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Group Prenatal Care Compared With Traditional Prenatal Care: A Systematic Review and Meta-analysis

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Abstract

Objective—To estimate the effect of group prenatal care on perinatal outcomes compared with traditional prenatal care.

Data Sources—We searched MEDLINE through PubMed, EMBASE, Scopus, Cumulative Index of Nursing and Allied Health literature [CINAHL], the Cochrane Database of Systematic Reviews, the Database of Abstracts of Reviews of Effects [DARE], the Cochrane Central Register of Controlled Trials [CENTRAL]) and clinicaltrials.gov.

Methods of Study Selection—We searched electronic databases for randomized controlled trials (RCT) and observational studies comparing group care with traditional prenatal care. The primary outcome was preterm birth. Secondary outcomes were low birthweight (LBW), neonatal intensive care unit (NICU) admission, and breastfeeding initiation. Heterogeneity was assessed using the Q test and I^2 statistic. Pooled relative risks (RRs) and weighted mean differences were calculated using random-effects models.

Tabulations, Integration, and Results—Four RCTs and ten observational studies met inclusion criteria. The rate of preterm birth was not significantly different with group care compared with traditional care (11 studies: pooled rates 7.9% vs. 9.3%, pooled RR 0.87; 95% CI 0.70–1.09). Group care was associated with a decreased rate of LBW overall (9 studies: pooled rate 7.5% group care vs. 9.5% traditional care; pooled RR 0.81; 95% CI 0.69–0.96), but not among RCTs (4 studies: 7.9% group care vs. 8.7% traditional care, pooled RR 0.92; 95% CI 0.73–1.16). There were no significant differences in NICU admission or breastfeeding initiation.

Conclusion—Available data suggest that women who participate in group care have similar rates of preterm birth, NICU admission, and breastfeeding.

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INTRODUCTION

Prenatal care is widely accepted as an important public health intervention; yet, its efficacy remains largely unstudied and unproven.(1, 2) Prenatal care in the United States is traditionally practiced through one-on-one encounters between a single patient and a single obstetric provider. The American College of Obstetricians and Gynecologists recommends prenatal visits occur every 4 weeks until 28 weeks, every 2 weeks until 36 weeks, and weekly until delivery.(3) Based on this schedule and an average prenatal visit lasting 10 minutes, most women spend a total of less than 2 hours with their obstetric providers during pregnancy. Thus, it is difficult to address routine pregnancy issues, contraception, breastfeeding, newborn care and patient questions during the course of prenatal care as it is currently practiced.

One alternative model of prenatal care gaining increasing attention for its efficiency and effectiveness is Group Care.(4) The most widely known model of group prenatal care in the United States is CenteringPregnancy®, which was developed in the 1990s to empower women to choose health-promoting behaviors.(5) The program is founded on 3 components: assessment, education, and support. CenteringPregnancy involves patients as active participants in their care. It consists of 5–12 patients meeting with an obstetric provider and co-facilitator for scheduled 2-hour sessions every 2–4 weeks throughout pregnancy.(5) The program focuses on nutrition, exercise, social support, health self-awareness, and relaxation techniques. Compared with individual care, group prenatal care has been associated with a reduction in preterm birth, increased birth weight in preterm infants, increased initiation of breastfeeding, increased utilization of postpartum family planning services, reduction in emergency visits in the third trimester, and varying degrees of improved satisfaction and increased knowledge.(6–8) However, some studies have reported no differences in pregnancy outcomes between CenteringPregnancy and routine care.(9–11) The most recent Cochrane review included only four RCTs and found no differences in prenatal outcomes between traditional care and group care.(12) Since then, other studies including a large RCT have been published.(13)

The objective of this study was to conduct an updated systematic review and meta-analysis of both observational studies and RCTs of group versus traditional prenatal care to estimate whether group care improves perinatal outcomes including preterm birth, low birthweight, NICU admission, and breastfeeding.

SOURCES

We searched the published literature using strategies created by a medical librarian (SF) for the concepts of CenteringPregnancy, group care, and prenatal care. These strategies were established using a combination of standardized index terms and natural language. The searches were implemented in Medline via PubMed 1946–2016, Embase 1947–2016, Scopus 1823–2016, Cumulative Index of Nursing and Allied Health literature (CINAHL) 1937–2016, the Cochrane Database of Systematic Reviews 1996–2016, the Database of Abstracts of Reviews of Effects (DARE 1994–2016), and the Cochrane Central Register of Controlled Trials (CENTRAL) 1898–2016. clinicaltrials.gov was also searched with

supplementary materials from the National Information Center on Health Services Research and Health Care Technology. The search terms used were MeSH headings, text words, and word variations of the words or phrases “Centering Pregnancy” OR “Group Prenatal Care” OR “Group Processes” OR “Group Meetings” OR “Group Thinking” OR “group care” OR “group discussion” OR “Support group” OR “group dynamics” AND “Prenatal Care” OR “antenatal care” OR “antenatal control”. All searches were completed in February of 2016. Results were exported to EndNote.

STUDY SELECTION

We included English language articles published prior to February 2016 that were RCTs or observational studies reporting pregnancy outcomes in women participating in group versus traditional prenatal care. We excluded case reports, case series, review articles, and studies without comparison groups. Institutional Review Board approval was not necessary for this study of de-identified data available in the public domain through prior publications.

The exposure for this review was group prenatal care. We adopted a comprehensive approach to evaluate maternal and fetal outcomes with an emphasis on the perinatal outcomes we considered most relevant to group prenatal care. The primary outcome was preterm birth. We also evaluated secondary outcomes that were reported in at least two studies with similar definitions, including low birthweight (LBW), neonatal intensive care unit (NICU) admission and initiation of breastfeeding. The definition of preterm birth was delivery prior to 37 weeks in all studies. Low birthweight in included studies was defined as infant birthweight < 2500 grams. The definition of breastfeeding initiation varied between studies and ranged from immediately postpartum to an assessment of breastfeeding at 3 months postpartum.

Titles and abstracts were screened by the first author (EC) and full text articles were retrieved if they appeared relevant or if there was some ambiguity as to whether the article was relevant. Full-text articles (or abstracts when full-text was unavailable) were independently reviewed against inclusion and exclusion criteria by two authors (EC and LT).

Data for included papers were abstracted into a standardized abstraction form by EC and LT. Any discrepancies in decisions regarding study inclusion/exclusion or were resolved by discussion and consultation with the senior author, when necessary. We critically appraised the quality of each study included in the meta-analysis using the Down’s checklist, which is a validated instrument to check the methodological quality of both randomized and non-randomized studies of healthcare interventions.(14) The checklist included 27 questions in the following quality categories of threat to validity: reporting, external validity, internal validity/bias, internal validity/confounding/selection bias, and power. The original paper by Downs did not define the threshold for high quality studies. For the sake of this review, we considered studies receiving the majority of the points available in at least four of the five categories of threat to validity as high quality. EC and LT completed the quality rating form for each article.

Data were analyzed using STATA (version 11, College Station, TX) with the METAN software package. Heterogeneity between studies was assessed using Cochran's Q and Higgins I² tests. To be conservative, heterogeneity was considered significant if P<0.1 or I²>30%. Data were pooled if there were at least two studies available for a given outcome. We adjusted data from cluster randomized trials using the methods described in the *Cochrane Handbook for Systematic Reviews of Interventions* (15). Estimates for intraclass correlation co-efficients (ICC) relevant to study outcomes were obtained from cluster RCT(13) or Piaggio et al(16) when not indicated in the original paper.(17) Relative risks (RR) were calculated from raw data from each study with a 95% confidence interval (CI). Publication bias for the primary outcome was assessed graphically using funnel plots and asymmetry was formally tested with Harbord's test for categorical variables. Data from the individual studies were pooled using the DerSimonian-Laird random-effects models regardless of whether there was evidence of statistical heterogeneity. We took this conservative approach because of the low statistical power of tests of heterogeneity. This approach also results in more conservative estimate of effect sizes. RR for each categorical outcome were plotted graphically as forest plots. We conducted stratified analysis by study design (RCTs, observational studies) to assess the effect of study design on the effect estimates. We also conducted subgroup analyses by study quality because there was such a large range of quality scores between studies meeting inclusion criteria. Subgroup analysis by race/ethnicity, for all studies and within high quality studies, was included based on prior literature suggesting a differential risk reduction rate among African American women participating in group care.(7)

RESULTS

The initial electronic literature search returned 2222 results with an additional 4 trials from clinicaltrials.gov with supplementary materials from the National Information Center on Health Services Research and Health Care Technology (Figure 1). We used the automatic duplicate finder in EndNote and 880 duplicates were identified and removed for a total of 1,346 unique citations. Titles for each citation were reviewed for relevance and 49 full-text papers (or abstracts if no full-text paper was available) were screened against inclusion and exclusion criteria. Bibliographies of selected papers were reviewed to determine whether additional relevant papers were missed in the search and one additional paper was found. (18) Additional studies were eliminated for following reasons: fails to meet inclusion/exclusion criteria (n=21), systematic review and/or meta-analysis (n=8), incomplete information (n=5), an abstract of a paper that was later published in full-text form and already included (n=1), did not include an outcome that could be pooled with another study (n=1). Fourteen studies were included in the final analysis, including four RCTs (8, 13, 17, 19) and 10 observational studies (7, 11, 20–27) (Figure 1). A total of 3229 (28%) patients participated in group prenatal care while 7092 (72%) participated in traditional care (Table 1). Rates of nulliparity ranged from 32–85% in group care and 27–87% in traditional care. With regard to women with a prior preterm birth, 1 study(13) excluded them and 5 studies(7, 8, 17, 24, 27) reported rates of prior preterm birth (Table 1). It is unclear whether women with prior preterm birth were excluded from the remaining studies.(11, 19–21, 25, 26)

The methodologic quality of each study was assessed using the validated Down's quality scale for randomized and non-randomized trials with a maximum possible score of 28 for high quality studies (Table 2). Quality scores ranged from 12–27 (median 21, Interquartile range 16–22). Three of the four RCTs and three of the ten observational studies met criteria for high quality. All of the RCTs and eight of the observational studies reported the primary outcome of preterm birth. However, one observational study had no preterm births in either group and was excluded from the analysis (Figure 2).(11)

There was no significant difference in the rate of preterm birth in group compared with traditional care (11 studies: pooled rates 7.9% vs. 9.3%, pooled RR 0.87; 95% CI 0.70–1.09). This was true for both observational studies and RCTs (Figure 2). The difference was also not statistically significant when analysis was limited to the high quality studies reporting preterm birth (5 studies: pooled rates 8.4% vs. 8.9%, pooled RR 0.92; 95% CI 0.64–1.32).

In subgroup analysis of studies reporting race/ethnicity, the rate of preterm birth was lower among African American women participating in group care compared with traditional care, but the difference was not statistically significant among the 1 RCT and 2 observational studies included (3 studies(7, 8, 25): pooled rates (8.6% vs. 11.1%, pooled RR 0.69; 95% CI 0.40–1.17). However, when the analysis was limited to the high quality studies (1 RCT and 1 observational study), African American women participating in group care had a significantly lower rate of preterm birth (2 studies (7, 8): pooled rates 8.0% vs. 11.1%, pooled RR 0.55; 95% CI 0.34–0.88). Latinas had similar rates of preterm birth overall (3 studies(7, 26, 27): pooled rates 5.5% vs. 5.9%, pooled RR 1.05; 95% CI 0.37–2.99) and in high-quality studies (2 studies(7, 27): pooled rates 5.9% vs. 4.7%, pooled RR 1.66; 95% CI 0.66–4.18).

Overall, there was significant heterogeneity between studies ($P=0.119$, $I^2=35.0\%$), however, after stratification by study design, heterogeneity was significant among observational studies ($P=0.076$, $I^2=47.5\%$), but not among RCTs ($P=0.270$, $I^2=23.5\%$) (Figure 2). There was no evidence of publication bias (Harbord test, $P=0.586$) (Figure 3).

Nine studies, including all of the RCTs, reported rates of LBW. Group care was associated with a decreased rate of LBW overall (9 studies: pooled rate 7.5% group care vs. 9.5% traditional care; pooled RR 0.81; 95% CI 0.69–0.96) and in observational studies (5 studies: pooled rate 7.0% group care vs 10.4% traditional care, pooled 0.71, 95% CI 0.56–0.91) but not in the RCTs (4 studies: 7.9% group care vs. 8.7% traditional care, pooled RR 0.92; 95% CI 0.73–1.16) (Figure 4). There were no significant differences in NICU (Figure 5) admission or rates of breastfeeding initiation (Figure 6) between group care and traditional care overall or by study design (Table 3).

DISCUSSION

The goal of this systematic review was to estimate whether group care improves perinatal outcomes compared with traditional care. In this review, we summarized and synthesized 14 articles that compared these modalities of care. We found that group prenatal care was not

associated with lower rates of preterm birth, NICU admission, or breastfeeding initiation overall or by study design. A significant decrease in rates of LBW was present overall and in observational studies, but not when analysis was limited to RCTs. The pooled results of two high-quality studies showed African American women in group care had lower rates of preterm birth.(7, 8) The observational studies meeting criteria for this analysis had a broad spectrum of quality ranging from very high to very low.

A 2015 Cochrane review on group prenatal care included 4 RCT's with most of the patients contributed by a single study. Our review included all of the RCT's in the Cochrane, with the addition of a recent cluster RCT of 1148 patients that was completed in the interim,(13) as well as observational studies. Our findings are consistent with the Cochrane review; however, we also assessed outcomes in low-income women of color participating in group prenatal care in 2 studies with underserved patient populations. Our findings in this study suggest a risk reduction of 3 preterm births per 100 livebirths in African American women. This is a potentially significant finding since rates of preterm birth are nearly twice as high in African American women compared to White women, even after controlling for confounding factors such as socioeconomic status.(28) There were no differences in preterm birth rates of Latina women participating in group care, which may be reflective of the "Latina Paradox," which is used to explain why this group of socioeconomically disadvantaged women still achieve favorable birth outcomes through informal family and community support networks.(29) One potential explanation for improved outcomes in African American women is the provision of social support, coping strategies and stress reduction through group prenatal care.(29, 30)

There are several strengths to the present study including a thorough literature search protocol by a trained librarian (SF) and protocol for study selection and data analysis. We closely followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and assessed heterogeneity.(31) We combined data using random effects model even when no evidence of statistical heterogeneity was noted. This took into account clinical heterogeneity which was likely present even in the absence of demonstrable statistical heterogeneity and produces more conservative estimates of effect sizes. Two cluster RCTs were included in the study and statistical adjustments were made to account for this study design. Finally, we stratified analysis by design and quality, which enabled us to assess the effect of study design on the pooled analysis.

While there are considerable strengths, this systematic review must be evaluated in the context of a number of limitations. Our findings are driven by studies available in the literature. The 4 RCTs mostly had small sample sizes and the observational studies are at high risk for selection bias and confounding. Women who chose to participate in group care are likely to differ from those who decline in favor of traditional care and may represent a more motivated patient population. There was significant clinical, methodological, and statistical heterogeneity between studies overall. We addressed this with stratification by study design and demonstrated that the statistical heterogeneity was attributable to the different study designs. Our results suggest improved preterm birth rates in African American women participating in group care, but there may be reporting bias in this regard since results by race are more likely to be described when there is a significant result.

Differences by race for our secondary outcomes were not reported in the papers included in this review so we were unable to assess racial differences in LBW, NICU admission, or breastfeeding. In addition to race, other factors such as socioeconomic status may influence the efficacy of group prenatal care, but we were unable to study this potential impact because it was not assessed in the source papers. Lastly, we were unable to evaluate other important outcomes such as postpartum depression, contraception initiation, patient satisfaction and provider satisfaction because of significant heterogeneity in the way these outcomes were assessed in the primary studies.

In summary, results of this systematic review and meta-analysis indicate that participation in group prenatal care was not associated with lower rates of preterm birth, NICU admission, or breastfeeding initiation overall or by study design. Group prenatal care may decrease the risk of preterm birth in African American women. Importantly, there is no evidence that group care causes harm. This alternative form of prenatal care warrants further study, especially with regard to postpartum maternal outcomes and in African American women. In addition, studies are needed to assess the effects of group care in high risk women, such as those with obesity or diabetes.

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References

1. Rosen MG, Merkatz IR, Hill JG. Caring for Our Future: A report by the Expert Panel on the Content of Prenatal Care. *Obstetrics and Gynecology*. 1991; 77(5):782–7. [PubMed: 2014096]
2. Villar J. Scientific basis for the content of routine antenatal care I. Philosophy, recent studies, and power to eliminate or alleviate adverse maternal outcomes. *Acta Obstetrica et Gynecologica Scandinavica*. 1997; 76(1):1–14. [PubMed: 9033238]
3. American Academy of Pediatrics, American College of Obstetricians and Gynecologists. Guidelines for perinatal care. 7th. Elk Grove Village (IL): AAP; 2012. p. 106 Washington, DC: American College of Obstetricians and Gynecologists
4. Krans EE, Davis MM. Strong Start for Mothers and Newborns: Implications for prenatal care delivery. *Current Opinion in Obstetrics and Gynecology*. 2014; 26(6):511–5. [PubMed: 25379768]
5. Rising SS. Centering pregnancy: An interdisciplinary model of empowerment. *Journal of Nurse-Midwifery*. 1998; 43(1):46–54. [PubMed: 9489291]
6. Tanner-Smith EE, Steinka-Fry KT, Lipsey MW. The effects of CenteringPregnancy group prenatal care on gestational age, birth weight, and fetal demise. *Maternal and child health journal*. 2014; 18(4):801–9. [PubMed: 23793483]
7. Picklesimer A, B D, Covington-Kolb S, Hale N, Billings D. The impact of CenteringPregnancy group prenatal care on preterm birth in a low-income population. *American journal of obstetrics and gynecology*. 2012; 206(1):S55–S6.
8. Ickovics JR, K TS, Westdahl C, Magriples U, Massey Z, Reynolds H, Rising SS. Group prenatal care and perinatal outcomes: a randomized controlled trial. *Obstetrics and gynecology*. 2007:330–9. [PubMed: 17666608]
9. Klima C, Norr K, Vonderheid S, Handler A. Introduction of CenteringPregnancy in a public health clinic. *Journal of midwifery & women's health*. 2009 Jan-Feb;54(1):27–34.
10. Shakespear K, Waite PJ, Gast J. A comparison of health behaviors of women in centering pregnancy and traditional prenatal care. *Maternal and child health journal*. 2010 Mar; 14(2):202–8. [PubMed: 19184385]

11. Robertson B, A DM, Darnell LA. Comparison of centering pregnancy to traditional care in Hispanic mothers. *Maternal and child health journal*. 2009 May; 13(3):407–14. [PubMed: 18465216]
12. Catling CJ, Medley N, Foureur M, Ryan C, Leap N, Teate A, et al. Group versus conventional antenatal care for women. *Cochrane Database of Systematic Reviews*. 2015; (2)
13. Ickovics JR, E V, Lewis JB, Kershaw TS, Magriples U, Stasko E, Rising SS, Cassells A, Cunningham S, Bernstein P, Tobin JN. Cluster Randomized Controlled Trial of Group Prenatal Care: Perinatal Outcomes Among Adolescents in New York City Health Centers. *American journal of public health*. 2016 Feb; 106(2):359–65. [PubMed: 26691105]
14. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *Journal of Epidemiology and Community Health*. 1998; 52(6):377–84. [PubMed: 9764259]
15. Higgins JP, Green S. *Cochrane Handbook for Systematic Reviews of Interventions: Cochrane Book Series*. 2008
16. Piaggio G, Carroli G, Villar J, Pinol A, Bakkeiteig L, Lumbiganon P, et al. Methodological considerations on the design and analysis of an equivalence stratified cluster randomization trial. *Statistics in Medicine*. 2001; 20(3):401–16. [PubMed: 11180310]
17. Jafari F. Maternal and neonatal outcomes of group prenatal care: A new experience in Iran. *Early human development*. 2010; 86:S140.
18. Ford K, Weglicki L, Kershaw T, Schram C, Hoyer PJ, Jacobson ML. Effects of a prenatal care intervention for adolescent mothers on birth weight, repeat pregnancy, and educational outcomes at one year postpartum. *The Journal of perinatal education*. 2002 Winter;11(1):35–8. [PubMed: 17273284]
19. Kennedy HP, F T, Paden R, Hill S, Jolivet RR, Cooper BA, Rising SS. A randomized clinical trial of group prenatal care in two military settings. *Military medicine*. 2011 Oct; 176(10):1169–77. [PubMed: 22128654]
20. Walton RBS, S S, Heaton J. Group Prenatal Care Outcomes in a Military Population: A Retrospective Cohort Study. *Military medicine*. 2015 Jul; 180(7):825–9. [PubMed: 26126255]
21. Trotman G, C G, Darolia R, Tefera E, Damle L, Gomez-Lobo V. The Effect of Centering Pregnancy versus Traditional Prenatal Care Models on Improved Adolescent Health Behaviors in the Perinatal Period. *Journal of pediatric and adolescent gynecology*. 2015 Oct; 28(5):395–401. [PubMed: 26233287]
22. Carter EB, A J, Barbier K, Sarabia R, Macones GA, Cahill AG, Tuuli MG. Group versus traditional prenatal care: A retrospective cohort study. *American journal of obstetrics and gynecology*. 2016; 214(1):S161.
23. Benediktsson I, M SW, Vekved M, McNeil DA, Dolan SM, Tough SC. Comparing CenteringPregnancy(R) to standard prenatal care plus prenatal education. *BMC pregnancy and childbirth*. 2013; 13(Suppl 1):S5. [PubMed: 23445830]
24. Ickovics JR, K TS, Westdahl C, Rising SS, Klima C, Reynolds H, Magriples U. Group prenatal care and preterm birth weight: results from a matched cohort study at public clinics. *Obstetrics and gynecology*. 2003 Nov; 102(5 Pt 1):1051–7. [PubMed: 14672486]
25. Klima C, N K, Vonderheid S, Handler A. Introduction of CenteringPregnancy in a public health clinic. *Journal of midwifery & women's health*. 2009 Jan-Feb;54(1):27–34.
26. Tandon SD, C L, Vega P, Murphy J, Alonso A. Birth outcomes associated with receipt of group prenatal care among low-income Hispanic women. *Journal of midwifery & women's health*. 2012 Sep-Oct;57(5):476–81.
27. Trudnak T. Outcomes of latina women in centeringpregnancy group prenatal care compared with individual prenatal care. *Journal of Midwifery and Women's Health*. 2014; 59(1):106—.
28. Muglia LJ, Katz M. The Enigma of Spontaneous Preterm Birth. *New England Journal of Medicine*. 2010; 362(6):529–35. [PubMed: 20147718]
29. McGlade MS, Saha S, Dahlstrom ME. The Latina paradox: An opportunity for restructuring prenatal care delivery. *American journal of public health*. 2004; 94(12):2062–5. [PubMed: 15569952]

30. Heberlein EC, Picklesimer AH, Billings DL, Covington-Kolb S, Farber N, Frongillo EA. The comparative effects of group prenatal care on psychosocial outcomes. *Archives of Women's Mental Health*. 2016; 19(2):259–69.
31. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA StatementThe PRISMA Statement. *Annals of Internal Medicine*. 2009; 151(4):264–9. [PubMed: 19622511]

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Figure 1.
Flow chart of study selection

Figure 2. Forest plot showing the effect of group care compared with traditional care on preterm birth, stratified by study type.

Figure 3.

Funnel plot with pseudo 95% confidence limits showing the effect of group compared with traditional prenatal care on preterm birth rate, stratified by study type. RR, risk ratio.

Figure 4. Forest plot showing the effect of group compared with traditional prenatal care on low birthweight, stratified by study type.

Figure 5. Forest plot showing the effect of group compared with traditional prenatal care on neonatal intensive care unit admission, stratified by study type.

Figure 6. Forest plot showing the effect of group compared with traditional prenatal care on breastfeeding initiation, stratified by study type.

Table 1
 Characteristics of 4 Randomized Trials and 10 observational studies comparing Group and Traditional Care

Study	Study Design	Study Years	Country	Setting	Inclusion/Exclusion	Outcomes						Details of Participants
						GC	TC	PTB	LBW	NICU	BF	
Ickovics ⁸ -2007	RCT	2001–2004	United States	2 university-affiliated clinics in Atlanta or New Haven	<24 weeks gestation, 25 years, no medical problems requiring individualized care, English or Spanish speaking, willing to be randomized	*623	370	X	X	X	X	-study population primarily young African American women with low socioeconomic status attending urban hospitals -included prior PTB
Ickovics ¹³ -2016	Cluster RCT	2008–2012	United States	4 community health centers and 10 hospitals in New York City	14–21 years old, <24 weeks gestation, low risk, English or Spanish-speaking, willing to participate in GC.	*573	575	X	X	X	X	-urban health centers serving predominantly low-income women -excluded women with prior PTB
Jafari ¹⁷ -2010	Cluster RCT	2007–2008	Iran	14 public health care centers in Zanjan area	Health centers able to provide at least 12 new patients in 1 month, intervention and control centers in same geographic region serving similar populations	320	308	X	X			-healthcare centers were the unit of randomization -included prior PTB
Kennedy ¹⁹ -2011	RCT	2005–2007	United States	Military Hospital in Pacific Northwest and Atlantic coast	<16 weeks gestation, 18 years old, no severe medical problem requiring individual therapy, understand English, willingness to be randomized	*162	160	X	X	X		-more college educated women in individual group, more nulliparous women living with partners in group -prenatal care group, which was controlled for in subsequent analyses
Benediktsson ²³ -2013	Prospective cohort	2008–2011	Canada	Local prenatal education classes in Calgary + routine prenatal care vs. CP	>25 weeks gestation, prenatal care in Calgary, English-speaking	*106	619				X	-prenatal classes required a fee with waiver available while CenteringPregnancy was free
Carter ²² -2016	Retrospective Cohort	2004–2014	United States	Prenatal clinic at	Received care in low-risk resident or nurse	*207	414		X	X		-Patients in GC matched 1:2 by delivery year, maternal age, race and

Study	Study Design	Study Years	Country	Setting	Inclusion/Exclusion	Outcomes						Details of Participants
						GC	TC	PTB	LBW	NICU	BF	
Ickovics ²⁴ -2003	Prospective cohort with match-ing	1999–2002	United States	tertiary hospital	practitioner clinic, term birth							insurance status to patients in TC
						* ₂₂₉	229	X				-Patients in GC matched 1:1 by age, race, parity to patient in TC with closest delivery date -included prior PTB
Klima ²⁵ -2009	Retrospective cohort	2004–2006	United States	Urban public health clinic in Midwest	Plan to continue prenatal care at site, <18 weeks gestation Exclusion: declined CP, > 18 weeks gestation, high risk obstetrical conditions, fetal demise or delivery before 28 weeks gestation or completion of 4 individual or group visits	* ₆₁	207	X			X	-largely African American study population
						* ₃₁₆	3767	X	X	X	X	-CP patients were younger, more likely to be minority, nulliparous -included 48 women who only had 1 CP visit -included prior PTB
Picklesimer ⁷ -2012												
Robertson ¹¹ -2009	Pro-spective cohort	NS	United States	Hispanic women in a hospital based clinic receiving CP vs. traditional care	Self-identified Hispanic, >18 years old, ability to read and speak English or Spanish	* ₁₈	15	X			X	-significant loss to follow-up. Only 33/49 patients with follow-up

Study	Study Design	Study Years	Country	Setting	Inclusion/Exclusion	Outcomes						Details of Participants
						GC	TC	PTB	LBW	NICU	BF	
Tandon ²⁶ -2012	Pro-spective cohort	2008–2009	United States	Centro Health Clinic in Lantana/Lake Worth FL (CP) and Palm Beach County Health Clinic (TC)	Hispanic or Mayan women, <20 weeks	*150	66	X	X			-CP and TC took place at different clinics -did not follow intention to treat principle
Trotman ²¹ -2015	Retro-Spective cohort	2008–2012	United States	Hospital-based clinic with adolescent patients in CP, single-provider care or multi-provider care	Adolescents 11–21 years in low-risk prenatal clinic	*50	150	X				-CP patients significantly older
Trudnak ²⁷ -2013	Retro-spective cohort	2006–2010	United States	Public health clinic in Florida choosing CP vs. traditional care	Self-identity as Spanish-speaking and Hispanic ethnicity Exclusion: did not complete prenatal care or 50% of expected number of visits	*240	240	X	X			-Matched number of charts for CP patients to randomly pull same number of charts of patients in TC for that month. -did not follow intention-to-treat, women excluded if they did not complete prenatal care -included prior PTB
Walton ²⁰ -2015	Retro-Spective cohort	2009–2013	United States	Tertiary care military hospital	Dependent wives of active duty service members or active duty women, participating in 9 CP sessions and controls receiving individual care with CNM	202	202	X		X		-CP patients received care 2009–2013 while CNM patients were from 2011–2013

RCT-randomized controlled trial, DM-diabetes mellitus, GC-group care, TC-traditional care, PTB-preterm birth, LBW-low birthweight, NICU-Neonatal intensive care unit admission, BF-breastfeeding initiation, CNM-certified nurse midwife

* Studies specifically remarking on using the trademarked CenteringPregnancy model in their Methods section are indicated in the table with “CP” while those that did not denote their source curriculum are generically referred to as “GC”.

Table 2

Quality Score for each study by area of threat to validity and overall

Study (possible points)	Reporting (11)	External Validity (3)	Internal Validity (7)	Confounding/Selection Bias (6)	Power (1)	Total (28)
Randomized Trials						
Ickovics ⁸ -2007	12 [*]	2 [*]	6 [*]	6 [*]	1 [*]	27 [†]
Ickovics ¹³ -2016	10 [*]	3 [*]	5 [*]	6 [*]	1 [*]	25 [†]
Jafari ¹⁷ -2010	9 [*]	3 [*]	5 [*]	3	0	20
Kennedy ¹⁹ -2011	10 [*]	3 [*]	5 [*]	5 [*]	1 [*]	24 [†]
Observational Studies						
Benediktsson ²³ -2013	10 [*]	1	5 [*]	1	0	17
Carter ²² -2016	10 [*]	1	6 [*]	4 [*]	0	21
Ickovics ²⁴ -2003	10 [*]	3 [*]	5 [*]	3	0	21
Klima ²⁵ -2009	6 [*]	1	5 [*]	2	0	14
Picklesimer ⁷ -2012	10 [*]	3 [*]	5 [*]	4 [*]	0	22 [†]
Robertson ¹¹ -2009	10 [*]	3 [*]	5 [*]	3	0	21
Tandon ²⁶ -2012	8 [*]	1	5 [*]	2	0	16
Trotman ²¹ -2015	7 [*]	1	5 [*]	2	0	15
Trudnak ²⁷ -2014	10 [*]	3 [*]	5 [*]	4 [*]	0	22 [†]
Walton ²⁰ -2015	7 [*]	1	5 [*]	1	1 [*]	15

* Denotes high quality (received majority of points) in given area

[†] Denotes overall high quality study (rated high quality in at least four out of the five areas of threat to validity)

Summary of pooled results based on random effects meta-analysis of proportions for primary and secondary endpoints overall

Table 3

Outcome	No. of Studies	Group Care (GC) Pooled rate	Traditional Care (TC) Pooled rate	Measure of Effect	Effect Size (95% CI)	I ² (%)	P
Preterm Birth	11	0.079	0.093	Pooled RR (random)	0.87 (0.70–1.09)	35.0	0.119
Low birthweight (<2500 g)	9	0.075	0.095	Pooled RR (random)	0.81 (0.69–0.96)	0.0	0.641
NICU admission	7	0.092	0.096	Pooled RR (random)	0.91 (0.68–1.23)	47.8	0.074
Breastfeeding Initiation	7	0.777	0.749	Pooled RR (random)	1.08 (0.99–1.17)	93.4	<0.001