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Women With High-Risk Pregnancies, Problems, and APN Interventions

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Abstract

Purpose—To (a) describe women's prenatal and postpartum problems and advanced practice nurses (APN) interventions; and (b) determine if problems and APN interventions differed by women's medical diagnosis (diabetes, hypertension, preterm labor).

Design and Methods—Content analysis of 85 interaction logs created by APNs during a randomized clinical trial in which half of physician-provided prenatal care was substituted with APN-provided prenatal care in the women's homes. Patients' problems and APN interventions were classified with the Omaha Classification System.

Findings—A total of 212,835 health problems and 212,835 APN interventions were identified. The dominant antenatal problems were physiologic (59.2%) and health-related behaviors (33.3%); postpartum were physiologic (44.0%) and psychosocial problems (31.6%). Antenatally, women with diabetes had significantly more health-related behavior problems; women with preterm labor had more physiologic problems. APN surveillance interventions predominated antenatally (65.6%) and postpartum (66.0%), followed by health teaching, guidance, and counseling both antenatally (25.4%) and postpartum (28.1%). Women with chronic hypertension required significantly more case-management interventions.

Conclusions—The categories of women's problems were largely similar across medical diagnostic groups. Interventions to address women's problems ranged from assessing maternal and fetal physiologic states to teaching interpersonal relationships and self-care management to assisting with transportation and housing. Data show the range of APN knowledge and skills needed to improve maternal and infant outcomes and ultimately reduce healthcare costs in women with high-risk pregnancies.

Keywords

high-risk pregnancy; patient problems; nurse interventions

The high rate of low birthweight (LBW) infants born in the US is costly in human and economic terms. Since 1990, the percentage of infants born LBW (<2500gms) has increased 16% and the preterm (<37 weeks gestation) birth rate increased 18% (Martin et al., 2006). Birth data for 2004 indicated that the LBW rate was 8.1%, and the rate of preterm birth was 12.5%, up from 7.9% and 12.3%, respectively, in 2003. Although substantial increases in multiple births associated with in vitro fertilization have influenced these rates, preterm and LBW rates have also increased among singleton births. Preterm and LBW infants experience increased morbidity, including mental retardation, deafness, blindness, cerebral palsy, respiratory and neurologic sequelae, and increased mortality compared to normal weight infants (Wood, Marlow, Costeloe, Gibson, & Wilkinson, 2000). These infants also have increased rates of rehospitalization and acute care visits over the 1st year of life compared to normal weight infants (Tomashek et al., 2006).

Although many reasons exist for increases in the numbers of preterm and LBW births, monitoring for problems and early intervention, especially for women at high risk of delivering LBW infants, has been shown to reduce the number of LBW infant births (Drinkard et al., 2001; Institute of Medicine, 1988). Unfortunately many women do not receive continuous prenatal care because of problems of access to care and transportation, lack of child care, long waiting periods to be seen (Stringer, 1998), anxiety over medical procedures, as well as other personal (Bennett, Switzer, Aguirre, Evans, & Barg, 2006), financial, and structural barriers (American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women, 2006). A major factor in providing continuous accessible, acceptable prenatal care is understanding the problems faced by women with high-risk pregnancies, and providing appropriate, acceptable interventions to resolve these problems.

The literature on problems of women with high-risk pregnancies remains heavily focused on provider directives on adherence to specific medical treatment plans such as monitoring blood sugar and uterine activity (Garfield, Maner, Mackay, Schlembach, & Saade, 2005), reduction of risk behaviors such as smoking (Lee, Hajek, McRobbie, & Owen, 2006), employment (Youngblut et al., 2000), anxiety and depression (Bowen & Muhajarine, 2006; Rubertsson, Wickberg, Gustavsson, & Radestad, 2005), and problems in attending early and continuous prenatal care (Zlotnick, Miller, Pearlstein, Howard, & Sweeney, 2006). Uterine activity monitoring, adequate fluids, and medication remain major elements in care to women with preterm labor (Maner, Garfield, Maul, Olson, & Saade, 2003). For women with diabetes in pregnancy, blood sugar monitoring and use of insulin remain major elements of care (Metzger, 2006). Women with chronic hypertension during pregnancy receive medication, with a focus on stress relief and case management (Frishman, Schlocker, Awad, & Tejani, 2005).

The development and testing of interventions to enroll and retain women in early and continuous prenatal care remains a major focus of provider practices. Approaches that have been tested include adding home care services by nurses (Koniak-Griffin, Anderson, Verzemnieks, & Brecht, 2000; Nguyen, Carson, Parris, & Place, 2003; Norr et al., 2003; York et al., 1997) or lay home visitors (Harrison et al., 2001; Persily, 2003) to usual physician-provided prenatal care, periodic nurse telephone contact and monitoring of pregnant women receiving physician prenatal care (Muender, Moore, Chen, & Sevick, 2000), home uterine monitoring, and substitution of half of usual physician clinic or office

prenatal care with prenatal care delivered in the women's homes by-master's educated APNs (Brooten et al., 2001).

Following a high-risk pregnancy, management of women's postpartum problems is also focused on provider directives to stabilize the preexisting medical condition, monitor maternal weight (Lederman, 2001; Pomerleau, Brouwer, & Jones, 2000) and physical health, health and care of newborns (Pridham, Lin, & Brown, 2001), parenting, depression (Josefsson, Berg, Nordin, & Sydsjo, 2001), fatigue, and return to work and school (DeMier et al., 2000).

The literature lacks empirical data for profiles of common problems women encounter during or following high risk pregnancy from the women's perspectives (Kline, Martin, & Deyo, 1998; Leithner et al., 2006). In addition, other than drug or specific medical treatment, few empirical data exist on provider responses to common problems women encounter. Such data are important in targeting health care resources for optimal pregnancy outcomes.

This study was conducted to describe women's prenatal and postpartum problems and APN interventions and to determine if women's problems and APN interventions differed by women's medical diagnosis (diabetes, hypertension, preterm labor). Data for this secondary analysis were derived from a two-group randomized clinical trial to examine prenatal maternal and infant outcomes and healthcare costs through 1 year after delivery. In the clinical trial, women in the control group received prenatal care delivered by physicians in the prenatal clinic or the physicians' offices. Women in the intervention group received half of their prenatal care from physicians in the prenatal clinic or the physicians' offices and half of their prenatal care from APNs in the women's homes (Brooten et al., 2001). Postpartum, APNs provided one home visit to the intervention group women. Women in the usual care group had no routine postpartum nurse visit. APN care for the intervention group, which extended during pregnancy and for 8 weeks postpartum, included teaching, counseling, telephone outreach, and daily telephone availability of the APNs with physician backup. The APNs were master's-educated perinatal clinical nurse specialists who did not have prescriptive privileges in the state at the time of the study. Results of the clinical trial included lower fetal and infant mortality (2 vs. 9), 11 fewer preterm infants, more twin pregnancies carried to term (77.7% vs. 33.3%), fewer prenatal hospitalizations (41 vs. 49), fewer infant rehospitalizations (18 vs 24), and a savings of 750 hospital days and \$2,496,145 in favor of the APN intervention group. The present study builds on the original randomized clinical trial by examining women's problems and APN interventions in the intervention group to understand the mechanism behind the intervention group's improved outcomes.

Design and Methods

Sample

The sample for the present analysis consisted of APN interaction logs with all 85 women in the intervention group. In the clinical trial, the APNs who provided the intervention recorded in interaction logs their discussions with women during telephone, home, and clinic visits. These logs were produced to document the care provided by the APN during each contact. All 85 logs produced during the clinical trial were secured in locked files stored in the lead author's research space since the reporting of the initial clinical trial. Mean age of women in the intervention group was 26.6 years. Most were African American (94%), had public health insurance (91.8%), and a high school education or higher (Table 1).

Procedure

The clinical trial and the present analyses were approved by the appropriate institutional review board. As part of the clinical trial, all interactions between the APNs and study participants in the intervention group were recorded as close to verbatim as possible immediately following the contact in APN interaction logs kept for each client. Data were recorded on standard forms structured with columns: reason for contact, issues identified during contact, response of APN, woman's response, and outcome of contact. The APNs also recorded the type of contact (e.g., telephone, home visit).

Content analysis was performed on all logs from intervention group women with the contact as the unit of analysis. The text of the interaction between the APN and the woman at each contact was reduced to the smallest word or phrase that contained a single idea, called "units." Each of these units was then classified with the Omaha system (Martin & Scheet, 1992). Based on our previous work using the Omaha system (Brooten, Youngblut, Deatrick, Naylor, & York, 2003), this unit of analysis is most appropriate and feasible because it allows analysis of individual healthcare problems and interventions as well as aggregation and analysis at the contact and patient levels. A photocopy of each record was made so that coding notes could be written on the records "to leave a paper trail." APN logs were divided into antenatal and postpartum sections and photocopied on different-colored paper to enhance accuracy in data coding and entry. Each contact underwent a first read-through during which the context of the entire contact was examined and potential difficulties were identified, including any poor photocopying or illegible handwriting. APNs who recorded the logs were available for interpretation of handwriting.

Once a satisfactory read-through was established, content analysis began for each contact. Each contact was analyzed individually with a worksheet containing a listing of the contact number, type of contact (e.g., home visit, telephone, clinic visit), healthcare problem (domain), and APN intervention (category and target). The worksheets enhanced our ability to monitor intercoder reliability and facilitate data entry. During content analysis, data were placed into appropriate categories as defined in the Omaha system. The definitions provided for categories were strictly applied during analysis. Clarifications, if needed, were obtained from Karen Martin, a developer of the system and a consultant on the study. Decision logs were maintained throughout the coding and shared by the two coders on the study. Interrater reliability was monitored throughout the study on a randomly selected sample of contacts and maintained at 85% or greater. SPSS was used for the quantitative analyses.

Measures of women's problems

The Problem Classification Scheme of the Omaha system was used to identify and classify women's problems indicated by the women or APNs. This system, developed over the past 20 years, has approximately 1,000 patient records for inductively deriving categories, conducting reliability and validity testing, and revising the taxonomy. The Problem Classification Scheme has 4 distinct hierarchical levels from broad to specific: domain, problem, modifier, sign/symptom. The system's four broad (Level 1) classifications or "domains" of patient problems are: (a) environmental; (b) psychosocial; (c) physiological; and (d) health-related behaviors. Each of these domains contains from 5 to 16 subcategories of problems for a total of 44 subcategories. Examples of subcategories within the physiological domain include hearing, vision, circulation, and ante- or postpartum problems. Examples of subcategories within the psychosocial domain include problems in caretaking or parenting, role change, communication, and interpersonal relationships. Definitions are provided for each subcategory of patient problem in the Omaha system. Validity of the Omaha system is supported by findings that it explained variation in nursing resource consumption (Hays, 1992). Martin and Scheet (1992) reported a range of 73% to 98%

agreement for intercoder reliability during development of the Omaha system and percentage agreement at or above 80% for the intervention categories and activities in 8 of 12 reliability testings in a subsequent study.

Measures of APN Interventions

The Intervention Scheme of the Omaha system was used to identify and classify APNs' interventions in response to each patient problem. The Intervention Scheme also has four broad categories of interventions: (a) health teaching, guidance, and counseling; (b) treatments and procedures; (c) case management; and (d) surveillance, and a total of 63 nursing practice activities (targets). Examples of these practice activities include behavior modification, stress management, feeding procedures, dressing changes, positioning, safety, and administering medications. Definitions are provided for each.

Findings

Women's Problems

The total number of healthcare problems for the 85 women was 212,835. The majority of the problems occurred antenatally (71.6%), with only 28.4% of the problems occurring postpartum. In the antenatal period, physiologic problems were most prevalent (59.2%), followed by problems in health-related behaviors (33.3%). In the postpartum period, physiologic problems were again most common (44.0%), followed by psychosocial problems (31.6%).

The three most frequent problems in each of the four broad classifications (domains) of patients' problems are shown in Table 2. During the antenatal period 86,237 of the physiologic problems were classified as antepartum or postpartum problems. They pertained to difficulty coping with body changes; problems with rest, exercise, diet, and discomforts; and fears regarding delivery. The remaining physiologic problems were focused on blood pressure, edema, cramping in the extremities, coughing, and difficulty breathing.

The second largest number of women's health problems antenatally pertained to health-related behaviors. Problems in healthcare supervision accounted for 35,158 problems. These problems were focused on women having difficulty in managing their symptoms, and in seeking, obtaining, and returning for medical care. Problems with nutrition accounted for another 13,151 problems which included problems with blood sugar levels, weight gain, and adherence to a prescribed diet.

In the broad category of psychosocial problems, interpersonal relationships predominated with 7,650 problems. These problems included difficulty in establishing and maintaining relationships, incongruence in goals and values, and problems with communication skills. Although problems with residence (heating, lead-based paint, crowding, electrical) were most frequent (1,466) in the environment category, the number of problems was far fewer than those found in antepartum and postpartum physiologic problems, healthcare supervision, nutrition, and interpersonal relationships.

During the postpartum period, the predominant healthcare problems were again antepartum or postpartum physiologic challenges, accounting for 24,020 problems, followed by problems of healthcare supervision (12,491) and problems of growth and development (12,287). The latter subcategory included concerns about abnormal infant weight, height, and head circumference, and lags in infant developmental tasks. Problems in interpersonal relationships remained (3,463) and problems in caretaking or parenting (3,171) became apparent. Parenting included providing newborn physical and emotional nurturance, safety issues, and difficulty with parenting responsibilities.

Women's Problems by Medical Diagnosis

Using Chi-square tests indicated that women's total healthcare problems and those found antenatally were significantly associated with medical diagnosis (Table 3). Although women with chronic hypertension comprised 21.1 % of the sample, they accounted for 26.2% of the healthcare problems. Antenatally, women with diabetes had significantly more problems with health-related behaviors, while women with preterm labor had significantly more physiologic problems. The distribution of problems for women with hypertension was about as expected. Postpartum, women with chronic hypertension had significantly more physiologic problems and significantly fewer psychosocial problems.

APN Interventions

The total number of APN interventions for the 85 women with high-risk pregnancies was 212,835. The majority of these interventions were provided antenatally (71.6%), with only 28.4% of the interventions provided postpartum. Surveillance interventions were most common both antenatally (65.6%) and postpartum (66.0%), followed by health teaching, guidance, and counseling interventions both antenatally (25.4%) and postpartum (28.1%). Treatments and procedures constituted the smallest number of APN interventions.

The three most frequent APN interventions in each of the four broad classifications of interventions are listed in Table 4. During the antenatal period, APN surveillance interventions were by far the most common, with surveillance of signs and symptoms of potential and actual physical problems accounting for 30,421 APN interventions. Interventions focused on exchange of information between the women and APNs, physicians, and other health care providers (communication) accounted for 13,204 interventions. Surveillance and reporting of laboratory findings (e.g., blood sugar, hemoglobin, WBC) accounted for 9,510 interventions. The second most frequent APN interventions were found in the broad category of health teaching, guidance, and counseling: 7,320 APN interventions were focused on communication and 6,064 on physical signs and symptoms. Treatments and procedures constituted the smallest number of APN interventions.

In the postpartum period, while decreasing in total number of APN interventions, the target rankings remained similar to those in the antenatal period with signs and symptoms and communication in the surveillance category, followed by communication and physical signs and symptoms in the health teaching, guidance, and counseling category. Treatments and procedures again were the smallest number of APN interventions and consisted mainly of dressing changes and wound care.

APN Interventions by Medical Diagnosis

Chi-square tests indicated that total APN interventions (antenatal and postpartum) were significantly associated with medical diagnosis (Table 5). Women with chronic hypertension required significantly more case management interventions, and women with diabetes and preterm labor required significantly less case management. In the other three intervention categories of health teaching, guidance, and counseling; treatments and procedures; and surveillance, numbers of APN interventions were similar across medical diagnoses. Treatments and procedures constituted less than 1% of the total APN interventions in each of the medical diagnostic groups.

Discussion

Surveillance was consistently the predominant APN function overall and across the three medical diagnosis groups of women, followed by health teaching, guidance, and counseling.

In all three groups, treatments and procedures accounted for less than 1% of total APN interventions. In findings from the original randomized trial, the APN-followed women had fewer rehospitalizations compared to the controls and a difference in healthcare cost savings of approximately \$2.5 million (Brooten et al., 2001). Documentation of the amount of APN surveillance, early detection of health problems, and focused health teaching of women regarding prevention and early detection of problems helps explain the reduced rehospitalizations and healthcare costs in the original trial. These study findings indicate that the APNs' specialty knowledge, well-developed assessment skills, and targeted patient teaching were important conditions for reducing morbidity and healthcare costs.

In all three medical diagnosis groups, case management was the third most frequent category of APN intervention. The need for case management reflects the complexity of care needed by these high-risk vulnerable women. These women often find management of their complex regimens difficult and confusing, and the services of APNs help them make better use of the available resources. APN skills in collaboration and negotiating systems were important in the original trial's successful outcomes. Successful communication also was important. In all three medical diagnosis groups, communication was the predominant APN intervention within the broad health teaching, guidance, counseling, and case management categories and the second most frequent intervention within the broad surveillance category. These rankings underscore the critical nature of communication skills in improving patient outcomes. This condition was especially important in this sample of women for whom problems in interpersonal relationships ranked high both antenatally and postpartum. Research by Leithner and colleagues (2006) showed that the great discomfort of women receiving prenatal care could be alleviated through communication training of prenatal care workers. Bennett et al. (2006) found that communication was critical to women's use of prenatal care.

The distribution of health problems encountered by women reflects the many common physiologic problems of women with high-risk pregnancies and their medical diagnoses. The latter required close monitoring of health behaviors for optimum maternal and newborn outcomes, making health-related behaviors the second most common type of problem antenatally. Psychosocial problems reflect the situation often encountered by low socioeconomic status women and single mothers. Both antepartum and postpartum, women had problems with interpersonal relationships with spouses, partners, boyfriends, and healthcare providers, making APN interventions in communication especially important. Following delivery and into the postpartum period, problems with infant growth and development, caretaking, and parenting were added to interpersonal problems, making psychosocial problems the second greatest problem category after physiologic problems.

Many approaches have been tested to improve maternal and infant outcomes in women with high-risk pregnancies including the use of lay or community workers, public health nurses, and home uterine monitoring. These studies (Harrison et al., 2001; Koniak-Griffin et al., 2000; Nguyen et al., 2003; Norr et al., 2003; Persily, 2003; York et al., 1997), as in the original clinical trial (Brooten et al., 2001), included reports on maternal morbidity, hospitalizations, length of hospital stay, infant morbidity, and health care costs. They did not report empirical findings of women's problems during pregnancy or analysis of interventionists' processes of care. Other studies of women's problems during pregnancy have been qualitative with small sample sizes, case studies, or focused on a single problem such as bedrest (Maloni & Park, 2005). Findings in this study show an overview of the range of problems in this sample of at risk, mainly African American women. Results also indicate the range of intervention skills of master's-educated APNs who were able to intervene in problems ranging from assessing and monitoring physiologic states of mother, fetus, and newborn, teaching self-care management of symptoms, and meeting nutritional needs, to

assisting with complex medical care systems, interpersonal relationships, transportation, and problems with housing. One might argue that such problems are beyond the scope of providing prenatal care. However, if they maintain high-risk women in prenatal care and result in improved outcomes and reduced healthcare costs, they become important issues requiring intervention.

This study was focused on problems of women with high-risk pregnancies who received interventions by APNs. Findings cannot be generalized to women with low-risk pregnancies. In addition, we do not know if other than master's educated APNs would provide similar interventions. However, a full-scale study ($N=300$) entitled "Tennessee Connections for Better Birth Outcomes" is currently beginning (Wilson, 2007). That study includes a biobehavioral intervention in which regularly scheduled prenatal care delivered in the prenatal clinic is alternated with prenatal care delivered during home visits by APNs. Outcomes to be measured include incidence of preterm birth, intervals between subsequent pregnancies, and health care costs. Findings about identifying and analyzing women's problems during pregnancy and postpartum and APN interventions would add to knowledge of the process of care with high-risk pregnant women and APN roles in improving maternal and infant outcomes in these high-risk groups.

Conclusions

In APN functions in providing half of prenatal care for women with high-risk pregnancies, surveillance was the predominant APN function across medical diagnosis groups. Treatments and procedures comprised less than 1 % of APN total functions. The categories of women's problems were largely similar across diagnostic groups. The great need for surveillance and teaching, guidance, and counseling of women at risk of having a preterm or low birthweight infant is clear from the study data, and the findings show the importance of matching APN clinical specialization with the patient population under their care wherever possible for optimal outcomes. Data document the range of APN knowledge and skills needed to improve maternal and infant outcomes and ultimately reduce healthcare costs in women with high-risk pregnancies.

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Table 1

Demographic Characteristics of the Sample

Characteristic		<i>n</i> (%)
Age in years <i>M</i> (<i>SD</i>)		26.6 (6.34)
Race	African American	80 (94.1%)
	White	5 (5.9%)
Education	<High school	31 (36.5%)
	High school grad	25 (29.4%)
	>High school	29 (34.1%)
Insurance	Public	78 (91.8%)
	Private	7 (8.2%)
Primary medical diagnosis	Diabetes	19 (22.4%)
	Chronic hypertension	18 (21.2%)
	Preterm labor	48 (56.5%)
Infant gestational age	Preterm	29 (30.9%)
	Full term	65 (69.1%)

Table 2

The Three Most Frequent Health Care Problems in Each Category

	Category	Healthcare problem	n (%)
Antenatal	Environmental	Residence	1466 (67.5%)
		Sanitation	404 (18.6%)
		Income	267 (12.3%)
	Psychosocial	Interpersonal relationships	7650 (82.7%)
		Caretaking/parenting	625 (6.8%)
		Growth & development	427 (4.6%)
	Physiologic	Antepartum/postpartum	86,237 (95.7%)
		Circulation	1471 (1.6%)
		Respiration	908 (1.0%)
	Health-related behaviors	Health care supervision	35,158 (69.3%)
Nutrition		13,151 (25.9%)	
Woman not home		1186 (2.3%)	
Postpartum	Environmental	Residence	286 (64.7%)
		Income	133 (30.1%)
		Sanitation	14 (3.2%)
	Psychosocial	Growth & development	12,287 (64.3%)
		Interpersonal relationships	3463 (18.1%)
		Caretaking/parenting	3171 (16.6%)
	Physiologic	Antepartum/postpartum	24,020 (90.3%)
		Integument	1551 (5.8%)
		Circulation	485 (1.8%)
	Health-related behaviors	Healthcare supervision	12,491 (87%)
Nutrition		910 (6.3%)	
Woman not home		669 (4.7%)	
Total	Environmental	Residence	1752 (67%)
		Sanitation	418 (16%)
		Income	400 (15.3%)
	Psychosocial	Growth & development	12,714 (44.8%)
		Interpersonal relationships	11,113 (39.2%)
		Caretaking/parenting	3796 (13.4%)
	Physiologic	Antepartum/postpartum	110,257 (94.5%)
		Circulation	1956 (1.7%)
		Integument	1692 (1.4%)
	Health-related behaviors	Healthcare supervision	47,649 (73.2%)
Nutrition		14,061 (21.6%)	
Woman not home		1855 (2.8%)	

Note. Because only the three most frequent problems are listed, numbers and percentages do not add to 100%.

Table 3

Healthcare Problems During and Following Pregnancy by Medical Diagnosis

Problem category	Diabetes (n=19)	Preterm labor (n=48)	Hypertension (n=18)	χ^2
	n (%)	n (%)	n (%)	
Antenatal				4738.16*
Environmental	620 (1.7%)	1140 (1.5%)	412 (1.0%)	
Psychosocial	1908 (5.3%)	4890 (6.6%)	2455 (5.8%)	
Physiologic	16,279 (45.5%)	48,210 (64.8%)	25,622 (60.8%)	
Health-related behaviors	16,976 (47.5%)	20,111 (27.1%)	13,680 (32.4%)	
Postpartum				208.26*
Environmental	101 (0.7%)	273 (0.8%)	68 (0.5%)	
Psychosocial	4384 (30.4%)	10,958 (33.8%)	3776 (27.7%)	
Physiologic	6357 (44.1%)	13,911 (42.9%)	6340 (46.4%)	
Health-related behaviors	3580 (24.8%)	7316(22.5%)	3468 (25.4%)	
Total				4236.14*
Environmental	721 (1.4%)	1413 (1.3%)	480 (0.8%)	
Psychosocial	6292 (12.5%)	15,848 (14.8%)	6231 (11.2%)	
Physiologic	22,636 (45.1%)	62,121 (58.2%)	31,962 (57.3%)	
Health-related behaviors	20,556 (41.0%)	27,427 (25.7%)	17,148 (30.7%)	

*
 $p < .001$.

Table 4

The Three Most Frequent APN Intervention Targets in Each Intervention Category

	APN intervention category	Intervention target	n(%)	
Antenatal	Health teaching, guidance, & counseling	Communication	7320 (19.0%)	
		Physical signs & symptoms	6064 (15.7%)	
		Medical/dental care	4078 (10.6%)	
	Treatments & procedures	Medical/dental care	122 (13.1%)	
		Medication administration/compliance	119 (12.7%)	
		Transportation	111 (11.9%)	
	Case management	Communication	3776 (29.4%)	
		Medical/dental care	3247 (25.3%)	
		Screening	1352 (10.5%)	
Surveillance	Physical signs & symptoms	30,421 (30.4%)		
	Communication	13,204 (13.2%)		
	Lab findings	9510 (9.5%)		
Postpartum	Health teaching, guidance, & counseling	Communication	3564 (21.0%)	
		Physical signs & symptoms	1998 (11.8%)	
		Medical/dental care	1653 (9.7%)	
	Treatments & procedures	Dressing change/wound care	136 (36.6%)	
		Personal care	45 (12.1%)	
		Feeding procedures	30 (8.1%)	
	Case management	Communication	1712 (53.7%)	
		Medical/dental care	797 (25.0%)	
		Family planning	147 (4.6%)	
	Surveillance	Physical signs & symptoms	10,837 (27.1%)	
		Communication	6143 (15.4%)	
		Medical/dental care	4388 (11.0%)	
	Total	Health teaching, guidance, & counseling	Communication	10,884 (19.6%)
			Physical signs & symptoms	8062 (14.5%)
			Medical/dental care	5731 (10.3%)
Treatments & procedures		Dressing change/wound care	138 (10.6%)	
		Medical/dental care	135 (10.3%)	
		Durable medical equipment	123 (9.4%)	
Case management		Communication	5488 (34.2%)	
		Medical/dental care	4044 (25.2%)	
		Screening	1357 (8.5%)	
Surveillance		Physical signs & symptoms	41,258 (29.5%)	

APN intervention category	Intervention target	n(%)
	Communication	19,347 (13.8%)
	Medical/dental care	11,491 (8.2%)

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Table 5

APN Interventions During and Following Pregnancy by Medical Diagnosis

Intervention categories	Diabetes (n=19)	Preterm labor (n=48)	Hypertension (n=18)	χ^2
	n (%)	n (%)	n (%)	
Antenatal				186.53 *
Health teaching, guidance, & counseling	8973 (25.1%)	19,340 (26.0%)	10,305 (24.4%)	
Treatments & procedures	195 (0.5%)	495 (0.7%)	244 (0.6%)	
Case management	2784 (7.8%)	5892 (7.9%)	4163 (9.9%)	
Surveillance	23,830 (66.6%)	48,625 (65.4%)	27,457 (65.1%)	
Postpartum				108.03 *
Health teaching, guidance, & counseling	4052 (28.1%)	9271 (28.6%)	3677 (26.9%)	
Treatments & procedures	145 (1.0%)	158 (0.5%)	69 (0.5%)	
Case management	648 (4.5%)	1666 (5.1%)	875 (6.4%)	
Surveillance	9577 (66.4%)	21,372 (65.8%)	9030 (66.2%)	
Total				283.03 *
Health teaching, guidance, & counseling	13,025 (25.9%)	28,611 (26.8%)	13,982 (25.0%)	
Treatments & procedures	340 (0.7%)	653 (0.6%)	313 (0.6%)	
Case management	3432 (6.8%)	7558 (7.1%)	5038 (9.0%)	
Surveillance	33,407 (66.6%)	69,997 (65.5%)	36,487 (65.4%)	

* $p < .001$.