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Association of Delivery Outcomes With the Number of Childbirth Education Sessions

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ABSTRACT

The objective of this study was to determine whether childbirth education conducted over 3 or more sessions is more effective than courses conducted over 1 or 2 sessions. This was a secondary analysis of 2853 participants in a longitudinal study of women recruited during their first pregnancy. Data on childbirth education attendance were collected during the 1-month postpartum interview. The Kruskal–Wallis test for ranks was used for univariate analysis by the number of class sessions, and logistic regression was used to compare no education with any childbirth education, single-session, 2-session, and 3-or-more-session courses. Primary outcomes included induction of labor, cesarean delivery, use of pain medication, and shared decision-making. Attending 3 or more education sessions was associated with a decreased risk of planned cesarean delivery and increased shared decision-making. Attending any childbirth education was associated with lower odds of using pain medication in labor, reduced odds of planned cesarean delivery, and increased shared decision-making. Childbirth education was not associated with induction of labor. Childbirth education can be provided over 3 or more sessions. This finding can be used to develop evidence-based childbirth education programs.

Key Words: cesarean delivery, childbirth education, shared decision-making

Childbirth education is considered a predictor of patient satisfaction with care and is recommended by most obstetricians and midwives.[1–3] In general, providers expect childbirth education courses to cover topics important for achieving population health goals such as birth options, breastfeeding, family planning, and safe infant sleep.[2] Several population-level studies have found that childbirth education results in reduced use of cesarean delivery, one of the Healthy People 2030 objectives.[4–6] These studies are limited to childbirth education as a dichotomous variable and do not address the effectiveness of childbirth education provided over different numbers of sessions. If the number of sessions in a course alters the outcomes such as cesarean delivery rate, educators can improve their programs by designing a course with the optimum number of sessions.

Studies on childbirth education hypothesize that cesarean delivery can be reduced with either (1) training in comfort measures to reduce pain and the need for intervention or (2) decision counseling to reduce fear and the desire for elective cesarean delivery. Globally, there is wide variation in the number of childbirth education sessions included as part of a study whether the study investigates comfort measures or decision counseling. Some studies examine self-study material, a single education session, or combinations of the two.[7–9] These studies report changes in knowledge, fear, or birth planning but do not report delivery outcomes. Most studies

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test a minimum of 16 hours of content distributed in 2, 4, or more sessions.[10–15] Some of these report a reduction in cesarean delivery, while others do not report delivery outcomes. The lack of consistency in the intervention and reporting of outcomes has resulted in a gap of knowledge about the effect of the number of sessions on efficacy of childbirth education as a method to achieve maternal health objectives.

A major limitation of the available literature on childbirth education is the conceptualization of childbirth education attendance as a dichotomous (yes/no) variable. If the number of sessions matters, combining programs with different numbers of sessions can bias results toward no effect. This may be why some studies do not find a relationship between childbirth education and cesarean delivery rates. Studies conducted in individual hospitals test a program with a specific number of sessions but may not account for hospital-level characteristics or other changes adopted that contribute to reduction in cesarean deliveries. For example, one study of the implementation of a standardized childbirth education program found the change in cesarean delivery rate was not consistent across the participating hospitals.[13] There is a need for population-level studies examining the number of sessions of childbirth education to provide evidence that can be generalized.

This study was designed to test whether the number of sessions of childbirth education is associated with delivery outcomes. The objective was to determine whether childbirth education courses conducted over 3 or more sessions were more effective at meeting quality goals than courses conducted over 1 or 2 sessions.

BACKGROUND

Formal childbirth education began during the natural childbirth movement as a way to educate women to use relaxation techniques to give birth without the use of pain medication. Certification for childbirth educators began in the 1960s with educators operating outside the healthcare system.[16] By 2000, 70% of first-time mothers attended formal childbirth education programs, most often at a hospital or medical office.[17] Healthy People 2020 included a goal to increase childbirth education attendance.[18] The Pregnancy Risk Assessment Monitoring Survey Phase 5 questionnaire tracked states' progress on childbirth education participation.[19] The general expectation was that childbirth education could improve maternal and neonatal health in the United States (US).

Instead, formal childbirth education lost momentum in the US in the new millennium. By 2013, participation of first-time mothers in childbirth education declined to 59%.[20] Childbirth education courses are now most often conducted in a single session.[2,20] Few educators include information on topics relevant to population health goals such as safe infant sleep or family planning.[2] These changes are likely due to changing consumer demands that resulted from the introduction of alternative avenues for education such as the Internet and doulas.

In the US, multiple options for perinatal education exist, though barriers and limitations to other methods suggest childbirth education remains a valuable tool. Group prenatal care is an effective intervention that integrates education and antenatal services in a single visit, but the space and staffing limitations are barriers to its implementation.[21–23] Doulas provide one-on-one education, but lack of Medicaid reimbursement creates an economic barrier for many families.[24–26] Health education is provided as part of traditional antenatal care visits, though this education is not associated with improvements in the population health objectives tracked through Healthy People.[27]

In 2016, the World Health Organization included health education in the package for comprehensive antenatal care establishing the importance of this resource.[28] Childbirth education remains a trusted intervention among healthcare providers and first-time parents and is effective for reducing cesarean delivery rates and increasing breastfeeding rates.[5,6] Half of the states include childbirth education in their Medicaid reimbursement package, reducing barriers to implementation.[26] These qualities indicate that childbirth education is a valuable tool for reaching both facility quality improvement and community population health goals.[29]

Before childbirth education can be implemented as an evidence-based intervention, the factors associated with its effectiveness must be described. One factor that has not been investigated is the number of sessions. Wide variance exists in this aspect of childbirth education. Single-session courses involving fewer hours are typically available through hospital institutions and serve to orient clients to the facility.[20] In contrast, mindfulness-based childbirth education programs designed to build comfort skills include between 18 and 27 hours of instruction over multiple days or weeks.[30]

METHODS

This was a secondary analysis of data collected as part of the First Birth Study, a longitudinal study of women recruited during their first pregnancy. This project was deemed excluded from review by the University of Nevada, Las Vegas Biomedical Institutional Review Board because use of the deidentified data did not meet the definition of human subjects research.

Setting

Recruitment for this study was conducted in Pennsylvania between 2009 and 2011. Recruits were eligible for the study if they were between 18 and 35 years of age and pregnant with a single fetus. Recruits were excluded if they had a prior pregnancy of at least 20 weeks' gestation, were planning tubal ligation at the time of delivery, or if they were planning an out-of-hospital birth.

Participants

Study participants were eligible for this analysis if they indicated they answered questions about whether or not they attended childbirth education classes. Participants who declined to answer or indicated they did not know were excluded from the analysis. The sample was further restricted to those who delivered at or after 37 weeks' gestation because those who delivered prior to 37 weeks may not have attended the full series of their intended childbirth education course.

Variables and measurement

The independent variable for this study was the number of sessions attended as part of a childbirth education course. This information was provided by respondents during the telephonic interview and recoded into an ordinal variable, with values indicating no childbirth education, a single-session course, a 2-session course, or a course with 3 or more sessions. These groupings were selected to allow comparison of common structures for childbirth education courses.

The primary outcomes for this study were induction of labor, use of pain medication, delivery by cesarean section, and shared decision-making. These outcomes were selected because they represent information that providers expect to be covered in childbirth education courses.[2,3] Secondary outcomes included use of epidural, use of systemic opioids, delivery by planned cesarean section, and delivery by unplanned cesarean section.

The delivery outcomes were identified on the postpartum survey and verified by the medical records. Respondents who did not provide an answer for an outcome were excluded from that analysis. Shared decision-making was measured using the Delivery Decision Making Scale.[31] This scale includes 6 items that focus on the respondents' perception of involvement and satisfaction with the decision-making process. Item responses are true or false, and the instrument is scored on the basis of a scale from 0 to 6, with higher scores indicating higher levels of shared decision-making. In the original study, this variable was highly skewed (more than half of the respondents had the highest score possible), so the variable was dichotomized to indicate a score of 6 or a score of less than 6.[32]

Control of bias

Control variables were selected on the basis of statistically significant differences in attendance at childbirth education in these data. These variables included maternal age, prepregnancy body mass index, maternal education level, pregnancy intention, insurance source, and maternal race and ethnicity. Because of low proportions of participants who identified themselves in underrepresented race or ethnic groups in some course structures, maternal race and ethnicity data were collapsed into 2 groups as non-Hispanic White or other race or ethnicity.

Two additional variables were included in the models for induction and cesarean delivery to control for any differences in medical indication for these procedures not accounted for in other variables. The variable for indication of induction included *ICD-9-CM* (*International Classification of Diseases, Ninth Revision, Clinical Modification*) codes that identified hypertension, diabetes, other medical conditions, premature rupture of membranes, fetal compromise, hydramnios or oligohydramnios, and postdate pregnancy. The variable for indication of cesarean delivery included *ICD-9* (*International Classification of Diseases, Ninth Revision*) codes that identified malpresentation, macrosomia, cephalopelvic disproportion, antepartum bleeding or placental conditions, abnormalities of the pelvis, nonreassuring fetal status, hypertension, diabetes, postterm pregnancy, umbilical cord complications, hydramnios, oligohydramnios, prolonged rupture of membranes, and fetal abnormalities.[33] The exact *ICD* codes used can be found in Supplement Digital Content 1 (available at: http://links.lww.com/JPNN/A18).

Statistical methods

Multiple imputation calculations provided values for any missing data. Descriptive analysis was conducted using the Kruskal-Wallis test by ranks to compare distribution of each characteristic by the number of childbirth education sessions attended.

Two multivariate logistic regression models were created for each outcome. The first model included childbirth education as a dichotomous predictor variable to calculate the odds of any childbirth education compared with no childbirth education. The second model included childbirth education as an ordinal variable, with no childbirth education set as the reference. This compared each category of the number of sessions with taking no childbirth education. All models used backward selection and included all variables that

had the potential to be associated with the number of sessions and the primary outcomes. Backward selection allows the model to keep only the control variables that are significant when predicting outcome and is therefore the most parsimonious model possible with these data. In these models, variables remained in the model as long as they had a *P* value less than .10. This method was selected because there was a paucity of existing literature to identify variables to control for confounding based on the number of class sessions.

Because odds ratios can overstate the risk for outcomes with incidence greater than 10%, the odds ratios from the logistic regression models were converted to approximated risk ratios using the method described by Zhang and Yu.[32]

RESULTS

Participants

The full sample included 3006 participants. After removing 120 participants who gave birth prior to 37 completed weeks and 2 participants who did not answer the question about prenatal education, 2884 respondents were eligible for this analysis. Of those, 895 (30.9%) did not attend childbirth education, 333 (11.4%) attended a single-session course, 320 (11.1%) attended a 2-session course, 1336 (46.8%) attended a course that had 3 or more sessions, and 5 participants did not provide the number of sessions attended. Full description of sample characteristics can be found in Table 1.

Table 1. Description of sample by the number of sessions in the childbirth education course

Characteristics	Did not attend (*N* = 895)	1 session (*N* = 332)	2 sessions (*N* = 315)	≥3 sessions (*N* = 1336)
Maternal age[a]				
18-24 y	428 (47.8%)	71 (21.3%)	48 (15%)	242 (18.1%)
25-29 y	272 (30.4%)	142 (42.6%)	133 (41.6%)	598 (44.8%)
30+ y	195 (21.8%)	120 (36.0%)	139 (43.4%)	496 (37.1%)
Prepregnancy BMI[b]				
≤24.9	483 (54.0%)	184 (55.4%)	193 (60.5%)	783 (58.6%)
Overweight	193 (21.6%)	82 (24.7%)	75 (23.5%)	290 (21.7%)
Obese	219 (24.5%)	66 (19.9%)	75 (16.0%)	263 (19.7%)
Maternal education level[a]				
High school or less	292 (32.6%)	44 (13.2%)	21 (6.6%)	125 (9.4%)
Some college	288 (32.2%)	91 (27.3%)	71 (22.2%)	328 (24.6%)
College	315 (32.2%)	198 (29.5%)	228 (71.3%)	883 (66.1%)
Pregnancy intention[a]				
Not intended	420 (47.6%)	95 (28.8%)	69 (21.7%)	331 (25.0%)
Intended	462 (52.4%)	235 (71.2%)	249 (78.3%)	995 (75.0%)
Rural residence[a]				
Yes	89 (9.9%)	45 (13.5%)	17 (5.3%)	98 (7.34%)
No	806 (90.1%)	288 (86.4%)	303 (94.7%)	1238 (92.7%)
Maternal race/ethnicity[b]				
Non-Hispanic White	617 (25.7%)	298 (12.4%)	283 (11.8%)	1203 (50.1%)
Non-Hispanic Black	152 (68.8%)	18 (8.1%)	11 (5.0%)	40 (18.1%)
Hispanic	86 (51.8%)	12 (7.2%)	17 (10.2%)	51 (30.7%)
Others	51 (44.0%)	7 (6.0%)	12 (10.3%)	46 (39.7%)
Insurance source[b]				
Public insurance	384 (57.4%)	62 (9.3%)	40 (6.0%)	183 (27.4%)
Private insurance	510 (23.1%)	271 (12.3%)	280 (12.7%)	1152 (52.1%)
Induction indication				
No	422 (47.2%)	167 (50.2%)	139 (43.4%)	656 (49.1%)
Yes	473 (52.9%)	166 (49.9%)	181 (56.5%)	680 (40.9%)
Cesarean delivery indication				
No	210 (23.5%)	75 (22.5%)	69 (21.6%)	270 (20.2%)
Yes	685 (76.5%)	258 (77.5%)	251 (78.4%)	1066 (79.8%)

Abbreviation: BMI, body mass index.
[a] $P < .05$.
[b] $P < .001$.

Descriptive data

The Kruskal-Wallis test for ranks identified differences in the number of sessions of childbirth education for all participant characteristics except indications for induction or cesarean delivery. The Kruskal-Wallis test for ranks identified differences based on sessions of childbirth education for the following 3 of the primary outcomes: use of any pain medication ($P < .05$); use of epidural ($P < .05$); and high shared decision-making score ($P < .001$). Mode of delivery was not associated with the number of sessions. Full description of outcomes by the number of class sessions can be found in Table 2.

Main results

Attendance at any childbirth education was associated with reduced use of pain medication during labor (approximated risk ratio [ARR] = 0.94; 95% CI, 0.88-0.98), including reduced use of epidural (ARR = 0.94; 95% CI, 0.90-0.99). The use of opioids increased for those attending childbirth education (ARR = 1.22; 95% CI, 1.06-1.39). Attending childbirth education was not associated with overall cesarean delivery use but was associated with reduced use of planned cesarean delivery (ARR = 0.65; 95% CI, 0.46-0.92). Attending childbirth education was associated with increased shared decision-making (ARR = 1.07; 95% CI, 1.01-1.12). Full results are available in Table 3.

Attending childbirth education conducted over 3 or more sessions was associated with reduced use of pain medication (ARR = 1.28; 95% CI, 1.12-1.46), reduced use of planned cesarean delivery (ARR = 0.74; 95% CI, 0.53-0.99), and increased shared decision-making (ARR = 1.20; 95% CI, 1.04-1.37). In contrast, attending childbirth education conducted as a single session or 2 sessions was only associated with reduced use of pain medication. No association was identified between childbirth education and use of induction of labor.

DISCUSSION

The key finding of this study is that childbirth education conducted over 3 or more sessions is more effective at achieving population health objectives and facility quality goals than courses conducted in 1 or 2 sessions. This information can be used by nurses to design childbirth education interventions that help meet specific facility or population health goals. In addition, pregnant people can use this information to help select the best childbirth education course for their needs. Finally, the number of sessions of childbirth education can be used as a marker for the quality of perinatal programs.

Although participants in any childbirth education course had reduced odds of using pain medication,

Table 2. **Description of outcomes by the number of sessions in the childbirth education course**

Outcomes	Did not attend (*N* = 895)	1 session (*N* = 332)	2 sessions (*N* = 315)	≥3 sessions (*N* = 1336)
Induction of labor				
Yes	323 (36.1%)	120 (36.0%)	112 (35.0%)	421 (31.5%)
No	572 (63.9%)	213 (64.0%)	208 (65.0%)	915 (68.5%)
Any pain medication				
Yes	849 (95%)	303 (91.0%)	292 (91.3%)	1184 (92.4%)
No	45 (5.0%)	30 (9.0%)	28 (8.6%)	98 (7.6%)
Epidural[a]				
Yes	761 (85.0%)	261 (78.4%)	266 (83.1%)	1 081 (80.9%)
No	134 (15%)	72 (21.6%)	54 (16.9%)	255 (19.1%)
Systemic opioids[a]				
Yes	238 (27.4%)	103 (31.0%)	52 (16.5%)	380 (28.9%)
No	632 (72.6%)	229 (69.0%)	263 (83.5%)	937 (71.15%)
Mode of delivery				
Vaginal	634 (70.8%)	243 (73.0%)	231 (72.2%)	952 (71.3%)
Cesarean delivery	261 (29.2%)	90 (27.0%)	89 (27.8%)	384 (28.7%)
Planned	53 (5.9%)	15 (4.5%)	16 (5%)	68 (5.1%)
Unplanned	208 (23.2%)	75 (22.5%)	73 (22.8%)	316 (23.7%)
Decision making[a]				
Score 6	489 (56.3%)	214 (66.5%)	206 (65.0%)	892 (67.9%)
Score <6	380 (43.7%)	108 (33.5%)	111 (35.0%)	421 (32.1%)

[a] $P < .05$.

Table 3. **Approximated risk ratios for outcomes with childbirth education by the number of sessions in the course**

	Any childbirth education, ARR (95% CI)	Analysis by structure of childbirth education		
		Single session, ARR (95% CI)	2-session course, ARR (95% CI)	≥3 sessions, ARR (95% CI)
Induction of labor	0.97 (0.84-1.11)	1.10 (0.91-1.32)	0.99 (0.80-1.21)	0.93 (0.79-1.08)
Any pain medication	0.94 (0.88-0.98)	0.93 (0.84-0.99)	0.94 (0.87-1.00)	0.95 (0.91-0.99)
Use of epidural	0.94 (0.90-0.99)	0.90 (0.80-0.98)	0.98 (0.91-1.04)	0.95 (0.90-1.00)
Use of opioids	1.22 (1.06-1.39)	1.28 (1.06-1.51)	0.75 (0.55-1.02)	1.28 (1.12-1.46)
Any cesarean delivery	0.92 (0.79-1.06)	0.88 (0.69-1.10)	0.87 (0.69-1.11)	0.97 (0.90-1.03)
Planned cesarean delivery	0.65 (0.46-0.92)	0.62 (0.34-1.10)	0.66 (0.37-1.17)	0.74 (0.53-0.99)
Unplanned cesarean delivery	1.02 (0.87-1.19)	0.98 (0.76-1.24)	0.98 (0.75-1.25)	1.04 (0.85-1.28)
Decision making	1.07 (1.01-1.12)	1.07 (0.98-1.16)	1.04 (0.94-1.13)	1.20 (1.04-1.37)

Abbreviation: ARR, approximated risk ratio.

only participants in courses conducted over 3 or more sessions had increased decision-making and reduced use of cesarean delivery. This may be due to a difference in the learning that can be achieved between single- or multiple-session courses. Courses conducted over multiple weeks take advantage of distributive practice. Distributive practice is an evidence-based strategy that results in improved learning compared with concentrated learning in a single session.[34] The findings of this study demonstrate that childbirth education courses are more effective when designed using distributive practice. Knowing this, the number of sessions can be considered as a measure of the quality of the childbirth education, especially when implemented to achieve population health or facility quality improvement goals.

The reduced use of planned cesarean delivery with childbirth education agrees with prior research.[5,6,29] There are 2 mechanisms by which childbirth education conducted over 3 sessions may reduce cesarean delivery rates. First, the distributive practice that results from 3-session courses likely results in increased knowledge and development of comfort skills. Increased knowledge about birth options is associated with favorable views about vaginal delivery.[4] The second potential mechanism is by reducing fear of childbirth. Fear of childbirth is associated with a preference for cesarean delivery but is reduced with education.[35] Longer courses may be able to include more information and result in larger reductions in fear of childbirth. Wide variations in the content of childbirth education, training of the educator, and duration of class sessions are reported in the US and in other high-income countries.[2,36–39] Future research should investigate which of these characteristics are related to the number of sessions and which could be used as additional measures for improving childbirth education quality.

Participation in childbirth education was associated with reduced use of pain medication for all categories of the number of sessions of childbirth education tested. It is possible that participants enrolled in childbirth education as a strategy to give birth without medication. This is unlikely because childbirth education was associated with an increase in use of opioids for pain relief. This study was not able to control the intention to use medication during labor. Prior research found that training in comfort measures for labor is associated with changing plans for pain management in labor, suggesting that this finding may be due to the education provided rather than a selection bias for those attending childbirth education courses.[40]

There are several reasons for which childbirth education may not be associated with induction of labor. First, there is an ongoing transition in scientific understanding of the risks for nonmedically indicated induction of labor.[41] In addition, prior evidence that decisions about induction of labor do not follow established standards of shared decision-making suggests childbirth education may have no impact on this outcome.[42] Finally, the participants in this study were mostly non-Hispanic White, a population subgroup with the highest rate of nonmedically indicated induction of labor.[43]

The finding of an association between shared decision-making and attending childbirth education of at least 3 sessions provides a foundation for understanding how childbirth education affects maternal health outcomes. Although shared decision-making is demonstrated to improve patient outcomes in other medical fields, it is uncommon in maternity care.[42,44] Shared decision-making has limited effect when it begins during a hospitalization, and the time constraints of the labor and delivery experience are a barrier to pregnant people examining options and values as they might for

other healthcare services.[45] One factor that increases the use of shared decision-making is patient education.[46] Childbirth education conducted over 3 or more sessions provides pregnant people with the time needed to review what they have learned and may function similarly to enhanced decision support from a trained health coach.

The findings from this study provide evidence of the need to further study childbirth education as a strategy for achieving population health objectives. The current body of evidence for childbirth education indicates improvements in maternal health across a wide variation in course content and distribution of the content across sessions. However, not every study finds a reduction in cesarean delivery with childbirth education interventions. Research is needed to identify which childbirth education characteristics are associated with improved maternal outcomes.

The findings of this study do not support prior findings from this time period that a single-session childbirth education course was the most commonly attended.[20] Instead, the most commonly attended course was conducted over 3 or more sessions. The sample for this study was consistent with samples from prior retrospective studies of childbirth education in the US that suggest that maternal age, race and ethnicity, education level, and income are associated with attendance at childbirth education.[3,5] These social determinants of health are also associated with access to care, pregnancy-related morbidity, and maternal health disparities. It is possible the sample for this analysis had fewer barriers to attending multisession childbirth education. Program implementation may be improved by research investigating the barriers and facilitators for attending 3 or more sessions of childbirth education.

Strengths and limitations

A particular strength of this study is that the data provided the education course subject, which allowed exclusion of individuals who attended breastfeeding or newborn care classes. Another strength was the validation of participant reports of cesarean delivery with the participant's medical record. Finally, inclusions of participants who attended childbirth education at multiple locations and gave birth in hospitals across the state strengthen the generalizability of these findings.

This study was limited by comparison of the number of childbirth education sessions without information about the specific content or function. There is a wide variation in the content of childbirth education courses, and this variation could not be controlled in this study.[36,47] This limitation was considered acceptable because this was the first examination of the effect of the number of sessions of childbirth education, and it is likely that the content provided in a course varies by the number of sessions. This study was further limited by the use of data from a single state. State variations, such as Medicaid reimbursement for childbirth education, alter access to childbirth education and therefore may alter the reasons pregnant people participate in childbirth education. This study was limited by use of data from 2009 to 2011, a time when participation in childbirth education was decreasing. The participation rates from this study should not be generalized to current participation.

Practice implications

Childbirth education conducted over 3 or more sessions can be considered an effective intervention for meeting population health or facility quality improvement goals. When evaluating a childbirth education program, the number of sessions can be evaluated as an indicator of the quality of the intervention. Nurses working to implement new childbirth education programs can improve the effectiveness by designing a course that is conducted over 3 or more sessions. Future research should investigate the barriers to implementing childbirth education of at least 3 sessions to improve implementation of evidence-based childbirth education.

CONCLUSION

This study found that childbirth education conducted in 3 or more sessions is associated with decreased use of planned cesarean delivery and increased shared decision-making. Implementing childbirth education programs with 3 or more sessions can be used to achieve population health or facility quality goals.

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