cultural and, at times, legal imperatives for the behavior of pregnant women. In other words, NST advice was not given to pregnant women to do with as they willed. Instead, the fetus was given social status never considered possible for an organ such as the heart.

The social, as opposed to the strictly medical, status given to the fetus during NSTs is important to the discussion in this chapter regarding medicalization. Medicalization means moving human activities into the medical domain where medical professionals dominate decisions regarding right and wrong, health and illness. NSTs, while occurring within medicine's physical space of the hospital, were not dominated by medical opinion and interpretation. In fact they were the opposite. They allowed for the display of intense social interest in and discussions of the fetus and fetal health. Doctors, if anything, used them to promote socialization while at the same time avoiding medicalization of, and therefore taking responsibility for, the fetus.

Performance Tests and the Community: from Private Practice to Public Display

Performance tests were the opposite of traditional private medical practice. Private practice occurred in the doctor's clinic with a physician's personal assessments. In performance tests, in contrast, a patient's physiological condition was shared instantly by anyone present for the test, and available for scrutiny by anyone gaining access to the test results. Individual doctors no longer strictly determined access to patient assessments and their interpretations.

Pregnant women, for example, had to visit the hospital during pregnancy to undergo a NST. Hospital visits by women during pregnancy seldom occurred prior to NSTing. Women only visited the hospital prior to labour onset for laboratory tests or once, in a group, as part of Pre-Natal Classes. In any case, neither patients or doctors considered these hospital visits as activities specifically "for the fetus".

For a NST, a woman went into the hospital, a public institution, where an EFM was used to detect and record the fetal condition. What was previously private fetal awareness, on the part of a woman and at times her doctor, became exposed to and ultimately on record in a public institution.

The following example demonstrates the relationships found in a NST as a performance test: between fetus and mother, public and private, foreground and background, present condition and future health.

Nonstress Tests as Performance Tests: an Example

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The event took place in 1986. The patient knew that I was studying the EFM and this NST as an anthropologist. As the attending doctor, I would not have witnessed the NST. Rather, the patient would have brought the EFM recording to the

clinic for interpretation, or the nurse would have kept it at the hospital for me to

interpret later.

J's regular antenatal visit at the clinic was over. As she was climbing down off of the examining table I asked "Are you sure you have time for the Nonstress Test right away?"

"Sure, no problem, I sort of expected it again anyway. Bill [her husband] will pick me up there on his way home for lunch and, besides, it gives me a chance to see my mom, she's still in hospital."

A few minutes later, at the hospital, I join J and one of the nurses in the labour room.

The test is proceeding well. J is lying on her back with the external, fetal heart sensor strapped around her abdomen. Her head is twisted around to watch the monitor screen.

J looks up as I come in "He's just kicking and punching up a storm. He sure is having a better day than I am."

The nurse is staring at the screen while adjusting the heart sensor. She says: "The little brat keeps running away from me."

Examining the monitor record in progress I notice a "healthy" pattern, "Looks good to me. If I were him, I wouldn't want to come out" See you again next week. Call me if you notice any change.

This patient was undergoing her second NST. I organized weekly NSTs because this was her first pregnancy and her blood pressure was elevated enough to concern both myself and the obstetrician in Cranbrook, who had assessed her two weeks earlier.

In the absences of an EFM, fetal assessments in a "high risk" case such as this, would have been limited to stethoscopic examinations during weekly clinic appointments. Weekly appointments were occurring in order to monitor this woman's blood pressure and to measure fetal growth. The NST was ordered because we had an EFM at the hospital. Other small communities in the area managed patients similar to this woman without the use of an EFM.

With an EFM, this patient, the nurse, and I were able to share in a dramatic public display not only of fetal life, but also of fetal performance in a test of its

"health". Therefore, instead of the usual clinic situation where doctors internalized and therefore thoroughly medicalized fetal assessments, during NSTs fetal health became something that could be revelled in; where doctors, nurses, and patients could share in the sounds and displays of fetal strength and its determination to live.

The patient, the nurse, and I considered this NST as a <u>fetal</u> test despite the obvious presence of a pregnant woman and the total dependence of the fetal oxygen supply (the primary focus of testing) on maternal circulation. For example, this patient understood that she was taking time and making and an effort to visit the hospital to have her fetus tested. She did not consider the concept of <u>fetal</u> testing as odd or as a misrepresentation of events. She did agree later, on questioning, that a NST could be seen as a test of pregnancy or a test of maternal/fetal circulation, however this was not something that she considered on her own. The nurse in the example was typical of the three nurses who routinely performed NSTs in this hospital, in that she understood her work to be specifically assessing a fetus, not a pregnant woman.

The patient acknowledged that by undergoing a NST she saw herself acting both as a "good patient" by undergoing the test, and as a "good mother" by putting her child's needs ahead of her own.

In summary, by the mid 1980s, the fetus had become not only something that doctors did not terminate in abortions in Invermere, it had also become an obstetrical focus considered explicitly in need of management; management of not only its presumed immediate needs, but also of its anticipated needs in the future. In other words, doctors judged, using various assessments including eventually NSTs, if the fetus was healthy, then, secondarily, how was the pregnancy and the pregnant

woman to be managed for the best fetal outcome?

How professionals and patients worked out obstetrical care in light of this increased awareness of the fetus and a locally available test of fetal health is explained in the section that follows. In the final section, I situate these local Invermere developments within the regional obstetrical district.

III. NSTs and Obstetrical Care During Pregnancy

Over time, as doctors ordered and patients underwent more and more NSTs, personal, local, and regional fetal management schemes were formed; management schemes that involved elaborate and time consuming activities in which authoritative obstetrical knowledge had a minimal role. The point 1 make regarding management schemes involving NSTs, therefore, is that these are schemes for the making and handling of information, not professional use of that information (similarly Young 1982).

livermere Doctors and the NST: Showing Personal Concern

With growing local interest in the fetus and fetal care during pregnancy, and with increasing professional interest in using performance tests in patient management, NSTs provided Invermere doctors with a perfect tool to deal with these rising public concern and to bring themselves in line with regional professional standards. That is, NSTs allowed local professionals, on the one hand, to look "inward" to "objectively" measure the fetus during intrauterine "life". On the other hand, NSTs allowed local professionals to look "outward" and to align local obstetrical knowledge with that of regional specialists and the obstetrical literature. Doctors

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were thus able both to show their concern for an individual fetus and to reassure pregnant women that Invermere and Invermere hospital were safe places to have their baby.

Prior to NSTs, if a pregnant woman raised concerns regarding the fetus, doctors limited their fetal assessments to listening to the fetal heart with a stethoscope and to feeling for fetal movements. Almost always the doctor located the FH and felt movements, then reassured the patient that the fetus was fine.

After EFM arrival, in these patient initiated clinic visits, doctors usually ordered a NST. They justified the NST as a way to demonstrate not only that the fetus was healthy at that particular moment, but also that it would remain healthy in the immediate future. Doctors knew that, with an EFM available, if they did not order a NST and a fetal death occurred, he/she could be considered negligent by patients. In addition the doctor could also have great difficulty living with himself/herself thinking that further tests could have perhaps helped to initiate life saving interventions.

NST records, which were almost invariably interpreted as "normal" remained marginal to these patient initiated cases. In contrast, considerable time and effort went into the making and handling of the recordings. Most of the benefit, therefore, was to patients and practitioners who took comfort in having done all that could be done for a fetus.

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A different case to the one mentioned above in which a fetal death occurred shows why patients and professionals came to use NSTs to comfort themselves regarding the state of the fetus. In this case, which occurred in Invermere in 1984, an otherwise healthy baby died late in pregnancy without having undergone a NST. In retrospect, Invermere doctors recognized that a NST possibly could have

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demonstrated the fetus to be in need of assistance. However, they also recognized that it is impossible to know whether or not a NSt would have helped in this case. The doctor involved explained that he felt guilty because he had listened to the pregnant woman, who had felt well and had no concerns regarding her baby. The doctor felt guilty because he had not persevered and carefully assessed the fetus despite this woman's claim that there was no problem. He had not "taken the fetus seriously". "I simply hoped that things would all work out". the fetus could actually have been saved.

Despite cases such as the one just described, Invermere doctors knew that NSTs could not be justified for all obstetrical cases. They also knew from their own experience and the obstetrical literature that fetal deaths would continue to occur in late pregnancy despite any amount of NSTing. As one other Invermere doctor and I reasoned, obstetrics resembles Russian Roulette, where some degree of tragedy was inevitable if the game continued long enough. We both knew, however, that neither of us could be complacent regarding the inevitability of fetal deaths.

Finally, the case mentioned above involving the fetal death was also important to fuel nurses interest in NSTs. Nurses, similarly to doctors, accepted frequent use of NSTs to help live with themselves when things went wrong. The nurse who discovered the intrapartum death in the case mentioned above, for example, was won over to the need for more NSTs.

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That was the worst moment of my life. Silence. All I heard was silence. I'll remember it as long as I live. I never want to have this happen to me again. I'll do anything to avoid letting it happen to me again.

This nurse became more vigilant toward the fetus by encouraging routine NSTs prior to and at the time of onset of the birth process.

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NST therefore became popular in instances where women approach doctors with concerns for their baby. For doctors, ordering a NST demonstrated that he/she was taking a pregnant woman and her concerns seriously. For professionals and patients, NSTs provided a reliable way to demonstrate that the fetus was healthy both to the doctor and nurse interpreting EFM recordings, and directly to patients who could hear and see its productions. In addition, professionals and patients used NST result to satisfy themselves that the fetus was "safe in the womb" for up to a week or more.

Community Fetal Management Schemes

NSTs formed invermere's first fetal management scheme. It included local resources such as hospital space and nursing time, as well as it meant that pregnant women both experienced and contributed to local efforts to care for the fetus. Moreover, Invermere doctors became linked with the hospital in a scheme to make and interpreted NST results.

During 1985 and 1986 in particular, pregnant women with or without their partners underwent NSTs, (approximately twenty percent of cases in 1985 and thirty percent in 1986), talked about them, and were driven to and from the hospital (as in the example). As a result, more and more patients became aware of fetal care in pregnancy and gradually refined their general concerns about women in pregnancy into fetal and/or maternal concerns.

NSTs and Regional Fetal Care: Sharing Knowledge

Invermere doctors favored NSTs not only because these tests allowed them to

take pregnant women and the fetus seriously, but also because, by performing these tests, they further shared responsibility for the fetus with regional obstetrical specialists and the obstetrical profession in gerneral.

Dating from the late 1970s, fetal assessment and fetal risk management were both becoming central focusses during antenatal care of women in Invermere. This was in part because all of the doctors practicing obstetrics in Invermere had been taught to take on more and more responsibility for the fetus throughout pregnancy. In addition, regional standards dictated that doctors should keep records specifically designated as fetal records. This included compiling a fetal risk score; a score that indicated whether or not a pregnancy involved a "high" risk fetus.

At the same time as Invermere doctors were becoming increasingly aware of the fetus, they were also becoming increasingly nervous about local facilities, and concerned about their own skills in obstetrics. Doctors found themselves struggling to satisfactorily reassure patients regarding the safety of rural obstetrical care. They all recognized, and indeed had experienced, unexpected problems that suddenly arose during late pregnancy; some of which required dangerous and painful transfers to larger hospitals.

With the introduction of NSTs, Invermere doctors were reassured, at least to some extent, regarding local obstetrical care. On the one hand, NSTs could performed in Invermere hospital as well as they could be performed in a tertiary care hospital. Doctors could therefore rest assured, at least in this sense, that their patients were receiving state-of-the-art care. On the other hand, they could share responsibility for the fetus with the obstetrical profession in general.

Invermere doctors used NSTs to share fetal responsibility in two ways. First,

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without a NST, fetal assessments remained as strictly private assessments by physicians. With NSTs, fetal health became objectified in a form that could be shared with distant specialists. Second, Invermere doctors also used NSTs to prove to themselves and to patients that Invermere was a safe place for the fetus while women awaited the onset of birth. Without NSTs, doctors could only give their word that pregnancy was going well. NST interpretations allowed them to invoke obstetrical norms as to where women were to be located (rural communities or near larger urban hospitals) during pregnancy.

Gathering NSTs also permitted Invermere doctors to connect themselves with various regional educational opportunities and to discuss individual cases with urban obstetrical specialists. Invermere doctors could, for example, send a facsimile transmission of a NST record to the regional hospital center for interpretation, and receive guidance from these specialists regarding patient management. At the same time, Invermere doctors could attend tele-conference sessions to learn the latest approaches to NST use and interpretation.

Tertiary care specialists in Calgary were particularly supportive of NSTS in Invermere. They provided a twenty-four hour a day interpretation service. They were also willing to accept transfers of patients if NSTs were found to be abnormal. This latter support remained more of a theoretical possibility than a reality because, in the seven years of this study, no Invermere patients were transferred to Calgary because of an abnormal NST.

Invermere doctors therefore used NSTs in order to pattern local antenatal care after regional obstetrical centers. In addition, performing NSTs facilitated regional connections for education and case discussion. However, these regional discussions

of NST record interpretation did nothing to help Invermere doctors to deal with a single obstetrical case, except by implicitly helping Invermere doctors to feel less direct responsibility for fetal outcome. Obstetrical knowledge based on NSTs therefore remained more of an idiom of communication among doctors rather than something actually applied to individual patient care.

NSTs and Preventing Obstetrical Interventions: NST Frequency Increases

NST frequency in Invermere increased dramatically beginning in 1984 and accelerating during 1985 and 1986. This was because NSTs became part of a movement, both national and local, for doctors to minimize, or at least to be more selective regarding, their interventions in pregnancy and birth. In this movement, NSTs became the "gold standard" by which professionals could judge whether they could safely observe, rather than impose interventions on a pregnant woman.

This movement to restrict obstetrical interventions was triggered by a growing concern within obstetrics and among the general public regarding the rising cesarean section rate. This rate, which was four to five percent in the 1970s, had climbed, by the mid 1980s, to twenty to twenty-five percent in numerous Canadian cities (Cunningham 1989:441). The remarkable rise in the cesarean section rate has been well documented in many industrialized countries (Notzan et al 1987) and especially in the United States (Bottoms et al 1980, and many authors since). The rising cesarean section rate in the United States and Canada became even more remarkable when compared with certain other developed countries, such as Holland, where the rate remained low (between four and ten percent) throughout this period (O'Driscoll 1984).

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The reasons for the rising cesarean rate have been documented both within obstetrics (almost all current texts), and by social scientists (Lichtman 1988:137, Michaelson 1988:13). In 1986, a National Consensus Conference, endorsed by the Canadian Society of Obstetricians and Gynecologists, published specific recommendations to try to deal with this problem. It published recommendations in the hope that documented national standards would help support individual doctors in patterns of care that did not lead to more and more cesarean sections.

The program to control the incidence of cesarean sections focussed on avoiding obstetrical interventions that were seen as leading to cesarean sections; for example interventions such as inductions and augmentations. Both inductions and augmentations were known to result in a higher incidence of cesarean birth because of what was called the "cascade effect." The cascade effect referred to the observed pattern that one intervention rapidly lead to another intervention in the management of an obstetrical case. For example, once an induction was started, obstetrical standards dictated that doctors needed to impose certain time frames on the labour process. If these time frames were not met, further intervention were needed, increasing the chance of a cesarean section operation.

The NST fit into this movement to avoid obstetrical interventions in birth because it could be used to "safely" (meaning safe for the fetus) delay an induction or augmentation. As mentioned earlier in this chapter, the NST had gained this reputation for predicting fetal health through its use in "high risk" obstetrical centers. In these centers, obstetricians used repeated NSTs to help them to safely delay cesarean sections as long as possible to allow for fetal development before birth.

Invermere doctors, while not particularly concerned about their cesarean

section rate, which had remained more or less the same during the 1980s³, were interested in NST use to avoid intervening in pregnancy or birth. Invermere doctors were particularly eager to use NSTs to avoid interventions such as inductions and augmentations. They had never been popular in Invermere either with doctors or nurses. These interventions had been performed as a necessary evil in order to conform to obstetrical time-frames.

Invermere doctors learned, through discussions with specialists in Calgary and through a visit by the obstetrician working in Cranbrook, that women could be "left" in pregnancy indefinitely, as long as the NST was considered normal. Furthermore, the Cranbrook obstetrician stated that augmentations to speed birth were unnecessary if an EFM recording was interpreted as normal. In other words, he was promoting use of the EFM during birth to justify relaxing rigid obstetrical time frames applied to this process.

Invermere patients also almost all supported using NSTs to avoid obstetrical interventions. On the one hand, they found NSTs reassuring, easy to tolerate, and seldom very inconvenient. On the other hand, except for the occasional woman who was past her due date and anxious to have her pregnancy ended, patients did not voice complaints when augmentations and hormonal inductions were for the most part discontinued.

By 1986, most NSTs were performed in Invermere to avoid interventions in pregnancy. Local doctors credited NSTs with helping to improve obstetrics by

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³ The cesarean section rate in Invermere remained more or less at ten percent during the 1980s. This rate is very misleading, however, because of the many patients transferred to regional hospitals for birth.

"relaxing" the time frames imposed on women. Local nurses pointedly observed that doctors were really using NSTs to return obstetrical care to patterns practiced in Invermere prior to the early 1980s. Nurses also pointed out that these new "progressive" patterns of care actually resembled expectant care, or supportive care practiced by nurses throughout the time period that hormonal inductions came and went.

The one difference between obstetrics in the early and late 1980s not noted by the nurses was that pregnancy and birth became managed with an explicit recognition of fetal health and fetal needs.

Fetal Health and Social Control

NSTs, while insignificant to obstetrical management -- except for their role in the removal of unnecessary time frames, became an opportunity for judgments for and against pregnant women, both by professionals as well as by concerned family and community members. That is, these tests were not only opportunities to publically display concern for the fetus, they were also significant opportunities for social control.

The fact that NST were always interpreted as normal meant that these tests were not used to instigate obstetrical interventions. While a normal test precluded obstetrical interventions, it fueled rather than quelled social interest in pregnant women. This was because women were judged as to whether or not they were adequate to care for one of society's future citizens.

That is, NSTs provided professionals and patients, as well as concerned relatives and citizens with an opportunity to legitimate their wishes for changes in the

pregnant woman's behavior in the name of NST proven fetal health. Questions were asked such as: "How should a woman behave to maintain this state of fetal health?" or "I am worried about the baby, don't you think you had better quit your job and rest?"

IV. Summary

In performing NSTs, professionals and patients saw themselves as getting in touch with the fetus, measuring its health, and holding its needs above all else during pregnancy. Maternal needs were not forgotten, rather they were pushed into the background. As a result, women became an environment; an environment free to be manipulated or observed, if and only if, fetal health was preserved.

Invermere doctors ordered and their patients consented to NSTs because of two major reorientations in obstetrics: first, the movement to identify and act in relationship to fetal needs, and second, the movement to decrease obstetrical interventions during pregnancy and birth. Both reorientations were outlined here in order to explain why NSTs were performed in Invermere despite their lack of success in improving obstetrical case outcomes.

Over time, Invermere doctors and patients established NSTs as the local gold standard tests of fetal health during pregnancy. The NST was taken as the gold standard for fetal management in late pregnancy because it was used not so much to diagnose existing fetal problems, rather because it was used to predict the health of the fetus in the future. The reason NSTs were used to predict future fetal health was because NSTs became seen as one of a growing number of "performance" tests found throughout various medical disciplines, some of which were present in
Invermere. In short, NSTs were used to justify "allowing" pregnancy to continue "naturally" because the fetus could be shown likely to "survive" in the womb.

Ordering, performing, and interpreting NSTs formed a "local fetal management scheme"; a hospital based scheme which required patient visits, time and effort by hospital administration, nursing staff, and record keeping, as well as interpretation by local doctors. The local managment scheme became both a display of personal, professional, and community concern for the fetus as well as generating information which local doctors could use in communcation with distant specialists. Ultimately, communication with specialists regarding the use and interpretation of NSTs was the primary use of obstetrical knowledge relating to these tests.

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Part III. DISCUSSION

Chapter 6

Beyond Obstetrics: EFM use in Invermere Hospital and Community Context Introduction

I have described three EFM uses -- screening, intervening, and testing -within the context of Invermere obstetrical care. Limiting descriptions to the obstetrical care context reflected my primary goal of explaining, in each instance, why the EFM was used. In this chapter, I move beyond obstetrics to contextualize each of the three EFM uses within broader hospital and community beliefs and traditions. This further contextualization will serve both as a summary of EFM use in Invermere and as a basis for the concluding remarks regarding the study of technology in obstetrics.

The purpose of this chapter is to explain that further contextualization of the three obstetrical traditions involving the EFM leads to a more fragmented, rather than to a more coherent understanding either of EFM use or of obstetrical care. In other words, I found that three distinctive hospital and community contexts shaped obstetrics and the EFM, namely: 1) EFM use in screening fit within gender and territorial negotiations and divisions of labour found throughout community institutions; 2) EFM use in interventions fit within highly rationalized treatment routines for bodily contact and control of biological processes; and 3) EFM use in performance tests fit within a regional system for making and processing fetal information.

I explain that EFM use in Invermere obstetrical care cannot be resolved into a single context involving all three of its uses. Instead, the EFM must be understood in

each of the three contexts separately. I explain this conclusion throughout this chapter and contrast it with the coherent vision of obstetrics and EFM use that doctors and nurses present through their case constructions; constructions which thoroughly dominate written and spoken representations of obstetrical care.

My position here is not that cases are imaginary or that they are an incorrect way to represent medical events. For example, pregnant women, supported by their spouses, isolate themselves in hospitals to approach birth as independent travellers determined that they will manage the journey with their own individual strength. At the same time, professional expertise to a large extent depends on doctors and nurses situating an individual patient among other cases they have known.

In the remainder of this chapter, I will describe the three hospital and community contexts shaping EFM use in Invermere obstetrics. In each instance I will explain that, while these contexts are not overtly evident in professional case constructions, they are as important as cases to professionals organizing and participating in obstetrical care. That is, these contexts are clearly understood and willingly discussed by doctors and nurses.

I. Screening uses of the EFM: Men and Women, Homes and the Hospital, and the shaping of Technology in Invermere

The greater context for screening uses of the EFM will be discussed in light of the insights of Pierre Bourdieu (1977). The work of Bourdieu is useful here because, while he did not directly consider medical, let alone obstetrical care, he provided an outline for studying human activities beyond the objectified accounts used by the participants in the activities:

The relationship between informant and anthropologist is somewhat analogous to a pedagogical relationship, in which the master must bring to the state of explicitness, for the purposes of transmission, the unconscious schemes of his practice.... The explanations agents may provide of their own practice, thanks to a quasi theoretical reflection on their practice, conceals, even from their own eyes, the true nature of their practical mastery, i.e. that it is learned ignorance (docta ignoratia), a mode of practical knowledge not comprising knowledge of its own principles. It follows that this learned ignorance can only give rise to the misleading discourse of a speaker himself misled, ignorant both of the objective truth about his practical mastery (which is that it is ignorant of its own truth) and the true principle of the knowledge his practical mastery contains (1977: 18-19).

Bourdieu is suggesting, among other things, that anthropologists must be careful not to elevate objectified accounts beyond their function in communication. That is, Bourdieu points out that words must be analysed in context, but also, in addition, tacit meanings embeded in day to day settings and bodily routines must be examined. More specifically, with respect to the present project, words and their meanings must be weighed against the meanings embodied by adept professionals and patients performing habitual activities, and against the historical continuities contained in inanimate objects such as equipment and buildings.

Bourdieu (1977) demonstrates his point regarding the limitations of objectified accounts by showing the resemblances between objects and activities within a Kabylian dwelling and those of Kabylian politics and ideology. In both instances, he shows that the disposition of objects and the distribution of tasks implicitly mark dwellings despite lack of formal representation in spoken or written language.

Following Bourdieu, I will situate screening use of the EFM in a context I call the gender and territorial divisions of labour in Invermere. My goal is to demonstrate that this is a rich and dynamic context common to the institutions of this community and that it is crucial to determining screening uses of the EFM during routine nursing

care.

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Gender and territorial divisions of labour occur in every aspect of Invermere community life from politics to economics, to personal affairs (similarly, Graham 1985). I will limit the discussion to the home and the hospital as I only wish to demonstrate the historical and cultural depth of this context.

Hospital Care and Home Care

As described in detail in Chapter 3, throughout Invermere history, divisions of labour in hospital closely resembled domestic divisions of labour. At first, nurses, who were all female, lived in and performed almost all day to day activities, most of which closely resembled activities described as women's work in their homes. Meanwhile, from the hospital's earliest days, doctors, who were all male, were described as primarily absent from the hospital institutions, visiting it only to examine patients and to perform procedures.

Hospital care clearly differed from home care even at this early stage. For example, hospital activities, unlike activities found in the home, were more open to public scrutiny. In addition, hospital care, unlike most aspects of home care, were associated with a literate professional tradition and scientific knowledge.

However, from the beginning in both the hospital and the home, doctors and nurses engaged in complex, tradition bound activities which were worked out in terms of, among other things, male/female roles and territorial divisions of labour. The influence of gender and territorial negotiations and interactions varied greatly both among activities and over time.

Invermere hospital grew into a more complex institution consisting of

specialists at every level of operation from floor cleaning to administration. Nevertheless, it retained these core gender and territorial divisions of labour relating to patient care. Generally speaking, throughout the time of this study in Invermere, the result has been that nurses, who came to include one man, provided all of the continuous patient care, while doctors, who came to include one woman, limited their hospital work, as much as possible, to performing particular tasks or making brief assessments.

Invermere homes also grew into larger, more expensive, and more complex institutions. However, similarly to the hospital, they retained this negotiation process between male and female over roles and obligations. Generally speaking, strict distinctions between male and female roles have been less closely observed in the home than in the hospital. For example, men came to share more of the health care duties previously described for women, while women more often took on traditionally male roles and worked outside of the home.

The point is not to overemphasise the similarities, or to gloss over the differences, between the hospital and the home. Rather, the point is that the two institutions have evolved together and, along with this evolution, men and women have worked out similar patterns for the accumulation and implementation of technology.

The complex place of technology amid community institutions, professionals, and changing male/female roles will be demonstrated using two examples, one from the more distant past and the other from the time immediately preceding EFM purchase.

Electricity and the X-ray machine: an Example of Simultaneous Institutional Evolution and Technological Accumulation

The use and updating of an x-ray machine will be used to demonstrate how

this gender and territorial context shapes community technological accumulation.

The following account is taken from an interview with a woman who has lived

in Invermere from the 1930s.

The biggest change in my life-time was the introduction of electricity. We already had full plumbing in our home when I was married.

In the 1930's Invermere's only power came from a diesel generator. It ran from dusk to 11:00 p.m., so its duration varied with time of year. It also ran in the mornings from 7:00 to 8:00 a.m.

The power supply was pretty weak and unreliable. The story went that the way to tell which light bulbs to turn off at bed time was to feel them to see if they were warm.

Dr. Coy had one of the earliest x-ray machines. Whenever he needed to take an x-ray he would call the telephone office from the hospital. The chief operator then called everyone in town who had a phone and we would all turn off all of our lights for half an hour.

It was after the second World War that a power supply came from a B.C. hydro station and became reliable.

This description refers to a time when the hospital and many community

homes were becoming united not only by their dependence on common energy

sources such as electricity, but also through the presence of communication devices

such as the telephone.

More and more, shared institutional needs and connections became

community issues both in politics and private discussions. Privately, as the interview

presented above demonstrates, community members formed and exchanged

standard jokes regarding the state of local technology. At the same time, community

members acted politically to demand a more reliable electricity supply so that, among

other things, better x-rays could be taken. Then, with the arrival of reliable power

prior to World War Two, community members, led by the Ladies Auxiliary, began

working to update the local x-ray machine because, among other things, a better power supply had become available.

To this day, community members actively determine community wide institutional infra-structure and technology. More recent examples range from obtaining a new community water supply to establishing a cable television network.

The place of the EFM in this community wide institutional context was explained by the woman quoted above. She had been influential in the Ladies Auxilary and its involvement in the purchase of the EFM for Invermere hospital. Later in the interview quoted earlier she stated:

Getting the monitor [EFM] was important because we no longer had to send so many of our mothers out of town. The doctors could use it to help babies here.

Her vision of obstetrical care, which was shared by many influential community women and remains as a powerful influence on obstetrics to this day, was for local care of local women. She knew that invermere doctors, who were predominately men, were all quite willing to give up obstetrical care altogether, or at least to transfer cases whenever possible. She also knew that acquiring an EFM allowed local doctors to take advantage of regional obstetrical expertise; expertise that could be used, in her view, to keep obstetrical cases "at home where they belonged". Of importance to this portion of the discussion is that she saw the EFM as something that her community possessed and as something that she could use to influence the medical care local women received.

Next, I will briefly describe the electrocardiographic (ECG) monitor, introduced into Invermere hospital during the late 1960s. The point is to show how this context involving sexual and territorial divisions of labour shapes not only the acquisition, but

also the use of technology. The ECG is worth considering because the patterns of use worked out for the ECG in the late 1960s and early 1970s formed the prototype for EFM use in the 1980s.

Interpreter Gatherers: Invermere Professionals and the Electrocardiographic (ECG) Monitor

ECG use in Invermere hospital was shaped by professional negotiations, hospital traditions, as well as by assumed patient needs. Taken together they formed what Bourdieu calls a "habitus" surrounding ECG monitoring. By this I refer not so much to the ECG recordings and their role in medical decision making, rather, I refer to the complex systems of transient physical relationships of patients, equipment, and techniques that become known both semi-consciously and sub-consciously by adept doctors and nurses. The reason for describing the ECG habitus is to understand the context which nurses, doctors, and patients imposed on the EFM and its use. The head nurse outlines ECG history in Invermere:

How long have you been head nurse?

Full time, since 1965. Before that I was head nurse off and on as others took the job and quit. I had 3 years off in the early 60s for maternity leave as well.

.... Tell me about the ECG.

I remember why we bought a cardiac monitor-defibrillator. It was the result of a case that George (deceased doctor) and I were in on. A young boy had accidentally taken Oil of Wintergreen and as a result his heart stopped. We couldn't get it going again and he died. We both feit that he would have lived if we had had a defibrillator. We managed to get a monitor-defibrillator soon after that.

George had actually tried to make one from a pair of car batteries hooked together. It didn't really work, but it was all that we had. Generally speaking, though, we just put cardiac patients to bed and hoped that they would live.

We bought our monitor/defibrillator in 1965 with money from the Ladies Auxiliary. The hospital and hospital programs did not agree with the purchase at the time. We went ahead anyway. We had to try something for these patients.Initially ECG use was a doctor's procedure only. The doctor stayed with a patient who was monitored. An intensive care was set up in the operating room. The doctor established and monitored a patient with the ECG. He stayed in the building and usually at the bedside. Nurses were very nervous about the monitor.

With the ECG we started to use IVs [intra-venous infusions] for cardiac patients. They [cardiac patients] never had IVs before this. It was with cardiac patients that nurses began to learn to start and maintain IVs.

Gradually nurses learned to do ECGs so that now they are taken routinely by all nurses, as well as by technicians in the lab.

.... After getting the monitor-defibrillator people with heart attacks gradually started to come to the hospital. Before that they just died at home. They new nothing could be done so they didn't hurry to the hospital. After 1965 more heart attacks came to the hospital and nurses gradually learned to establish and monitor with the ECG. This helped the doctors out. For years, we only had two doctors here. Today, nurses routinely "special" cardiac patients.

Nurses and doctors learned to meaningfully accept the ECG and ECG

monitored patients into their practice routines as they learned to "em-body (them) as

structure(s) in their world" (Bourdieu 1977:89).

In embodying the ECG and ECG practices, doctors and nurses invoked

longstanding traditions regarding division of labour and underwent complex

negotiations over roles and obligations. The head nurse alludes to a few of these

traditions and negotiations in the interview presented above. For example, she

describes the initial fears of nurses being close to the monitor, the need for nurses to

take on ECG work to ease the burden of work of the community's two doctors, and

ultimately nurses taking up the ECG as part of an expanded professional identity.

Taken together, Invermere professionals formed an ECG habitus that I will characterize as interpreter/gatherer; that is, nurses gathered, while doctors interpreted ECG records. This particular division of labour reflected, on the one hand, the assignment of the more menial task of gathering to nurses who held less prestigious

positions, were considered less time constrained, and had had less formal education particularly relating to ECG interpretation. Doctors, on the other hand, were spared the tedious task of handling the ECG and were left to interpret its recordings at their discretion.

Actual nursing care of cardiac patients during the long hours that doctors were absent, however, necessitated nurses privately interpreting ECG records. Part of what nurses learned, therefore, was to manage patients and the ECG such that they <u>appeared</u> to leave interpretations to doctors. This meant that nurses did not tell their interpretations to patients or record them in hospital charts. Nevertheless, they were often aware of ECG demonstrated patient conditions.

Nurses and doctors developing EFM monitoring practices adopted much of this adult cardiac monitoring habitus. Similarities included almost identical rooms and equipment, as well as restrictive patient positions and strict division of professional roles -- with nurses as gatherers and doctors as interpreters of EFM recordings. Similarities also included the lone presence of nurses during the long hours of the birth process. In addition, fetal heart activity, as the central focus of EFM monitoring, became analogous to the critically ill, diseased heart found in adult cardiac monitoring. Nurses, who had not previously been intensely aware of fetal heart activity during birth, learned the meaning not only of fetal heart patterns but also to fear, similarly to adult cardiac care, that at any moment the fetal heart could stop.

In their traditional nursing role -- alone with women during the birth process, and with an EFM present at the head of the bed, Invermere nurses felt compelled to use the EFM to assess the fetus. This was in part because of their growing professional status associated with handling other machines such as the ECG, and

their fear of personal and professional failure if a fetal problem occurred.

As a result, at times nurses used the EFM during routine nursing care. And, in keeping with traditional nursing roles, for the most part, they interpreted its recordings and kept their interpretations to themselves. Nurses noted in individual patient records, for example, if and when the EFM was used and whether or not its information products were seen by the doctor. Only two of the junior nurses admitted to telling their interpretations to patients. The other nurses explained to patients that the doctor would interpret the recording later.

In keeping with tradition, Invermere doctors seldom interpreted nurse initiated EFM records at or near the time of their collection. If doctors interpreted the records it was later when they were at the hospital for other reasons. Whether interpreted immediately or following a delay, these interpretations were recorded in the hospital charts in less than half of the cases. Furthermore, in no instances did doctors use these nurse initiated EFM records to justify initiating or delaying interventions.

Nurse intitiated EFM use, therefore, was seldom described in individual patient charts or made use of by professionals in their patient management decisions. However, despite the lack of formal representation in hospital cases it is wrong to assume that this electronic monitoring habitus was completely redundant or that professionals were satisfied with their respective roles. In fact, the opposite was true. That is, while many aspects of electronic monitoring were accepted as habitual and therefore accepted, discussions and negotiations regarding other aspects of screening EFM use formed one of the most intense and longest lasting intraprofessional and inter-professional discussions in this hospital.

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Invermere Professionals and the Endless EFM Debate

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Doctors and nurses in Invermere continually discussed screening uses of the EFM. These professional and inter-professional discussions occurred at several levels: informally between individual doctors and nurses, informally and formally among professional groups, and more formally between professional groups and the hospital administration.

Nurses usually initiated the daily informal discussions between doctors and nurses regarding screening uses of the EFM. Nurses initiated these discussions because they wondered when to use, and whether or not to interpret EFM recordings. They noted that, on the one hand, if they did not use the EFM and a baby was born with problems, they would be held responsible. If, on the other hand they did use the EFM, they were in the absurd position of not being allowed to interpret its records.

These issues of when to use and who should interpret EFM recordings were never resolved because doctors were not interested in making rules regarding routine EFM use. These decisions, they argued, were best left to the individual nurse attending a birth.

In addition to daily informal discussions, nurses also raised the issue of routine screening uses of the EFM during various hospital committee meetings. These meetings, which included medical staff and nursing staff alone and with the hospital administration and board, tackled difficult issues regarding training, standards of care, and hospital policy regarding the EFM and its interpretations.

The hospital committee meetings resulted in, if anything, attempts at consensus through policy statements; policy statements collected and kept in the hospital "procedure book". This book, which was kept at the nursing station,

summarized the hospital's various rules and policies regarding proper procedures and responsibilities. It was referred to by doctors and nurses, at times, to further their stance regarding EFM use in an individual case. Most often, however, its contents were ignored.

In summary, Invermere doctors and nurses situated screening EFM use among their hospital's electronic monitoring activities. As a result, they took on roles and assumed responsibilities in keeping with longstanding gender and territorial divisions of labour present since the time of hospital origins in this community.

II. The EFM in Inductions, Augmentations, and Intensive Care Treatments

In using the EFM in inductions, augmentations, and intensive care treatments, Invermere professionals located the EFM among a longstanding tradition of active management procedures. This active management procedure tradition will be presented here to further contextualize inductions, augmentations and intensive care treatments. Similarly to the contextualization of screening use of the EFM, EFM use during active management procedures is shown to remain largely absent from professional case constructions.

Active management procedures will be set in context using an analytical structure developed by various authors who have examined forms of human torture (Asad 1983, Foucault 1979, Scarry 1985, Spetzack 1987, Tuassig 1987). At issue is how a social group organizes and relates to socially sanctioned activities designed to alter the physical body. The emphasis in this analytical structure is on the relationship between the power to physically alter a body and the power to "know" a body.

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The use of an analytical structure developed for understanding torture techniques is not meant as an implicit or explicit criticism of active management techniques. Instead, the analytical structure is employed to help emphasize the political significance of the bodily contact found in this type of medical activity.

The essential characteristic of this category of medical activities is whether or not the physical body is altered. If a medical activity alters the physical body, then objects and machines involved in these activities are understood a certain way in keeping with longstanding hospital traditions. A classic example of an active management procedure is a surgical operation, such as an appendectomy. Active management procedures also include a wide variety of invasive diagnostic tests, such as the injection of radiopaque dye during some forms of x-ray imaging. In obstetrical care, this type of activity includes forceps applications and cesarean section operations, as well as, most recently, intervention procedures involving the EFM, such as inductions and augmentations.

Doctors, nurses, and patients in Invermere and elsewhere in my medical experience recognize a category of medical activities I am calling active management procedures. Doctors and nurses, for example, distinguish these activities as the things that they "do"; the hands on skills of which they consider themselves capable. To a significant extent, doctors, more than nurses, define themselves as a professional in terms of the active management skills that they are able to perform.

The active management procedure category is also distinguished by hospital administrators and board members as one way to describe their hospital. They speak of, for example, the medical procedures that are "done" locally, as well as they define hospital progress in terms of acquiring new active management capabilities.

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The historical processes and cultural traditions shaping active management procedures are as old as Invermere hospital itself. These processes and traditions are outlined here to explain the continuities shaping these interventional aspects of medical care and its associated technology. These continuities are important in demonstrating that the hospital is organized around, and seen through traditions other than those suggested through cases and case constructions. The purpose of showing these various hospital and community traditions is to argue that EFM use was shaped much more by its location in these hospital and community traditions than its specific uses in individual patient care.

Hospital Growth and the Active Management Revolution

Throughout Invermere hospital history, powerful forces continually centralized community and professional attention on the hospital as <u>the</u> place for active management procedures to occur. The social and historical processes initially leading to this centralization of medical care in hospital around the turn of this century are described by numerous authors including Starr (1982) and Rosenberg (1979). Leavitt (1986), among many others, describes the movement to centralize obstetrical intervention equipment and expertise in hospitals.

The social and cultural forces resulting in the housing of intervention procedures in hospital, if anything, intensified as this century unfolded. Torrance (1987:479-500), for example, describes how accumulation of new equipment and ancillary staff for interventions fueled hospital growth throughout Canada. Invermere hospital followed these country-wide trends. For example, a newspaper article from the early 1950s summarizes the facilities, staff, and activities at that time, and it shows the continued community investment in acquiring equipment for and improving

capabilities found in the local hospital:

The hospital has 13 beds and four cribs. There is a well equipped operating room where approximately 100 major operations and innumerable minor ones are performed each year. The X-ray machine is adequate, but not up to date....

Ladies Aid presented a modern sterilizer to the hospital last year. The Invermere Seniors group donated an electric refrigerator and modern laundry equipment. This year they gave a double sink for the kitchen which is being modernized. The Invermere Junior Aid presented an incubator and supplied the nursery with necessary linens....

About 50 babies were born in the hospital this year. (Windermere Valley Echo, January 2, 1952).

After World War II, the number of active management procedures housed in

Invermere hospital expanded exponentially. This also fit with country wide trends:

Then, after the Second World War, the pent up demand for new facilities and technology exploded. Doctors and patients began to use hospitals as never before (Torrance 1981:257).

Hospital expansion to accommodate new equipment and active management

procedures accelerated in the 1970s, so that by the end of the decade, the years

immediately prior to EFM purchase, Invermere hospital was becoming more and

more a place where things were done, rather than a place to house the sick and

injured. This accumulation of treatment options, coupled with the expansion of

consumers' expectations resulted in changes in hospital utilization. The hospital

administrator in Invermere explains these changes:

I started as administrator in 1970, when the planning for this latest hospital addition was completed.

Our problem then was getting more beds. The new addition increased our bed total from 24 to 31 and added the emergency stretchers, physiotherapy and X-ray. We had 11,000 to 12,000 patient-days/year back then. Now we have 4 or 5,000 patient-days/year. The hospital population, in the meantime has gone from about 5,000 to 7,000.

Now, our problems are keeping chronic care patients out of the acute care beds, and having enough rooms for all the day-visit activities. Did you know that the RCMP estimated over 35,000 people

came into this area on the May long weekend? The number of tourists coming here as out-patients is the biggest change in the hospital.

Hospital use by local people as a place to stay has also gone down. This is mainly because it is the day of the specialist and specialist activities. Its not that people don't like to stay here as patients. In my 20 years we have never had a complaint about the quality of care in this hospital. People have complained about personality things, not the care they were given. So, patients like care here, however, now they just want things to be done and then to leave (Interview material, 1989, year four of the project).

In the 1980s, as doctors began performing more and more active

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management procedures in obstetrics, they brought obstetrics in line with this growing category of active management of patients. Before situating obstetrical active management procedures in this context, a few general features of the active management tradition will be outlined using an appendectomy as an example.

General Features of Active Management Procedures and their Representation by Professionals

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During an appendectomy, similarly to any other active management procedure, doctors and nurses physically contact and directly alter the physical body, at a scheduled time, in a particular place, with highly specialized equipment.

Doctors and nurses begin an appendectomy by both physically and conceptually bracketing out most of the patient's body so that the appendix can be isolated and removed. At no other time in a patient's life, and at no other time in a practitioner's evaluation of a patient, is the appendix considered as such an important organ; that is, as something dominating the rest of the body.

At the same time as the appendix has been isolated in the body and elevated to center stage in these activities, relationships with the appendix have become leveled to a single interactive plane. This means that, as much as possible,

professionals have become concerned with linear, cause and effect processes. Professionals, particularly surgeons, are allowed to ruthlessly include and exclude objects, instruments, and ideas, in order to safely and properly handle biological structures.

An active management procedure in which the physical body is directly altered, such as an appendectomy, is performed, as much as possible, in keeping with a strictly defined routine; a routine learned by doctors and nurses through direct experience with similar routines both during training and later in practice. Rules of order define the sequence of events, bodily positions of patients and professionals, dress code, as well as determining who is permitted to speak, when, and what they are allowed to say. All of this routine is taken for granted by adept professionals and is almost never represented in individual patient charts.

Written medical representations of active management procedure: are primarily found in a report produced by the doctor performing the procedure. This usually takes the form of a one page summary of the techniques employed, pathological findings, and any complications encountered. Nurses record numerous details in a patient's chart including the timing of events, people present, and equipment used. However, only doctors describe the actual procedures themselves.

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Active management procedures such as an appendectomy involve different social-cultural structures than those described for screening uses of the EFM. Screening uses of the EFM are situated in habitual bodily routines dominated by gender and territorial divisions of labour. Active management procedures, in contrast, are dominated by social-cultural concerns regarding causality, responsibility, effectiveness, and public scrutiny. In other words, during active management

procedures, doctors and nurses are held almost totally responsible not only for the direct effects, or "outcome", of their operations on the body, but also for the overall condition of a patient during the course of the procedure¹.

Active management procedures also differ from screening uses of the EFM in their respective use of words and statements. While both contexts involve actitivities largely unrepresented in case constructions or other forms of medical representations, in the screening context, professionals use words to influence one another, whereas in the intervention context words are used in defence against patient and public scrutiny.

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Professional understanding of active management procedures follows what Giere termed a reproductive model; a model that reproduces a part of the world by simulating lived bodily states. Words, in these instances take the form of an hypothesis regarding, rather than representations of, events².

² Giere (1988) defines a model as a human construction, both linguistic and nonlinguistic, about how part of the world is ordered or operates. At one extreme, he sees models taking the form of an explanation, for example, psychoanalytical constructions of thought and behavior. These are largely linguistic structures where words function to represent part of the world, or a person's lived experience. At the other extreme, he sees models taking the form of an experimental reconstruction that actually reproduces part of the world, for example, a steel ball and incline plane model - found in physics experiments - that simulates gravitational activity. These are largely non-linguistic structures that represent part of the world themselves. This means that, in reproductory models, words function very differently than in explanatory models because they act as hypothesis about the models' relationship to the world rather than as representations.

¹ Scarry (1985), in her analysis of the wider human experience of pain outside of medical events, similarly describes the intense yet implicit public investment in dealing with physical pain. She explains that, while an individual in pain is cut off from other members of a social group, every aspect of his/her treatment is thoroughly invested in social significance. For example, as Scarry explains, providing or denying something as taken for granted as a chair or bed can result in intense bodily effects from profound relief to intense discomfort.

Active Management Procedures and Obstetrical Care

Increasingly toward the mid-1980s, Invermere doctors and nurses performed more and more active management procedures to initiate and control the birth process. Prior to that time, active management procedures in obstetrics were limited to forceps applications or cesarean section operations when all else had failed. The new active management procedures -- inductions, augmentations, and intensive care treatments -- in contrast, were not applied as rescue operations, rather they were attempts by doctors and nurses to prevent problems occurring during birth.

The active management activity in inductions and augmentations was administering a labour controlling medication. Taking this action had several effects on obstetrical care: it heightened professional attention and responsibility; 2) doctors and nurses took a more active, while patients took a more passive, role in the birth process; and 3), doctors rather than nurses directed obstetrical care.

In performing these procedures and thus becoming directly involved in attending and managing birth, Invermere doctors demonstrated their concern for pregnant women and their willingness to help women during birth. This demonstration of concern for women during birth helped doctors both to satisfy their own need to do all that they could in each obstetrical case, and to show the community that pregnant women were receiving state-of-the-art care. And, as mentioned above, state-of-the-art care at this time meant that doctors took a more active role managing all types of hospital patients.

In keeping with the traditions of active management procedures, during these obstetrical interventions, doctors and nurses bracketed out pregnant women, making

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them into the background constraints to which the birth process was related. In addition, as much as possible they operated as if pregnant women were made up of determinative, measurable units, units related to one another on a single, mechanistic plane. Furthermore, cause and effect relationships dominated all other relationships and time was considered as a limited commodity and often as the enemy, similarly to when doing an appendectomy.

During active management procedures, doctors and nurses used the EFM to directly contact the fetus, measure its health, and weigh its health against maternal health. Similarly to the intervention procedures themselves, EFM use allowed doctors and nurses to demonstrate to themselves, patients, and the community that they were both concerned regarding fetal health and willing to involve themselves in fetal care.

While professionals intervened in the birth process to change the rate and intensity of uterine contractions -- considered as the "forces" of labour, it was the fetus that became the focus of attention and responsibility. This was in part because the EFM dramatically simulated fetal heart sounds, but also the fetus became the central "object" of these procedures, analogous to the appendix during an appendectomy.

The fetus as central object during obstetrical interventions suited doctors, nurses, and patients because they could see themselves as holding fetal needs above all else. In other words, patients and professionals could discuss and manage birth in terms of the fetus and fetal health ideals.

Pregnant women in labour were willing to accept fetal oriented care in part because of their very real concern for the condition of the fetus in these intensive

care circumstances. They also accepted a strong fetal emphasis because they were concerned that their labour was harming the fetus, and they welcomed the reassurance that the fetus was healthy.

In taking full responsibility for the fetus as the central object of their active management procedures, doctors established themselves both as fetal champions and as scapegoats if fetal problems occurred.

The corollary of practitioners taking the fetus as the central object of these active management procedures, was that the birth process and, indeed, pregnant women themselves became an adversary of the fetus and their champions -- doctors. Professionals, for example, almost inevitably became impatient with the birth process because they saw it as adversely affecting the fetus, their focus of concern and responsibility.

In keeping with active management traditions, Invermere doctors and nurses almost never represented intervention uses of the EFM in hospital charts. In addition, in contrast to screening uses of the EFM -- where doctors and nurses commonly discussed the EFM, professionals rarely discussed EFM use in interventions. Doctors and nurses commonly discussed intervention procedures themselves. In fact, the issue of whether or not to perform an induction was one of the most common topics in this hospital during the time of this research. However, because the EFM was considered as a routine part of the intervention procedures, its use was taken as automatic once the decision to intervene had been made.

Doctors occasionally noted EFM interpretations in the hospital records during an augmentation procedure if fetal problems were suspected after the augmentation had started. The assumed fetal problems demonstrated by the EFM were used to

justify stopping the augmentation.

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In the latter years of this study, 1987 to 1989, EFM interpretations of fetal "health" were specifically noted by doctors during intensive care treatments, if the doctor wished to justify "delaying" interventions in the birth process. These instances, described in detail in Chapter 4, occurred when the length of the birth process extended beyond standardized obstetrical time frames, and doctors needed to justify why they were "allowing" the birth process to continue.

The most remarkable feature of EFM use in induction and augmentation procedures from 1984 to 1986, was how seldom doctors and nurses recorded interpretations of the hours of fetal heart rate and uterine contraction recordings. If doctors interpreted these recordings, these interpretations were seldom represented in hospital records. Nurses recorded their interpretations if they suspected fetal problems enough to discontinue the procedures.

In summary, Invermere professionals routinely used the EFM to contact the fetus and to demonstrate fetal health during active management procedures. In as much as doctors actively managed the birth process, the EFM became an essential, important tool in obstetrical care. Similarly to screening uses of the EFM, EFM use in interventions seldom were mentioned in obstetrical case constructions. These interventions were not mentioned because, unlike screening uses where the EFM was largely ignored, during interventions the EFM was taken for granted as demonstrating fetal health.

III. The EFM and Nonstress Tests: the Making and Managing of Medical Information Systems

During Nonstress tests, the EFM became part of a third type of hospital activity; a type of activity with traditions and models distinctive from those found for EFM use during screening and interventions. Similarly to the discussion in the preceding two sections, the traditions and models shaping EFM use during NSTs are outlined in order to demonstrate their importance to professionals and professional care, and to contrast them with cases and case constructions.

The historical process and cultural traditions shaping the EFM during NSTs are those involving information systems; that is, the rationalization of health care through regionalization of facilities and centralization of information processing. The NST context differs from either screening uses of the EFM -- which were shaped by issues of territory and division of labour -- or intervention uses of the EFM, which were shaped by issues of direct cause and effect a well as public accountability and responsibility.

Formal systems for gathering, processing, and interpretating information were not isolated either to medical care in general or to obstetrical care in particular. By the early 1980s, most Invermere institutions, from homes, to schools, to banks, had developed sophisticated and innovative ways to collect and manage information.

Making arrangements for, travelling to and undergoing a NST are all aspects of the production of medical knowledge. Young (1981a) stresses importance of analysing, not only knowledge products, but also the knowledge production process. He emphasizes that studies of medicine must avoid "reduce(ing) questions about the <u>process</u> by which informants and researchers produce their knowledge to questions about the structure of knowledge" (1981a:379, emphasis in original). Young explains

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that the problems with this approach are that it ignores "other factors producing knowledge, such as social relations between healers or between healers and their clients", misses the "heterogeneity" of everyday or practical meanings, and it "generally ignore(s) questions about relation between knowledge and ideology" (1981a:379).

Producing Obstetrical Information and Knowledge Associated with the Fetus

By the time NSTs began in Invermere in 1983-1984, local and regional obstetrical care had already established an information production system directed at care of the fetus.

Obstetrical care in Invermere began making, organizing and discussing knowledge on the fetus around 1980. At that time, local doctors learned about while the regional hospital in Cranbrook and the tertiary hospital in Calgary acquired certain fetal testing techniques. As a result, a system was established where Invermere doctors arranged for local pregnant women to travel to other towns where machines such as ultrasound imagers were located. There, women underwent the test quided by technicians. Regional and tertiary care specialists then interpreted the tests and reported results back to physicians in Invermere.

During the years of this study, fetal testing capabilities in regional centers became more varied and this testing more commonly accepted as part of routine obstetrical care. As a result, on the one hand, pregnant women and their partners became more willing and in some cases were eager to take time off work and to travel to other communities where the technology was located. Most pregnant women also became quite accepting of the self-imposed bodily restrictions before and

during the tests. On the other hand, more and more professionals and professional activities became involved in establishing and running these fetal testing programs. This included acquiring and repairing equipment, scheduling appointments, training and hiring skilled technicians, as well as the effort involved in image gathering and reporting. At the same time, regional and teriary care hospitals grew or were remodelled to provide physical space for machines, people, and reporting, as well as purchasing communication equipment for booking appointments and reporting results.

In keeping with a growing interest in and responsibility for the fetus, Invermere doctors ordered NSTs in order to help them to manage "the fetus" during pregnancy prior to the onset of labour.

NSTs resulted in formation of a local fetal information production system within the larger regional system. That is, NSTs required pregnant women to visit the hospital prior to the onset of birth where the EFM was used and a NST record was produced. The nurse then stored one copy of the NST at the hospital and sent another copy of the tracing to the doctor's clinic for interpretation and recording in the patient's chart.

NSTs and Obstetrical Case Constructions

In comparison to this industry for making and managing obstetrical information and images, use of this information and these images in obstetrical case management in Invermere was usually brief and taken for granted. Generally speaking, this was because, for the patient population handled in Invermere, tests such as ultrasound and NSTs were almost always interpreted as normal; normal tests did not result in any intervention in pregnancy.

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The obstetrician who worked in Cranbrook throughout the time of this

research describes his similar experience with NSTs, in particular their marginal role

of NSTs in his obstetrical management decisions.

I do approximately 300 NSTs every year, and of those I bet there are only 4 or 5, that I have to make a <u>major</u> decision on.

You know, the one that I can remember that I'll never forget was a patient of Dr. ----. She called him one day because she didn't feel the baby move. He said not to worry but to call him again the next day, which she did. She said she still couldn't feel movement so he asked her to come in. She was only 32 weeks, so he sent her along to me for a NST. It showed an absolutely flat [fetal heart] rate with spontaneous decelerations, so I immediately performed a cesarean section. The baby was born alive but died the next day in Calgary. Ugly, but the NST did its job.

Did you have other cases like that where a NST tripped your action?

Hold on, in this case I don't think the NST tripped my action, it was the mother. If a mother is concerned I am ready to act. The NST did very little and in this case made no difference. You know, I think count to ten charts³ are just as good as NSTs.

Is that in the literature.

No, that is just my opinion.

In a case construction, therefore, the entire effort to gather and interpret fetal

tests were often reduced to one word, normal; a word that received only brief

acknowledgement in the course of a patient's subsequent visit to her doctor.

Normal test results were clearly important both to patients and practitioners.

The discussion here is not meant to diminish their importance. Rather, of interest is

describing the much larger context for NSTs within the fetal testing industry; an

industry with professional and corporate interests outside of the concerns found in

³ A count to ten chart is a method of assessing fetal health where pregnant women are instructed to count the number of fetal movements that they feel over the course of a day. They are told to stop once they reach ten as this is considered indicative of a healthy fetus. If they do not notice ten movements, then they are instructed to notify their doctor.

individual case management; an industry which is profoundly interested in having all forms of fetal testing associated with modernity, progress, and concern for the unborn.

NSTs therefore provided Invermere doctors, patients, and the hospital administration with the opportunity both to see themselves and to be seen by the community as producing and dealing with the needs of the fetus. This impression of producing and dealing with fetal needs, however, was more the result of women visiting the hospital and undergoing these tests, than local doctors using the test results in obstetrical case management.

IV. Summary

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In this chapter, I presented three different contexts involving obstetrical use of the EFM: 1) evolving gender and territorial divisions of labour in community institutions; 2) centralization and politicization of active management procedures; and 3) the development of systems for information production and management. The three EFM contexts were shown as distinct from one another and not represented in oit tetrical case constructions.

Throughout this chapter, I explained that further contextualization of EFM use in Invermere obstetrical care did not lead to a more coherent understanding of obstetrical care, the EFM, or of its use. Instead, further contextualization of obstetrical care involving the EFM lead to a greater appreciation of the disparate and often contradictory social-cultural and historical forces shaping obstetrical care in this community.

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PART IV. CONCLUSION

Chapter 7

Technology and the Application of Medical Knowledge and Practice

Social scientists have paid considerable attention to the social production of medical knowledge and practice in western Europe and industrialized North America (see collections such as Wright and Treacher 1982, Hahn and Gaines 1983, Lock and Gordon 1988). To date, however, they have paid relatively little attention to the application of medical knowledge and practice to individual patient problems such as pain or suffering (Conrad 1992:36, Lock 1988:5). In particular, these social scientists have been reluctant to study the application of technology to patient care. As Koenig (1988) explains, aside from one or two rare exceptions in the study of the use of medical technology, "the field is barren" (1988:468).

The almost complete absence of studies of the use of medical technology has left unchallenged at least two important assumptions regarding its relationship to medical knowledge and practice. In keeping with the interests of social scientists studying the social construction of medical knowledge and practice, both of these assumptions were examined and challenged in this research. The first is the assumption that technology has primarily shaped medical care in Western countries, rather than the other way round. The second is the assumption that medical technology can be adequately understood through measurement of its impact on patients.

1) The Assumption of technological determinism

Over the past century, medicine in Western Europe and North America has accumulated technology at an ever increasing rate; technology increasingly targeted both in the popular and medical literature as the cause of uncontrollable change and runaway health costs. For example, this view is captured in the title of a book by the historian Reiser: "Medicine and the Reign of Technology" (1978, see also Reiser 1986). Similarly, Oakley writes of the period 1960-1980 as the "Reign of Technology" (1984:153-209) in obstetrical care. She goes as far as to say that intranatal care along with antenatal and postnatal care were "revolutionized" by technological developments. While she is not suggesting that technology caused change by itself, she does imply that medical care evolves as it races along from one new technology to the next.

A technologically determined view of modern medicine clearly is of benefit to doctors and nurses. They can, for example, blame technology for a wide variety of problems arising in medical care, instead of various human causes: from misplaced economic priorities, to professional laziness or ignorance, to unreasonable patient expectations.

The reason critics or analysts propose technology as the primary engine of change is less clear, and varies among authors. Overall, these authors seem prepared to accept technology in this role because it contributes to their larger agendas. Rachlis and Kushner (1989), for example, in their criticism of Canadian medicine, name technology as a major force shaping medical care. Assigning technology this role strengthens their cases against medicine because technology, which symbolizes the dehumanization of care and the intrusion of corporate interests,

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is seen to displace patient's needs as the primary determinants of medical care¹.

The technology studied in this research, in contrast, was not found to have an important deterministic role on the evolution of medical knowledge and practice. Rather, the technology was almost always found simply to be a part of something else. The implication is not that the technology was trivial or transparent². In fact, the opposite was found to be the case. EFM use significantly changed medical capabilities, making professionals and patients acutely aware of otherwise unknowable details regarding the condition of the fetus. The use of this information, however, was almost totally shaped by established practice schemes and evolving hospital traditions, rather than the other way round.

The conclusion reached here -- that information technology did not have a deterministic role on medical knowledge and practice in a particular community -- while challenging the generally held deterministic assumption, cannot be extrapolated to other forms of technology or to this same technology in other settings. On the one hand, professionals may use other forms of technology -- for example surgical

¹ Various books, written mainly by social scientists, similarly have assigned a deterministic role to reproductive technologies and their associated techniques (Baruch et al 1988, Stanworth 1987). While valuable for their contributions to understanding the social, political, ethical, and personal dimensions of these innovations, theses books all leave readers with the impression that reproductive medicine is swept up in rapid and uncontrolled technologically driven change.

² A trivial view of technology, which is argued more and more often in relationship to medical imaging technology (Pasveer 1989, Yoxen 1987), is that all current technology, including its associated knowledge, are the products of historical processes. This is clearly true; that is, nothing is inherent to a technology or to its images. However, saying that everything, including technology, is historically determined does not help to explain the evolution of medical knowledge and practice. It is also necessary to examine a specific context to see which forces and factors professionals actually use in shaping medical care.

implements used to do things to patients rather than to gather information for professionals -- in ways that have a more deterministic influence on medical knowledge and practice. These other forms of technology therefore need to be studied in themselves. On the other hand, the lack of a deterministic role for the EFM in Invermere cannot be extrapolated to other settings because, for example different professionals in different settings were found to assign the EFM a more deterministic role.

The place of technology in the evolution of medical knowledge and practice therefore is context dependent. It cannot be studied through sampling one setting and extrapolating to others. Instead, the place of the technology depends on local factors such as community size and stability, hospital history and traditions, the age of professionals and their personalities, as well as patient expectations and education.

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2) The assumption that technology can be adequately assessed through outcome measurement

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A second assumption regarding technology, found throughout the medical literature and is left unchallenged in the absence of studies of technological use, is that technology can be understood, and ultimately controlled, through examining its effects on medically defined case outcomes.

Studying technology through outcome measurements ignores the influence of professional variation on both technology use and interpretation. In fact, studies or outcome measurement assume that professionals are a "common denominator" that can be factored out of technology assessments. In my research, in contrast,

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professional variation -both within and between professions -was found to critically affect the relationship between technology and medical care.

More generally, I found that professionals used technology for a wide variety of personal, cultural, and historical reasons other than their expectations that it would improve patient outcome. For example, professionals used technology for reasons as varied as responding to patient expectations or acting in keeping with hospital character.

Understanding medical technology, therefore, was not so much a matter of understanding its direct impact on patient outcome, rather, it was a matter of understanding its place in professional, hospital, and community affairs.

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