Contraception: *Original Research*

Role of Bridge Contraception in Postpartum Long-Acting Reversible Contraception and Sterilization Fulfillment Rates

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OBJECTIVE: To estimate the association of bridge contraception with interval long-acting reversible contraception (LARC) and sterilization fulfillment rates.

METHODS: This is a secondary analysis of a retrospective single-center cohort chart review study examining 1,851 postpartum women who requested LARC or sterilization after discharge. Bridge contraception was requested by 597 of these women. Primary outcomes included LARC or sterilization fulfillment, time to fulfillment, postpartum visit attendance, and pregnancy within 365 days of delivery.

RESULTS: The rate of LARC or sterilization fulfillment within 90 days of delivery was 147 of 597 (24.6%) women using bridge contraception and 287 of 1,254 (22.9%) women not using bridge contraception (P=.41). After adjusting for maternal age, parity, gestational age, mode of delivery, adequacy of prenatal care, race–ethnicity, and education level, the use of bridge contraception was associated with LARC or sterilization fulfillment (adjusted odds ratio [OR] 1.30, 95% CI 1.02–1.67). Adequacy of prenatal care and black race was associated with fulfillment. The use of bridge contraception was not associated with time to fulfillment (adjusted hazard ratio 1.17, 95% CI 0.95–1.44) or postpartum visit attendance (adjusted OR 0.97, 95% CI 0.77–1.23). The use of bridge contraception was not associated with increased pregnancy within 365 days of delivery (OR 1.00, 95% CI 0.95–1.05; adjusted OR 0.96, 95% CI 0.73–1.26).

CONCLUSION: Bridge contraception is associated with increased LARC and sterilization fulfillment after postpartum discharge. Long-acting reversible contraception or sterilization fulfillment after discharge occurred in less than one in four women. Strategies to improve provision of LARC or sterilization before hospital discharge are necessary.

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Short interpregnancy interval (fewer than 18 months) has been linked to adverse maternal and neonatal outcomes such as gestational diabetes and preterm birth.[1,2] The use of postpartum contraception can reduce rates of short interval pregnancy.[3] Long-acting reversible contraception (LARC) and permanent sterilization are the most effective methods of postpartum contraception and result in significantly fewer unplanned, short-interval pregnancies.[4–6] However, the ideal timing of postpartum LARC or sterilization fulfillment is less clear. Both LARC placement and sterilization procedures can be initiated immediately postpartum or in an interval fashion, generally at or after the outpatient postpartum visit.[7,8] Many barriers to postplacental LARC and inpatient postpartum sterilization exist, including financial, logistic, clinical, administrative, and policy barriers.[6–11] These factors often result in delayed LARC or sterilization fulfillment until an outpatient appointment, but postpartum

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visit attendance can be quite low in some communities and as many as 40% of women will have already resumed intercourse by the time of their postpartum visit.[8,12,13]

Short-acting bridge contraception can be used while awaiting interval LARC or sterilization fulfillment, although the evidence is contradictory on its effect (Berger A, Hinz E, Lackritz K, Woodhams E. Does a contraceptive bridge method affect rates of postpartum IUD placement in a resident urban clinic? [abstract] Contraception 2014;90:325.).[14] Our goal was to examine the effect that bridge contraception has on these outcomes while accounting for the effect of related clinical and demographic factors such as insurance type, age, race or ethnicity, and education. We hypothesized that once prescribed bridge contraception, women may be less motivated to pursue long-acting contraception, leading to decreased LARC and sterilization fulfillment, increased time to LARC and sterilization fulfillment, decreased postpartum visit attendance, and increased subsequent pregnancy.

MATERIALS AND METHODS

This is a secondary analysis of a subset of women in a retrospective single-site cohort study involving 8,654 women who delivered at a gestational age of 20 weeks or more between January 1, 2012, and December 31, 2014, at our urban, tertiary care, academic hospital. The primary analysis investigated only the subset of this study population desiring postpartum sterilization.[15] For this analysis, the cohort was restricted to women who requested postpartum LARC or sterilization but did not achieve fulfillment before discharge (Fig. 1). Postpartum contraception plans for each patient were abstracted from the delivery discharge summaries or inpatient postpartum daily progress notes if not available in the discharge summary. All study participants had a contraceptive plan documented in the electronic medical record in one of these two places. For those women who delivered more than once within the study timeframe and indicated interest in either LARC or sterilization for both deliveries, only the first pregnancy was included. Inpatient postpartum LARC was not available at our hospital (or any other hospital in our region) at the time of this study.

The linked outpatient and inpatient electronic medical record for each participant was reviewed for characteristics such as maternal age, parity, gestational age, delivery type, race or ethnicity, marital status, and education as well as for the documentation of

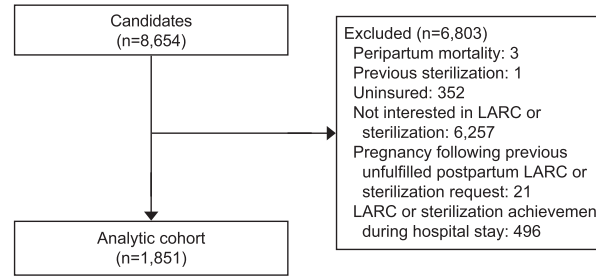

Fig. 1. Flowchart of the study population. Exclusions are not mutually exclusive. LARC, long-acting reversible contraceptives.

Montague. Bridge Contraception and LARC or Sterilization Fulfillment. Obstet Gynecol 2018.

contraceptive counseling, plan, and fulfillment up to 1 year after delivery.

Long-acting reversible contraception or sterilization fulfillment was recorded as a binary outcome, defined as LARC placement or sterilization within 90 days of delivery. Fulfillment within 6 weeks of delivery was also calculated because women with Medicaid resulting from pregnancy are eligible for Medicaid coverage for up to 6 weeks after delivery in the state of Ohio. This coverage includes comprehensive contraceptive coverage, including LARC and sterilization. However, the primary outcome was defined as 90 days to provide a more comprehensive account of LARC or sterilization fulfillment that includes service recovery of those who missed their initial postpartum visit, scheduling of surgery, and accounts for those health care providers who routinely require a second procedure-only visit rather than placing LARC at the time of the postpartum visit.

The time between delivery and LARC or sterilization achievement was calculated as a continuous outcome in number of days. Postpartum visit attendance was recorded if an outpatient postpartum note was documented. Although short-interval pregnancy is defined as two pregnancies within 18 months of each other, we abstracted subsequent pregnancy within 365 days for this study. Rate of subsequent pregnancy within 365 days of delivery after LARC or sterilization nonachievement was calculated based on documentation in our electronic medical record by either a positive urine or serum pregnancy test, presentation for prenatal care, or notation of pregnancy care at an outside hospital in our hospital's clinical documentation.

"Bridge" contraception was defined as the simultaneous documentation of request for LARC or sterilization as well as provision of combined oral contraception pills, progestin-only pills, epidermal

patch, vaginal ring, or depot medroxyprogesterone acetate (DMPA) as temporary contraception between discharge after delivery and outpatient LARC or sterilization fulfillment. The request for bridge contraception was identified from the contraceptive plan, as noted previously, and verified by either the concurrent order for inpatient DMPA administration or provision of a prescription for combined oral contraception pills, progestin-only pills, patch, or vaginal ring. Women who received bridge contraception but did not subsequently fulfill LARC or sterilization plans were included in the analysis as having not achieved their overall desired contraceptive plan.

Insurance status, maternal age at delivery in years, parity at admission, gestational age at delivery in weeks, number of prenatal visits, delivery type, race or ethnicity, marital status, and education level were recorded. Insurance status was analyzed as private compared with public (Medicaid, Medicare, and Champus or Tricare–the insurance product of the Department of Defense). Parity was collapsed into two levels: parity less than two or parity of two or more. Adequate prenatal care was defined as six or more prenatal visits.[16] Education level was initially abstracted as a factor with eight possible levels but was collapsed into two levels (no college vs at least some college). All covariates were prespecified for multivariable analyses, except for the consolidation of two categorical variables with fewer than five observations (forceps and vacuum-assisted deliveries were collapsed into operative vaginal deliveries and education level as noted previously) in any predictor–outcome combination.

Records were abstracted by one of four trained researchers and coded using an iterative process to assure completeness, accuracy, and consistency of data collection. Several variables were directly obtained from our institution's perinatal database and subsequently verified by researchers during chart review. Insurance status for each participant was obtained directly by comparing medical records with billing records. The four researchers involved in this study each reviewed 100 selected charts to calculate a Fleiss κ for concordance for a documented contraceptive plan and plan achievement, for which 95% CIs were constructed according to normal quantiles multiplied by Fleiss' estimated standard error.

Demographic and clinical variables were calculated across bridge contraception status using *t* tests and χ^2 tests for continuous and proportional outcomes, respectively. Long-acting reversible contraception or sterilization fulfillment with and without bridge contraception was analyzed using univariable and multivariable logistic regression to yield crude odds ratios (ORs) and adjusted ORs, respectively. Collinearity was assessed in our multivariable model by calculating variance inflation factors for each variable. Time from delivery to LARC or sterilization fulfillment across bridge contraception status was compared by univariable and multivariable Cox hazards modeling to yield crude average hazard ratios (HRs) and adjusted average HRs, respectively. Because nonproportional hazards were detected across the primary predictor of interest, weighted Cox regression rather than Cox proportional hazards regression was used. Postpartum visit attendance across bridge contraception groups was compared using multivariable logistic regression. Finally, the rate of subsequent pregnancy within 365 days of delivery after LARC or sterilization nonachievement was compared between women choosing bridge contraception or not through χ^2. All tests were two-tailed, and an α of 0.05 was used to define statistical significance. All models were initially prespecified to include all covariates listed previously. However, categorical covariates with any cell counts amounting to fewer than 110 observations (10 times the planned number of adjustors) over bridge contraception categories were removed from models. For the purposes of survival analysis, participants without a date of achievement were considered right-censored and assigned a survival time starting at the delivery day and ending on the last day of chart review (December 31, 2015). Regression and adjusted estimates used data with less than 5% missingness. Sixty-eight (4%) participants were missing data on the number of prenatal care visits, which was used to determine adequacy of prenatal care, and 73 (4%) observations of educational level were missing. For multivariable estimates using these data, participants with missing values were excluded (n=137 [7.4%]).

Analyses for this study were performed using R Version 3.4.0.[17] A power analysis was not conducted because this study is a secondary analysis based off an existing data set that was designed to compare rates of sterilization request fulfillment between women with Medicaid and women with private insurance.[15] This study was approved by the institutional review board of MetroHealth Medical Center.

RESULTS

After exclusions, 1,851 (21.4%) women in the overall cohort of 8,654 patients requested LARC or sterilization. Of these, 597 (32.3%) chose to use bridge contraception and 1,254 (67.7%) did not (Table 1). Among those 597 women who were prescribed bridge

Table 1. Clinical and Demographic Characteristics of Our Study Population

Characteristic	Chose to Use Bridge Contraception	Did Not Choose Bridge Contraception	Missing Values	*P*
No. of participants	597	1,254	NA	
Private insurance	44 (7.4)	161 (12.8)	NA	**.001**
Maternal age at delivery (y)	26.71±5.65	26.87±5.96	0 (0.0)	.59
Parity			0 (0.0)	**<.001**
0	93 (15.6)	257 (20.5)		
1	136 (22.8)	386 (30.8)		
2 or more	368 (61.6)	611 (48.7)		
Gestational age at delivery (wk)	38.02 (2.82)	38.07 (2.60)	0 (0.0)	.67
Adequate prenatal care	429 (74.2)	984 (81.7)	68 (3.7)	**<.001**
Delivery type—cesarean	119 (19.9)	287 (22.9)	0 (0.0)	.17
Race or ethnicity			0 (0.0)	**<.001**
Black	345 (57.8)	581 (46.3)		
White	152 (25.5)	414 (33.0)		
Hispanic	82 (13.7)	194 (15.5)		
Asian	7 (1.2)	18 (1.4)		
Other	11 (1.8)	47 (3.7)		
Married	68 (11.7)	223 (18.5)	61 (3.3)	**<.001**
College education	165 (27.6)	440 (35.1)	73 (3.9)	**<.001**

NA, not applicable.
Data are n (%) or mean±SD unless otherwise specified.
Bold indicates statistically significant associations.

contraception, 386 (64.7%) chose DMPA, 158 (26.5%) progestin-only pills, 49 (8.2%) combined oral contraception pills, and four (0.7%) a vaginal ring (Table 2). The Fleiss κ statistic among the four researchers was 0.86 (95% CI 0.79–0.95) for LARC or sterilization as postpartum contraception plan, 0.75 (95% CI 0.60–0.90) for use of bridge contraception, and 0.82 (95% CI 0.67–0.97) for plan achievement.

Table 2. Clinical and Demographic Characteristics by Type of Bridge Contraception

Characteristic	DMPA	POPs	COCPs	Vaginal Ring	None
No. of participants	386	158	49	4	1,254
Insurance type					
Private	22 (5.7)	17 (10.8)	4 (8.2)	1 (25.0)	161 (12.8)
Public	364 (94.3)	141 (89.2)	45 (91.8)	3 (75.0)	1,093 (87.2)
None	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Mean maternal age at delivery (y)	26.63±5.58	26.70±5.95	27.29±5.26	27.75±7.54	26.87±5.96
Parity					
0	50 (13.0)	36 (22.8)	6 (12.2)	1 (25.0)	257 (20.5)
1	82 (21.2)	38 (24.1)	16 (32.7)	0 (0.0)	386 (30.8)
2 or more	254 (65.8)	84 (53.2)	27 (55.1)	3 (75.0)	611 (48.7)
Gestational age at delivery (wk)	37.95 (2.95)	38.30 (2.32)	37.60 (3.19)	38.00 (2.71)	38.07 (2.60)
Adequate prenatal care	272 (72.9)	124 (79.5)	31 (67.4)	2 (66.7)	984 (81.7)
Cesarean delivery	77 (19.9)	31 (19.6)	11 (22.4)	0 (0.0)	287 (22.9)
Race or ethnicity					
Black	223 (57.8)	93 (58.9)	27 (55.1)	2 (50.0)	581 (46.3)
White	93 (24.1)	40 (25.3)	18 (36.7)	1 (25.0)	414 (33.0)
Hispanic	59 (15.3)	19 (12.0)	3 (6.1)	1 (25.0)	194 (15.5)
Asian	3 (0.8)	4 (2.5)	0 (0.0)	0 (0.0)	18 (1.4)
Other	8 (2.1)	2 (1.3)	1 (2.0)	0 (0.0)	47 (3.7)
Married	41 (10.9)	19 (12.2)	7 (14.9)	1 (25.0)	223 (18.5)
College education	93 (24.1)	55 (34.8)	16 (32.6)	1 (25.0)	440 (35.1)

DMPA, depot medroxyprogesterone acetate; POPs, progestin-only pills; COCPs, combined oral contraception pills.
Data are n (%) or mean±SD.

The rate of LARC or sterilization achievement within 90 days of delivery was 147 of 597 (24.6%) women using bridge contraception and 287 of 1,254 (22.9%) women not using bridge contraception (P=.41). When limited to the first 6 weeks after delivery, only 4 of 597 (0.7%) using bridge contraception and 17 of 1,254 (1.4%) not using bridge contraception had achieved LARC or sterilization. After adjusting for the patient characteristics prespecified previously, the association between bridge contraception and LARC or sterilization fulfillment within 90 days of delivery was significant (adjusted OR 1.30, 95% CI 1.02–1.67) (Table 3). Additionally, adequacy of prenatal care (adjusted OR 2.50, 95% CI 1.75–3.66) and black race (adjusted OR 0.67, 95% CI 0.53–0.84) were both significantly associated with LARC or sterilization fulfillment in multivariable analysis. No meaningful collinearity between factors was identified because the variance inflation factor was less than 1.21 for each covariate. Although the primary outcome was whether women received the contraceptive method they expressed desire in at the time of hospital discharge, four patients initially desired sterilization at the time of hospital discharge but expressed a preference for LARC instead at the 6-week postpartum visit. None of these patients had received a bridge contraception method. Zero patients had initially expressed interest in LARC but stated they desired sterilization at the postpartum visit.

Of the 434 women who did achieve LARC or sterilization within 90 days after delivery, we found no significant difference in time from delivery to achievement between those who used and did not use bridge contraception after adjusting for the listed covariates (median 70 vs 63 days for bridge vs no bridge, respectively) (adjusted HR 1.17, 95% CI 0.95–1.44) (Table 4). However, adequacy of prenatal care (adjusted HR 2.28, 95% CI 1.63–3.21) and black race (adjusted HR 0.72, 95% CI 0.58–0.88) were significantly associated with time to achievement.

When considering whether type of bridge contraception affected LARC or sterilization fulfillment, 95 (24.6%) women who chose DMPA, 42 (26.6%) women who chose progestin-only pills, and 11 (22.4%) women who chose combined oral contraception pills subsequently achieved LARC or sterilization within 90 days of delivery (P=.48, OR 1.02, 95% CI 0.97–1.07; P=.39, OR 1.03, 95% CI 0.96–1.11; and P=.94, OR 1.00, 95% CI 0.88–1.12, respectively). Bridge type-specific analysis was not conducted for vaginal ring users given the low number in this group (n=4). Time to achievement for each type of bridge was examined individually. Median time to achievement was similar in each subgroup (70–72 days).

Two hundred seventeen of 597 (36.3%) women using bridge contraception and 385 of the 1,254 women (30.7%) not using bridge contraception did not return for their postpartum visit. After adjusting for relevant patient characteristics, the use of bridge contraception was not significantly associated with postpartum visit attendance (adjusted OR 0.97, 95% CI 0.77–1.23) (Table 5). However, several other factors were found to be positively associated with postpartum visit attendance including maternal age (adjusted OR 1.04, 95%

Table 3. Logistic Regression of Long-Acting Reversible Contraception or Sterilization Fulfillment by 90 Days After Delivery

	Univariable OR	95% CI	Multivariable OR	95% CI
Use of bridge contraception*	1.02	0.98–1.06	**1.30**	1.02–1.67
Mean maternal age at delivery†	1.00	1.00–1.00	1.02	0.99–1.04
Parity 2 or greater‡	**0.95**	0.91–0.98	0.79	0.61–1.01
Gestational age at delivery§	1.01	1.00–1.02	1.05	1.00–1.11
Adequate prenatal care‖	**1.17**	1.12–1.23	**2.50**	1.75–3.66
Cesarean delivery¶	1.01	0.96–1.06	1.15	0.86–1.51
Black or African American#	**0.92**	0.89–0.96	**0.67**	0.53–0.84
College education**	**1.06**	1.01–1.10	1.14	0.89–1.47

OR, odds ratio.
Bold indicates statistically significant associations.
* Referent group—no use of bridge contraception.
† Analyzed continuously.
‡ Referent group—parity less than 2.
§ Analyzed continuously.
‖ Referent group—inadequate prenatal care (fewer than six prenatal visits).
¶ Referent group—spontaneous or operative vaginal delivery.
# Referent group—nonblack or African American.
** Referent group—no college education.

Table 4. Weighted Cox Hazard Ratios of Time to Long-Acting Reversible Contraception or Sterilization Fulfillment

	Univariable HR	95% CI	Multivariable HR	95% CI
Use of bridge contraception*	1.03	0.84–1.26	1.17	0.95–1.44
Mean maternal age at delivery†	1.01	0.99–1.03	1.01	1.00–1.03
Parity 2 or greater‡	**0.80**	0.66–0.98	0.84	0.67–1.05
Gestational age at delivery§	**1.08**	1.02–1.13	1.05	0.99–1.11
Adequate prenatal care‖	**2.63**	1.89–3.67	**2.28**	1.63–3.21
Cesarean delivery¶	1.06	0.84–1.34	1.11	0.87–1.40
Black or African American#	**0.69**	0.57–0.84	**0.72**	0.58–0.88
College education**	**1.29**	1.04–1.58	1.15	0.92–1.42

HR, hazard ratio.
Bold text denotes statistically significant associations.
* Referent group—no use of bridge contraception.
† Analyzed continuously.
‡ Referent group—parity less than 2.
§ Analyzed continuously.
‖ Referent group—inadequate prenatal care (fewer than six prenatal visits).
¶ Referent group—spontaneous or operative vaginal delivery.
# Referent group—nonblack or African American.
** Referent group—no college education.

CI 1.02–1.06), parity greater than or equal to two (adjusted OR 0.54, 95% CI 0.42–0.69), adequacy of prenatal care (adjusted OR 3.86, 95% CI 2.97–5.03), black race (adjusted OR 0.77, 95% CI 0.61–0.96), and college education (adjusted OR 1.53, 95% CI 1.18–1.99).

Among those who did not achieve LARC or sterilization fulfillment, 125 of 450 (27.8%) women who used bridge contraception and 268 of 967 (27.7%) women who did not use bridge contraception had a subsequent pregnancy within 365 days of delivery; this was not significant after adjusting for relevant patient characteristics (adjusted OR 0.96, 95% CI 0.73–1.26) (Table 6).

DISCUSSION

After adjusting for insurance status, maternal age, parity, gestational age, adequacy of prenatal care, delivery type, race or ethnicity, marital status, and education level, the use of bridge contraception was associated with increased LARC and sterilization fulfillment, contrary to our initial hypothesis. Adequacy of prenatal care and black race were the strongest predictors of plan fulfillment and nonfulfillment, respectively. This confirms the importance of antenatal contraceptive counseling and reducing disparities in contraceptive care as previously demonstrated.[15] Furthermore, because less than one in four

Table 5. Logistic Regression of Postpartum Visit Attendance and Use of Bridge Contraception

	Univariable OR	95% CI	Multivariable OR	95% CI
Use of bridge contraception*	**0.95**	0.90–0.99	0.97	0.77–1.23
Mean maternal age at delivery†	1.01	1.00–1.01	**1.04**	1.02–1.06
Parity 2 or greater‡	0.88	0.85–0.92	**0.54**	0.42–0.69
Gestational age at delivery§	**1.02**	1.01–1.03	1.04	0.99–1.08
Adequate prenatal care‖	**1.42**	1.35–1.49	**3.86**	2.97–5.03
Cesarean delivery¶	1.00	0.95–1.06	1.04	0.79–1.37
Black or African American#	**0.93**	0.89–0.97	**0.77**	0.61–0.96
College education**	**1.16**	1.10–1.21	**1.53**	1.18–1.99

OR, odds ratio.
Bold indicates statistically significant associations.
* Referent group—no use of bridge contraception.
† Analyzed continuously.
‡ Referent group—parity less than 2.
§ Analyzed continuously.
‖ Referent group—inadequate prenatal care (fewer than six prenatal visits).
¶ Referent group—spontaneous or operative vaginal delivery.
# Referent group—nonblack or African American.
** Referent group—no college education.

Table 6. Logistic Regression of Second Pregnancy and Use of Bridge Contraception

	Univariable OR	95% CI	Multivariable OR	95% CI
Use of bridge contraception*	1.00	0.95–1.05	0.96	0.73–1.26
Mean maternal age at delivery†	0.99	0.98–0.99	0.92	0.89–0.94
Parity 2 or greater‡	0.98	0.93–1.02	1.29	0.97–1.73
Gestational age at delivery§	1.00	1.00–1.01	0.99	0.95–1.05
Adequate prenatal care‖	0.95	0.90–1.00	0.84	0.62–1.14
Cesarean delivery¶	0.95	0.90–1.00	0.82	0.59–1.12
Black or African American#	1.04	0.99–1.09	1.34	1.04–1.73
College education**	0.87	0.82–0.92	0.59	0.43–0.80

* Referent group—no use of bridge contraception.
† Analyzed continuously.
‡ Referent group—parity less than 2.
§ Analyzed continuously.
‖ Referent group—inadequate prenatal care (fewer than six prenatal visits).
¶ Referent group—spontaneous or operative vaginal delivery.
# Referent group—nonblack or African American.
** Referent group—no college education.

women requesting LARC or sterilization after hospital discharge achieved fulfillment, LARC or sterilization fulfillment during inpatient postpartum care should be prioritized.

No specific type of bridge method was significantly associated with LARC and sterilization fulfillment. The time from delivery to achievement of LARC or sterilization was not significant after adjusting for clinical and demographic factors. Furthermore, there was also no association between the use of bridge contraception and postpartum visit attendance or subsequent short-interval pregnancy after adjusting for relevant clinical and demographic factors. Therefore, greater effort at achieving fulfillment of the desire for highly effective contraception before hospital discharge is necessary to reduce rates of short-interval pregnancies because temporizing measures such as bridge contraception were not effective in our study.

Our study adds further depth to the existing literature on the role of bridge contraception in that it addresses several outcomes in a large, diverse patient population while accounting for the various clinical and demographic variables that affect contraceptive fulfillment. In a previous study involving 3,548 women requesting postpartum interval LARC placement, the use of bridge contraception was associated with decreased LARC placement.[11] However, our patient population had a greater proportion of women insured by Medicaid insurance and a higher rate of bridge contraception use. Our outcome also included both LARC and sterilization fulfillment. A second study of 199 women requesting postpartum intrauterine devices found that the use of bridge contraception in general was not significantly associated with the rate of interval intrauterine device placement, although in our study, this association was significant after multivariable analysis.[12] However, further study is necessary to better elucidate the precise role and effect of bridge contraception given the complexity of the clinical scenario as evidenced by the effect of the multivariable analyses on the outcomes of achievement, time to achievement, postpartum visit attendance, and short-interval pregnancy rates.

Our study is limited by its retrospective nature and potential loss to follow-up. Women who did not return for postpartum visits may have received care elsewhere or outside of the 90-day window we considered for the primary outcome. It is unlikely that sterilization was performed at an outside facility during this timeframe, however, given the federally required waiting period in the Medicaid population. Additionally, as a single-center study, contraceptive practices and barriers related to our institution's policies, practices, and patient characteristics may limit generalizability of our results. For example, during the study timeframe, our practice was to schedule women for an outpatient 6-week postpartum visit. A separate appointment for LARC insertion was required subsequently and the sterilization procedure was scheduled after this postpartum appointment. Implementing same-day LARC insertion and scheduling women for their postpartum appointment sooner after delivery may reduce barriers to fulfillment.

In conclusion, after adjusting for clinical and demographic factors, bridge contraception appears to be associated with increased LARC and sterilization fulfillment without resulting in delays in time to

fulfillment or decreased postpartum visit attendance in our patient population. Importantly, bridge contraception does not appear to affect short-interval pregnancy rates. Strategies to increase provision of LARC or sterilization before hospital discharge are needed. Patient populations similar to ours might benefit from the use of bridge contraception in women desiring interval postpartum LARC and sterilization.

REFERENCES

1. Hanley GE, Hutcheon JA, Kinniburgh BA, Lee L. Interpregnancy interval and adverse pregnancy outcomes: an analysis of successive pregnancies. Obstet Gynecol 2017;129:408–15.
2. Shachar BZ, Mayo JA, Lyell DJ, Baer RJ, Jeliffe-Pawlowski LL, Stevenson DK, et al. Interpregnancy interval after live birth or pregnancy termination and estimated risk of preterm birth: a retrospective cohort study. BJOG 2016;123:2009–17.
3. Centers for Disease Control and Prevention (CDC). Update to CDC's U.S. medical eligibility criteria for contraceptive use, 2010: revised recommendations for the use of contraceptive methods during the postpartum period. MMWR Morb Mortal Wkly Rep 2011;60:878–83.
4. Centers for Disease Control and Prevention. Contraception. How effective are birth control methods? Available at: www.cdc.gov/reproductivehealth/contraception/index.htm. Retrieved June 1, 2018.
5. Brunson MR, Klein DA, Olsen CH, Weir LF, Roberts TA. Postpartum contraception: initiation and effectiveness in a large universal healthcare system. Am J Obstet Gynecol 2017;217:55.e1–9.
6. White K, Teal SB, Potter JE. Contraception after delivery and short interpregnancy intervals among women in the United States. Obstet Gynecol 2015;125:1471–7.
7. Immediate postpartum long-acting reversible contraception. Committee Opinion No. 670. American College of Obstetricians and Gynecologists. Obstet Gynecol 2016;128:e32–7.
8. Access to postpartum sterilization. Committee Opinion No. 530. American College of Obstetricians and Gynecologists. Obstet Gynecol 2012;120:212–5.
9. Taub RL, Jensen JT. Advances in contraception: new options for postpartum women. Expert Opin Pharmacother 2017;18:677–88.
10. Hofler LG, Cordes S, Cwiak CA, Goedken P, Jamieson DJ, Kottke M. Implementing immediate postpartum long-acting reversible contraception programs. Obstet Gynecol 2017;129:3–9.
11. Block-Abraham D, Arora KS, Tate D, Gee RE. Medicaid consent to sterilization forms: historical, practical, ethical, and advocacy considerations. Clin Obstet Gynecol 2015;58:409–17.
12. Tully KP, Stuebe AM, Verbiest SB. The fourth trimester: a critical transition period with unmet maternal health needs. Am J Obstet Gynecol 2017;217:37–41.
13. Sok C, Sanders JN, Saltzman HM, Turok DK. Sexual behavior, satisfaction, and contraceptive use among postpartum women. J Midwifery Womens Health 2016;61:158–65.
14. Harney C, Dude A, Haider S. Factors associated with short interpregnancy interval in women who plan postpartum LARC: a retrospective study. Contraception 2017;95:245–50.
15. Arora KS, Wilkinson B, Verbus E, Montague M, Morris J, Ascha M, et al. Medicaid and fulfillment of desired postpartum sterilization. Contraception 2018;97:559–64.
16. Santos Neto ET, Oliveira AE, Zandonade E, Leal Mdo C. Access to prenatal care: assessment of the adequacy of different indices. Cad Saude Publica 2013;29:1664–74.
17. R Core Team. R: a language and environment for statistical computing. Available at: http://R-project.org. Retrieved June 1, 2018.