Prenatal Care: A Comparative Evaluation
Of Nurse-Midwives and General Practitioners

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ABSTRACT

The practice of midwifery by those other than physicians is illegal in Canada and despite recommendations of nursing, medical and consumer groups, no trials evaluating the effectiveness of the nurse-midwife as a member of the modern obstetrical team have occurred here. To demonstrate a nurse-midwifery model, four nurse-midwives provided primary care to forty-seven childbearing women and their families over a twenty-two month period in a maternity teaching hospital. This clinic presented a unique opportunity for comparing the prenatal care provided by nurse-midwives with that of general practitioners who attended deliveries in the same setting. Utilizing a retrospective chart audit, case control study design, the nurse-midwife cases (NM cases) were each matched to two general practitioner controls (GP controls) through the use of the hospital's perinatal data base. The matching characteristics included low risk status, date of delivery, age, parity, gravidity, previous pregnancy losses and census tract income. Prenatal criteria that had been developed and tested in "The Burlington Randomized Clinical Trial of the Nurse Practitioner" for assessing the quality of care were reviewed and updated for this study. With these criteria two blinded abstractors audited the prenatal record forms of all the subjects and scored them as either "superior", "adequate" or "inadequate".

Seventy-seven percent of the records of the NM cases received a "superior" score, where as 60% of the GP controls' records received an "inadequate" score ($x^2_{mh} = 18.02, p < .01$). Overall, the general practitioners' records indicated more erratic care than those of the nurse-midwives. Although the physicians met most of the initial assessment criteria, they failed to meet the criteria that evaluated the ongoing
routine assessment process by recording an inadequate number of prenatal visits (36%), or by omitting urine test results (38%) and blood pressure readings (21%). No differences were found in variables relating to labour and delivery with the exception of the incidence of episiotomies. The results indicate that nurse-midwives as part of an obstetrical team are able to provide safe prenatal care to a low risk population in a Canadian urban context, and that their records are thorough and more consistent than those of general practitioners.
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CHAPTER 1

Introduction

1.1 Statement of the Problem

Over the past decade, several organizations have recommended the introduction of nurse-midwives into various obstetrical care settings in Canada. Ideally, the trial period would be accompanied by evaluative research which examined the safety, quality, acceptability, and costs of this alternative care giver. These recommendations are based on the positive experiences of other industrialized countries where midwives are an integral part of the health care system (e.g. U.S.A., Netherlands, Great Britain, etc.) (Federal Task Force Report 1984:30; Keirse 1982; Robinson, Golden and Bradley 1982). Support for this innovation in health care delivery in Canada is found in nursing schools, nursing associations, health consumer organizations and with many obstetricians, perinatalogists and pediatricians (Carty 1985; Midwifery Fact Sheet 1981; Korn 1980; Task Committee Report 1979).

In addition to these recommendations, the recent Federal Task Force on High Risk Pregnancies and Prenatal Record Systems (1984), whose participants included obstetricians, perinatalogists and nurse specialists, briefly reviewed the evaluation research on nurse-midwifery and noted that none existed in Canada. They concluded that: "It would seem that there is a complementary role for each of the three: (the) nurse in reproductive care, (the) family physician, and (the) obstetrician. Any system will be most efficient when personnel are utilized appropriately according to their level of training" (Federal Task Force Report 1984:31). They recommended that: "Whereas the role of the nurse in reproductive care is recognized in many countries, it has not yet been agreed upon in Canada, and therefore the Committee proposes the establishment of a National Task Force to address this important issue " (Federal Task Force Report 1984:31).

Many pregnant women are questioning the traditional style of the doctor-patient relationship and are seeking active participation in health care activities. Some of these women want the services of professional nurse-midwives, particularly if delivery could occur in a flexible hospital setting (Diers 1982; Enkin and Chalmers 1982b; Gillespie 1981; Lindheim 1981; Powis 1981; Rising and Lindell 1982; Weatherston, Carty, Rice and Tier 1985). They feel that nurse-midwives offer an alternative style of care which they prefer. The Dean of the School of Nursing at Yale has described the values of nurse-midwives as including: a genuine interest in the health of women, emphasis on patient participation and low intervention with good clinical judgement; attention to the "soft" non-medical aspects of care; concentration on the patient in the context of her living environment; continuity of care giver; emphasis on early intervention and
prevention; and a degree of excellence of care which supports a source of personal power (Diers 1980). These values appeal to health care consumers who want to be informed and active participants in the child-bearing process.

Despite this broad base of support, funding for the demonstration and evaluation of a nurse-midwifery model in Canada has not been forthcoming. Resistance to this innovation in health care delivery lies in two areas: (a) In provincial ministries of health where it is anticipated that nurse-midwives will cause "add on" rather than "substitutive" costs and therefore increase demands on health care budgets, and (b) in medical associations and colleges where general practitioners actively lobby to restrict the practice of nurse-midwives because they perceive them as competitors in the health care market (Carty, Gordon and Rice 1981; Position on Midwifery 1984). This resistance has so far effectively frustrated most Canadian attempts of a trial of a nurse-midwifery model in a modern obstetrical care setting.

1.2 Setting

A limited demonstration of a nurse-midwifery model has been undertaken in Canada in an academic setting (Carty et al. 1984). The School of Nursing (University of British Columbia) and the Division of Maternal and Fetal Medicine, Department of Obstetrics and Gynecology (University of British Columbia) in conjunction with the Grace Hospital Nursing Department established the "Low-Risk Clinic" in 1982. A precursor to the clinic was the "Hands on Clinic for Nursing Instructors" at the Vancouver General
Hospital (VGH) which functioned for one year prior to the amalgamation of the VGH's and Grace Hospital's maternity services in 1982.

The team of care givers in the Low-Risk Clinic consisted of four nurse-midwives and four obstetricians; the nurse-midwives functioned as the primary care givers.

Although no explicit funding supported the Low-Risk Clinic, the Grace Hospital provided space and clerical support in the out-patient area of the hospital. A large component of the nurse-midwives time was volunteered.

The purpose of the clinic was threefold:

1. To provide "hands on" practice for nursing instructors, enabling them to maintain their clinical expertise.

2. To provide care which would be both safe and satisfying to the families involved in the pregnancy and birth and which would avoid interventions whenever possible.

3. To demonstrate that nurse-midwives could work as an integral part of the obstetrical team in the Canadian health care system, and at the same time recognize that nurse-midwives had a significant and unique contribution to make to the health care of the woman and her family during the perinatal period (Carty et al. 1984:1).
The B.C. College of Physicians and Surgeons was informed of the Low-Risk Clinic and approved the clinical activities of the nurse-midwives: medical functions undertaken by nurse-midwives, such as delivery of the baby, were regarded as "physician delegated" functions, and they were carried out by the nurse-midwives with medical supervision.

Over a period of two years, 51 women were enrolled in the Low-Risk Clinic at the Grace Hospital. In this setting the nurse-midwives emphasized the unique needs of the family and attempted to protect the importance of the childbearing experience. The nurse-midwives chose to use a family centered approach integrated with emotional support, counselling, and teaching. Throughout the childbearing process they encouraged active parental participation and offered continuity of care and accessibility in their style of practice. It was their belief that eventual economic and legal support for nurse-midwifery would come from clinical demonstration.

The entire research component of the Low-Risk Clinic and the Hands-on-Clinic consisted of a summation of descriptive and outcome variables for both clinics and a satisfaction study involving the first third (23) of the patients seen by the nurse-midwives. In their study, analysis of the outcome variables can only remain descriptive due to the relatively small number of women seen at the two clinic settings when compared to the rest of the childbearing population in the area. The results of the satisfaction study were used to provide the nurse-midwives with feedback in the early stages of the clinic's development. All of these data were presented in a report entitled "The Low-Risk Clinic: Family Care Based on the Midwifery Model, 1981-1984" (Carty et al. 1984).
1.3 Purpose

The general purpose of this study is to provide initial data that evaluates the quality of care that nurse-midwives provided in a Canadian setting. Evidence of safe and adequate care will support and legitimize the expansion of nursing into the field of nurse-midwifery (Diers and Burst 1983). When considering (a) the recommendations of professional, consumer, and public policy organizations that the role of nurse-midwives be explored; (b) the unique existence of the Low-Risk Clinic in the Canadian health care system; and (c) the absence of Canadian data evaluating nurse-midwifery care, further evaluation of the Low-Risk Clinic's experience is clearly warranted. Moreover such data would provide information that could contribute to policy studies examining alternative health care delivery systems and innovations in nursing practice.

Since physicians are the legitimate care givers to childbearing families, medical standards of care are the most appropriate criteria for an initial evaluation of the care provided by nurse-midwives: to establish credibility, nurse-midwives have to provide at least equivalent care to that of general practitioners.

Criteria developed to evaluate the effectiveness of nurse practitioners in a Canadian family practice setting (Sibley et al. 1975) were chosen for application to this study. The selected criteria evaluated the quality of prenatal care as evidenced by the patient's medical record, and were based on a medical model. These explicit criteria examine the
process of the care provided, and enable comparisons between different care givers. Unfortunately the criteria only assess a limited aspect of the prenatal care at the Low-Risk Clinic. However, after questions of safety and adequacy are resolved, further research can explore the intrapartal and postpartal periods, as well as the different practice models of nurse-midwives and physicians.

1.4 Research Question

The specific purpose of this study is to compare the process of prenatal care provided to low risk pregnant women by nurse-midwives and general practitioners with the following research hypothesis:

The nurse-midwives at the "Low-Risk Clinic" in the Grace Hospital provide more effective prenatal care than general practitioners who deliver in the same setting, as evidenced by the fact that more of the nurse-midwives prenatal records are rated "adequate" or "superior" using the Burlington Prenatal Criteria.

1.5 Thesis Outline

The thesis is organized in the following manner. Chapter 2 discusses the quality of care literature by first examining general research into ambulatory settings and then by specifically reviewing research which evaluates the effectiveness of nurse-midwives in various settings. In Chapter 3, the effectiveness of prenatal care is discussed with a review of
the literature that attempts to identify predictive indicators of prenatal outcomes. The methodology of the study is presented in Chapter 4 with discussions on both the instrument and modification to the criteria, as well as, a detailed description of the study design and it's reliability. The results are presented in Chapter 5 and discussed with comparable research in Chapter 6. The thesis closes with discussions and the implications and feasibility of the study's methodology, and the implications of the study's results on effecting the legitimacy, feasibility and support for the issue of incorporating the nurse-midwife into the Canadian health care system.
CHAPTER 2

Quality of Care - Literature Review

2.1 Ambulatory Setting

The elements involved in evaluating the quality of care that practitioners provide has been outlined and defined by Donabedian (1967) and Sanazaro (1980), among others. Initial development in this field of research focused on care provided in hospitals and examined outcome factors such as rates of post-operative infection. In the 1950's methodologies applied to quality of care research in hospital settings were clarified. (Sheps, M. 1953). In the past twenty years quality of care research has broadened to include evaluations of primary care in ambulatory settings. More recently this research has examined the care provided by different care givers. The emergence of the nurse practitioner and the physician's assistant and their role overlap with physicians in primary care has become a new focus of quality of care research.

An assessment of the quality of care provided by different health professionals in a primary care setting faces the same issues and methods problems outlined by Donabedian (1967). He recommended for example, that a definition of quality be established early in the research because it has a profound influence on the approaches and methods one chooses to assess the care. He reviewed approaches that can be taken, and identified (a) outcome of care, (b) process of care and, (c) assessment of structure, as three broad areas for research. He noted limitations with each approach, particularly in linking process to structure, or outcome to structure.
However, Donabedian recommended considering factors, related to all three (process - outcome - structure) when designing assessment research. He also described sources and methods for obtaining the desired information (e.g. clinical records) and noted some limitations of the data sources (e.g. completeness).

The next issue that Donabedian addressed was identification of the generalizability of the research which is accomplished by defining the universe to be sampled. For example, he stated that if one is evaluating the "capacity of a specified group of providers to provide care" (Donabedian 1967:174) then one needs to achieve a representative sample of providers in the study but not necessarily a representative sample of their care. He felt that in this situation it was more important to uniformly select significant dimensions of care. As an example, he suggested that evaluation in areas of particular stress might be more revealing of weaknesses in the new care giver than evaluation in more general and less stressful situations (Donabedian 1967:174).

In another part of his paper, Donabedian discussed the measurement of quality; he noted that it usually involved the development of a standard. He also discussed questions of validity, reliability and bias with regard to the specific standards developed and the evaluation process in general.

Donabedian's paper closed with a presentation of logical and economic efficiency. He stated that these two concepts have a prominent role in quality of care research. Logical efficiency was defined as "the use of information to arrive at decisions" (Donabedian 1967:192). He identified
access to information as well as duplication of information by the care
giver as relevant issues in the evaluation. Economic efficiency was
defined as being concerned with "the relationships between inputs and
outputs and asks whether a given output is produced at least cost"
(Donabedian 1967:192). He felt that economic efficiency tended to examine
more general questions of cost to the community or the society. At the
present time identification of economic efficiency is an important
consideration when evaluating innovations in health care delivery such as
new technologies or new care givers.

Sanazaro in a recent publication, reviewed the history of "Quality
Assessment and Quality Assurance in Medical Care" (1980), particularly with
respect to the political and policy changes in U.S. health care funding
that have occurred over the past ten years. Generally he found that the
assessment and assurance studies that were done to meet these licensing and
funding requirements were not good examples of research. He stated that,
"The effect has been to replicate a much criticized practice in the medical
literature: publication of ideas or premature conclusions based on small,
uncontrolled or biased studies, leading to widespread application of
methods that are subsequently discredited or found to be ineffective"
(Sanazaro 1980:60).

In his review of the literature Sanazaro concluded that further
development of process and outcome evaluations were necessary, but at the
same time information was currently available to allow the development of
more meaningful research. He identified many problems with the current
research, and noted that "studies of physician performance have not produced standardized methods of reliably evaluating actual performance in the care of patients" (Sanazaro 1980:60). He recommended several "agenda items" for the development of better approaches to quality assessment and assurance of the medical care review program. Many of these included recommendations for research into relationships between physician knowledge and performance, and the development of evaluation methods that promoted them, but at the same time provided reliable and valid data on quality of care (e.g. computer software systems).

Other issues which recur in the literature that considers the evaluation of care giver performance include the reliability of methods for evaluation, the validity of the medical record, and the development of standards. These issues, while often interrelated, will now be discussed separately.

The reliability of various methods of evaluating the quality of care in specific settings is not resolved. As noted earlier, Donabedian described the process - outcome - structure model for quality of care research in the sixties, and this model remains relevant today. However, questions concerning the validity of "process versus outcome" indicators of quality continue to be debated (e.g. Brook 1979; McAuliff 1979). This debate influences choices regarding both methods and study designs. The consensus in the literature has been that assessment in both areas is necessary for the most comprehensive reviews, and that further research is needed to delineate the relationships between process and outcome factors. (Sanazaro 1980).
Sheps and Robertson also discussed the relationship between caregiver and patient outcomes, and they concluded that "...this issue is relevant primarily when the criteria for care evaluation are being developed. Once elaborated, such criteria can be used without reference to patient outcomes if ...the objective is to assess the quality of care given" (Sheps and Robertson 1984:885).

Kessner, Kalk and Singer (1973) facilitated the design of evaluations of primary care in ambulatory settings with the development of "tracers" (indicator conditions). Kessner et al. stated:

For measuring the functions of a health care system, the tracers needed are discrete, identifiable health problems - each shedding light on how particular parts of the system work, not in isolation, but in relation to one another. The basic assumption remains the same -- namely, how a physician or team of physicians routinely administers care for common ailments will be an indicator of the general quality of care and efficacy of the system delivering that care. (Kessner et al. 1973:189).

This method moved evaluations away from assessing every visit for every illness, to the much more manageable situation of sampling conditions. Kessner et. al furthermore discussed the need for knowledge of the context in which indicator conditions would be applied so that their representativeness could be maximized. Several researchers have incorporated Kessner's indicator conditions into evaluations of ambulatory care settings and discussed the implications of its use. (e.g. Hulka, Kupper and Cassel 1976; Sibley et al. 1975; Sheps, S., and Robertson 1984). Sibley et al. (1975:51) noted that uniformity with individual indicator
conditions among primary practitioners cannot be expected while Hulka et al. (1976:1177) found differences in level of management by practitioners with certain indicator conditions but not with others. Sheps and Robertson (1984:885) stated that since the indicator condition only allows an evaluation of a sample of care given "generalizability to other clinical problems may be limited." Kessner et al. specifically outlined the criteria for the selection of good indicator conditions and developed their use for application to medical chart audits. This method measures both processes and outcomes of care. A limitation of this method however "...is the assumption that good medical records are a requisite for good medical practice" (Kessner et al. 1973:193).

The validity of the medical record in indicating the quality of care provided to the patient is a second issue which is frequently debated. Romm and Putman investigated this question and found few studies "which compared what actually took place during the visit with the patient's record" (Romm and Putman 1981:310). In their limited study they noted that on average 59% of the items mentioned in either the record or the transcript of the visit were found in both sources, however, 92% agreement was found in the area of chief complaint. Generally they found that physicians did not include in the medical record information about family, social situation or other past medical history present in the transcript, while they included information on lab tests and treatment plans in the medical record which was not present in the transcript.

The format of the medical record affects the validity; a standardized format permits a comparison between care giver and/or patients which would
otherwise be difficult. The variation in medical record format from practice to practice is a particular problem when evaluating ambulatory primary care settings (Hulka et al. 1976). Choosing indicator conditions which may utilize a standard form (e.g. prenatal care) or evaluating a setting in isolation of other settings has resolved this problem in some studies.

The ability of the medical record to mirror the quality of care actually provided continues to be an issue. Conclusions have tended toward including an audit of the medical record as only one component of an overall review of the quality of care until further research defines the area. (Donabedian 1967; Sanazaro 1980). Other researchers have contended that good medical records are a minimal requirement for providing adequate care (Kessner et al. 1973). Sanazaro stated however, that technical care provided by physicians would continue to be assessed by chart audits based on explicit criteria. (Sanazaro 1980:51).

The development of standards employed in quality of care research has evolved along with the methodology. Initially, standards were implicit and applied by peers who judged medical care or medical records against their personal knowledge and experience. The later development of explicit standards provided more consistent and reliable evaluations and enabled replication of studies. However, the standards were often developed by experts in the field and defined "optimal care" which in many settings resulted in an unrealistic appraisal of the quality of care provided (Brook and Appel 1973:1328). The "optimal care standards" brought into question the validity of this style of assessment (Donabedian 1967:178; Sanazaro
In the last decade, "minimal explicit consensus criteria" for particular indicator conditions have been developed for assessing care giver performance in ambulatory settings (Hulka et al. 1976; Sibley et al. 1975). Participation by primary care givers in developing these criteria have improved their validity and applicability. Hulka et al. found that with two of the four indicator conditions they studied, the minimal explicit consensus criteria could discriminate among varying levels of physician performance (Hulka et al. 1975:1173). Sibley et al. found that the use of minimal explicit criteria provided results that were: (a) "...in close agreement with the outcome measurements of mortality and physical, social, and emotional function done on the same study subjects...", (b) that there was internal consistency among the three approaches used in the study, and (c) that there was high inter-observer agreement using the criteria for scoring the practices (Sibley et al. 1975:51).

Evaluation methods of care giver performance in primary ambulatory care settings are developing. The use of minimal explicit consensus criteria to evaluate the medical record appears to be a reliable method, particularly if the record has a consistent format. The identification of appropriate indicator conditions facilitates this type of evaluation and it encourages the measurement of both process and outcome factors. At the same time, measurement of processes to the exclusion of outcome factors with previously established criteria further expands the horizons of quality of care research and enables evaluation of such areas as caregiver models, patterns of practice, adequacy of practitioner's education, and innovations in health care delivery systems. To allow comparison of results
and to define method flexibility, some quality of care researchers should now turn to replicating good studies by using the same standards and methods but applying these to different problems in a variety of settings.

### 2.2 Nurse-Midwifery Care

The body of literature which has evaluated the quality of nurse-midwifery care has employed a broad range of methods. As with quality of care studies in general, the various methods and criteria used in nurse-midwifery evaluations applied varied measures of effectiveness, which has limited the comparability of the studies. However, Diers has presented this evaluative literature as a case study because it promoted the legitimacy of nurse-midwifery in the U.S. She stated that "To properly understand the nurse-midwifery effectiveness/evaluation literature, 'effectiveness' has to be understood in the historical context of nurse-midwifery practice when the study was done. ... Effectiveness has generally meant program effectiveness as determined in each case by whatever reason a nurse-midwife was being brought into a situation" (Diers 1983:69). That is, definitions of effectiveness were the definitions of quality, as evaluations and descriptions of programs often did not included specific criteria for measuring quality. (e.g. morbidity and mortality rates).

A great deal of the nurse-midwifery literature has been descriptive and presents testimonials of physicians and nurse-midwives on the improved quality of services that resulted from the introduction of the new care giver into their community or practice. (Burnett 1972; Gatewood and Stewart 1975; Haire 1981; Thiede 1971). Other articles have related tangentially
to issues of quality of care. An example is Record and Greenlick's (1975) discussion of physician receptivity at a Kaiser Permanente Health Centre of new health professionals (i.e. certified nurse-midwife, physician assistant and pediatric nurse practitioner). They concluded that the new care givers receptivity was directly dependant on whether he or she was perceived as role-elevating or role-threatening by the physicians. A second example is an early study by Ford, Searat and Silver (1966) in which patient, satisfaction with an expanded role for public health nurses was studied. Their results indicated high patient satisfaction with seeing a public health nurse for prenatal and well baby care, in conjunction with seeing a physician. (Substituting the nurse for the doctor was not an option in the study, and the results reported were preliminary).

A few studies were found in which outcomes of pregnancy were compared "before and after" the establishment of a nurse-midwifery service. The reports of the Frontier Nursing Service are the earliest example of this type of evaluation. They reported a substantial drop in infant and maternal morbidity and mortality rates with the introduction of nurse-midwives into rural Kentucky in the 1930's. Reid and Morris commented that "the several analyses of infant and maternal morbidity and mortality rates that have been conducted suggest that, in general, the health status of infants delivered by this nurse-midwife program is superior to that of other infants born in Kentucky or the nation as a whole" (Reid and Morris 1979:491).
In another early study, Levy, Wilkinson and Marine (1971) examined morbidity and mortality rates before, during and after a demonstration nurse-midwifery program in rural California. During the three years that the service functioned, rates of prematurity and neonatal mortality decreased substantially at the nurse-midwives' hospital, and they increased after the program ended. In a comparison hospital in a nearby community, the rates stayed the same throughout the time of the study. Also during the program, rates of prenatal care increased and then diminished when the program ended. Possible confounding variables were explored by the authors, for example, a shift in the risk status of the maternity population, changes in medical personnel in the communities, changes in the rates of unusual events, such as, nursery epidemics or multiple birthrates, but none were discovered that could account for the differences found.

A more recent study by Reid and Morris (1979) examined the effectiveness and the costeffectiveness of a nurse-midwife program in a poor rural population. The authors compared the birth outcomes of the target population to those in the surrounding counties with a retrospective study design, before and after the program was introduced. They also estimated the expenditures for perinatal care for each population. The data sources in this study included vital statistics, birth certificates, hospital statistics and records, and nurse-midwives' clinic records, as well as expenditure information from hospital and government programs. The authors found decreases in the rates of infant mortality, neonatal mortality, low birthweight and short gestational age, as well as a reduction in expenditures for perinatal care. The retrospective collection
of data from various sources for the different groups place severe limitations on this study. However, the authors acknowledged this and concluded that a prospective study would be the next appropriate step for further clarifying nurse-midwives' effectiveness and cost effectiveness.

In another example of a "before and after" study design, Ross (1981) examined the impact of a nurse-midwifery program on an isolated American Indian population by evaluating the utilization of services and the outcomes of pregnancy. The author audited prenatal, labour and delivery records as well as the charts of all children less than one year of age that were admitted to the community's hospital. Overall the author concluded that the differences in outcome measures indicated that the addition of the nurse-midwifery program improved the maternal-infant care services provided, which contributed to the improvement in maternal and infant health. He found that utilization of services increased, the length of postpartum hospitalization decreased, and the incidence of hospitalization of infants remained similar but their length of stay was reduced. The common source of data for the study populations supported reliability of the data.

Other studies have evaluated the effectiveness of nurse-midwives by comparing them to other medical care givers, usually medical school residents, house staff, or obstetricians. Runnerstrom's prospective study was the first to investigate "The effectiveness of nurse-midwives in a supervised hospital environment" (Runnerstrom 1969:41) and to compare outcome variables of care between nurse-midwife interns and obstetrical
residents. Several problems were present in the method and analysis of the study which made the conclusions unreliable. In particular, no definition was provided for the criteria of "uncomplicated prognosis" which was a prerequisite for inclusion in the nurse-midwife group. Criteria for inclusion into the obstetrical residents group was also not mentioned, and women were enrolled into the study throughout the pregnancy cycle (60% were enrolled at the time of delivery). In addition to these problems, the characteristics of the two patient groups were not described, so their comparability cannot be determined. Runnerstrom's most startling finding, however, was that the nurse-midwives had a spontaneous vaginal delivery rate of 90% while the obstetrical residents had a 58% operative delivery rate.

In a well designed study, Slome et al (1976) analyzed prenatal, intrapartal and immediate postpartal outcomes of low risk patients who were randomly allocated to either nurse-midwife or resident staff care in a hospital setting in Mississippi. The use of explicit criteria for inclusion of patients in the study, as well as the selection procedure, and the random allocation to the care giver, produced two comparable but different sized groups of patients. The data was abstracted from the medical records and the reliability of the abstraction was determined.

The study included 298 patients who saw nurse-midwives and 140 patients who saw physicians. No discussion was presented on the power of the study. Slome et al found no differences between the two groups prenatal outcomes, however the nurse-midwives' patients attended their
appointments more often (94%) than the resident staff's patients (80%), and a higher proportion of the nurse-midwives' patients had more visits than were scheduled compared to the residents' patients. The authors also found that the nurse-midwives performed more tests for urinary tract infections and investigated more patients for diabetes. Differences in labour and delivery outcomes were few except that the residents had a higher incidence (3x) of low forceps use. The infant outcomes were also very similar between the two care giver groups. The authors concluded that the data indicated that in this hospital setting, prenatal, intrapartal and postpartal care provided by nurse-midwives with physician consultant back-up produced health outcomes equivalent to traditional physician services.

Two additional studies were found which identified pregnancy outcome differences between nurse-midwives and physicians. Dillon et al. (1978) retrospectively compared nurses-midwives' and obstetricians' care at a hospital in New York. However, the study design did not include an assessment of the risk status of the patients, therefore, the two study groups may not have been comparable. Their findings included a lower operative delivery rate and high patient satisfaction with the nurse-midwives group. In another retrospective study Neeson, Patterson, Mercer and May (1983) examined pregnancy outcomes of a high risk adolescent population who attended a nurse-midwife clinic or an obstetrical residents clinic. The selection process of patients for the two care giver groups was different, as the nurse-midwives' clinic received early referrals from a pediatric clinic while the obstetrical residents clinic saw adolescents who attended the outpatient clinic. The mean age, gravidity and week of
gestation at first prenatal visit were significantly different between the two groups. The selection process contributed confounding variables and obscured the differences in care giver approaches. Unfortunately the authors did not discuss this problem but instead concentrated on the differences in care and the differences in outcomes.

No studies were found which evaluated the effectiveness of nurse-midwives by examining the process of care that they provided. Occasionally, the number of prenatal visits was counted or an analysis of investigative procedures was presented (e.g. Slome et al. 1976). Otherwise the literature focused entirely on outcome variables and inferred causal relationships between care giver and outcome. Except in a few cases this assumption was not valid because poor study design introduced bias, confounding variables, or unreliable data sources.

The focus on outcome variables is not unique to evaluations of nurse-midwives. Yankauer and Sullivan reported that one author reviewed 40 studies examining the quality of care provided by new health professionals; 21 studies compared their care to that of physicians. "Measures of quality in the 21 studies included process in 4 studies, outcome in 12, patient satisfaction in 12 and agreement with physician in 4 (examining the same patient)". This review concluded that "In all cases, care rendered by the new health professional was equal to or, in the use of patient satisfaction and possibly compliance, superior to that provided by physicians." The author pointed out however, that some studies had problems with design and validity but that the major concern was problems with generalizability or applicability on a large scale (Yankauer and Sullivan 1982:263-4).
The Burlington Randomized Trial of the Nurse Practitioner is an example of a study in which the process of care provided by a new health professional is compared to that of physicians. In this study the evaluation of the process of care with indicator conditions and explicit criteria was only one component of the comparison. In the overall study design, several outcome factors were also analyzed (Sibley et al. 1975). This study found that nurse practitioners provided equivalent prenatal care to that of a control group of physicians, as well as another community group of physicians (Sibley et al. 1975:47).

Future research which investigates the quality of care provided by nurse-midwives would be improved if it utilized similar methods such as Sibley et al's. Including an evaluation of the process of care could provide valuable information on different styles of practice and furthermore, could investigate the logical efficiency and economic efficiency that Donabedian describes as an essential component of quality of care research. Such innovations in study designs would create more meaningful data for determining the effectiveness of the nurse-midwife in the health care system.
CHAPTER 3

Prenatal Care - Literature Review

3.1 Development and Goals of Modern Prenatal Care

Routine prenatal visits, now a common experience of childbearing women, began in the first quarter of this Century. Prior to this time, prenatal care was limited to one or two visits by a physician or a midwife and focused on diet and discomforts of pregnancy. In the second quarter of the Century the medical development of prenatal care proceeded. Routine urine testing was introduced and used for screening pre-eclampsia and gestational diabetes. Physical and abdominal examinations became more common, and fetal heart auscultation was initiated. By the late 1940s, the majority of pregnant women in most western industrialized countries were receiving prenatal care either in out-patient clinics, physicians offices, or at home. The pattern of care was more or less universal and included a schedule of frequent prenatal visits at which the patient was weighed, her urine tested, her blood pressure taken, and her abdomen examined. In the latter part of pregnancy, the fetal heart rate was also assessed. (Oakley 1982a,1982b).

Current pattern of prenatal care are similar but now include "risk assessment" and more screening procedures as a result of medical technological advances. The development of risk scoring, "which is a numerical weighting of individual and combined risk factors" (Federal Task Force Report 1984:19), has resulted in the publication of several guides, but their ability to modify perinatal outcomes has remained controversial (Casson and Sennett 1984; Federal Task Force Report 1984). However, risk
assessment has developed in recent years with the identification of certain predictive factors which identify patients who have an increased risk of an adverse outcome. Many factors (such as a previous low birth weight infant, previous congenital anomalies, maternal age, grand multiparity, very low socio-economic status, alcoholism and heavy smoking) are generally accepted as being associated with adverse outcomes, while other factors (such as occupation, toxic exposures, early antepartum bleeding and post-term pregnancy) continue to be debated in the literature.¹

The major new technologies that are involved in prenatal care include ultrasound, fetal monitoring and amniotic fluid assays. These technologies all provide detailed information on the well-being of the fetus and are used in varying degrees by different practitioners.

If medical textbooks indicate current medical thinking, general expectations of the benefits of prenatal care are high. One author stated that ".... The fundamental goals of prenatal care remain the same: (1) to maintain or improve the health of the pregnant woman, (2) to promote the optimal health of the fetus and infant, (3) to promote the optimal development of the family in accepting a new member, and (4) to be cost effective" (Bachman 1983:145). Another medical author more generally wrote that "the goal of antenatal care is to prevent deviations from the normal and to detect and reverse them when they arise" (Caplan 1982:104). And a third author instructed medical students on the purpose of prenatal
care by stating, "As a result of careful examination of the pregnant patient at frequent intervals throughout the period of gestation, abnormalities can be detected and dealt with before difficulties arise, and catastrophic occurrences can be almost eliminated" (Danford 1982:363). These statements have all placed an emphasis on the process of prenatal care and have implied that medical surveillance during the prenatal period is a factor which promotes maternal and fetal health.

3.2 Prenatal Care - General Discussions - Literature Review

A search for scientific literature examining any component of the prenatal care process indicate that few studies investigate this aspect of pregnancy. However, some papers were found which presented relevant discussions on various aspects of prenatal care.

Enkin and Chalmers (1982c) in an excellent overview discuss current medical knowledge regarding advice, therapies and interventions commonly given or experienced during the prenatal period. They also identified a tendency toward poor relationships between health professionals and clients, and suggested these factors as contributing to the dissatisfaction many prenatal clients experienced in England. A recent supplement to Acta Obstetrica and Gynecologica Scandinavia (1983) also presented a general discussion of prenatal care with a focus on the increasing "medicalization" of the experience. It was accompanied by an extensive bibliography which included many articles on psychosocial aspects of pregnancy.
A few recent articles, all cited in Enkins and Chalmers (1982a) text, *Effectiveness and Satisfaction in Antenatal Care*, were particularly informative of prenatal care content. Grant and Mohide (1982) presented a general analysis of prenatal care as a screening program. They included a discussion on the effectiveness of diagnostic tests by reviewing the current literature on fetal movement counting. In two articles Redman presented the current understanding and screening practices for pre-eclampsia (1982b) and the issues of its management and treatment (1982a). The literature was reviewed by Lumley and Astory (1982) in a paper which considered pregnancy in association with sexual activity, cigarettes, alcohol, food, exercise, work, holidays and anxiety. In this article the authors expressed a concern about professional advice which is commonly given without consideration for the environment in which the woman exists (e.g. her economic environment). They concluded that most of the advice is based on very weak research. In other articles in the volume, Chalmers and Enkin reviewed the current literature and medical practices of the prenatal interventions of Rh immunization, preparation for breast feeding and external cephalic version (1982) as well as the symptomatic treatments with antiemetics, antacids, laxatives and calcium supplements (Enkins and Chalmers 1982c).

All these papers are useful contributions to discussions on the appropriate content of routine prenatal care. However they did not address the overall issue of the value of prenatal care.
3.3 Prenatal Care - Effectiveness Studies - Literature Review

Underlying many discussions and studies is the assumption that prenatal care attendance was a predictor of good perinatal outcome. As stated earlier, prenatal care is commonly believed to promote the health of the mother and fetus/infant. Interestingly, the research which has examined its' effectiveness does not clearly support this belief.

Prenatal evaluative research has tended to identify associations between attendance and individual indicators of effectiveness, such as low birth weight and infant or maternal mortality or morbidity. These studies also tended to identify the quantity of care as an important factor, but did not include an evaluation of the quality of the prenatal care provided or identify social-economic status as a potential confounding factor. A few exceptions existed in studies which considered the process and the productivity of the care as well as, the social-economic status of the study population.

In the remainder of this chapter, the literature which has addressed the effectiveness of prenatal care will be reviewed. However, like prenatal care in general, few studies were found that specifically investigated the issue of prenatal care effectiveness. First, two recent studies that utilized vital statistics of large populations will be presented. They will be followed by several studies that examined smaller prenatal populations using a variety of methods.

Gortmaker (1979) analyzed all the births and infant death records in New York City in 1968 (90,339 births) and established estimates of the
impact that variations in the quantity of prenatal care had upon the relative risk of low birth weight, neonatal, and post-neonatal mortality. He controlled for a wide variety of "available" social, demographic and medical factors in the analysis in an attempt to approximate the design of a prospective study in which patients were randomly assigned to prenatal care or no prenatal care. The adequacy of prenatal care was based on criteria that adjusted the number and the timing of prenatal care visits to gestation period. Conclusive causative relationships were not identified due to the retrospective limitations of the data, but associations did exist. He found that "white mothers who delivered on a general service and all black mothers, experienced substantially increased risks [of low birth weight infants] when receiving inadequate prenatal care" (Gortmaker 1979:653). He also found that prenatal care exhibited little relationship to neonatal and post-neonatal mortality once birth weight and other variables were controlled, suggesting that the impact of prenatal care on infant mortality may only be through its' influence on birth weight. He further pointed out that the relationship between lack of prenatal care and low birth weight could be partially or totally explained by the self selection of women into prenatal care, indicating that women who do not seek prenatal care may share other variables such as inadequate diet, smoking, drinking or drug abuse, which were not available for analysis. Due to the limitations of the information available for this study it was not possible to reach conclusions about the relationships between the quantity of prenatal care and outcomes of pregnancy. The author correctly stated that only an association between birthweight and prenatal care can be developed, however the scarcity of detailed data made even this very hypothetical.
In a similar study design, Greenberg (1983) analyzed all U.S. birth certificate records for 1977 in an attempt to explore relationships of prenatal care and sociodemographic characteristics, and "to demonstrate that misleading conclusions can be drawn from summary measures of antenatal care health impact" (Greenberg 1983:797). The exposure variable of prenatal care was classified as either "some" or "no" care on the birth certificates. Sociodemographic variables considered in the analysis were maternal race (black or white) and education (< 11 years or ≥ 12 years). The outcome variable analyzed was birth weight. By estimating the relative risk with an odds ratio of prenatal care abstention in relation to low birth weight (LBW) for each social stratum in the study, Greenberg was able to estimate the etiologic fraction which he defined as "the proportion of LBW deliveries in a specified population which may be attributed to prenatal care abstention" (Greenberg 1983:798). Greenberg concluded that about 5% of all LBW deliveries among black, less-educated women may be attributed in part to abstention from prenatal care, whereas, only <1% of all LBW deliveries among white highly-educated women could be attributed to the abstention from prenatal care. This analysis enabled Greenberg to conclude that the health impact of prenatal attendance varied between social strata, and that the social environment of the study population was an important consideration when assessing prenatal care efficacy. Greenberg appropriately pointed out the limitations of this study: (a) vital statistics records did not provide information on all variables of interest, (b) reliability of variables studied may be challenged, and (c)
the population at risk was limited to live births, excluding pregnancies terminated by induced or spontaneous abortions and stillbirths. With these limitations in mind he concluded that all study populations fared better with prenatal care and "from a public health perspective, the greatest reduction in adverse pregnancy outcome may be anticipated from prenatal services which are directed at socially disadvantaged women" (Greenberg 1983:800). (In this study it should be noted that the exposure variable of interest, prenatal care, was at best a gross indicator of quantity of prenatal care and that Greenberg was comparing birth weight outcomes between women who received no prenatal care at all to those who received any type of prenatal care).

In a third study, Ryan, Sweeney and Solola (1980) investigated the relationship of prenatal care to perinatal outcome retrospectively in a hospital population, over a six month period. The authors stated that the study population was racially and socio-economically homogeneous, as 80% of the population was black and 84% medically indigent. The exposure variable prenatal care, was divided into two groups, with "0 to 3 prenatal visits" in one group (1,102 patients), and "4 or more prenatal visits" in the other group (2,027 patients). No information on the source of the data, the setting, or the content of the prenatal care was provided.

Several variables were analyzed including socio-economic factors, maternal age, birth order, marital status, place of residence, trimester in which care was initiated, education, and initial risk assessment. The authors found that the two groups were similar with the exceptions of the
following variables. The "0 to 3 prenatal visits" group had a higher neonatal mortality ratio and stillbirth ratio, and a higher incidence of low birth weight infants than the "4 or more prenatal visits" group. The authors concluded that the absence of adequate prenatal care had influenced these outcomes.

Unfortunately the authors did not adjust their analysis for the number of prenatal visits in relation to gestational age. This omission biased the results, as a premature delivery of necessity limits a patient's opportunities to attend prenatal care. In addition to this oversight, the authors provided very little methodological information, consequently it is difficult to evaluate the study's reliability, validity, and generalizability.

Several evaluative studies of Maternal and Infant Care Programs (MIC) and Improved Pregnancy Outcome Projects (IPO) in the U.S. have recently been reported in the literature. A major thrust of the program is providing prenatal care to low socio-economic populations. Many of the programs have been underway since the mid-60s. The MIC programs are federally supported and evaluative research has recently become a necessary aspect of the funding process. All of the studies noted here were retrospective, and relied on program records and vital statistics for data. To evaluate effectiveness, they all selected comparison populations in the general geographic area where the program was not available.

Most of these studies found an association with poor prenatal attendance and low birth weight infants. They also identified the poor
ineducated young black or hispanic mother as being at greatest risk and for whom the program was most effective. The individual programs varied and included maternal nutritional supplements and other interventions which are not typical of routine prenatal care.

Peoples and Siegel (1983) evaluated an MIC program in North Carolina. They found the program had little effect when they examined the whole population, but an analysis by maternal risk status found that the greatest program impact was on the population at highest risk. The authors recommended more scrutiny of sub-populations in future prenatal program evaluation projects.

Kotelchuck, Schwartz, Anderka and Finison (1984) found program participation associated with a decrease in low birth weight and neonatal mortality and an increase in gestational age as well as a reduction in the incidence of prenatal care. The major focus of the program they examined was maternal nutrition during pregnancy, and it is not clear in the article how other aspects of prenatal care or attendance were evaluated.

In another study Peoples, Grimson and Daughtry (1984) evaluated an IPO project in North Carolina in which no effect was found on the incidence of low birth weight among program participants. In the discussion Peoples et al. suggested that the rural locale and the high turnover among staff may have contributed to these findings.

In general all three studies were limited by their data. Vital statistics can be a poor source of information and may present difficulties with reliability. The limitations are compounded when vital statistics are the only source of matching characteristics for a comparison population.
Nutting, Barrick and Logue (1979) evaluated a maternal child health care (MCH) program by examining the process and outcomes of the care provided to program users, as well as the program's impact on all prenatal patients in the community. The authors studied the MCH program, which was located on a poor Indian reserve in Arizona, by retrospectively identifying and examining high risk and low risk cohort groups before and after implementation of the program. The target population of the program was high risk mothers as defined by age, gravidity, and previous pregnancy losses. With existing prenatal records from a variety of settings (with some available on a computerized Health Information System), the authors found that standard measures of utilization and productivity indicated that the program was successful. For example, the mean week of gestation during which prenatal care was sought decreased from 24.6 weeks to 21.8 weeks and the average number of prenatal visits increased from 5.8 visits to 7.4 visits. Measures of the process of prenatal care with established criteria (prenatal work-up rate, pregnancy assessment rate, anemia screening rate, pre-eclampsia screening rate) indicated that the quality of care had improved with the implementation of the program. However, an evaluation of the high risk group in the community-at-large indicated that the program did not effect this group's pregnancy outcomes and instead, improved outcomes for the low risk group in the community. The focus of the evaluation, which included the surrounding community as well as the program participants, and the use of criteria for assessing the content of the care provided was unique among the studies reviewed which evaluated U.S.
government funded prenatal programs. The setting of the study limited the generalizability of the results to similar low income isolated communities, but the methodology could be adapted to broader population bases.

Harris (1982) was one of the few authors who has examined the overall question of whether prenatal medical care had favourably influenced the outcome of pregnancy. In the analysis four distinct relationships were examined: (a) prenatal care and duration of pregnancy, (b) prenatal care and unobserved fetal survival characteristics, (c) prenatal care and the rate of intrauterine growth (birth weight) and (d) prenatal care and infant mortality. In an extensive review of the literature the author concluded that these "four main issues underlie the controversy about prenatal care and pregnancy outcome" (Harris 1982:46). Very briefly, he concluded that (a) the relationship between timing of prenatal visits and deviation of pregnancy has been poorly characterized; (b) the risks of early termination of pregnancy varied considerably among unborn infants; (c) the frequently observed correlation between quantity of prenatal care and birthweight lacked a convincing biological or behavioural explanation, and (d) past analyses of prenatal care have not squarely confronted a critical point about the recent decline in U.S. neonatal and infant mortality rates (Harris suggests that this decline may be a secular trend, that has no relationship to prenatal care). (Harris 1982:46-47).

Utilizing vital statistics data from a population of black women in Massachusetts, Harris developed statistical models which included several variables in the analysis to identify factors which influenced pregnancy outcome. He found that prenatal care prevented preterm deliveries by
increasing gestation by approximately one week, but that the influence of prenatal care on birth weight was only weakly positive and statistically insignificant. He also found that vital statistics data limited application to his models which investigated (a) the influence of fetal selection on duration of pregnancy, and (b) the timing of prenatal care and birth weight specific mortality. In both cases too many assumptions were necessary for the author to be able to make conclusions. Harris clearly indicated that the population he studied was not representative of the general population, however, further application of his models to other large studies using vital statistics may clarify some of the issues he has identified. He recommended narrowly focussed clinically designed studies of prenatal interventions as a feasible approach to future studies.

In England, Hall, Chng and MacGillvray (1980), and Hall and Chng (1982) studied prenatal care effectiveness in a different manner. Utilizing all available prenatal records for one year in a large community in Scotland (1,907 of a possible 2,168 records), the authors explored client records to answer the question of whether routine prenatal care was worthwhile. In their study they specifically determined: (a) the percentage of high risk patients identified at their first prenatal visit, (b) the extent to which abnormal conditions of mother and baby were detected by routine care and at what gestational stage, (c) the productivity of the prenatal visits, (d) the frequency with which problems occurred in spite of prenatal care, and (e) the rate of specialized investigations.
Two types of care were available to women in the study. The majority of women (65%) attended an outpatient prenatal clinic at a hospital where they received care from a variety of health professionals. The other women in the study (35%) experienced shared care in that they were seen primarily by their general practitioners and occasionally attended a hospital outpatient clinic.

Overall the authors concluded that professional expectations of prenatal care were unrealistic. Specifically, the efficiency of the first prenatal visit for identifying higher risk patients varied with the condition. For example, 77% of the women with significant medical conditions (e.g. chronic renal, respiratory, or cardiovascular disease, etc.) were noted, whereas only 26% of the 174 cases of previous post-partum hemorrhage were noted. (Hall and Chng 1982:63). They also found that the majority of emergency hospital admissions during pregnancy occurred in spite of routine prenatal care, indicating that it may not be possible to prevent or detect the conditions that cause emergency admission. Furthermore, Hall et al. found that less than half of the actual cases of intrauterine growth retardation (IUGR) were detected prenatally, and that 30% of the cases of pre-eclampsia presented for the first time in labour or the puerperium and therefore were not detected by prenatal care. The authors also determined that productivity of the prenatal visits which they do not define, was very low prior to 34 weeks gestation, especially in detecting pre-eclampsia and IUGR among healthy low risk multiparas. They established that for every correctly diagnosed case of IUGR, 2.5 cases were falsely diagnosed, and that for every case of pre-eclampsia or hypertension diagnosed another 1.3 cases were falsely diagnosed.
Hall et al. concluded that the routine prenatal care they evaluated was inefficient. They recommended a more flexible prenatal schedule that addressed the real benefits of the screening process (a) by providing more detailed care to women on their initial visit, (b) by following patients with specific risk factors appropriately, and (c) by providing less routine unproductive care to low risk women. The authors presented a convincing argument for more patient tailored care and they suggested that it would improve both patient satisfaction and productivity.

Hall et al. did not present any limitations of their study except by noting in a conclusion that "the study has not directly considered the efficacy of prenatal care, but rather has attempted to delineate those areas in which benefit might reasonably be expected" (Hall and Chng 1982:66). The process of the chart audit was not described in the two articles reviewed. The format, completeness and legibility of the prenatal records were not indicated, which prevented the reader from assessing the validity and reliability of the data.

Although the authors' review of the prenatal record introduced new concepts of productivity and efficiency into the evaluation of prenatal care, they did not present or discuss comparisons of productivity and efficiency between the two groups of patients (i.e. hospital out-patients or shared care patients), between the different risk groups in their population, or between providers. At the time of their study it was well documented that strong associations existed between pregnancy outcomes and maternal risk status. Presumably risk status data was collected for the evaluation of the first prenatal visit.
A final criticism is that the authors provided no discussion on the levels of productivity which the medical profession and other health care professionals and consumers considered minimally acceptable for the diagnoses of pre-eclampsia, IUGR, and malpresentation. Hall et al. suggested that the finding of a productivity of <1% in pre-eclampsia screening prior to 34 weeks gestation indicated that routine screening of previously normotensive multigravidas earlier than 34 weeks was not worthwhile. No other studies were found which identified the general issue of productivity of the routine prenatal visit. However, in Redman's discussion on pre-eclampsia diagnosis, he stated that "...even if the screening of 5,000 pregnant women at 28 weeks gestation prevents just one maternal death, most pregnant women would want to be so protected, even though in retrospect more than 90% of the visits would have been non-productive" (Redman 1982b:77).

In general, Hall et al.'s research was extremely useful because it examined the process of prenatal care and provided detailed data with which the effectiveness of this major and costly screening program could begin to be evaluated. Their research was not directly generalizable to a Canadian context where prenatal care is usually provided by a physician in a private office rather than by a variety of personnel in an out-patient clinic. However, this research has promoted the development of more specific prenatal care objectives and has introduced a model for evaluation.
In conclusion, the general efficacy of prenatal care is not well established. As indicated, it is assumed by most health care professionals to be an important factor in promoting good pregnancy outcomes. However, little exploration into the area has occurred. All the studies reviewed were retrospective in design as no prospective clinical trials specifically investigating prenatal care effectiveness were found. The use of vital statistics and various prenatal records also limited these studies because of the irregularity of recording and reporting that accompanied them. Furthermore, these data sources and study designs eliminated consideration of many factors which may be crucial to determining prenatal effectiveness such as the content and quality of the care received, the care giver's background, and the patients' satisfaction with the prenatal care. As a result of inadequate research, conclusions regarding the need for and the effectiveness of prenatal care as it is routinely provided today were impossible. Until more decisive studies are completed, evaluations of the quality of the prenatal care process must be based on standards developed by the professional bodies who normally provide that care.
NOTES:

CHAPTER 4

Methodology

A retrospective case-control design was used to examine the quality of prenatal care provided to a group of women cared for by nurse-midwives and a comparable group of women cared for by general practitioners. The standardized provincial prenatal record form located in the hospital chart was reviewed for all patients in the study using established criteria for prenatal care. Each record was abstracted for the presence or absence of the criteria and was scored as either "adequate", "superior" or "inadequate". The labour and delivery record was also abstracted for general outcome factors.

4.1 Definitions

Low Risk Patient:

The patients in this study consist of women who were assessed in early pregnancy as being essentially healthy with no current medical or obstetrical problems, and with the potential for continued normal progress. They had no past medical, surgical or obstetrical history noted on the prenatal record which would adversely influence the course of the pregnancy or be unfavourably affected by it, thus requiring special medical management. (see Appendix A for Low Risk Criteria).
Experimental Group:

Pregnant women attending the nurse-midwife's "Low-Risk Clinic" at Grace Hospital between July 1982 and April 1984 who delivered after 32 weeks gestation.

Comparison Group:

Pregnant women who visited family physicians for prenatal care at the same time as the experimental group and who delivered after 32 weeks gestation. The physicians attended their patients' delivery at Grace Hospital but provided prenatal care in their private offices.

Nurse-Midwives Associated with Low-Risk Clinic:

Graduates of both a school of midwifery recognized by the International Confederation of Midwives and of an approved school of nursing with current registration in the Province of B.C. In addition, they had demonstrated clinical expertise in perinatal nursing as approved by the obstetrical physician team working in liaison with the nurse-midwives and had demonstrated abilities in teaching and counselling. (Carty et al. 1984). Four nurse-midwives worked in the Low-Risk Clinic.
Family Practitioner:

A graduate of a recognized medical school and current registration with the B.C. College of Physicians and Surgeons. Family practitioners have highly variable backgrounds; some have specialist training in family medicine and/or obstetrics and gynecology. No obstetricians were included in the study.

4.2 The Instrument - Selection, Application and Validity

This study utilized the prenatal care criteria based on the Burlington randomized trial of the nurse practitioner. (NAPS 1975). A group of researchers from McMaster University studied the quality of care provided by family physicians and nurse practitioners in the Ontario community of Burlington in the early nineteen seventies. In one aspect of their study the researchers focussed on the process of medical care by selecting indicator conditions and appraising the quality of the care provided with criteria. They noted that the use of specific criteria in the medical audit had been used extensively in hospitals but that this style of appraisal had rarely been applied to an ambulatory practice setting (Sibley et al. 1975).

The researchers specifically selected indicator conditions in which outcomes were influenced by management and the frequency of the occurrence was sufficiently high to provide adequate data for analysis. Prenatal care was selected as one of ten indicator conditions. In the criteria the researchers wanted to include items which would indicate:
1. Observations that were considered essential for adequate monitoring of the patient's progress,

2. management decisions that would indicate sound clinical judgement, and

3. that the possible serious significance of apparently benign symptoms, signs, or laboratory findings would be recognized (Sibley et al. 1975:47).

The specific criteria for each condition were selected and pretested by a peer advisory group composed of three family physicians working in a variety of practice settings. The goal was to establish criteria that would reflect community standards for adequacy in primary care management.

This group established the following criteria as necessary for an "adequate" score for prenatal care in an uncomplicated pregnancy: (a) pelvic assessment, if there was no previous history of a successful delivery; (b) past obstetrical history; (c) complete physical assessment within a 2-year period; (d) hemoglobin; (e) urinalysis at each visit; (f) monthly visits from the first through to the seventh month, visits every two weeks for the eighth month, then weekly visits through to term; (g) record of weight at each visit; (h) record of blood pressure at each visit; (i) record of Rh status and of serological test for syphilis; and (j) a statement of gestational age (Sibley et al. 1975:48). If any of these criteria were not met, the chart was scored "inadequate". In addition, fourteen intermediate stages of possible complications of pregnancy and
mandatory interventions were identified, which if met, maintained the score of "adequate". A "superior" score was established if at least one of four other criteria was achieved (e.g. psychosocial interview and pap smear record) (see Appendix B for complete Burlington Prenatal Criteria).

The McMaster researchers concluded that the criteria for measuring quality of care were valid because "the three simultaneous approaches (the surveillance of the management of indicator conditions, the evaluation of clinical use of drugs and the assessment of referral decisions) gave consistently similar results about the relative performances of the practices compared and were in agreement with concurrent outcome studies" (Sibley et al. 1975:46).

A review of various standards such as (a) Guidelines for Prenatal Care in Canada - 1984 by the Society of Obstetricians and Gynecologists of Canada (1984), (b) Standards for Obstetric-Gynecologic Services by the American College of Obstetricians and Gynecologists (1982), and (c) Guidelines for Perinatal Care by the American Academy of Pediatrics (1983), indicated that the Burlington Prenatal Criteria still represents a relevant minimum level of care. However, all three associations recommended more frequent visits after 28 weeks and more comprehensive laboratory work. Changes in some of the medical interventions were also noted.

To assess the validity of the criteria for family practice in 1984 in the Vancouver area, a questionnaire reviewing the Burlington Prenatal Criteria was developed and informally circulated to a variety of colleagues practising obstetrics by a general practitioner known to the researcher.
The practitioners were not informed of the study. Seventeen general practitioners, and after completion of the study, four nurse-midwives in the Low-Risk Clinic completed the questionnaire. (see Appendix C for questionnaire). The response rate of the physicians was 70% and the average number of births they attended per month was 6.6, ranging from 2 to 15 births a month.

The results of the survey indicated that generally the criteria remained relevant; all the physicians agreed that the criteria required for an "adequate" score were applicable to their practices, and that the information required to meet the criteria should be recorded on the provincial prenatal record form. Three physicians indicated that the four criteria for "superior" care should be reconsidered as "adequate" care. Three other physicians commented that the "superior" criteria of "evidence of psychosocial interview" and "meeting of husband and wife together during pregnancy" would not be recorded on the prenatal form due to the lack of an appropriate space.

In reviewing the intermediate conditions and interventions, 92% of the physicians stated that diuretics and sedation (Phenobarbital) were no longer applicable in prenatal care. Seventy-five percent indicated that the criterion and/or the interventions for "excessive weight gain" were not applicable. The survey also found that evidence of a dietary interview" and a "record of fundal height measurements in centimeters" should now be included in routine prenatal care. Seventy-five percent of the physicians felt that a dietary interview should be included in the "adequate" category, while 25% placed it in the "superior" category. Fundal height
measurements were placed in the "adequate" category by 92% of the physicians. The consistency of the responses to the questionnaire suggested that minimal updating of the Burlington Prenatal Criteria would provide appropriate criteria for assessing general practitioners prenatal care.

The four nurse-midwives' questionnaires had similar results except for the criterion of "pelvic assessment". Three nurse-midwives stated that a pelvic assessment was often indicated in prenatal care, however, they all felt that it was not appropriate for determining the adequacy of the pelvis in primiparas. Only three physicians commented on this issue.

As indicated earlier, physicians in the Province of British Columbia maintain prenatal records on a standardized form which provides explicit space for recording all the information needed to achieve an "adequate" score using the Burlington criteria (see Appendix D for B.C. Prenatal Record). Other space is available on the form for recording information which would achieve a "superior" score, however, the space is not explicit and it is limited.

Generally, physicians sent the prenatal record to the hospital in the last few weeks of pregnancy, whereas, the nurse-midwives maintained their records in the out-patient clinic until labour commenced. It was anticipated that this difference would increase the number of visits recorded by the nurse-midwives, exposing them to more evaluation and increasing their chances of achieving an "inadequate" score. However, this
difference would also increase their opportunities to meet one of the superior criterions and achieve a "superior" score. It was decided that for the purpose of this study, each prenatal record would be considered complete, and the abstractor evaluated the record as if delivery occurred after the last recorded prenatal visit.

It was concluded that the Burlington Prenatal Criteria provided a solid basis for the retrospective evaluation of prenatal care in this setting. However, the peer review questionnaire and the review of other published standards suggested that a comprehensive updating of the criteria was required.

4.3 Modification of the Criteria

The peer review questionnaire plus a review of current obstetrical standards and obstetrical interventions indicated that the Burlington Prenatal Criteria should be updated as follows:

Basic Criteria

1. Gestational age should be referred to in weeks rather than in months, thus the frequency of visits was described as:

   - Visits every 4 weeks from first prenatal visit to 32 weeks
   - Visits every 2 weeks from 32 weeks to 36 weeks
   - Weekly visits from 36 weeks to term
Intermediate State - complications of pregnancy

2. Albuminuria.
   - This was not defined, therefore the following definition was used: +1 (urine dipstick) or 30mg of protein on two successive urine tests.

3. Excessive weight gain—over 5 lbs (2.3 kg) per 4 weeks
   - Use of this criterion for weight gain was found to be unrealistic, particularly in the second trimester
   - The area of appropriate weight gain during pregnancy is a controversial topic. In order to identify extremely excessive weight gain in this patient population the criterion of: >3.6 kg (8 lbs) over 4 weeks, for two consecutive visits was used.
   - The administration of diuretics for excessive weight gain was deleted from the "appropriate" intervention list.

4. Hypertension and Albuminuria and weight gain
   - The optional administration of diuretics was deleted from the "appropriate" intervention list.

5. Weight gain and Albuminuria
   - The optional administration of sedation (Phenobarbital) was deleted from the "appropriate" intervention list.
6. Inadequacy of pelvis in primipera
   - This category was deleted since clinical examination is questionable as an indicator of adequacy of the pelvis.

7. Rising Rh titre or anticipated problem
   - If present, Rh immune globulin administered at 28 weeks if the woman is Rh negative unsensitized and the father is Rh positive was added to the "appropriate" interventions.

As well as assessing the prenatal records with the Burlington criteria updated as above, an adapted criteria was established to examine more areas of prenatal care. Based on the survey of general practitioners, it was considered reasonable to add the following criteria to the requirements for an "adequate" score:

1. Evidence of a dietary interview
2. Must be a record of fundal height measurements in centimeters after 20 weeks gestation

Thus two scores were determined for each chart:

1. Updated Burlington Prenatal Criteria (UBPC) and
2. Adapted Burlington Prenatal Criteria (ABPC).

It was felt that the two additional criteria included in the ABPC would make the achievement of an "adequate" score more difficult, but that it appropriately reflected current and expected general practitioner prenatal care (see Appendix B.2 and B.3 for UBPC and ABPC).
The Burlington criteria were developed for assessment of the patient's chart in the practitioner's office. Therefore, requirements for the test results for the intermediate medical conditions in the hospital chart record were not expected. Any indication on the prenatal record that the required test or examination was done was considered adequate.

4.4 Study Design

Setting and Study Population

Fifty-one women attended the Low-Risk Clinic at Grace Hospital between July 1982 and April 1984 where they received prenatal care from four nurse-midwives. The clinic was located in the out-patient area of the hospital and it was held one afternoon a week. The patients were usually self-referred. They heard of the clinic through word of mouth, or through professional contacts. "The couples who sought out the clinic were well-educated, well-informed, and highly aware consumers..." (1/3 of the women were registered nurses) (Carty et al. 1984:4-5). Prospective patients made an initial visit to discuss the philosophy of the clinic, to briefly review their medical and obstetrical history, and to discuss their reasons for wishing to be involved in this clinic.

Access to the clinic was limited to approximately four new patients per month. If space was available, and if the patient had a low risk history and was in agreement with the nurse-midwives philosophy and approach, involvement in the clinic was offered. All patients had provincial medical health insurance and no additional fee was required. At
the next visit further assessment of the patient and her pregnancy occurred in conjunction with one of the obstetricians associated with the nurse-midwives. For the remainder of the prenatal period the nurse-midwives were the patients' primary care providers.

Selection of Controls

Utilizing the "perinatal data base", each nurse-midwife patient was matched to two family physician patients. The perinatal data base provides a summary of information on every patient admitted for delivery to Grace Hospital since January 1983. This record is separate from the hospital chart and is organized by date and time of birth. For deliveries prior to January 1983 the hospital's delivery census was used for matching.

The matching characteristics and process were as follows:

1. Date of delivery - screening for a match began with the next consecutive delivery after the nurse-midwife's delivery and proceeded for one week. If no match was found, the week previous to the delivery was screened which was then followed by the second week after the delivery. This pattern was maintained until two matches were identified. Usually two or three weeks were reviewed to find two matches, however, 11% of the 88 control matches delivered more than two weeks before or after the nurse-midwife patient.

2. The primary practitioner in the control population was a family physician.
3. Prenatal care was initiated by twenty weeks gestation in the control population and delivery occurred after 32 weeks gestation. (Both numbers were set to coincide with the parameters of the cases).

4. The patient met the low risk criteria (see Appendix A) and had no history of caesarean section.

5. Age - was matched to within 5 years of the nurse-midwife patient.

6. Parity - was matched to the same number as the nurse-midwife patient.

7. Previous pregnancy loss - was matched to either ≤2 previous pregnancy losses, or >2 previous pregnancy losses.

8. Gravidity - was matched to the same number as the nurse-midwife patient allowing for previous pregnancy losses noted above.

9. 1980 Census tract, average family income ± S.D. (estimated standard error of average income) ± $1,000.¹ (Statistics Canada 1983). (Patients were generally matched to the same or nearby census tract that met this criteria. A few patients in outlying areas were matched to other outlying areas some distance apart.)

Of the 51 women accepted into the Low-Risk Clinic between July 1982 and April 1984, four had spontaneous abortions before 20 weeks gestation. The remaining 47 nurse-midwife patients, were carefully matched to 94 general
practitioner patients, strictly following the above criteria. Seventy-one family physicians provided care to the comparison population. Unfortunately only incomplete data was available on education level and occupations, so it could not be used for matching.

**Abstraction and Scoring the Prenatal Record**

An abstraction and coding form was developed and pretested by the researcher for this study which enabled an abstractor to review all the prenatal record forms in the hospital chart, and to record the presence or absence of the Updated Burlington Prenatal Criteria (UBPC) and the Adapted Burlington Prenatal Criteria (ABPC) (see Appendix E.1 Abstraction Form, and Appendix E.2 for Coding Guide). The Gestational weeks at each prenatal visit with an indication as to whether or not there was an accompanying record of weight, B.P., urine and fundal height measurement were also transcribed.

The abstractor was a baccalaureate nursing graduate with experience in maternity nursing. She was blinded to the hypothesis of the study but was informed that it was a general examination of prenatal care. She was given a randomized list of the one hundred and forty-one charts for the review. The abstractor blinded the abstraction and coding form by using invisible ink for the patient's name and chart number.

Following the completion of the abstraction the researcher reviewed each form and scored the care twice as either "adequate", "superior" or "inadequate" using first the UBPC and then the ABPC. After all the forms were scored they were unblinded and identified, and given their appropriate study identification number.
Statistical Methodology

The number of the cases available for this study was 47. The retrospective nature of the study, and the self selection of cases implied a need for matched controls. The better known formulas for statistical tests with such matched data require that the scores of the charts be reduced to a dichotomous "all-or-none" variable (i.e. an "adequate or superior" score versus an "inadequate" score), although all 3 levels of care can be used in more complicated tests.

The statistical efficiency of the study was improved by matching 2 controls to each case. Ury (1975) states that the efficiency of \( k \) controls per case to \( k \) controls per case equals: \( \frac{k(k+1)}{k(k+1)} \).

(In particular, efficiency = \( \frac{4}{3} \) for 2 controls per case.

If \( k = 1 \), and \( k = 2 \), then

\[
\frac{k(k+1)}{k(k+1)} = \frac{2(2)/(1)(3)}{4/3} = 1.333.
\]

That is, each 3 cases with 2 controls per case provide about as much information as would 4 cases with 1 control per case. Additional matched controls per case would further increase efficiency, but the marginal increase is small. (For example, the efficiency of 3 controls per case \( k = 3 \) relative to 2 controls per case \( k = 2 \) was \( \frac{9}{8} \), only 12.5% more efficient.) It was concluded that for this study, 2 controls would be matched to each case.
Miettinen (1968) presented the analysis of matched pair design in the case of all-or-none responses and, in a later paper, the analysis of individual cases matched with multiple controls (Miettinen 1969). Pike and Morrow (1970) also presented the statistical analysis of case-control studies with an all-or-none variable, extending the general test developed by Mantel and Haenszel. Pike and Morrow noted a general confusion in the medical literature regarding analysis of retrospective studies which involved individual matching between the case and the control. The usual unmatched chi-square test categorized individuals rather than pairs and summarized the groups compared, ignoring the qualities of the individual matches. Pike and Morrow pointed out that the use of this statistical analysis and the corresponding sample size or power calculation was only appropriate if the matching was irrelevant. The text by Schlesselman (1982) summarizes these authors and discusses the analysis of case-control studies for both unmatched and matched studies.

In the present study, the "treatment groups" are the nurse-midwife cases (NM cases) and the general practitioner controls (GP controls). The level of care (i.e. "superior", "adequate" or "inadequate") is the observed variable.²

Schlesselman discussed the specific situation of a study involving matched triplets (i.e. case, control₁, control₂) with a dichotomous variable and presented the eight possible outcomes as follows:
Table 4.1 Sample Frequencies of Eight Possible Outcomes for Matched Triplets (Case, Control₁, Control₂)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Frequency</th>
<th>Outcome</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ + +</td>
<td>n₀</td>
<td>- + +</td>
<td>n₄</td>
</tr>
<tr>
<td>+ + -</td>
<td>n₁</td>
<td>- + -</td>
<td>n₅</td>
</tr>
<tr>
<td>+ - +</td>
<td>n₂</td>
<td>- - +</td>
<td>n₆</td>
</tr>
<tr>
<td>+ - -</td>
<td>n₃</td>
<td>- - -</td>
<td>n₇</td>
</tr>
</tbody>
</table>

1Adequate or Superior (+), Inadequate (-).
(adapted from Schlesselman 1982:214)

Triplets in which all outcomes are (+) or in which all outcomes are (-), play no role in the statistical analysis. The Mantel-Haenszel test of the null hypothesis with the odds ratio (Ψ) equal to 1, \( H₀ : \Psi = 1 \), against the two-sided alternative \( H_A : \Psi ≠ 1 \) utilizes the other six possible frequency outcomes as follows: Let

\[ N₁ = [n₁ + n₂ + 2(n₃ - n₄) - (n₅ + n₆)]/3 \]

and

\[ N₂ = 2[n₁ + n₂ + n₃ + n₄ + n₅ + n₆]/9. \]

Then, Schlesselman (1982:215) gives

\[ \chi^2_{\text{mh}} = \frac{(|N₁| - 1/2)^2}{N₂} \text{ with the "continuity correction"} \]

or

\[ \chi^2_{\text{mh}} = N₂^2/N₁ \text{ without the "continuity correction"}. \]

Under the null hypothesis, \( \chi^2_{\text{mh}} \) has a chi-square distribution with one degree of freedom (Schlesselman 1982:215).
For a more powerful analysis of the score results using the original three ordered categories ("superior", "adequate", "inadequate") a generalized Mantel-Haenszel test (Mantel 1963) and a generalized Friedman rank test (Benard and van Elteren 1953), both with one degree of freedom, can be used to test the null hypothesis.

Although 70 non-homogenous pairs are needed for a pair matched study to detect a two-fold odds ratio (Ψ = 2) with α = .05 (one-sided) and β = .10, the improved efficiency of a triplet matched study reduces the non-homogenous triplets to approximately 52 (see Appendix F.1). As noted earlier only 47 matched triplets were available, thus the power of this study to detect an odds ratio of at least 2 (Ψ = 2), with the hypothetical finding of 36 non-homogenous matched triplets was found to be 75%. (Appendix F.2).

4.5 Reliability

Throughout the abstraction and scoring process reliability testing was performed. Before beginning the abstraction, the researcher and the abstractor practiced on ten prenatal records in a family practice setting, not included in this study and then compared and discussed the abstractions. This was followed by a pretrial for inter-rater reliability at Grace Hospital where we both abstracted ten more charts. The assessment of the abstraction recording process examined whether the same data was recorded by both abstractors. No systematic errors were noted. Table 4.2. indicates the frequency with which discrepancies occurred. Each coding form required 54 boxes to be marked.
Table 4.2. Frequency of Discrepancies in Inter-rater Reliability Assessment

<table>
<thead>
<tr>
<th>Number of Discrepancies</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>&lt;7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Charts Charts (N=10)</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Hence there was a median value of 1 discrepancy (among 54 boxes per chart), and the average proportion of agreement between the two abstractors was 95.2% per chart. (average number of agreements per chart/total number of possible agreements per chart = \( \frac{51.4}{54} = 95.2\% \), determining a KAPPA for this comparison was not appropriate). Following the abstraction and the assessment of the inter-rater reliability, the discrepancies were discussed. These results indicated consistent and similar recording between the two abstractors.

Towards the end of the abstraction process the abstractor was given an additional list of forty charts to review to determine intra-rater reliability. The list contained twenty nurse-midwife charts and twenty family physician charts which had already been abstracted. Later in the study four of these charts were omitted from the analysis because they were mismatched, leaving thirty-six charts for comparison. Again, the assessment of the abstraction recording process was examined, but on this occasion the consistency of the abstractor was the focus. Table 4.3. indicates the frequency with which discrepancies occurred. Each coding form now required the abstractor to mark 49 boxes.
Table 4.3. Frequency of Discrepancies in Intra-rater Reliability Assessment

<table>
<thead>
<tr>
<th>Number of Discrepancies</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>&gt;11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Charts (N=36)</td>
<td>12</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Hence there was a median value of 1 discrepancy (among 49 boxes per chart), and the average proportion of agreement between the two abstractions was 96.1% per chart (47.1 /49 = 96.1%). Generally this assessment indicated consistent abstraction and no systematic errors were noted. However, one comparison indicated 11 discrepancies, and a further examination revealed that the abstractor had reviewed the prenatal records of two siblings rather than the same child's record twice, in the mother's chart. In the overall abstraction the appropriate prenatal record was identified by the mother's parity and gravida as well as the general dates of the study. Abstraction of the wrong prenatal record in the mother's chart was noted on one other occasion and the mistake was corrected.

Prior to the researcher scoring any of the abstraction forms as "superior", "adequate" or "inadequate", a comparison was made between her scoring and that of a physician who had experience with the Burlington criteria. The forty charts abstracted for the intra-rater reliability test were scored by both the researcher and the physician. Each was blind to the others decision on the score during the process. Judging with the UBPC, there was 92.5% agreement (KAPPA = .80), and with the ABPC there was
95% agreement (KAPPA = .87). To determine the KAPPA (Laudis and Koch 1977), the score was adjusted to a dichotomous variable by combining "superior" and "adequate" scores and comparing it to "inadequate" scores (see Appendix G for KAPPA calculations).
1. Definitions of terms as follows:

Family/Household Total Income: The total income of a census family or household is the sum of the total incomes of the members of that family or household.

Average Income: The average family/household income refers to the weighted mean total income of families/households in 1980. Average income is calculated from unrounded data by dividing the aggregate income of a group of families/households by the number of families/households in that group. Similarly, the average income of a group of non-family persons is calculated from unrounded data by dividing the aggregate income of the group by the number of all non-family persons 15 years and over in the group whether or not they reported income. However, the average income of individuals 15 years and over is calculated for only those individuals who reported income for 1980.

Standard Error of Average Income: Refers to the estimated standard error of average income for an income size distribution (for total income, employment income, family income or household income). It is an estimate of the error introduced into these data due to the fact that they are collected only from a one in five random sample of households. When using these figures, the user can be reasonably certain that for the enumerated population, the true value (the value that would have been obtained had sampling not been used) lies within plus or minus twice the standard error and virtually certain that it lies within plus or minus three times the standard error. These estimates do not include the effects of certain types of response error or systematic or coverage errors.

2. Schlesselman's (1982:206) terminology of "disease/non-disease" refers to the treatment groups in this study, and his "exposed/non-exposed" categories refer to the levels of care.
CHAPTER 5

Results

5.1 Matched Variables

Patients who attended the nurse-midwives' Low-Risk Clinic (NM cases) were matched to two patients seen by general practitioners (GP controls) on the criteria of similar age (± 5 years), equal parity, approximate gravidity (± 2), approximate previous pregnancy losses (± 2), similar or same census tract of residence, and date of delivery.

After the study charts were abstracted, a review of the matching variables revealed 3 triplet sets (case, control₁, control₂) that contained an improper match, because the chart number obtained from the "perinatal data base" did not correspond to the actual chart. The 3 triplets that were affected (9 charts) were discarded, leaving 44 triplets for analysis.

As expected little difference was found between the matching variables for the two groups (Table 5.1.). The overall study population had a mean and median age of 28.5 years; 43% were primigravidas and 66% were primiparous.

Table 5.1. Means of Matching Variables for NM Cases and GP Controls

<table>
<thead>
<tr>
<th>Matching Criteria</th>
<th>NM Cases</th>
<th>GP Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Yrs.)</td>
<td>29.25</td>
<td>28.17</td>
</tr>
<tr>
<td>Parity</td>
<td>.54</td>
<td>.54</td>
</tr>
<tr>
<td>Gravidity</td>
<td>1.97</td>
<td>1.93</td>
</tr>
<tr>
<td>Previous Pregnancy Losses</td>
<td>.43</td>
<td>.39</td>
</tr>
</tbody>
</table>
5.2 Unmatched Variables

Prenatal Attendance

Information abstracted from the charts describing prenatal attendance indicated that on average the NM cases sought prenatal care earlier, experienced more prenatal visits, and were seen over a longer period of time than the GP controls (Table 5.2.). As anticipated, the general practitioners sent the prenatal record to the hospital at approximately 37 weeks gestation. The nurse-midwives recorded an average of 2 additional visits per patient with a range from 0 to 5 visits, after 37 weeks gestation.

Table 5.2. Prenatal Attendance Variables (Unmatched) For NM Cases and GP Controls

<table>
<thead>
<tr>
<th>Prenatal Attendance</th>
<th>NM Cases</th>
<th>GP Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Prenatal visit M week + (SD)</td>
<td>10.1 (+ 3.2)</td>
<td>11.3 (+ 3.4)</td>
</tr>
<tr>
<td>Last Prenatal visit M week + (SD)</td>
<td>39.0 (+ 2.0)</td>
<td>37.3 (+ 1.8)</td>
</tr>
<tr>
<td>Number of recorded prenatal visits M + (SD)</td>
<td>13.4 (+ 2.3)</td>
<td>9.3 (+ 2.3)</td>
</tr>
<tr>
<td>Number of weeks seen for prenatal care M + (SD)</td>
<td>28.8 (+ 4.0)</td>
<td>26.0 (+ 3.7)</td>
</tr>
</tbody>
</table>
Labour and Delivery

Data collected on the process and outcomes of labour and delivery revealed that a slightly higher proportion of the NM cases began labour spontaneously, and that essentially equal proportions of the two groups were induced (Table 5.3.). A higher proportion of the G.P. controls' labours were augmented with artificial rupture of the membranes (14.8%) compared to the NM cases (6.8%).

Table 5.3. Percentage of Labour Variables for NM Cases and GP Controls

<table>
<thead>
<tr>
<th>Labour Variable</th>
<th>NM Cases (n=44)</th>
<th>GP Controls (n=88)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (Actual No.)</td>
<td>% (Actual No.)</td>
</tr>
<tr>
<td>No labour</td>
<td>2.3% (1)</td>
<td>5.7% (5)</td>
</tr>
<tr>
<td>Spontaneous</td>
<td>79.5% (35)</td>
<td>70.5% (62)</td>
</tr>
<tr>
<td>Induced</td>
<td>9.1% (4)</td>
<td>8.0% (7)</td>
</tr>
<tr>
<td>Augmented</td>
<td>6.8% (3)</td>
<td>14.8% (13)</td>
</tr>
<tr>
<td>Not recorded</td>
<td>2.3% (1)</td>
<td>1.1% (1)</td>
</tr>
</tbody>
</table>

* Cesarean Section prior to the onset of labour.
The manner in which the fetus was monitored throughout labour was similar with approximately 50% of both groups receiving auscultation only. (Table 5.4.). Forceps assisted delivery was also equivalent and occurred in 15.9% of the study population.

Table 5.4. Percentage of Fetal Monitoring Activities and Forceps Use for NM Cases and GP Controls

<table>
<thead>
<tr>
<th></th>
<th>NM Cases (n=44) % (Actual No.)</th>
<th>GP Controls (n=88) % (Actual No.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fetal Monitoring</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auscultation only</td>
<td>52.3% (23)</td>
<td>50.0% (44)</td>
</tr>
<tr>
<td>External monitor</td>
<td>15.9% (7)</td>
<td>17.0% (15)</td>
</tr>
<tr>
<td>and Auscultation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other monitoring</td>
<td>31.9% (14)</td>
<td>33.0% (29)</td>
</tr>
<tr>
<td><strong>Forceps Use</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>84.1% (37)</td>
<td>84.1% (74)</td>
</tr>
<tr>
<td>Low outlet</td>
<td>11.4% (5)</td>
<td>8.0% (7)</td>
</tr>
<tr>
<td>Midrotation</td>
<td>4.5% (2)</td>
<td>6.8% (6)</td>
</tr>
<tr>
<td>Not recorded</td>
<td>0</td>
<td>1.1% (1)</td>
</tr>
</tbody>
</table>
The condition of the perineum postpartum differed between the two groups (Table 5.5.). The NM cases had a higher proportion of intact perineums and a much lower rate of episiotomies: GP controls received episiotomies 3 times more frequently than NM cases. However, the NM cases experienced a 1 1/2 times greater frequency of 1° tears, and a 1 1/2 times greater frequency of >1° tears than the GP controls. Overall the combination of an episiotomy and tear was more frequent in the GP controls.

Table 5.5. Percentage of Perineum Condition for NM Cases and GP Controls

<table>
<thead>
<tr>
<th>Perineum Variable</th>
<th>NM Cases (n=44)</th>
<th>GP Control (n=88)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (Actual No.)</td>
<td>% (Actual No.)</td>
</tr>
<tr>
<td>Intact</td>
<td>13.6% (6)</td>
<td>8.0% (7)</td>
</tr>
<tr>
<td>Episiotomy</td>
<td>13.6% (6)</td>
<td>37.5% (33)</td>
</tr>
<tr>
<td>1° Tear</td>
<td>34.1% (15)</td>
<td>20.0% (18)</td>
</tr>
<tr>
<td>&gt; 1° Tear</td>
<td>27.3% (12)</td>
<td>17.0% (15)</td>
</tr>
<tr>
<td>Episiotomy and Tear</td>
<td>2.3% (1)</td>
<td>6.8% (6)</td>
</tr>
<tr>
<td>Cesarean Section</td>
<td>9.1% (4)</td>
<td>9.1% (8)</td>
</tr>
</tbody>
</table>

The proportions of vaginal deliveries (90.9%) and cesarean section deliveries (9.1%) were equivalent for the two groups.

During the intrapartum period some patients shifted to a higher risk category and were no longer under the primary care of the nurse-midwife or general practitioner. Tables 5.3, 5.4, and 5.5 are presented as descriptions of the study populations and do not infer causal links between prenatal care and labour and delivery outcomes.
5.3 Prenatal Criteria Assessment

A review of the prenatal records with the Updated Burlington Prenatal Criteria (UBPC) and the Adapted Burlington Prenatal Criteria (ABPC) identified substantial differences between the two care giver groups:

With the UBPC the following scores were achieved:

NM cases - 77.3% superior, 6.8% adequate, and 15.9% inadequate;
GP controls - 23.9% superior, 15.9% adequate, and 60.2% inadequate.

With the ABPC the following scores were achieved:

NM cases - 75.0% superior, 9.1% adequate, and 15.9% inadequate;
GP controls - 22.7% superior, 13.6% adequate, and 63.6% inadequate.

Only a minor shift in scores occurred with the adaptation of the criteria. (see Appendix B.2 and B.3 for criteria, and Appendix E.1 and E.2 for abstraction form and coding guide).

The usual analysis of matched triplets requires these scores to be a dichotomous variable (Schlesselman 1982). Table 5.6 and Table 5.7 list the sample frequencies of the eight possible triplet outcomes for the UBPC and the ABPC respectively, for which the scores have been reduced to: (+) "superior" or "adequate", and (-) "inadequate". The Mantel-Haenszel chi-square test found a significant difference between the NM cases and GP controls with both criteria. The NM cases achieved significantly more "superior" or "adequate" scores of the prenatal record than did the GP controls.
Table 5.6. Frequency of Eight Possible UBPC Outcomes<sup>1</sup> Among Case-Control Triplets (Case, Control<sub>1</sub>, Control<sub>2</sub>)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Frequency</th>
<th>Outcome</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ + +</td>
<td>4(n&lt;sub&gt;0&lt;/sub&gt;)</td>
<td>- + +</td>
<td>0(n&lt;sub&gt;4&lt;/sub&gt;)</td>
</tr>
<tr>
<td>+ + -</td>
<td>8(n&lt;sub&gt;1&lt;/sub&gt;)</td>
<td>- + -</td>
<td>2(n&lt;sub&gt;5&lt;/sub&gt;)</td>
</tr>
<tr>
<td>+ - +</td>
<td>13(n&lt;sub&gt;2&lt;/sub&gt;)</td>
<td>- - +</td>
<td>4(n&lt;sub&gt;6&lt;/sub&gt;)</td>
</tr>
<tr>
<td>+ - -</td>
<td>12(n&lt;sub&gt;3&lt;/sub&gt;)</td>
<td>- - -</td>
<td>1(n&lt;sub&gt;7&lt;/sub&gt;)</td>
</tr>
</tbody>
</table>

<sup>1</sup> "superior" or "adequate" (+), "inadequate" (-)

<sup>2</sup> N<sub>1</sub> = 39/3 = 13, N<sub>2</sub> = 78/9 = 8.7,

\[ \chi^{2}_{mh} = 18.0 \text{ (p < .005, two-sided) with "continuity correction"} \]

\[ \chi^{2}_{mh} = 19.5 \text{ (p < .005, two-sided) without "continuity correction"} \]

Table 5.7. Frequency of Eight Possible ABPC Score Outcomes<sup>1</sup> Among Case-Control Triplets (Case, Control<sub>1</sub>, Control<sub>2</sub>)

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Frequency</th>
<th>Outcome</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ + +</td>
<td>4(n&lt;sub&gt;0&lt;/sub&gt;)</td>
<td>- + +</td>
<td>1(n&lt;sub&gt;4&lt;/sub&gt;)</td>
</tr>
<tr>
<td>+ + -</td>
<td>6(n&lt;sub&gt;1&lt;/sub&gt;)</td>
<td>- + -</td>
<td>2(n&lt;sub&gt;5&lt;/sub&gt;)</td>
</tr>
<tr>
<td>+ - +</td>
<td>11(n&lt;sub&gt;2&lt;/sub&gt;)</td>
<td>- - +</td>
<td>3(n&lt;sub&gt;6&lt;/sub&gt;)</td>
</tr>
<tr>
<td>+ - -</td>
<td>16(n&lt;sub&gt;3&lt;/sub&gt;)</td>
<td>- - -</td>
<td>1(n&lt;sub&gt;7&lt;/sub&gt;)</td>
</tr>
</tbody>
</table>

<sup>1</sup> "superior" or "adequate" (+), "inadequate" (-)

<sup>2</sup> N<sub>1</sub> = 42/3 = 14, N<sub>2</sub> = 78/9 = 8.7,

\[ \chi^{2}_{mh} = 21.0 \text{ (p < .005, two-sided) with "continuity correction"} \]

\[ \chi^{2}_{mh} = 22.6 \text{ (p < .005, two-sided) without "continuity correction"} \]
The scores can also be tested in their original categories with a generalized Mantel-Haenszel test (Mantel 1963) and with a generalized Friedman rank test (Bernard and Van Elteren 1953) both with one degree of freedom. Tables 5.8 and 5.9 summarize the data for the individual scores ignoring the matching, and include these two statistical tests of significance.

**Table 5.8. Frequency of UBPC Score Outcomes for NM Cases and GP Controls**

<table>
<thead>
<tr>
<th>Score</th>
<th>NM Cases</th>
<th>GP Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual No. (%)</td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>34 (77.3%)</td>
<td>21 (23.9%)</td>
</tr>
<tr>
<td>Adequate</td>
<td>3 (6.8%)</td>
<td>14 (15.9%)</td>
</tr>
<tr>
<td>Inadequate</td>
<td>7 (15.9%)</td>
<td>53 (60.2%)</td>
</tr>
</tbody>
</table>

\[ \chi^2_{mh} = 27.59701 \ (p < .005, \text{two-sided}) \] generalized Mantel-Haenszel

\[ \chi^2_{mh} = 24.60465 \ (p < .005, \text{two-sided}) \] generalized Friedman

**Table 5.9. Frequency of ABPC Score Outcomes for NM Cases and GP Controls**

<table>
<thead>
<tr>
<th>Score</th>
<th>NM Cases</th>
<th>GP Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Actual No. (%)</td>
<td></td>
</tr>
<tr>
<td>Superior</td>
<td>33 (75.0%)</td>
<td>20 (22.7%)</td>
</tr>
<tr>
<td>Adequate</td>
<td>4 (9.1%)</td>
<td>12 (13.6%)</td>
</tr>
<tr>
<td>Inadequate</td>
<td>7 (15.9%)</td>
<td>56 (63.6%)</td>
</tr>
</tbody>
</table>

\[ \chi^2_{mh} = 29.1128 \ (p < .005, \text{two-sided}) \] generalized Mantel-Haenszel

\[ \chi^2_{mh} = 24.9921 \ (p < .005, \text{two-sided}) \] generalized Friedman
5.4 Patterns of Care

Marked differences were found in the patterns of care for the two groups. Both the UBPC and the ABPC contained the same four indications for a "superior" score. The majority of the NM cases (63.6%) had two indications per chart for a "superior" score and the majority of the GP controls (62.5%) had one indication per chart for a "superior" score. (Figure 5.1).

Many more indications for an "inadequate" score were possible. The inability of the record to meet the 10 basic criteria of the UBPC or the 12 basic criteria of the ABPC, or to have an "inappropriate action" with an intermediate condition resulted in an "inadequate" score. 77.3% of the NM cases had no indications on the prenatal record for an "inadequate" score as compared to 27.3% of the GP controls. In fact, half of the GP controls had $>2$ indications for an "inadequate" score, with 10.3% having $>5$ "inadequate" indications (Figure 5.2).
The criteria which were most frequently scored "inadequate" included the record for "blood pressure" (21% of GP controls), record for "urine" (38% of GP controls), and "frequency of prenatal visits" (36% of GP controls). The NM cases had a similar pattern, but a lower proportion of "inadequate" indications. (e.g. BP - 2.3%, urine - 9.1%, visit frequency - 13.6%). (Figure 5.3).
Figure 5.3 Proportions of "Inadequate" Scores per Criterion (UBPC and ABPC) for NM Cases and GP Controls

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>Percentage of Omission</th>
<th>NM Cases</th>
<th>GP Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pelvic Assessment</td>
<td>8% (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obstetrical History</td>
<td>2.3% (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete Physical</td>
<td>5.7% (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial Haemoglobin</td>
<td>9.1% (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rh Status</td>
<td>4.5% (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record of Weight</td>
<td>2.3% (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record of B.P.</td>
<td>6.8% (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Record of Urine</td>
<td>21.6% (19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency of Prenatal Visits</td>
<td>13.6% (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement of Gestational Age</td>
<td>(0)</td>
<td>36.4% (32)</td>
<td></td>
</tr>
<tr>
<td>Fundal Height</td>
<td>22.7% (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary Interview</td>
<td>13.6% (12)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A review of the incidences of the intermediate conditions indicated a marked difference between the two groups. The NM cases contained 58 intermediate conditions within 44 charts whereas, the GP controls contained 28 intermediate conditions within 88 charts. (Figure 5.4). Hypertension, albuminuria and glucosuria were the only intermediate conditions evaluated that the abstractor was able to note from the ongoing prenatal record. The other conditions were identified if a comment was made or an investigative test was reported. In the case of albuminuria, the nurse-midwives tended to order a urinalysis before two abnormal urine "dipstick tests" were established. As a result, the abstractor recorded the condition because the investigation was done.

**Figure 5.4** Proportions of Intermediate Conditions Found for NM Cases and GP Controls

<table>
<thead>
<tr>
<th>Intermediate Conditions</th>
<th>Incidence per 100</th>
<th>NM Cases</th>
<th>GP Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuminuria</td>
<td>31.8% (14)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>29.5% (13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucosuria</td>
<td>27.3% (12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge/Pruritis</td>
<td>25.1% (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pyuria</td>
<td>23.1% (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible Rubella Contact</td>
<td>11.4% (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rh Titre Rising or Anticipated</td>
<td>10.5% (8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* identified if urinalysis is present
The appropriate intervention was performed for all the intermediate conditions identified with the exception of four conditions found among the GP controls, which included 2 cases of "hypertension", 1 case of "discharge or pruritis", and 1 case of "possible rubella contact". Therefore, inappropriate action for an intermediate condition caused only 6% of the "inadequate" scores with the UBPC.

In summary, two comparable patient groups were found to have significantly different prenatal record scores; the NM cases received "adequate" or "superior" scores more frequently than the GP controls. The Mantel-Haenszel estimate of the odds ratio (Schlesselman 1982:215) was 7.5 for the UBPC and the power of the study was greater than 99% (Appendix F.3). While both groups met the criteria for the initial prenatal assessment, patterns of care differed between the two groups: a higher proportion of the GP controls received inadequate scores in association with the ongoing recording of the prenatal assessment process. It was also found that the NM cases contained a higher proportion of intermediate conditions than the GP controls.
CHAPTER 6

Discussion

6.1 Methodology Discussion

A health record audit using explicit criteria and indicator conditions has been widely used as a methodology for investigating quality of care in ambulatory settings. The important aspects of this research design are the selection of indicator conditions for which medical care is generally agreed upon and for which specific criteria can be developed. Prenatal care is a good example of such an indicator condition because the basic medical care of pregnant women has become standardized over the last several decades and medical practice beliefs accept a specific common minimal level of care. The Burlington prenatal criteria mirror these medical practices and the Updated Burlington Prenatal Criteria reflect current terminology and practice.

In most studies several indicator conditions are selected in order to identify a representative study population with a range of clinical problems for the measurement of quality of care. In the present study, prenatal care was the only indicator condition used to assess the quality of care, as the purpose was to determine if a different health professional, the nurse-midwife, could provide prenatal care that was equivalent to the predominant and accepted care giver, the general practitioner. Choosing one indicator condition for appraisal was a function of time constraints, available published criteria, limited clinical areas of overlap between the two practitioner groups and limited access to records.
A second adaptation of the traditional chart audit was the selection of practitioners for the control group. All of the nurse-midwife patients attending the Low-Risk Clinic were compared to a relatively small sample of general practitioner patients who delivered at the same hospital. Seventy-one general practitioners provided care to the 88 matched controls assessed in this study. Over 600 physicians have privileges to practice at the hospital where the study took place; the physicians were included in the study only because they had hospital privileges and because their patient was matched to one of the nurse-midwives patients. Thus, this study compares the prenatal care received by 44 nurse-midwife patients to that of 88 general practitioner patients rather than the prenatal care provided by 4 nurse-midwives to that provided by 71 general practitioners.

An additional adaptation was the use of a case-control design with the analysis of each matched triplet. A retrospective audit of the nurse-midwives records alone, with the established and tested criteria would have indicated the quality of care provided by this group in isolation, apart from comparisons to other published studies which used the same criteria. The introduction of a matched control group enabled comparisons of care to that which was actually provided in the same community, thus permitting broader conclusions.

Certain limitations arise with a retrospective chart audit which measures quality of care. A major concern is the reliability of the medical record in reflecting the care that actually occurred. In this study several factors contribute to the validity of the prenatal record. First, a large component of routine prenatal care is a systematic screening
process that is well established and accepted, and secondly, it is recorded on a standardized form. While, it is possible for whole visits to go unrecorded, or for normal signs and symptoms to be omitted from the record which were mentally noted by the conscientious practitioner, a component of prenatal care is the identification of changes over time, which demands a complete ongoing record for adequate assessment. (eg. B.P., urine tests, fetal growth, weight). Thirdly, the prenatal record is a communication to colleagues both within a practice and in the hospital where it is sent prior to delivery. Hospitals require the submission of prenatal records, and internal hospital committees utilize this record for peer review. Moreover, the prenatal record is a legal record of medical care. Consideration of the multiple purposes of the prenatal record and of the nature of prenatal care in general, supports its use as a good indicator of the care that was provided to the prenatal patient.

Another common concern with chart audits is the appropriateness of the criteria used for assessing the level of care provided. The use of explicit rather than implicit criteria, and the development of minimal standards of care rather than optimal standards has improved the reliability of this method in general (Brook and Appel 1973). The original Burlington prenatal criteria listed 10 requirements for an adequate score which were developed by family physicians and pretested, and it was found that the criteria did measure the quality of care and provided results that were similar to outcome measures of quality of care in the same practice settings (Sibley et al. 1975:51). (see Chapter 4 for further discussion of the Burlington prenatal criteria). For the present study the criteria were
reviewed by general practitioners so that their current applicability could be assessed. As discussed in Chapter 4, all the practitioners felt the basic criteria were relevant to their practices and their suggested changes to the criteria simply involved updating terminology and altering "appropriate interventions" in a few of the intermediate conditions. An extensive peer review was not performed because of time constraints and because this group produced very similar results. A further comparison of the criteria to the published standards of several medical professional organizations supported the Burlington prenatal criteria as minimal, but appropriate indicators of prenatal care. In considering the manner in which the Burlington criteria were developed and tested, the review by practitioners in the local community, and the comparison with professional standards, it was concluded that the criteria were valid measures of quality of prenatal care. It is interesting to note that the additional criteria included in the Adapted Burlington Prenatal Criteria did not alter the scores appreciably, however they did provide more information on patterns of practice.

The present study permits conclusions to be made about the quality of the process of care received by a group of patients attended by nurse-midwives and another group of patients attended by general practitioners. Conclusions can also be made from this study about the prenatal care the nurse-midwives provided in the Low-Risk Clinic. Furthermore, these results are applicable to other nurse-midwives with comparable backgrounds practising in similar settings with a similar model. However, this study design does not allow conclusions about the quality of care provided to
prenatal patients in general by physicians since no attempt was made to establish a representative sample of patients seen by general practitioners. The focus was to establish two similar groups of patients to determine if there was a difference in the care they received. The sample of general practitioners has wide confidence intervals and it is possible that a socio-economic confounder influenced the selection of general practitioners through the patient matching process. At the same time, however, there is no reason to conclude that the physicians in this study were different from others who practiced at the same hospital.

6.2. Results Discussion

The minimal and explicit Burlington prenatal criteria indicated that the care received by nurse-midwife patients at the Low-Risk Clinic is more comprehensive than the care received by general practitioner patients as measured from the prenatal record. Given the "experimental" nature of the Low-Risk Clinic, the high score achieved by the nurse midwives (84% "superior" or "adequate" with UBPC) is not surprising (i.e. the Hawthorne effect).

The low proportion of "adequate" or "superior" scores (40% with UBPC) found in the general practitioner control group was not anticipated as family physicians achieved higher scores in other studies using the Burlington prenatal criteria. Sibley et al's, and Sheps and Robertson's studies found "adequate" or "superior" scores of 70% and 48% respectively among general practitioners records. (Table 6.1). A minor adaptation of the scoring process which was also used in the present study, boosted Sheps and Robertson's score to 65%. 
Table 6.1. Proportions of Adequate and Superior Scores Achieved with the Burlington Randomized Clinical Trial (BRCT) Criteria for Prenatal Care in Three Studies

<table>
<thead>
<tr>
<th>Care Giver Group</th>
<th>Studies</th>
<th>Nurse Practitioner (NP)</th>
<th>NP + GP</th>
<th>General Practitioner (GP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>%(Actual No.)</td>
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</tr>
<tr>
<td>Sibley et al.</td>
<td>(1976)</td>
<td>77% (13)</td>
<td>71% (31)</td>
<td></td>
</tr>
<tr>
<td>Sheps &amp; Robertson</td>
<td>(1984)</td>
<td>48% (11)</td>
<td>65% (15)</td>
<td></td>
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<tr>
<td>Buhler(^1)</td>
<td>84% (37)(^2)</td>
<td></td>
<td>40% (35)</td>
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</tr>
</tbody>
</table>

1. Updated Burlington Prenatal Criteria Results
2. Certified Nurse-Midwives
3. Adjusted ratings by Sheps & Robertson, similar to UBPC.

Sibley et al.'s study was prospective and the practitioners in the three practices they studied were aware of a research program. These three practices achieved similar scores. Sheps and Robertson performed a chart audit using the Burlington criteria for 7 of the possible 10 indicator conditions developed by Sibley et al. They retrospectively examined the primary care provided by 2 nurse practitioners and five family physicians in a community clinic. The scores of the nurse practitioners and the physicians were combined as care giver per se was not an issue in that study. Both of these studies evaluated the care provided in specific medical settings. The present study differs from these two in that the control group is composed of many general practitioners functioning in
their own private medical practices, thus introducing a range of settings. The numbers of prenatal records reviewed in these two studies were small. Sibley et al. reviewed 13 charts in the randomized nurse practitioner group and 31 charts in the control group; Sheps and Robertson reviewed 23 prenatal records. In the present study records for 44 NM cases and 88 GP controls were reviewed which, in turn, examined 75 practitioners (4 NM, 71 GP).

The differences in the scores for the nurse-midwife group and the general practitioner group are emphasized by the findings that 84% of the NM cases had two or more "superior" indications per chart while 51% of the GP controls had at least 2 "inadequate" indications per chart. The nurse-midwives consistently met the superior criteria of "evidence of a psychosocial interview" (68%) while the general practitioner met the pap smear criterion (70%) but rarely met the psychosocial criterion (10%). This finding clearly identifies a difference in practice between the two care giver groups as the nurse-midwives recorded psychosocial adaptation throughout the pregnancy cycle. A third superior indication, "interview with husband and wife together", was known to occur with all Low-Risk Clinic patients and was likely to have occurred with many general practitioners' patients, but neither group noted it in the record.

The high proportion of "inadequate" indications found in the GP controls' records was not entirely limited to one or two criteria, although most omissions were associated with the ongoing care; a smaller proportion of charts (between 5-10%) omitted initial assessment criteria. Many of these omissions have practical implications for identifying inadequate care
because one purpose of prenatal screening is identifying changes over time. The magnitude of these omissions is increased when the leniency of the scoring process is considered. For example, if a urine test, blood pressure reading, or weight was omitted on a single visit but other ongoing recordings were present, that visit was still judged "adequate" if the omission occurred once in the record. Furthermore, frequency of prenatal visits was judged adequate even if "up to 6 weeks" elapsed between visits on one occasion, prior to 32 weeks gestation. Visits 5 weeks apart prior to 32 weeks gestation, and 3 weeks apart between 32 and 36 weeks gestation were also considered adequate. In addition to these considerations, if a chart received an "inadequate" score because of one indication but was "superior" in other respects, the chart was re-assessed as "adequate". This scoring was considered realistic since it did not penalize practitioners for occasional omissions and for difficulties scheduling appointments. Despite this "leniency", the GP controls still achieved a remarkably low level of "adequate" or "superior" scores. These differences support the hypothesis of the study and indicate that the nurse-midwives' records were more thorough and more consistent than those in the general practitioner group.

An examination of variables other than those which were used for matching reveals more similarities and a few differences between the patient groups. The outcomes of labour and delivery, with the exception of the condition of the perineum were similar. The differences in the frequencies of episiotomies and tears between the two groups indicates the different style of practice during delivery of the nurse-midwives and the
general practitioners. The similarities of the matching, and labour and delivery variables supports the conclusion that two low risk groups were established.

The differences found in the frequency of prenatal visits is a result, to some degree, of the GP controls' records being sent to the hospital at 37 weeks gestation while the nurse-midwife's records were maintained until delivery. An analysis of the frequency of visits for each group prior to 37 weeks gestation was not done. However, the mean number of visits recorded for the NM cases was 13.4 and for the GP controls was 9.3. The NM cases had a mean of 2 visits after 37 weeks with a range from 0 to 5 visits. Therefore, one can surmise that the NM cases experienced approximately 2 more visits than GP controls prior to 37 weeks gestation. It is not possible to determine from this study whether this difference was client or provider initiated, or whether it simply indicates a difference in patient compliance in attending scheduled appointments. It is possible that this finding identifies a difference in the two patient groups supporting the anecdotal comment that the Low-Risk Clinic served a unique clientele of "highly aware health care consumers" (Carty et al 1984:4). It was not possible to measure this variable in the present study as it was beyond the scope of a retrospective chart audit. The difference in prenatal visits may also be an indication of a difference in the styles of practice between nurse-midwives and general practitioners, with the former scheduling more appointments for routine prenatal care, and not a difference in patient groups. The nurse-midwives reported extra
appointments during the prenatal process for an initial interview, for developing a birth plan, and for a labour and delivery "dress rehearsal". It is not known whether routine prenatal screening always occurred at these visits or even if they were consistently recorded on the prenatal record.

As suggested in Chapter 4, the implication of a higher frequency of prenatal visits for the nurse-midwives with respect to the evaluation are two-fold. Since NM cases had more visits evaluated per patient than the GP controls, they had more opportunities to achieve both an "inadequate" score or meet a "superior" criterion. The actual results of the study indicate that the additional prenatal visits experienced by the NM cases did not cause many "inadequate" scores. As well, the achievement of the superior criteria occurred early in the record, as "pap smear or cytology record" was done in the first trimester, and "evidence of a psychosocial interview" was an ongoing aspect of the nurse-midwife's records. Thus despite a "harder test", the nurse-midwives performed better. The increased number of visits evaluated did not affect the resulting score and further supports the evidence that nurse-midwives are capable of providing superior care throughout the prenatal period.

Differences found in the quantity of intermediate conditions between the two groups is also interesting. The NM cases had a much higher proportion of intermediate conditions than did the GP controls. The higher incidence of Albuminurea was discussed briefly in Chapter 5. This difference was probably a result of the nurse-midwives ordering a urinalysis after one abnormal urine dip-stick test. Another difference, the 2 1/2 times higher incidence of hypertension in the NM cases may have been a function of the fact that the nurse-midwives' records were
maintained through the latter part of pregnancy. The incidence of hypertension does increase progressively in the last trimester of pregnancy (Hall and Chng 1982:64). The 5 times higher incidence of discharge or pruritis and the accompanying intervention of pelvic examination and culture may have also been a function of the latter part of pregnancy as the nurse-midwives may have screened patients for candidiasis infections for the purpose of preventing neonatal thrush. The identification of a "Rh titre rising or anticipated problem" was likely a result of the extensive antibody screening test that was routinely performed at the Low-Risk Clinic. Evidently this test is not routinely performed in general practitioners' offices.

The small number of "inappropriate interventions" in the GP controls and the absence of "inappropriate interventions" in the NM cases for the intermediate conditions indicates that, in one sense, prenatal care was generally good, that is, potentially serious conditions were not misdiagnosed by either group. At the same time, however, the incomplete prenatal records of many GP controls made identification of intermediate conditions less reliable than that of the NM cases.

In general, the differences in the incidence of the various intermediate conditions between the groups can be explained by the longer screening period that the NM cases experienced, particularly at the end of pregnancy, and by a more rigorous attitude toward screening by the nurse-midwives. In retrospect it is unfortunate that the charts were not
abstracted in a way that would have indicated the weeks of gestation at the
time that the intermediate condition was identified. This lack of
information makes it impossible to conclude whether it was a real
difference in practice between the groups, or whether it was a function of
the time period involved in the screening (ie. the nurse-midwives having
the chart later in pregnancy).

6.3. Limitations

Specific limitations of this study include (a) the comparability of
the two patient groups, and (b) the application of a chart audit for
reviewing a small group of practitioners and comparing them to a large
group of practitioners. As noted earlier, the two patient groups were
similar on many matched as well as unmatched variables. However, a
"membership bias" may have influenced the results of the study. Sackett
states that "membership in a group may imply a degree of health which
diffs systematically from that of the general population" (Sackett
1979:54).

This definition can be applicable to the patients who attended the
Low-Risk Clinic and thus may have systematically influenced the care they
received, making it different than the comparison group. If true, it would
be difficult to ascertain in a retrospective study, how the care was
influenced. One could surmise that an assertive, knowledgeable health care
consumer who sought out a nurse-midwife could insist that discussions or
screening practices take place which could influence assessment of scores
of their prenatal records. However, the criteria used for the assessment
were not designed for this type of health care consumer, but rather reflected normal interactions in a general practice setting. The Burlington criteria, therefore, would minimize the possible bias the NM cases may have introduced.

The other major concern with regard to the limitations of this study focuses on the application of a chart audit which compares a small group of practitioners to a large group of practitioners. Other studies were found which made similar comparisons between nurse-midwives and physicians but they almost exclusively examined outcome indicators, rather than process of care indicators. Publications using the Burlington criteria have not evaluated large groups of practitioners. It is possible that the difference found between the NM cases and the GP controls were skewed by one group functioning in a small cohesive setting while the other group functioned in a variety of settings under variable conditions and with different backgrounds. Penalizing physicians for differences in approaches to care however was reduced by selecting minimal criteria that applied to general practice, by interpreting the criteria leniently, and by reviewing the criteria with general practitioners many of whom were later (by chance) included in the study. Further research evaluating specific general practitioners in the same community with the Burlington criteria could indicate whether this bias was introduced by the study design.
CHAPTER 7

Implications

7.1. Feasibility and Application of the Research Method

Chart audits which use process criteria for evaluation of primary practice settings have many applications because the results describe patterns, as well as, quality of care. The results provide specific and clear information to the practitioner(s) evaluated by identifying the strong and weak areas of their care. For example, Sheps and Robertson summarized their results with the Burlington criteria into the general areas of (a) history taking, (b) physical examination, (c) laboratory work, and (d) management. This allowed them to identify trends in particular aspects of medical care and provided useful feedback to the practitioners evaluated (Sheps and Robertson 1984:883). A process focused, quality of care evaluation can also provide baseline information for a practice which wants to measure innovations in care. (e.g. introduction of new personnel, change in chart format, or a new organization structure). At the same time, it can provide the standard for comparing different types of care givers, as in the present study, or it can be used for comparing different models or settings of care. Process quality of care studies have applications beyond the practice setting. The results may identify need for change or augmentation in a practitioner's primary and continuing education, as well as, support further research into primary care practice by providing data which can generate more specific hypotheses. Finally, process of care studies evaluating primary care settings contribute new information which can be used to affect social policy changes, such as the introduction of an alternative health care provider.
When considering the applications of this study methodology, its limitations should be kept in mind. Generally, chart audits are indirect measures of care, and the use of one indicator condition (e.g., prenatal care) severely restricts the generalizability of the conclusions of the study. The use of the prenatal record in the present study minimized one limitation of the audit because the record itself was an important aspect of the care. The other limitation, that of using one indicator condition, does not apply to this study because the purpose was to examine only that aspect of the practitioner's ability to provide care. Most applications necessitate the use of several indicators to evaluate the overall quality of care provided.

The use of the Burlington prenatal criteria in this case-control chart audit was a feasible solution to a research situation in which the quality of prenatal care provided by two health professional groups was evaluated and compared. The criteria were found to be straightforward. The current applicability of criteria in general, is assured with a review by practitioners in the study's locale. This review is an essential aspect of the study's methodology as it updates the criteria to current terminology and practice, and in this case, supported the inclusion of additional criteria.

The original Burlington abstraction sheets were not used for the present study because more information was required from the charts. The new abstraction sheets developed for this audit permit scoring to occur after all the charts are abstracted. This is an important consideration when practitioners from different disciplines are compared, as different
models of practice may be reflected in the content of the records. The new abstraction sheets facilitate reliable scoring by presenting the data in a more consistent format and eliminating potentially biasing influences such as, legibility, additional information, and overall appearance of the record.

In general, the methods of this study can be applied to other primary care settings, and with the prenatal record in particular, to hospital settings. The most time consuming aspect was the selection of controls. At the time of the study, the "perinatal data base" was not entered into a computer system so the original data base forms were used: the matching process took approximately 120 hours. The abstractions of the charts were straight forward and took approximately 20 minutes per chart and the scoring took an additional 5 minutes per chart. The data were easily entered into a computer for the initial analyses from the abstraction sheets. As Sheps and Robertson found, "The evaluation method used is feasible for short-term studies and is relatively inexpensive in terms of research time and money: it thus can realistically be applied to many primary care settings" (Sheps and Robertson 1984:886).

7.2. Implications for Planning

This research, which has found nurse-midwives to be safe and "superior" practitioners of prenatal care and able to achieve many similar labour and delivery outcomes to those of general practitioners, contributes needed information to the issue of nurse-midwifery practice in Canada. Hall, Land, Parker and Webb (1975) identify general criteria and factors
which influence emerging issues in the realm of innovative social policy changes. They identify information as one of several factors which influences both the legitimacy, feasibility and support criteria of the issue, as well as, the "image" of the issue. The findings of this study alter the placement of the nurse-midwifery issue along each criteria continuum in the following way.

The legalization of nurse-midwifery is clearly a legitimate responsibility of government. For example, recent court cases and inquiries into homebirths attended by midwives have addressed the implications of their current illegal status. (Hendrickson 1985). In one inquiry the judge noted health consumers' desires for alternative birthing experiences and recommended the legal recognition of midwifery so that the profession could be regulated and controlled. (Globe and Mail 1985). The Ontario Minister of Health responded by stating that his ministry would be looking into research which examines this issue. Hall et al. stated that "The empirical demonstration that certain problems actually exist is regarded as an essential step in securing state action to deal with them" (Hall et al. 1975:502). The combination of the recent court cases and this research, which not only finds the nurse-midwife to be an effective provider of prenatal care but also identifies a problem with the quality of prenatal care that is presently being provided by general practitioners, may be enough evidence to encourage the government to address the issue of nurse-midwifery practice in a concrete manner.

Hall et al. state that the feasibility of an issue is usually not readily apparent. Aside from ideological viewpoints among policy makers
and the political climate, these authors note that the feasibility of an issue is influenced by available resources, collaborative feasibility and administrative feasibility (Hall et al. 1975:479-83). At the present time little is known about the feasibility of including nurse-midwives in the Canadian health care system. However, the Low-Risk Clinic's report (Carty et al. 1984) and the present study indicate that nurse-midwives have an adequate theoretical and technical knowledge base and function well in a hospital based setting. Other factors, outside of the parameters of this study also contribute to the feasibility of this issue. First, Canadian nursing associations have collaborated with nurse-midwives in defining standards of practice and they have offered to monitor and register nurse-midwives until an independent organization is established (eg. Task Committee Report 1979). Secondly, a potential source of manpower is an unknown number of Canadian nurses who have been trained and are accredited in midwifery in other countries. Thirdly, to meet future manpower training needs some nursing schools have developed a potential three year nurse-midwifery curriculum (Carty 1985). Fourthly, the development of delivery of care models, which incorporate nurse-midwives into modern Canadian obstetrical care, can be based on the varied models found in the United States and Western European countries (eg. Keirse 1982; Lindheim 1981; Parboosingh and Kerr 1982; Powis 1981; Rising and Lindell 182; Robinson, Golden and Bradley 1982). Moreover, the Federal Task Force on High Risk Pregnancies (1984) suggested expanded roles for several groups of practitioners in obstetrical care. However, further studies are necessary at this time to explore the many feasibility questions that have not been addressed. In particular there is a need to assess the financial
feasibility of a nurse-midwifery component in various models of obstetrical care delivery. Other aspects of the evaluation should include consumer satisfaction and integration within the system, as well as, the nurse-midwife's integration into the system. The present research evaluating the Low-Risk Clinic encourages further exploration into the feasibility of including nurse-midwives in Canadian obstetrical care.

Support is the third criteria which influences social policy issues as identified by Hall et al. As noted earlier, many health consumers, nursing organizations and individual physicians support the development of nurse-midwifery in Canada. However, medical organizations and provincial governments have so far opposed this innovation. Hall et al. state that "when issues are advanced from positions of weakness the deployment of factual evidence will be important in affecting their progress..." (1975:506), and "the actual magnitude of issues indicated by the fact is also likely to affect their impact" (1975:505).

The results of this study may have two effects on reducing the opposition to nurse-midwifery. First, since nurse-midwives were found to be effective providers of prenatal care, governments may reconsider nurse-midwives as "substitute" care givers for physicians, rather than "add-on" care givers. Substitute care givers implies that they would decrease or maintain health care expenditures. This finding, coupled with increasing consumer demand, may encourage governments to explore, more realistically, the nurse-midwife alternative. The second result, which found "inadequate" prenatal care among the majority of general practitioner patients in the
study, undermines a common physician argument that inclusion of other non-physician personnel in primary care will reduce the quality of care. For example, in a recent policy paper addressing midwifery, the B.C. College of Physicians and Surgeons state that inclusion of a midwife as an independent practitioner in the Canadian health care system would increase home births as well as maternal/infant morbidity and mortality rates. They also note that this change would alter the health care structure in a counterproductive manner and that "It would be an unjustified and regressive measure to authorize any group with different training and background to practice obstetrical and newborn care". ("Position on Midwifery" 1984:6). Interestingly, the position paper only implies that nurse-midwives would provide lower quality obstetrical care, it is never explicitly stated. In contrast to this position, the present study indicates that a different health professional (i.e. the nurse-midwife) would improve obstetrical care. This finding may clarify the issue and alter some opponent's positions, thus increasing support for exploration of a nurse-midwifery model in Canada.

In summary, this study's results present new information which influences the criteria of legitimacy, feasibility and support of the issue of nurse-midwifery. First, its legitimacy has been increased with the identification of "inadequate" prenatal care scores among the general practitioner patients in the study. Secondly, its feasibility has been supported by the finding that nurse-midwives have adequate theoretical and technical knowledge as indicated by their "superior" prenatal care scores. And thirdly, increased support for nurse-midwives will develop among
various constituencies from the presentation of this data. If the issue moves from the realm of a potential innovation to the realm of an actual innovation in health care delivery, this study will provide background information which health care planners can utilize in the data gathering phrase of the planning process (Taylor 1972:22).

7.3. Conclusion

In conclusion, this study found nurse-midwives to be safe effective primary practitioners in a hospital based setting with low risk patients. A comparison to another group of practitioners with established criteria found that nurse-midwives provided "superior" prenatal care and that general practitioners provided "inadequate" prenatal care. Both groups tended to meet the initial prenatal criteria, but the general practitioners frequently omitted ongoing recordings such as blood pressure and urine tests, and they recorded an inadequate number of visits. These findings suggest that the inclusion of the nurse-midwife on the modern obstetrical team would improve the quality of maternal/infant care in Canada. Their inclusion would also provide an opportunity to more fully evaluate the effectiveness of this innovative health care professional. Information gathered in this study has contributed to the legitimacy, feasibility and support of the legalization of nurse-midwifery and at the same time, has demonstrated an economical and feasible methodology for examining quality of care in primary practice.
BIBLIOGRAPHY


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APPENDIX A

Low Risk Criteria


POLICIES FOR MIDWIFE MANAGEMENT OF CLIENT CARE

I. Selection of Clients

The midwives may take responsibility for specific delegated aspects of obstetrical care of the following women:

A. Those whose past medical, surgical and obstetrical history reveals no condition which would adversely influence the course of the pregnancy or be unfavourably affected by it, thus requiring special medical management.

B. Those who present no indication of pathology.

C. Those who are obstetrically and medically normal with the potential for continued normal progress without special medical management.

Conditions which exclude women from the program:

A. Diabetes
B. Cardiac disease
C. Epilepsy
D. Tuberculosis or other pulmonary complication
E. Severe anemia
F. Blood dyscrasias
G. Essential hypertension
H. Previous perinatal death
I. Previous caesarean
J. Grand multipara 4
K. Elderly primipara 40 years
L. Obesity 200 lbs
M. Poor obstetrical history
Conditions which require immediate obstetrical consultation during the antepartum period include:

A. Hyperemesis gravidarum
B. Multiple pregnancy
C. Vaginal bleeding
D. Sensitized Rh-negative women
E. Polyhydramnios
F. Preterm labour
G. Pregnancy-induced hypertension
H. Intra-uterine growth retardation
I. Temperature elevation over 38°C
J. Malpresentation or malposition after 36 weeks' gestation
K. Premature rupture of membranes
L. Suspected gestational diabetes
M. Fetal cardiac arrhythmias
N. Cholestasis
O. Decreased fetal movements
P. Postdatism
Q. Primigravida with unengaged head at term

The midwives may continue to give nursing support to women who develop complications during the course of pregnancy, if appropriate, even though they are no longer under their direct care.
APPENDIX B.1

Burlington Prenatal Criteria

Source: NAPS document #02421, Order from ASIS/NAPS

INDICATOR CONDITION #3 - PREGNATAL CARE IN PHYSICIAN’S OFFICE

DEFINITION OF AN EPISODE - PRENATAL CARE

Assessment of prenatal care will be of a period not less than five months of the gestation period, provided the five-month episode falls within particular definite dates that identify the interval of interest in the study.

A patient that was seen four months prior to beginning date of study could be included, and the last five months of the pregnancy assessed. A patient whose date of gestation fell four months past closing date of the study, could be assessed for the first five months. The period under study in the Burlington practices will be June 28, 1971 to June 30, 1972.

CATEGORIES OF INTERVENTION

1. Pelvic assessment - if no previous successful delivery
2. Past obstetrical history
3. Complete physical assessment - within two year period
4. At least one haemoglobin during prenatal period
5. Urinalysis on each visit
6. Frequency of subsequent visits
   Monthly or four weekly - 1st to 7th month
   two weekly - 8th month
   weekly - 9th month to term
7. Must be record of weight
8. Must be record of blood pressure
9. Must be record of Rh and S.T.S.
10. Must be statement of gestation
11. Evidence of a psycho-social interview (expressed fear or anxiety)
12. A meeting of the husband and wife together during the pregnancy
13. Pap smear
14. A two-hour P.C. sugar if there is a strong family history
    OR
    If there is glucosuria found,
    OR
    If there is a history of large babies.

SCORING

ADEQUATE

1. Pelvic assessment - if no previous successful delivery
2. Past obstetrical history
3. Complete physical assessment - within two year period
4. At least one haemoglobin during prenatal period
5. Urinalysis on each visit
6. Frequency of subsequent visits
   Monthly or four weekly - 1st to 7th month
   two weekly - 8th month
   weekly - 9th month to term
7. Must be record of weight
8. Must be record of blood pressure
9. Must be record of Rh and S.T.S.
10. Must be statement of gestation

INADEQUATE
Absence of any one of the above

SUPERIOR
Adequate - PLUS ONE OF THE FOLLOWING:

11. Evidence of a psycho-social interview (expressed fear or anxiety)
12. A meeting of the husband and wife together during the pregnancy
13. Pap smear
14. A two hour P.C. sugar if there is a strong family history
   OR
   If there is glucosuria found,
   OR
   If there is a history of large babies.

INTERMEDIATE STATE

CONDITION

A Albuminuria
B Hypertension - a diastolic over 90 or 15 mm. over the previous baseline.
C Excessive weight gain (over 5 lbs. per 4 weeks)

INTERVENTION
1. Must have further urinary investigation or an adequate explanation.
2. A statement of concurrent urinary findings.
3. Patient cautioned and/or dietary enforcement and/or more frequent visits and...
<table>
<thead>
<tr>
<th>CONDITION</th>
<th>INTERVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D 1. Hypertension and weight gain</td>
<td>4.1. Rest</td>
</tr>
<tr>
<td>D 2. Hypertension and albuminuria</td>
<td>4.2. Re-visit within 72 hours</td>
</tr>
<tr>
<td>D 3. Hypertension plus albuminuria plus weight gain</td>
<td>4.3. Salt restriction and/or diuretics</td>
</tr>
<tr>
<td>D 4. Weight gain plus albuminuria</td>
<td>4.4. Sedation (Phenobarb) - optional</td>
</tr>
<tr>
<td>D 5. Glucosuria</td>
<td>4.5. Either a blood sugar recorded or an adequate explanation for the glucosuria</td>
</tr>
<tr>
<td>E Discharge and/or pruritus - persistent or distressing</td>
<td>5. Culture and smear of the discharge</td>
</tr>
<tr>
<td>F Pyuria</td>
<td>6. Urine, culture and sensitivity</td>
</tr>
<tr>
<td>G Diagnosis of diabetes, either previously established or currently established</td>
<td>7. Consultation during pregnancy</td>
</tr>
<tr>
<td>H Possible German Measles contact</td>
<td>R. H. I. A.</td>
</tr>
<tr>
<td>I Established German Measles contact</td>
<td>9. Consultation</td>
</tr>
<tr>
<td>J Last trimester bleeding</td>
<td>10. Admission to hospital and consultation</td>
</tr>
<tr>
<td>K First trimester bleeding - not in the scope of this evaluation</td>
<td>11. Hospitalization immediately In labour within 12 hours, or Consultation</td>
</tr>
<tr>
<td>L Premature rupture of membranes</td>
<td>12. Subsequent notation re disproportion</td>
</tr>
<tr>
<td>M Inadequacy of pelvis in primipara</td>
<td>13. Subsequent laboratory follow-up, or Consultation</td>
</tr>
<tr>
<td>N Rising Rh Titre or anticipated Rh problem</td>
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**INADEQUATE**

The appropriate intervention for the specific condition was not carried out.
A. ADEQUATE

1. Pelvic Assessment, if no previously successful delivery
2. Past obstetrical history.
3. Complete physical assessment within 2 year period.
4. At least one hemoglobin during the prenatal period.
5. Urinalysis on each visit.
6. Frequency of subsequent visits:
   monthly to four week intervals from 6 weeks to 32 weeks
   two week intervals from 32 weeks to 36 weeks
   weekly intervals from 36 weeks to term
7. Must be a record of weight.
8. Must be a record of B.P.
9. Must be a record of Rh and A.R.T.
10. Must be a statement of gestation.

B. INADEQUATE

Absence of any categories above, 1-10.

C. SUPERIOR

Adequate score plus one of the following:
11. Evidence of a psychosocial interview.
12. A meeting of the husband & wife together, during the pregnancy.
13. Pap Smear.
14. A two hour p.c. sugar if there is a strong family history, or if there is glucosuria found, or if there is a history of large babies.

INTERMEDIATE CONDITIONS

(Condition & Intervention)

Albuminuria - > + 1 (30 mg.) over a period of two tests further urinary investigation or an adequate explanation

Hypertension - a diastolic over 90 or, 15mm, over previous baseline statement of concurrent urinary findings.

Excessive Weight Gain (over 2.3 kg or 5 lbs. in 4 weeks)

> 2.3 kg/4 wk. (5 lbs.) but < 3.6/8 wk. (8 lbs.) cautioned (patient and/or dietary enforcement and/or more frequent visits)

> 2.3 kg/4 wk. but not over 3 wk. cautioned (patient cautioned and/or dietary enforcement and/or more frequent visits)

> 7.2 kg/8 wk. cautioned (patient cautioned and/or dietary enforcement and/or more frequent visits)

Hypertension and weight gain
- comment to rest

Hypertension and Albuminuria
- re-visit within 72 hours

Hypertension plus Albuminuria plus weight gain
- salt restriction or other intervention

Weight gain plus Albuminuria
- rest
Glucosuria - blood sugar recorded or adequate explanation for glucosuria

Discharge and/or pruritis -- persistent and distressing
- culture and smear of discharge

Pyuria - urine culture and sensitivity

Diagnosis of Diabetes, either previously established or currently established - consultation during pregnancy

Possible Rubella Contact - R.H.I.A. Test

Established Rubella Contact - consultation

Last Trimester bleeding - admission to hospital and consultation

First Trimester bleeding - not in the scope of this study

Premature Rupture of Membranes
- present - hospitalization immediately and in labour within 12 hours

Rising Rh titre or anticipated Rh problem
- subsequent laboratory follow-up
- consultation
- Rho Gam given
ADAPTED BURLINGTON PRENATAL CRITERIA (ABPC)

A. ADEQUATE

Same as above except omit No. 1, pelvic assessment and add:

15. Evidence of a dietary interview.

16. Must be a record of fundal height measurements in centimeters after 20 weeks.

B. INADEQUATE

Same as UBPC.

C. SUPERIOR

Same as UBPC.
I am a graduate student in the Health Services Planning program in the Department of Health Care and Epidemiology in the Faculty of Medicine at U.B.C. In my thesis I am evaluating prenatal care. A standard referred to as the "Burlington Criteria" was developed ten years ago to measure the quality of prenatal care in general practice. The categories of intervention are brief and general, as they were used for measuring quality of care by reviewing patient's charts. The Burlington group decided that adequate care was provided when the patient's chart included information regarding interventions one through ten; superior care was provided when the chart also included either intervention 11, 12, 13 or 14; and inadequate care occurred when one of the first ten interventions was omitted. I would like you to briefly review these criteria and to comment on their appropriateness in general practice in 1984. Your assistance will be most helpful.

Categories of Intervention---Prenatal Care in a Family Practice Office

The following are the categories of care that the Burlington group found relevant to general practice prenatal care. Is this intervention applicable to your practice? Would you define this intervention differently? If yes, how would you describe this intervention?

1. PELVIC ASSESSMENT - if no previous successful delivery

<table>
<thead>
<tr>
<th>Is this intervention applicable to your practice?</th>
<th>Yes</th>
<th>No</th>
<th>Comments:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Would you define this intervention differently?</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>If yes, how would you define this intervention?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. PAST OBSTETRICAL HISTORY
   Is this intervention applicable to your practice? Yes ___ No ___ Comments:
   Would you define this intervention differently? Yes ___ No ___
   If yes, how would you define this intervention:

3. COMPLETE PHYSICAL ASSESSMENT - within two year period
   Is this intervention applicable to your practice? Yes ___ No ___ Comments:
   Would you define this intervention differently? Yes ___ No ___
   If yes, how would you define this intervention:

4. AT LEAST ONE HAEMOGLOBIN DURING PREGNATAL PERIOD
   Is this intervention applicable to your practice? Yes ___ No ___ Comments:
   Would you define this intervention differently? Yes ___ No ___
   If yes, how would you define this intervention:

5. URINALYSIS ON EACH VISIT
   Is this intervention applicable to your practice? Yes ___ No ___ Comments:
   Would you define this intervention differently? Yes ___ No ___
   If yes, how would you define this intervention:

6. MUST BE RECORD OF WEIGHT ON EACH VISIT
   Is this intervention applicable to your practice? Yes ___ No ___ Comments:
   Would you define this intervention differently? Yes ___ No ___
   If yes, how would you define this intervention:

7. FREQUENCY OF SUBSEQUENT VISITS - monthly or four weekly - 1st to 7th month
two weekly - 8th month weekly - 9th month to term
   Is this intervention applicable to your practice? Yes ___ No ___ Comments:
   Would you define this intervention differently? Yes ___ No ___
   If yes, how would you define this intervention:
8. MUST BE A RECORD OF BLOOD PRESSURE ON EACH VISIT

Is this intervention applicable to your practice? Yes  NO  
Comments: 

Would you define this intervention differently? Yes  No  
Comments: 

If yes, how would you define this intervention? 

9. MUST BE RECORD OF Rh AND S.T.S.

Is this intervention applicable to your practice? Yes  NO  
Comments: 

Would you define this intervention differently? Yes  No  
Comments: 

If yes, how would you define this intervention? 

10. MUST BE A STATEMENT OF GESTATION

Is this intervention applicable to your practice? Yes  NO  
Comments: 

Would you define this intervention differently? Yes  No  
Comments: 

If yes, how would you define this intervention? 

11. EVIDENCE OF A PSYCHO-SOCIAL INTERVIEW (expressed fear or anxiety)

Is this intervention applicable to your practice? Yes  NO  
Comments: 

Would you define this intervention differently? Yes  No  
Comments: 

If yes, how would you define this intervention? 


Is this intervention applicable to your practice? Yes  NO  
Comments: 

Would you define this intervention differently? Yes  No  
Comments: 

If yes, how would you define this intervention? 

13. PAP SMEAR

Is this intervention applicable to your practice? Yes  NO  
Comments: 

Would you define this intervention differently? Yes  No  
Comments: 

If yes, how would you define this intervention?
14. **A TWO-HOUR P.C. SUGAR IF THERE IS A STRONG FAMILY HISTORY OR IF THERE IS GLUCOSURIA FOUND OR IF THERE IS A HISTORY OF LARGE BABIES**

Is this intervention applicable to your practice?  Yes  No

Would you define this intervention differently?  Yes  No

If yes, how would you define this intervention?

---

In my chart evaluation I intend to abstract the information about the interventions from the provincial prenatal record form contained in the hospital records. The record will be scored as either ADEQUATE, INADEQUATE, or SUPERIOR according to the arrangement of the following categories (an adequate chart must include all of the items 1-10):

<table>
<thead>
<tr>
<th>ADEQUATE</th>
<th>INADEQUATE</th>
<th>SUPERIOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pelvic assessment-if no previous successful delivery</td>
<td>Absence of any of categories 1-10</td>
<td>Adequate score plus one of the following:</td>
</tr>
<tr>
<td>2. Past obstetrical history</td>
<td></td>
<td>11. Evidence of a psycho-social interview (expressed fear or anxiety)</td>
</tr>
<tr>
<td>3. Complete physical assessment-within a two year period</td>
<td></td>
<td>12. A meeting of the husband and the wife together during the pregnancy</td>
</tr>
<tr>
<td>4. At least one haemoglobin during prenatal period</td>
<td></td>
<td>13. Pap smear</td>
</tr>
<tr>
<td>5. Urinalysis on each visit</td>
<td></td>
<td>14. A two hour P.C. sugar if there is a strong family history or if there is glucosuria found or if there is a history of large babies</td>
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<tr>
<td>6. Frequency of subsequent visits monthly to 4 weekly - 1st to 7th mo.</td>
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<tr>
<td>7. Must be record of weight</td>
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<td></td>
</tr>
<tr>
<td>8. Must be record of blood pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Must be record of Rh and S.T.S.</td>
<td></td>
<td></td>
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<tr>
<td>10. Must be statement of gestation</td>
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</tbody>
</table>

DO you think this arrangement is appropriate for general practitioners?  yes  no

If no, WHY? WHAT WOULD YOU SUGGEST?
Two categories that I think should be added to the list of interventions are:

15. EVIDENCE OF DIETARY INTERVIEW

Is this intervention applicable to your practice? Yes  No  Comments:

Would you define this intervention differently? Yes  No

If yes, how would you define this intervention?

In which category should this intervention be considered?

Adequate  Superior  Not applicable

16. FUNDAL HEIGHT MEASURES

Is this intervention applicable to your practice? Yes  No  Comments:

Would you define this intervention differently? Yes  No

If yes, how would you define this intervention?

In which category should this intervention be considered?

Adequate  Superior  Not applicable

Are there any interventions that you could add that have not been considered? Yes  No

If Yes:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
The Burlington criteria states that under the following conditions, a specific intervention must take place in order to maintain an adequate or superior score. Is the condition and/or intervention still appropriate? If it is inappropriate, please comment at the end of the list.

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>INTERVENTION</th>
<th>APPROPRIATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Albuminuria</td>
<td>1. Must have further urinary investigation or an adequate explanation</td>
<td>Y N</td>
</tr>
<tr>
<td>B. Hypertension-diastolic over 90 or, 15 mm., over the previous baseline</td>
<td>2. A statement of concurrent urinary findings</td>
<td>Y N</td>
</tr>
<tr>
<td>C. Excessive weight gain (over 2.3 kg. (5lbs.) per 4 weeks)</td>
<td>3. Patient cautioned and/or dietary enforcement and/or more frequent visits and/or diuretics</td>
<td>Y N</td>
</tr>
<tr>
<td>D1. Hypertension and weight gain</td>
<td>4.1 Rest</td>
<td>Y N</td>
</tr>
<tr>
<td>D2. Hypertension and Albuminuria</td>
<td>4.2 Re-visit within 72 hrs</td>
<td>Y N</td>
</tr>
<tr>
<td>D3. Hypertension plus Albuminuria plus weight gain</td>
<td>4.3 Salt restriction and/or diuretics</td>
<td>Y N</td>
</tr>
<tr>
<td>D4. Weight gain plus Albuminuria</td>
<td>4.4 Sedation (Phenobarb) - optional</td>
<td>Y N</td>
</tr>
<tr>
<td>D5. Glucosuria</td>
<td>4.5 Either a blood sugar recorded or an adequate explanation for the glucosuria</td>
<td>Y N</td>
</tr>
<tr>
<td>E. Discharge and/or pruritis - persistent and distressing</td>
<td>5. Culture and smear of the discharge</td>
<td>Y N</td>
</tr>
<tr>
<td>F. Pyuria</td>
<td>6. Urine culture and sensitivity</td>
<td>Y N</td>
</tr>
<tr>
<td>G. Diagnosis of Diabetes, either previously established or currently established</td>
<td>7. Consultation during pregnancy</td>
<td>Y N</td>
</tr>
<tr>
<td>H. Possible German Measles contact</td>
<td>8. R.H.I.A</td>
<td>Y N</td>
</tr>
<tr>
<td>I. Established German Measles contact</td>
<td>9. Consultation</td>
<td>Y N</td>
</tr>
<tr>
<td>J. Last trimester bleeding</td>
<td>10. Admission to hospital and consultation</td>
<td>Y N</td>
</tr>
<tr>
<td>K. First trimester bleeding - not in the scope of this evaluation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L. Premature rupture of membranes</td>
<td>11. Hospitalization immediately, in labor within 12 hrs. or consult</td>
<td>Y N</td>
</tr>
<tr>
<td>M. Inadequacy of pelvis in primipara</td>
<td>12. Subsequent notation re disproportion</td>
<td>Y N</td>
</tr>
<tr>
<td>N. Rising Rh titre or anticipated Rh problem</td>
<td>13. Subsequent laboratory follow-up, or consultation</td>
<td>Y N</td>
</tr>
<tr>
<td>CONDITION (letters)</td>
<td>/120</td>
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<tr>
<td>+/or</td>
<td></td>
<td></td>
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<tr>
<td>INTERVENTION (numbers)</td>
<td>COMMENTS</td>
<td></td>
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</tbody>
</table>

Can you suggest any conditions or interventions that have been omitted?

THANK YOU for taking the time to review the "Burlington Prenatal Criteria". To give me an idea of who reviewed the criteria, could you please indicate whether you are a general practitioner or an obstetrician, and approximately, the number of births you attend per month. Thank you.

_____ General Practitioner
_____ Obstetrician
_____ Other: ______________________

Approximate Number of Births Attended per Month: ______________
PRENATAL RECORD

PART I

1. NAME

MOTHER'S NAME

FATHER'S NAME

TELEPHONE NUMBER

MARITAL STATUS

2. OBSTETRICAL HISTORY INCLUDING ABORTIONS

DATE

PLACE OF ABORTION

AGE OF FETUS

TYPE OF DELIVERY

COMPLICATIONS MOTHER AND/OR INFANT

SEX

WEIGHT

PREVIOUS HEALTH

3. RISK ASSESSMENT

Reproductive History

AGE

Parity

Weight

Habitual Abortion

Fetal Anomalies

Labour Premature

Labour Prolonged

Labour Precocious (<2 hours)

Difficult Delivery

Post partum Hemorrhage, Manual Removal

Preeclampsia/Hypertension

Associated Hi Risk Conditions

Associated with Maternities

Cervical Stitches, etc.

Chronic Renal Disease

Diabetes (incl. Gest.)

Cardiac Disease & Hypertension

Semen Medical, Surgical or Psychiatric Disorders

4. HISTORY OF PRESENT PREGNANCY (Specify)

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLOOD:</td>
<td>(Date)</td>
</tr>
<tr>
<td>Pyelitis:</td>
<td>(Date)</td>
</tr>
<tr>
<td>Radiation:</td>
<td>(Date)</td>
</tr>
<tr>
<td>Nausea:</td>
<td></td>
</tr>
<tr>
<td>Smoking:</td>
<td>(Date started &amp; usage)</td>
</tr>
<tr>
<td>Alcohol:</td>
<td>(Date started &amp; usage)</td>
</tr>
<tr>
<td>Occupational:</td>
<td></td>
</tr>
<tr>
<td>Nutrition:</td>
<td>(24 hour recall)</td>
</tr>
</tbody>
</table>

5. PAST ILLNESS

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renal:</td>
<td></td>
</tr>
<tr>
<td>Cardiac:</td>
<td></td>
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<tr>
<td>Infections:</td>
<td></td>
</tr>
<tr>
<td>Rubella:</td>
<td></td>
</tr>
<tr>
<td>Varicella:</td>
<td></td>
</tr>
<tr>
<td>Allergies:</td>
<td></td>
</tr>
<tr>
<td>Operations:</td>
<td></td>
</tr>
<tr>
<td>Transfusions:</td>
<td></td>
</tr>
<tr>
<td>Others:</td>
<td></td>
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</tbody>
</table>

6. FAMILY HISTORY

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
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</thead>
<tbody>
<tr>
<td>Diabetes:</td>
<td></td>
</tr>
<tr>
<td>Cardiac:</td>
<td></td>
</tr>
<tr>
<td>Hypertension:</td>
<td></td>
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<tr>
<td>Tuberculosis:</td>
<td></td>
</tr>
<tr>
<td>Twins:</td>
<td></td>
</tr>
<tr>
<td>Malformations:</td>
<td></td>
</tr>
<tr>
<td>Others:</td>
<td></td>
</tr>
</tbody>
</table>

7. MENSTRUAL HISTORY

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.M.P. (Date)</td>
<td></td>
</tr>
<tr>
<td>E.D.C.</td>
<td></td>
</tr>
<tr>
<td>IF UNSURE CONSIDER EARLY ULTRASOUND</td>
<td></td>
</tr>
</tbody>
</table>

8. METHOD OF CONTRACEPTION

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Method</td>
<td></td>
</tr>
</tbody>
</table>

9. CURRENT MEDICATIONS

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Last</td>
<td></td>
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</tbody>
</table>

10. EXAMINATION

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
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<tbody>
<tr>
<td>Date of Last</td>
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</table>

11. TOPICS FOR DISCUSSION AND ADVICE

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
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</thead>
<tbody>
<tr>
<td>Alternate Physician(s)</td>
<td></td>
</tr>
<tr>
<td>Genetic Counseling</td>
<td></td>
</tr>
<tr>
<td>Prenatal Course</td>
<td></td>
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<tr>
<td>Fetal Care</td>
<td></td>
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<tr>
<td>Nutrition</td>
<td></td>
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<tr>
<td>Supplements</td>
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<tr>
<td>Anesthesia &amp; Analg.</td>
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<tr>
<td>Obstetric &amp; Gyn.</td>
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<tr>
<td>Medications</td>
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<tr>
<td>Labour &amp; Delivery</td>
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<tr>
<td>Maternity Unit</td>
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<tr>
<td>Baby Care</td>
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<tr>
<td>Labour &amp; Delivery</td>
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<tr>
<td>Maternity Unit</td>
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<td>Baby Care</td>
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<tr>
<td>Labour &amp; Delivery</td>
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<tr>
<td>Maternity Unit</td>
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This form is part of the B.C. Prenatal Record Form. (Permission to use follows)
12. LABORATORY

Blood Group

Haemoglobin

Initial 36-38 Weeks

Rubesin

Rubella HI Titre

Hepatitis Garner?

Rh Anti-Dody T

Dates

Results

13. RISK FACTORS TO BE ANTICIPATED (PART I)

NO YES

PREGNANCY  

DELIVERY  

NEWBORN  

Risk Factors in Present Pregnancy?

- Uncontrolled Diabetes
- Multiple Pregnancy
- Pre-existing Hypertension
- Maternal Anemia
- Bleeding (3rd trimester)
- Suspected IUGR
- Preeclampsia
- Polyhydramnios
- Loss of Upper 3rd Trimester
- Sustained Uterine Activity

AGE  GRAV.  PARA.  ABORTIONS  LIVING CHILDREN  L.M.P.  E.D.C.  DATE OF QUICKENING

DATE  W.T.  B.P.  URINE  GEST. AGE IN (WEEKS)  HT. OF FUNDUS  CM  ACTIVITY  PRESENT 

RISK ASSESSMENT (Low, Med., High)  MEDICATION - REMARKS  RETURN IN

14. PHYSICIAN TO CARE FOR INFANT:

15. SPECIAL INVESTIGATIONS (ULTRA SOUND LABORATORY ETC.) OTHER COMMENTS

NOTE: SEND HOSPITAL COPIES AT 37 WEEKS

SYMPHYSIS—FUNDUS HEIGHT (cm)

Gestational Age (Weeks)

PHYSICIAN IN CHARGE OF PATIENT

PREPARED BY:

THE PERINATAL PROGRAM OF BRITISH COLUMBIA

YELLOW COPY - INFANT'S CHART

VANCOUVER, B.C.

PINK COPY - PHYSICIAN'S
### SECTION I

Please record actual numbers:

1. **AGE**
2. **PARITY**
3. **GRAVIDA**
4. **PREVIOUS PREGNANCY LOSSES**
5. **Number of weeks pregnant at first visit**
6. **Number of weeks pregnant at last visit**

### SECTION II

For the following seven items mark 1 if present, 2 if absent, & 9 if "not applicable."

- **Pelvic Assessment (or previous successful delivery)**
- **Obstetrical History**
- **Complete Physical (within two years)**
- **Haemoglobin - initial - 36-38 weeks**
- **Rh status**
- **A.R.T. status**
- **Statement of Gestation**

### SECTION III

In the following section, indicate if the weight, B.P., urine and fundus height were recorded at each prenatal visit by marking 1 if present, 2 if absent, & 9 if not applicable. Record the actual number of weeks gestation at each visit.

<table>
<thead>
<tr>
<th>WEIGHT</th>
<th>B.P.</th>
<th>URINE</th>
<th>GESTATION WEEKS</th>
<th>HEIGHT OF FUNDUS</th>
</tr>
</thead>
<tbody>
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</table>
## SECTION IV

For the following five items, mark 1 if present, 2 if absent, and 9 if not applicable:

1. (13 & 15) Evidence of a psychosocial interview
2. (13 & 15) Meeting of the husband and wife together during the pregnancy
3. (10 & 15) Pap smear or record of cytology
4. (6, 13 & 2) A two hour P.C. sugar if there is a strong family history or if there is glucosuria found or if there is a history of large babies
5. (4 & 15) Nutritional or Dietary Interview

## SECTION V

Record the following information noted in section (15) Special Investigations:

<table>
<thead>
<tr>
<th># weeks gestation</th>
<th>Test/Intervention</th>
<th>Indication</th>
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## SECTION VI

Were any of the following conditions present during the prenatal period? If they were not present indicate with a 0, if they were present see coding guide.

- Albuminuria (A)
- Hypertension (H)
- Excessive wt. gain (2.3 kg./4wks)
- H & wt. gain
- H & A
- H & A & wt. gain
- Wt. gain & A
- Glucosuria
- Discharge &/or pruritis
- Pyuria
- Diagnosis of Diabetes
- Rubella contact (possible)
- Rubella contact (established)
- Last Trimester Bleeding
- First Trimester Bleeding/ not reviewed
- Premature Rupture of Membranes
- Inadequate Pelvis/ Primipera
- Rh titre rising or anticipated Rh problem

**SCORE OF CHART USING STRICT CRITERIA**

**SCORE OF CHART USING ADAPTED CRITERIA**

**Number of weeks seen**
SECTION VII

The following information is found in the LABOUR SUMMARY AND DELIVERY RECORD

Mark the appropriate number indicate in each category:

(4) LABOUR  
1 None
2 Spontaneous
3 Induced
4 Augmented

(5) FETAL MONITORING  
1 None
2 Auscultation Only
3 External Monitor & Auscultation
4 Scalp Electrode & Auscultation
5 Internal Uterine Pressure Catheter & Auscultation
6 Both 3 & 4
7 Both 4 & 5
8 Both 3, 4 & 5

(10) DELIVERY  
1 Vaginal
2 C-section

(11) Forceps Use  
1 None
2 Low/Outlet Forceps
3 Mid Forceps or rotation forceps
4 Both 2 & 3

(13) Perineum  
1 Intact (Vaginal Birth)
2 Episiotomy
3 Laceration 1st
4 Laceration 3rd or 4th degree or 2nd degree
5 Not applicable due to C-section
CODING GUIDE

BOX

Section 1

1 2 3

Study numbers
all N.Midwife patients have a 0 in Box 1
all G.P. patients have 1 or 2 in Box 1

Box 2 and 3 indicates the N.M. patient and the GP patients that were matched to that individual. i.e. pt No. 107 and 207 are GP patients matched to N.M. pt No.007.

4 5

actual age (matched to within 5 years)
one patient is 6 years, it was the best I could match.

6

parity (actual No.) - parity matched exactly

7

gravida (actual No.) - gravida matched to same No. + up to two pregnancy losses, or two pregnancy losses.

8

previous pregnancy loss two previous pregnancy losses
or two previous pregnancy losses

9 10

actual number of weeks pregnant at first prenatal visit

11 12

actual number of weeks pregnant at last prenatal visit.
### Section II

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Code 1</th>
<th>Code 2</th>
<th>Code 3</th>
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</thead>
<tbody>
<tr>
<td>13</td>
<td>pelvic assessment</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>14</td>
<td>obstetrical history</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>15</td>
<td>complete physical</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>16</td>
<td>Initial hemoglobin</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>17</td>
<td>36-38 wk. hemoglobin</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>18</td>
<td>Rh status</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>19</td>
<td>A.R.T. status</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>20</td>
<td>Statement of gestation (EDC...)</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>
Section III

|   | weight | boxes marked as 1 if the column above contained 1's for each prenatal visit; if the item is not recorded for a visit but is present for another prenatal visit occurring within the same time period of the schedule, the box was marked 1. Box was marked 2 if the item was actually marked 2 for the minimum number of prenatal visits. (If 2 prenatal visits occurred in the first 13 weeks, their data was summarized to make one visit if data was missing.) |
|   | blood pressure | |
|   | urine | |

|   | frequency of visits | marked 1 if adequate; 2 if inadequate.  
adequate is as follows:  
up to 32 weeks | ideally wanted "4 weekly" visits but accepted 5 week intervals and one 6 or 7 week interval - any less frequent than that was inadequate |
|   | after 32 weeks up to & including 36th week | ideally wanted 2 week intervals, accepted one three week interval if it was followed by weekly visits. (eg. 32, 35, 36 etc.) |
|   | after 36 weeks to delivery | ideally wanted weekly visits, accepted one two week interval if it was from the 35th to 37th week. |

|   | fundal heights | marked 1 if adequate; 2 if inadequate  
adegurate: if fundal height was recorded for the actual minimum of prenatal visits after 20 weeks. |
Section IV

(Superior indications)

26 psychosocial interview

27 husband & wife visit

marked: 1 if present
2 if absent
9 if N/A

(only 29 received any 9's)

28 pap smear or record of cytology

29 2 hr. p.c. sugar if...

30 nutritional or dietary interview

(just adequate on adapted criteria)

Section V

mark: 0 if none
1 ultrasound for dates
2 ultrasound - other
3 amniocentesis or genetic counselling
4 fetal monitoring - non stress testing

31 common medical practices

32
Section VI

35 53

See typed guide for intermediate conditions.

Box 54

UBPC Score

1 if superior
2 if adequate
3 if inadequate

Adequate is indicated by: 1 in boxes 13, 14, 15, 16 or 17, 18, 19, 20, 21, 22, 23, and 24.

Inadequate is indicated by a 2 in any of these boxes.

Superior is indicated by an adequate score plus a 1 in box 26, 27, 28 or 29.

If an adequate or superior score is achieved but an 8 is marked in any of the boxes 35 - 53, the score becomes inadequate.

If on one prenatal visit 1 or 2 of the following items: weight 21, BP 22, urine 23, were not recorded but in all other respects the chart was Superior, the chart was rescored adequate.

Box 55

ABPC Score

1 if superior
2 if adequate
3 if inadequate

Adequate is indicated by: 1 in boxes 14, 15, 16 or 17, 18, 19, 20, 21, 22, 23, 24, 25 and 30.

Inadequate is indicated by a 2 in any of these boxes.

Superior is indicated by an adequate score plus a 1 in box 26, 27, 28 or 29.

If an adequate or superior score is achieved but an 8 is marked in any of the boxes 35 - 53, the score becomes inadequate.

If on one prenatal visit 1 or 2 of the following items: weight 21, BP 22, urine 23, were not recorded but in all other respects the chart was Superior, the chart was rescored adequate.

56 57

actual total number of weeks seen for prenatal care i.e. The range.
Section VII

Labour

1 none
2 spontaneous
3 induced
4 augmented
9 not marked

Fetal Monitoring during labour and delivery

1 none
2 auscultation only
3 ext. monitoring and auscultation
4 scalp electrode and auscultation
5 internal uterine press catheter and auscultation

Delivery

1 vaginal
2 C. Section
9 not marked

Forceps Use

1 none
2 low/outlet forceps
3 mid/rotation forceps
4 both 2 & 3
9 not marked

Perineum

1 intact (vaginal birth)
2 episiotomy
3 laceration 1st degree
4 laceration 2nd, 3rd or 4th degree
5 not applicable - C. section
6 episiotomy & laceration

Total number of inadequacies

maximum of 1 inadequacy for each prenatal visit, if pelvic assessment was absent, counted as inadequate, used strict criteria, did not count dietary review or fundal height measures.

Total number of superior indications

Total number of prenatal visits recorded
**CODING GUIDE FOR INTERMEDIATE CONDITIONS**

For the following conditions, mark 0 if they are not present, and as indicated depending upon the intervention as listed;

<table>
<thead>
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<th>Box</th>
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<tbody>
<tr>
<td>35</td>
</tr>
<tr>
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<tr>
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<tr>
<td>8</td>
</tr>
<tr>
<td>36</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>37</td>
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<tr>
<td>00</td>
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<tr>
<td>10</td>
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<td>8</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>
### Hypertension plus Albuminuria plus weight gain

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>not present</td>
</tr>
<tr>
<td>1</td>
<td>present - salt restriction</td>
</tr>
<tr>
<td>2</td>
<td>present - diuretics (omitted)</td>
</tr>
<tr>
<td>3</td>
<td>present - salt restriction and diuretics</td>
</tr>
<tr>
<td>4</td>
<td>present - other intervention</td>
</tr>
<tr>
<td>8</td>
<td>present without intervention</td>
</tr>
</tbody>
</table>

### Weight gain plus Albuminuria

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>not present</td>
</tr>
<tr>
<td>1</td>
<td>present - sedation (Phenobarb?) optional (omitted)</td>
</tr>
<tr>
<td>8</td>
<td>present without intervention</td>
</tr>
</tbody>
</table>

### Glucosuria

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>not present</td>
</tr>
<tr>
<td>1</td>
<td>present - blood sugar recorded</td>
</tr>
<tr>
<td>2</td>
<td>present - adequate explanation for glucosuria</td>
</tr>
<tr>
<td>3</td>
<td>present - both 1 &amp; 2</td>
</tr>
<tr>
<td>8</td>
<td>present - with appropriate intervention</td>
</tr>
</tbody>
</table>

### Discharge and/or pruritis -- persistent and distressing

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>not present</td>
</tr>
<tr>
<td>1</td>
<td>present - culture and smear of discharge</td>
</tr>
<tr>
<td>8</td>
<td>present - without appropriate intervention</td>
</tr>
</tbody>
</table>

### Pyuria

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>not present</td>
</tr>
<tr>
<td>1</td>
<td>present - urine culture and sensitivity</td>
</tr>
<tr>
<td>8</td>
<td>present - without appropriate intervention</td>
</tr>
</tbody>
</table>

### Diagnosis of Diabetes, either previously established or currently established

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>not present</td>
</tr>
<tr>
<td>1</td>
<td>present - consultation during pregnancy</td>
</tr>
<tr>
<td>8</td>
<td>present - without appropriate intervention</td>
</tr>
</tbody>
</table>
Possible Rubella Contact
0 not present
1 present - R.H.I.A. test
8 present - without appropriate intervention

Established Rubella Contact
0 not present
1 present - consultation
8 present - without appropriate intervention

Last trimester bleeding
0 not present
1 present - admission to hospital and consultation
8 present - without appropriate intervention

First trimester bleeding
0 not in the scope of this study

Premature Rupture of Membranes
0 not present
1 present - hospitalization immediately and in labour within 12 hours
2 present - consultation
8 present - without appropriate intervention

Inadequacy of Pelvis in primipera (omitted)
0 not present
1 present - subsequent notation re disproportion
8 present - with no comment re disproportion

Rising Rh titre or anticipated Rh problem
0 not present
1 present - subsequent laboratory follow-up
2 present - consultation
3 present - Rho Gam given
8 present - without appropriate intervention
APPENDIX F.1

Determination of Sample Size (for 90% power) in a Matched Pair Study

For a specified \( \alpha \) and \( \beta \), the number of discordant pairs required to detect an odds ratio \( \psi \) is given by:

\[
m = \left[ \frac{Z_\alpha/2 + Z_\beta \sqrt{P(1-P)}}{P - 1/2} \right]^2 / (P - 1/2)^2
\]

(Schlessman 1982:161)

where

\[
P = \frac{\psi}{1 + \psi}
\]

If \( \alpha = 0.5 \) (one-sided)

\[
\beta = 0.10
\]

\[
\psi = 2 \quad \text{and} \quad P = \frac{2}{1+2} = \frac{2}{3}
\]

then

\[
m = \left[ \frac{1.645/2 + 1.28 \sqrt{(2/3)(1/3)}}{2/3 - 1/2} \right]^2 / (2/3 - 1/2)^2
\]

\[
m = \left[ .82 + 1.28 (.47) \right]^2 / (.17)^2 = 2.02 / 0.29
\]

\[
m \approx 69.7 \approx 70 \quad \text{discordant pairs}
\]

A triple matched design increases efficiency by 4/3, (Ury 1975) thus approximately reducing the number of discordant pairs to 52.
APPENDIX F.2

Calculation of Power Estimate of Matched Study Based on m Discordant Pairs

For specified $\alpha$ and number of discordant pairs, with a specific odds ratio $\psi$, the power estimate is given by:

$$ Z = \frac{-Z_{\alpha}/2 + \sqrt{m(P - 1/2)^2 / P(1 - P)}}{\sqrt{P(1 - P)} } $$ (Schlesselman 1982:162)

If $\alpha = 0.5$ (one-sided)

$m = 36 \approx$ approximates $36 (4/3) = 48$ pairs, when triple-matched

$\psi = 2$ and $P = \psi / (1 + \psi) = 2/3$.

Then:

$$ Z = \left[ -1.645/2 + \sqrt{48(2/3 - 1/2)^2} / \sqrt{2/3(1/3)} \right] $$

$$ = \left[ -0.8225 + 6.928/6 \right] / .471 $$

$$ = .3322 / .471 $$

$$ Z \approx .705 $$

$\beta = 1 - .75$

Power $\approx 75\%$ @ $\psi = 2$. 

APPENDIX F.3

Mantel-Haenszel Estimate of the Odds Ratio

\[ \psi_{mh} = \frac{(n_1 + n_2 + 2n_3)/(2n_4 + n_5 + n_6)}{n_2 + n_3 + 2n_4/2(n_5 + n_6)} \] (Schlessman 1982:215)

For UBPC:

\[ \psi_{mh} = 8 + 13 + 2(12)/2(0) + 2 + 4 \]
\[ \psi_{mh} = 7.5 \]

Power Estimate

\[ Z_B = \left[ -\frac{Z_\alpha}{2} + \sqrt{m(P - 1/2)^2} \right] / \sqrt{P(1 - P)} \] (Schlessman 1982:162)

If: \( \alpha = 0.5 \) (one sided)

\[ m = (4/3) 39 = 52 \text{ discordant pairs} \]
\[ \psi_{mh} = 7.5 \]
\[ P = \psi / 1 + \psi = 7.5 / 8.5 = .88 \]

Then:

\[ Z_B = \left[ -1.645/2 + \sqrt{52(.88 - .5)^2} \right] / \sqrt{.88(1 - .88)} \]
\[ = [-.822 + \sqrt{52(.144)}] / \sqrt{.106} \]
\[ = -.822 + 2.740 / .325 \]
\[ = 1.918 / .325 \]
\[ Z_B = 5.9 \]
\[ \beta = 1 - .9990 \]

Power = >99% @ \( \psi_{mh} = 7.5 \)
Kappa Calculations

1. Updated Burlington Prenatal Criteria (UBPC)

<table>
<thead>
<tr>
<th></th>
<th>researcher (+)</th>
<th>researcher (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>physician (+)</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>physician (-)</td>
<td>2</td>
<td>28</td>
</tr>
</tbody>
</table>

\[
K = \frac{P_{ob} - P_{ex}}{1 - P_{ex}}
\]
\[
K = \frac{.93 - .61}{1 - .61} = \frac{.32}{.39}
\]
\[
K = .82 \text{ UBPC}
\]

2. Adapted Burlington Prenatal Criteria (ABPC)

<table>
<thead>
<tr>
<th></th>
<th>researcher (+)</th>
<th>researcher (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>physician (+)</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>physician (-)</td>
<td>1</td>
<td>28</td>
</tr>
</tbody>
</table>

\[
K = \frac{P_{ob} - P_{ex}}{1 - P_{ex}}
\]
\[
K = \frac{.95 - .60}{1 - .60} = \frac{.35}{.40}
\]
\[
K = .875 \text{ ABPC}
\]