

4-2012

Health Problems and APN Interventions in Pregnant Women with Diabetes

Dorothy Brooten

Nicole Wertheim College of Nursing and Health Sciences, Florida International University, brooten@fiu.edu

JoAnne M. Youngblut

Nicole Wertheim College of Nursing and Health Sciences, Florida International University, youngblu@fiu.edu

Jean Hannan

Nicole Wertheim College of Nursing and Health Sciences, Florida International University

Frank Guido-Sanz

Nicole Wertheim College of Nursing and Health Sciences, Florida International University

Donna Felber

University of Florida

See next page for additional authors

Follow this and additional works at: https://digitalcommons.fiu.edu/cnhs_fac



Part of the [Medicine and Health Sciences Commons](#)

Recommended Citation

Brooten, Dorothy; Youngblut, JoAnne M.; Hannan, Jean; Guido-Sanz, Frank; Felber, Donna; and Deoisres, Wannee, "Health Problems and APN Interventions in Pregnant Women with Diabetes" (2012). *Nicole Wertheim College of Nursing and Health Sciences*. 46.
https://digitalcommons.fiu.edu/cnhs_fac/46

This work is brought to you for free and open access by the Nicole Wertheim College of Nursing and Health Sciences at FIU Digital Commons. It has been accepted for inclusion in Nicole Wertheim College of Nursing and Health Sciences by an authorized administrator of FIU Digital Commons. For more information, please contact dcc@fiu.edu.

Authors

Dorothy Brooten, JoAnne M. Youngblut, Jean Hannan, Frank Guido-Sanz, Donna Felber, and Wannee Deoisres



Published in final edited form as:

Pac Rim Int J Nurs Res Thail. 2012 ; 16(2): 85–96.

Health Problems and APN Interventions in Pregnant Women with Diabetes

Dorothy Brooten, PhD, RN, FAAN [Professor of Nursing],

Florida International University, University Park, 11200SW 8th Street, Miami, FL 33199, USA.

JoAnne M. Youngblut, PhD, RN, FAAN [Professor of Nursing],

Florida International University, University Park, 11200SW 8th Street, Miami, FL 33199, USA.

Jean Hannan, PhD, ARNP [Assistant Professor],

Florida International University, University Park, 11200SW 8th Street, Miami, FL 33199, USA.

Frank Guido-Sanz, PhD (Candidate), ARNP,

Florida International University, University Park, 11200SW 8th Street, Miami, FL 33199, USA.

Donna Felber Neff, PhD, RN [Associate Professor], and

University of Florida, College of Nursing HPNP Room 3232; PO Box 100197, Gainesville, FL 32610, USA.

Wanee Deoisres, PhD, RN [Associate Professor]

Burapha University, Faculty of Nursing, 169 Longhard Bangsaen Road, Muang, Chon Buri Province, Thailand.

Abstract

The purpose of this study was to compare health problems and advanced practice nursing (APN) interventions in two types of APN care provided to 41 childbearing women with diabetes. The study's design involved content analysis of interaction logs containing the process of APN care during two clinical trials: 1) APN care was added to physician care ($n = 22$); and, 2) half of physician care was substituted with APN care ($n = 19$). Women's health problems and APN interventions were classified using the Omaha System's Problem Scheme and Intervention Scheme. The women, in the study, had a mean age of 30, and were predominantly Black, high school graduates, with a low income.

The findings identified 61,004 health problems and 60,980 APN interventions from the interaction logs. APNs provided significantly more interventions antenatally to the women in the substitution group than to those in the additive group. However, the overall categories of problems were the same in both groups. Surveillance and health teaching/counseling were the top APN interventions antenatally and postpartum. Case management interventions were third most common for both groups, while treatments and procedures constituted the least number of APN interventions in each group before and after birth.

When APNs shared care more equally with physicians, they intervened differently in type and number of interventions. Their broad range of skills and depth of understanding in clinical practice, health systems, family and personal issues allowed them to intervene early and effectively.

Keywords

APN interventions; Health care services; Diabetes in pregnancy

Background

The role and use of advanced practice nurses (APNs) has expanded globally due to an increased need for health care providers with advanced knowledge and skills.¹ APNs are practicing independently, in joint practices, and as members of health teams in large health care systems among a myriad of other practice sites. The scope and content of APN practice may differ depending on patient group, system policies and practice site. This increase and expansion of APN practice, for patients with chronic health problems and at high risk of poor outcomes, has been especially important for patient groups with limited access to care. Women with diabetes during pregnancy are one such group.

Women with diabetes during pregnancy encounter more than usual pregnancy discomforts. For those entering pregnancy with diabetes, maintaining appropriate diets and blood sugar levels can be challenging given increasing physiologic changes, including those that interfere with insulin use. Women who develop gestational diabetes must learn about both diabetes and how to manage it for the remainder of their pregnancy. The literature on problems of women with diabetes during pregnancy is heavily focused on provider directives regarding adherence to specific medical treatment plans (monitoring blood sugar, use of insulin and uterine activity).^{2, 3} Following pregnancy, management of women's postpartum problems is centered on provider directives to stabilize the preexisting diabetes or on monitoring the lingering effects of gestational diabetes. Postpartum care also is directed toward care of newborns,⁴ parenting, depression,⁵ fatigue, and return to work and school.⁶

However, the literature lacks empirical data, from the women's perspective, regarding profiles of common problems encountered, during or following pregnancy, that are complicated by diabetes.^{7, 8, 9} In addition, apart from specific medications or treatments, there are few empirical data on provider responses to common problems these women encounter and if provider responses differ by model of care delivery. Therefore, the purpose of this study of pregnant women with diabetes was to examine differences in type and frequency of health care problems, and APN interventions between two models of APN provided prenatal care. In one model, APN care was added to physician-provided prenatal care (additive). In the second model, half of physician-provided prenatal care was substituted with APN-provided prenatal care in the women's homes (substitution). Data, for this study, were derived from two randomized clinical trials, detailed below, that examined prenatal, maternal and infant outcomes, and health care costs through one year after delivery.

Additive APN Care

In the test of the additive APN care model, one group of women with diabetes during pregnancy received APN home visits and telephone outreach from antenatal hospitalization to eight weeks post-delivery. APNs were master's prepared clinical specialists. The APN intervention consisted of teaching and counseling about pregnancy and complications, diabetes management in pregnancy, monitoring and management of blood glucose, with backup from the women's respective physicians. A control group received routine antenatal and post-delivery care, with no additive APN care. Antenatally, women with diabetes followed by APNs had significantly fewer re-hospitalizations, fewer low birth weight infants (8.3% vs. 29%), and 38% lower total hospital charges than the control group.¹⁰

APN Substitution Care

In the APN substitution care model, women in the control group received prenatal care from physicians in the prenatal clinic or the physicians' offices. Women in the intervention group (i.e. APN substitution care) 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 respective homes.¹¹ Postpartum, APNs provided one home visit to the intervention group women. Women in the control group had no routine postpartum nurse visit. APN care for the intervention group (pregnancy to 8 weeks postpartum) included teaching, counseling, telephone outreach and daily telephone availability of the APNs, with physician backup. The APNs were master's prepared 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/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 re-hospitalizations (18 vs. 24), and a savings of 750 hospital days (\$2,496,145 USD) in favor of the APN intervention group.¹¹

The present study examined women's problems and APN interventions, in the two APN intervention groups (substitution and additive), so as to understand the mechanisms behind the intervention groups' improved outcomes over the control groups.

Method

Design

The study design was a content analysis of interaction logs containing the process of APN care during the two prior clinical trials.

Ethical Considerations

Approval to conduct the study was granted by the Institutional Review Board (IRB) of the researchers' academic institution. In addition, women participating in both prior clinical trials, from which the data were obtained, were informed about the nature of the study, what was involved to participate in the study, withdrawal at any time without repercussions, and anonymity and confidentiality issues. Women consenting to take part, in the previous two studies, signed a consent form.

Sample

The study sample consisted of the APN interaction logs from 41 pregnant women, from two APN clinical trial groups (19 substitution APN care & 22 additive APN care), who had diabetes during their pregnancies. In both trials, APNs providing the interventions recorded in interaction logs, as close to verbatim as possible, discussions with women during telephone, home and clinic visits. The logs documented care provided by APNs during each contact. Recorded data consisted of reason for contact, issues identified during contact, response of APN, woman's response and outcome of contact.

Women in the two groups did not differ on any of the demographic variables (see Table 1). The mean age of the women was approximately 30 years; 83% of the sample was Black; 34% had not completed high school; most had public insurance (73%); and, 49% had an annual income less than \$10,000 (USD). Although the mean number of pregnancies was 4.2, the mean number of living children was 1.5. Infants had an average gestational age of 38 weeks and a birth weight of 3344 grams. Seventy-five percent of the infants were born full-term.

Measures

The Omaha System's Problem Scheme was used to identify and classify health care problems identified by the women and/or the APNs. Each problem was assigned to one of the system's four broad (level 1) classifications or "domains," including: 1) environmental; 2) psychosocial; 3) physiological; and, 4) health-related behaviors. Each of these domains contains five to 16 subcategories of problems, for a total of 44 subcategories. Definitions are provided for each subcategory. Examples of subcategories within the physiological domain include: hearing; vision; circulation; and, ante/postpartum problems. Examples of subcategories within the psychosocial domain include: problems in caretaking/parenting; role change; communication; and, interpersonal relationships. Examples of subcategories within the environmental domain include: problems with income, sanitation, residence and neighborhood/workplace safety. Examples of subcategories within the health-related behavior domain include: problems with nutrition, sleep and rest, physical activity, personal hygiene, family planning, health care supervision and prescribed medications.

The Omaha System's Intervention Scheme was used to identify and classify the APN's interventions in response to each patient problem. The Intervention Scheme also contains four broad categories of interventions: 1) health teaching, guidance and counseling; 2) treatments and procedures; 3) case management; and 4) surveillance, along with a total of 63 nursing practice activities (targets). Examples of these practice activities (targets) include behavior modification, stress management, feeding procedures, dressing changes, positioning, safety and administering medications. Definitions are provided for each target. Validity of the Omaha System is supported by findings that the Omaha System explains variation in nursing resource consumption.¹² Martin and Scheet¹³ reported a range of 73 to 98 percent agreement for inter-coder reliability during the development of the Omaha System and percent agreement at or above 80% for the intervention categories and activities in 8 of 12 reliability testings in a subsequent study.

A "contact" was defined as any interaction between the APN and the women, as well as interactions between the APN and other health care providers about the women's care. Type of contact indicated where/how the contact took place, including home visits, telephone calls, clinic visits and hospital visits. Each contact was numbered consecutively, the type and duration (in minutes) of the contact was recorded, and classified as antenatal or postpartum.

Procedure

A photocopy was made of each log so coding notes could be written on the logs to leave a paper trail. Logs from the additive trial¹⁰ and the substitution trial¹¹ were divided into antenatal and postpartum sections and photocopied on different-colored paper to enhance accuracy in data coding and entry. For each contact in the interaction logs, the text of the interaction between the APN and the woman was divided into the smallest word or phrase that contained a single idea, called "units." Each unit was classified using the Omaha System.¹³ Based on the researchers' previous work using the Omaha System,¹⁴ this unit of analysis was most appropriate and feasible because it allowed analysis of individual health care problems and interventions, as well as aggregation and analysis at the contact and patient levels.

Each contact underwent a first read-through for understanding and examination for potential difficulties, i.e. poor photocopying or illegible handwriting. Content analysis began for each contact after a satisfactory read-through. During content analysis, data units were assigned to domains and subcategories for health care problems, and to intervention categories and targets for APN interventions. Category definitions in the Omaha System were strictly

applied during analysis, and clarifications, if needed, were obtained from Karen Martin, a developer of the system and a consultant on the study. For each contact, work sheets were used to record the contact number, type and duration of contact, health care problem (domain and subcategory), and APN intervention (category and target). These work sheets enhanced monitoring inter-coder reliability and facilitated data entry. Decision logs were maintained throughout the coding and shared by the two coders on the study. Inter-rater reliability was monitored throughout the study on a randomly selected sample of contacts and maintained at 85% or greater.

Results

Women's Problems

The number of health care problems for all 41 women totaled 61,004. The majority experienced 42,944 [70.4%] of them antenatally, with 18,060 (29.6%) occurring postpartum (see Table 2). The most prevalent health care problems were similar in both APN groups. Antenatally, in both the APN additive and APN substitution groups, problems in health-related behaviors were most prevalent followed by physiologic problems. However, antenatally there were a greater number of psychosocial problems in the APN substitution group. In the postpartum period, physiologic problems and then psychosocial problems were most common in both APN groups. However, APNs for the additive group identified slightly more physiologic problems, while the APNs for the substitution group identified slightly more psychosocial problems. These differences were apparent for both the antenatal and postpartum periods in both groups. The substitution group had a mean of 2642 ($SD = 1062$) problems (82.3% of total number of problems identified), significantly more than the mean of 491 ($SD = 366$; 17.7%) for the additive group, $t(21.69) = 8.41, p < .001$. In the antepartum period, the mean number of problems was 1883 ($SD = 1075$) for the substitution group, but only 326 ($SD = 321$) for the additive group, $t(20.77) = 6.09, p < .001$. The postpartum period reflected the same pattern, with a mean of 759 ($SD = 302$) problems for the substitution group and 165 ($SD = 206$) for the additive group, $t(39) = 7.45, p < .001$.

The three most frequent problems in each of the four broad classifications (domains) of women's problems are listed in Table 3. These three problems account for 89% to 100% of the total number of problems in their respective domains. Antenatally, the profile of the top three health care problems in health related behaviors and physiologic problems were similar in both APN groups. Antenatal physiologic problems focused on difficulty coping with body changes; problems with rest, exercise, diet, and discomforts; and, fears regarding delivery. The remaining physiologic problems were blood pressure, edema, cramping in the extremities, coughing and difficulty breathing. Nutritional problems included problems with blood sugar levels, weight gain and adherence to a prescribed diet. Problems in health care supervision focused on women having difficulty in caring for their symptoms, and seeking, obtaining and returning for medical care. The greatest psychosocial problem for the APN substitution group was interpersonal relationships (difficulty in establishing and maintaining relationships, incongruence in goals and values, and problems with communication skills). For the APN additive group, caretaking/parenting problems (providing newborn physical and emotional nurturance, safety issues, and difficulty with parenting responsibilities) were most common. In the environmental category, women in the APN substitution group had a greater number of residence (heating, lead-based paint, crowding and electrical) problems, but income problems were noted most frequently by women in the additive group.

After birth, women in both groups were focused on physiologic problems common to the postpartum period, followed by psychosocial problems of growth and development, including abnormal infant weight, length and head circumference, and lags in infant developmental tasks. In the health-related behavior domain, health care supervision and

nutritional problems were the two highest problems, with health care supervision at the top for the APN substitution group and nutritional problems as the top for the APN additive group.

APN Interventions

The total number of APN interventions for all 41 women was 61,007, 70.3% provided antenatally and 29.7% postpartum. The APNs provided significantly more interventions antenatally, [$t(20.77) = 6.08, p < .001$], postpartum [$t(39) = 7.45, p < .001$], and in total [$t(21.69) = 8.41, p < .001$] to the women in the substitution group than to the women in the additive group. In both APN groups, surveillance followed by health teaching/guidance/counseling were predominate interventions antenatally and postpartum. Case management interventions were the third most common for both groups, although the number of these interventions dropped from antenatal to postpartum. Treatments and procedures constituted the least number of APN interventions in each group, before and after birth (see Table 2).

The three most frequent APN intervention targets in each of the four broad classifications of interventions are listed in Table 4. In both groups, antenatally and postpartum, interventions regarding signs and symptoms of potential and actual physical problems were first or second in the categories of surveillance and health teaching/guidance/counseling. Reporting and intervening with laboratory findings (i.e. blood sugar, hemoglobin and WBC) was the second most common surveillance intervention in both groups, antenatally, and in the additive group postpartum. Problems in case management focused heavily on medical/dental care and communication (exchange of information between the women, APNs, physicians and other health care providers) for both groups. The number of interventions in the treatment and procedures category were slightly higher postpartum than antenatal for both groups.

Discussion

Study results provide important information about APN practice, overall, in caring for women with diabetes in pregnancy, as well as information on potential differences in APN functioning in the two APN models of care. APNs in both groups: followed women during pregnancy to 8 weeks postpartum; followed similar study protocols regarding the number of visits to the women antenatally and postpartum; and used their own clinical judgments in providing care. The latter included contacting the women more frequently when the APNs felt it was needed. In the additive group, although there was collaboration with physicians, APN care was added to routine physician prenatal and postpartum care. In the APN substitution group, the women's antenatal and postpartum care was more equally shared between the APNs and physicians.

Comparing the Two APN Models of Care

Overall, the profile of health care problems of the women, in both APN groups, was similar. The APN interventions differed in number and target between groups. Although similar in number of women in each group, 19 and 22, the mean number of problems identified and APN interventions were significantly higher in the substitution group.

These differences, between groups, may have been a function of the women in the additive group being a healthier group. However, there was no difference in demographics between groups. Another possible explanation was the level of shared responsibility for care in each of the APN groups. Women in the APN substitution group received more than double the number of contacts than women in the additive group [$M = 87.6 (SD = 44.0)$ vs. $M = 39.8 (SD = 30.9)$; $t(39) = 4.06, p < .001$]. This may be because, in the APN additive group,

physicians were responsible for all of the antenatal and postpartum management of the women, while in the substitution group APNs provided half of that care. As a function of this difference in management responsibility and authority, the APNs intervened differently in both type and amount of interventions.

Problems and APN Practice

The distribution of health problems encountered by women in both APN groups reflected the many common physiologic problems of women with diabetes in pregnancy. They required close monitoring of health behaviors for optimum maternal and newborn outcomes, making health-related behaviors the most frequently identified problem category, antenatally. Psychosocial problems reflected problems often encountered by low socioeconomic women and single mothers. Both in the antepartum and postpartum periods, women in the substitution group had problems regarding interpersonal relationships with spouses, partners, boyfriends and health care providers, while problems of caretaking/parenting and child neglect and abuse in the additive group made APN communication especially important.

In examining APN interventions, surveillance was the predominant APN function in providing care to women in both groups, followed by health teaching/guidance/counseling. Treatments and procedures accounted for 1% or less of total APN interventions in both groups. In the two original clinical trials, the APN-followed women, compared to women in the control groups, had fewer preterm infants, re-hospitalizations and reduced health care charges.^{10, 11}

The concentrated APN surveillance, early detection of health problems, and focused health teaching and counseling of women, regarding prevention and early detection of problems, helps explain the improved pregnancy outcomes and reduced health care charges in the original trials. Findings suggested the APNs' specialty knowledge, well-developed assessment skills, and effective patient teaching and communication played an important part in reducing morbidity and health care charges.

Case management was the third most frequent category of intervention in both APN groups, reflecting the complexity of care needed by vulnerable low income women whose pregnancies are complicated by diabetes. Women often found management of their diabetic regimens difficult and confusing during pregnancy, while APN care helped directly in the monitoring and management of their diabetes, and helped them make better use of the available resources.

Communication was the predominant antenatal APN intervention within the broad health teaching/guidance/counseling category and the second most frequent intervention within the broad surveillance and case management categories in the substitution group. Communication was the second most frequent intervention overall, antenatally, in the additive group. These rankings, as noted by D'Amour, Ferrada-Videla, San Martin Rodriguez, and Beaulieu,¹⁵ underscore the critical nature of APN communication skills in collaboration and negotiating systems to improve patient outcomes. Communication was especially important in this sample of women where there were problems in interpersonal relationships and caretaking/parenting. Prior studies have demonstrated communication and communication training for prenatal care workers is critical to women's use of prenatal care.^{8, 16}

Various approaches have been tested to improve maternal and infant outcomes in women with high risk pregnancies and other patient groups, including the use of home monitoring,¹⁷ telehealth approaches,¹⁹ public health nurses,²⁰ and lay or community workers.^{18, 21, 22}

Most studies report patient morbidity, hospitalizations, length of hospital stay and health care costs, but fail to report data on patient's problems or analysis of the provider's process of care. This study provided an overview of the range of problems in this sample of pregnant women with diabetes. Results also demonstrated the range of intervention skills of the master's prepared APNs who intervened in problems that ranged from: assessing and monitoring physiologic states of mother, fetus and newborn; teaching self-care, symptom management, monitoring and management of diabetes, including insulin and nutritional management; and, assisting in negotiating complex medical care systems, interpersonal relationships, transportation and problems with income and housing. These interventions resulted in: maintaining women in prenatal care; prolonging pregnancies; improved outcomes; and, reduced health care costs.

In conclusion, the number of APNs and their practice sites, in primary care, tertiary care and collaborative practices with other health care providers, is increasing worldwide. In each of these practice sites it is important to capture the process of APN care and the differences these processes make in improving patient outcomes. As this study demonstrated surveillance and teaching/guidance/counseling were predominant APN functions in improving patient outcomes in both types of APN care. While treatments and procedures comprised 1% or less of APN total functions with these two groups of pregnant women, such APN functions are likely more essential in tertiary care settings and underscore the importance of matching APN clinical specialization with the patient population receiving care so as to realize optimal outcomes.

Limitations and Recommendations

The study focused on pregnant women with diabetes who received interventions from master's prepared APNs. Thus, it is not known if other than master's prepared APNs would provide similar interventions and/or identify similar health care problems in pregnant women with diabetes. Future studies may want to focus on pregnant women with diabetes who receive interventions from non-master's prepared APNs. However, prior studies have demonstrated improved patient outcomes with more highly educated nurses.^{23, 24}

Acknowledgments

This study was supported by National Institute of General Medical Sciences (S06-GM008205-210029) and the National Institute of Nursing Research (R01-NR04102), National Institutes of Health, USA.

References

1. Sheer B, Wong FKY. The development of advanced nursing practice globally. *J Nurs Scholarsh.* 2008; 40(3):204–11. doi:10.1111/j.1547-5069.2008.00242.x. [PubMed: 18840202]
2. Garfield R, Maner W, Mackay L, Schlembach D, Saade G. Comparing uterine electromyography activity of antepartum patients versus term labor patients. *Am J Obstet Gynecol.* 2005; 193(1):23–9. doi:10.1016/j.ajog.2005.01.050. [PubMed: 16021054]
3. Metzger BE. Diet and medical therapy in the optimal management of gestational diabetes mellitus. *Nestlé Nutr Workshop Ser Clin Perform Programme.* 2006; 11:155–65. doi:10.1159/000094449.
4. Pridham K, Lin C, Brown R. Mothers' evaluation of their caregiving for premature and full-term infants through the first year: contributing factors. *Res Nurs Health.* 2001; 24:157–69. doi:10.1002/nur.1019. [PubMed: 11526615]
5. Kozhimannil K, Pereira M, Harlow B. Association between diabetes and perinatal depression among low-income mothers. *J Am Med Assoc.* 2009; 301:842–47. doi:10.1001/jama.2009.201.
6. DeMier R, Hynan M, Hatfield R, Varner M, Harris H, Manniello R. A measurement model of perinatal stressors: Identifying risk for postnatal emotional distress in mothers of high-risk infants. *J*

Clin Psychol. 2000; 6:89–100. doi: 10.1002/(SICI)1097-4679(200001)56:1<89::AID-JCLP8>3.0.CO;2-6. [PubMed: 10661371]

7. Anderberg E, Berntorp K, Crang-Svalenius E. Diabetes and pregnancy: women's opinions about the care provided during the childbearing year. *Scand J Caring Sci.* 2009; 23:161–70. doi: 10.1111/j.1471-6712.2008.00614.x. [PubMed: 19192239]
8. Leithner K, Assem-Hilger E, Fisher-Kern M, Loffler-Stastka H, Thien R, Ponocny-Seliger E. Prenatal care: The patient's perspective - a qualitative study. *Prenat Diagn.* 2006; 26:931–37. doi: 10.1002/pd.1529. [PubMed: 16845682]
9. Sidani S, Epstein D, Miranda J. Eliciting patient treatment preferences: A strategy to integrate evidence-based and patient centered care. *Worldviews Evid Based Nurs.* 2006; 3:116–23. doi: 10.1111/j.1741-6787.2006.00060.x. [PubMed: 16965313]
10. York R, Brown L, Samuels P, Finkler S, Jacobsen B, Persely C, et al. A randomized trial of early discharge and nurse specialist transitional follow-up care of high-risk childbearing women. *Nurs Res.* 1997; 46:254–61. [PubMed: 9316597]
11. Brooten D, Youngblut J, Brown L, Finkler S, Neff D, Madigan E. A randomized trial of nurse specialist home care for women with high-risk pregnancies: outcomes and costs. *Am J Manag Care.* 2001; 7:793–803. [PubMed: 11519238]
12. Hays B. Nursing care requirements and resource consumption in home health care. *Nurs Res.* 1992; 41:138–43. [PubMed: 1584655]
13. Martin, K.; Scheet, N. *The Omaha system: Application for community health nursing.* Saunders; Philadelphia (PA): 1992.
14. Brooten D, Youngblut J, Deatrck J, Naylor M, York R. Patient problems, advanced practice nurse interventions, time and contacts among five patient groups. *J Nurs Scholarsh.* 2003; 35:73–9. doi: 10.1111/j.1547-5069.2003.00073.x. [PubMed: 12701530]
15. D'Amour D, Ferrada-Videla M, San Martin Rodriguez M, Beaulieu M. The conceptual basis for interprofessional collaboration: Core concepts and theoretical frameworks. *J Interprof Care.* 2005; 19:116–31. doi:10.1080/13561820500082529. [PubMed: 16096150]
16. Bennett I, Switzer J, Aguirre A, Evans K, Barg F. "Breaking it down": Patient-clinician communication and prenatal care among African American women of low and higher literacy. *Ann Fam Med.* 2006; 4:334–40. doi:10.1370/afm.548. [PubMed: 16868237]
17. Harrison M, Kushner K, Benzies K, Kimak C, Jacobs P, Mitchell B. In-home nursing care for women with high-risk pregnancies: outcomes and cost. *Obstet Gynecol.* 2001; 97:982–7. [PubMed: 11384707]
18. Mendelson S, McNeese-Smith D, Koniak-Griffin D, Nyamathi A, Lu M. A community-based parish nurse intervention program for Mexican American women with gestational diabetes. *J Obstet Gynecol Neonatal Nurs.* 2009; 37:415–25. doi:10.1111/j.1552-6909.2008.00262.x.
19. MacDonald-Rencz S, Craddock T, Parker-Taillon D. The national initiative for telehealth guidelines. *Telemed J E Health.* 2004; 10:113–4. doi:10.1089/153056204773644661. [PubMed: 15104924]
20. Nguyen JD, Carson ML, Parris K, Place P. A comparison pilot study of public health field nursing home visitation program interventions for pregnant Hispanic adolescents. *Public Health Nurs.* 2003; 20:412–8. doi:10.1046/j.1525-1446.2003.20509.x. [PubMed: 12930465]
21. Norr K, Crittenden K, Lehrer E. Maternal and infant outcomes at one year for a nurse-health advocate home visiting program serving African Americans and Mexican Americans. *Public Health Nurs.* 2003; 20:190–203. doi:10.1046/j.0737-1209.2003.20306.x. [PubMed: 12716399]
22. Persily CA. Lay home visiting may improve pregnancy outcomes. *Holist Nurs Pract.* 2003; 17(5): 231–8. [PubMed: 14596372]
23. Aiken L, Clarke S, Cheung R, Sloane D, Silber J. Educational levels of hospital nurses and surgical patient mortality. *J Am Med Assoc.* 2003; 290:1617–23. doi:10.1001/jama.290.12.1617.
24. McGillis Hall L, Doran D, Baker R. Nursing staffing models as predictors of patient outcomes. *Med Care.* 2003; 41:1096–1109. doi:10.1097/01.MLR.0000084180.07121.2B. [PubMed: 12972849]

Table 1

Demographic Characteristics of the Additive APN Group and the Substitution APN Group

Characteristic	Total (N = 41)	Additive Group (n = 22)	Substitution Group (n = 19)	Statistic
<i>Age in Years</i> [M(SD)]	30.0 (5.41)	29.2 (5.40)	30.8 (5.43)	$t = 0.98$
Race				
• Black	34 (83%)	17 (77%)	17 (90%)	$X^2 = 1.07$
• White	7 (17%)	5 (23%)	2 (10%)	
Education				
• < High School	14 (34%)	7 (32%)	7 (37%)	$X^2 = 1.45$
• High School Grad	10(24%)	7 (32%)	3 (16%)	
• > High School	17 (42%)	8 (36%)	9 (47%)	
Annual income				
• < \$10,000	17 (49%)	8 (42%)	9 (56%)	$X^2 = 1.41$
• \$10,000 - 20,000	10 (28%)	7 (37%)	3 (19%)	
• > \$20,000	8 (23%)	4 (21%)	4 (25%)	
<i>Gravida</i> (w/current preg.) [M(SD)]	4.2 (2.24)	4.7 (2.23)	3.5 (2.14)	$t = 1.68$
<i>Para</i> (w/o study infant) [M(SD)]	1.5 (1.38)	1.9 (1.58)	1.2 (1.02)	$t = 1.67$
<i>Infant gestational age</i> (wks.) [M(SD)]	38.0 (2.38)	38.6 (1.78)	37.4 (2.83)	$t = 1.57$
• Preterm [M(SD)]	35.0 (2.89)	36.2 (1.79)	33.9 (3.49)	$t = 1.32$
• Full-term [M(SD)]	39.0 (0.98)	39.3 (0.95)	38.7 (0.92)	$t = 1.87$
<i>Infant birth weight</i> (grams) [M(SD)]	3344 (628)	3480 (528)	3194 (707)	$t = 1.46$
• Preterm [M(SD)]	3111 (968)	3408 (749)	2814 (1152)	$t = 0.97$
• Full-term [M(SD)]	3422 (463)	3502 (468)	3330 (457)	$t = 1.01$

*
 $p < .05$ **
 $p < .01$

preg. = pregnancy

Table 2

Health Care Problems and APN Interventions, During and Following Pregnancy, for Women with Diabetes in the Additive APN and Substitution APN Groups

	Total (N = 41) N (%)	Additive Study (n = 22) N (%)	Substitution Study (n = 19) N (%)	X ²
Problem Domain				
<i>Antenatal</i>				352.9**
Environmental	707 (1.6%)	87 (1.2%)	620 (1.7%)	
Psychosocial	1936 (4.5%)	28 (0.4%)	1908 (5.3%)	
Physiologic	19,777 (46.1%)	3498 (48.9%)	16,279 (45.5%)	
Health-related Behaviors	20,524 (47.8%)	3548 (49.5%)	16,976 (47.5%)	
<i>Postpartum</i>				35.87**
Environmental	137 (0.8%)	36 (1.0%)	101 (0.7%)	
Psychosocial	5348 (29.6%)	964 (26.5%)	4384 (30.4%)	
Physiologic	8140 (45.0%)	1783 (49.0%)	6357 (44.1%)	
Health-related Behaviors	4435 (24.6%)	855 (23.5%)	3580 (24.8%)	
Intervention Categories				
<i>Antenatal</i>				1364.4**
Health teaching, guidance, & counseling	11,725 (27.4%)	2779 (38.8%)	8973 (25.1%)	
Treatments & procedures	214 (0.5%)	19 (0.3%)	195 (0.5%)	
Case management	3960 (9.2%)	1176 (16.4%)	2784 (7.8%)	
Surveillance	27,020 (62.9%)	3190 (44.5%)	23,830 (66.6%)	
<i>Postpartum</i>				436.16**
Health teaching, guidance, & counseling	5154 (28.5%)	1102 (30.3%)	4052 (28.1%)	
Treatments & procedures	174 (1.0%)	29 (0.8%)	145 (1.0%)	
Case management	1140 (6.3%)	492 (13.5%)	648 (4.5%)	
Surveillance	11,593 (64.2%)	2016 (55.4%)	9577 (66.4%)	

* p < .05

** p < .01

Table 3

Three Most Frequent Health Care Problems in Each Domain

Domain	Top Three Health Care Problems	
	Additive Group (n = 22)	Substitution Group (n = 19)
<i>Antenatal</i>		
Environmental	Income (49)	Residence (31)
	Sanitation (1)	Residence (343)
	Sanitation (186)	Income (82)
Psychosocial	Caretaking/parenting (22)	Growth & development (4)
	Neglected child/adult (2)	Interpersonal relationship (1483)
	Caretaking/parenting (130)	Growth & development (120)
Physiologic	Antenatal (3115)	Circulation (87)
	Respiration (86)	Antenatal (15,713)
	Respiration (295)	Circulation (87)
Health-related Behaviors	Nutrition (2476)	Health care supervision (879)
	Prescribed medication regimen (18)	Nutrition (8439)
	Health care supervision (8015)	Prescribed medication regimen (44)
<i>Postpartum</i>		
Environmental	Residence (22)	Income (13)
	Neighborhood safety (1)	Residence (82)
	Income (11)	Sanitation (5)
Psychosocial	Growth & development (488)	Caretaking/parenting (411)
	Abused child/adult (44)	Growth & development (2772)
	Interpersonal relationships (987)	Caretaking/parenting (596)
Physiologic	Postpartum (1581)	Integument (61)
	Circulation (33)	Postpartum (5334)
	Integument (745)	Pain (112)
Health-related Behaviors	Nutrition (447)	Health care supervision (307)
	Prescribed medication regimen (10)	Health care supervision (2622)
	Nutrition (768)	Family planning (21)

Table 4

Three Most Frequent APN Intervention Targets in Each Intervention Category

APN Intervention Category	Intervention Target	
	Additive Group (n = 22)	Substitution Group (n = 19)
Antenatal		
Health teaching, guidance, & counseling	Sickness/injury care (587)	Signs/symptoms physical (574)
	Nutrition (374)	Signs/symptoms physical (1267)
	Communication (1723)	Medical/dental care (1123)
Treatments & procedures	Medication admin./compliance (5)	Nutrition (5)
	Screening (3)	Medical/dental care (39)
	Transportation (29)	Screening (25)
Case management	Communication (875)	Medical/dental care (229)
	Nutrition (25)	Medical/dental care (735)
	Communication (671)	Screening (420)
Surveillance	Signs/symptoms physical (1502)	Lab findings (621)
	Nutrition (256)	Signs/symptoms physical (5526)
	Lab findings (4938)	Communication (2766)
Postpartum		
Health teaching, guidance, & counseling	Signs/symptoms physical (169)	Sickness/injury care (135)
	Nutrition (115)	Communication (816)
	Signs/symptoms physical (458)	Medical/dental care (357)
Treatments & procedures	Growth & development (9)	Dressing change/wound care (9)
	Caretaking/parenting (8)	Dressing change/wound care (76)
	Personal care (15)	Transportation (11)
Case management	Communication (363)	Medical/dental care (93)
	Sickness/injury care (8)	Communication (274)
	Medical/dental care (223)	Family planning (25)
Surveillance	Signs/symptoms physical (834)	Lab findings (155)
	Dressing change/wound care (132)	i Signs/symptoms physical (2418)
	Communication (1360)	Medical/dental care (989)