

Intrauterine Contraception Continuation in Adolescents and Young Women: A Systematic Review



K.M. Usinger MS, S.B. Gola MS, M. Weis MS, MPH, A. Smaldone PhD *

Columbia University School of Nursing, New York, New York

ABSTRACT

Study Objective: Adolescents are at high risk for unintended pregnancies. Although intrauterine devices (IUDs), long-acting reversible contraceptives (LARCs), are known to be highly effective in preventing pregnancy, little is known about IUD adherence in adolescents. In this systematic review (SR) we examined IUD continuation rates compared with other forms of contraception in young women aged 25 years and younger.

Design, Setting, Participants, Interventions, and Main Outcome Measures: A systematic search of Ovid Medline, Cochrane Library, and Embase was conducted for the years 1946–2015. Included studies examined IUD use in women 25 years of age and younger, compared IUD use with another form of contraception, and measured continuation rates at 12 months. The quality of each study was appraised using the Downs and Black criteria, and 12-month continuation rates among studies were pooled and analyzed according to contraceptive type.

Results: Of 3597 articles retrieved, 9 studies met criteria for SR. Synthesized across studies, 12-month continuation was significantly higher for IUD users (86.5%, 12,761/14,747) compared with oral contraceptives (39.6%, 1931/4873), Depo-Provera (Pfizer Inc, New York, NY) hormonal injection (39.8%, 510/1282), vaginal ring (48.9%, 196/401), and transdermal patch (39.8%, 37/93; all P values < .001). There was no statistically significant difference in 12-month continuation between the IUD and another LARC method, the subdermal etonogestrel implant (85.3%, 4671/5474).

Conclusion: Findings of this SR suggest that continuation rates for IUDs are generally higher compared with other contraceptive methods for women aged 25 years and younger. In a population with high rates of unintended pregnancies, generally low adherence, and imperfect use with other non-LARCs, IUD use should be encouraged.

Key Words: Adolescent, Young women, IUD, Contraception, Compliance, Continuation

Introduction

Unintended pregnancies worldwide are a serious public health concern because of increased risk of adverse social, economic, and physical health outcomes.^{1,2} Adolescents and young women have the highest rates of unintended pregnancy. Of 2.3 million births to US teenagers in 2006–2010, 77% were unintended at conception.³ Fifty percent of births were unintended among young women aged 20–24 years, and more than half (64%) of unplanned pregnancies occur within this age group.^{3,4} Encouraging the use of effective and acceptable contraception is critical to decrease these rates. An increase in consistent contraceptive use contributed to 86% of the significant decline in adolescent pregnancy rates seen in the US in the 1990s and early 2000s.⁵ The most commonly used reversible hormonal methods for teenagers are oral contraceptives (OCs) and Depo-Provera (Pfizer Inc, New York, NY) hormonal injection (DMPA), although these methods are often used inconsistently.^{4,6} These methods and other short-acting methods such as the transdermal patch (patch) and the vaginal ring (ring) have higher failure rates with typical use (9% for OC, patch, and ring, 6% for DMPA) compared with long-acting

reversible contraceptive (LARC) methods such as the intrauterine device (IUD; 0.2%–0.8%) and subdermal etonogestrel implant (implant; 0.05%).⁷

LARCs are known to be highly effective in preventing pregnancy, and the American College of Obstetricians and Gynecologists has recommended the IUD as first-line contraceptive for adolescents for a number of years.⁸ In 2014, the American Academy of Pediatrics also made this endorsement.⁹ Despite promotion of the IUD by professional organizations, IUDs are still not commonly used by younger women, particularly nulliparous young women, and many providers might not offer this option to this population.^{10–12} Providers frequently have misconceptions about appropriate candidacy for the IUD. In a recent survey of more than 1000 obstetrician-gynecologists who are American College of Obstetricians and Gynecologists members it was reported that that 67% of providers surveyed considered nulliparous women to be inappropriate candidates for the IUD, and 43% considered adolescents inappropriate candidates.¹³ Many of these provider attitudes are outdated and not evidence-based; thus, their misconceptions prevent recommendation of these highly effective forms of contraception.^{14–16} For example, some primary care providers might be hesitant to place an IUD in nulliparous women, misbelieving that this might cause an increased risk of pelvic inflammatory disease (PID) and/or infertility in this population.^{16,17} However, associations between IUD use and infertility have been debunked,¹⁸ and

The authors indicate no conflicts of interest.

* Address correspondence to: A. Smaldone, PhD, 617 W 168th St, New York, NY 10032; Phone: (212) 342-3048

E-mail address: ams130@cumc.columbia.edu (A. Smaldone).

studies show that beyond the first 20 days after insertion, IUDs do not increase rates of PID.^{19,20} Additionally, current data suggest that IUDs are generally well tolerated in young women.^{21–23} Because of the low usage despite professional recommendations, it is imperative to consider the data surrounding continuation of the IUD compared with other contraceptive methods. A recently updated systematic review (SR) examined hormonal methods of contraception, including the hormonal IUD, for women aged 25 years and younger.^{24,25} The authors synthesized data from randomized controlled trials (RCTs) in which researchers examined failure rates between any 2 hormonal methods. A secondary outcome was continuation rates, but only 1 study directly compared use of the IUD with another method. Our SR specifically focused on comparing the IUD with other contraceptive methods, and we included a wider range of study designs to capture a larger group of studies. The purpose of this SR was to examine 12-month continuation rates for IUDs compared with other forms of contraception in young women aged 25 years and younger.

Materials and Methods

The guidelines set forth in the Preferred Reporting Items for Systematic Reviews and Meta-analyses were followed.²⁶ Broad categories of search terms were selected, including adolescent, contraception, intrauterine devices, and compliance. Then, specific terms within each category were identified (for example, compliance also included continuation and discontinuation). A systematic database search of Ovid Medline, Cochrane Library, and Embase was conducted in the first week of October 2014 then rerun in November 2015 using all possible combinations of terms from each category (Appendix A). No date restrictions were used.

Inclusion criteria required study samples of female participants aged 25 years and younger using any IUD. Included studies had to compare continuation of IUD users with that of users of some other form of contraception, and report continuation rates over a period of 12 months. There was no restriction on study design. Exclusion criteria were studies that examined IUD continuation but lacked a comparison method, studies reporting duplicate data from another included study, and studies including women of all ages without study findings stratified according to age group. Additionally, studies were excluded if they were published in a language other than English or if the full-text article was not available. Studies focusing on special populations, such as HIV-positive or developmentally disabled female participants, were not included in this analysis.

After removing duplicates, 2 reviewers independently screened studies for title and abstract exclusion and a third reviewer determined consensus on any disagreements. Three reviewers then evaluated full text studies for inclusion and exclusion.

A modified Downs and Black Quality Appraisal Tool was used to appraise the quality of each of the included studies.²⁷ Item 27 was modified to allow for 1 point for an a priori performance of a power analysis and achieving a sample size that showed adequate power to detect significant differences between groups, and 0 points if these criteria were not met.

Two reviewers independently appraised each study and discrepancies were discussed until consensus was reached among all the authors. The modified tool had 28 total possible points, including up to 11 points for strength in reporting, 3 for external validity, 13 for internal validity (bias and confounding variables), and 1 for power. Score ranges were grouped into 4 different quality categories: excellent (26–28), good (20–25), fair (15–19), and poor (≤ 14). Reported continuation rates at 12 months were synthesized according to contraceptive type and also grouped according to publication time frame (older vs more recent studies); data were analyzed using descriptive and χ^2 statistics. To minimize the occurrence of type 1 error, a Bonferroni correction was used with an α of < 0.01 considered statistically significant.

Results

Of 3597 articles retrieved in the search, 9 studies^{28–36} were deemed eligible for inclusion in the qualitative and quantitative synthesis. Figure 1 details the process of the search and appraisal for inclusion/exclusion of studies. The most common reason for full text exclusion was that the IUD was not compared with another method in the study design. The 9 studies included 5 prospective cohort studies,^{28–30,32,36} 3 retrospective cohort studies,^{31,34,35} and 1 RCT.³³ Studies were conducted in the United States,^{28,31,32,35,36} Scandinavia,^{29,33} Israel,³⁰ and Papa New Guinea.³⁴ All studies evaluated continuation rates of an IUD compared with another form of contraception. Comparison contraceptive methods included implant,^{28,35,36} OC,^{28–31,33,34} DMPA,^{28,32,34} ring,²⁸ and patch.²⁸ A variety of IUD devices were used, including nonhormonal copper IUDs,^{28–30,36} hormonal IUDs,^{28,32,33,35,36} and an inert IUD, the Lippes Loop, no longer used in the United States.³⁴ Overall sample sizes of female participants aged 25 years and younger ranged from 66³² to 15,594³⁵ participants. In total, the data represent 26,907 young women (LARC methods: IUD, $n = 14,784$; implant, $n = 5474$; non-LARC methods: OC, $n = 4873$; DMPA, $n = 1282$; ring, $n = 401$; patch, $n = 93$) who participated in the studies. Two studies restricted inclusion criteria to nulliparous young women,^{29,33} and others included only postpartum young women.^{31,32,36} Of note, the included studies were conducted within 2 distinct publication time frames: 1975–1983,^{29–31,34} and 2004–2015.^{28,32,33,35,36} Sources of investigator support and potential conflict was reported in 4 of the 9 studies with 3 reporting no potential conflicts of interest,^{28,32,35} and 1 reporting a potential conflict for one of the study investigators.³⁶ We deemed this unlikely to have influenced reporting or interpretation of the research results. Table 1 shows a summary of each study according to its design, sample characteristics, IUD type, comparison contraceptives, and continuation rates.

Study Quality

Overall risk of bias in the included studies was moderate. Five of the 9 included studies^{28,31–33,36} were rated as good quality, with the remaining studies rated as either fair^{30,35} or poor^{29,34} quality (Fig. 2). Most studies showed a low risk of

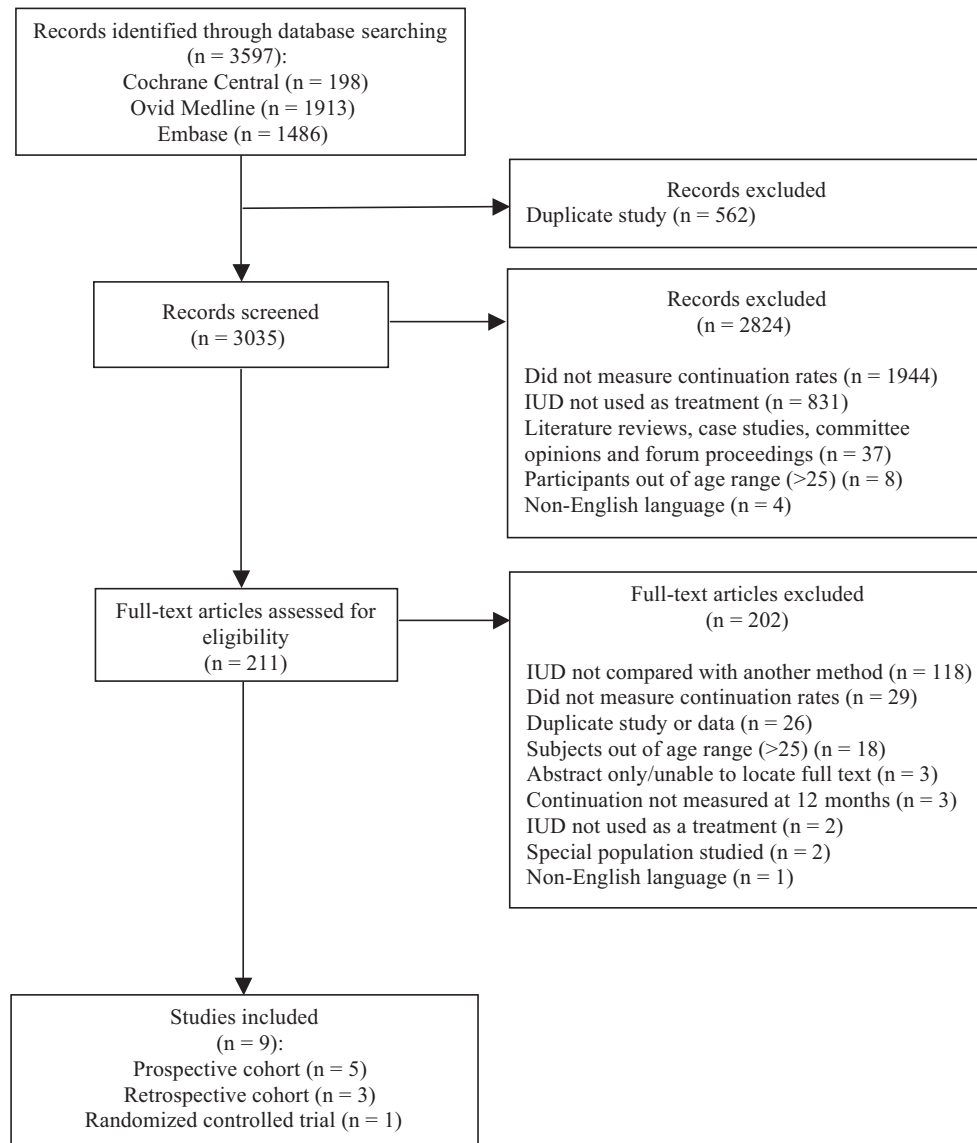


Fig. 1. Literature search and selection of studies. IUD, intrauterine device.

bias in reporting, clearly describing study aims, outcomes, study population, and findings. However, there were threats to external and internal validity identified across studies. In most cases, study participants were not randomly chosen, and many researchers used convenience sampling for enrollment. In fact, the participants in a number of the studies were seeking or requesting a contraceptive method, which might not be representative of the general population from which the study sample was taken.^{30,33}

Because of the nature of the intervention in these studies, blinding of the participants and providers was not possible, introducing a possible source of bias. Confounding variables pose a significant threat to the internal validity of studies included in this analysis. In most studies, study participants were not randomly assigned a contraceptive method. Instead, participants chose their method of contraception, and these choices were subject to potential biases of the participant and the provider. In some cases, providers educated the patient on at least 2 methods, including the IUD^{29,30} and the patient chose their

preference, unless one was contraindicated. Some providers emphasized the IUD and implant over other methods of contraception before patients chose their method,²⁸ and some participants were potentially only ever informed of 1 method.³⁴ Additionally, a possible confounding variable across studies was nonstandardized insertion of the IUD. Providers of “various experience,” including gynecologists and midwives,²⁹ specialists or experienced residents,³³ and a nurse practitioner³² all inserted IUDs. Clinical practice for insertion was often not standardized within study or the same across all studies. Although some were inserted “preferably” during postmenstrual time, others were inserted postpartum immediately after placental delivery or had no standard practice established. These factors could all influence IUD placement, discomfort, expulsion, and measured continuation rates.

Finally, although loss to follow-up was not a significant issue across all studies, it still provided a challenge for a number of studies. Twelve-month follow-up ranged from 38%³² to 94%,²⁸ although most had more than 80% retention

Table 1
Characteristics of Included Studies

Reference/Country/Study Design	Sample Characteristics		IUD Type	Reported Continuation Rates	
	Age, Population Specifics, and Study Setting	Method: n		At 12 months	At Other Time Intervals
Berenson et al ³⁵ United States Retrospective cohort	<ul style="list-style-type: none"> 14–24 Years Parity NR Race and SES NR 	IUD: 11,192 Implant: 4402	LNG-IUD	IUD: 87% Implant: 86%	
Bergqvist et al ²⁹ Sweden Prospective cohort	<ul style="list-style-type: none"> 14–25 Years Nulliparous Attended hospital's family planning clinic 	IUD: 74 OC: 86	Cu-T 200 or Cu-7	IUD: 58% OC: 86%	
Cohen et al ³⁶ United States Prospective cohort	<ul style="list-style-type: none"> 13–22 Years Postpartum (immediate) 45% Hispanic, 34% black Treated by multidisciplinary team in hospital and follow-up clinic 	IUD: 82 Implant: 162	LNG-IUD or T380 A (Cu)	IUD: 61% Implant: 86%	6 Months <ul style="list-style-type: none"> IUD: 71% Implant: 97%
Goldman et al ³⁰ Israel Prospective cohort	<ul style="list-style-type: none"> 14–18 Years Parity NR High SES Requesting contraception Referred to clinic or private physician 	IUD: 30 OC: 72	Cu-T 200 or Cu-7	IUD: 80% OC: 86%	6 Months <ul style="list-style-type: none"> IUD: 83% OC: 90% 24 Months <ul style="list-style-type: none"> IUD: 73% OC: 73%
Graves et al ³¹ United States Retrospective cohort	<ul style="list-style-type: none"> 14–19 Years Postpartum 100% Black 	IUD: 98 OC: 158	NR	IUD: 60% OC: 26%	
Howard et al ³² United States Prospective cohort	<ul style="list-style-type: none"> Younger than 20 (age means: IUD, 16; DMPA, 17.2) years Postpartum Adolescent clinic Urban 	IUD: 37 DMPA: 29	LNG-IUD	IUD: 77% DMPA: 43%	6 Months <ul style="list-style-type: none"> IUD: 88% DMPA: 88%
Rosenstock et al ²⁸ United States Prospective cohort	<ul style="list-style-type: none"> 14–25 Years Parity NR Recruited from family planning, university-affiliated, or community clinics Urban 	IUD: 2225 Implant: 910 OC: 531 DMPA: 356 Ring: 401 Patch: 93	LNG-IUD or Cu IUD	IUD: 85% Implant: 81% OC: 50% DMPA: 54% Ring: 49% Patch: 40%	
Suhonen et al ³³ Sweden and Finland RCT	<ul style="list-style-type: none"> 18–25 Years Nulliparous Seeking contraception Family planning clinics in university hospitals 	IUD: 99 OC: 101	LNG-IUD	IUD: 80% OC: 73%	
Townsend et al ³⁴ Papa New Guinea Retrospective cohort	<ul style="list-style-type: none"> 15–24 Years Nulliparous and postpartum Urban, provincial, and rural 	IUD: 947 OC: 3925 DMPA: 897	Lippes Loop	IUD: 85% OC: 36% DMPA: 34%	24 Months <ul style="list-style-type: none"> IUD: 69% OC: 20% DMPA: 15% 36 Months <ul style="list-style-type: none"> IUD: 54% OC: 10% DMPA: 5%

DMPA, Depo-Provera (Pfizer Inc, New York, NY) injection; IUD, intrauterine device; LNG-IUD, levonorgestrel intrauterine device (Mirena; Bayer HealthCare Pharmaceuticals Inc, Whippany, NJ); NR, not reported; OC, oral contraceptive; RCT, randomized controlled trial; SES, socioeconomic status

of participants at 12 months. Reported continuation could be inaccurate because of the method of measuring continuation. For example, in 1 study measurement of continuation rates was on the basis of a participant's "not returning" to the clinic for IUD removal or refill of other contraceptive method instead of confirming directly with the patient or using chart records.³⁴

Continuation Rates

Six of the 9 studies^{28,31–35} reported higher continuation rates in the IUD group compared with another method at 12 months. Figure 3 shows the pooled continuation rates according to contraceptive method using the number of female participants who started each method and those still

using that method 1 year later. Twelve-month continuation for IUD users (86.5%, 12,761/14,747) was significantly higher compared with non-LARC methods (OC, 39.6%, 1931/4873; DMPA, 39.8%, 510/1282; ring, 48.9%, 196/401; and patch, 39.8%, 37/93; all P values < .001). There were no significant differences in 12-month continuation rates between IUD and implant (86.5%, 12,761/14,747 vs 85.3%, 4671/5474; $P = .03$; deemed not statistically significant using Bonferroni correction for multiple comparisons) users. Figure 4 shows pooled 12-month continuation rates stratified according to publication time frame. Earlier studies published between 1975 and 1983 limited comparisons with the IUD to OC and DMPA whereas more recent studies (2004–2015) included additional methods such as the implant, ring, and patch. Older studies also examined relatively more users of

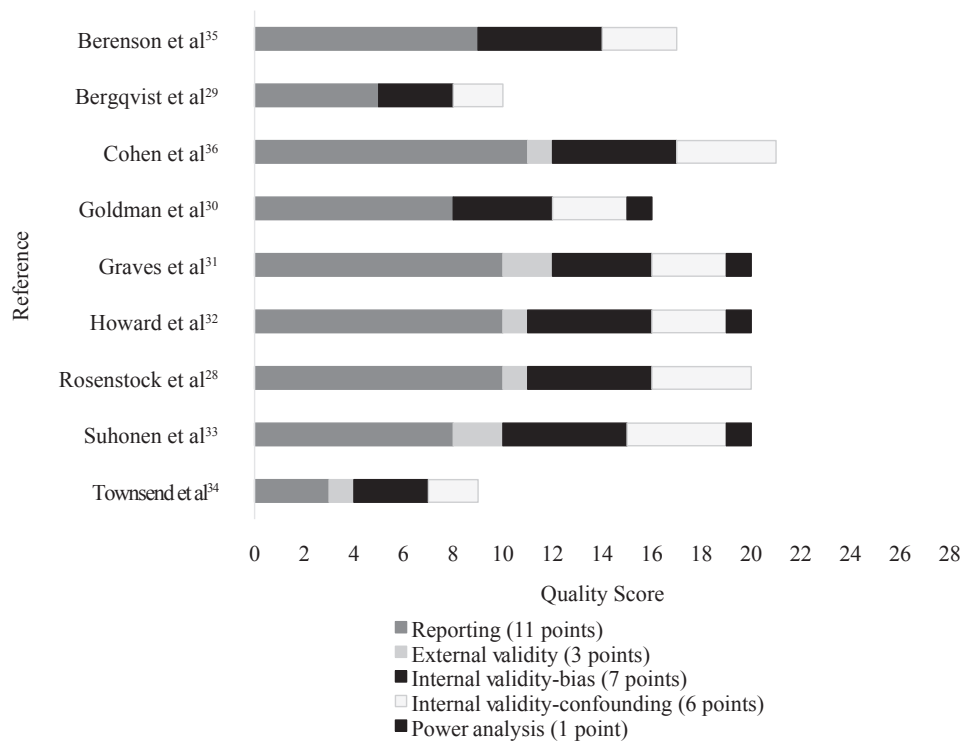


Fig. 2. Risk of bias assessment on the basis of Downs and Black Checklist for Measuring Quality.

OC and DMPA compared with more recent studies, in which there were greater numbers of IUD users. Regardless of study time frame, the IUD had the highest continuation rate (84%, 931/1112 and 87%, 11,830/13,635; $P = .004$) among all contraception types. Compared with rates reported in the earlier studies, pooled continuation rates of more recent studies were significantly higher for OC (54%, 341/632 vs 38%, 1590/4241; $P < .001$) and DMPA (53%, 204/385 vs 34%, 306/897; $P < .001$).

Some studies reported additional data points at 6 months,^{30,32,36} 24 months,^{30,34} and 36 months.³⁴ Figure 5 shows continuation rates over time from studies that

reported data at additional time points. Data were grouped into LARC and non-LARC methods, and then shown at 6, 12, 24, and 36 months. Although continuation of all methods generally decreased over time, the decrease in LARC methods was less over longer periods of time compared with non-LARC methods. For example, 1 study reported a 7% decrease in IUD continuation from 12 to 24 months, whereas the decrease in OC continuation was 14% over the same time period.³⁰

IUD Adverse Events

Six of 9 studies reported adverse events associated with IUD use.^{29,30,32,33,35,36} In studies that reported incidence of PID in IUD users, frequencies were extremely low to nonexistent.^{29,30,33,35} In the study that was a large chart review of more than 11,000 young female IUD users, PID incidence was 0.2%.³⁵ One study reported 1 PID case in which the patient was successfully treated with antibiotics,³⁰ and when reported, PID or other infections did not require removal of the IUD.^{29,30,33}

Reported IUD expulsions ranged from 1 partial expulsion of 94 insertions observed at a 6-month follow-up visit,³³ to 2 of 30 users, both of which occurred within 1 month of insertion,³⁰ to 5 of 29 users who were aged 20 years or younger.²⁹ The highest reported expulsion rate of 25% was reported in a study examining young women who had their IUDs placed postpartum immediately after the delivery of the placenta.³⁶ Expulsion was recognized by the user in 15 of these 17 expulsions, with a median time to expulsion of 4.1 weeks.³⁶ Of note, in all studies, all reported expulsions occurred within 6 months of insertion, with most occurring within 4 months, if not sooner.

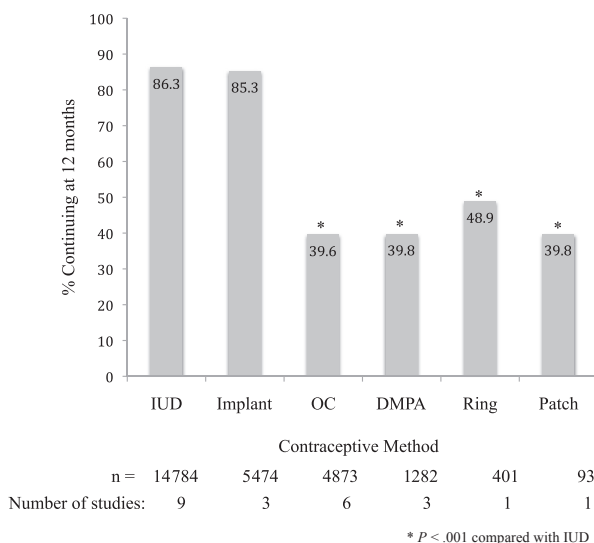


Fig. 3. Twelve-month continuation rates according to contraceptive type. DMPA, Depo-Provera (Pfizer Inc, New York, NY) hormonal injection; IUD, intrauterine device; OC, oral contraceptive.

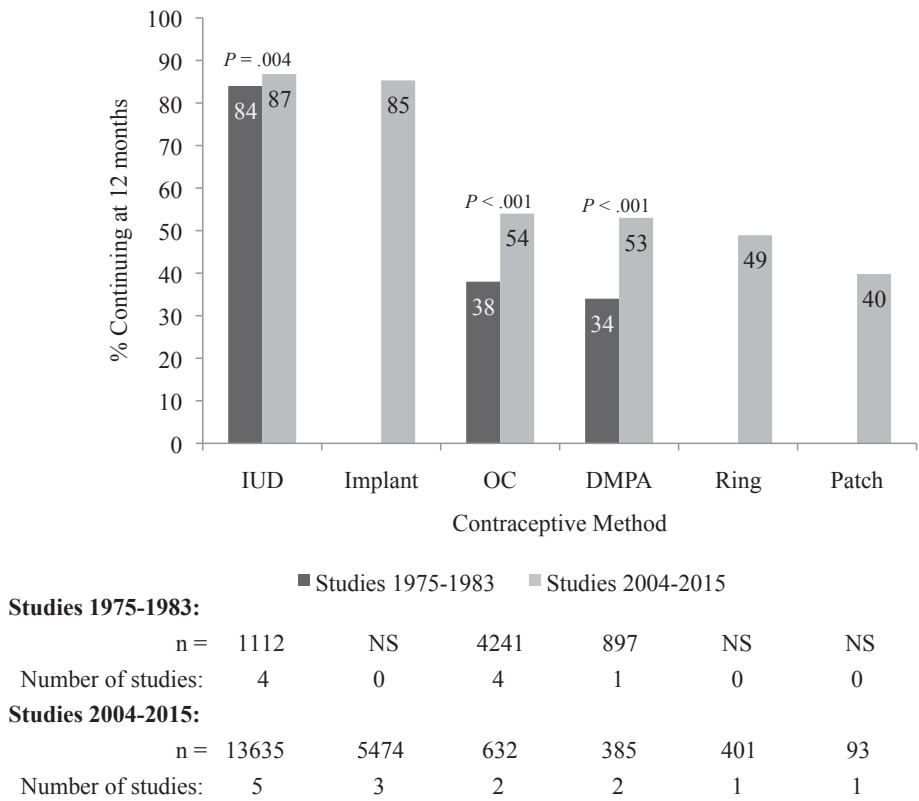


Fig. 4. Comparison of 12-month continuation rates according to publication time frame. DMPA, Depo-Provera (Pfizer Inc, New York, NY) hormonal injection; IUD, intrauterine device; NS, not studied; OC, oral contraceptive.

Bleeding and pain were the most commonly reported side effects of the IUD, although these symptoms were not universal and rarely necessitated discontinuation of the method. These findings were consistent regardless of the

study's publication time frame. Women using the IUD reported a disruption in their menstrual cycles, including irregular menstrual cycles, “break-through” bleeding, or excessive/frequent menstruation.^{30,33,35} However, the

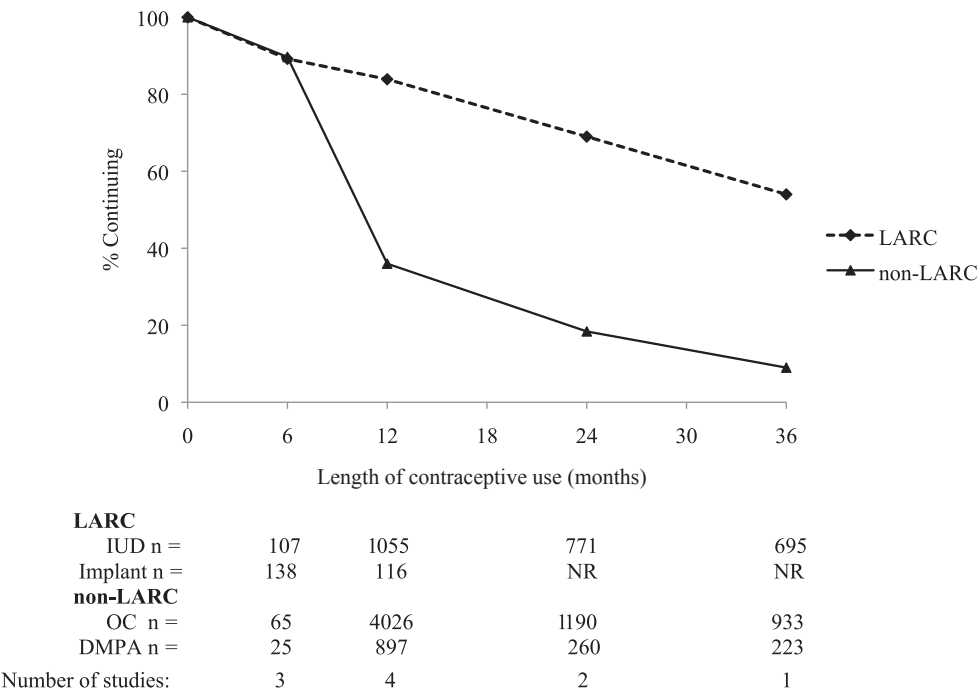


Fig. 5. Contraceptive continuation over time. DMPA, Depo-Provera (Pfizer Inc, New York, NY) hormonal injection; IUD, intrauterine device; LARC, long-acting reversible contraceptive; NR, not reported; OC, oral contraceptive.

number of days of intermenstrual bleeding did decrease over time.³³ One study measured the acceptability of unpredictability and quantity of bleeding of young women using IUD and DMPA contraception.³² Greater numbers of DMPA users reported bleeding quantity unacceptable compared with IUD users. Similar numbers of IUD users (11.1%) and DMPA users (10%) reported the unpredictability of bleeding unacceptable.³² Most pain was experienced shortly after IUD insertion, and could be managed with pain relievers.³⁰ Dyspareunia was reported by less than 2% of IUD users throughout 1 year of follow-up.³⁵ Pain was the leading cause of discontinuation in 1 study, with most occurring within 3 months of insertion.³³

Discussion

Findings of this SR suggest that continuation rates for IUDs are higher compared with other non-LARC contraceptive methods for women 25 years of age and younger. Pooled results from the studies showed continuation rates at 12 months for the IUD were significantly higher compared with methods such as OCs and DMPA. The IUD continuation rate findings from this review are consistent with current published information about continuation rates in women of any age and parity, which range between 82% and 89% at 12 months.^{37,38} Regardless of publication time frame, reported continuation rates for the IUD were significantly higher compared with OC and DMPA. The differences in continuation rates for OC and DMPA in older vs more recent studies could be because of differences in methods for measuring continuation, as well as variation in health care setting and patient population between the studies. This variability is also in line with other reported data; for example, studies that measured 12-month continuation of DMPA reported ranges from 12%³⁹ to 51%.⁴⁰ Overall, despite the difference in DMPA and OC continuation rates stratified according to publication time frame, IUD continuation remained significantly higher at 12 months and supports current practice recommendations to offer LARC methods, including the IUD, to adolescents.

Implants are also recommended as first-line options for birth control to adolescents, and the results of this SR suggest similarly high continuation rates compared with the IUD. Two included studies that examined the use of the implant in young women showed similarly high continuation rates compared with the IUD.^{28,35} A third study reported a significantly higher 12-month continuation rate for implant users compared with IUD users when devices were placed immediately postpartum.³⁶ Most of the IUD discontinuations (65%) in this case were because of expulsion, with the reported expulsion rate at 25%.³⁶ A 25% expulsion rate is higher than expected for young women in general, but similar findings have been published for young women with postplacental insertion of the device.^{41,42} highlighting the need for particularly close follow-up of this patient subset.³⁶ Despite the high expulsion rate in this study, the number of participants who discontinued each method according to preference was the same, showing similar tolerability of the LARC devices.³⁶ Generally speaking, LARC methods are promising for use in this population,

regardless of parity. Adolescents who use contraception are often inconsistent or use the method incorrectly; LARC methods allow for closer to optimal use without having to emphasize time management, planning, and remembering to use or refill prescriptions required by other contraceptive methods.^{9,30} After LARCs are inserted they require little maintenance, and continuation of these devices is easier over longer periods of time compared with non-LARC methods.

Unfortunately, outdated concerns over adverse events continue to discourage providers from offering LARC methods to adolescents.¹⁶ PID risk for women with IUDs is generally very low, particularly after the first month, and the risk is not significantly higher for nulliparous than for postpartum women.^{43–45} The collective incidence of PID summarized in this SR supports the notion that PID is generally a rare event, and can most often be treated without removal of the device and without further sequelae. Although pain secondary to IUD placement remains a concern, the reported data indicate that pain improves over time, and that it rarely requires removal of the device. Most study participants who required IUD removal because of pain had this done within the first few months after insertion. Perhaps preparing patients for this possibility and acknowledging that pain is most likely temporary will make the pain more acceptable earlier on, thus further increasing adherence. This highlights the importance of educating patients regarding adverse events as part of usual clinical care.

To implement the current recommendations for practice, provider hesitancy to discuss and use IUDs with adolescents must be addressed. Many providers cite lack of didactic and hands-on training as a barrier to use.⁴⁶ Educating providers on LARC methods and their use in adolescents will improve provider comfort with initiating the discussion, patient awareness of these methods, and address any fears and misinformation.¹⁴ Although providers are in a position to help decrease unintended pregnancies in this age group by offering LARC methods, cost might also be a barrier for this population. The state of Colorado recently successfully decreased teen pregnancy by 26% through increasing health care provider education and decreasing out of pocket costs for the IUD and implant.⁴⁷ The Affordable Care Act has addressed the issue of cost by requiring coverage of contraceptives, including LARCs; however, some private health plans might not be sufficiently compliant with the law.⁴⁸ More efforts are needed on a state and national level to increase access and ensure full coverage of these highly effective forms of contraception, particularly for this vulnerable population.

Limitations

The findings of this SR should be considered in light of various limitations. We included only studies published in English and excluded those published in other languages. All relevant studies might not have been captured, because we searched only 3 databases, and did not do a complete literature search. Studies that did not have full text available or conference abstracts were not included in our analysis, in

addition to any unpublished research. The wide variability between study samples, location of health care, and contraception education given to study participants should be underscored and limits the generalizability of these findings to all sexually active adolescents. Additionally, only 1 RCT met inclusion criteria for this analysis, and more RCTs with sufficient power are needed to properly compare adherence to IUD contraception compared with other methods. Because 4 studies included in this SR were conducted in the 1970s and 1980s, findings might also be limited by potentially outdated data and changes made to the contraceptive devices since then. Acknowledging these limitations, pooled findings of this SR show that the IUD is an acceptable form of birth control for younger women and its continuation rate at 12 months was significantly higher compared with non-LARC methods in this age group.

Implications for Practice

More training opportunities for pediatricians and other primary care health care providers regarding discussing LARC methods and inserting IUDs are needed to improve access to this form of contraception for young women. Providers should include IUDs as an option when counseling adolescents on birth control choices, with education about risks, benefits, effectiveness, and potential side effects or adverse events included as part of the discussion. If used to their full extent, IUDs could make a significant contribution to decreasing unintended pregnancies for young women, thus increasing their overall health and well-being.

References

- Ott MA, Sucato GS: Committee on Adolescence. Contraception for adolescents. *Pediatrics* 2014; 134:e1257
- Oringanje C, Meremikwu MM, Eko H, et al: Interventions for preventing unintended pregnancies among adolescents. *Cochrane Database Syst Rev* 2009; 4:CD005215
- Mosher WD, Jones J, Abma JC: Intended and unintended births in the United States: 1982–2010. *Natl Health Stat Report* 2012; 55:1
- Finer LB, Henshaw SK: Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspect Sex Reprod Health* 2006; 38:90
- Santelli JS, Lindberg LD, Finer LB, et al: Explaining recent declines in adolescent pregnancy in the United States: the contribution of abstinence and improved contraceptive use. *Am J Public Health* 2007; 97:150
- Blanc AK, Tsui AO, Croft TN, et al: Patterns and trends in adolescents' contraceptive use and discontinuation in developing countries and comparisons with adult women. *Int Perspect Sex Reprod Health* 2009; 35:63
- Trussell J: Contraceptive failure in the United States. *Contraception* 2011; 83:397
- American College of Obstetricians and Gynecologists: ACOG Committee Opinion No. 392, December 2007. Intrauterine device and adolescents. *Obstet Gynecol* 2007; 110:1493
- Committee on Adolescence: Contraception for adolescents. *Pediatrics* 2014; 134:e1244
- Madden T, Allsworth JE, Hladky KJ, et al: Intrauterine contraception in Saint Louis: a survey of obstetrician and gynecologists' knowledge and attitudes. *Contraception* 2010; 81:112
- Finer LB, Jerman J, Kavanaugh ML: Changes in use of long-acting contraceptive methods in the United States, 2007–2009. *Fertil Steril* 2012; 98:893
- Harper CC, Blum M, de Bocanegra HT, et al: Challenges in translating evidence to practice: the provision of intrauterine contraception. *Obstet Gynecol* 2008; 111:1359
- Luchowski AT, Anderson BL, Power ML, et al: Obstetrician-gynecologists and contraception: practice and opinions about the use of IUDs in nulliparous women, adolescents and other patient populations. *Contraception* 2014; 89:572
- Teal SB, Romer SE: Awareness of long-acting reversible contraception among teens and young adults. *J Adolesc Health* 2013; 52(4 Suppl):S35
- Hathaway M, Torres L, Vollett-Krech J, et al: Increasing LARC utilization: any woman, any place, any time. *Clin Obstet Gynecol* 2014; 57:718
- Rubin SE, Davis K, McKee MD: New York City physicians' views of providing long-acting reversible contraception to adolescents. *Ann Fam Med* 2013; 11:130
- Middleton AJ, Naish J, Singer N: General practitioners' views on the use of the levonorgestrel-releasing intrauterine system in young, nulligravid women, in London, UK. *Eur J Contracept Reprod Health Care* 2011; 16:311
- Hubacher D, Lara-Ricalde R, Taylor DJ, et al: Use of copper intrauterine devices and the risk of tubal infertility among nulligravid women. *N Engl J Med* 2001; 345:561
- Mohllajee AP, Curtis KM, Peterson HB: Does insertion and use of an intrauterine device increase the risk of pelvic inflammatory disease among women with sexually transmitted infection? A systematic review. *Contraception* 2006; 73:145
- Farley TM, Rosenberg MJ, Rowe PJ, et al: Intrauterine devices and pelvic inflammatory disease: an international perspective. *Lancet* 1992; 339:785
- Hubacher D: Copper intrauterine device use by nulliparous women: review of side effects. *Contraception* 2007; 75(6 Suppl):S8
- Brockmeyer A, Kishen M, Webb A: Experience of IUD/IUS insertions and clinical performance in nulliparous women—a pilot study. *Eur J Contracept Reprod Health Care* 2008; 13:248
- Thonneau P, Almont T, de La Rochebrochard E, et al: Risk factors for IUD failure: results of a large multicentre case-control study. *Hum Reprod* 2006; 21:2612
- Tang JH, Lopez LM, Mody S, et al: Hormonal and intrauterine methods for contraception for women aged 25 years and younger. *Cochrane Database Syst Rev* 2012; 11:CD009805
- Krashin J, Tang JH, Mody S, et al: Hormonal and intrauterine methods for contraception for women aged 25 years and younger. *Cochrane Database Syst Rev* 2015; 8:CD009805
- Moher D, Liberati A, Tetzlaff J, et al: Preferred Reporting Items for Systematic Reviews and Meta-analyses: the PRISMA statement. *PLoS Med* 2009; 6:e1000097
- Downs SH, Black N: The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health* 1998; 52:377
- Rosenstock JR, Peipert JF, Madden T, et al: Continuation of reversible contraception in teenagers and young women. *Obstet Gynecol* 2012; 120:1298
- Bergqvist A, Rybo G: IUD compared with oral contraception in nulliparae. *Contraception* 1979; 20:407
- Goldman JA, Reichman J: Contraception in the teenager. A comparison of four methods of contraception in adolescent girls. *Isr J Med Sci* 1980; 16:510
- Graves WL, Bradshaw BR: Early reconception and contraceptive use among black teenage girls after an illegitimate birth. *Am J Public Health* 1975; 65:738
- Howard DL, Wayman R, Strickland JL: Satisfaction with and intention to continue Depo-Provera versus the Mirena IUD among post-partum adolescents through 12 months of follow-up. *J Pediatr Adolesc Gynecol* 2013; 26:358
- Suhonen S, Haukamaa M, Jakobsson T, et al: Clinical performance of a levonorgestrel-releasing intrauterine system and oral contraceptives in young nulliparous women: a comparative study. *Contraception* 2004; 69:407
- Townsend PK: Contraceptive continuation rates in Papua New Guinea. *P N G Med J* 1983; 26:114
- Berenson AB, Tan A, Hirth JM: Complications and continuation rates associated with 2 types of long-acting contraception. *Am J Obstet Gynecol* 2015; 212:761.e1
- Cohen R, Sheeder J, Arango N, et al: Twelve-month contraceptive continuation and repeat pregnancy among young mothers choosing postdelivery contraceptive implants or postplacental intrauterine devices. *Contraception* 2016; 93:178
- Abraham M, Zhao Q, Peipert JF: Young age, nulliparity, and continuation of long-acting reversible contraceptive methods. *Obstet Gynecol* 2015; 126:823
- Hall AM, Kutler BA: Intrauterine contraception in nulliparous women: a prospective survey. *J Fam Plann Reprod Health Care* 2016; 42:36
- Raine TR, Foster-Rosales A, Upadhyay UD, et al: One-year contraceptive continuation and pregnancy in adolescent girls and women initiating hormonal contraceptives. *Obstet Gynecol* 2011; 117:363
- Hubacher D, Goco N, Gonzalez B, et al: Factors affecting continuation rates of DMPA. *Contraception* 1999; 60:345
- Chen XK, Wen SW, Fleming N, et al: Teenage pregnancy and adverse birth outcomes: a large population based retrospective cohort study. *Int J Epidemiol* 2007; 36:368
- Jatlaoui TC, Marcus M, Jamieson DJ, et al: Postplacental intrauterine device insertion at a teaching hospital. *Contraception* 2014; 89:528
- Hubacher D: Intrauterine devices & infection: review of the literature. *Indian J Med Res* 2014; 140:S53
- Duenas JL, Albert A, Carrasco F: Intrauterine contraception in nulligravid vs parous women. *Contraception* 1996; 53:23
- Veldhuis HM, Vos AG, Lagro-Janssen AL: Complications of the intrauterine device in nulliparous and parous women. *Eur J Gen Pract* 2004; 10:82
- Potter J, Koyama A, Coles MS: Addressing the challenges of clinician training for long-acting reversible contraception. *JAMA Pediatr* 2015; 169:103
- Ricketts S, Klingler G, Schwalberg R: Game change in Colorado: widespread use of long-acting reversible contraceptives and rapid decline in births among young, low-income women. *Perspect Sex Reprod Health* 2014; 46:125
- Sonfield A: Implementing the Federal Contraceptive Coverage Guarantee: progress and prospects. *Guttmacher Policy Review* 2013; 16:8

Appendix A. Search Strategies*Cochrane Central: All Years on November 14, 2015*

#1 MeSH descriptor: (Adolescent) this term only 77,891
 #2 adolescen*:ti,ab 11,465
 #3 teen*:ti,ab 1050
 #4 nulliparous:ti,ab 949
 #5 (young next (women or adult* or female*)):ti,ab 4791
 #6 girl*:ti,ab 3636
 #7 pubescent:ti,ab 25
 #8 #1 or #2 or #3 or #4 or #5 or #6 or #7 90,357
 #9 MeSH descriptor: (Contraception) explode all trees 344
 #10 contracept*:ti,ab 3709
 #11 "birth control":ti,ab 146
 #12 MeSH descriptor: (Intrauterine Devices) explode all trees 536
 #13 "intrauterine device*":ti,ab 851
 #14 (iud or IUDs):ti,ab 537
 #15 #9 or #10 or #11 or #12 or #13 or #14 4377
 #16 MeSH descriptor: (Compliance) this term only 212
 #17 discontinu*:ti,ab 16,712
 #18 continu*:ti,ab 56,437
 #19 #16 or #17 or #18 58,673
 #20 #8 and #15 and #19 198

Embase: 1974 to November 14, 2015

#1 adolescen*:ab,ti 249,934
 #2 teen*:ab,ti 30,185
 #3 nulliparous:ab,ti 9434
 #4 young:ab,ti AND (women: ab,ti OR adult: ab,ti OR female*: ab,ti) 139,942
 #5 girl*:ab,ti 150,544
 #6 #1 OR #2 OR #3 OR #4 OR #5 515,187

#7 contracept*:ab,ti 66,797
 #8 "birth control":ab,ti 3954
 #9 intrauterine AND device:ab,ti 6130
 #10 iud*:ab,ti 7357
 #11 #7 OR #8 OR #9 OR #10 74,948
 #12 continu*:ab,ti 987,813
 #13 discontinu*:ab,ti 137,499
 #14 compliance:ab,ti 128,007
 #15 #12 OR #13 OR #14 1,208,066
 #16 #6 AND #11 AND #15 1486

Ovid Medline: 1946 to First Week of November 2015

1. "(Adolescent)".sh. 1,727,257
2. "adolescen*".ab,ti. 178,622
3. "teen*".ab,ti. 22,022
4. nulliparous.ab,ti. 6677
5. (young women or young adult* or young female*).ab,ti. 81,572
6. "girl*".ab,ti. 108,680
7. pubescent.ab,ti. 546
8. 1 or 2 or 3 or 4 or 5 or 6 or 7 1,858,580
9. "(Contraception)".sh. 17,361
10. "contracept*".ab,ti. 56,255
11. "birth control".ab,ti. 4209
12. "(intrauterine devices)".sh. 8151
13. "intrauterine device*":ab,ti. 4093
14. (iud or IUD).ab,ti. 6187
15. 9 or 10 or 11 64,279
16. 12 or 13 or 14 11,821
17. 15 or 16 69,001
18. "(compliance)".sh. 3811
19. "*continu*".ab,ti. 700,825
20. 18 or 19 704,407
21. 8 and 17 and 20 1913