



# Implementation of Recommendations for Long-Acting Contraception Among Women Aged 13 to 18 Years in Primary Care

Sharisse M. Arnold Rehring, MD; Liza M. Reifler, MPH; Jennifer H. Seidel, MD; Karen A. Glenn, BS; John F. Steiner, MD, MPH

From the Department of Medical Education (SM Arnold Rehring, JH Seidel, and JF Steiner), Department of Pediatrics (SM Arnold Rehring), Department of Women's Health (JH Seidel), Colorado Permanente Medical Group; Institute for Health Research (LM Reifler, KA Glenn, and JF Steiner), Kaiser Permanente Colorado; Department of Pediatrics (SM Arnold Rehring), and Department of Medicine (JF Steiner), University of Colorado Anschutz Medical Campus, Aurora

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Address correspondence to John F. Steiner, MD MPH, Institute for Health Research, Kaiser Permanente Colorado, 2550 S. Parker Rd, Suite 200, Aurora CO 80014 (e-mail: [john.f.steiner@kp.org](mailto:john.f.steiner@kp.org)).

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## ABSTRACT

**OBJECTIVE:** Clinical specialty societies recommend long-acting reversible contraceptives (LARCs) as first-line contraception for adolescent women. We evaluated whether a combined educational and process improvement intervention enhanced LARC placement in primary care within an integrated health care system.

**METHODS:** The intervention included journal clubs, live continuing education, point-of-care guidelines, and new patient materials. We conducted a retrospective cohort study across 3 time periods: baseline (January 2013–September 2015), early implementation (October 2015–March 2016), and full implementation (April 2016–June 2017). The primary outcome was the proportion of LARCs placed by primary care clinicians among women aged 13 to 18 years compared with gynecology clinicians.

**RESULTS:** Kaiser Foundation Health Plan of Colorado cared for approximately 20,000 women aged 13 to 18 years in each calendar quarter between 2013 and 2017. Overall, LARC placement increased from 7.0 per 1000 members per quarter at baseline to 13.0 per 1000 during the full intervention. Primary

care clinicians placed 6.2% of all LARCs in 2013, increasing to 32.1% by 2017 ( $P < .001$ ), including 45.5% of contraceptive implants. Clinicians who attended educational sessions were more likely to adopt LARCs than those who did not (17.9% vs 6.4% respectively,  $P = .009$ ). Neither overall LARC placement rates (relative risk, 1.9; 95% confidence interval, 0.7–5.6) nor contraceptive implant rates (relative risk, 3.0; 95% confidence interval, 0.9–9.8) increased significantly in clinicians who attended educational activities.

**CONCLUSIONS:** This multimodal intervention was associated with increased LARC placement for adolescent women in primary care. The combination of education and process improvement is a promising strategy to promote clinician behavior change.

**KEYWORDS:** adolescence; continuing medical education; dissemination and implementation; long-acting contraception; women's health

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## WHAT'S NEW

A multimodal educational and process improvement intervention in an integrated health care system increased placement of long-acting reversible contraceptives (LARCs) by primary care clinicians from 6.2% to 32.1%. Both attendees and non-attendees at educational sessions increased LARC placement.

HISTORICALLY, ADOLESCENT WOMEN have used contraceptive methods such as withdrawal, condoms, or oral contraceptive pills, which have rates of high failure.<sup>1,2</sup> In contrast, long-acting reversible contraceptives (LARCs),

including contraceptive implants and intrauterine devices, have rates of failure  $<1\%$  in routine practice.<sup>3</sup> Women prefer LARCs when cost is not a consideration<sup>4,5</sup> and are more likely to continue LARCs over the long term.<sup>6</sup> LARC use among adolescent women reduces unintended pregnancies and pregnancy-related health care costs.<sup>7–10</sup> The American College of Obstetrics and Gynecology (ACOG) and the American Academy of Pediatrics (AAP) have recommended LARCs as first-line contraception for adolescents since 2011 and 2014, respectively.<sup>11,12</sup>

Successful interventions to increase LARC use have been reported in academic practices<sup>7</sup> and family planning networks<sup>8–10</sup> but not in community-based health care systems,

where pediatricians and other primary care clinicians provide the majority of contraceptive care. To increase LARC placement in primary care, patients and clinicians must be educated about benefits, risks, and misconceptions for LARCs.<sup>13-16</sup> Clinicians who did not receive procedural training during residency must be trained in LARC placement.<sup>17</sup> LARCs should be available during the same visit and at the same primary care site to enhance continuity of care and reduce the risk of pregnancy in the interval between the contraceptive decision and LARC placement.<sup>15</sup>

In 2015, the Department of Education in the Colorado Permanente Medical Group and a LARC task force in the Kaiser Foundation Health Plan of Colorado (KPCO) launched a multicomponent intervention including educational and process improvement components to implement AAP and ACOG recommendations.<sup>11,12</sup> We evaluated this intervention to address 2 questions: 1) Did the overall rate of LARC placement increase among primary care clinicians in comparison with gynecologists? and 2) Did participation in educational components increase LARC placement compared with process improvement components alone?

## METHODS

### SETTING

KPCO is an integrated health care system that provided health insurance and clinical care to >650,000 members in Colorado in 2016, of whom approximately 20,000 were women aged 13 to 18 years. KPCO members were insured by comprehensive health maintenance organization plans, high-deductible plans, Medicaid, the Children's Health Insurance Program, and other payers. Although not all KPCO members used their insurance benefits in any time period, those who did so received primary care in 27 clinics staffed by pediatricians, family physicians, nurse practitioners, and physician assistants. Adolescents who received pediatric care generally transferred to adult medicine at age 18 years. Women could receive contraceptives in primary care or could self-refer to gynecologists, specialized advanced practice nurses, or physician assistants in KPCO gynecology clinics. LARC options in KPCO included an etonogestrel implant and intrauterine devices (both levonorgestrel-releasing and copper). Other contraceptive options included oral contraceptive pills, contraceptive patches and rings, and depot medroxyprogesterone acetate injections. Health insurance provided full or partial coverage for pharmaceutical contraceptives.<sup>18,19</sup>

When ACOG and AAP recommendations were released, adolescent women in KPCO faced substantial barriers to obtaining LARCs. Only 5 clinics had a primary care clinician trained to place intrauterine devices or etonogestrel implants. No pediatricians provided LARC placement. Many pediatricians and family physicians were hesitant to recommend LARCs for adolescents due to misconceptions about side effects and contraindications. As a result, patients who desired LARCs often needed to schedule a second appointment in another clinic with an unfamiliar clinician, after a 7- to 10-day wait.

### INTERVENTION

Leaders in the Departments of Education, Pediatrics, and Women's Health in KPCO convened a task force in May 2015 to promote LARC as first-line contraception for all women, including those between 13 and 18 years of age. The task force was composed of gynecologists, pediatricians, family physicians, nurse practitioners, and nurse managers. The goals of the task force were to 1) provide LARC education and procedural training to primary care clinicians (pediatric and family medicine physicians and advanced practice nurses and physician assistants who practiced in primary care clinics); 2) foster interaction between gynecology clinicians and front-line primary care clinicians, registered nurses, and pharmacists who provided contraceptive counseling and office staff who assisted with LARC placement; and 3) promote LARC placement at the time and place when the member first sought contraceptive care.<sup>15</sup> The intervention was implemented between September 2015 and May 2016.

### EDUCATIONAL COMPONENTS

The Department of Education in the Colorado Permanente Medical Group is an accredited provider of *AMA PRA Category 1 Credit*. The department includes physicians, nurses, and pharmacy educators who collaborate with KPCO clinical departments and process improvement teams. As shown in [Table 1](#), educational components of the LARC intervention included journal clubs<sup>4,12,14</sup> and live educational sessions (accessible by video conference) for gynecology and primary care audiences, follow-up "take-home points," and in-service training for clinicians and staff. The journal club and live educational sessions were developed by practicing clinicians and designed around case presentations. These sessions provided a balanced discussion of etonogestrel implants and intrauterine devices so that patients could make an informed decision. These sessions also addressed misconceptions of patients and clinicians about the safety, effectiveness, and side effects of LARCs; emphasized concurrent use of barrier methods to reduce sexually transmitted infections; and proposed approaches to address abnormal uterine bleeding resulting from LARCs. Session moderators used audience response polling systems and encouraged attendees to submit questions by text message. Primary care clinicians who elected to place etonogestrel implants received Food and Drug Administration–mandated training from the manufacturer and were linked with a "mentor" gynecologist who provided further support, including supervised placement of LARCs, medical record reviews, and telephone consultations. Those who elected to place intrauterine devices attended a 2-day training.

### PROCESS IMPROVEMENT COMPONENTS

The LARC intervention also included updates to the LARC implementation toolkit in the KPCO electronic health record (EHR) to assist with ordering, documentation, coding, consent, and procedural set-up; online clinical guidelines; and patient educational materials that supported

**Table 1.** Components of Intervention to Increase Use of LARCs in Women Aged 13 to 18 Years, Kaiser Permanente Colorado 2015 to 2017

Intervention Components	Date(s)	Target Audience (Attendees)	Content
<b>Educational components</b>			
Pediatric journal club	September 2015	Pediatricians (12 attendees)	Reviewed influential papers <sup>4,12,14</sup>
Follow-up “take home” points	October 2015	All pediatricians	Longitudinal reinforcement of learning
Live 1-hour gynecology educational session	September 2015	Gynecologists, advanced practice nurses, physician assistants (63 attendees)	Anticipating and managing LARC side effects, consulting with primary care clinicians placing LARC
Follow-up “take home” points	October 2015	All gynecology clinicians	Longitudinal reinforcement of learning
Live, case-based, 2-hour primary care educational session	April 2016	All primary care clinicians (207 attendees)	Debunk misconceptions about LARC and encourage training in placement
Follow-up “take home” points	May 2016	All primary care clinicians	Longitudinal reinforcement of learning
Training in placement of implants or intrauterine devices	Ongoing	Primary care physicians, advanced practice nurses, physician assistants	E-mail reminders about training opportunities and LARC information Hands-on training sessions Identification of LARC mentors in gynecology
Education for nurses, medical assistants, and pharmacists	Ongoing	Primary care and gynecology registered nurses, medical assistants, licensed practical nurses, pharmacy technicians	Contraception counseling guidelines and documentation tool for nurse telephone visits Handout for MA/LPN debunking myths about LARC Standardized set-up for LARC placement Pharmacy protocol to recommend switch to LARC for women receiving other contraceptives
<b>Process improvement components</b>			
LARC task force	May 2015	Gynecologists, pediatricians, family physicians, RNs, nurse managers, pharmacists	Mission to make LARC first-line recommendation in contraception counseling for all women
EHR-based LARC implementation toolkit	Established 2010 Updated 2015	All clinicians placing LARC	Tools to help with LARC ordering, documentation, coding, consent, and procedural set-up
Clinical guidelines and other information resources	April 2016	All clinicians	Repository of pertinent information in online clinical library
Changes to written patient instructions for contraception	May 2016	All women making contraceptive decisions	Included information on all contraceptive options, recommended LARC as first-line contraception
EHR ordering tool to address abnormal uterine bleeding from LARC	November 2016	All primary care and gynecology clinicians	Promote continuation of LARC

LARC indicates long-acting reversible contraceptive; MA/LPN, medical assistants and licensed practical nurses; RN, registered nurses; and EHR, electronic health record.

AAP and ACOG recommendations for LARCs. These materials are available on request.

### EVALUATION DESIGN

We used a retrospective cohort design to evaluate the LARC intervention. Since adolescent women could join or leave KPCO at any time, we defined a series of 18 cohorts that included all female KPCO members aged 13 to 18 years in the Denver-Boulder and Northern Colorado regions during each quarter of the 4.5-year study period. Each cohort included all women who were health plan members during that quarter, not only those who used clinical services. Exclusions from each cohort included women <13 or ≥19 years of age, those who disenrolled from the health plan, and those who died.

Before data collection, we designated 3 time periods to compare rates of LARC placement: baseline (January 1, 2013–September 30, 2015), early intervention (October 1, 2015–March 31, 2016), and full intervention (April 1, 2016–June 30, 2017). The early intervention period began after the live educational session for gynecology clinicians and the pediatric journal club and lasted until the live educational session for primary care clinicians. The full intervention period began after the live primary care educational session.

We identified all physicians, physician assistants, nurse practitioners, and nurse midwives practicing in pediatrics, obstetrics/gynecology, family medicine, or internal medicine during the same 4.5-year period, including participants in the task force. Clinicians were excluded who did not provide care to adolescent women during the baseline period or were

not employed after September 2015. In a few cases, administrative records linked LARC procedures to physicians from other clinical specialties. These patients and physicians were excluded. Clinicians who attended live educational sessions were identified using sign-in sheets and course evaluations. Clinicians were unaware that their LARC prescribing would later be assessed in aggregate.

## STUDY MEASURES

Clinical data were derived from the Virtual Data Warehouse (VDW) in the KPCO Institute for Health Research. The VDW is a comprehensive research data resource built from EHRs, claims, pharmacy and membership systems.<sup>20</sup> Clinician specialty was obtained from employment records.

The primary study outcome was LARC placement, defined as a contraceptive implant or an intrauterine device placed in a KPCO outpatient clinic between January 1, 2013, and June 30, 2017. To calculate the intervention rate in the entire population, we divided the number of women aged 13 to 18 years who received LARC per quarter by the number of eligible health plan members in that quarter. To more directly assess changes in clinician behavior, we also calculated the quarterly rate of LARC placement per 1000 ambulatory visits for any reason among eligible women who used care in that quarter. Using visits rather than individuals as the denominator estimated the likelihood of LARC placement in response to a clinical discussion about contraceptive options.

We identified LARC implants using International Statistical Classification of Diseases and Related Health Problems (ICD)-9 codes (V25.5), ICD-10 codes (Z30.017, Z30.019), Current Procedural Terminology codes (11981, 11983) and Healthcare Common Procedure Coding System codes (J1050, J7307). Placement of intrauterine devices was identified using ICD-9 codes (V25.11, V25.13), ICD-10 codes (Z30.014, Z30.430, Z30.433), Current Procedural Terminology codes (58300), and Healthcare Common Procedure Coding System codes (J7297, J7298, J7300, J7301, J7302). We excluded cases for which diagnostic codes were not confirmed by a pharmacy or procedure code, since medical record reviews found that they reflected contraceptive counseling without LARC placement. Each LARC was assigned to a specific clinician. If a woman had multiple LARC placements during a 90-day period, we analyzed only the first procedure. We did not assess other pharmaceutical or non-pharmaceutical contraceptive methods. Although we did not define a reduction in the pregnancy rate as an outcome, organizational leaders requested us to track pregnancy rates over time. We identified pregnancies using a 2017 modification of the VDW pregnancy episode table, a comprehensive set of procedure and diagnosis codes for prenatal, delivery, and postnatal care.<sup>21</sup> Pregnancy rates were calculated as the number of pregnancies per 1000 women aged 13 to 18 years per quarter.

## STATISTICAL METHODS

We calculated quarterly rates of LARC placement and 95% confidence intervals in the entire population and by

clinical specialty. We compared overall LARC placement rates between primary care clinicians (physicians and non-physicians) and gynecology clinicians (physicians and non-physicians) over the 3 time periods and by year using Chi-square tests. We also conducted comparisons for pediatric clinicians only and for contraceptive implants and intrauterine devices separately.

We compared LARC placement rates among primary care clinicians who attended educational activities with those who did not over the same 3 periods, using a generalized estimating equation with a negative binomial distribution to evaluate differences in LARC rates. The outcome was the average number of LARCs placed per clinician per quarter. The natural logarithm of the number of ambulatory visits per clinician per quarter was used as an offset, to estimate the potential population with whom a clinician may have discussed contraceptive options. Clinician was modeled as a random effect. A first-order autoregressive correlation structure accounted for nonindependence of multiple observations within the same clinician. In the overall analysis, fixed effects were clinician specialty (gynecology or primary care), intervention period (baseline, early intervention, full intervention), and interactions of these main effects. In the analysis limited to primary care clinicians, fixed effects were educational session attendance (yes or no), intervention period, and the interactions of these main effects. Changes in pregnancy rates were modeled in a similar way, with the natural logarithm of the number of eligible women per quarter as an offset. Predicted average quarterly rates and 95% confidence intervals were generated from the models. We used  $\alpha=0.05$ , 2-sided, to determine significance. SAS, version 9.4.1 (SAS Institute, Inc. Cary, NC) was used for all analyses.

## HUMAN SUBJECTS REVIEW

The evaluation was designated as a quality improvement intervention by the KPCO institutional review board, which waived full board review and informed consent.

## RESULTS

### PATIENT AND CLINICIAN COHORTS

Between January 2013 and June 2017, KPCO cared for a mean of 20,610 women aged 13 to 18 years in each calendar quarter. Table 2 shows the sociodemographic characteristics of the member cohort during the first quarter of the early intervention period (October–December 2015). These characteristics were consistent across calendar quarters. At the beginning of the intervention, KPCO had 105 eligible gynecology clinicians (63 physicians, 1 physician assistant, 41 advanced practice nurses or midwives) and 472 eligible primary care clinicians, including 98 pediatric clinicians (85 physicians, 10 physician assistants, 3 nurse practitioners) and 374 clinicians from other primary care specialties (285 physicians, 52 physician assistants, 37 nurse practitioners). Sixty-three clinicians attended the gynecology educational session. Of 472

**Table 2.** Characteristics of Women Aged 13 to 18 Years Receiving Care at Kaiser Permanente Colorado, October to December 2015 (N = 21,095)

Characteristic	n (%)
Age, y	
13–14	7277 (34.5%)
15–16	6975 (33.1%)
17–18	6843 (32.4%)
Race/ethnicity	
Asian	862 (4.1%)
African-American	1114 (5.3%)
Hispanic or Latino	4031 (19.1%)
Other	1169 (5.5%)
Unknown	3865 (18.3%)
White	10,054 (47.7%)
Insurance plan	
Children's Health Plan Plus	1301 (6.2%)
Deductible plans	9148 (43.4%)
Traditional HMO plan	5892 (27.9%)
Medicaid	3780 (17.9%)
Other	974 (4.6%)

HMO indicates health maintenance organization.

eligible primary care clinicians, 207 (43.9%) participated in at least one formal educational activity, including 199 who attended the live educational session and 8 pediatricians who attended only the pediatric journal club.

#### CHANGE IN OVERALL LARC RATES OVER TIME

In quarterly cohorts of women aged 13 to 18 years, the rate of LARC placement increased from a mean of 7.0 per 1000 members during the baseline period to 13.0 per 1000 members during the full intervention period (Fig. 1, top panel). As shown in Table 3, the overall rate of LARC placement per 1000 patient visits did not change among gynecology clinicians in the early intervention period and increased only slightly in the full intervention period (relative risk, 1.2; 98% confidence interval, 1.0–1.4). The rate of implant placement by primary care clinicians per 1000 patient visits increased substantially in both early and full intervention periods, compared both with their baseline rates and with the rate of change for gynecology clinicians. Primary care clinicians placed 6.2% of LARCs in 2013, 7.1% in 2014, 9.3% in 2015, 32.3% in 2016, and 32.1% in the first 6 months of 2017 ( $P < .001$  compared with gynecology clinicians). The subset of LARCs placed by pediatricians increased from 0% of implants in 2013 to 0.4% in 2014, 1.1% in 2015, 15.0% in 2016, and 13.7% in the first 6 months of 2017 ( $P < .001$  compared with gynecology clinicians).

#### CHANGES IN IMPLANT AND INTRAUTERINE DEVICE PLACEMENT

The placement rate for intrauterine devices in primary care did not change substantially (Fig. 1, middle panel), but etonogestrel implants increased from 4.5 per 1000 members during the baseline period to 8.6 per 1000 members during the full intervention period, due largely to an increased rate in primary care (Fig. 1, bottom panel). Primary care clinicians (including both family medicine and

pediatric clinicians) placed 4.9% of etonogestrel implants in 2013, 4.8% in 2014, 10.8% in 2015, 42.6% in 2016, and 45.4% in the first 6 months of 2017 ( $P < .001$  compared with gynecology clinicians). The subset of these etonogestrel implants placed by pediatric clinicians increased from 0% in 2013 to 0.6% in 2014, 1.8% in 2015, 21.9% in 2016, and 22.3% in the first 6 months of 2017.

By mid-2017, 20 of 27 primary care clinics had at least one primary care clinician who placed LARC, compared with 5 before the initiative. Table 4 shows the net increase in the number of primary care clinicians who placed etonogestrel implants. The number of implants placed by primary care clinicians increased significantly, whereas the number placed by each gynecology clinician declined.

#### EFFECT OF EDUCATIONAL SESSION ATTENDANCE

Of the 207 eligible clinicians who attended any educational activity, 37 (17.9%) adopted LARCs thereafter, compared with 17 of the 265 who did not attend educational activities (6.4%,  $P = .009$ ). Table 3 compares the average quarterly rate of overall LARC placement during baseline, early, and full intervention periods for educational session attendees and non-attendees. The rate of LARC placement increased significantly in both groups and both intervention periods compared with baseline. Clinicians who attended educational sessions had a greater relative increase in overall LARC placement (relative risk in the full intervention period, 1.9; 95% confidence interval, 0.7–5.6) and etonogestrel implant placement (relative risk in the full intervention period, 3.0; 95% confidence interval, 0.9–9.8), but neither difference was statistically significant.

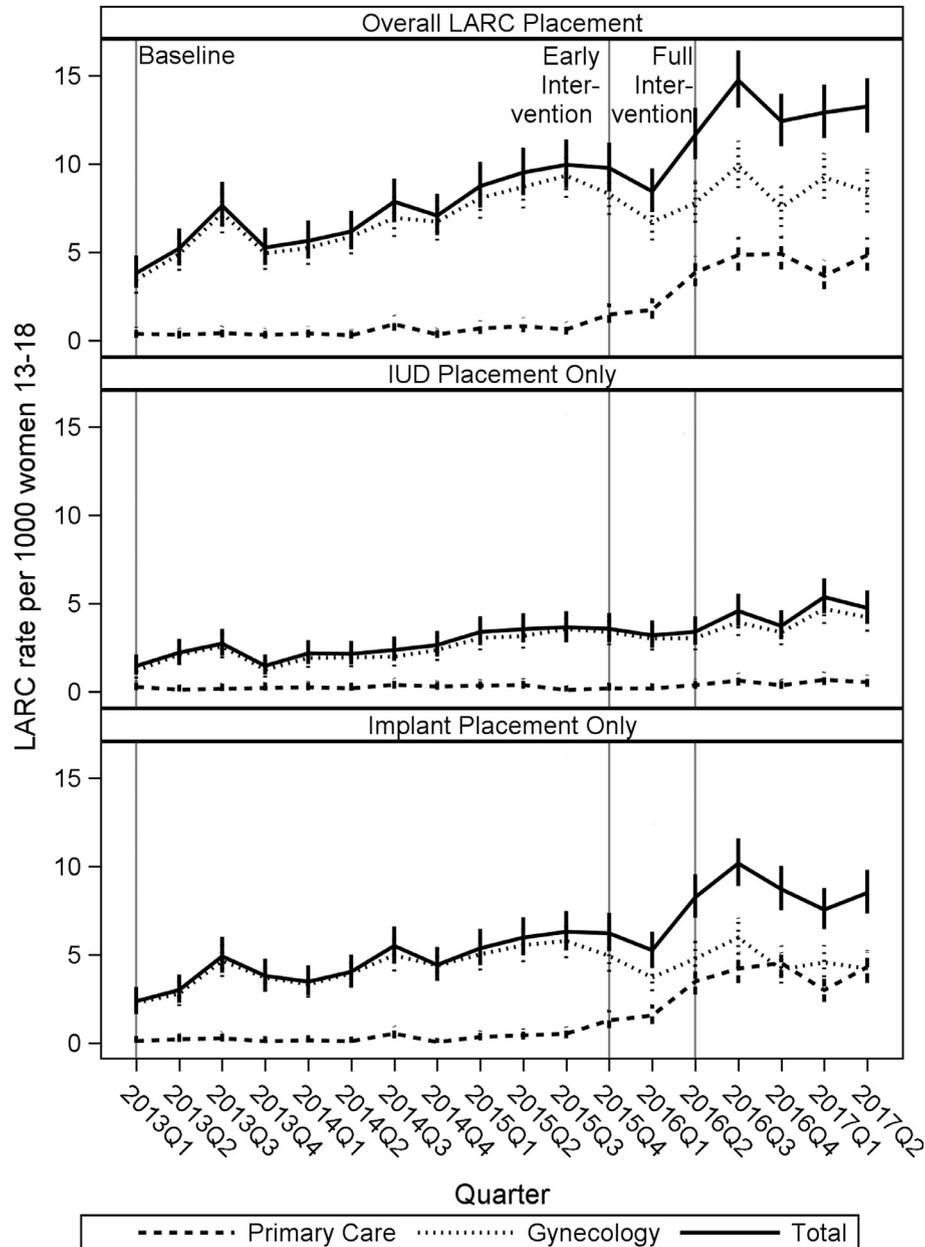
#### PREGNANCY RATES

The pregnancy rate in KPCO members aged 13 to 18 years declined throughout the 4.5-year study period, but no additional decline was evident after the LARC intervention (Fig. 2).

### DISCUSSION

We found that an intervention combining interactive, case-based education with process improvement was associated with a significant increase in the rate of LARC placement by pediatric and family practice clinicians for women aged 13 to 18 years in KPCO. Most of these LARC procedures were etonogestrel implants.<sup>15,17</sup> Overall LARC placement rates increased both in clinicians who attended educational activities and in those who did not.

Previous interventions have increased LARC placement in other clinical settings. The Contraceptive CHOICE Project (CHOICE) provided free contraception to adolescents and adults in academic and community gynecology and family planning practices.<sup>4,7,22</sup> CHOICE showed that adolescent women preferred LARCs to other contraceptive methods,<sup>5</sup> continued LARC at high rates,<sup>6,23</sup> and had fewer unintended pregnancies.<sup>7</sup> Interventions in Title X family planning clinic networks in Iowa and Colorado and a cluster-randomized trial in family planning clinics across the



**Figure 1.** Quarterly rates of overall LARC placement, IUD placement, and implant placement for women aged 13 to 18 years in Kaiser Permanente Colorado, 2013 to 2017. LARC indicates long-acting reversible contraceptive; IUD, intrauterine device.

United States also showed increased adoption of LARC, reductions in unintended pregnancies,<sup>8,9</sup> and a reduction in pregnancy-related costs.<sup>9,10</sup> All these initiatives focused on socioeconomically disadvantaged women and relied on private funding of contraceptives to remove financial barriers.<sup>24</sup>

The KPCO intervention adopted recommendations that continuing professional education programs should employ mutually reinforcing strategies.<sup>25</sup> The educational intervention incorporated established educational principles, using evidence that clinicians are more likely to change behavior when educational programs are longitudinal, relevant, interactive, engaging, involve multiple exposures to content, and align with learner priorities.<sup>26,27</sup> Adult learning theories also recognize that professionals also learn through social interactions, observation of colleagues, and opportunities to build shared understanding

and experience.<sup>28</sup> These additional factors may have enhanced LARC prescribing by primary care clinicians who did not attend educational sessions.<sup>26,29</sup> This possibility was reinforced by informal conversations with front-line clinicians, which suggested that educational attendees frequently discussed LARC placement with their clinical partners and reinforced the use of EHR-based process improvement tools within clinics. In other words, the intervention might have become “contagious” through educational opinion leaders, a shared EHR, and peer influence within communities of clinical practice.

Several attributes of the KPCO system facilitated both LARC implementation and the evaluation of the intervention. All contraceptive options were at least partially covered by health insurance. Knowledgeable clinicians developed decision support and patient education tools to enhance the EHR.

**Table 3.** Comparison of LARC Placement Rates between Gynecologists and Primary Care Clinicians and Between Primary Care Educational Session Attendees and Non-Attendees

Group	N	Rate of LARC Placement per 1000 Visits for Women Aged 13–18 y (95% CI)			Relative Change in Rates Within Specialty, RR (95% CI)		Comparison of Rate Changes Between Specialties or Attendees/Nonattendees, RRR (95% CI)	
		Pre-intervention	Early Intervention	Full Intervention	Pre- to Early Intervention	Pre- to Full Intervention	Pre- to early	Pre- to Full
All primary care	472	1.11 (0.65–1.89)	3.48 (2.16–5.62)	10.29 (7.60–13.94)	3.1 (1.7–5.7)	9.3 (5.3–16.1)	3.2 (1.8–5.9)	7.8 (4.4–13.8)
Gynecology	105	145.29 (127.75–165.22)	141.71 (121.78–164.90)	173.12 (152.11–197.02)	1.0 (0.8–1.1)	1.2 (1.0–1.4)		
Primary care educational attendees	207	0.66 (0.33–1.31)	2.09 (0.96–4.58)	8.92 (6.23–12.77)	3.2 (1.2–8.6)	13.5 (6.6–27.8)	1.0 (0.3–3.3)	1.9 (0.7–5.6)
Primary care educational non-attendees	265	1.76 (0.85–3.66)	5.76 (3.16–10.48)	12.38 (7.38–20.77)	3.3 (1.6–6.6)	7.0 (3.2–15.3)		

LARC indicates long-acting reversible contraceptive; RR, risk ratio; CI, confidence interval; and RRR, relative risk ratio.

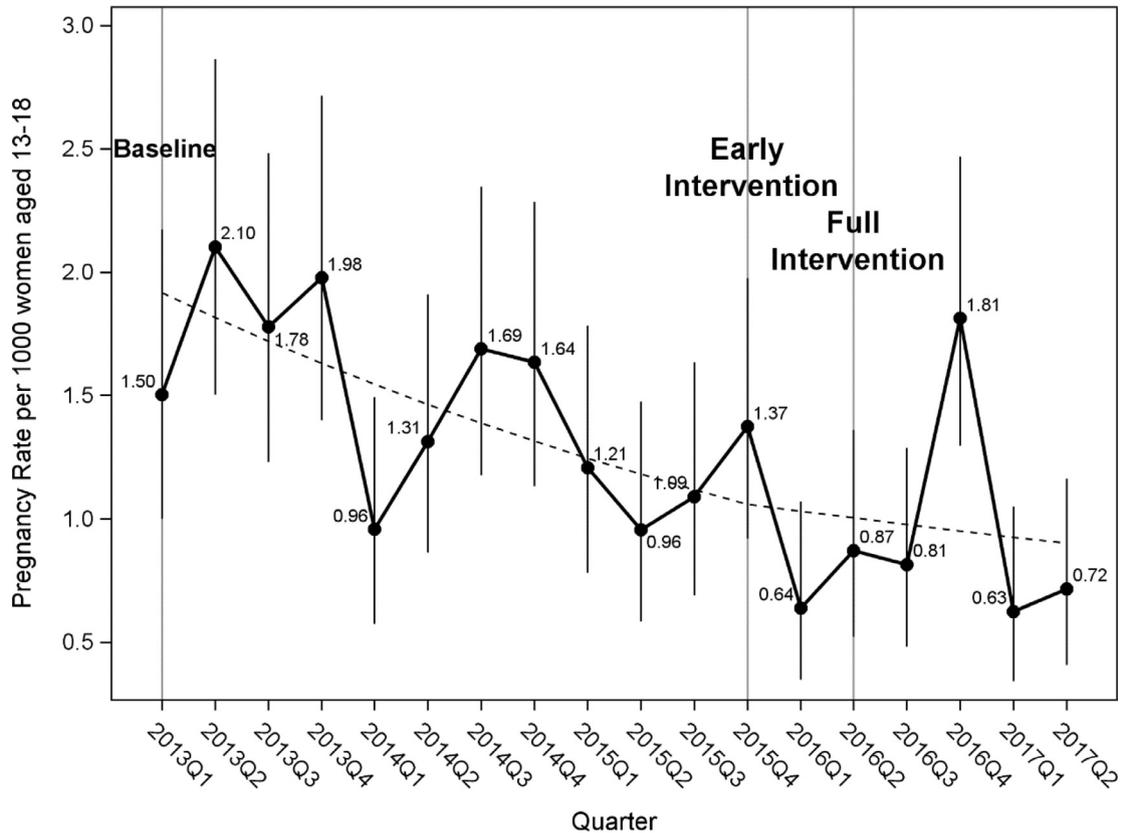
**Table 4.** Change between Baseline and Full Intervention Periods in the Number of Clinicians Placing LARC and Number of LARC Placements

Department	N	Period	Clinicians Placing Implants	Mean Implants per Clinician (95% CI)	Median Implants per Clinician (Min, Max)
Primary care	472	Baseline	25	2.2 (1.1–3.2)	1 (1, 11)
		Full intervention	68	6.6 (4.7–8.4)*	3 (1, 34)
Gynecology	105	Baseline	74	12.5 (9.4–15.5)	8.5 (1, 80)
		Full intervention	66	9.9 (7.5–12.3)†	6.5 (1, 46)

LARC indicates long-acting reversible contraceptives; CI, confidence interval.

\* $P < .001$  for difference between preintervention and postintervention mean.

† $P = .002$  for difference between preintervention and postintervention mean.



**Figure 2.** Quarterly pregnancy rates per 1000 women aged 13 to 18 years, Kaiser Permanente Colorado, 2013 to 2017.

Because we could define a denominator of eligible members, we could compare rates of LARC placement across specialties and over time. Our comprehensive data systems allowed us to identify LARC placement using diagnostic codes, procedure codes, and pharmacy-dispensing data.

The study also had limitations. Because it took place in a single geographic region, an integrated delivery system, and a privately insured population, our findings may not be generalizable to other settings. Although contraceptive care outside KPCO might not have been identified, members had financial incentives to obtain services within the system. Since the intervention focused on promoting LARC placement, we did not assess changes in other contraceptive modalities or concurrent use of barrier methods to prevent sexually transmitted infections. We also did not assess LARC complications or discontinuation. Clinicians chose to attend continuing education activities, so unmeasured characteristics could have confounded comparisons between attendees and non-attendees. Attendance at educational activities was documented by voluntary attendance logs and evaluations, so some attendees may not have been identified. We did not track use of specific process-improvement components such as patient education materials. Finally, increasing public emphasis on LARCs as a contraceptive option for adolescent women undoubtedly affected both patient and clinician behavior independently of interventions within KPCO, as did changes in insurance coverage of contraception under the Affordable Care Act.<sup>19</sup> In particular, awareness of LARCs may have been increased by a Colorado

program designed to increase LARC placement that began in 2009 in federally funded family planning clinics in the state.<sup>9</sup>

In summary, we found that a multicomponent intervention that combined educational components and system-based process improvement was associated with successful implementation of AAP and ACOG recommendations for LARC use among adolescent women in a community-based, primary care setting. This comprehensive approach also holds promise for promoting clinician behavior change around other important clinical issues.<sup>30</sup>

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