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Pregnancy-Related Hypertension in North Dakota: Incidence, Outcomes, and Nursing Care Practices

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PREGNANCY-RELATED HYPERTENSION IN NORTH DAKOTA:
INCIDENCE, OUTCOMES, AND NURSING CARE PRACTICES

by

Karen S. Reed

Bachelor of Science in Nursing, Southwest Baptist University, 1995

A Thesis

Submitted to the Graduate Faculty

of the

University of North Dakota

in partial fulfillment of the requirements

for the degree of

Master of Science

Grand Forks, North Dakota

May

1999

This thesis, submitted by Karen S. Reed in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

Susan Heul
(Chairperson)

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This thesis meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

Dean of the Graduate School

Date

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Department Nursing

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ABSTRACT

Preeclampsia and pregnancy-induced hypertension complicate 6 to 7% of all pregnancies in the United States with the incidence varying among different regions, counties, and states. For improved perinatal outcomes in high-risk pregnancies there must be adequate care given in a timely and appropriate manner. Very little has been written on the incidence and trends in rural America and even less is known about incidence and trends in the rural Native American population. It is unknown how effective small rural hospitals are in the nursing care of the hypertensive pregnant women they encounter.

This project was an epidemiological retrospective cohort study of pregnancy-related hypertension (PRH) which also included a descriptive analysis of nursing care practices for hypertensive pregnant women in North Dakota hospitals. It encompassed all births to North Dakota residents from 1989 through 1997 who were Caucasian and Native American. The epidemiological data was extracted from the North Dakota Health Department birth records. A survey was sent to all North Dakota hospitals offering delivery services to obtain data on nursing care practices.

Of the 87,737 births analyzed, the overall incidence of PRH was 3.8%, lower than the national average. The Caucasian population with an overall incidence of 3.8% is slightly more at risk than the Native American population, with overall incidence of 3.6%. Plurality of births posed the greatest relative risk with 1995 showing a high of

3.34, with a 95% confidence interval of (2.40, 4.64). The relative risk for infants of hypertensive pregnancies to be of low birth weight ranged from 2.51 to 4.13, and prematurity of gestation was also a great risk at 3.09. Consistently throughout the nine years smoking was a protective factor against preeclampsia. The risk of having PRH and a low birth weight infant were higher in the nonsmoking groups than the smoking groups. Maternal outcomes include an increased risk of being transferred to a referral hospital and delivery by cesarean section.

The survey of nursing care practices revealed that the hypertensive pregnant woman is being effectively cared for, overall, and appropriately transferred when necessary. The greatest concerns expressed by nursing staff in caring for mothers with PRH are lack of experience and fears of inability to handle seizures and other emergency situations.

There is a great need for providing education to nurses in these small rural communities. Astute nursing surveillance is essential during the antepartum and intrapartum periods to mitigate the effects of PRH and decrease perinatal morbidity and mortality. Future studies need to focus on the paradoxical effects of smoking and pregnancy, and what makes it protective for preeclampsia. Nursing research is needed on the effectiveness of activity restriction with preeclampsia, and whether controlling the environment actually makes a difference in illness experiences and the outcomes for mothers and infants.

CHAPTER I

INTRODUCTION

“Maternal mortality is a major and universally used index to evaluate not only the quality of health care for women but also the quality of maternal health practices throughout the world” (Gold, 1994, p.214). It is a priority area for improvement of pregnancy outcome in the United States, with a goal of no more than 3.3 maternal deaths per 100,000 live births overall by the year 2000 (Koonin, MacKay, Berg, Atrash, & Smith, 1997).

Hypertensive diseases are the most common pregnancy complication in the United States and are significant contributors to perinatal morbidity and mortality. The incidence is 8 to 11% of all pregnancies with one-half to two-thirds due to gestational hypertension and preeclampsia, and the remainder from chronic hypertension (Working Group, 1990; Zuspan, 1997). In the United States, preeclampsia and eclampsia are the second leading cause of pregnancy-related deaths, and the leading cause in many developing nations (Atrash, Koonin, Lawson, Franks, & Smith, 1990). Mortality is associated with placental abruption, disseminated intravascular coagulation (DIC), cerebral hemorrhage, infection, and acute renal or cardiac failure (Cunningham et al., 1997; Roberts, 1994). The fetus is at risk for growth restriction, preterm birth, and perinatal mortality (Cunningham et al.)

Early recognition of hypertension in pregnancy and astute perinatal surveillance is essential to minimizing maternal and perinatal morbidity and mortality (Dougherty, 1992;

Roberts, 1994). To insure optimal outcomes perinatal nurses in any setting must be efficient in assessing and caring for high-risk pregnant women with hypertensive diseases (Dougherty; McGee, 1995; Krening, 1992).

Significance

Hypertensive disease is prevalent in 8 to 11% of all pregnancies and is associated with high morbidity and mortality (Zuspan, 1997). The rural population is at increased risk (Gennaro, Kowalski, Murphy, Arnold, & Kirby, 1995; Johnson, 1994) as is the Native American population (Levy, Jacober, & Sowers, 1994; Ventura, Martin, Curtin, & Matthew, 1997). It is imperative that nurse professionals possess the knowledge and skills necessary to provide safe, quality, expert nursing care. This study describes the incidence of hypertensive disease in pregnancy and evaluates and identifies gaps in effort, effectiveness, and adequacy of nursing services in North Dakota.

Purpose

The goal of this project was to describe the epidemiology of hypertensive complications of pregnancy in North Dakota as a foundation for planning and evaluating high risk obstetrical nursing services. The specific aims were to:

1. Describe the temporal and geographic incidence of pregnancy-induced hypertension (PIH) and preeclampsia in North Dakota.
2. Identify personal and health services-related risk factors for PIH and preeclampsia in North Dakota.
3. Compare outcomes in normal pregnancies with those complicated by PIH and preeclampsia.

4. Describe existing perinatal care practices for treatment of pregnancies complicated by PIH and preeclampsia in North Dakota hospitals maternity services.
5. Associate reported care practices with outcomes, using combined data sources.

CHAPTER II
REVIEW OF THE LITERATURE
Epidemiology

The Healthy People 2000 goal of no more than 3.3 maternal deaths per 100,000 live births (National Center for Health Statistics, 1993) remains unmet. From 1987 to 1990 the pregnancy-related (maternal) mortality ratio was 9.2 deaths per 100,000 live births (Koonin et al., 1997). The term maternal mortality ratio is a more accurate description of the maternal mortality index, as the “numerator includes the number of deaths, regardless of pregnancy outcome (e.g., live birth, stillbirth, ectopic pregnancy), while the denominator includes only the number of live births” (Koonin, Atrash, Rochat, & Smith, 1988, p.21). The leading causes for these deaths were hemorrhage, embolism and hypertensive diseases of pregnancy (Berg, Atrash, Koonin, & Tucker, 1996). In an epidemiological study analyzing the data from the National Hospital Discharge Survey (1979 through 1986), it was found that 26 per 1000 births were complicated by preeclampsia (Safitlas, Olson, Franks, Atrash, & Pokras, 1990).

In 1995 the rate of pregnancy-associated hypertension was 34.1 per 1000 live births overall; for whites it was 34.6 per 1000 live births and for Native Americans it was 45.9 per 1000 live births (Ventura et al., 1997). In a study of the Navajos (Levy et al., 1994), the largest Native American tribe, it was found that they “like other Native Americans appear to be in an epidemiologic transition and are accordingly experiencing

increased rates of hypertension, diabetes, and obesity” (p. 2181). They found the incidence of pregnancy-induced hypertensive disorder in the Navajo population was 10.9% compared to 3 to 6% incidence in other Americans.

Hypertension Defined

Hypertension is defined by the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy (Working Group, 1990) as a systolic blood pressure increase of 30 or greater or a diastolic increase of 15 or greater from values obtained prior to 21 weeks gestation. If prior blood pressure is unknown, 140/90 or greater after 20 weeks is considered hypertensive. Preeclampsia is defined as hypertension accompanied by proteinuria, edema, or both (O’Brien, 1992). The onset of proteinuria is associated with a steep increase in risks for mother and fetus (Sashadri & Vankataraman, 1997) and potential worsening of the disease (Goldenberg et al, 1994; Roberts, 1994). Eclampsia is preeclampsia accompanied by convulsions (Cunningham et al., 1997).

Hypertension is a physical sign of disease which may be due to a number of underlying causes (Davey & MacGillivray, 1988). Hypertensive disorders which complicate pregnancy include pregnancy-induced hypertension (PIH) (hypertension without proteinuria, preeclampsia, eclampsia); coincidental hypertension (chronic hypertension that precedes pregnancy or persists postpartum); pregnancy aggravated hypertension (underlying hypertension with super-imposed preeclampsia, eclampsia); and transient hypertension, which develops after midtrimester with mild elevation of blood pressure that doesn’t compromise the pregnancy (Cunningham et al., 1997). It is difficult

to differentiate between the causes until later in the disease process (Benedetto et al., 1996).

Pathophysiology of Preeclampsia

Over 100 tests (clinical, biophysical, and biochemical) have at some time been recommended to identify the woman at risk for preeclampsia or to predict its development, but due to lack of agreement in the serial test results none are reliable as a screening test (Witlin & Sibai, 1997). It is known that preeclampsia only occurs in pregnancy and requires a placenta for its initiation. It can occur in abdominal pregnancies, indicating uterine distention is not required, yet large uterine mass such as in molar pregnancy and multiple gestations greatly increases the risk (Kulb, 1993). It can occur without a fetus, as in molar pregnancy (Vasilev & Morrow, 1991).

The pathology of preeclampsia is initiated by an abnormal implantation of the placenta, resulting in shallow, endovascular cytotrophoblast invasion of the spiral arteries (Dekker, Robillard, & Hulsey, 1998; Ness & Roberts, 1996; Ros, Cnattingius, & Lipworth, 1998; Sibai, 1996; Zamorski & Green, 1996). This invasion process normally converts small, narrow arteries into widened uteroplacental arteries to accommodate a generous blood supply emptying into the intervillous spaces of the placenta. These small arteries lead to arterial vasoconstriction at the uteroplacental site in preeclampsia (Krening, 1992), and decreased uteroplacental blood flow.

Homeostasis in the pregnant woman is maintained by vasopressor (vasoconstriction) and vasodilator (vasodilation) tendencies which result in normal blood pressures. With preeclampsia, hypertension is caused by vasospasm and

vasoconstriction. There is an imbalance in prostacyclin (a potent vasodilator which inhibits platelet aggregation and resists circulating vasoconstrictors) and thromboxane (a potent vasodilator produced by platelets which stimulates platelet aggregation). There is a deficiency of certain protective substances found in the prostaglandins predisposing them to increased angiotensin II sensitivity, which leads to increased vascular tone and hypertension (Roberts & Redman, 1993; Sibai, 1996). The red blood cells become damaged as they pass through constricted blood vessels resulting in the presence of abnormally shaped Burr cells and schistocytes on blood smears (Krening, 1992). The presenting signs and symptoms of preeclampsia are a result of the arterial vasoconstriction and vasospasm of the kidney, cerebrum, liver, and uteroplacental unit (Martin & Pearce, 1996).

Endothelial cell damage plays a major role in the pathophysiology (Ness & Roberts, 1996; Roberts & Redman, 1993). As the vasospasm worsens there is capillary damage, resulting in increased capillary permeability. Circulating factors produced by the abnormal placental perfusion alter endothelial cell function. Serum from preeclamptic women is cytotoxic to endothelial cells in vitro (Sibai, 1996). Due to this endothelial cell injury, fluid shifts from intravascular to extravascular space resulting in generalized edema; vascular volume depletion, leading to hemoconcentration (elevated hematocrit); increased interstitial fluid in the lungs leading to pulmonary edema; and cerebral edema causing headache, visual disturbance, and hyperreflexia. The injured epithelium also activates the coagulation cascade and fibrin is deposited at the injured sites leading to thrombocytopenia, increased fibrin split products, and DIC (Roberts, 1994; Sibai).

Proteinuria, a late sign of preeclampsia, is caused by destruction of protein-sparing reticulum in the kidney, and indicates the presence of renal vasospasm which will eventually result in hypoperfusion (oliguria) and renal cellular damage (Poole, 1997; Roberts & Redman; Rubin & Farber, 1994).

Risk Factors

Preeclampsia is immunologically mediated by exposure to paternal antigens, as is evidenced by the majority of cases occurring in nulliparous women (Sibai et al., 1995), and the risk increasing with new paternity (Dekkar, Robillard, & Hulse, 1998; Smith, Walker, Tessier, & Millar, 1997; Trupin, Simon, & Eskenazie, 1996). It has also been found that risk is decreased with increased duration of sexual activity antedating the pregnancy (Dekkar, Robillard, & Hulse; Ness & Roberts, 1996; Smith et al.; Taylor, 1997). Teens under 15 are at 2.8 times greater risk than older women up to 35 years of age. As age increases in nulliparous women from 35 to 39 the frequency increases from 8% to 9%, but with increasing age of multiparous women the frequency of preeclampsia is tripled from 2% to 6% (Brobowsky & Bottoms, 1995).

Preexisting medical/physical conditions also increase the risk for preeclampsia. They include chronic hypertension, hypertension, preeclampsia, and eclampsia in a previous pregnancy; family history of preeclampsia, eclampsia (Ness & Roberts, 1996; O'Brien, 1992); relative prepregnancy obesity (increase in risk occurs at 20% above desirable weight) (Mittendorf, Lain, Williams, & Walker, 1996; Sibai et al., 1995; Stone et al., 1994); insulin-dependent diabetes (Zamorski & Green, 1996); and systemic lupus.

Smoking history also plays a part in preeclampsia. The incidence is 5.9% higher among those who never smoked; lowest among those who quit smoking at onset of pregnancy; and women who smoke and develop preeclampsia have the highest rates of perinatal mortality and lower birth weights (Cnattingius, Mills, Yuen, Eriksson, & Ros, 1997; Sibai et al., 1995)

Hypertension as Risk Factor for Poor Perinatal Outcomes

Risk assessment is a vital part of obstetrical care. In theory, it should identify the population at high risk for complications of pregnancy. Maternal health outcomes include mortality and morbid conditions. Perinatal outcomes include low birth weight, morbidity, and mortality (McCarthy & Berg, 1994). Birth weight is a good outcome variable as it provides a summation of maternal health as well as the most predictive factor for newborn survival (Goldenberg & Bronstein, 1994). Hypertension of all types is one medical factor most strongly associated with intrauterine growth restriction (IUGR). The relative risk for IUGR among women with preexisting high systolic blood pressure ranges from 1.9 to 4.2. The relative risk for IUGR among women with preeclampsia ranges from 6.2 to 40.4 (Institute of Medicine, 1985).

Perinatal Services and Pregnancy Outcomes

The early detection of an elevated blood pressure is considered crucial in preventing maternal and perinatal morbidity and mortality (Roberts, 1994). When the underlying disease is expressed as an elevated blood pressure, there is already vascular damage, decreased perfusion in the placenta and great potential for maternal-fetal compromise. In a longitudinal study on blood pressure patterns in normal pregnancy,

PIH, preeclampsia and chronic hypertension (Benedetto et al., 1996), it was found that pathophysiological changes are different depending on the type of blood pressure increase. If blood pressure increase is constant, there is vessel damage in the kidneys with long-term maternal complications, and there is risk of fetal growth restriction in the uteroplacental unit. If the blood pressure increase is acute and severe, the complications are acute and severe: abruption, cerebral hemorrhage, cardiovascular failure, and pulmonary edema. The elevated blood pressure identifies the woman who needs careful surveillance (Atterbury, Broome, & Baker, 1996; Roberts).

A fundamental fact in obstetrics today is that for improved perinatal outcomes for high-risk pregnancies there must be adequate prenatal care, and it must be obtained in a timely and appropriate manner (Hangsleben, Jones, Lia-Hoagberg, Skovolt, & Wingeier, 1995; Nesbitt, Connell, Hart, & Rosenblatt, 1990). “High-quality prenatal-care services can prevent or identify problems and complications that arise during pregnancy, labor and delivery, and the postpartum period” (Koonin et al., 1997, p. 32). From 1987 to 1990, of the women who died from pregnancy-related causes after delivering a live-born infant, the greatest proportion had received no prenatal care (Koonin et al.).

“The primary barriers to improving maternal-child health in rural America are associated with high poverty rates, lack of health care coverage, health care provider shortages, and transportation problems. These factors have a direct relationship to access of care” (Johnson, 1994, p.171). With the large number of hospital closures increasing the distance between health care facilities, rural areas have reduced access to basic care for low-risk, uncomplicated births (Johnson). “Women at greatest risk for receiving

inadequate prenatal care include members of ethnic minorities, teenagers, single women, multiparas, poor women, those who lack a high school education, and those who live in inner cities or isolated rural communities” (Gennaro, Kowalski, Murphy, Arnold, & Kirby, 1995, p. 597).

“Clinical expertise is an essential attribute of nursing and a significant component in the delivery of excellent prenatal care” (McGee, 1995, p. 605). When women present to the hospital experiencing symptoms of preeclampsia, or in a hypertensive crisis, astute nursing care is essential. Since preeclampsia is a multisystem disease, “it is imperative that perinatal nurses understand the related pathophysiology and patient care principles” (Surratt, 1993, p. 500). Initial and ongoing assessments require the skills of an experienced and competent nurse; one who remains calm and provides reassurance and emotional support while making rapid and accurate assessments and initiating an immediate plan of care (Dougherty, 1992; Krening, 1992). “Fear can dramatically increase blood pressure, and the nurse’s ability to remain calm and provide reassurance to the patient in hypertensive crisis is imperative” (Krening, p. 418).

Perinatal nurses in any environment must possess certain attributes and skills to be effective in working with preeclamptic patients including the ability to be perceptive, to work as a team in difficult situations, to discern between essentials and non-essentials, to express concerns clearly and assertively, to be able to make rapid decisions, and still be calm and provide emotional support for these patients (Dougherty; Krening). These skills are learned over time and with much experience.

Gap

Since the underlying disease process of preeclampsia is often unrecognized until late in the pregnancy, the woman at risk must be identified preconceptually or early prenatally and monitored closely throughout the pregnancy to decrease the morbidity and mortality associated with hypertensive disease. There is no question that hypertensive diseases continue to persist, but little is known of the incidence and trends in rural America, and even less is written on the incidence and trends in the Native American population. It is unknown how effective small rural hospitals are in their nursing care of the hypertensive pregnant women they encounter.

Research Questions

1. What is the temporal and geographic incidence of PIH and preeclampsia in North Dakota?
2. Are there personal and health services-related risk factors for PIH and preeclampsia in North Dakota?
3. How do the outcomes in normal pregnancies compare with the outcomes in pregnancies complicated by PIH and preeclampsia?
4. What are the perinatal care practices for treating pregnancies complicated by PIH and preeclampsia in North Dakota hospitals maternity services?
5. Are reported care practices associated with maternal and fetal outcomes in PIH-complicated pregnancies?

CHAPTER III

METHOD

Purpose of the Study

The goal of this project was to describe the epidemiology of hypertensive complications of pregnancy in North Dakota as a foundation for planning/evaluating high risk obstetrical nursing services. The specific aims were to:

1. Describe the temporal and geographic incidence of PIH and preeclampsia in North Dakota.
2. Identify personal and health services-related risk factors for PIH and preeclampsia in North Dakota.
3. Compare outcomes in normal pregnancies with those complicated by PIH and preeclampsia.
4. Describe existing perinatal nursing care practices for treatment of pregnancies complicated by PIH and preeclampsia in North Dakota hospitals maternity services.
5. Associate reported care practices with outcomes, using combined data sources.

Population

All birth records from 1989 through 1997 from the North Dakota Department of Health were used in this study to extract the epidemiological data. All of the hospitals in North Dakota which offer delivery services were sent surveys to evaluate perinatal care practices for hypertensive pregnant women.

Samples

Two samples were used. Information about pregnancy outcomes was extracted from birth certificate records obtained from the North Dakota Department of Health and included all pregnancies from 1989 through 1997 which had the medical risk factors of hypertension, pregnancy-associated, and preeclampsia.

Hospitals with active maternity services provided data about nursing care practices for hypertensive pregnancies. All hospitals in North Dakota were given the opportunity to participate.

Procedure

This study involved the use of vital records data from the North Dakota Health Department. Birth certificates with identifiers removed were provided by the North Dakota Department of Health. A survey was sent to all North Dakota hospitals offering delivery services to obtain data on nursing care practices for hypertensive pregnant women. Supervisors or designated hospital personnel provided this information. The surveys were usually returned by post-paid mail. Nonrespondents were contacted by phone and asked if they preferred to answer questions verbally or if they needed another copy of the survey.

Research Design

This project was an epidemiological retrospective cohort study which also included a descriptive analysis (Jekel, Elmore, & Katz, 1996). The birth record data from the Department of Health was a summary of prospectively collected perinatal and intrapartum information which was evaluated retrospectively for this study. The survey

of the North Dakota hospitals offering delivery services and caring for hypertensive complications of pregnancy was analyzed descriptively.

Protection of Human Subjects

This proposal was presented to the Institutional Review Board of the University of North Dakota and permission was granted to do the study. The use of vital records presented minimal risk; identifiers were removed prior to release of the information by the North Dakota Department of Health. With the surveys, respondents may have been embarrassed or anxious if, when responding, they perceived that their services were less than optimal. However, questions were asked in a nonjudgmental fashion and were similar to those routinely considered as part of hospital quality control. Also, to minimize this risk, the name and position of the respondent, and the hospital name and address was on a sheet separate from the survey, which could have been excluded when sending the survey if the respondent had desired.

Variables and Measurement

Pregnancy-Related Hypertension (PRH)

Pregnancy-related hypertension includes hypertension complicating pregnancy, childbirth, and the puerperium (ICD - 9 code 642; D.H.H.S., 1989); and mild or severe preeclampsia (ICD - 9 codes 642.4 and 642.5). Hypertension complicating pregnancy, also referred to as PIH or gestational hypertension, is hypertension after 20 weeks gestation in a previously normotensive woman. Preeclampsia is hypertension after 20 weeks gestation with edema and proteinuria (Cunningham et al., 1997; Witlin & Sibai,

1997). These are listed on the North Dakota birth certificates as hypertension, pregnancy associated, and preeclampsia, both under medical risk factors.

Personal Risk Factors

Personal risk factors are data listed on the North Dakota birth certificate including race (Caucasian and Native American); young age (18 or younger); older age (35 or greater); plurality of gestation (twins and multiples); smoking; and alcohol use.

Health-Services Related Risk Factors

Health-service related risk factors include not having any prenatal care or having late care as defined on the North Dakota birth certificate by the week of gestation when prenatal care was initiated and the number of visits.

Maternal Outcomes of Pregnancy Complicated by Hypertensive Disease

Maternal outcomes of pregnancy complicated by hypertensive disease are defined on the North Dakota birth certificate as maternal transfer to a referral center; the type of delivery (cesarean section or vaginal); and maternal weight gain (defined by less than 20 pound weight gain).

Infant Outcomes of Pregnancy Complicated by Hypertension

Infant outcomes of pregnancy complicated by hypertension include prematurity (gestation of 36 weeks or less by exam); low birth weight (2500 grams or less); infant being transferred to referral center; and presence of anomalies, as listed on the North Dakota birth certificates.

Nursing Care Interventions

Nursing care interventions are activities nurses do to assist the hypertensive pregnant woman in moving toward the desired outcome of delivering a healthy baby without worsening of her disease process (Bulechek & McCloskey, 1992) . This study includes the diagnostic and interventional protocols listed in Table 1. This will be measured by the “Pregnancy-Related Hypertension: Hospital Nursing Care Practices” survey.

Data Analysis

Standard epidemiologic measures were used to analyze the data (Jekel, Elmore, & Katz, 1996). Incidence (Aim 1) was computed as the number of PRH cases divided by number of births. Risk ratios (Aims 2 & 3) were computed as the ratio of incidence in those exposed to the risk factor to incidence in mothers not exposed. Frequencies were used to tabulate survey responses describing perinatal nursing care practices (Aim 4). Crosstabulations and correlations were used to study the association between nursing care practices and outcomes (Aim 5).

Table 1

Nursing Care Protocols for Hypertension of Pregnancy

<u>Antepartum & Intrapartum</u>	
Environment	<ul style="list-style-type: none"> Quiet with dim lighting Limited visitors Bedrest on left side
Nursing Assessments	<ul style="list-style-type: none"> (As condition warrants) Vital signs, lung sounds, deep tendon reflexes <ul style="list-style-type: none"> Every 2-4 hours or more frequent Maternal/fetal monitor <ul style="list-style-type: none"> with vital signs or continuous Intake/output – hourly or every 4 hours Urine protein – hourly or every 4 hours Daily weight
Treatment	<ul style="list-style-type: none"> Magnesium sulfate prescribed Infusion pump Continuous pulse oximetry (First 24 to 48 hours or until stable)
<u>Postpartum</u>	
Environment	<ul style="list-style-type: none"> Bedrest / limited activity Baby to mom intermittently (promote bonding)
Nursing Assessments	<ul style="list-style-type: none"> (every 4 hours or more frequently) Vital signs, lung sounds, deep tendon reflexes
Anticipatory Guidance	<ul style="list-style-type: none"> Educate on signs of worsening disease process Discuss lingering symptoms Teach newborn cares

Note. (Burke & Poole, 1996; Olds, London, & Ladewig, 1996; Sinclair, 1996)

CHAPTER IV

RESULTS

The results section is in three parts. The first part describes the epidemiology of PRH in North Dakota. This includes defining the population, describing the temporal and geographic incidence, addressing maternal risk factors, and evaluating maternal and fetal outcomes. The second part describes nursing care practices in North Dakota. This is based on the results of the survey sent to all hospitals with obstetrical services. The third part describes the association between nursing care practices and patient outcomes. This was accomplished through analysis of the combined data from the Department of Health and the nursing care practices survey.

Epidemiology of Pregnancy-Related Hypertension in North Dakota

Data Sources

The North Dakota Department of Health sent the birth certificate information electronically in compressed files. They were unzipped and a code book was used to organize and set up the syntax to put it into the SPSS computer program.

Aim 1: Incidence of Pregnancy-Related Hypertension in North Dakota

Time Table 2 lists the number of births, the number of cases of PRH, and the incidence for years 1989 through 1997. There was a decline in number of births to Caucasian and Native American mothers, with 10,707 in 1989 and 9,180 in 1997, with a

Table 2
Incidence of Pregnancy-Related Hypertension (PRH), 1989-1997

<u>Year</u>	<u>Births</u>	<u>PRH</u>	<u>Incidence</u>
1989	10,707	422	3.9%
1990	10,327	377	3.7%
1991	9,973	309	3.1%
1992	9,921	386	3.9%
1993	9,545	346	3.6%
1994	9,422	347	3.7%
1995	9,362	395	4.2%
1996	9,300	394	4.2%
1997	9,180	351	3.8%
Overall	87,737	3,327	3.8%

Note. Births are to Caucasian or Native American mothers who are North Dakota residents.
 PRH includes PIH and preeclampsia.

9-year total of 87,737 births. The incidence of pregnancy-related hypertension fluctuated from a low of 3.1% (1991) to a high of 4.2% (1995 and 1996).

Place North Dakota was divided into four geographical sections, each with a referral center as shown in Figure 1. The incidence of PRH at referral and outlying centers in each geographic section for each year is shown in Table 3. The northwest (4.4 cases per 100 live births) and southeast (4.5 cases per 100 live births) sections showed the greatest incidence and the northeast (2.5 cases per 100 live births) was the lowest.

Aim 2: Risk of Pregnancy-Related Hypertension in North Dakota

Maternal personal characteristics Table 4 shows the relative risk (RR) of preeclampsia with 95% confidence intervals (CI) for the personal risk factors of race, being of young age (18 or younger), of older age (35 or greater), gestational plurality, smoking, and use of alcohol. In this analysis, plurality of births posed the greatest risk for PRH with the highest RR being 3.34 (1995). Being 18 years of age was a slightly greater risk than being 35 or greater. The findings indicate that the Caucasian population in North Dakota was more at risk for PRH than the Native American (Table 5). Smoking was protective against pregnancy-related hypertension and alcoholism was not a significant risk factor.

Table 6 shows the incidence of PRH, the incidence of low birth weight (LBW), and the risk for LBW associated with PRH for Caucasian and Native American smoking and nonsmoking mothers. The incidence of PRH overall was higher in nonsmokers than in smokers. Among smokers, incidence of PRH was higher in Caucasians than in Native

Figure 1
North Dakota According to Regions

<u>Region</u>	<u>Number of Responding Hospitals</u>
Northwest	7
Southwest	4
Northeast	8
Southeast	2

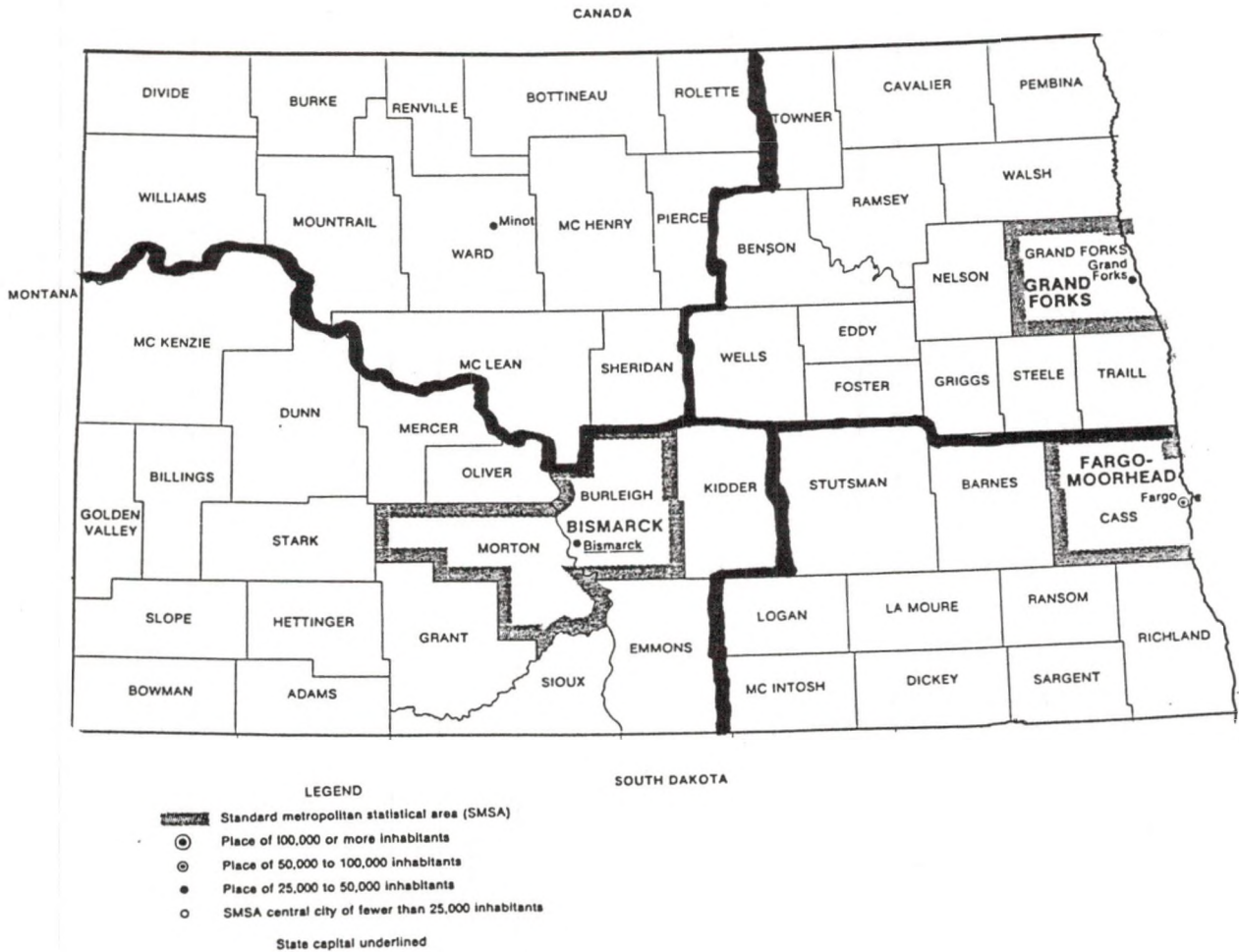


Table 3
Incidence of PRH in 4 North Dakota Regions, 1989 - 1990

<u>Region</u>	<u>Year</u>									<u>Overall</u>
	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	
Northwest	3.9	4.4	3.6	5.3	3.9	5.0	5.1	4.9	3.8	4.4
Southwest	3.4	3.7	2.6	3.9	3.0	3.7	4.2	3.7	3.1	3.5
Northeast	4.2	2.7	2.2	2.3	2.9	2.8	2.1	1.9	1.3	2.5
Southeast	4.1	3.7	3.9	4.1	4.2	3.4	5.2	5.6	5.9	4.5

Note. Entries are number of cases per 100 live births.

Table 4
Personal Risk Factors for PRH, 1989 - 1997

Maternal Characteristics												
Year	Race		Young		Old		Plural		Smoke		Alcohol	
	RR	CI	RR	CI	RR	CI	RR	CI	RR	CI	RR	CI
1989	1.13	(.81, 1.58)	.87	(.44, 1.74)	1.08	(.77, 1.51)	2.55	(1.71, 3.80)	.67	(.52, .87)	.81	(.50, 1.30)
1990	1.07	(.76, 1.50)	1.92	(1.18, 3.11)	1.26	(.89, 1.77)	2.16	(1.41, 3.29)	.77	(.59, .99)	.88	(.50, 1.55)
1991	1.38	(.91, 2.06)	1.51	(.88, 2.60)	1.06	(.72, 1.56)	2.42	(1.51, 3.88)	.76	(.58, 1.01)	.90	(.45, 1.80)
1992	.82	(.62, 1.09)	1.72	(1.12, 2.66)	1.20	(.88, 1.65)	2.91	(2.02, 4.18)	.72	(.55, .94)	.95	(.50, 1.82)
1993	1.14	(.78, 1.66)	1.26	(.74, 2.17)	1.52	(1.12, 2.05)	.92	(.46, 1.83)	.70	(.52, .94)	.15	(.02, 1.09)
1994	.85	(.61, 1.20)	1.46	(.88, 2.41)	1.04	(.74, 1.47)	1.05	(.57, 1.95)	.55	(.40, .76)	.35	(.09, 1.39)
1995	.95	(.67, 1.34)	.98	(.57, 1.69)	1.24	(.93, 1.65)	3.34	(2.40, 4.64)	.67	(.50, .90)	.17	(.02, 1.20)
1996	.86	(.63, 1.67)	1.00	(.57, 1.75)	1.04	(.77, 1.40)	1.57	(1.01, 2.42)	.57	(.42, .78)	.17	(.03, 1.23)
1997	2.07	(1.28, 3.36)	.90	(.47, 1.73)	1.22	(.91, 1.65)	1.81	(1.19, 2.74)	.83	(.63, 1.09)	.27	(.04, 1.88)

Note. Race of mother indexes risk associated with Caucasian.
 Risk ratios significantly different from 1.0 ($p < .05$) are entered in bold.

Table 5
Incidence Rate of PRH According to Race, 1989 - 1997

<u>Year</u>	<u>Caucasian</u>	<u>Native American</u>
1989	4.0%	3.5%
1990	3.7%	3.4%
1991	3.2%	2.3%
1992	3.8%	4.6%
1993	3.7%	3.2%
1994	3.6%	4.3%
1995	4.2%	4.4%
1996	4.2%	4.9%
1997	4.0%	1.9%
Overall	3.8%	3.6%

Table 6
Race, Pregnancy-Related Hypertension, Smoking and Low Birth Weight

Caucasian									
		<u>Smokers</u>			<u>Nonsmokers</u>				
<u>Year</u>	<u>n</u>	<u>PRH</u>	<u>LBW</u>	<u>PRH & LBW</u>	<u>n</u>	<u>PRH</u>	<u>LBW</u>	<u>PRH & LBW</u>	<u>RR</u>
		<u>Inc</u>	<u>Inc</u>	<u>RR</u>		<u>Inc</u>	<u>Inc</u>		
1989	1900	2.9%	9.9%	1.88	7999	4.2%	4.3%	3.04	
1990	1872	3.2%	9.1%	1.32	7696	3.8%	4.9%	3.72	
1991	1795	2.6%	7.7%	1.97	7354	3.6%	4.6%	4.31	
1992	1638	2.9%	8.4%	2.08	7468	4.0%	5.1%	4.01	
1993	1553	2.9%	9.5%	.93	7410	3.8%	5.0%	3.53	
1994	1507	2.0%	8.8%	2.74	7368	3.9%	4.6%	3.81	
1995	1393	2.8%	8.5%	2.87	7462	4.5%	5.0%	4.65	
1996	1373	2.5%	10.3%	1.41	7275	4.5%	5.3%	4.17	
1997	1467	4.0%	10.2%	1.92	7072	4.3%	5.8%	2.62	
Overall	14498	2.9%	9.1%		67104	4.1%	5.0%		

Table 6, cont.

Native American

<u>Year</u>	<u>n</u>	<u>Smokers</u>			<u>n</u>	<u>Nonsmokers</u>		
		<u>PRH</u> <u>Inc</u>	<u>LBW</u> <u>Inc</u>	<u>PRH &</u> <u>LBW</u> <u>RR</u>		<u>PRH</u> <u>Inc</u>	<u>LBW</u> <u>Inc</u>	<u>PRH &</u> <u>LBW</u> <u>RR</u>
1989	505	3.0%	11.0%	3.92	543	4.4%	5.9%	1.44
1990	498	2.0%	6.6%	1.53	530	4.9%	5.8%	1.34
1991	506	2.4%	9.7%	1.75	577	2.3%	5.0%	3.21
1992	488	3.5%	7.0%	1.73	622	5.3%	6.3%	6.16
1993	367	1.9%	5.4%	--	512	4.3%	4.5%	3.34
1994	350	2.9%	9.4%	2.19	484	5.2%	9.3%	1.79
1995	308	3.9%	7.5%	1.12	465	4.7%	5.6%	6.04
1996	337	2.7%	8.3%	1.35	528	6.3%	3.4%	3.00
1997	377	1.1%	8.8%	2.91	508	2.6%	5.7%	4.39
Overall	3736	2.6%	8.3%		4769	4.4%	5.7%	

Note. No risk ratio was computed for 1993 for Native American smokers because there were no cases of PRH and LBW

Americans. Among nonsmokers, incidence of PRH was lower in Caucasians than in Native Americans. In contrast, incidence of LBW was higher in smokers than nonsmokers. Among nonsmokers, the incidence of LBW was lower in Caucasians than Native Americans, and in the general population PRH is regarded as an important risk factor for LBW. The data in Table 6 suggest a more complicated relationship. Among Caucasian nonsmokers and Native American nonsmokers to a lesser extent, risk of LBW is clearly elevated in the presence of PRH. Among smokers of either race, the association is equivocal.

Health services utilization Health service utilization was indexed by looking at the month prenatal care was initiated and the number of prenatal clinic visits recorded on the North Dakota birth certificates. Risk of late prenatal care (initiated after the first trimester of pregnancy) and unusual care (few visits less than 8 or too frequent of visits greater than 12) and PRH is shown in Table 7. Late prenatal care did not seem to pose a risk, nor did too few or too frequent visits.

Aim 3: Outcomes of Pregnancy-Related Hypertension

Infants Infant outcomes of PRH for 1989 - 1997 were indexed (Table 8) by low birth weight (2500 grams or less); prematurity by exam after birth (36 weeks gestation or less); presence of anomalies; and infant being transferred to a referral center. PRH was a consistent and important risk factor for low birth weight, with a RR ranging from 2.51 in 1997 to 4.13 in 1995. Accordingly, 1995 also showed the highest RR for prematurity of gestation, at 3.09. There did not appear to be a significant risk for anomalies associated

Table 7
Prenatal Care Visits and Incidence of PRH

<u>Year</u>	<u>Late Prenatal Care</u>		<u>Unusual Care</u>	
	<u>RR</u>	<u>CI</u>	<u>RR</u>	<u>CI</u>
1989	.79	(.62, 1.00)	1.29	(1.07, 1.54)
1990	.95	(.74, 1.23)	1.34	(1.11, 1.63)
1991	.80	(.60, 1.07)	1.24	(1.01, 1.52)
1992	.92	(.71, 1.18)	1.25	(1.03, 1.51)
1993	1.09	(.85, 1.40)	1.07	(.88, 1.31)
1994	.94	(.72, 1.23)	1.34	(1.10, 1.64)
1995	.84	(.64, 1.09)	1.39	(1.15, 1.67)
1996	1.06	(.83, 1.36)	1.33	(1.10, 1.61)
1997	.77	(.57, 1.03)	1.46	(1.20, 1.77)

Note. Unusual care includes few visits (less than 8) or many visits (more than 12).

Table 8
Infant Outcomes of PRH, 1989 - 1997

<u>Year</u>	<u>Low Birth Weight</u>		<u>Premature</u>		<u>Anomalies</u>		<u>Transferred</u>	
	<u>RR</u>	<u>CI</u>	<u>RR</u>	<u>CI</u>	<u>RR</u>	<u>CI</u>	<u>RR</u>	<u>CI</u>
1989	2.57	(2.00, 3.31)	2.13	(1.64, 2.75)	1.00	(.99, 1.01)	1.13	(.53, 2.40)
1990	2.72	(2.11, 3.51)	2.38	(1.87, 3.02)	1.00	(1.00, 1.01)	1.96	(1.01, 3.83)
1991	3.56	(2.77, 4.58)	2.69	(2.10, 3.45)	1.00	(1.00, 1.01)	2.25	(1.11, 4.58)
1992	3.67	(2.94, 4.58)	2.80	(2.29, 3.43)	1.00	(.99, 1.01)	1.41	(.66, 2.99)
1993	2.91	(2.25, 3.78)	2.76	(2.19, 3.47)	1.00	(.99, 1.01)	1.34	(.55, 3.28)
1994	3.29	(2.57, 4.22)	2.82	(2.27, 3.51)	1.00	(.99, 1.01)	3.45	(2.00, 5.97)
1995	4.13	(3.33, 5.12)	3.09	(2.55, 3.74)	1.00	(.99, 1.00)	2.22	(1.13, 4.37)
1996	3.30	(2.63, 4.13)	3.10	(2.57, 3.73)	1.00	(.99, 1.00)	1.36	(.56, 3.34)
1997	2.51	(1.94, 3.24)	2.51	(2.03, 3.10)	1.00	(1.00, 1.00)	1.20	(.38, 3.80)

Note. Risk ratios significantly different from 1.00 ($p < .05$) are entered in bold.

with PRH. Relative risk of having transferred the infant to a referral center varied over the 9 year period from 1.13 to 3.45.

Maternal outcomes Maternal outcomes for 1989 - 1997 were measured by the type of delivery (cesarean or vaginal); being transferred to a referral center before delivering; and weight gain during pregnancy (with less than 20 pound being below recommended). Table 9 displays these outcomes. Mothers with PIH and preeclampsia were at great risk for being transferred to a referral hospital in North Dakota, with the RR as high as 3.74 (2.51, 5.56). They were at great risk for a cesarean delivery. PRH was not associated with low weight gain during pregnancy.

Nursing Care Practices

Data Management

The "Pregnancy-Related Hypertension: Hospital Nursing Care Practices" survey was sent to all North Dakota hospitals offering delivery services to obtain information on 1998 care practices for hypertensive pregnancies. When the surveys were returned the information was coded and entered into the SPSS computer program. It was then analyzed and put into frequencies and percentage tables.

Survey Responses

Surveys were sent to 49 North Dakota hospitals, 14 of which responded by letter or follow-up phone calls stating they no longer provide obstetrical services and did not have any deliveries in 1998. Of the remaining 35 hospitals, 14 hospitals (40%) did not return the surveys, even after follow-up phone calls. Of the 21 hospitals that returned the survey, 6 (29%) immediately transfer hypertensive pregnant women to a referral hospital.

Table 9
Maternal Outcomes of PRH, 1989 - 1997

<u>Year</u>	<u>Outcomes</u>					
	<u>Delivery Type</u>		<u>Transfer</u>		<u>Weight Gain</u>	
	<u>RR</u>	<u>CI</u>	<u>RR</u>	<u>CI</u>	<u>RR</u>	<u>CI</u>
1989	2.06	(1.81, 2.34)	1.88	(1.19, 2.96)	1.04	(.82, 1.31)
1990	2.11	(1.85, 2.40)	2.35	(1.58, 3.49)	.85	(.65, 1.12)
1991	2.03	(1.75, 2.35)	2.15	(1.29, 3.59)	.83	(.61, 1.13)
1992	2.07	(1.81, 2.37)	3.12	(2.19, 4.45)	.89	(.68, 1.15)
1993	2.01	(1.74, 2.32)	3.24	(2.15, 4.88)	1.06	(.83, 1.35)
1994	1.83	(1.58, 2.13)	3.74	(2.51, 5.56)	.73	(.54, .98)
1995	1.80	(1.55, 2.08)	3.58	(2.42, 5.31)	.74	(.57, .97)
1996	1.95	(1.70, 2.25)	3.56	(2.32, 5.46)	.82	(.64, 1.05)
1997	1.65	(1.34, 2.03)	1.85	(1.04, 3.30)	.97	(.76, 1.06)

Note. Significant findings ($p < .05$) are entered in bold.

The nursing care practices analyzed in this study are from the remaining 15 hospitals that completed the survey, and are representative of all geographical areas in the state of North Dakota. Surveys were received from 3 out of the 4 referral centers in geographic regions. The other 12 surveys represent small rural communities throughout the state of North Dakota.

Maternity Unit Descriptions

Of the 21 responding hospitals, 15 were public, 3 were private, 1 was military, 1 an Indian Health Service facility, and 1 did not designate. Babies were delivered by family practice physicians (95%), obstetrician (38%), certified nurse midwives (10%), and locum tenens (3%) (which reflects use of one or more). Registered nurses care for the hypertensive pregnant patients in 91% of the responding hospitals, 14% also engage licensed practical nurses in their care, and nurses assistants or technicians are also utilized in 5 % of the hospitals.

To provide education for nurses caring for the hypertensive pregnant patients, 43% of the hospitals have yearly inservices, 23% never provide training, and 5% offer it once to their staff, as part of their orientation when they were hired. One survey stated they depend on their referral center for this education.

Hypertensive pregnant women were transferred to referral hospitals , depending on the severity of the disease, their gestational age, and labor status. Most of the respondents stated they transfer if the condition of the patient necessitates it, 29% always transfer women with PRH, and 5% (referral center) never transferred.

Nursing Staff Concerns

Concerns nursing staff have when caring for hypertensive pregnant women are listed in Table 10. The most frequently cited (67%) was lack of experience in caring for women with PRH. Other great concerns were fear that the patient might have seized, being unsure of what to do in this and other emergency situations, and not being familiar with the hypertensive disease process and treatment.

Aim 4: Usual Nursing Care Practices

Nursing care practices were evaluated according to the standard of care ascribed to by the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) guidelines (Burke & Poole, 1996). For each item, a score of 1 was assigned if the standard was met. Total scores for each category were computed as the percentage of specific criteria met in the category.

In caring for these patients hospitals most often use standing orders and written protocols. Overall, hospitals met AWHONN guidelines most frequently in caring for the antepartum hypertensive women, and received a slightly lower overall score during the intrapartum phase, with fewer hospitals meeting the guidelines in the postpartum care, as evidenced by the mean scores in Table 11.

In the antepartum nursing care (Table 12), environmental guidelines were most often met, but nursing assessments were greatly lacking in checking deep tendon reflexes, lung sounds, and urinary output and protein.

In the intrapartum stage (Table 13) hospitals scored lowest in their positioning of the patient during labor, and assessment of urine protein. Fewer than half indicated they

Table 10
Nursing Staff Concerns About Caring For Women With Pregnancy-Related Hypertension

<u>Concern</u>	<u>Frequency</u>	<u>%</u>
Lack of experience	14	67%
Fear of seizures	12	57%
Unsure of ability to handle emergency situations	10	48%
Not being familiar with the disease process	8	38%
Not familiar with treatment protocol	6	29%
Physician not immediately available	5	24%
Lack of peer support	3	14%

Table 11
Nursing Care Practices Overall Scores

	<u>Category</u>	<u>Mean</u>	<u>Standard Deviation</u>
Antepartum	Environment	89.52	11.41
	Assessment	58.52	18.53
Intrapartum	Treatment	83.33	26.16
	Environment	65.33	21.99
	Assessment	60.00	28.11
Postpartum	Environment	28.57	22.26
	Assessment	73.33	41.69
	Teaching	68.88	42.66

Table 12
Antepartum Nursing Practices

<u>Category</u>	<u>Practice</u>	<u>Frequency</u>	<u>%</u>
Environment	Quiet Environment	15	100%
	Dim Lights	15	100%
	Restricted Activity	15	100%
	Bedrest	13	87%
	Seizure Precautions	13	87%
	Limited Visitors	12	80%
	Bathroom Privileges	11	73%
Assessment	Daily Weight	14	93%
	Maternal/Fetal Monitoring	12	80%
	Deep Tendon Reflexes	8	47%
	Lung Sounds	5	33%
	Intake/Output	5	33%
	Urine Protein	2	13%

Note. Percentages based on 15 hospitals who care for hypertensive pregnant women.
 Assessments are every 4 hours or more frequently.

Table 13
Intrapartum Nursing Practices

<u>Category</u>	<u>Practice</u>	<u>Frequency</u>	<u>%</u>
Environment	Quiet Environment	14	93%
	Dim Lights	14	93%
	Bathroom Privileges	12	80%
	Limited Visitors	11	73%
	Bedrest	9	60%
	Positioned on Left Side	8	53%
Assessments	Maternal/Fetal Monitoring	13	87%
	Vital Signs	9	60%
	Deep Tendon Reflexes	9	60%
	Intake/Output	7	47%
	Urine Protein	3	20%
Treatment	Magnesium Sulfate Prescribed	14	93%
	Loading Dose Given	14	93%
	Use of Infusion Pump	14	93%
	Continuous Pulse Oximeter	8	53%

Note. Percentages based on 15 hospitals who care for hypertensive pregnant women.
 Assessments are every 4 hours or more frequently.

assess intake and output every four hours or more frequently. They scored high in management of magnesium sulfate.

The postpartum nursing care practices (Table 14) scored the lowest. This was evidenced by the number who failed to control the environment (limiting activity and baby cares) and frequently assess vital signs.

Nursing Care Practices and Patient Outcomes

Aim 5: Reported Care Practices Associated with Outcomes

Data from vital records were aggregated and linked to survey data using hospital identification codes. Case load characteristics (births, cesarean births, early prenatal care, low birth weight, and PRH) were available for each hospital. Overall nursing care practice scores were computed by summing scores for each care category. Correlations were used to evaluate case load characteristics and overall score for quality of nursing care practices (Table 15). The analysis showed that there was no significant relationship.

T-tests were run to see if there was a relationship between rural-urban hospitals, those with a formal collaborative agreement with a tertiary care center to transfer hypertensive pregnant women, and those who provide inservices for nurses on hypertensive pregnancies and the quality of nursing care provided (as evidenced by scores received). The results (Table 16) of this analysis showed that there was no significant difference in the overall nursing care scores received when comparing rural to urban, those with a collaborative transferal agreement to those without, and those who provide inservice learning experiences and those who do not.

Table 14
Postpartum Nursing Practices

<u>Category</u>	<u>Practice</u>	<u>Frequency</u>	<u>%</u>
Environment	Bedrest / Limited Activity	11	73%
	Baby Goes to Mom Intermittently	11	73%
	Baby Rooms In	4	27%
Assessment	Nursing Assessment	12	80%
	Vital Signs	10	67%
Anticipatory Guidance	Newborn Infant Cares	12	80%
	Lingering Disease Symptoms	10	67%
	Signs of Increasing Disease Process	9	60%

Note. Percentages based on 15 hospitals who care for hypertensive pregnant women.
 Assessments are every 4 hours or more frequently.

Table 15
Correlations: Nursing Care Practices (Overall %) & Caseload Descriptions

	1995	1996	1997
Births	-.15	-.16	-.18
Cesarean Births	.16	.21	-.03
Early Prenatal Care	.02	-.45	-.17
Low Birth Weight	-.13	-.19	-.13
Pregnancy Related Hypertension	-.01	.11	-.05

Note. N=15.

Table 16
Maternity Unit Characteristics and Overall Nursing Care Scores

<u>Characteristic</u>	<u>n</u>	<u>Mean</u>	<u>SD</u>	<u>t</u>	<u>P</u>
Location					
Rural	13	64.05	9.29	.9	.38
Urban	2	57.61	10.76		
Inservices (PRH)					
Rarely	3	62.32	3.32	-.17	.87
More Often	12	63.41	10.44		
Agreement					
Yes	12	65.21	7.0	1.81	.09
No	3	55.08	14.80		

Note. Designation as urban or rural was made by respondents.

CHAPTER V

DISCUSSION

Preeclampsia and gestational hypertension continue to complicate 6 to 7% of all pregnancies in the United States with the incidence varying among different hospitals, regions and counties (Witlin & Sibai, 1997). Very little has been written on the incidence and trends in rural America and even less is known about the incidence and trends in the rural Native American population. This project, encompassing all the births to North Dakota residents who were Caucasian and Native American from 1989 through 1997, shows that while births have declined in this population over the nine-year period pregnancy-related hypertension has continued to persist with an overall incidence of 3.8%. Patients with PRH are usually transferred from small rural hospitals to referral facilities. Nurses in these hospitals cite lack of experience, fear of seizures, uncertainty of ability to handle emergency situations, and lack of knowledge about the disease process as their greatest concerns when caring for the hypertensive pregnant woman.

Aim 1: Incidence of PRH in North Dakota

The overall incidence of PRH in North Dakota from 1989 through 1997 was 3.8% which is considerably lower than the national average of 6 to 7% (Working Group, 1990; Zuspan, 1997). In 1991, the southwestern Navajo Indian tribe, Crown Point, New Mexico, showed a rate of 10.9% (Levy, Jacober, & Sowers, 1994), and the authors cited obesity and insulin resistance as contributing to the high rate. This study found the

Native American (including Chippewa, Mandan Hidatsa-Arikara, and Sioux tribes) incidence to be 2.3% for 1991, and the nine-year overall incidence to be 3.6%, which is much lower than for the Navajo tribe. In 1995 the Centers for Disease Control (CDC) (Ventura et al., 1997) reported the incidence of PRH among American Indians to be 4.6%, compared to the rate of 4.4% in North Dakota that year. The CDC report also stated a rate of 3.5% incidence among the white population, with this study showing a rate of 4.2% for whites.

When considering the geographic incidence of PRH the greatest numbers are in the northwest (4.4 cases per 100 live births) and the southeast (4.5 cases per 100 live births) quarters. The northeast area includes Grand Forks and towns along the Red River which were flooded in the spring of 1997. Altru Hospital, normally a referral facility, was closed for six weeks when the entire city flooded and was evacuated. Pregnant women relocated and transferred their care, many for the duration of the pregnancy, to other cities and states, accounting for the very low numbers in this region.

Aim 2: Risks of Pregnancy-Related Hypertension in North Dakota

In a study (Saftlas et al., 1990) on preeclampsia from 1979 to 1986 it was found that the trend in rates for women of black and other minority races appeared to be declining while the rate for white women was starting to increase. Several recent studies have shown the incidence is increasing among black women (Knuist, Bonsel, Zondervan, & Treffers, 1998; Samadi et al., 1996). This project showed the Caucasian population of North Dakota to be more at risk for PRH than the Native American population.

It is a well-recognized fact that multiple fetuses are a significant risk factor for PRH (Ros, Cnattingius, & Lipworth, 1994; Sibai et al., 1995), and this study concurs. The relative risk for PRH among females 18 years or younger is greater than the relative risk of being 35 or older, and both are greater than the risk for females 19-35 years of age. These findings are consistent with other findings (Bobrowski & Bottoms, 1995; Saftlas et al., 1990).

Smoking is recognized as a significant factor in the development of cardiovascular disease and low birth weight. The surprising finding that smoking is associated with lower rates of PRH (Cnattingius et al., 1997; Ros, Cnattingius, & Lipworth, 1998; Sibai et al., 1995) was corroborated here. It was suggested that smoking does not enhance the implantation of the placenta, rather it decreases the amount of impaired perfusion (Ros, Cnattingius, & Lipworth), due to the smaller size of placenta found in smokers. Cigarette smoke also includes toxic substances which have hypotensive effects, and nicotine, which may inhibit thromboxane (a potent vasoconstrictor and platelet aggregation stimulator) production, thus appearing to be protective mechanisms (Cnattingius et al.).

Of the 87,737 births considered in this study, 18,234 of the mothers were identified to have smoked during pregnancy. The results of smoking were consistent throughout all nine years, showing the risk of having PRH and a low birth weight infant were higher in the nonsmoking groups of the Caucasian and Native Americans than in the smoking groups (Table 6). This seems to contradict previous studies (Cnattingius et al.; Ros, Cnattingius, & Lipworth; Sibai et al.) which state that women who smoke and get preeclampsia have worse maternal and fetal outcomes. This study also shows the

dramatic difference in incidence of low birth weight infants between smokers and nonsmokers (much greater incidence with smoking) when pregnancy-related hypertensive diseases are not in the picture.

The lack of association between PRH and health services utilization may be due to the fact that PRH typically is manifested late in the pregnancy. The risk for PRH would not be appropriately reflected by the number of prenatal visits.

Aim 3: Outcomes of Pregnancy-Related Hypertension

Infant outcomes, reflected by low birth weight were discussed in relation to smoking. Even in nonsmokers, the relative risk of low birth weight is greatly increased with PRH (Table 7). The relative risk for prematurity is greatly increased with PRH due to the severity of the disease requiring an early delivery.

The fact that the relative risk for the mother being transferred is considerably greater than the relative risk for the infant being transferred is reflective of the small rural hospitals which predominate in North Dakota. They are not equipped to care for these high risk pregnancies and are quick to transfer care to referral centers. This is an appropriate pattern of care.

The relative risk of having a cesarean section with PRH is high, reflecting severity of disease necessitating an expedient delivery. Weight gain does not adequately reflect maternal outcome in this study. Weight gain would have to be considered in relation to weeks of gestation, the pattern of increase, and any rapid increase associated with edema. This information is not available through birth certificate data.

Aim 4 and 5: Nursing Care Practices and Outcomes

Information received from the survey sent to the North Dakota hospitals revealed that there are about 35 hospitals still offering delivery services, with three of the larger cities having two hospitals each. With 53 counties in the state, that leaves many without a hospital. With every hospital that closes or discontinues delivery services, there is reduced access to prenatal care and increased distance to travel for that care. The small rural hospitals are quick to transfer high risk pregnant women to the larger referral centers which was shown by the survey and also by the birth certificate data.

As a whole, the survey showed there is a need for education concerning the disease process involved in preeclampsia, with special emphasis placed on the postpartum phase, which received the lowest overall scores. The fact that delivery of the baby interrupts the progression of the disease process, does not mean the woman is cured and out of danger. This need for education is also reflected in the lack of positioning labor patients on the left side for optimal uteroplacental perfusion, and not assessing for urine protein, which indicates worsening of the disease.

Nursing staff are concerned about their lack of experience caring for hypertensive pregnant women, and fear their ability to handle emergency situations such as with seizures. The survey revealed that few hospitals offer seminars or inservices with information on caring for the hypertensive pregnant woman. One hospital stated it is up to the nurse to get that information when possible.

Summary

The overall incidence of pregnancy-related hypertension in North Dakota from 1989 through 1997 is 3.8%. This is lower than the national average of 6 to 7%. The incidence among the Native Americans (3.6%) is slightly lower than for the Caucasian population (3.8%). The most significant maternal risks for PRH identified in this study were with multiple gestation and being a nonsmoker. Maternal outcomes include an increased risk of being transferred to a referral hospital and delivery by cesarean section. The infants of hypertensive pregnant women are at risk for low birth weight and premature birth. The nursing care practices reveal that the hypertensive pregnant woman is being effectively cared for, and appropriately transferred when necessary, but there is a need for nursing education concerning the disease process and how it relates to care practices.

One limitation to this study is that the birth certificate information recorded may have processing errors. Hypertension, pregnancy-associated, and preeclampsia are not always defined or diagnosed consistently. Women have been taught that smoking during pregnancy is harmful to the growth of the fetus, therefore, this information is often under reported by the mother, and therefore on the birth certificate.

Implications for Nursing

The information gained from this study is important for secondary prevention of pregnancy-related hypertension and prenatal risk assessment. It validates the fact that pregnancy-related hypertension continues to persist, and contributes significantly to perinatal morbidity and mortality. Prenatally, those patients at risk must be identified and

monitored closely throughout the pregnancy. Women must continue to be instructed not to smoke during pregnancy due to the significant risk of delivering a low birth weight infant. Astute nursing surveillance is essential during the antepartum and intrapartum periods to mitigate the effects of PRH, and decrease maternal morbidity.

This study demonstrates the need for providing education to nurses in small rural communities where they rarely care for these high-risk pregnant women. Just knowing what to do to prepare a hypertensive pregnant woman for transport to a referral center, and how to handle an emergency that might arise would decrease the anxiety for the nurse. There is a great need for advanced practice nurses skilled in caring for the high-risk pregnant patient to be a resource to these small communities.

This study was completed using population data in a sparsely settled, rural state. Thus, results would be of interest to professionals in other rural populations in the Midwest.

Further studies need to be done regarding the paradoxical effects of smoking and pregnancy, and what makes it protective for preeclampsia. It would be informative to replicate this epidemiological study in North and South Dakota including the effects of diabetes on the incidence of preeclampsia in the Native American and Caucasian population. Further nursing research is needed on the effectiveness of activity restriction with preeclampsia, and whether controlling the environment actually makes a difference in the outcomes of the disease. There is so much to learn about the hypertensive diseases of pregnancy.

APPENDIX

**PREGNANCY-RELATED HYPERTENSION:
HOSPITAL NURSING CARE PRACTICES SURVEY**

University of North Dakota
College of Nursing
Karen S. Reed, BSN, RNC

PLEASE PROVIDE INFORMATION ABOUT YOUR MATERNITY SERVICES:

1. Number of births in 1998 _____
 Cesarean births _____
 Vaginal births _____

2. Number of hypertensive pregnancies _____

3. For items 1 - 2, where did you obtain your data?
 Unit summary records (logs) _____
 Estimate (best guess) _____
 Individual charts _____
 Other _____

4. Your hospital is rural _____
 urban _____

5. Type of hospital
 Indian Health Service _____
 Military _____
 Private _____
 Public _____
 Other _____

6. The care provider who delivers is (Check all that apply)

- Obstetrician _____
- Certified Nurse Midwife _____
- Family Practice Physician _____
- Physicians Assistant _____
- Locum Tenem _____
- Other _____

7. Those providing direct patient care for nursing management of hypertensive pregnant women (Check all that apply)

- Registered Nurse _____
- Licensed Practical Nurse _____
- Nurse Assistant _____
- Other _____

8. How often do the care-givers attend inservices or receive special training in caring for hypertensive pregnant women?

- Once _____
- Yearly _____
- Never _____
- Other _____

9. Does your hospital maintain a formal collaborative agreement with a tertiary care center?

- Yes _____
- No _____

10. Do you transfer hypertensive pregnant women to tertiary care centers?

- No, never _____
- Sometimes _____
- Always _____

Briefly described criteria for transfer _____

11. Concerns your nursing staff have about caring for pregnant women with hypertension: (Check all that apply)

- Lack of experience _____
- Lack of peer support _____
- Physician not immediately available _____
- Not being familiar with the disease process _____
- Fear of seizures _____
- Unsure of ability to handle emergency situations _____
- Not familiar with treatment protocol _____

12. Usual practice of nursing care for hypertensive pregnant women

Standard of care is a: Written protocol _____
 Procedure book _____
 Standing physician orders _____

CHECK ALL USUAL PRACTICES

Antepartum

Bedrest _____
 Restricted activity _____
 Bathroom privileges only _____
 Dim lighting _____
 Quiet environment _____
 Visitors _____ Limited visitors _____
 Seizure precautions _____
 Nursing assessment frequency _____
 Lung sounds _____
 Deep tendon reflexes _____
 Intake/output _____ Frequency _____
 Urine protein _____ Frequency _____
 Maternal/fetal monitoring
 Continuous _____
 Intermittent _____
 Daily weight _____

Intrapartum

Magnesium sulfate prescribed _____
 Loading dose _____
 Infusion pump _____
 Pulse oximetry _____
 Bedrest _____ BRP only _____
 Maternal position _____
 Dim lighting _____
 Quiet environment _____
 Visitors _____ Limited visitors _____
 Nursing assessment frequency _____
 Vital sign frequency _____
 Deep tendon reflexes _____
 Intake/output _____ Frequency _____
 Urine protein _____ Frequency _____
 Foley catheter _____
 Maternal/fetal monitoring
 Continuous _____
 Intermittent _____

Postpartum

Nursing assessment frequency _____

Vital sign frequency _____

Bedrest / limited activity _____

Baby . . .

Rooms in _____

Goes to mother intermittently _____

Anticipatory guidance/teaching

Possible lingering symptoms _____

Signs of increasing disease process _____

Newborn infant cares _____

PLEASE INCLUDE ANY COMMENTS YOU WOULD LIKE TO MAKE IN THE SPACE PROVIDED BELOW.

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