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Lopez LM, Grey TW, Tolley EE, Chen M.
Brief educational strategies for improving contraception use in young people.
Cochrane Database of Systematic Reviews 2016, Issue 3. Art. No.: CD012025.
DOI: 10.1002/14651858.CD012025.pub2.

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[Intervention Review]

Brief educational strategies for improving contraception use in young people

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Editorial group: Cochrane Fertility Regulation Group.
Publication status and date: New, published in Issue 3, 2016.

Citation: Lopez LM, Grey TW, Tolley EE, Chen M. Brief educational strategies for improving contraception use in young people. *Cochrane Database of Systematic Reviews* 2016, Issue 3. Art. No.: CD012025. DOI: 10.1002/14651858.CD012025.pub2.

ABSTRACT

Background

Global high rates of unplanned pregnancy and abortion among young women demonstrate the need for increased access to modern contraceptive services. In sub-Saharan Africa, the birth rate for those aged 15 to 19 years is 121 per 1000. In the USA, 6% of teens aged 15 to 19 years became pregnant in 2010. Most pregnancies among young women to age 25 are unintended.

Objectives

The aim was to identify brief educational interventions for improving contraceptive use among young people that are feasible for implementing in a clinic or similar setting with limited resources.

Search methods

To 7 March 2016, we searched for studies in CENTRAL, PubMed, POPLINE, Web of Science, ClinicalTrials.gov and ICTRP.

Selection criteria

We considered randomized controlled trials (RCTs) that assigned individuals or clusters as well as non-randomized studies (NRS). We included young people to age 25.

The intervention had to be sufficiently brief for a clinic, i.e. one to three sessions of 15 to 60 minutes plus potential follow-up. The strategy had to emphasize one or more effective methods of contraception. Primary outcomes were pregnancy and contraceptive use.

Data collection and analysis

We assessed titles and abstracts identified during the searches. One author extracted and entered the data into Review Manager; a second author verified accuracy. We examined studies for methodological quality.

For dichotomous outcomes, we calculated the Mantel-Haenszel odds ratio (OR) with 95% confidence interval (CI). For continuous variables, we computed the mean difference (MD) with 95% CI. We used adjusted measures for cluster RCTs, typically ORs, that the investigators reported. For NRS, which need to control for confounding, we also used reported adjusted measures. We did not conduct meta-analysis due to varied interventions and outcome measures.

Main results

We found 11 studies, published from 1983 to 2015, that included a total of 8338 participants. Ten were from the USA and one was from China. We focused here on intervention effects for our primary outcomes. Five studies showed some effect on contraceptive use. Of three RCTs that examined innovative counseling, one showed an intervention effect. At one year, adolescents with developmental counseling were more likely to use contraception effectively than those with standard counseling (OR 48.38, 95% CI 5.96 to 392.63).

Three studies used an audiovisual tool plus counseling; two reported some effect on contraceptive use. An NRS with young men, aged 15 to 18, examined a slide-tape presentation plus reproductive health consultation. At one year, the intervention group was more likely than the standard-care group to report using an effective contraceptive and having a partner who used oral contraceptives (OCs), both at last intercourse (reported adjusted OR 1.51 and 1.66, respectively). Another study utilized a computer program for contraceptive decision-making plus standard counseling for women to age 20. At one year, fewer women in the intervention group at one site had not used OCs compared with the counseling-only group (3.4% versus 8.8%; reported P = 0.05).

Three RCTs provided phone follow-up after counseling, one of which showed an effect on contraceptive use among women age 16 to 24. Women who received counseling plus phone calls to encourage contraceptive use were more likely than the counseling-only group to report consistent OC use at three months (OR 1.41, 95% CI 1.06 to 1.87) and six months (OR 1.39, 95% CI 1.03 to 1.87). Also at three months, they were more likely to report condom use at last sex (OR 1.45, 95% CI 1.03 to 2.03).

Two cluster randomized trials trained providers on contraceptive methods and counseling. One trial with an intervention effect tested comprehensive contraceptive services for women to age 25, postabortion. At six months, the comprehensive-service group was more likely than the standard-care group to use an effective contraceptive (reported adjusted OR 2.03, 95% CI 1.04 to 3.98) and to use condoms consistently and correctly (reported adjusted OR 5.68, 95% CI 3.39 to 9.53).

Authors' conclusions

Few studies tested brief strategies for young people. We noted heterogeneity across studies in participants' ages and life situations. Of five studies with some effect, one provided moderate-quality evidence; four were older studies with low-quality evidence. More intensive strategies could be more effective, but would also be challenging for many clinics to implement.

PLAIN LANGUAGE SUMMARY

Brief teaching methods to improve contraceptive use among young people

Background

Young people up to age 25 have high rates of unplanned pregnancy. They need modern birth control methods and services. We wanted to find ways to educate young people about birth control that are brief enough for clinic use.

Methods

To 7 March 2016, we ran computer searches for randomized and non-randomized studies. The teaching strategy could involve up to three sessions of 15 to 60 minutes plus follow-up. The effort had to address an effective method of birth control. Main outcomes were pregnancy and birth control use.

Results

We found 11 studies from 1983 to 2015 that included 8338 women. Ten studies were from the USA and one was from China. We focused here on the five studies that showed some effect. Two tested special counseling. At one year, teens with special counseling for their age used birth control more effectively than those with standard counseling.

Two studies used audiovisual tools plus counseling. One trial provided a slide-tape presentation on sexual health for young men. At one year, the treatment group was more likely than the control group to use an effective contraceptive and have a partner who used oral contraceptives (OCs). The other used a computer program for decision-making for young women. At one year, more women in the intervention group at one site used OCs compared with the control group.

Two other studies showed some effect. In one, young women with phone follow-up and counseling were more likely to have consistent OC use at three months and six months than the group with counseling only. Also at three months, they were more likely to report

condom use at last sex. One trial that assigned sites compared an enhanced package of birth control services after abortion versus standard care. At six months, the enhanced-service group was more likely to use effective contraception and use condoms consistently and correctly.

Authors' conclusions

Few studies tested brief teaching methods for young people. About half of the studies had some effect, but they differed in methods and in ages and life situations of the young people. More intense strategies could work better, but would be difficult for many clinics to use. Overall, study quality was low.

SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Special counseling + phone follow-up compared with special counseling for improving contraceptive use

Patient or population: young women, 16 to 24 years old, with desire to avoid pregnancy
Settings: clinic
Intervention: special counseling + phone follow-up
Comparison: special counseling

Outcomes	Relative effect (95% CI)[a]	Participants (studies)	Quality of the evidence (GRADE)	Comments
Counseling + phone follow-up vs counseling Consistent OC use (at 3 months; at 6 months)	OR 1.41 (1.06 to 1.87); OR 1.39 (1.03 to 1.87)	767 (Berenson 2012)	⊕⊕⊕◯ **moderate**	_
Counseling + phone follow-up vs counseling Condom use at last sex (at 3 months)	OR 1.45 (1.03 to 2.03)	767 (Berenson 2012)	⊕⊕⊕◯ **moderate**	_

CI: confidence interval; **OC:** oral contraceptive; **OR:** odds ratio

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[a]Significant differences between study arms for primary outcomes in this review

BACKGROUND

Description of the condition

Millennium Development Goal 5 of the United Nations included increased access to contraception among young women (UN 2015). In sub-Saharan Africa, South Central Asia, and Southeast Asia, 68% of women aged 15 to 19 years want to avoid pregnancy but are not using a modern contraceptive method, and the figure is 51% for women aged 20 to 24 years old (Darroch 2011). In addition, 87% of unintended pregnancies occur among women who do not use a modern contraceptive method. In low- and middle-income countries (LMICs), 33 million women from 15 to 24 years old have an unmet need for contraception (MacQuarrie 2014). Among unmarried women in this age group, the need ranges from 7% in Ukraine to 70% in Senegal. For married young women, the comparable figures are 8% in Indonesia and 46% in Ghana.

Of the 16 million births per year to adolescents 15 to 19 years old, 95% occur in LMICs (Chandra-Mouli 2014). In sub-Saharan Africa, the birth rate for young women aged 15 to 19 years old is 121 per 1000 (UN 2015). The next-highest birth rate is 86 per 1000 young women in Latin America and the Caribbean. The average for 'developing regions' is 56 per 1000 ((UN 2015). Complications from pregnancy and childbirth are the leading cause of death in this age group. Many adolescents choose abortion, which may be unsafe due to local restrictions. Three-fourths of unsafe abortions, as well as other causes of maternal mortality, could be prevented by improved access to modern contraception (WHO 2011). In the USA, 6% of teenagers aged 15 to 19 years became pregnant in 2010 (Kost 2014). When based on those who had ever had sex, the pregnancy rate was 12.7%. Furthermore, 82% of the pregnancies among women 15 to 19 years old in 2008 were unintended, as were 64% of those among women 20 to 24 years old (Finer 2014). Young women 18 to 19 years old represented 69% of all teenage pregnancies. Rates for adolescent pregnancies, births, and abortions have decreased markedly since 1990. Of teenage women in the USA at risk of unintended pregnancy, 59% reportedly use highly effective contraception (Guttmacher 2015). The male condom is the most common method at first sex and at most recent sex (Martinez 2011; Guttmacher 2015).

Women under 25 years of age who use modern contraceptives have higher typical rates for contraceptive failure within the first 12 months compared with women 25 years of age and older. First-year contraceptive failure rates were 13% to 14% for women younger than 25 years of age versus 8% for women aged 30 years and older (Kost 2008). When examined for pill use, younger age was a significant predictor of failure along with intent to have more children, being currently married, and parity. For condom use, the same factors were important, as were race or ethnicity and poverty status.

Description of the intervention

Behavioral strategies to improve contraception use include counseling or education in clinical settings (Jaccard 2013). The intervention can take the form of traditional oral or written communication, or may involve the use of mobile phones or other technology (Guse 2012; Gilliam 2014). A strategy could be conducted through single or multiple sessions and targeted to individuals, couples, or groups (Robin 2004). Clinic-based interventions are less likely to have multiple sessions or be multifaceted than school-based or community-based interventions, which may be considered educational programs or communication campaigns (Lopez 2013a).

Family planning services may provide counseling as well as improve access to contraception (Blank 2012; Chandra-Mouli 2014). Global high rates of unplanned pregnancy and abortion among adolescents and young women demonstrate the need for increased access to modern contraceptive information and services. Such access has been recognized internationally as a human rights issue for young women (UNFPA 2010). However, numerous barriers exist and may vary across geographical settings. These include regulations and policies that prohibit young or unmarried women from accessing some or any contraception (Ross 2013; Chandra-Mouli 2014); attitudes or beliefs that lead parents, teachers, and providers to discourage young women or withhold contraceptive information or services (Biddlecom 2008; Bankole 2010; Ross 2013); and young women's lack of knowledge, skills, or resources to access the available information and services (Chandra-Mouli 2014). Even in the context of youth-friendly services, unmarried or nulliparous young women may have limited access to the most effective contraceptive methods, such as intrauterine contraception (Wilson 2012; Rubin 2013). Because adolescents' needs and preferences vary, young women should have access to the full complement of methods (Comm Adolescence 2014). Meeting the needs of adolescents in different contexts may require a range of information channels and communication approaches (Chandra-Mouli 2014).

Why it is important to do this review

Several reviews have examined educational strategies to improve contraceptive use. These may include interventions for preventing HIV or sexually transmitted infections (STIs), as well as for improving contraceptive use and preventing pregnancy (Oringanje 2009). Some include studies of varying designs (Blank 2012). A Cochrane review of educational interventions addressed theory-based strategies and found that programs for youth often have multiple sessions (Lopez 2013b). Postpartum education to improve contraceptive use among teenage mothers may occur in the clinic or home, depending on local standards of care and the particular project (Lopez 2015).

In this review, we examined behavioral strategies to improve contraceptive use among young people to age 25 years. The inter-

vention must have involved counseling or education to improve knowledge of effective contraception and appropriate method use. Such efforts can help young people choose an appropriate contraceptive method and continue to use the preferred type. The focus of such strategies is preventing unintended pregnancy.

While multifaceted interventions help address the complexity of contraception behavior, most contraception counseling occurs in a clinical setting. Time and counseling expertise are often limited, along with knowledge about specific contraceptive methods, such as long-acting reversible contraception (Harper 2013; Lewis 2013). We tried to identify interventions that focus on contraception use by young people and are feasible for clinical settings.

OBJECTIVES

The aim was to identify brief educational interventions for improving contraceptive use among young people that are feasible for implementing in a clinic or similar setting with limited resources.

METHODS

Criteria for considering studies for this review

Types of studies

We considered randomized controlled trials (RCTs) and non-randomized studies (NRS). RCTs include trials that assigned individuals or clusters, such as clinics. The NRS had to be prospective and have a comparison group. The design and conduct of educational interventions may be influenced by funding limitations, clinic logistics, and ethics regarding who receives the new program. Therefore evidence from RCTs about what may help inform people about choosing contraceptives is limited (Halpern 2013; Lopez 2013b). Considering NRS broadened the base from which to draw evidence.

Types of participants

We included study participants aged 25 years or younger. Participants may have been initiating contraceptive use, switching to a different method, or continuing use of the same method. We also included women who were postpartum or postabortion.

The age range for adolescence and young adulthood varies in research and policymaking. While contraceptive counseling for adolescents may focus on those aged 14 to 19 years, some scientists consider 20 to 25 years of age a period of "extended adolescence" or "emerging adulthood" (Jaccard 2013). Societal changes may delay independence and the assumption of adult roles. Healthcare policy organizations have considered 10 to 15 years old as the lower age cutoff for adolescence and 18 to 24 years old as the upper limit (DHHS 2008; Gavin 2009; WHO 2014; UN 2015). Peer education for sexual health among young people has included ages 10 to 24 years (Tolli 2012). Contraceptive service interventions for young people in healthcare settings have participants up to 25 years of age (Blank 2012).

Types of interventions

We considered educational strategies to improve contraceptive use among young people. The intervention had to be sufficiently brief or focused for implementing in a clinic or similar setting with limited time or staffing. Strategies had to be one to three sessions of 15 to 60 minutes each, and may have been conducted with individuals or groups. Methods could include direct oral communication or the use of video or an Internet-based program. Additional education or reminders may have been provided by phone call or mobile phone messaging. Another Cochrane review addresses mobile phone interventions but has different inclusion criteria (Smith 2015). Interventions may have been developed for school-based or community-based clinics. A classroom-based strategy could have been feasible if it had a single session or was computer-based, but multiple lessons or a detailed curriculum would be too intensive for most clinics. The comparison condition may have been another educational strategy, usual care, other health education, or no intervention.

The behavioral strategy being tested had to emphasize one or more reversible methods of contraception. The intervention should have addressed modern family planning methods and included those considered more effective in preventing pregnancy. Effectiveness is 99% with correct and consistent use of the more effective methods, and typical-use effectiveness ranges from 90% to 99% (Trussell 2011; WHO 2015). These methods include pills, injectables, the contraceptive patch, the vaginal ring, lactational amenorrhea, and emergency contraception. Further, long-acting methods such as intrauterine contraception and implants have typical-use effectiveness of greater than 99%. Of the fertility awareness-based methods, sometimes known as 'natural family planning,' only the symptothermal method may have typical-use effectiveness greater than 90%; effectiveness is 98% with correct and consistent use (WHO 2015).

Types of outcome measures

Primary outcomes

Included studies must have had one of the measures listed below.

- Contraception use (at least three months after the intervention began)
    - use of a new method
    - improved use or continuation of a method
- Pregnancy (at least six months after the intervention began)

Contraceptive use could have been assessed in a variety of ways, such as consistent use or improved adherence. Where we found multiple measures within a study, we focused on the investigator's assessment of consistent use or use at last sex. If we did not find one of those preferred measures, we accepted the method used by the investigator.
For high quality evidence, the time frames for assessment were 6 months or more for contraception use and 12 months or more for pregnancy. The longer time frames provide more meaningful outcome measures.

Secondary outcomes

These measures evaluate whether the study groups differed after the intervention in thinking about contraception, regardless of whether behavior changed.

- Knowledge of contraceptive effectiveness or effective method use
- Attitude about contraception or a specific contraceptive method

The time frame for assessment was three months or more. For high-quality evidence, the time frame was six months or more.

Search methods for identification of studies

Electronic searches

To 7 March 2016, we searched for eligible studies in PubMed, the Cochrane Central Register of Controlled Trials (CENTRAL), POPLINE, and Web of Science. Searches started from the inception of each database. We also searched for recent studies via ClinicalTrials.gov and the World Health Organization's International Clinical Trials Registry Platform (WHO ICTRP). We have shown the search strategies with the search end dates in Appendix 1.

Searching other resources

We examined the reference lists of reviews and other relevant articles to find studies we may have missed in our electronic searches.

Data collection and analysis

Selection of studies

We assessed for inclusion all titles and abstracts identified during the literature search. One author reviewed the search results, and a second author examined the reports identified for appropriate categorization. We obtained and examined the full-text articles for studies that appeared eligible for the review. The authors resolved any discrepancies by discussion.

Data extraction and management

Two authors conducted the data extraction. One author entered the data into Review Manager (RevMan) (RevMan 2014), and a second author checked accuracy. These data include the study characteristics, risk of bias, and outcomes. We focused on the primary and secondary outcomes for this review, which do not include all outcomes from each study. We resolved discrepancies through discussion.

Assessment of risk of bias in included studies

Intervention fidelity

We used an existing framework to assess the quality of the educational strategy (Borrelli 2011). Domains of treatment fidelity are study design, training of providers, delivery of treatment (intervention), receipt of treatment, and enactment of treatment skills. The framework was intended for assessing current trials. The criteria of interest for our review are listed below.

- Study design: had a curriculum or treatment manual
- Prior training of providers: specified providers' credentials
- Project-specific training: provided standardized training for the intervention
- Delivery: assessed providers' adherence to the protocol
- Receipt: assessed clients' understanding and skills regarding the intervention

For the assessment of evidence quality, we downgraded the studies that met fewer than four of these five criteria.

Research design

We evaluated the included RCTs for methodological quality in accordance with recommended principles (Higgins 2011), and entered the information into the 'Risk of bias' tables. We considered the randomization method, allocation concealment, blinding, and losses to follow-up and early discontinuation.
For the NRS considered for inclusion, we used the Newcastle-Ottawa Quality Assessment Scale (NOS) (Higgins 2011; Wells 2014). Of the two NOS versions, i.e. for case-control and cohort studies, the latter was more pertinent here (Appendix 2). The developers are examining the criterion validity and construct validity of this scale, as well as the inter-rater reliability and intra-rater reliability. The scale does not yet have an overall scoring or threshold for a 'good' or 'poor' quality study. The NOS has eight items within three domains: selection (representativeness), comparability (due to design or analysis), and outcomes (assessment and follow-up).

A study can receive one star (*) for meeting each criterion. The exception is comparability (design or analysis), for which a study can receive two stars (for design and analysis). We adapted the NOS items as suggested by the developers (Wells 2014).

Measures of treatment effect

For the dichotomous outcomes, we calculated the Mantel-Haenszel odds ratio (OR) with 95% confidence interval (CI). An example is the proportion of young women who initiated use of a particular contraceptive method. Fixed effect and random-effects give the same result if no heterogeneity exists, as when a comparison includes only one study. For continuous variables, we computed the mean difference (MD) with 95% CI. RevMan uses the inverse variance approach (RevMan 2014).

Cluster randomized trials may use a variety of strategies to account for the clustering. When available, we used adjusted measures that the investigators considered the primary effect measures. Odds ratio (OR) is an appropriate effect measure and is commonly provided when adjusted analyses are obtained using cluster-adjusted logit models with or without covariates. However, if an appropriate adjusted OR was not available from the report, we considered other effect measures, e.g. rate ratio, hazard ratio, or incidence difference. Where multivariate models were used, we did not analyze the treatment effect, as that would usually require individual participant data. Instead we presented the results from adjusted models as reported by the study investigators.

Non-randomized studies

Given the need to control for confounding factors in NRS, we used adjusted measures for the primary effect measures when available. OR is an appropriate effect measure for both cohort and case-control studies and is commonly provided when adjusted analyses are obtained using logistic regression models. However, we considered other effect measures if an appropriate adjusted OR was not available from the report. The effect measure may have been an odds ratio, risk ratio, or hazard ratio.

Investigators used a variety of adjustment strategies. We specified whether confounding was considered in the design (e.g. matching, stratification). In the Characteristics of included studies and Effects of interventions, we identified the confounding factors considered in the design and analysis. As noted for cluster RCTs above, when investigators used multivariate models, we did not analyze the treatment effect but presented the results from the adjusted models. If the report did not provide adjusted measures for the primary analysis, we used unadjusted measures. If data were available for unadjusted dichotomous outcomes, we calculated the OR with 95% CI.

Unit of analysis issues

If clustering was part of the design, we assessed whether the study investigators properly adjusted the estimates to account for clustering effects. Cluster RCTs may use various methods of accounting for the clustering, such as multilevel modeling. We noted the specific methods used in the results for each included study. We presented the results as reported by the investigators.

Dealing with missing data

We wrote to investigators to request missing data, such as sample sizes for analysis and actual numbers for outcomes presented in figures. However, we limited our requests to studies less than 10 years old, as well as studies that had a report within the past five years. Investigators are unlikely to have access to data from older studies. In some cases, we had obtained additional information for an earlier review that included the specific study.

Assessment of heterogeneity

Due to the variability in educational interventions, we were unable to conduct meta-analysis; statistical heterogeneity was irrelevant. However, we addressed heterogeneity due to differences in study design, populations, interventions, outcome measures, and analysis. We examined any differences across studies by participant age group. Studies may focus on adolescents to age 18 or 19 versus young people up to age 25. The location and setting may influence the design and results. The type of outcome measure may affect results, and we have addressed this below. In addition, we synthesized results by the type of intervention, e.g. counseling, counseling plus reminders, or counseling plus improved access to services. The last includes providing contraceptives free or at reduced cost to one or more study groups.

Data synthesis

To assess the quality of evidence and address confidence in the effect estimates, we applied principles from GRADE (Grades of Recommendation, Assessment, Development and Evaluation) (Higgins 2011; GRADE 2013). As meta-analysis was not viable due to varied interventions and outcome measures, a typical 'Summary of findings' table was not feasible. Also, the criteria for NRS and RCTs differ. We did provide a 'Summary of findings' table for the main results, although we did not conduct a formal GRADE assessment for all outcomes (GRADE 2013).

We based our assessment of the body of evidence on the quality of evidence from the included studies. For the RCTs, we entered the information into the 'Risk of bias' tables. For the NRS, we used the Newcastle-Ottawa Quality Assessment Scale (NOS) as noted earlier (Appendix 2). Evidence quality included the design, implementation, and reporting of the intervention and the study. The information on intervention fidelity was part of the overall assessment. We have listed the criteria for downgrading the quality of the evidence below.

- Intervention fidelity information for fewer than four criteria
- NRS: not meeting at least one NOS criterion for selection
- Risk of bias was high
    - RCT: inadequate randomization sequence generation or allocation concealment, no information for either one, or the study was not randomized
    - NRS: no stars for comparability, i.e. not controlling for any confounding

- No objective measure for outcome assessment, e.g. pregnancy test or record or contraceptive use (clinic records of depot medroxyprogesterone acetate (DMPA) injections)
- Follow-up less than 6 months for contraceptive use and less than 12 months for pregnancy
- Loss to follow-up greater than 20%

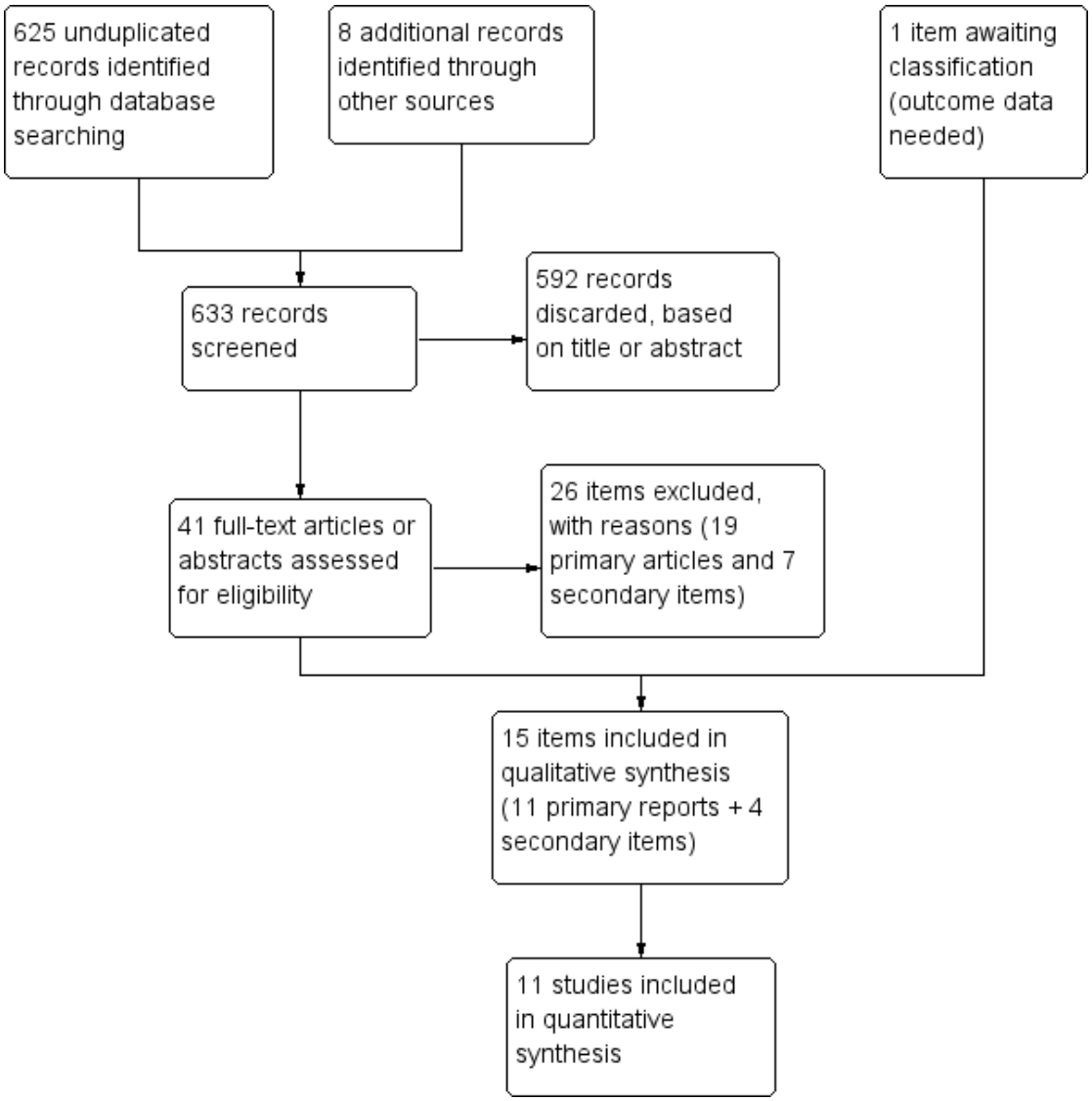
RESULTS

Description of studies

Results of the search

The database searches yielded 625 unduplicated references (Figure 1). We added 8 items from other sources for a total of 633. We discarded 592 references based on the title or abstract. After reviewing the full text of 41 articles or abstracts, we excluded 26 items that did not meet the eligibility criteria (19 primary reports plus 7 secondary references). We included 15 items, i.e. 11 primary reports from studies that met the eligibility criteria plus 4 secondary references. We placed one trial that had only produced an abstract to date in Studies awaiting classification until a report is available with four-month outcome data. Searches of clinical trials listings produced 107 unduplicated trials; we listed 3 in Ongoing studies. The others were not relevant or were listings for completed trials we had already considered.

Figure 1. Study flow diagram.



Included studies

Of 11 studies, 9 were individually randomized trials, 2 were cluster randomized trials, and 2 were non-randomized studies. Ten studies were conducted in the USA and one was carried out in China. Participants were typically recruited from primary care sites and family planning clinics.

Publication dates for these reports ranged from 1983 to 2015. Four trials provided details on sample size calculations. The total number of participants was 7765. Sample sizes for the studies that assigned individuals ranged from 33 to 1155 with a median of 228. Four studies that randomized individuals had 100 or fewer participants; two had approximately 1000. Of the two trials that randomized sites, or clusters, one included 2336 women from 16 clinics, and the other had 1500 women from 40 clinics. The effective sample sizes for those two trials would be smaller due to the assignment of groups rather than individuals.

Because these studies tested clinic-based interventions, most focused on educating individuals. One had a group session and partner involvement as well as individual contact (Zhu 2009). Studies with phone follow-up or text messages had multiple contacts with participants. Most studies focused on teenagers, a few included

young people up to age 24 or 25 years, and two had age ranges from 18 years to 24 or 25 years.

We categorized the interventions as counseling (Marcy 1983; Jay 1984; Ceperich 2011), counseling plus audiovisual methods (Danielson 1990; Chewning 1999; Gilliam 2004), counseling plus phone calls or text messages (Kirby 2010; Berenson 2012; Trent 2015), and counseling plus training of providers (Zhu 2009; Harper 2015).

Some studies focused on a specific contraceptive method, e.g. oral contraceptives (OCs) (Jay 1984; Chewning 1999; Gilliam 2004; Berenson 2012), long-acting reversible contraception (LARC) (Harper 2015), or the injectable DMPA (Trent 2015). Others addressed 'more effective methods' (Zhu 2009; Ceperich 2011) or various methods (Marcy 1983; Danielson 1990; Kirby 2010).

Excluded studies

Studies were typically excluded for not having an eligible intervention. Some interventions did not address contraception, while others were too intensive to meet the criteria for a brief strategy. Details can be found in Characteristics of excluded studies.

Risk of bias in included studies

Figure 2 summarizes our assessments of risk of bias for the overall review; Figure 3 provides our assessment for each study. Because we adapted the 'Risk of bias' tables to accommodate criteria for non-randomized studies, some categories are not relevant to an RCT or to an NRS. We left those categories blank so that an empty cell in Figure 3 indicates the criterion was 'not applicable' and distinguishes between 'unclear' and no assessment.

Figure 2. Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

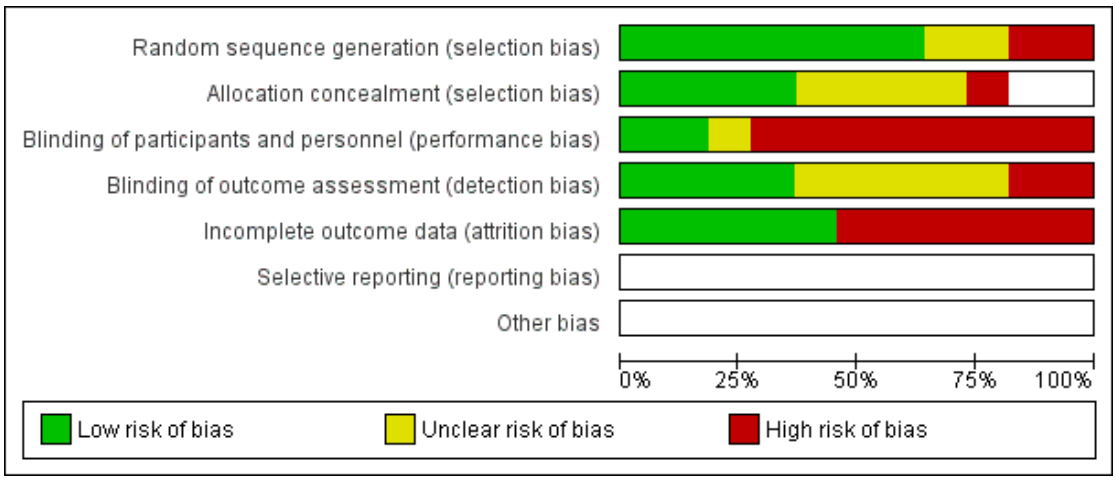
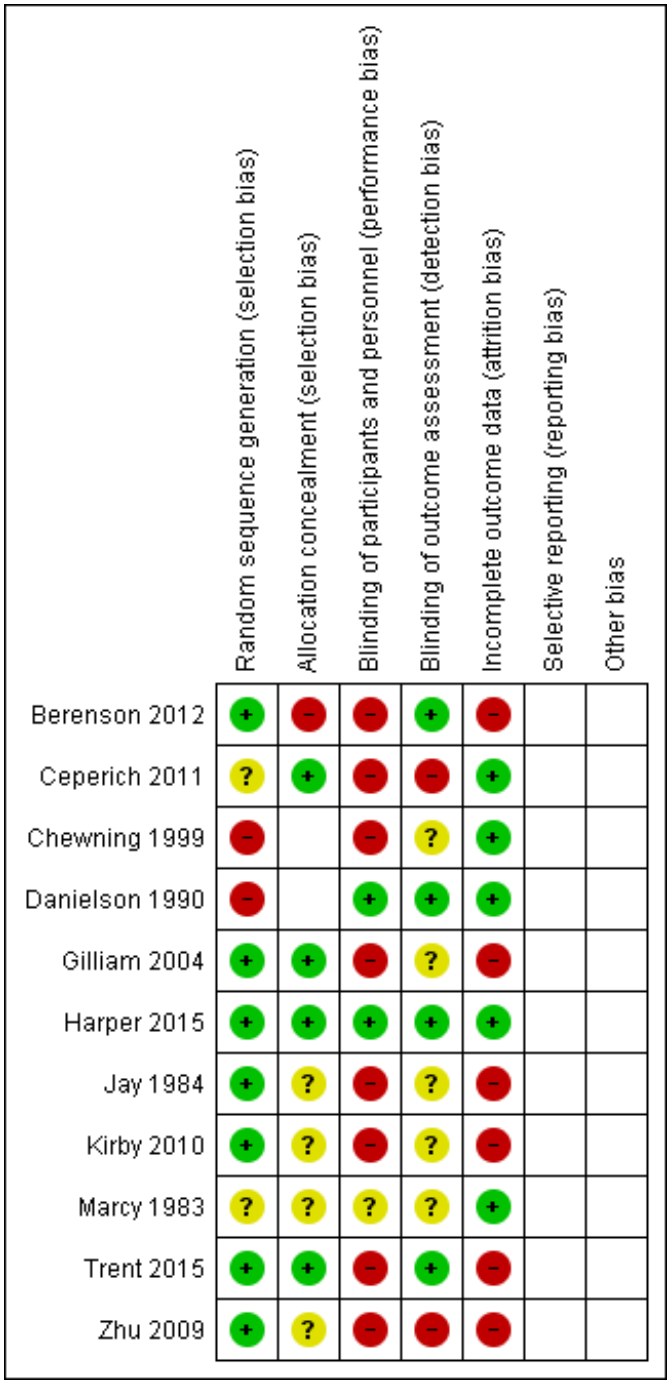


Figure 3. Risk of bias summary: review authors' judgements about each risk of bias item for each included study. Blank cells indicate the criterion was not relevant due to study design and therefore was not assessed.



We looked for evidence of intervention fidelity in the included studies. Table 1 lists the included studies by major type of intervention. Our assessment of evidence quality includes intervention fidelity reporting.

Allocation

Seven of the nine RCTs specified the randomization method; most used a computer-generated sequence (Jay 1984; Gilliam 2004; Kirby 2010; Berenson 2012; Harper 2015; Trent 2015), while one used coin tossing (Zhu 2009).

The two NRS used alternate assignment (Danielson 1990; Chewning 1999). Both met some of the NOS selection criteria. Danielson 1990 also met the comparability criteria due to adjusting the analysis for potential confounding factors.

Three RCTs provided the method of allocation concealment (Gilliam 2004; Ceperich 2011; Trent 2015). Berenson 2012 communicated they did not conceal allocation from the investigators, which may have referred to blinding. One cluster randomized trial stated the clinics were unaware of assignment until study began (Harper 2015). The other four RCTs had no information on concealment.

Blinding

Seven studies mentioned some blinding. These were primarily participants (Danielson 1990; Harper 2015) and outcome assessors (Jay 1984; Kirby 2010; Berenson 2012; Harper 2015). Three mentioned research personnel (Gilliam 2004; Kirby 2010; Trent 2015), but none of the studies could feasibly mask the intervention providers due to the types of interventions. Zhu 2009 stated the interviewers (assessors) were not blinded to intervention group. Three trials had no information on blinding (Marcy 1983; Chewning 1999; Ceperich 2011).

Incomplete outcome data

Six trials lost 20% or more to follow-up; they are listed below by the percent lost. Two had major differential losses between the intervention and control groups (Jay 1984; Gilliam 2004).

- Zhu 2009: 44% special intervention; 40% comparison
- Berenson 2012: 44% counseling; 43% counseling + phone; 45% standard care
- Jay 1984: 42% nurse-counselor group; 23% peer-counselor group
- Trent 2015: 34% intervention; 28% control
- Kirby 2010: 25% overall
- Gilliam 2004: 24% overall (11% intervention; 40% control)

Other potential sources of bias

Of six studies that assessed pregnancy, two used medical records or home pregnancy tests, while the others had self reports. In addition to self report for pregnancy, Berenson 2012 used medical records and Harper 2015 used home pregnancy tests and medical records. Under-reporting is possible since women may not have reported an abortion, which could have been done at another clinic.

Most studies had self-reported contraceptive use, but two had objective measures. The use of a biomarker to assess pill use strengthened the results of Jay 1984. Trent 2015 used clinic records of on-time injections for DMPA.

Effects of interventions

See: **Summary of findings for the main comparison** Counseling + phone follow-up versus counseling; **Summary of findings 2** Enhanced counseling versus standard care; **Summary of findings 3** Counseling + audiovisual tool versus usual care

For studies that used multivariate models, we have presented the results from the adjusted models. Other reports did not contain sufficient data for analysis in this review, so we have presented the results as reported by the investigators. For reports that did not provide a P value when the comparison groups did not differ significantly, we used 'NS' in the data table to indicate no significant difference.

We present the results by type of intervention. Table 2 summarizes the various strategies explained below and the intervention effects. The studies show some heterogeneity in participant ages and recruitment source. Most studies recruited young women from family planning clinics, but one used a medical clinic to reach young men. Others focused on young women who were pregnant or were postabortion.

Counseling

Three RCTs examined innovative methods for counseling. Two trials compared a newer method to standard contraceptive counseling (Marcy 1983; Jay 1984), while one provided the control group with a general pamphlet on women's health (Ceperich 2011).

Marcy 1983 compared developmental counseling versus conventional counseling for adolescents, age 13 to 18 years (N = 80). This developmental counseling addressed the particular social and psychological concerns of adolescents. The Characteristics of included studies table provides the principles and constructs of this approach. Effective contraceptive use was defined as follows: medical chart showed refilled contraceptive prescriptions regularly during year; participant kept intrauterine device (IUD) in place; at clinic appointment, participant stated she was using foam and condom together or using diaphragm and spermicidal jelly together; participant abstained from intercourse. At one year, adolescents in

the intervention group were more likely to be effective users of contraception (odds ratio (OR) 48.38, 95% confidence interval (CI) 5.96 to 392.63; participants = 78) (Analysis 1.1). The wide CI indicates imprecision in the estimate.

Jay 1984 compared peer counseling versus nurse counseling to improve adherence to oral contraceptives (OCs) among adolescents (N = 57). Participants ranged in age from 14 to 19 years old. Non-adherence was measured with the score from a four-factor Guttman scale: became pregnant during the previous month; missed appointment; reported missing three or more OCs during the month; and at follow-up had absence of urinary fluorescence (a marker added to the OCs). At four months, the peer-counseling and nurse-counseling groups did not differ significantly in their non-adherence scores (Analysis 2.1).

The intervention in Ceperich 2011 was based primarily on motivational interviewing and addressed reducing risk for alcohol-exposed pregnancy. Participants were university students, 18 to 24 years old (N = 228). The intervention involved a single session lasting about an hour. The control group received a pamphlet on women's health. At four months, the treatment group was less likely than the control group to report using ineffective contraception, but the difference was not statistically significant (Analysis 3.1).

Counseling plus audiovisual

Three studies used some type of audiovisual presentation or computer tool as an adjunct to counseling. Two were older NRS with alternate assignment to intervention groups (Danielson 1990; Chewning 1999). One was a small RCT (Gilliam 2004).

Danielson 1990 focused on young men aged 15 to 18 years. The analysis of contraceptive use outcomes included 522 young men who were sexually active; 1195 participated in the intervention. The experimental group viewed an audiovisual presentation (slide-tape) on reproductive health, which addressed fertility, sexually transmitted infections (STIs), contraception, and abstinence. The slide-tape was followed by a healthcare visit focused on contraception, e.g. consistency of contraceptive use, use of back-up methods, and condom use. For analysis, the logistic regression models included potential confounding variables such as baseline demographics, sexual activity, and contraceptive use. The comparison groups reportedly did not differ significantly for contraceptive methods used in the previous year and frequency of birth control use. Two items on contraceptive use associated with the intervention were open-ended questions: main method used in the past year and method used at last intercourse. Contraceptive effectiveness was categorized as no method, method less effective than condom, condom alone, and method more effective than condom alone (primarily OCs). Since the report did not provide the 95% CI, we show the P values as provided in the report. At one year, the intervention group was more likely than the control group to have used an effective method at last intercourse (reported adjusted OR 1.51; $P < 0.05$); the difference was also apparent within the subgroup not sexually active at baseline (reported adjusted OR 2.53; $P < 0.01$) (Analysis 4.1). The intervention group was also more likely to have a partner who used OCs at last intercourse (reported adjusted OR 1.66; $P < 0.05$), and the difference was evident within the subgroup not sexually active at baseline (reported adjusted OR 3.06; $P < 0.01$) (Analysis 4.1). For contraceptive knowledge, the analysis included all participants who completed follow-up and had complete data (N = 971). Within the subgroup that was sexually active at baseline, the intervention group was more likely than the control group to agree that OCs were safe (reported adjusted OR 1.68; $P < 0.05$) (Analysis 4.2). Overall, the intervention group was more likely than the control group to understand fertility timing in the menstrual cycle (reported adjusted OR 1.37; $P < 0.01$) (Analysis 4.2).

Gilliam 2004 provided a multicomponent intervention of counseling, a videotape about OCs, and written material. The comparison group received usual care. Participants were pregnant at age 25 or younger (N = 33). At one year, the experimental and comparison groups did not differ significantly in the proportions that continued OC use (Analysis 5.1) or those who switched contraceptive method (Analysis 5.2). The investigators noted the sample size was not sufficient to detect a 20% difference between groups, due to resource limitations.

In Chewning 1999, the intervention was standard counseling plus a computer program for contraceptive decision-making compared with standard counseling alone. Participants were women, 20 years old or younger (N = 949). The investigators presented results by clinic due to site differences in populations and in protocols for the standard counseling (see Characteristics of included studies). They did not provide sample sizes by study arm for analysis. The intervention was not significantly associated with number of months on OCs (Analysis 6.1) or with pregnancy (Analysis 6.2) at either site. At the Chicago site, 3.4% of the intervention group did not start using OCs compared with 8.8% of the control group (reported $P = 0.05$). At the Madison site, knowledge of OCs was greater for the intervention group compared with the control group (reported $P = 0.031$) (Analysis 6.1).

Counseling plus phone calls or text messages

Three RCTs utilized phone follow-up in addition to contraceptive counseling. Two made personal phone calls after the clinic visit to encourage and assist with contraceptive use (Kirby 2010; Berenson 2012). The third trial provided text messages for appointment reminders and education (Trent 2015).

Kirby 2010 used motivational interviewing during phone calls to improve contraceptive use for adolescents, aged 14 to 18 years (N = 805). After the initial clinic visit, nine calls could be provided in 12 months: monthly for the first six months and then every other month. The comparison group had usual care from the reproductive health clinic, e.g. calls to report abnormal results or respond

to patients' inquiries. Only 30% of calls were completed (mean of 2.7 per participant). The regression analyses treated time either continuously or discreetly, and controlled for baseline values and other significant covariates. The intervention and control groups did not differ significantly at 6, 12, or 18 months in the reported percentages for hormonal contraceptive use at last sex (Analysis 7.1), condom use at last sex (Analysis 7.2), or use of hormonal contraceptive or condom at last sex (Analysis 7.3). The investigators provided additional results. Self-reported pregnancy did not differ significantly for the two groups at study end (27% treatment; 23% control) (Analysis 7.4). Pregnancy rates from clinic charts were much lower than those from self report, but participants did not necessarily use the same clinic.

For Berenson 2012, the three study conditions were special counseling about OCs plus monthly follow-up phone calls (C + P), special counseling (SC) about OC use, and usual clinic services. The women were 16 to 24 years old and recruited from five reproductive health clinics serving low-income women (N = 1155). The investigators did not report any differences as significant. They used P < 0.017 (0.05/3) to indicate significance as an adjustment for multiple comparisons among three intervention groups. In this review, we had two comparisons and considered P < 0.05 to indicate significance: C + P versus SC and SC versus standard care (usual clinic services). The C + P group was more likely than the SC group to report consistent OC use at three months (OR 1.41, 95% CI 1.06 to 1.87; participants = 767) and at six months (OR 1.39, 95% CI 1.03 to 1.87; participants = 767) (Analysis 8.1). Inconsistent condom users were asked about condom use. At three months, the C + P group was more likely than the SC group to report condom use at last sex (OR 1.45, 95% CI 1.03 to 2.03; participants = 767) (Analysis 8.2). The C + P and SC groups did not differ significantly for any outcome at 12 months. The SC and standard care groups did not differ in OC use or condom use at any time point (Analysis 8.3; Analysis 8.4). Regarding attitudes, women in the C + P group were more likely than those in the SC group to recommend OC use to a friend at three months (OR 1.52, 95% CI 1.11 to 2.09; participants = 623) and at six months (OR 1.68, 95% CI 1.20 to 2.36; participants = 545) (Analysis 8.5). However, the SC group was less likely than the standard care group to recommend OC use to a friend at six months (OR 0.65, 95% CI 0.46 to 0.91; participants = 538) (Analysis 8.6). Pregnancy rates from medical records did not differ significantly across comparison groups (Analysis 8.7; Analysis 8.8).

Trent 2015 addressed adherence to DMPA injection appointments for urban women, 13 to 21 years old (N = 100). This pilot project was not powered for efficacy analysis. Both groups received standard care, i.e. clinic appointment reminders and a call from a nurse manager after missing a scheduled re-injection appointment. The intervention group received daily text reminders for appointments starting three days before a scheduled appointment for DMPA injection. The intervention also included monthly health messages about use of condoms, weight control, DMPA side effect management, and STI testing. Intervention participants were called for a missed appointment or for no reply to an appointment reminder or other text message. The intervention and control groups did not differ significantly in the proportions that completed any injection cycle of three months each (Analysis 9.1).

Counseling plus provider training

Two cluster randomized trials trained providers on the intervention, including contraception counseling. Zhu 2009 provided comprehensive contraceptive counseling for participants. Harper 2015 focused on promoting long-acting reversible contraception (LARC) such as intrauterine contraception (IUC) and the subdermal implant.

Zhu 2009 compared comprehensive counseling versus standard counseling for women aged 25 years or younger (16 sites; N = 2336). Participants had visited one of the study hospitals in China for an abortion. Providers had specific training for each intervention group. Both study arms had group counseling and referral to family planning services. The comprehensive package also included individual counseling, free provision of contraceptives, and involvement of male partner. The investigators used conditional logistic regression to account for hospital matching and robust variance estimates to account for clustering at the hospital level. Final models that were adjusted for potential confounding factors indicated significant effects. The investigators estimated relative effects using an interaction term to account for baseline differences. By six months, the comprehensive and standard counseling groups did not differ significantly for use of any contraceptive method or regular OC use (Analysis 10.1) or for "unwanted" pregnancy or abortion (Analysis 10.2). Women in the comprehensive counseling group were more likely to report using an effective contraceptive method at six months compared with those in the standard care group (reported adjusted OR 2.03, 95% CI 1.04 to 3.98) (Analysis 10.1). The comprehensive-counseling group was also more likely to use condoms consistently (reported adjusted OR 2.32, 95% CI 1.55 to 3.46), correctly (reported adjusted OR 2.78, 95% CI 1.81 to 4.26), as well as both consistently and correctly (reported adjusted OR 5.68, 95% CI 3.39 to 9.53) (Analysis 10.3).

For Harper 2015, providers at the intervention sites received training on LARC counseling and insertion of an IUD and implant. The other sites received no special training and provided usual care. Participants were women, 18 to 25 years old (40 sites; N = 1500). The primary outcome was LARC uptake at the clinic visit, but the report did not provide continuation data. For pregnancy rates, the investigators used Cox proportional hazards models with shared frailty to account for clustering. The study groups did not differ for pregnancy at one year based on unadjusted analysis (Analysis 11.1) as well as covariate-adjusted analysis (Analysis 11.2). However, women from abortion care sites were more likely to become pregnant than those from family planning sites (reported adjusted

OR 2.11, 95% CI 1.53 to 2.90) (Analysis 11.2). The investigators also reported a significant interaction effect between visit type and the intervention (Analysis 11.2). In further analysis, the investigators found that more women in the intervention group who chose LARCs could obtain the method in family planning visits (73%) than in abortion visits (44%).

ADDITIONAL SUMMARY OF FINDINGS *[Explanation]*

Enhanced counseling + provider training compared with standard care for improving contraceptive use

Patient or population: young women with need for contraception
Settings: clinic
Intervention: special counseling
Comparison: standard care

Outcomes	Relative effect (95% CI)[a]	Participants (study)	Quality of the evidence (GRADE)	Interventions and population
Use of effective contraceptive method at 6 months	Reported adjusted OR 2.03 (1.04 to 3.98)	2336 (16 sites) (Zhu 2009)	⊕⊕◯◯ **low**	Comprehensive service package vs standard package; to age 25 requesting abortion; cluster (site) RCT
Condom use at 6 months: consistent; correct; consistent and correct	Reported adjusted ORs: 2.32 (1.55 to 3.46); 2.78 (1.81 to 4.26); 5.68 (3.39 to 9.53)	2336 (16 sites) (Zhu 2009)	⊕⊕◯◯ **low**	Comprehensive service package vs standard package; to age 25 requesting abortion; cluster (site) RCT
Effective user of contraception at 1 year	OR 48.38 (5.96 to 392.63)	78 (Marcy 1983)	⊕◯◯◯ **very low**	Developmental counseling vs standard counseling; 13 to 18 years old

CI: confidence interval; **OR:** odds ratio; **RCT:** randomized controlled trial

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[a]Significant differences between study arms for primary outcomes in this review

Counseling + audiovisual tool compared with usual care for improving contraceptive use

Patient or population: young men or women with need for contraception
Settings: medical office or clinic
Intervention: counseling + audiovisual tool
Comparison: usual care

Outcomes	Reported relative effect (reported P value)	Participants (studies)	Quality of the evidence (GRADE)	Intervention
Effectiveness of method used at last intercourse (at 1 year) sexually active at follow-up; not sexually active at baseline	Adjusted OR 1.51 (P < 0.05); Adjusted OR 2.53 (P < 0.01)	1195 (Danielson 1990)	⊕◯◯◯ **very low**	Slide-tape presentation + reproductive health consult; young men 15 to 18 years old
Partner's use of OC at last intercourse (at 1 year) sexually active at follow-up; not sexually active at baseline	Adjusted OR 1.66 (P < 0.05); Adjusted OR 3.06 (P < 0.01)	1195 (Danielson 1990)	⊕◯◯◯ **very low**	Slide-tape presentation + reproductive health consult; young men 15 to 18 years old
No OC use (by 1 year) Chicago site	3.4% vs 8.8% (P = 0.05)	949 (Chewning 1999)	⊕◯◯◯ **very low**	Computer-aided decision-making + standard counseling; young women to age 20

CI: Confidence interval not reported; **OC:** oral contraceptive; **OR:** odds ratio

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

DISCUSSION

Summary of main results

Five studies showed some evidence of strategy effectiveness. In some cases, lack of effect may be attributable to small sample sizes. The 'Summary of findings' tables contain results for our primary outcomes for which the study arms differed significantly. We have presented them in order of evidence quality.

Special counseling plus phone follow-up was more effective than counseling alone on use of OCs and condoms among young women, 16 to 24 years old (Summary of findings for the main comparison). Two other types of special counseling also had effects on contraceptive use compared with standard care (Summary of findings 2). For women age 25 and younger, who were postabortion, a comprehensive package of contraceptive services resulted in more use of effective contraceptives and condoms. An intervention of developmental counseling led to more adolescents who used an effective contraceptive.

Utilizing an audiovisual tool plus counseling showed some associations with contraceptive use (Summary of findings 3). Interventions included an audiovisual presentation (slide-tape) plus reproductive health consultation for male adolescents, and a computer-assisted decision aid plus standard counseling for young women, age 20 years and younger.

Three studies had results for our secondary outcomes of knowledge or attitude. Danielson 1990 and Chewning 1999 reported the intervention group had better knowledge of OCs compared with the control group. Berenson 2012 showed that women with counseling plus phone follow-up were more willing to recommend OCs to a friend compared with women in the counseling-only group.

Overall completeness and applicability of evidence

We did not find any studies in low- or middle-income countries (LMIC) with high fertility rates for adolescents. As noted earlier, 95% of the 16 million births per year to adolescents 15 to 19 years old occur in LMIC (Chandra-Mouli 2014). In our review, 10 of the 11 included studies came from the USA, which had a 2014 birth rate of 24 per 1000 for 15- to 19-year old adolescents. The remaining study was from China, where the comparable birth rate has been less than 8 per 1000 for the past decade. China's 'one-child' policy, introduced in 1979, included mass education as well as mandatory IUD insertion, sterilization, and abortion (Wang 2012). Although the Chinese government modified the program in the mid-1990s (Wang 2012), and further relaxed it in 2013 (Connett 2015), the fertility rate remains low. In contrast, United Nations data show the birth rate for 15- to 19-year-old women in low-income countries was 98 in 2014, and virtually all the rates over 90 were in Africa (World Bank 2015). In LMIC combined, the fertility rate for young women 15 to 19 years old was 49. In many areas, young people may not have access to contraceptives due to cultural, economic, or logistical barriers. Studies to improve access may not have met our inclusion criteria, e.g. if they were not evaluating brief interventions or did not have a comparison group.

Most studies in our review recruited young women in family planning clinics. One focused on young men in medical offices and others on young women who were pregnant or postabortion. The types of interventions varied from novel counseling strategies to utilizing technology as an adjunct to counseling or to training providers on counseling and provision of more effective contraceptives.

Overall, we identified relatively few brief interventions for young people. Expansion of our search to include non-randomized studies produced two additional studies that were eligible. Lengthier or more intensive interventions are more likely to be effective but may not be feasible for many clinics. Some community-based interventions for young married people in LMIC were associated with improvements in contraceptive communication and uptake (Sarkar 2015). However, many of those programs were multifaceted and did not meet our inclusion criteria.

Quality of the evidence

Of 11 studies, one provided high-quality evidence, one was moderate quality, and one was high quality for the pregnancy outcome and moderate quality for contraceptive use (Table 3). The main reasons for downgrading the quality of the evidence were not having an objective outcome measure (7 studies), high loss to follow-up (5 studies), and limited reporting on intervention fidelity (4 studies). The four older studies that had evidence of very low quality were published before the development of standards for reporting trials in the late 1990s. The Consolidated Standards of Reporting Trials (CONSORT) statement was widely adopted in 2010 (Schulz 2010). Of five studies that showed some effect, four provided evidence of low or very low quality.

Sensitivity analysis

We planned to look separately at the studies with evidence of moderate or high quality. Only one study with evidence of intervention effect fit into that category (Berenson 2012). That large RCT provided six monthly phone calls after counseling to encourage contraceptive use.

Given the difficulty and expense of assessing contraceptive use objectively, having an objective outcome measure might be considered too restrictive. Removing that criterion would bring only one trial with an intervention effect into the moderate-quality range (Zhu 2009).

Potential biases in the review process

As mentioned earlier, we did not attempt to contact investigators for details about studies that were more than 10 years old. We may have lacked information for grading the evidence quality in some studies. However, investigators are not likely to have access to details of older studies.

Agreements and disagreements with other studies or reviews

Several systematic reviews have studied interventions for young people. The scope generally differed from ours, so we cannot make direct comparisons. In one review, clinic-based interventions for young people included new clinics, outreach, and provision of emergency contraception or condoms (Blank 2012). Many of the 23 studies did not test an educational strategy, and some were not comparative. Two studies overlapped with those included in our review; others we excluded. The researchers reported the field lacked good-quality studies of effectiveness and needed better outcome measures. A systematic review of interventions for adolescents addressed the broad area of sexual health (Guse 2012). Of 10 studies, some were school-based, which we considered for another review in development. Others were single-arm, focused on HIV/STI rather than contraception, or did not have a behavioral outcome. Another review examined interventions using motivational interviewing to improve contraceptive use among women of childbearing age (Wilson 2015). Three of eight reports (from two trials) overlapped with our review (Kirby 2010; Ceperich 2011). Their meta-analyses indicated an improvement in contraceptive use by four months but not by eight months. The researchers included data from two time points in the same trial. They did not see any intervention effect on pregnancies or births at 12 or 24 months.

A Cochrane review examined mobile phone interventions for improving contraceptive use (Smith 2015). We included only one of five RCTs in our review due to different age ranges, and the investigators used a different outcome measure (Trent 2015). The researchers did not find much evidence of effect in their review. A newer mobile phone intervention, based in Ghana, reported some effect (Rokicki 2015). Text messages addressed to young women, age 14 to 23, included unidirectional and interactive strategies. Both methods reduced the likelihood of pregnancy and increased knowledge compared with the control group, but weekly messages for 12 weeks may be too intensive for most clinics.

Other recent efforts are promising but have not yet reported on contraceptive continuation. A brief counseling intervention for adolescents showed higher long-acting reversible contraception (LARC) uptake at the initial visit, but has not yet reported on continuation at four months (Wilson 2014). A cluster RCT in this review focused on women 18 to 25 years old. Providers were trained in LARC counseling and insertion. The report showed LARC uptake was greater for the intervention group but did not provide continuation at one year (Harper 2015). Gilliam 2014 developed an iOS app for use in a clinic waiting room. The app addresses LARC as well as the range of contraceptive methods. A pilot RCT tested the app among women 15 to 30 years old. Use of the app increased knowledge of contraceptive effectiveness and interest in an implant. However, the study had no follow-up, so outcomes did not include actual contraceptive use. Garbers 2015 tested the feasibility of an Internet-based video on IUD use with a pre- and post-test design. Participants were women age 18 to 45 years. For the full sample and for those 18 to 25 years old, knowledge about IUD use increased significantly, as did intent to use an IUD in the next three months. The study did not have any follow-up to assess actual IUD use.

Chernick 2015b tested a referral system to family planning for adolescents who visit the emergency department. The strategy had a standard provider's script based on the transtheoretical model to encourage behavior change. The non-randomized study compared results for the intervention group to records of non-participants. The primary outcome was follow-up for family planning within two months. Feasibility of the intervention was limited, as it only reached about one-third of eligible adolescents. An ongoing study is using text messages to motivate and educate adolescents who visited the emergency department (Chernick 2015a).

AUTHORS' CONCLUSIONS

Implications for practice

We found relatively few studies that tested brief strategies for this age group. About half the studies had some effect on contraceptive use or pregnancy. Types of interventions varied widely. One trial showed that phone follow-up after counseling improved use of oral contraceptives and condoms. Other studies with some effect were generally older and had limited reporting. Their strategies included motivational interviewing for university women, comprehensive contraceptive services for young women postabortion, and developmental counseling on contraception for adolescents. One provided an audiovisual presentation plus counseling for young men, while another utilized a computer-assisted decision aid and counseling for young women. We did not find many studies with contraceptive services tailored for younger people, even though their developmental stage may warrant adapting counseling to be effective.

Implications for research

The need is still great for strategies to improve contraceptive use among young people that are feasible for clinics. We examined RCTs and non-randomized studies, but identified few brief strategies focused on this age group. Of five studies with some effect, one provided moderate quality evidence; four were older studies

with low quality evidence. Many interventions for youth were too intensive to meet the criteria for brevity. While more extensive programs may be effective, they are unlikely to reach many young people if most clinics cannot implement them. Other potential studies focused on knowledge and intent to use contraceptives, but did not assess the behavioral outcomes of contraceptive use or pregnancy. A few examined contraceptive uptake at the initial visit but did not report on continuation. The field needs well-designed and carefully implemented studies that test practical interventions to improve contraceptive use among young people.

ACKNOWLEDGEMENTS

We based the search strategies on earlier work of Carol Manion from FHI 360.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Berenson 2012

Methods	Design: RCT Location: Southeast Texas (USA) Time frame: July 2006 to January 2010 Sample size calculation (and outcome of focus): N = 190 in each group (570 total) for 90% power to detect OR of 2.0 for oral contraceptive (OC) continuation after 12 months
Participants	General with N: 1155 women; 16 to 24 years of age; from 5 public reproductive health clinics serving low-income women Inclusion criteria: sexually active; non-pregnant; 16 to 24 years old; requesting OC initiation Exclusion criteria: desire to become pregnant in next year; medical contraindication to OC; current or prior (> 1 month) OC use
Interventions	Study focus: increasing contraceptive adherence and dual-method use to prevent STI and pregnancy Theory or model: health belief model 1. Intervention: i) Special counseling (SC): standard care (below) plus 45 minutes of contraceptive counseling from study staff; ii) Special counseling + phone calls (C + P): SC (above) plus phone calls by contraceptive counselor (weekly until initiation, then monthly for 6 months) and access to 24-hour toll-free number 2. Comparison: standard care from nurse practitioner with written protocol for new OC users Duration: 6 months
Outcomes	Primary: OC adherence (consistent OC use); condom use at last sex (if inconsistent condom user); dual-method use (OC + condom; not used in this review); Secondary: pregnancy (self report and medical record review); satisfaction Follow-up: 3, 6, and 12 months
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated randomization scheme (PLAN procedure, SAS Institute)
Allocation concealment (selection bias)	High risk	When asked about concealment before assignment, investigator communicated that they did not conceal from researchers but

Berenson 2012 (*Continued*)

		did conceal from participant
Blinding of participants and personnel (performance bias) All outcomes	High risk	No blinding of participants due to nature of interventions
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Staff who made assessment phone calls blinded to intervention group
Incomplete outcome data (attrition bias) All outcomes	High risk	Loss to follow-up: by 12 months counseling 44%, counseling + phone 43%, and standard care 45%

Ceperich 2011

Methods	Design: RCT Location: Richmond VA (USA) Time frame: no date; recruiting via mailings and posted flyers on campus and in student health center Sample size calculation (and outcome of focus): no mention
Participants	General with N: 228 female students at urban university randomized Inclusion criteria: 18 to 24 years old; at risk for alcohol-exposed pregnancy, i.e. had sex with man in past 90 days, use contraception ineffectively (none, incorrect use of effective method or use of ineffective method), and drinking at risk levels (≥ 5 drinks per occasion in past 90 days or ≥ 8 drinks per week on average) Exclusion criteria: no mention
Interventions	Study focus: reducing alcohol-exposed pregnancy risk Theory or model: motivational interviewing 1. Intervention: motivational interviewing with 1 session of 60 to 75 minutes; retrospective recording of risk behavior; exercises such as decisional balance and development of goal statements and change plans; feedback using "elicit-provide-elicit strategy"; included assessment of whether contraceptive method use was effective or not, presentation of appropriate method use, and pregnancy risk with perfect or typical use of various contraceptives 2. Comparison: information pamphlet on women's health Duration: 1 session or pamphlet
Outcomes	Primary: ineffective contraceptive use • 2005 report, 1-month assessment: no use, incorrect use of effective method, use of ineffective method only • 2011 report, 4-month assessment: used method effectively for part of 3 months; used method effectively but no back-up when needed, e.g. antibiotic use and oral contraceptives Secondary: none relevant Follow-up: 1 and 4 months 2008: Investigator communicated that "ineffective methods" included those with high

Ceperich 2011 (*Continued*)

	pregnancy rates such as withdrawal, "natural family planning," and spermicide only	
Notes		

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	No information
Allocation concealment (selection bias)	Low risk	Closed envelope
Blinding of participants and personnel (performance bias) All outcomes	High risk	After assessment, counselor opened allocation envelope and provided counseling intervention or information-only condition Presume no blinding of participants; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	High risk	Questionnaires mailed to participants
Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: 10% overall; by group, intervention 13% (13/114), control 8% (8/114) Exclusions after randomization: none apparent

Chewning 1999

Methods	Design: non-randomized controlled study Location: Madison WI and Chicago IL (USA) Time frame: no information Sample size estimation and outcome of focus: no mention
Participants	General with N: 949 young women Inclusion criteria: read and understand English; interest in obtaining a contraceptive when scheduling clinic appointment; <= 20 years old Exclusion criteria: no mention
Interventions	Study focus: improve selection and use of contraception Theory or model: none apparent; mentions transtheoretical model as basis for some computer programs 1. Intervention: standard patient education plus Aid for Contraceptive Decision-making (ACD), menu-driven program addressing various contraceptive methods and their effectiveness, assessment of personal traits and situation, method benefits and costs, and advice and feedback

Chewning 1999 (*Continued*)

	2. Comparison: standard patient education Chicago clinic provided patient education in groups on Monday; other days and Madison site had one-on-one format
Outcomes	Primary: knowledge about OCs (scale); confidence in OC efficacy; OC use and continuation; self-reported pregnancy Secondary: no mention Follow-up: immediately after program; 1 year by phone No sample sizes by study arm for analysis
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Alternate assignment to intervention groups as much as possible within clinic schedules
Blinding of participants and personnel (performance bias) All outcomes	High risk	Presume no blinding of participants or providers; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: 17% overall; by site, Madison 10% (51/500) and Chicago 25% (114/449)

Danielson 1990

Methods	Design: before-after experimental; 2 groups Location: Portland OR and Vancouver WA (HMO service areas), USA Time frame: recruitment June 1985 to November 1986 Sample size estimation and outcome of focus: no mention
Participants	General with N: 522 sexually active young men (assessment of contraceptive use); 1195 young men in intervention (assessment of contraceptive knowledge) Inclusion criteria: age 15 to 18 years; had ambulatory care at participating medical office during recruitment period Exclusion criteria: no mention
Interventions	Study focus: counseling to improve reproductive health of men Theory or model: mentions developmental approach 1. Intervention: promote abstinence and contraception via reproductive health consultation during 1-hour medical appointment, consisting of audiovisual (slide-tape)

Danielson 1990 (*Continued*)

	presentation (anatomy, fertility, STI, contraception, and abstinence) and visit with healthcare practitioner (focused on contraception and guided by participant's interests; included consistency of contraceptive use, use of back-up methods, condom use) 2. Comparison: usual care until follow-up questionnaire completed, then intervention (above)
Outcomes	Primary: sexual activity; contraceptive use from "variety of items," e.g. methods used in past year, frequency of use, main method used in previous year, method used at last sex (last 2 were open-ended) Contraceptive effectiveness categorized as no method, method less effective than condom, condom alone, and method more effective than condom alone (primarily OCs) Secondary: knowledge of fertility (when pregnancy is most and least likely to occur in menstrual cycle) Follow-up: 1 year
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Alternate assignment
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants reportedly unaware of group assignment Presume no blinding of providers; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Personnel who administered questionnaires did not know group assignment
Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: reportedly 18%; reportedly 17% intervention and 19% control; usable questionnaires 81% (971/1195)

Gilliam 2004

Methods	Design: RCT Location: Hospital in Chicago, IL (USA) Time frame: 1998 to 1999 Sample size estimation and outcome of focus: not mentioned until discussion; sample size not sufficient to detect 20% difference between groups, due to resource limitations
Participants	General with N: 33 African-American low-income women randomized; attending resident-run clinic that serves women receiving public assistance Inclusion criteria: 25 years or younger; with unplanned pregnancy; intending to use OCs

Gilliam 2004 (*Continued*)

	postpartum Exclusion criteria: history of consistent or successful oral contraceptive (OC) use prior to pregnancy
Interventions	Study focus: increasing OC adherence Theory or model: principles of self efficacy Both groups had standard postpartum counseling from medical residents on OCs plus 3 labeled pill packets with instructions and phone numbers for 24-hour access for questions 1. Intervention: antepartum, multicomponent intervention consisting of counseling, videotape about OCs, and written material 2. Comparison: standard postpartum counseling
Outcomes	Primary: continuation rate; switch to other contraceptives; pregnancy rate for 9 women (delivery records or self report) Secondary: knowledge of OCs (follow-up data for 14 participants; within-group comparisons mentioned in text) Follow-up: 1 year
Notes	43 women enrolled but 33 randomized: changed mind about using OCs or delivered at outside hospital; study team failed to randomize participant prior to leaving hospital due to miscommunication with nursing staff or woman left after 24-hour rather than 48-hour stay

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers table; randomized following delivery
Allocation concealment (selection bias)	Low risk	Study packets in envelopes that "concealed the contents"
Blinding of participants and personnel (performance bias) All outcomes	High risk	Research team members reportedly blinded to group participation Presume no blinding of intervention providers; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	High risk	Loss to follow-up: 52% dropped out by 1 year; data on OC use for 76% (25/33) and on OC knowledge for 42% (14/33) Pregnancy data for 9 who dropped out from records or contacting participants; data loss 8/33 = 24%

Harper 2015

Methods	Design: cluster RCT Location: clinics in 15 US states Time frame: May 2011 to May 2013 Sample size estimation and outcome of focus: intervention leading from 4% to 10% uptake of LARC, 80% power and alpha = 0.05, at least 316 women per group; with 20% loss to follow-up, 395 women per group Cluster randomized trial: 40 clinics; 20 intervention and 20 control
Participants	General with N: 40 reproductive health clinics across the USA; 1500 women attending clinics Inclusion criteria: • Participants: 18 to 25 years old; fluent in English or Spanish; not want to become pregnant in the next 12 months; sexually active in last 3 months; at risk of pregnancy; not pregnant; received contraceptive counseling; and willing to be contacted by telephone over next 12 months • Staff: employed by participating Planned Parenthood clinic; offer clinical care, counseling, or education for abortion or contraception at clinic • Clinics: do not share staff; have no active LARC interventions; have > 400 clients per year Exclusion criteria: no mentioned
Interventions	Study focus: improve access to LARC and decrease pregnancy rates via training providers about LARC Theory or model: none apparent in design; discussion mentions Ajzen's theory of planned behavior 1. Intervention: clinicians and educators in clinics received half-day Continuing Medical Education LARC education and training session (on counseling and insertion of IUD and implant) 2. Comparison: standard practice, i.e. clinicians and educators did not receive special LARC training and education session
Outcomes	Primary: number of participants who choose LARC (IUD or implant) at end of visit Secondary: unintended pregnancy; satisfaction (not defined); knowledge of contraceptive effectiveness; provider knowledge and practices; LARC continuation; assessment of counseling experience; and autonomy in contraceptive decision-making. Follow-up: 12-month questionnaires, home urine pregnancy tests (also at 6 months), review of medical records; questionnaires also at 3, 6, 9 months on contraceptive choice and use, continuation, satisfaction, and pregnancies 8 December 2015: Wrote to investigator regarding publication of continuation data (reportedly gathered)
Notes	55 clinics assessed for participation; 45 randomized; 40 participated Analysis: Investigators used generalized estimating equations to account for clustering, with robust standard error. Models adjusted for age, ethnic origin, parity, method use within 3 months before enrollment, desired timing of next pregnancy, and visit type at clinic
Risk of bias	

Harper 2015 (*Continued*)

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated schedule, stratified by clinic size; done by independent statistician
Allocation concealment (selection bias)	Low risk	Cluster randomization; clinics unaware of allocation until study began
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Participants unaware of sites that received training. Masking of clinic personnel after allocation was not feasible because intervention sites received training
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Outcome assessor unaware of group assignment
Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: intervention 6% (51/802); control 9% (65/698) Pregnancy analysis excluded 138 women (9%) who withdrew or were lost to follow-up (63 intervention; 75 control)

Jay 1984

Methods	Design: RCT Location: Augusta, GA (USA); Children and Youth Project site Time frame: no mention Sample size estimation and outcome of focus: no mention
Participants	General with N: 57 adolescents randomized (participants were 14 to 19 years old) Inclusion criteria: attending adolescent gynecology clinic and were willing to use oral contraceptives (OCs) Exclusion criteria: no mention
Interventions	Study focus: increasing OC adherence Theory or model: none apparent 1. Intervention: peer counselors trained (with role playing) on conversational and interaction skills; observational skills; decision-making; formal counseling; confidentiality; problem-solving; birth control 2. Comparison: nurse counselors with same training as peer counselors Both groups had 3 appointments
Outcomes	Primary: OC non-adherence via Guttman scale 1. avoidance of pregnancy (apparently self report); 2. appointment adherence; 3. pill count;

Jay 1984 (*Continued*)

	4. urinary fluorescence for riboflavin (marker added to OCs). Secondary: attrition rate at 4 months (end of study), i.e. failed to keep second rescheduled appointment or discontinued OC regimen Follow-up: 4 months
Notes	31 (54%) participants assigned to nurse-counselor group; 26 (46%) assigned to peer-counselor group

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-generated random numbers table
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Presume no blinding of participants or providers; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Urine samples for fluorescence: 3 independent observers evaluated in double-blind fashion Presume no blinding of self-reported pregnancy and pill count for non-adherence scale
Incomplete outcome data (attrition bias) All outcomes	High risk	Loss to follow-up: 33% overall; nurse-counseled 42%; peer-counseled 23%

Kirby 2010

Methods	Design: RCT Location: San Francisco, CA (USA) Time frame: July 2005 to August 2007 Sample size calculation and outcome of focus: 80% power to detect 10-percentage-point difference between groups in the proportion of women who used hormonal contraception for 6 months or longer, needed 600 women; with expected follow-up 75%, planned to enroll 800
Participants	General with N: 805 young women, 14 to 18 years old Source: reproductive health clinic for adolescents and young adults Inclusion criteria: not pregnant or trying to become pregnant; had sex in the last 3 months; no consistent hormonal contraception for 3 months and no IUD or contraceptive implant Exclusion criteria: no information

Kirby 2010 (*Continued*)

Interventions	Study focus: improve contraceptive use; reduce unintended pregnancy and STI Theory or model: motivational interviewing; Health Belief Model 1. Intervention: intense phone follow-up after initial visit; 9 calls planned (1 per month for 6 months then every 2 months for 6 months); addressed effective use of contraceptives and superiority of hormonal methods over condoms for preventing pregnancy 2. Comparison: usual care (no phone follow-up) Duration: 12 months
Outcomes	Primary: hormonal contraceptive use at last sex, condom use at last sex, self-reported pregnancy; completed online at youth center or phone survey Secondary: no information Additional data from investigator (2010): pregnancy rates by group (self report and clinic charts); effect sizes and P values for outcomes without detail in report Follow-up: 6, 12, 18 months after baseline
Notes	Analysis: multiple linear and logistic regression repeated measures; adjusted for differences between groups

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Random number generator; participants stratified by age
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Research team blind to group composition until after analysis of primary hypothesis Presume no blinding of participants or providers; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Outcome assessor unaware of group assignment, except for final follow-up, which included questions about intervention
Incomplete outcome data (attrition bias) All outcomes	High risk	Loss to follow-up: 6 months 22%, 12 months 26%, 18 months 25%; reportedly did not differ by group No N per group for assessments

Marcy 1983

Methods	Design: RCT Location: Portland, OR (USA) Time frame: fall 1980 Sample size estimation and outcome of focus: no mention
Participants	General with N: 80 adolescents with negative pregnancy test or routine medical visit accepted counseling Source: large prepaid health plan, 5 clinics Inclusion criteria: 13 to 18 years old; unmarried; sexually active; not desiring pregnancy; and not using contraceptives regularly Exclusion criteria: no mention
Interventions	Study focus: improving contraceptive use Theory or model: principles of developmental theory from Schinke 1. Intervention: developmental counseling included steps from conventional (below) but based on developmental theory (Schinke, Piaget, Chilman, and Cvetkovich); stressed adolescent's maturity, responsibility, and ability to make decisions about contraceptive use; included personalized discussion and dealing with social and psychological concerns regarding contraception. 2. Comparison: conventional counseling with assessment of contraceptive risk, discussion of birth control methods, prescription of specific contraceptive, and instructions for use Clinic staff requested check-ups in 3 months and then as needed
Outcomes	Primary: accept contraceptive counseling (keep counseling appointment); effective user at 1 year *Effective user*: medical chart showed refilled contraceptive prescriptions regularly during year; kept IUD in place; at clinic appointment, stated using foam and condom together or diaphragm and spermicidal jelly together; or abstained from intercourse *Ineffective user*: did not refill prescription; sexually active and not using birth control or using "unapproved" method (foam alone, condom alone, rhythm, withdrawal) Secondary: no mention Follow-up: 1 year
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Randomly assigned" those who accepted counseling (developmental group N = 44; conventional group N = 36)
Allocation concealment (selection bias)	Unclear risk	No information
Blinding of participants and personnel (performance bias) All outcomes	Unclear risk	Presume no blinding of providers; not feasible due to type of intervention Participants could have been unaware of

Marcy 1983 (*Continued*)

		intervention group assignment
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	No information
Incomplete outcome data (attrition bias) All outcomes	Low risk	Loss to follow-up: 2.5% by 1 year (2 from conventional group)

Trent 2015

Methods	Design: pilot RCT Location: Baltimore, MD (USA) Time frame: October 2011 to February 2012 Sample size estimation and outcome of focus: 100 minimum recruitment as practical milestone for feasibility and acceptability (pilot study); focus on injection appointment adherence
Participants	General with N: 100 urban adolescent girls Source: urban academic general pediatric and adolescent medicine practice Inclusion criteria: age 13 to 21 years; willing to be randomized; currently using DMPA; have cellular phone with text messaging capability for personal use Exclusion criteria: no cell phone with text messaging capability for personal use; cognitive impairment prevented use of cell phone texting
Interventions	Study focus: improve appointment adherence for contraceptive injections Theory or model: Geser's sociological framework for understanding innovative potential of cell phone technology 1. Intervention: standard care plus daily text appointment reminders starting 72 hours before clinical visit; monthly healthy self-management messages (condom use, weight control, side effect management, STI testing reminder); call for missed appointment or no reply to appointment reminder (or other text message) 2. Comparison: standard counseling and clinic appointment reminders to home phone; call from nurse case manager after missing re-injection appointment
Outcomes	Primary: appointment adherence (3 contraceptive injection appointments) Follow-up: 9 months
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Investigator communication: computer-generated randomization sequence

Trent 2015 (*Continued*)

Allocation concealment (selection bias)	Low risk	Investigator communicated randomization concealed prior to assignment. Research staff opened packet with randomization status and pertinent information for next steps
Blinding of participants and personnel (performance bias) All outcomes	High risk	Investigator communication: principal investigator blinded to enrollment status Presume no blinding of participant or provider; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Appointment adherence (for injections) via electronic tracking database
Incomplete outcome data (attrition bias) All outcomes	High risk	Loss to follow-up: 31% did not complete cycle 3; intervention 34% (33/50); control 28% (36/50)

Zhu 2009

Methods	Design: cluster RCT Location: Beijing, Shanghai, and Zhengzhou (China); 8 abortion clinics (hospitals) per city Time frame: May to November 2006 Sample size estimation and outcome of focus: based on simulations for varying rates of contraceptive use (0%, 5%, or 10%), needed ≥ 60 women; 80% power when effect size > 10% in contraceptive use. For 25% loss to follow-up, needed 1800 participants; 900 each arm Cluster randomized trial: 24 hospitals (8 per city) matched in pairs (characteristics of clinics, mainly abortion in 2005; "no substantial difference" in characteristics of women) ; randomly assigned to 1 of 2 intervention packages 8 pairs of hospitals in analysis: 2 Beijing; 4 Shanghai; 2 Zhengzhou 5 hospitals did not follow randomization protocol; 4 pairs of hospitals ineligible for analysis
Participants	General with N: 16 hospitals; 2336 women who requested abortion in 2-month period Inclusion criteria: < 25 years old; first trimester of pregnancy; seeking abortion Exclusion criteria: no information
Interventions	Study focus: improve contraceptive use and reduce repeat abortion rate Theory or model: none apparent; interventions adapted for cultural and socioeconomic appropriateness Provider training for both groups; service guidelines and training module 1. Intervention (special or comprehensive): provider training 2 days; group education for women; individual counseling including information on contraceptive methods and recommendation of most suitable methods; free provision of

	contraceptives (condoms, OCs, IUD, implant); involvement of male partner; and referral to existing family planning services. 2. Comparison (standard or essential): provider training 1 day; group education for women; and referral to existing family planning services.
Outcomes	Primary (questionnaire): contraceptive use; use of more effective contraceptive methods (condoms, OCs, IUDs and implants); regular intake of OCs among OC users; consistent and correct use of condoms among condom users; pregnancy; repeat induced abortion during follow-up plus unwanted pregnancies (counted once) Secondary: knowledge of contraception (13 items); postabortion family planning services received; patient satisfaction with clinic services Follow-up: 6 months (mostly by phone)
Notes	Data collected before randomization of hospitals and after intervention implementation Analysis: Investigators used conditional logistic regression to account for hospital matching and robust variance estimates to account for baseline differences. Final models adjusted for potential confounding factors showed significant effects. Investigators estimated relative effects using an interaction term to account for baseline differences

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Randomization via coin tossing by "neutral person" not involved in study at 1 research center 5 hospitals did not follow randomization protocol, therefore 4 pairs of hospitals ineligible for analysis 8 pairs of hospitals in analysis: Beijing 2; Shanghai 4; Zhengzhou 2
Allocation concealment (selection bias)	Unclear risk	Cluster randomization with matching of hospitals as above; no further information
Blinding of participants and personnel (performance bias) All outcomes	High risk	Presume no blinding of participant or provider; not feasible due to type of intervention
Blinding of outcome assessment (detection bias) All outcomes	High risk	Interviewers not blinded to intervention group
Incomplete outcome data (attrition bias) All outcomes	High risk	Loss to follow-up: special intervention 44% (473/1065); comparison 40% (372/927)

DMPA: depot medroxyprogesterone acetate

IUD: intrauterine device
LARC: long-acting reversible contraception
OC: oral contraceptive
OR: odds ratio
RCT: randomized controlled trial
STI: sexually transmitted infection

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Aubrey 2014	No relevant outcome
Bertrand 1986	Training peer counselors may preclude implementation in most clinics, i.e. training prior to project start and during project locally and elsewhere (overseas in this case)
Castaño 2012	Intervention involved 180 text messages over 6 months; intensive not brief strategy
Charron-Prochownik 2008	Focused on effects of diabetes on reproductive health and preventing pregnancy-related complications; no mention of contraception in intervention though assessed use as outcome Program was preconception counseling for teens with diabetes Investigator communicated they did not present each contraceptive method in detail; not general sex education
Charron-Prochownik 2013	Focused on effects of diabetes on reproductive health and preventing pregnancy-related complications; no mention of contraception in intervention though assessed use as outcome Program was preconception counseling for teens with diabetes Investigator communicated they did not present each contraceptive method in detail; not general sex education
Ekstrand 2008	Focused on advanced provision of emergency contraception (EC). All participants requested and received EC and were scheduled for counseling and pregnancy test 3 weeks later. Intervention group received 1 extra dose of EC, 10 condoms, and a leaflet on EC and condom use
Erickson 1994	Full text indicated intensive case management program (not brief strategy). Investigators abandoned case-control design due to high attrition (intervention 57%; control 85%)
Fischl 2010	Same intervention as that in Charron-Prochownik 2013 with the addition of "booster" counseling session with nurse No information on whether the intervention specifically addressed contraceptive methods
Gold 2004	Intervention was advance supply of emergency contraception provided to 1 group. Both groups received the same information about emergency contraception and where to access it
Hanna 1993	Primary outcome of contraceptive adherence combined pill-taking (frequency of omitting an OC and adjusting OC-taking schedule) as well as appointment-keeping
Kershaw 2009	Behavioral intervention did not address contraception

(*Continued*)

Norton 2012	No outcome data for pregnancy prevention intervention alone. Investigators used generalized estimated equations to compare condom use in (1) 3 intervention groups combined (prevention of pregnancy, STIs, or HIV) vs control group (usual services); and in (2) pregnancy and STI groups (combined) vs HIV group
Núñez Rocha 2005	Educational intervention too intensive for many clinics (4 sessions of 1.5 hours each, over 4 days)
Roye 2007	Study focus: brief intervention to prevent HIV via condom use (in addition to current use of hormonal contraceptives)
Stanton 1996	Community-based intervention; 8-week program
Stephenson 2008	Training of peer educators too intensive for many clinics: 3 pre-training meetings, 2 days of training, and 1 follow-up meeting
Topatan 2015	Does not meet criteria for brief intervention for clinics: postpartum education while still in hospital; 4 hours over 2 days Experimental had family planning along with 4 other topics; content not specified
Ullman 1996	Both study groups had same educational intervention regarding dual protection; difference was condom distribution. Data on use of OC use not provided
Van Dover 1985	Does not meet criterion for 3-month follow-up: post-test may have been administered at 6 to 8 weeks, based on 2 weeks between contacts (3 or 4) Within-group comparisons presented for consistent contraception (no definition); denominator may have been 'completers' rather than those randomized Differential drop-outs across groups

HIV: human immunodeficiency virus
OC: oral contraceptive

Characteristics of studies awaiting assessment *[ordered by study ID]*

Wilson 2014

Methods	Design: RCT Location: Philadelphia, PA (USA) Time frame: March to September 2013 Sample size estimation and outcome of focus: no information
Participants	General with N: 110 women Inclusion criteria: women 13 to 21 years old desiring contraception; not taking contraception or not satisfied with current method; and not desiring pregnancy in next 12 months Exclusion criteria: pregnant or desiring pregnancy in next 12 months

Wilson 2014 (*Continued*)

Interventions	1. Intervention: routine care plus brief peer counseling where mentor describes positive experience with LARC and participant asks questions related to mentor's experience; duration < 10 minutes 2. Comparison: routine care
Outcomes	Primary: chose LARC after contraceptive counseling (IUD or implant inserted after counseling) Secondary: maintained LARC uptake; positive opinion of LARC as primary choice of birth control Follow-up: 4 months
Notes	Information from conference abstract and ClinicalTrials.gov listing Abstract has results from initial visit only; 4-month assessment planned 16 July 2015: Wrote to investigator (C Schreiber) regarding when 4-month results might be available

LARC: long-acting reversible contraception
RCT: randomized controlled trial

Characteristics of ongoing studies *[ordered by study ID]*

Chernick 2015a

Trial name or title	A Pilot Study Using Messaging to Communicate With Adolescent Females in the Pediatric Emergency Department (T2I)
Methods	RCT; single blind (participant) Location: Children's Hospital Emergency Department, Manhattan, NY (USA) Time frame: January 2014 to November 2015 Sample size estimation and outcome of focus: no information
Participants	General with N: 100 females; 14 to 19 years old Inclusion criteria: sexually active with males in past 3 months; presenting to emergency department for reproductive health complaint Exclusion criteria: currently pregnant; too ill for participation per attending physician; cognitively impaired; in foster care or ward of state; does not speak English or Spanish; does not own cellular or mobile phone with text messaging; used contraception at last intercourse or is using "highly effective" or "effective" contraception as defined by WHO; does not live in Manhattan or Bronx
Interventions	1. Intervention: educational and motivational text messages 2. Control: standard referral arm with paper-based information about family planning clinic
Outcomes	Primary: initiation of highly effective contraception as defined by WHO (electronic medical record review and phone follow-up) Secondary: visits to family planning clinic (electronic medical records); follow-up for contraceptive counseling to doctor or nurse (self report and electronic medical records); change in pregnancy intentions (phone follow-up) Follow-up: 3 months after enrollment

Chernick 2015a (*Continued*)

Starting date	January 2014 Primary completion November 2014; estimated study completion December 2015
Contact information	Lauren S. Chernick, MD; Columbia University
Notes	

Downs 2015

Trial name or title	Teen Video Study to Reduce Risky Driving and Sexual Behavior in Adolescents (TVS)
Methods	RCT; double blind (caregiver, investigator, outcome assessor) Location: Children's Hospital, Columbus, OH; Children's Hospital, Pittsburgh, PA; West Virginia University, Morgantown, WV (USA) Time frame: June 2012 to August 2016 Sample size estimation and outcome of focus: no information
Participants	General with N: 3000 females; age 14 to 19 years Inclusion criteria: patient at participating healthcare facility; unmarried and not pregnant at enrollment; available for contact over 15 months Exclusion criteria: apparent or stated inability to comprehend consent or assent form; inability to provide at least 2 methods of contact; married or pregnant at enrollment
Interventions	1. Intervention: interactive video about sexual behavior with unlimited access for 6 months (sexual decision-making, responses to situations, rehearsal of preventive behaviors, and information about hormonal and non-hormonal contraception 2. Comparison: interactive video about safe driving techniques with unlimited access for 6 months
Outcomes	Primary: pregnancy; STI incidence; automobile collisions and injuries Secondary: self-reported sexual behaviors (number of partners, type of sexual behavior, proportion of condom use, use of other contraceptives) Follow-up: 3 months for sexual behavior; 6 months for all outcomes
Starting date	June 2012 Estimated study completion August 2016
Contact information	Julie S. Downs, PhD; Carnegie Mellon University
Notes	

Stein 2015

Trial name or title	Contraceptive Awareness and Reproductive Education
Methods	RCT; double blind (participant and outcome assessor) Location: Juvenile Probation, Cranston, RI (USA) Time frame: August 2012 to September 2015 Sample size estimation and outcome of focus: no information
Participants	General with N: 250 females; age 13 to 18 years old Inclusion criteria: currently sexually active with males defined as having coital sex and intending to have coital sex within the next 6 months; willing to comply with protocol, follow-up assessments, and provide at least 1 locator; fluent in English Exclusion criteria: inability to give consent secondary to organic brain dysfunction, or active psychosis or otherwise not able to participate in the intervention or assessments; not sexually active; currently pregnant
Interventions	1. Intervention: motivational interventions (MI) with three 45- to 60-minute sessions of tailored MI that occur at enrollment, 1 week after, and 3-month follow-up 2. Comparison: educational counseling, i.e. 30- to 45-minute sessions of didactic information related to contraception and STI prevention (at enrollment, 1 week, and 3 months)
Outcomes	Primary: Timeline Followback (TLFB): contraceptive, sexual, and drug-related behaviors measured via calendar recall behavioral assessment for both interventions; initiation and continuous use of highly effective contraceptives Secondary: Incident STI Follow-up: 3, 6, 9 months
Starting date	August 2012 Primary completion September 2015; estimated study completion June 2016
Contact information	Lynda Stein, PhD; University of Rhode Island
Notes	

RCT: randomized controlled trial
STI: sexually transmitted infection
WHO: World Health Organization

DATA AND ANALYSES

Comparison 1. Developmental versus conventional counseling

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Effective user of contraception at 1 year	1	78	Odds Ratio (M-H, Fixed, 95% CI)	48.38 [5.96, 392.63]

Comparison 2. Peer counseling versus nurse counseling

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 OC non-adherence (Guttman score) at 4 months	1	38	Mean Difference (IV, Fixed, 95% CI)	-0.21 [-0.88, 0.46]

Comparison 3. Motivational interviewing versus pamphlet on health

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Ineffective contraceptive use at 4 months	1	205	Odds Ratio (M-H, Fixed, 95% CI)	0.57 [0.32, 1.01]

Comparison 4. Audiovisual + consultation versus usual care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Contraceptive use at 1 year			Other data	No numeric data
2 Contraception knowledge at 1 year			Other data	No numeric data

Comparison 5. Multicomponent intervention versus routine counseling

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Continuation of oral contraceptives at 1 year	1	25	Odds Ratio (M-H, Fixed, 95% CI)	0.67 [0.11, 3.99]
2 Switched contraceptives by 1 year	1	25	Odds Ratio (M-H, Fixed, 95% CI)	2.0 [0.37, 10.92]

Comparison 6. Computer-aided decision-making versus usual counseling

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Continuous outcomes at 1 year			Other data	No numeric data
2 Dichotomous outcomes at 1 year			Other data	No numeric data

Comparison 7. Motivational phone calls versus usual care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Hormonal contraceptive use at last sex			Other data	No numeric data
2 Condom use at last sex			Other data	No numeric data
3 Use of hormonal contraceptive or condom at last sex			Other data	No numeric data
4 Pregnancy by 18 months			Other data	No numeric data

Comparison 8. Counseling + phone calls versus counseling versus standard care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Consistent OC use: counseling + phone versus counseling	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 At 3 months	1	767	Odds Ratio (M-H, Fixed, 95% CI)	1.41 [1.06, 1.87]
1.2 At 6 months	1	767	Odds Ratio (M-H, Fixed, 95% CI)	1.39 [1.03, 1.87]
1.3 At 12 months	1	767	Odds Ratio (M-H, Fixed, 95% CI)	1.12 [0.78, 1.61]
2 Condom use at last sex: counseling + phone versus counseling	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
2.1 At 3 months	1	767	Odds Ratio (M-H, Fixed, 95% CI)	1.45 [1.03, 2.03]

2.2 At 6 months	1	767	Odds Ratio (M-H, Fixed, 95% CI)	1.30 [0.86, 1.98]
2.3 At 12 months	1	767	Odds Ratio (M-H, Fixed, 95% CI)	0.93 [0.55, 1.57]
3 Consistent OC use: counseling versus standard care	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
3.1 At 3 months	1	771	Odds Ratio (M-H, Fixed, 95% CI)	0.81 [0.61, 1.07]
3.2 At 6 months	1	771	Odds Ratio (M-H, Fixed, 95% CI)	0.78 [0.58, 1.05]
3.3 At 12 months	1	771	Odds Ratio (M-H, Fixed, 95% CI)	0.89 [0.62, 1.27]
4 Condom use at last sex: counseling versus standard care	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
4.1 At 3 months	1	771	Odds Ratio (M-H, Fixed, 95% CI)	0.91 [0.64, 1.29]
4.2 At 6 months	1	771	Odds Ratio (M-H, Fixed, 95% CI)	0.90 [0.59, 1.38]
4.3 At 12 months	1	771	Odds Ratio (M-H, Fixed, 95% CI)	1.01 [0.60, 1.70]
5 Would recommend OC use to a friend: counseling + phone versus counseling	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
5.1 At 3 months	1	623	Odds Ratio (M-H, Fixed, 95% CI)	1.52 [1.11, 2.09]
5.2 At 6 months	1	545	Odds Ratio (M-H, Fixed, 95% CI)	1.68 [1.20, 2.36]
5.3 At 12 months	1	432	Odds Ratio (M-H, Fixed, 95% CI)	1.13 [0.75, 1.68]
6 Would recommend OC use to a friend: counseling versus standard care	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
6.1 At 3 months	1	625	Odds Ratio (M-H, Fixed, 95% CI)	0.78 [0.57, 1.07]
6.2 At 6 months	1	538	Odds Ratio (M-H, Fixed, 95% CI)	0.65 [0.46, 0.91]
6.3 At 12 months	1	427	Odds Ratio (M-H, Fixed, 95% CI)	0.82 [0.55, 1.23]
7 Pregnancy by 12 months (counseling + phone vs counseling)	1	767	Odds Ratio (M-H, Fixed, 95% CI)	0.80 [0.53, 1.18]
8 Pregnancy by 12 months (counseling vs standard care)	1	771	Odds Ratio (M-H, Fixed, 95% CI)	1.39 [0.93, 2.09]

Comparison 9. Text messages for injection appointments versus routine care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Completed cycles	1		Odds Ratio (M-H, Fixed, 95% CI)	Subtotals only
1.1 Cycle 1	1	100	Odds Ratio (M-H, Fixed, 95% CI)	1.19 [0.37, 3.84]
1.2 Cycle 2	1	100	Odds Ratio (M-H, Fixed, 95% CI)	0.89 [0.35, 2.27]
1.3 Cycle 3	1	100	Odds Ratio (M-H, Fixed, 95% CI)	0.75 [0.32, 1.77]

Comparison 10. Comprehensive versus standard counseling

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Contraceptive use at 6 months			Other data	No numeric data
2 Pregnancy or abortion by 6 months			Other data	No numeric data
3 Condom use at 6 months			Other data	No numeric data

Comparison 11. LARC training versus no LARC training for providers

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Pregnancy (per 100 person-years) by 12 months			Other data	No numeric data
2 Pregnancy by visit type by 12 months			Other data	No numeric data

ADDITIONAL TABLES

Table 1. Intervention fidelity

Study	Curriculum or manual	Provider credentials	Training for intervention	Assessed adherence to protocol	Assessed intervention receipt	Fidelity criteria met
Marcy 1983	Protocol for conventional and developmental counseling	Nurse practitioners	Training in developmental counseling	_	_ *[Contraception knowledge as independent variable]*	3
Jay 1984	For provider training, not for counseling sessions	From youth project: peers (age 17 to 18) based on skills and maturity; nurses working in program (age 26 to 29)	Training (with role play) on conversation and interaction, observation, decision-making, counseling, confidentiality, problem solving, birth control	_	_	3

Table 1. Intervention fidelity (*Continued*)

Ceperich 2011	Semi-structured counseling manual with activities and materials	Counselors (master's degree in psychology or social work); supervisors experienced in MI training and supervision	Training in motivational interviewing (MI) and counseling manual; reviewed, practiced MI twice per month	Sessions audiotaped, used in supervision sessions; adjustments made if drifting noted	Involved participant in summarizing, self assessment, readiness for change	5
Danielson 1990	Slide-tape presentation; consult format and content specified	Investigators adapted slide-tape; consult with nurse practitioner, physician assistant, or RN	Practitioners trained to provide consultation	-	-	3
Gilliam 2004	Developed counseling program, video, pamphlet	Resident physicians; nurses for additional counseling	Training session for resident physicians and nurses	-	Outcome: OC knowledge	3
Chewning 1999	Computer program for contraceptive decision-making	Developed program: national panel of experts on contraception + local advisory group	Not applicable for computer program; standard care as per clinic procedures	-	Outcome: OC knowledge	4
Kirby 2010	Motivational interviewing (MI) guide and training materials	Clinic staff with training on family planning methods, adolescent risk behavior, and counseling	Call content plus 3 sessions on MI; observed ≥ 4 calls before making solo calls	-	Interview methods engaged participant in decision-making	4
Berenson 2012	"Standardization of counseling techniques" (lower-literacy handouts, key points, review instructions)	*Not specific:* Research assistants	Investigator trained research assistant in contraceptive counseling	Audio record some sessions for each research assistant; review for key points	Develop cue for pill-taking, discuss risks and benefits of pill use, develop plan for side effects, practice condom application	4
Trent 2015	Standard reminder	Automated system and case	Standard health messages	Messaging system tracked	-	4

Table 1. Intervention fidelity (*Continued*)

	and health messages and procedures	nurse managers		communications		
Zhu 2009	Intervention package: training, service guidelines, information for counseling and referral	Clinicians (providers)	Standard training schedule and module (comprehensive 2 days; essential 1 day)	*Not specific:* Intervention supervised and monitored by research team in each city	Knowledge of contraception and family planning services received	4
Harper 2015	For provider training, LARC insertion and counseling principles; educational video for waiting area	Clinicians and educators	1/2 day on LARC methods and counseling	-	Experience of counseling (method effectiveness and autonomy in contraception decision-making)	4

LARC: long-acting reversible contraception
MI: motivational interviewing
OC: oral contraceptive
RN: registered nurse

Table 2. Educational strategies and effects

Study	N	Participants	Recruitment source	Educational strategies	Intervention effects
Marcy 1983	80	Age 13 to 18	5 clinics	Counseling: developmental counseling to improve contraceptive use vs standard counseling	Effective use of contraception
Jay 1984	57	Age 14 to 19	1 adolescent gynecology clinic	Counseling: peer vs nurse counseling to improve OC use	-
Ceperich 2011	228	Age 18 to 24; college students	1 university	Counseling: motivational interviewing to increase effective contraceptive use vs pamphlet	-
Danielson 1990	1200	Age 15 to 18; males	2 health service areas	Counseling + AV: slide-tape presentation and repro-	Effective contraceptive use; partner's OC use

Table 2. Educational strategies and effects (*Continued*)

				ductive health consultation focused on contraception vs standard care	
Gilliam 2004	33	Age <= 25; pregnant	1 hospital clinic	Counseling + AV: counseling, videotape, and written material to improve OC use vs standard counseling	-
Chewning 1999	949	Age <= 20	2 family planning clinics	Counseling + AV: computer-assisted decision making for contraception + counseling vs standard education	OC use
Kirby 2010	805	Age 14 to 18	1 reproductive health clinic	Counseling + phone follow-up: intense follow-up to improve contraceptive use	-
Berenson 2012	1155	Age 16 to 24	5 reproductive health clinics	Counseling + phone follow-up: special counseling with intensive follow-up to improve use of OCs and condoms vs special counseling vs standard care	OC use; condom use
Trent 2015	100	Age 13 to 21	1 clinic	Counseling + phone follow-up: mobile phone reminders for DMPA injection appointments and self-management messages vs usual care	-
Zhu 2009	2336	Age <= 25; postabortion	8 hospital clinics in 3 cities	Counseling + provider training: comprehensive contraceptive services (counseling, free provision of method, and involvement of male partner) vs essential package	Use of effective contraceptive; correct and consistent condom use
Harper 2015	1500	Age 18 to 25	40 family planning clinics	Counseling + provider training: training for providers on LARC counseling and insertion	-

Table 2. Educational strategies and effects (*Continued*)

				of IUD and implant vs standard practice (no special training)	

AV: audiovisual method
DMPA: depot medroxyprogesterone acetate
IUD: intrauterine device
LARC: long-acting reversible contraception
OC: oral contraceptive

Table 3. Summary of evidence quality

Study	Intervention fidelity	Randomization and allocation concealment; NRS	NRS: NOS selection	NRS: NOS comparability	Objective outcome assessment	Follow-up period	Loss > 20%	Evidence quality[a]
Berenson 2012	_	_	NA	NA	_ (P)[b] -1 (C)	_	_	High (P) Moderate (C)
Harper 2015	_	_	NA	NA	_	_	_	High
Trent 2015	_	_	NA	NA	_	_	-1	Moderate
Kirby 2010	_	_	NA	NA	-1	_	-1	Low
Ceperich 2011	_	_	NA	NA	-1	-1	_	Low
Zhu 2009	_	_	NA	NA	-1	_ (C) -1 (P)	-1	Low (C) Very low (P)
Marcy 1983	-1	-1	NA	NA	-1	_	_	Very low
Jay 1984	-1	_	NA	NA	_	-1	-1	Very low
Danielson 1990	-1	-1	_	_	-1	_	_	Very low
Chewning 1999	_	-1	_	-1	-1	_	_	Very low
Gilliam 2004	-1	_	NA	NA	-1	_	-1	Very low

C: contraceptive use outcome
NA: not applicable
NOS: Newcastle-Ottawa Quality Assessment Scale
NRS: non-randomized study
P: pregnancy outcome
[a] Downgrading: (1) intervention fidelity information < 4 criteria; (2) NRS: no NOS selection criterion met; (3a) risk of bias high for randomization sequence generation or allocation concealment or provided no information on either, or study was non-randomized; (3b) NRS: no stars for comparability, i.e. control for confounding; (4) no objective outcome measure; (5) follow-up < 6 months for contraceptive use or < 12 months for pregnancy; (6) loss to follow-up > 20%
[b] · indicates not downgraded for that outcome

CONTRIBUTIONS OF AUTHORS

L Lopez initiated the review and developed the search strategies. L Lopez and T Grey reviewed the search results and full text of relevant articles. They extracted, entered, and checked the data. M Chen contributed to the analysis sections of the Methods. He reviewed the assessment of evidence quality and helped with the statistical interpretation of results. EE Tolley contributed to the Background and the Criteria for considering studies. All authors reviewed and commented on the manuscript.

DECLARATIONS OF INTEREST

Laureen Lopez has no known conflict of interest.

Thomas Grey has no known conflict of interest.

Elizabeth Tolley has no known conflict of interest.

Mario Chen has no known conflict of interest.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- National Institute of Child Health and Human Development, USA.

Support for conducting the review at FHI 360

INDEX TERMS

Medical Subject Headings (MeSH)

Condoms; Contraception [*methods]; Contraceptive Agents [*administration & dosage]; Randomized Controlled Trials as Topic; Sex Education [*methods]

MeSH check words

Adolescent; Female; Humans; Male; Young Adult