OBSTETRICS

Group prenatal care: model fidelity and outcomes

Gina Novick, PhD, CNM; Allecia E. Reid, PhD; Jessica Lewis, CMFT; Trace S. Kershaw, PhD; Sharon Schindler Rising, CNM, MSN; Jeannette R. Ickovics, PhD

OBJECTIVE: CenteringPregnancy group prenatal care has been demonstrated to improve pregnancy outcomes. However, there is likely variation in how the model is implemented in clinical practice, which may be associated with efficacy, and therefore variation, in outcomes. We examined the association of fidelity to process and content of the CenteringPregnancy group prenatal care model with outcomes previously shown to be affected in a clinical trial: preterm birth, adequacy of prenatal care, and breast-feeding initiation.

STUDY DESIGN: Participants were 519 women who received CenteringPregnancy group prenatal care. *Process fidelity* reflected how facilitative leaders were and how involved participants were in each session. *Content fidelity* reflected whether recommended content was discussed in each session. Fidelity was rated at each session by a trained researcher. Preterm birth and adequacy of care were abstracted from medical records. Participants self-reported breast-feeding initiation at 6 months postpartum.

RESULTS: Controlling for important clinical predictors, greater process fidelity was associated with significantly lower odds of both preterm birth (B = −0.43, Wald $\chi^2 = 8.65$, $P = .001$) and intensive utilization of care (B = −0.29, Wald $\chi^2 = 3.91$, $P = .05$). Greater content fidelity was associated with lower odds of intensive utilization of care (B = −0.03, Wald $\chi^2 = 9.31$, $P = .001$).

CONCLUSION: Maintaining fidelity to facilitative group processes in CenteringPregnancy was associated with significant reductions in preterm birth and intensive utilization of care. Content fidelity also was associated with reductions in intensive utilization of care. Clinicians learning to facilitate group care should receive training in facilitative leadership, emphasizing the critical role that creating a participatory atmosphere can play in improving outcomes.

Key words: CenteringPregnancy, facilitative leadership, group prenatal care, model fidelity, preterm birth

Cite this article as: Novick G, Reid A, Lewis J, et al. Group prenatal care: model fidelity and outcomes. Am J Obstet Gynecol 2013;209:112.e1-6.

CenteringPregnancy, an innovative model of group prenatal care that integrates physical assessment with extensive health education and group support, has been demonstrated to improve several important pregnancy outcomes.[1-6] In a large multisite randomized controlled trial, CenteringPregnancy group prenatal care reduced the likelihood of preterm birth by 33%, with an even greater reduction among African American women, compared with individual prenatal care.[1] CenteringPregnancy also reduced the likelihood of inadequate care and increased initiation of breast-feeding.[1]

★ EDITORS' CHOICE ★

Despite the success of CenteringPregnancy, obstetrical providers and clinical sites likely differ in how they implement the model. Although data are limited, elements considered essential for model fidelity[7,8] are sometimes dropped,[9-11] and such variation in implementation may be associated with variation in intervention efficacy.[10] A small body of existing literature suggests that greater fidelity to a structured intervention is associated with improvements in health and educational outcomes.[12-15] We consider 2 types of fidelity: *process fidelity* refers to the strategies and skill with which the intervention is delivered by individuals providing the intervention, whereas *content fidelity* is the provision of the model's treatment, programmatic material, or knowledge with the frequency and duration prescribed by the model's designers.[16] Understanding whether and how implementation factors influence intervention efficacy is crucial for widespread translation of an efficacious intervention into clinical practice. This study examined the association of fidelity to CenteringPregnancy's recommended

From the School of Nursing (Dr Novick), Center for Interdisciplinary Research on AIDS (Dr Reid), and School of Public Health (Ms Lewis and Drs Kershaw and Ickovics), Yale University, New Haven, CT, and the Centering Healthcare Institute, Silver Spring, MD (Ms Rising).

Received Nov. 29, 2012; revised Feb. 27, 2013; accepted March 19, 2013.

This project was funded in part by National Institute of Mental Health grant numbers R01 MH/HD61175 (to J.R.I.) and T32 MH20031 (to A.R.), and National Institute of Nursing Research grant number T32 NR008346 (to G.N.).

S.S.R. is CEO of the nonprofit entity the Centering Healthcare Institute Inc, which promotes the CenteringPregnancy model of care nationally and internationally. The other authors report no potential conflict of interest.

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Reprints not available from the authors.

0002-9378/free • http://dx.doi.org/10.1016/j.ajog.2013.03.026

For Editors' Commentary, see Contents

TABLE 1
Recommended discussion topics for CenteringPregnancy sessions

Variable	Session no.									
Topic	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Centering overview	X									
Nutrition	X	X								
Common discomforts of pregnancy		X								
Body mechanics and exercise		X								
Substance use/toxic exposures		X								
Relaxation			X	X	X	X	X	X	X	X
Labor			X		X	X	X	X		
Family and parenting issues			X	X						
Baby feeding			X						X	X
Contraception/birth control/condom use				X			X			X
Relationship issues/sexuality				X			X			
HIV/STI[a]				X			X			
Sexual communication and negotiation[a]						X	X			
Signs of labor					X	X	X			
Premature labor					X					
Birth experience					X	X	X			
Tour of birthing unit					X					
Early postpartum care[b]						X	X			
Emotional adjustment postpartum								X		
Baby care							X		X	X
Discussion of siblings									X	
Sharing birth stories									X	X
Future plans										X

Checklist derived from intervention protocols for randomized controlled trial, based on CenteringPregnancy program guidelines.

HIV, human immunodeficiency virus; *STI*, sexually transmitted infection.

[a] Only recommended in CenteringPregnancy Plus arm; [b] Only recommended in CenteringPregnancy arm.

Novick. Group prenatal care fidelity and outcomes. Am J Obstet Gynecol 2013.

processes and content with outcomes affected by CenteringPregnancy in the prior randomized controlled trial: preterm birth, adequacy of care, and breastfeeding initiation.

CenteringPregnancy group prenatal care

CenteringPregnancy group prenatal care provides prenatal care to groups of women of similar gestational age and their significant others. This model has been discussed in detail elsewhere, and will be described briefly here.[1,2,17] Group sessions begin in the second trimester and follow the standard prenatal visit schedule for a total of 10 sessions. CenteringPregnancy is provided by a prenatal care provider such as a nurse-midwife, nurse practitioner, or physician, along with another clinician or staff member. CenteringPregnancy groups consist of 8-12 pregnant women, and may include the father of the baby and/or other persons (eg, sister, mother).

During CenteringPregnancy sessions, women first check and record their own weight and blood pressure, followed by a prenatal examination conducted by a clinician within the group space. While waiting, women chat informally and fill out self-assessment sheets, which are used later in the discussion. The remainder of the session consists of group discussion facilitated by the clinician and a cofacilitator, which lasts approximately 60-90 minutes.[17,18] The group format provides pregnant women with 15-20 hours of contact time with the same provider, which contrasts with approximately 2.5 hours of total contact time during 10 traditional, individual prenatal visits. This allows for discussion of a wide range of pregnancy-related health content, including early pregnancy concerns, childbirth preparation, and psychological and social issues (Table 1). Participation in group discussions is voluntary, and women decide what personal information they would like to share with the group. To maintain privacy, confidentiality guidelines are discussed in the group and all participants sign a confidentiality agreement.

Although there is a schedule of recommended topics for discussion during each session, an important feature of CenteringPregnancy is the use of a facilitative, or nondidactic, leadership approach. Group leaders guide rather than control the group discussions, so participants' interests significantly influence the direction discussions take and the topics covered. Group leaders also promote engagement by employing participatory group activities, by referring questions raised during discussions back to the group, and by encouraging women to share information with one another. Therefore, the model can be considered more process driven, rather than content driven. To create a social atmosphere and to stimulate interaction, everyone sits in an open circle, time is allotted for socializing, and healthy snacks are provided.[2,17] The CenteringPregnancy model thus incorporates several elements that are quite distinct from individual prenatal visits: self-care, prenatal examinations in the group space, extended contact time with clinicians, expanded educational content, facilitated group discussion, and peer support. To date, however, no studies

have explored how fidelity to the implementation of CenteringPregnancy may be associated with intervention outcomes. The goal of these analyses was to examine the associations of process and content fidelity with pregnancy outcomes. We hypothesized that participants in groups with higher fidelity to facilitative group process and to content recommendations would have lower likelihood of preterm birth and higher likelihood of receiving adequate care and initiating breast-feeding.

Materials and Methods

We conducted a secondary analysis of data from the randomized controlled trial of group prenatal care that demonstrated a reduced likelihood of preterm birth and inadequate care and increased likelihood of breast-feeding initiation.[1] Inclusion in the parent study required that participants were <24 weeks' gestation, were between 14-25 years old, did not have high-risk pregnancies at enrollment (eg, diabetes, human immunodeficiency virus [HIV]), spoke English or Spanish, and were receiving prenatal care at 2 public health centers in Atlanta, GA, and New Haven, CT. Women were randomized to 1 of 3 arms: (1) standard individual care; (2) standard CenteringPregnancy group prenatal care (CP); or (3) CenteringPregnancy Plus, which included the same content as CP with added HIV prevention components (CP+). Because fidelity measures were not collected for the standard individual care visits, we analyzed only women randomized to 1 of the 2 group conditions (CP or CP+). Women were assigned to prenatal groups based only on gestational age. Groups therefore included women of different ages and ethnicities.

Group prenatal care providers were nurse-midwives, obstetrical residents, and attending obstetricians who worked in the 2 hospital-based clinics. All providers received 2 full days of formal training in CenteringPregnancy group prenatal care and facilitative leadership. Providers also received extensive training in the research protocol. Procedures were approved by human investigation committees at both sites (no. 11972, Yale University, New Haven, CT; and no. 197−2001, Emory University, Atlanta, GA).

Prior to entry into group prenatal care, women provided self-report data during their first trimester of pregnancy. Follow-up data collection and sexually transmitted infection (STI) testing occurred during the third trimester and again at 6 months postpartum. There was no evidence of differential attrition across arms of the intervention.[1,4] Inclusion in analyses examining preterm birth and adequacy of prenatal care required that a woman's medical records had been reviewed and that she had a singleton pregnancy, provided complete data on all first-trimester control variables, and participated in STI testing during her third trimester (n = 519). Inclusion in breast-feeding initiation analyses required participation in the 6-month postpartum interview when breast-feeding was assessed (n = 435).

Measures

Outcomes

Gestational age at delivery was obtained by review of inpatient medical records. Reviews were conducted by trained medical abstractors who were independent of care and blinded to study assignment.[1] Gestational age at delivery was dichotomized as full term vs preterm (<37 weeks). Adequacy of prenatal care was assessed by review of outpatient medical records and was categorized into inadequate, adequate, and intensive utilization of care using standard scoring on the Kotelchuck[19] Index. These terms are defined as follows: inadequate care reflects women who began prenatal care after the fourth month of gestation or attended ≤79% expected visits; adequate care and intensive utilization of care reflect women who began care by the fourth month and attended 80-109% or ≥110% of expected visits, respectively. In analyses, adequate care was always the reference group, compared against inadequate or intensive utilization of care. Whether or not a woman had initiated breast-feeding (yes or no) was assessed 6 months postpartum in a structured interview.

Fidelity

Process fidelity was measured using 2 items: "To what extent was the group session didactic vs facilitative?" and "How much were group members involved and connected?" Response options ranged from 1-10 (didactic to facilitative, and not at all to very much, respectively). Leader facilitation and group involvement scores were created by averaging ratings for each item across all 10 intervention sessions. Leader facilitation and group involvement scores were highly correlated (r = 0.76) and analyses examining each as a separate predictor were consistent across outcomes; therefore the 2 items were averaged to reflect a measure of process fidelity. Content fidelity was assessed using a checklist to indicate which of the recommended topics had been discussed during the session. For each session, we calculated the proportion of topics recommended for that session that were actually discussed. Content fidelity scores reflect average adherence to recommended topics across all 10 sessions.

Process and content fidelity were assessed independently by both a trained researcher assigned to each group and the group care provider at the end of each session. Researcher fidelity ratings were not made available to intervention providers. Researcher and intervention providers' ratings of fidelity to process and content converged (r = 0.55, P = .001 for process fidelity; mean kappa = .59, mean agreement = 86% for content fidelity). Because the trained researchers provided more complete data, their ratings were used as the primary indicators of fidelity. When the researchers' ratings were missing, they were supplemented with ratings provided by the prenatal care providers.

Data analysis

Analyses were collapsed across study arms because mean levels of process fidelity, content fidelity, and the examined outcomes did not differ between CP and CP+ (all P values > .09). Associations of process and content fidelity with preterm birth, adequacy of care, and breast-feeding initiation were examined using generalized estimating equations

TABLE 2
Relationships of process and content fidelity to outcomes

	Unadjusted analysis			Adjusted analysis		
Variable	B	Wald χ^2	*P* value	B	Wald χ^2	*P* value
Process fidelity						
Preterm birth	−0.41	7.21	.01	−0.43	8.65	.001
Inadequate vs adequate care	0.19	2.07	.15	—	—	—
Intensive vs adequate care	−0.40	11.01	.001	−0.29	3.91	.05
Breast-feeding initiation	0.03	0.10	.75	—	—	—
Content fidelity						
Preterm birth	−0.01	0.97	.33	—	—	—
Inadequate vs adequate care	−0.01	0.87	.35	—	—	—
Intensive vs adequate care	−0.03	6.14	.01	−0.03	9.31	.001
Breast-feeding initiation	−0.01	0.31	.58	—	—	—

Novick. Group prenatal care fidelity and outcomes. Am J Obstet Gynecol 2013.

to account for nonindependence among women assigned to the same prenatal care group. As interpreting generalized estimating equations with multinomial data can be complicated, adequacy of care was examined as 2 separate dichotomous outcomes (inadequate vs adequate care; intensive vs adequate care). We first examined unadjusted associations of process and content fidelity with outcomes. When significant unadjusted relationships were observed ($P \leq .05$), the associations of process and content fidelity were then examined in adjusted analyses.

Study arm, study site, and clinical factors related to preterm birth, adequacy of care, and breast-feeding were included as covariates in adjusted analyses.[1,5,20] These included study arm (CP vs CP+), study site (Atlanta, GA, vs New Haven, CT), race (African-American vs all others), age, education, employment, relationship status, parity (0 vs ≥1), body mass index, any history of adverse pregnancy outcomes (eg, stillbirth), any current pregnancy complications (eg, gestational diabetes), acquiring STI during pregnancy, any cigarette use, any drug use, depressive symptomatology, stress, self-esteem, and social support. Because inadequate care relates to preterm birth,[16] dummy codes capturing inadequate and intensive utilization of care vs adequate care were included as covariates in the adjusted preterm birth analysis.

RESULTS

Participants in the present study were 519 young women (CP: n = 263; CP+: n = 256) in 77 prenatal care groups. Mean group size was 8 women (range, 3−16). Women were predominantly African American (81.5%); 10.8% identified as Hispanic and 6% as white and 1.7% as other. Women averaged 20 years of age (range, 14−25). In all, 50% had completed high school, 80% were in a relationship, and 33% were primarily supported by their own income. Mean gestational age at delivery was 39.4 weeks (range, 24−42 weeks). Of participants, 67% were nulliparous. In all, 7.7% delivered preterm. Most women had adequate care (57%), with 25% having inadequate care and 18% having intensive utilization of care. Rates of preterm birth did not differ between those who received inadequate vs adequate care ($\chi^2 = .51$, $P = .48$). Of participants, 56% initiated breast-feeding.

Across prenatal care groups, fidelity to both process and content was high. Process fidelity scores ranged from 5.4−9.7 (on a scale of 1-10), with a mean of 7.7. Content fidelity ranged from .41−1.00, with a mean of .70. Excluding topics only relevant to CP+ (ie, HIV content), on average, groups discussed 95% of the recommended topics at least once across the 10 sessions (range, 77−100%).

Results of the unadjusted and adjusted analyses are presented in Table 2. In unadjusted analyses, greater process fidelity was associated with lower odds of both preterm birth and intensive care. Content fidelity was related only to lower odds of intensive care. In adjusted analyses, process fidelity remained significantly associated to both preterm birth (B = −0.43, Wald $\chi^2 = 8.65$, $P = .001$) and intensive care (B = −0.29, Wald $\chi^2 = 3.91$, $P = .05$) over and above the medical and biological covariates included. Content fidelity also remained significantly related to intensive care (B = −0.03, Wald $\chi^2 = 9.31$, $P = .001$) in adjusted analyses. Neither process nor content fidelity differentiated between inadequate and adequate care or between women who did and did not breast-feed (all *P* values > .15).

COMMENT

This study begins to identify specific features of process and content associated with improved outcomes and utilization of group prenatal care. Our findings support implementation research that suggests the importance of process fidelity for behavioral interventions.[12,13] Specifically, greater facilitation was associated with lower odds of both preterm birth and intensive utilization of care. Participating in highly facilitative groups may provide social support and increase learning, thereby enhancing intervention effects.[20-23] Women receiving CenteringPregnancy have previously reported developing meaningful relationships with women and group leaders.[2,24] Highly facilitative groups can help women feel comfortable, relieve fears,[2,23-25] and enable behavior change.[2,25] These effects may be especially important for women from vulnerable populations who are at risk of adverse pregnancy outcomes,[26] and who may experience chronic challenges such as poverty, neighborhood stressors, and homelessness.[20,27,28]

Increased content fidelity was associated only with reduced odds of intensive

utilization of care. Information about normal pregnancy changes, conveyed at times in pregnancy designed to anticipate women's concerns, may help reduce questions and worries, leading women to seek fewer extra individual visits. In contrast, content fidelity was not associated with preterm birth or with initiating breast-feeding. This finding might seem surprising, as following content guidelines might be expected to improve outcomes; however, although CenteringPregnancy guidelines include discussion topics for each session, adhering to that sequence is not required; in fact, strict adherence may conflict with promoting group member involvement and direction of discussions.

Nonetheless, since adherence to the schedule of topics was high, with groups discussing, on average, 70% of topics on schedule, it is possible that variation in timing was not sufficient to demonstrate a difference in outcomes. Furthermore, there was substantial fidelity to *overall* content delivery, with groups discussing an average of 95% of all topics at least once throughout the 10 sessions, regardless of timing. Finally, given that breast-feeding is a postpartum behavior, timing of breast-feeding discussion may not be important, as long as it is discussed prior to birth.

Limitations and strengths

The measure of process fidelity evidenced restriction of range; groups were fairly facilitative, with scores above the midpoint of the scale, limiting the variance and potentially our ability to find significant relationships. Greater variation in process fidelity scores might be expected in a large effectiveness study. Further, additional features of process fidelity were not reflected in our brief 2-item measure. For example, we did not measure whether examinations were conducted within the group space or whether groups sat in a circle for discussions. However, given the observed relationships of process fidelity to outcomes and the high correspondence between raters' assessments of the items, our measure appears to meaningfully capture group processes. Data were drawn from a randomized controlled trial in which attention to the implementation of all components of the CenteringPregnancy model, including components not examined at present, was carefully observed.[1] However, when CenteringPregnancy is translated into clinical settings, there is evidence that adherence to some features of the model does not occur.[10] This loss of fidelity may affect the magnitude of observed outcomes and the relationships of indicators of fidelity to these outcomes. In addition, the study sample consisted of young, minority women receiving care in 2 urban clinics; therefore, findings may not generalize to other populations and settings. Finally, the Kotelchuck[19] Index does not differentiate between additional visits that are medically indicated vs those that are not. We do not have data regarding reasons for additional visits; therefore, it is unclear whether greater process fidelity was primarily associated with fewer visits that were not medically indicated.

Despite these limitations, the study has a number of strengths, including rigorous data collection procedures, a large sample size, analysis procedures that appropriately accounted for the nested nature of the data, novel findings, and implications for patient care. Furthermore, the inclusion of a young vulnerable population may also be considered a strength—especially considering improved outcomes with regard to preterm birth and other outcomes.

Implications

Biobehavioral interventions are particularly vulnerable to loss of fidelity when implemented, owing to their intrinsic complexity and to factors in clinical settings that impede adherence.[10,14,16,29,30] CenteringPregnancy has been previously demonstrated to reduce preterm birth, and the effect on this intractable problem may be even stronger with greater model fidelity. Therefore, future training and research should identify specific elements of CenteringPregnancy that are subject to loss of fidelity, and factors in settings that impede group processes.

Training health care providers to provide group prenatal care and to develop a more facilitative style of communication should be incorporated into medical and nursing programs for educating new obstetrical providers. Experienced clinicians originally educated to provide individual care also need training and ongoing support as they transition to the new role of group facilitator, which may be challenging.[31] Finally, all training in facilitation should include developing an awareness of the critical role that creating a participatory atmosphere may have in improving outcomes, and reassurance that content suggestions are simply recommendations, not requirements.

Future research should explore fidelity prospectively to identify specific components of the CenteringPregnancy model that affect outcomes. This research should employ more fine-grained, reliable, valid measures of facilitator and participant behaviors and perceptions; incorporate qualitative methods[32,33]; and compare the impact of different combinations of model components on outcomes. We also need to determine the impact of providing different amounts and types of health education in group prenatal care, and to compare the effects of content provided in group and in individual care on outcomes. Understanding the impact of fidelity to these model features on outcomes will contribute to the design of future prenatal care interventions by supporting development of evidence-based approaches for enhancing intervention effects on pregnancy outcomes. ■

ACKNOWLEDGMENTS

We would like to thank Sangchoon Jeon, PhD, for his assistance during the initial phase of this project.

REFERENCES

1. Ickovics JR, Kershaw TS, Westdahl C, et al. Group prenatal care and perinatal outcomes: a randomized controlled trial. Obstet Gynecol 2007;110:330-9.

2. Novick G, Sadler LS, Kennedy HP, Cohen SS, Groce NE, Knafl KA. Women's experience of group prenatal care. Qual Health Res 2011;21:97-116.

3. Picklesimer AH, Billings D, Hale N, Blackhurst D, Covington-Kolb S. The effect of CenteringPregnancy group prenatal care on

preterm birth in a low-income population. Am J Obstet Gynecol 2012;206:415.e1-7.
4. Kershaw TS, Magriples U, Westdahl C, Rising SS, Ickovics J. Pregnancy as a window of opportunity for HIV prevention: effects of an HIV intervention delivered within prenatal care. Am J Public Health 2009;99:2079-86.
5. Magriples U, Kershaw TS, Rising SS, Massey Z, Ickovics JR. Prenatal health care beyond the obstetrics service: utilization and predictors of unscheduled care. Am J Obstet Gynecol 2008;198:75.e1-7.
6. Tanner-Smith EE, Steinka-Fry KT, Lipsey MW. A multi-site evaluation of the Centering-Pregnancy programs in Tennessee. Nashville, TN: Vanderbilt University; 2012.
7. Centering Healthcare Institute. Site approval. Available at: http://www.centeringhealthcare.org/pages/centering-model/site-approval.php. Accessed Nov. 30, 2012.
8. Centering Healthcare Institute. Essential elements. Available at: https://www.centeringhealthcare.org/pages/centering-model/elements.php. Accessed Dec. 2, 2012.
9. Andersson E, Christensson K, Hildingsson I. Parents' experiences and perceptions of group-based antenatal care in four clinics in Sweden. Midwifery 2012;28:502-8.
10. Novick G, Sadler LS, Knafl KA, Groce NE, Kennedy HP. In a hard spot: providing group prenatal care in two urban clinics. Midwifery 2012; http://dx.doi.org/10.1016/j.midw.2012.06.013.
11. Wedin K, Molin J, Crang Svalenius EL. Group antenatal care: new pedagogic method for antenatal care—a pilot study. Midwifery 2010;26:389-93.
12. O'Donnell CL. Defining, conceptualizing, and measuring fidelity of implementation and its relationship to outcomes in K-12 curriculum intervention research. Rev Educ Res 2008;78:33-84.
13. Resnick B, Bellg AJ, Borrelli B, et al. Examples of implementation and evaluation of treatment fidelity in the BCC studies: where we are and where we need to go. Ann Behav Med 2005;29(Suppl):46-54.
14. Allen JD, Linnan LA, Emmons KM. Fidelity and its relationship to implementation effectiveness, adaptation, and dissemination. In: Brownson RC, Colditz GA, Proctor EK, eds. Dissemination and implementation research in health. New York: Oxford University Press; 2012.
15. Hogue A, Henderson CE, Dauber S, Barajas PC, Fried A, Liddle HA. Treatment adherence, competence, and outcome in individual and family therapy for adolescent behavior problems. J Consult Clin Psychol 2008;76:544-55.
16. Carroll C, Patterson M, Wood S, Booth A, Rick J, Balain S. A conceptual framework for implementation fidelity. Implement Sci 2007;2:1.
17. Rising SS. Centering pregnancy: an interdisciplinary model of empowerment. J Nurse Midwifery 1998;43:46-54.
18. Novick G. CenteringPregnancy and the current state of prenatal care. J Midwifery Womens Health 2004;49:405-11.
19. Kotelchuck M. The adequacy of prenatal care utilization index: its US distribution and association with low birthweight. Am J Public Health 1994;84:1486.
20. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. Lancet 2008;371:75-84.
21. March of Dimes Foundation. Local programs. Available at: http://www.marchofdimes.com/pregnancy/localprograms.html. Accessed Feb. 14, 2011.
22. Dunkel Schetter C. Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues. Annu Rev Psychol 2011;62:531-58.
23. Kennedy HP, Farrell T, Paden R, et al. "I wasn't alone"—a study of group prenatal care in the military. J Midwifery Womens Health 2009;54:176-83.
24. McNeil DA, Vekved M, Dolan SM, Siever J, Horn S, Tough SC. Getting more than they realized they needed: a qualitative study of women's experience of group prenatal care. BMC Pregnancy Childbirth 2012;12:17.
25. Herrman JW, Rogers S, Ehrenthal DB. Women's perceptions of CenteringPregnancy: a focus group study. MCN Am J Matern Child Nurs 2012;37:19-26.
26. Geronimus AT. Understanding and eliminating racial inequalities in women's health in the United States: the role of the weathering conceptual framework. J Am Med Womens Assoc 2001;56:133-6, 149-50.
27. Novick G, Sadler LS, Knafl KA, Groce NE. The intersection of everyday life and group prenatal care for women in two urban clinics. J Health Care Poor Underserved 2012;23:589-603.
28. Lu MC, Kotelchuck M, Hogan V, Jones L, Wright K, Halfon N. Closing the black-white gap in birth outcomes: a life-course approach. Ethn Dis 2010;20(Suppl):S2-62-76.
29. Aarons GA, Hurlburt M, Horowitz SM. Advancing a conceptual model of evidence-based practice implementation in public service sectors. Adm Policy Ment Health 2011;38:4-23.
30. Perrin KM, Burke SG, O'Connor D, et al. Factors contributing to intervention fidelity in a multi-site chronic disease self-management program. Implement Sci 2006;1:1.
31. Teate A, Leap N, Homer CSE. Midwives' experiences of becoming CenteringPregnancy facilitators: a pilot study in Sydney, Australia. Women Birth 2013;26:e31-6.
32. Eames C, Daley D, Hutchings J, et al. The leader observation tool: a process skills treatment fidelity measure for the Incredible Years parenting program. Child Care Health Dev 2008;34:391-400.
33. Hasson H. Systematic evaluation of implementation fidelity of complex interventions in health and social care. Implement Sci 2010;5:67.