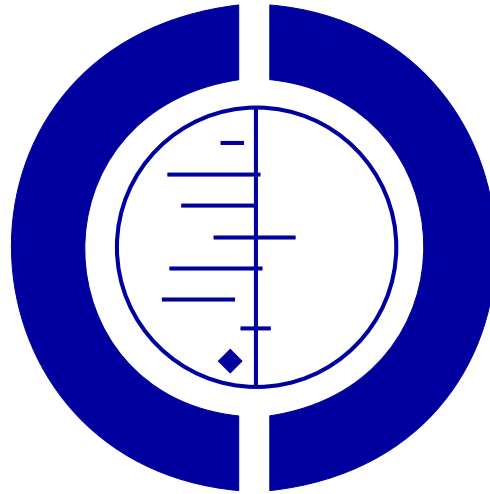


Advance provision of emergency contraception for pregnancy prevention (full review) (Review)

Polis CB, Schaffer K, Blanchard K, Glasier A, Harper CC, Grimes DA



**THE COCHRANE
COLLABORATION®**

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2007, Issue 2

<http://www.thecochranelibrary.com>



TABLE OF CONTENTS

ABSTRACT	1
PLAIN LANGUAGE SUMMARY	2
BACKGROUND	2
OBJECTIVES	3
CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW	3
SEARCH METHODS FOR IDENTIFICATION OF STUDIES	3
METHODS OF THE REVIEW	3
DESCRIPTION OF STUDIES	4
METHODOLOGICAL QUALITY	5
RESULTS	5
DISCUSSION	7
AUTHORS' CONCLUSIONS	7
POTENTIAL CONFLICT OF INTEREST	8
ACKNOWLEDGEMENTS	8
SOURCES OF SUPPORT	8
REFERENCES	8
TABLES	11
Characteristics of included studies	11
Characteristics of excluded studies	14
ANALYSES	14
Comparison 01. Advance provision vs. standard provision of emergency contraception	14
COVER SHEET	15
GRAPHS AND OTHER TABLES	16
Analysis 01.01. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 01 Pregnancy (at twelve month follow-up)	16
Analysis 01.02. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 02 Pregnancy (at six month follow-up)	17
Analysis 01.03. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 03 Pregnancy (at three month follow-up)	17
Analysis 01.04. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 04 Pregnancy for levonorgestrel regimens only	18
Analysis 01.05. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 05 Pregnancy for Yuzpe regimens only	18
Analysis 01.06. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 06 Pregnancy for mifepristone regimens only	19
Analysis 01.07. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 07 Pregnancy for levonorgestrel or Yuzpe regimens	19
Analysis 01.08. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 08 Sexually transmitted infections	20
Analysis 01.09. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 09 Ever use of emergency contraceptives during trial	20
Analysis 01.10. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 10 Multiple uses of emergency contraceptives during trial	21
Analysis 01.11. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 11 Mean time interval between unprotected intercourse and use of emergency contraception	21
Analysis 01.12. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 12 Ever unprotected intercourse in past two weeks	22
Analysis 01.13. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 13 Ever unprotected intercourse in past month	22
Analysis 01.14. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 14 Ever unprotected intercourse in past 3 months	23

Analysis 01.15. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 15 Ever unprotected intercourse in past 6 months	23
Analysis 01.16. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 16 Condom use at 12 months	24
Analysis 01.17. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 17 Condom use at 6 months	24
Analysis 01.18. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 18 Condom use in last month	25

Advance provision of emergency contraception for pregnancy prevention (full review) (Review)

Polis CB, Schaffer K, Blanchard K, Glasier A, Harper CC, Grimes DA

Status: *New*

This record should be cited as:

Polis CB, Schaffer K, Blanchard K, Glasier A, Harper CC, Grimes DA. Advance provision of emergency contraception for pregnancy prevention (full review). *Cochrane Database of Systematic Reviews* 2007, Issue 2. Art. No.: CD005497. DOI: 10.1002/14651858.CD005497.pub2.

This version first published online: 18 April 2007 in Issue 2, 2007.

Date of most recent substantive amendment: 14 January 2007

ABSTRACT

Background

Emergency contraception can prevent pregnancy when taken after unprotected intercourse. Obtaining emergency contraception within the recommended time frame is difficult for many women. Advance provision, in which women receive a supply of emergency contraception before unprotected sex, could circumvent some obstacles to timely use.

Objectives

To summarize randomized controlled trials evaluating advance provision of emergency contraception to explore effects on pregnancy rates, sexually transmitted infections, and sexual and contraceptive behaviors.

Search strategy

In August 2006, we searched CENTRAL, EMBASE, POPLINE, MEDLINE via PubMed, and a specialized emergency contraception article database. We also searched reference lists and contacted experts to identify additional published or unpublished trials.

Selection criteria

We included randomized controlled trials comparing advance provision and standard access, which was defined as any of the following: counseling which may or may not have included information about emergency contraception, or provision of emergency contraception on request at a clinic or pharmacy.

Data collection and analysis

We evaluated all identified titles and abstracts found for potential inclusion. Two reviewers independently abstracted data and assessed study quality. We entered and analyzed data using RevMan 4.2.8. We calculated odds ratios with 95% confidence intervals for dichotomous data and weighted mean differences with 95% confidence intervals for continuous data.

Main results

Eight randomized controlled trials met our criteria for inclusion, representing 6389 patients in the United States, China and India. Advance provision did not decrease pregnancy rates (OR 1.0; 95% CI: 0.78 to 1.29 in studies for which we included twelve month follow-up data; OR 0.91; 95% CI: 0.69 to 1.19 in studies for which we included six month follow-up data; OR 0.49; 95% CI: 0.09 to 2.74 in a study with three month follow up data), despite increased use (single use: OR 2.52; 95% CI 1.72 to 3.70; multiple use: OR 4.13; 95% CI 1.77 to 9.63) and faster use (weighted mean difference (WMD) -14.6 hours; 95% CI -16.77 to -12.4 hours). Advance provision did not lead to increased rates of sexually transmitted infections (OR 0.99; 95% CI 0.73 to 1.34), increased frequency of unprotected intercourse, nor changes in contraceptive methods. Women who received emergency contraception in advance were equally as likely to use condoms as other women.

Authors' conclusions

Advance provision of emergency contraception did not reduce pregnancy rates when compared to conventional provision. Advance provision does not negatively impact sexual and reproductive health behaviors and outcomes. Women should have easy access to emergency contraception, because it can decrease the chance of pregnancy. However, the interventions tested thus far have not reduced overall pregnancy rates in the populations studied.

PLAIN LANGUAGE SUMMARY

Easier access to emergency contraception to help women prevent unwanted pregnancy

Emergency contraception is an increased dose of the hormones found in ordinary birth control pills. This medication can prevent unwanted pregnancy if taken soon after unprotected sex. Getting a prescription for emergency contraception can be difficult and time-consuming. Giving emergency contraception to women in advance could ensure that women have it on hand in case they need it. We searched for studies comparing women who got emergency contraception in advance to women who got emergency contraception in standard ways. We examined whether these groups had different rates of pregnancy or sexually transmitted infections. We also studied how often and how quickly both groups used emergency contraception. Finally, we looked at whether advance provision of emergency contraception changed sexual behavior. Studies showed that the chance of pregnancy was similar regardless of whether or not women have emergency contraception on hand before unprotected sex. Women who had emergency contraception in advance were more likely to use the medication, and to use it sooner after sex. Having emergency contraception on hand did not change use of other kinds of contraception or change sexual behavior.

BACKGROUND

Emergency contraception can prevent pregnancy when taken within 120 hours of unprotected intercourse. Several types of emergency contraception regimens exist, including an estrogen-progestin combination (sometimes called “combined regimen” or “Yuzpe regimen”), levonorgestrel alone, and mifepristone. An alternate method of emergency contraception is post-coital insertion of a copper-bearing intrauterine device (IUD), but this review does not cover IUDs as emergency contraceptives.

Effectiveness and side effects vary by regimen (Cheng 2004). A meta-analysis of eight studies suggested that combined regimens reduce the risk of pregnancy by about 74% when taken within 72 hours of unprotected intercourse (Trussell 1999). A more recent analysis using potentially improved methodology suggested lower effectiveness rates, with the two largest studies showing rates of 47% and 53% (Trussell 2003). Levonorgestrel regimens are more effective than combined regimens (with estimates ranging from 59-94%), with less nausea and vomiting (Task Force 1998; Trussell 2006a).

Several barriers discourage widespread and timely use of emergency contraception, including limited knowledge among women and a lack of routine counseling by providers and/or willingness to prescribe the medication. In some countries, emergency contraception is available only after obtaining a prescription, which can be difficult and time-consuming, particularly on holidays or weekends when most clinics and physicians' offices are closed. Moreover, some women find it difficult or embarrassing to re-

quest emergency contraception from their physician, and others may not have a primary health care provider. Emergency contraception should be taken as soon as possible, and most guidelines suggest taking the medication within 72 or 120 hours of unprotected intercourse. Even under ideal circumstances, obtaining a prescription within 72 hours can be difficult (Trussell 2000); to date, no studies have investigated barriers to accessing a prescription within the 120 hour time limit. Some countries, including China, France, Sweden, Norway and India, sell emergency contraception over-the-counter without a prescription, and over thirty countries (ASEC 2006) and nine U.S. states (AGI 2006) allow women to obtain emergency contraception directly from a pharmacist without a doctor's prescription under collaborative practice agreements with physicians or state approved protocols. In August 2006, the United States Federal Drug Administration announced that it would allow one brand of emergency contraception to be sold without a prescription to women aged eighteen years and older.

Providing emergency contraception before it is needed in case unprotected intercourse occurs gives women rapid access to the medication. This strategy was first evaluated in a 1998 study (Glasier 1998) and has received increased attention since that time. Economic modeling indicates that advance provision of emergency contraception is a cost-effective public health strategy (Trussell 2006a). However, some worry that having emergency contraception on hand may encourage repeat or incorrect use, increase risky sexual behavior, or discourage use of ongoing or more reliable methods of contraception (particularly barrier methods), thereby

increasing the risk of pregnancy or sexually transmitted infections (Gold 1997; Golden 2001; Sherman 2001).

OBJECTIVES

To summarize randomized controlled trials evaluating advance provision of emergency contraceptive pills.

CRITERIA FOR CONSIDERING STUDIES FOR THIS REVIEW

Types of studies

This review included all randomized controlled trials in English that evaluated advance provision of emergency contraception. We excluded studies that failed to clearly report the proportion of women in each treatment arm who became pregnant (as determined by self-report and/or medical testing) during follow up, and for which we were unable to obtain clear data by asking authors directly.

Types of participants

Women of reproductive age.

Types of intervention

Any emergency contraceptive regimen (combined, levonorgestrel, or mifepristone) provided in advance of need compared to a control group, defined as any of the following: counseling which may or may not include a discussion of emergency contraception, or provision of emergency contraception on request at a clinic or pharmacy.

Types of outcome measures

Primary outcome measures were pregnancy and sexually transmitted infection rates. Secondary outcomes were frequency of emergency contraception use, unprotected intercourse, use of more effective methods of contraception, condom use, delay in taking emergency contraception after unprotected intercourse, and knowledge about emergency contraception.

SEARCH METHODS FOR IDENTIFICATION OF STUDIES

See: Cochrane Fertility Regulation Group methods used in reviews.

See Helmerhorst 2001 for methods used in reviews of the Fertility Regulation Group.

During August 2006, we identified relevant trials from the Cochrane Central Register of Controlled Trials (CENTRAL) on the Cochrane Library, EMBASE, POPLINE, MEDLINE

via PubMed, and the website of the International Consortium for Emergency Contraception (www.cecinfo.org/database/who/index.php). Where possible, searches were restricted to human studies only. We restricted our search to English (Moher 2000; Juni 2002).

We used the following strategy to search CENTRAL: ((postcoital or emergency) and contracept* and (advance* or self administr*))

We used the following strategy to search EMBASE: (((('emergency'/exp OR 'emergency') OR ('emergency'/exp OR 'emergency')) OR postcoit*) AND (contracept*) AND (advance AND provision OR advanced AND provision) AND [english]/lim AND [humans]/lim

We used the following strategy to search POPLINE: (emergency contraception/contraceptive agents, postcoital/fertility control, postcoital) & (advance provision/advanced provision/self administration)

We used the following strategy to search MEDLINE via PubMed: (emergency contracepti* OR contraception, postcoital OR contraceptives, postcoital) AND (advance OR advanced OR self administ* OR home)

We used the following strategy to search the database of scientific articles on the website of the International Consortium for Emergency Contraception (ICEC) (<http://www.cecinfo.org/database/who/index.php>): “advance” or “advanced”

We also searched reference lists of included studies for information about additional trials and contacted experts in the field for information on additional published or unpublished trials.

METHODS OF THE REVIEW

All studies that met our inclusion criteria were independently evaluated by two reviewers. We assessed the methodological quality of each study using the guidelines described in the Cochrane Reviewers' Handbook (Alderson 2004). We designed a data abstraction form, and the two reviewers abstracted the data separately. Discrepancies about the inclusion of studies or about abstracted data were resolved by discussion. When necessary, we contacted researchers to obtain additional information about study methods or outcome measures. We entered and analyzed the data using RevMan 4.2.8.

We calculated odds ratios (OR) with 95% confidence intervals for dichotomous variables and weighted mean averages (WMA) for continuous variables for which means and standard deviations were reported. Medians were not used in our graphs since RevMan 4.2.8 does not accept data in this format. We tested the

outcome data for heterogeneity using the I^2 statistic, and in cases where I^2 exceeded 50%, we employed a DerSimonian and Laird random effects model to provide a more conservative estimate of significance (DerSimonian 1986; Higgins 2003). Finally, we conducted sensitivity analyses based on rates of loss to follow up (Schulz 2006), in which studies that had rates of loss to follow up over 20% were excluded. We did not generate a funnel plot to assess for publication bias, since these plots are less useful when there are fewer than ten included studies (Higgins 2005).

One study (Belzer 2005) collected 12-month follow up information, but due to the presentation of results, we were only able to include 6-month follow-up information. In cases where data were available, we calculated statistics using an intent-to-treat analysis if the author failed to do so (Belzer 2005, see also Trussell 2006b).

To explore whether intervention effect waned over time, we contacted authors of studies with 12 months of follow-up to obtain pregnancy outcomes at 6 months, and pooled these outcomes with studies which had a total follow-up time of 6 months. To explore whether pregnancy outcomes differed according to type of regimen, we performed subgroup analyses of studies using Levonorgestrel, Yuzpe regimen, Levonorgestrel or Yuzpe, and mifepristone.

DESCRIPTION OF STUDIES

Eight randomized controlled trials (Hazari 2000; Jackson 2003; Gold 2004; Lo 2004; Belzer 2005; Hu 2005; Raine 2005; Raymond 2006) met our inclusion criteria. The total number of randomized participants was 6389, with sample sizes ranging from 160 to 2000. Raine 2005 enrolled 2117 total participants, but this review used only two treatment groups of that study. Five studies were conducted in the United States (Jackson 2003; Gold 2004; Belzer 2005; Raine 2005; Raymond 2006), with four in California and the rest in Nevada, North Carolina, or Pennsylvania. One study was conducted in Hong Kong (Lo 2004) and one in mainland China (Hu 2005). One study was conducted in India (Hazari 2000). Four studies (Gold 2004; Belzer 2005; Raine 2005; Raymond 2006) focused specifically on younger populations, and Belzer 2005 focused on adolescent mothers. Two studies primarily enrolled post-partum women (Jackson 2003; Hu 2005). Three studies recruited women from family planning clinics (Lo 2004; Raine 2005; Raymond 2006), three recruited from hospitals (Jackson 2003; Gold 2004; Hu 2005), and one recruited adolescent mothers receiving case management services (Belzer 2005). The recruitment site was unclear in one study (Hazari 2000).

Exclusion criteria for baseline contraceptive use varied greatly between the studies. The most restrictive criteria excluded women using or planning to use any hormonal method or an IUD (Lo 2004; Hu 2005). Raymond 2006 excluded women for using some hormonal methods or sterilization, and Raine 2005 excluded women

for using some hormonal methods. Gold 2004 excluded women using long acting contraceptive methods (IUD, implants and injectables), and Belzer 2005 excluded only IUD and implant users. One study excluded women who were sterilized or had a sterilized partner (Jackson 2003). Finally, one study excluded only women who were determined at baseline to be pregnant (Hazari 2000). Although several studies included post-partum women, only one study specified excluding women who were currently breastfeeding (Raymond 2006).

Control groups also differed considerably. One study (Jackson 2003) provided the control group with only routine counseling, which may or may not have included a discussion about emergency contraception. Two studies (Belzer 2005; Hu 2005) specifically provided information about emergency contraception to the control group, but did not facilitate access to the medication in any other way. Finally, control participants in five studies (Hazari 2000; Gold 2004; Lo 2004; Raine 2005; Raymond 2006) were able to obtain emergency contraception on request at the clinic, although not necessarily through study staff. Two studies reported providing all participants with condoms (Hazari 2000; Hu 2005).

The number of courses of emergency contraception provided in advance ranged from one to three. Four studies provided only one course of emergency contraception in advance (Hazari 2000; Jackson 2003; Gold 2004; Belzer 2005). Gold 2004 offered two additional courses on request at the study office, Belzer 2005 offered a replacement pack through the study, and Jackson 2003 provided instructions on obtaining additional emergency contraceptive pills (but did not specify if that was through the study office or by prescription). One study (Raymond 2006) provided two courses in advance and made particular effort to ensure that all women in the advance provision group had two courses in their possession at all times. Finally, three studies provided three courses of emergency contraception in advance (Lo 2004; Hu 2005; Raine 2005), and one (Lo 2004) specifically noted that women using all three packs were instructed to return for contraceptive counseling and, if appropriate, given three additional packets.

Most trials administered levonorgestrel pills. Four studies used the same formulation of pills (2 tablets of 0.75 mg levonorgestrel) sold under the brand name Plan B or Norlevo (Lo 2004; Belzer 2005; Raine 2005; Raymond 2006). In addition, Gold 2004 replaced a Yuzpe regimen (200 µg ethinyl estradiol and 2 mg norgestrel) with Plan B when it became the standard of care mid-way through their study. Two earlier studies used a combined regimen (Hazari 2000; Jackson 2003), and one study based in China provided 10 mg mifepristone (Hu 2005).

Follow up ranged from three to twelve months. Five studies aimed to follow all participants for one year (Jackson 2003; Lo 2004; Belzer 2005; Hu 2005; Raymond 2006). However, we report only on six-month follow-up data for most outcomes (except pregnancy) in Jackson 2003 and all outcomes in Belzer 2005, since these studies provided six month data and six to twelve month

data, but not cumulative twelve month data. Two studies followed all participants for six months (Gold 2004; Raine 2005) and one study followed participants for three months (Hazari 2000).

All studies attempted to measure pregnancy, whereas only three studies measured sexually transmitted infections (Gold 2004; Raine 2005; Raymond 2006). Four studies solely relied on self-reported pregnancy data (Jackson 2003; Gold 2004; Belzer 2005; Hu 2005), whereas four studies used more objective pregnancy detection methods, comprised of some combination of self-report, testing at follow-up, or medical chart review (Hazari 2000; Lo 2004; Raine 2005; Raymond 2006). Among the studies which measured sexually transmitted infections, one used self-reported data (Gold 2004) and two used combinations of more objective methods including testing at follow-up and medical chart review (Raine 2005; Raymond 2006).

METHODOLOGICAL QUALITY

Six studies used computer-generated randomization sequences (Hazari 2000; Lo 2004; Belzer 2005; Hu 2005; Raine 2005; Raymond 2006). One study had participants select a colored condom from a covered bucket to determine allocation (Gold 2004), and another used cluster randomization by date of discharge in order to avoid accidental crossover (Jackson 2003).

Six studies had adequate allocation concealment methods. Four used either sequentially numbered, opaque, sealed envelopes or identical treatment boxes (Lo 2004; Hu 2005; Raine 2005; Raymond 2006) while Gold 2004 and Hazari 2000 used schemes undecipherable to clinic staff. One study had unclear allocation concealment, since authors specified using "sealed envelopes" only (Belzer 2005). One study had inadequate concealment methods that allowed for assignment prediction (Jackson 2003).

Three studies (Hu 2005; Raine 2005; Raymond 2006) provided sample size calculations based on detecting a decrease in pregnancy rates. However, Hu 2005 was underpowered due to unexpectedly low pregnancy rates in their study population. The other five studies primarily investigated behavior change and were not powered to measure pregnancy. Of these, three (Jackson 2003; Gold 2004; Lo 2004) calculated sample sizes in accordance with anticipated differences in emergency contraceptive use between groups, and two (Hazari 2000; Belzer 2005) did not provide sample-size calculations.

Five studies had loss to follow up under 20% (Hazari 2000; Lo 2004; Hu 2005; Raine 2005; Raymond 2006). Three studies had larger losses (Jackson 2003; Gold 2004; Belzer 2005), ranging up to one-third of participants lost to follow up (Jackson 2003; Belzer 2005). In addition, Gold 2004 showed differential loss to follow up.

RESULTS

None of the studies found significant differences in pregnancy rates (Hazari 2000; Jackson 2003; Gold 2004; Lo 2004; Belzer 2005; Hu 2005; Raine 2005; Raymond 2006), including the two studies that were adequately powered to detect a difference (Raine 2005; Raymond 2006). Furthermore, results from the pooled analyses showed no significant difference in pregnancy rates between advance provision and control groups. The combined OR for pregnancy comparing women receiving emergency contraception in advance to women in the control group was 1.0 (95% CI 0.78 to 1.29) in studies with twelve month follow-up, 0.91 (95% CI 0.69 to 1.19) in studies for which we included six month follow-up information, and 0.49 (95% CI: 0.09 to 2.74) for one study with three month follow-up data. Restricting this comparison in a sensitivity analysis to include only studies with a loss to follow up rate under 20% did not substantially change the results (twelve month follow up: OR 1.0; 95% CI 0.76 to 1.31; six month follow up: OR 1.00; 95% CI 0.73 to 1.37; three month follow up: OR 0.49; 95% CI 0.09 to 2.74). None of the analyses pooled by regimen type demonstrated a reduction in pregnancy rates (levonorgestrel only: OR 0.87, 95% CI: 0.67 to 1.13; Yuzpe only: OR 0.90, 95% CI: 0.47 to 1.74; levonorgestrel or Yuzpe: OR 0.87, 95% CI: 0.69 to 1.09; and mifepristone: OR 1.2, 95% CI: 0.74 to 1.93).

None of the three studies that measured sexually transmitted infection rates found significant differences between groups (Gold 2004; Raine 2005; Raymond 2006). The combined OR for sexually transmitted infections was 0.99 (95% CI 0.73 to 1.34). Restricting this analysis to only studies with a loss to follow up rate under 20% did not substantially change the results (OR 0.96; 95% CI 0.69 to 1.33).

Emergency contraceptive use was significantly higher in the advance provision group in five studies (Jackson 2003; Lo 2004; Hu 2005; Raine 2005; Raymond 2006), and in Hazari 2000 and Gold 2004, emergency contraceptive use was higher but the difference did not reach statistical significance. Belzer 2005 reported emergency contraceptive use only for a subgroup of participants and we did not include those results in this analysis. The combined OR for emergency contraception use for all studies was 2.52 (95% CI 1.72 to 3.70). The sensitivity analysis including only studies with a loss to follow up rate under 20% yielded similar results (OR 2.55; 95% CI 1.64 to 3.97). Three studies (Hu 2005; Raine 2005; Raymond 2006) also showed that women in the advance provision group were significantly more likely to use emergency contraception two or more times (OR: 4.13; 95% CI 1.77 to 9.63); no sensitivity analysis was conducted for this outcome since all studies in the original analysis had low loss to follow up under 20%.

The percentage of women who did not use emergency contraception after unprotected intercourse ranged widely and was reported in different ways. Four studies (Jackson 2003; Lo 2004; Hu 2005;

Raymond 2006) reported non-use of emergency contraception among women who became pregnant. Two studies reported non-use among women who had unprotected intercourse (Gold 2004; Raine 2005). In all studies reporting on non-use, non-use was lower among participants in the advance provision group compared to controls. Belzer 2005 reported use of emergency contraception among a subgroup of participants (data not reported).

Hu 2005 reported non-use of emergency contraception among women who became pregnant during one year of follow-up (n=70); 79% in the advance provision group and 100% in the control group did not use emergency contraception during the cycle in which they conceived. Among women who became pregnant in Jackson 2003 (n=27), 64% in the advance provision group and 100% in the control group did not use emergency contraception. Among women who became pregnant in Lo 2004 (n=16), 71% in the advance provision group and 100% in the control group did not report using emergency contraception during the cycle in which the pregnancy occurred. Raymond 2006 reported that for the 148 menstrual cycles in which women experienced pregnancy, 77% of women in the advance provision group and 97% of women in the control group did not use emergency contraception during those cycles.

Gold 2004 reported that at 6 month follow up, 26% of participants in both arms had unprotected intercourse in the past month, but 92% of women in the advance provision group and 94% in the control group did not report use of emergency contraception. In Raine 2005, among women who reported ever having unprotected sex, 6% of women in the advance provision group and 49% of women in the control group did not report using emergency contraception during the study period.

In addition, emergency contraception was sometimes used incorrectly. Lo 2004 reported that although all participants took the first dose within 72 hours of intercourse, 17% of women in the advance provision group took the second dose of levonorgestrel incorrectly. No women in the control group reported taking the second dose incorrectly. Jackson 2003 reported incorrect use only among women who became pregnant and who reported using emergency contraception in the cycle in which they conceived (n=4). Two of these four women used emergency contraception incorrectly. Hu 2005 reported that all women in the advance provision group took emergency contraception within the recommended 120 hours, but did not report on correct use by control participants. Five studies (Hazari 2000; Gold 2004; Belzer 2005; Raine 2005; Raymond 2006) did not report on incorrect use.

Four studies collected information on time intervals between unprotected intercourse and use of emergency contraception. In general, this interval was shorter for women receiving emergency contraception in advance. One study provided mean time and standard deviation (Lo 2004). Women with advance provision took emergency contraception an average of 14.6 hours earlier than women with standard provision (WMD -14.6, 95% CI -16.77 to

-12.43 hours). Two other studies reached similar conclusions, the first with a comparison of median times of 11.4 hours for advance provision vs. 21.8 hrs for control (p=0.005) (Gold 2004), the second with imputed median midpoints of 12 hours for advance provision vs. 36 hours for control (p<0.010) (Raymond 2006). Raine 2005 also found a significantly shorter delay for the advance provision group (p=0.008). One study suggested no difference in timing (8 hours for both groups), but this study was conducted in China, where levonorgestrel is available over-the-counter (Hu 2005). A small number of women (n=2) in this study did report purchasing levonorgestrel over the counter.

Six studies compared the frequency of unprotected intercourse using different time frames (Hazari 2000; Jackson 2003; Gold 2004; Belzer 2005; Raine 2005; Raymond 2006). None showed any difference between comparison groups (unprotected intercourse in past two weeks: OR 0.84 (95% CI 0.66 to 1.06); unprotected intercourse in past month: OR 0.95 (95% CI 0.46 to 1.94); unprotected intercourse in past three months: OR 1.28 (95% CI: 0.73 to 2.24); unprotected intercourse in past six months: OR 0.95 (95% CI 0.76 to 1.19)).

Five studies examined change in contraceptive use using a variety of measurements (Jackson 2003; Belzer 2005; Hu 2005; Raine 2005; Raymond 2006). Belzer 2005 described this information only for a subgroup (data not reported). Jackson 2003 found no differences between treatment arms in consistency of contraceptive use or type of method use during six months of follow up, and among women who only used condoms, there was no decrease in condom use among the group with advance provision of emergency contraception. Similarly, Hu 2005 and Raine 2005 reported no differences between treatment arms in patterns of contraceptive use or method change. Finally, Raymond 2006 reported that use of contraception (other than emergency contraception) as reported at follow-up did not differ significantly by group. In this study, the proportion of sexually active women who did not use any form of contraception decreased slightly in both groups during follow-up.

Jackson 2003 examined patient knowledge about emergency contraception, as measured by answering four or more questions correctly out of seven. Knowledge about emergency contraception was significantly higher at follow up in the advance provision group (OR: 3.16; 95% CI 1.89 - 5.29). Belzer 2005 also attempted to measure knowledge about emergency contraception, but only reported on a subgroup of participants (data not reported).

Six studies looked at condom use. Condom use was no different between groups in five studies (Lo 2004; Belzer 2005; Hu 2005; Raine 2005; Raymond 2006), and in Gold 2004, reported condom use was higher in the advance provision group. The OR for condom use at twelve months was 1.01 (95% CI 0.87 to 1.16); at six months: OR 0.94 (95% CI 0.66 to 1.34), and in last month: OR 1.54 (95% CI 0.94 to 2.53).

None of the studies reported adverse events (Hazari 2000; Jackson 2003; Gold 2004; Lo 2004; Belzer 2005; Hu 2005; Raine 2005; Raymond 2006).

DISCUSSION

Advance provision of emergency contraception did not reduce unplanned pregnancies when compared to standard access situations (defined as routine contraceptive counseling, provision of information on emergency contraception, or emergency contraception on request). None of the adequately powered trials found a decrease in pregnancy rates with advance provision of emergency contraception (Raine 2005; Raymond 2006). Pooled estimates also showed no difference in pregnancy rates, indicating that based on available data, advance provision of emergency contraception does not lead to reduced rates of unintended pregnancy. Analyses by length of follow-up and by type of regimen did not change results. This conclusion conflicts with earlier optimistic projections of the potential public health impact of improved access (Trussell 1992). Emergency contraception is more effective than placebo in preventing unwanted pregnancy (Raymond 2004), and advance provision increases use and shortens time between unprotected intercourse and emergency contraceptive use. Since evidence now supports ingestion of both doses simultaneously, and several countries now market levonorgestrel emergency contraception in a single dose, incorrect use will likely be less of a problem in the future (Arowojolu 2002; von Hertzen 2002). Nevertheless, women may not perceive themselves to be at risk of pregnancy and may fail to use the method after unprotected sex has occurred, despite ready availability. Recent research suggests that unperceived pregnancy risk, concerns about side effects, and inconvenience are some of the reasons why women may not use emergency contraception when needed (Sorenson 2000; Moreau 2005; Rocca 2006; Goulard 2006). Future research should address this utilization gap.

As with other contraceptive methods, the disparity between theoretical and actual effectiveness can be large (Steiner 1996). Emergency contraception has higher efficacy than placebo in preventing unwanted pregnancy (Raymond 2004), but more precise estimates may help to shed light on advance provision's lack of impact on unintended pregnancy.

These trials share a common weakness. Reported information on use of emergency contraception, frequency of unprotected intercourse, and changes in contraceptive patterns was of unknown validity. Since these self reports lacked objective verification, this information should be viewed with caution. Objective evidence indicates that self reports on use of contraceptives (Galvao 2005; Macaluso 2003; Lawson 1998; Walsh 2003) and other medications (Landry 2006) are inaccurate, and that self-report of unprotected intercourse is inferior to other ascertainment methods (Rogers 2005). Some degree of underreporting of pregnancies may

have occurred in both the advance provision and control groups in these trials, particularly those trials using only self-reported data. Unplanned pregnancies terminated by induced abortion are routinely underreported (Fu 1998). However, results from the trials relying on pregnancy testing were consistent with results from the trials using self-reports of pregnancy.

Advance provision of emergency contraception consistently increased its reported use and usually shortened the reported interval between unprotected intercourse and drug administration. However, changes in these measures did not correlate with changes in pregnancy rates, demonstrating that these measures are poor surrogate markers of pregnancy risk, and should not be used as proxies for pregnancy risk in future clinical research.

The quality of these randomized controlled trials varied widely. While many had good methods of randomization and allocation concealment, follow-up rates differed greatly. One trial planned not to follow most participants after randomization (Walsh 2006), so we excluded it. In the view of Sackett and others, when losses exceed 20% of participants randomized, the credibility of a trial is suspect (Schulz 2006). Trials with high losses to follow up resemble cohort studies in their potential for bias. For the sake of completeness, we included trials with poor follow up and performed a sensitivity analysis with and without these reports; the results were similar.

AUTHORS' CONCLUSIONS

Implications for practice

Existing data shows that providing women with emergency contraception in advance of need does not reduce unintended pregnancy on a population level. Advance provision did not have any harmful effects; it did not increase rates of sexually transmitted infections, decrease condom use, encourage adoption of less reliable contraceptive methods, or otherwise negatively impact sexual and reproductive behavior. Advance provision did increase use of emergency contraception and decrease the length of time between unprotected intercourse and use of emergency contraception. Conclusions about population level effects should not impede efforts to ensure all women have access to emergency contraception when they need it. Women should be given information on and easy access to emergency contraception because individual women can decrease their chances of pregnancy by using the method. However, current data on advance provision of emergency contraception indicates that tested interventions will not reduce overall unintended pregnancy rates.

Implications for research

Future research should address the behavioral issues surrounding the failure to use emergency contraception when needed, even when it is readily available.

POTENTIAL CONFLICT OF INTEREST

Two review co-authors were also co-authors of certain included studies (Cynthia Harper: Raine 2005, and Anna Glasier: Lo 2004 and Hu 2005).

ACKNOWLEDGEMENTS

The authors are extremely grateful to the late Charlotte Ellertson, who conceived the idea for this review and provided generous encouragement and advice. We also thank Carol Manion for assistance with our search strategy, and Elizabeth Raymond and James Trussell for their helpful comments.

SOURCES OF SUPPORT

External sources of support

- No sources of support supplied

Internal sources of support

- Ibis Reproductive Health USA

REFERENCES

References to studies included in this review

Belzer 2005 *{published data only}*

Belzer M, Sanchez K, Olson J, Jacobs AM, Tucker D. Advance supply of emergency contraception: A randomized trial in adolescent mothers. *Journal of Pediatric and Adolescent Gynecology* 2005;**18**:347–354.

Gold 2004 *{published and unpublished data}*

Gold MA, Woldford JE, Smith KA, Parker AM. The effects of advance provision of emergency contraception on adolescent women's sexual and contraceptive behaviors. *Journal of Pediatric and Adolescent Gynecology* 2004;**17**:87–96.

Hazari 2000 *{published data only}*

Hazari K. Use of emergency contraception by women as a back-up method. *Health and Population* 2000;**23**:115–122.

Hu 2005 *{published data only}*

Hu X, Cheng L, Hua X, Glasier A. Advanced provision of emergency contraception to postnatal women in China makes no difference in abortion rates: a randomized controlled trial. *Contraception* 2005;**72**: 111–116.

Jackson 2003 *{published data only}*

Jackson RA, Schwarz EB, Freedman L, Darney P. Advance supply of emergency contraception: effect on use and usual contraception - a randomized trial. *Obstetrics and Gynecology* 2003;**102**:8–16.

Lo 2004 *{published data only}*

Lo SST, Fan SYS, Ho PC, Glasier AF. Effect of advanced provision of emergency contraception on women's contraceptive behavior: a

randomized controlled trial. *Human Reproduction* 2004;**19**:2404–2410.

Raine 2005 *{published and unpublished data}*

Raine TR, Harper CC, Rocca CH, Fischer R, Padian N, Klausner JD, et al. Direct access to emergency contraception through pharmacies and effect on unintended pregnancy and STIs: a randomized controlled trial. *JAMA* 2005;**293**:54–62.

Raymond 2006 *{published and unpublished data}*

Raymond EG, Stewart F, Weaver M, Monteith C, Van Der Pol B. Randomized trial to evaluate the impact of increased access to emergency contraceptive pills. *Obstetrics and Gynecology* 2006; Vol. (in press).

References to studies excluded from this review

Blanchard 2003

Blanchard K, Bungay H, Furedi A, Sanders L. Evaluation of an emergency contraception advance provision service. *Contraception* 2003;**67**:343–348.

Ellertson 2001

Ellertson C, Ambardekar S, Hedley A, Coyaji K, Trussell J, Blanchard K. Emergency contraception: randomized comparison of advance provision and information only. *Obstetrics and Gynecology* 2001;**98**: 570–575.

Endres 2000

Endres LK, Beshara M, Sondheimer S. Experience with self-administered emergency contraception in a low-income, inner-city family

- planning program. *Journal of Reproductive Medicine* 2000;**45**:827–830.
- Glasier 1998**
Glasier A, Baird D. The effects of self-administering emergency contraception. *New England Journal of Medicine* 1998;**339**:1–4.
- Glasier 2004**
Glasier A, Fairhurst K, Wyke S, Ziebland S, Seaman P, Walker J, et al. Advanced provision of emergency contraception does not reduce abortion rates. *Contraception* 2004;**69**:361–366.
- Golden 2004**
Golden MR, Whittington WLH, Handsfield HH, Clark A, Malinsky C, Helmers JR, et al. Failure of family-planning referral and high interest in advanced provision emergency contraception among women contacted for STD partner notification. *Contraception* 2004;**69**:241–6.
- Harper 2005**
Harper CC, Cheong M, Rocca CH, Darney PD, Raine TR. The effect of increased access to emergency contraception among young adolescents. *Obstetrics and Gynecology* 2005;**106**:483–491.
- London 2006**
London S. Easy access to EC increases teenagers' use, but does not lead to risky behavior. *Perspectives on Sexual and Reproductive Health* 2006;**38**:55–6.
- Lovvorn 2000**
Lovvorn A, Nerquaye-Tetteh J, Glover EK, Amankwah-Poku A, Hays M, Raymond E. Provision of emergency contraceptive pills to spermicide users in Ghana. *Contraception* 2000;**61**:287–293.
- Raine 2000**
Raine T, Harper C, Leon K, Darney P. Emergency contraception: advance provision in a young, high-risk clinic population. *Obstetrics and Gynecology* 2000;**96**:1–7.
- Skibiak 1999**
Skibiak JP, Ahmed Y, Ketata M. Testing strategies to improve access to emergency contraception pills: prescription vs. prophylactic distribution. Nairobi: Population Council 1999.
- Stehle 1999**
Stehle K. The effects of self-administering emergency contraception. *Journal of Nurse-Midwifery* 1999;**44**:82–4.
- Walker 2006**
Walker D, Gutierrez JP, Torres P, Bertozzi SM. HIV prevention in Mexican schools: prospective randomised evaluation of intervention. *BMJ* 2006;**332**:1189–94.
- Walsh 2006**
Walsh TL, Freziers RG. Patterns of emergency contraception use by age and ethnicity from a randomized trial comparing advance provision and information only. *Contraception* 2006;**74**:110–117.
- Additional references**
- AGI 2006**
Alan Guttmacher Institute (AGI). State Policies in Brief: access to emergency contraception. http://www.guttmacher.org/statecenter/spibs/spib_EC.pdf (accessed June 28, 2006).
- Alderson 2004**
Alderson P, Green S, Higgins JPT, editors. Cochrane Reviewer's Handbook 4.2.2 [updated March 2004]. <http://www.cochrane.org/resources/handbook/hbook.htm> (accessed August 10, 2004).
- Arowojolu 2002**
Arowojolu AO, Okewole LA, Adekunle AO. Comparative evaluation of the effectiveness and safety of two regimens of levonorgestrel for emergency contraception in Nigerians. *Contraception* 2002;**66**:269–73.
- ASEC 2006**
American Society for Emergency Contraception. Dedicated ECPs worldwide. <http://www.emergencycontraception.org/asec/ecpillsworldwide.html> (accessed June 28, 2006).
- Cheng 2004**
Cheng L, Gulmezoglu AM, Van Oel CJ, Piaggio G, Ezcurra E, Van Look PFA. Interventions for emergency contraception. In: *Cochrane Database of Systematic Reviews*, 3, 2004. Oxford, UK: Update Software Ltd.
- DerSimonian 1986**
DerSimonian R, Laird N. Meta-Analysis in Clinical Trials. *Controlled Clinical Trials* 1986;**7**:177–88.
- Fu 1998**
Fu H, Darroch JE, Henshaw SK, Kolb E. Measuring the extent of abortion underreporting in the 1995 National Survey of Family Growth. *Family Planning Perspectives* 1998;**30**:128–33, 138.
- Galvao 2005**
Galvao LW, Oliveira LC, Diaz J, Kim DJ, Marchi N, van Dam J, et al. Effectiveness of female and male condoms in preventing exposure to semen during vaginal intercourse: a randomized trial. *Contraception* 2005;**71**:130–6.
- Gold 1997**
Gold MA, Schein A, Coupey SM. Emergency contraception: a national survey of adolescent health experts. *Family Planning Perspectives* 1997;**29**:15–9, 24.
- Golden 2001**
Golden NH, Siegel WM, Fisher M, Schneider M, Quijano E, Suss A, et al. Emergency contraception: pediatricians' knowledge, attitudes and opinions. *Pediatrics* 2001;**107**:287–92.
- Goulard 2006**
Goulard H, Moreeau C, Gilbert F, Job-Spira N, Bajos N. Contraceptive failures and determinants of emergency contraception use. *Contraception* 2006;**74**:208–13.
- Helmerhorst 2001**
Helmerhorst F, Van Oel C, Kulier R (on behalf of the Editorial Team). Cochrane Fertility Regulation Group. The Cochrane Library 2006, issue Issue 2.
- Higgins 2003**
Higgins JPT, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003;**327**:557–60.
- Higgins 2005**
Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions 4.2.5 [updated May 2005]. In: The Cochrane Library Issue 3, 2005. Chichester, UK: John Wiley & Sons, Ltd..

Juni 2002

Juni P, Holenstein F, Sterne J, Bartlett C, Egger M. Direction and impact of language bias in meta-analyses of controlled trials: empirical study. *International Journal of Epidemiology* 2002;**31**:115–23.

Landry 2006

Landry P, Iorillo D, Darioli R, Burnier M, Genton B. Do travelers really take their mefloquine malaria chemoprophylaxis? Estimation of adherence by an electronic pillbox. *Journal of Travel Medicine* 2006;**13**:8–14.

Lawson 1998

Lawson ML, Macaluso M, Bloom A, Hortin G, Hammond KR, Blackwell R. Objective markers of condom failure. *Sexually Transmitted Diseases* 1998;**25**:427–32.

Macaluso 2003

Macaluso M, Lawson ML, Hortin G, Duerr A, Hammond KR, Blackwell R, et al. Efficacy of the female condom as a barrier to semen during intercourse. *American Journal of Epidemiology* 2003;**157**:289–97.

Moher 2000

Moher D, Pham B, Klassen TP, Schulz KF, Berlin JF, Jadad AR, et al. What contributions do languages other than English make on the results of meta-analyses?. *Journal of Clinical Epidemiology* 2000;**53**:964–72.

Moreau 2005

Moreau C, Bouyer J, Goulard H, Bajos N. The remaining barriers to the use of emergency contraception: perception of pregnancy risk by women undergoing induced abortions. *Contraception* 2005;**71**:202–7.

Raymond 2004

Raymond E, Taylor D, Trussell J, Steiner MJ. Minimum effectiveness of the levonorgestrel regimen of emergency contraception. *Contraception* 2004;**69**:79–81.

Rocca 2006

Rocca CH, Schwarz EB, Stewart FH, Darney PD, Raine TR, Harper CC. Beyond access: acceptability, use and non-use of emergency contraception among young women. *American Journal of Obstetrics and Gynecology* 2006; Vol. (in press).

Rogers 2005

Rogers SM, Willis G, Al-Tayyib A, Villarroel MA, Turner CF, Ganapathi L, et al. Audio computer assisted interviewing to measure HIV risk behaviors in a clinic population. *Sexually transmitted infections* 2005;**81**:501–7.

Schulz 2006

Schulz KF, Grimes DA. *The Lancet handbook of essential concepts in clinical research*. London: Elsevier, 2006.

Sherman 2001

Sherman CA, Harvey SM, Beckman LJ, Petitti DB. Emergency contraception: knowledge and attitudes of health care providers in a

health maintenance organization. *Women's Health Issues* 2001;**11**:448–57.

Sorenson 2000

Sorenson MB, Pedersen BL, Nyrnberg LE. Differences between users and non-users of emergency contraception after a recognized unprotected intercourse. *Contraception* 2000;**62**:1–3.

Steiner 1996

Steiner M, Dominik R, Trussell J, Hertz-Picciotti I. Measuring contraceptive effectiveness: a conceptual framework. *Obstetrics and Gynecology* 1996;**88**:24S–30S.

Task Force 1998

Task Force on Postovulatory Methods of Fertility Regulation. Randomised controlled trial of levonorgestrel versus the Yuzpe regimen of combined oral contraceptives for emergency contraception. *Lancet* 1998;**352**:428–33.

Trussell 1992

Trussell J, Stewart F, Guest F, Hatcher RA. Emergency contraceptive pills: a simple proposal to reduce unintended pregnancies. *Family Planning Perspectives* 1992;**24**:269–73.

Trussell 1999

Trussell J, Rodríguez G, Ellertson C. Updated estimates of the effectiveness of the Yuzpe regimen of emergency contraception. *Contraception* 1999;**59**:147–51.

Trussell 2000

Trussell J, Duran V, Shochet T, Moore K. Access to emergency contraception. *Obstetrics and Gynecology* 2000;**95**:267–70.

Trussell 2003

Trussell J, Ellertson C, von Hertzen H, Biggig A, Webb A, Evans M, et al. Estimating the effectiveness of emergency contraceptive pills. *Contraception* 2003;**67**:259–65.

Trussell 2006a

Trussell J, Stewart F, Raymond EG. Emergency contraception: a cost-effective approach to preventing unintended pregnancy. <http://ec.princeton.edu/questions/EC-review.pdf> July 2006.

Trussell 2006b

Trussell J, Raymond E, Stewart F. Re: Advance supply of emergency contraception [Letter to the editor]. *Journal of Pediatric and Adolescent Gynecology* 2006;**19**:251.

von Hertzen 2002

von Hertzen H, Piaggio G, Ding J, Chen J, Song S, Bartfalvi G, et al. Low dose mifepristone and two regimens of levonorgestrel for emergency contraception. *The Lancet* 2002;**360**:1803–10.

Walsh 2003

Walsh TL, Freziers RG, Peacock K, Nelson AL, Clark VA, Bernstein L, et al. Use of prostate-specific antigen (PSA) to measure semen exposure resulting from male condom failures: implications for contraceptive efficacy and the prevention of sexually transmitted disease. *Contraception* 2003;**67**:139–50.

TABLES

Characteristics of included studies

Study	Belzer 2005
Methods	RCT. Computer generated randomization number table. Sealed envelopes (unclear whether opaque or sequentially numbered). 12 mo <i>f/u</i> , data reported in 6 mo intervals. We utilize only the 6 mo data.
Participants	160 adolescent mothers, 13-20 yrs, mostly Hispanic, receiving case management services in a large metropolitan area. Excluded if attempting to get pregnant or using implant or an IUD.
Interventions	Intervention group received 1 course levonorgestrel-only regimen (2 tabs 0.75 mg levonorgestrel), to be taken in 2 doses 12 h apart. Replacement pack provided if package used or lost. Control group received EC info only.
Outcomes	Pregnancy rates, frequency of unprotected intercourse, condom use.
Notes	Large loss to <i>f/u</i> (31% at 6 months). Original statistical analysis not intent-to-treat. All self-reported data. No sample size calculation. Controls significantly more likely to report condom use and sexual activity at baseline; differences not controlled for in analysis.
Allocation concealment	B – Unclear

Study	Gold 2004
Methods	RCT (by colored condom chosen from age-stratified bucket). Correspondence with primary author indicated that participants could not see inside bucket before choosing and were unaware of the color assignments. Two colors, distributed 50:50, inside each bucket. Most clinic staff unlikely to have been able to decipher the color code, method unlikely to have affected randomization. 6 mo <i>f/u</i> .
Participants	301 sexually-active adolescents, aged 15-20 yrs, in Southwestern Pennsylvania, primarily minority and low-income. Excluded if using IUD, implant, injectable, if living in foster care or group home, or if had other characteristics which could threaten <i>f/u</i> .
Interventions	From study start until April 2000, intervention group received 1 course Yuzpe regimen 200 mcg ethinyl estradiol plus 2 mg norgestrel, plus an extra dose in case of vomiting, in addition to diphenhydramine. After April 2000, when levonorgestrel only regimens became standard of care, a levonorgestrel-only regimen was used (2 tabs of levonorgestrel 0.75 mg). Participants could obtain 2 additional courses over 6 mo period by request, regardless of whether unprotected intercourse had occurred. Participants also received counseling and EC info. Control group received EC on request at the clinic and EC info.
Outcomes	Pregnancy and STI rates (specific STIs not specified), use of EC, interval between unprotected intercourse and EC use, frequency of unprotected intercourse, condom use.
Notes	Large loss to <i>f/u</i> (26% at 6 mo - for reasons other than pregnancy), and loss to <i>f/u</i> differential by treatment group (33% in advance provision group, 19% in control group). Not powered to detect differences in pregnancy or STI rates.
Allocation concealment	A – Adequate

Study	Hazari 2000
Methods	RCT. Coded randomization slips prepared off -site. 3 mo <i>f/u</i> .
Participants	200 condom-using women in Mumbai, India, generally low SES and mostly between the ages of 25-34. Excluded if pregnant at baseline as determined by history of last menstrual period and recent unprotected intercourse, vaginal exam, or if required, urine pregnancy test and ultrasonography.

Characteristics of included studies (Continued)

Interventions	Intervention group received one course Yuzpe regimen (50 µg ethinyl estradiol and 0.25 mg levonorgestrel) to be taken in 2 doses 12 h apart. Replacement pills were provided on request at the clinic. Control group received EC on request at the clinic. Both groups were provided with condoms.
Outcomes	Pregnancy rates, EC use, frequency of unprotected sex.
Notes	Small loss to <i>f/u</i> (1%). One pregnancy was missed at baseline, excluded from this review. Article poorly described methodology, participants, and outcomes. Unclear whether differences between groups at baseline. No discussion of sample size.
Allocation concealment	D – Not used

Study Hu 2005

Methods	RCT. Computer generated simple randomization list. Sequentially numbered, opaque, sealed envelopes. 12 mo <i>f/u</i> .
Participants	2000 post-partum women in Shanghai hospital. Excluded if planning on using an IUD or hormonal contraception.
Interventions	Intervention group received 3 courses of mifepristone (10 mg). Control group received only EC info (but levonorgestrel available in China OTC). All participants received 10 condoms.
Outcomes	Pregnancy rates, use of EC, interval between unprotected intercourse and EC use, change in contraceptive methods, condom use.
Notes	Reasonable loss to <i>f/u</i> (17%). Originally powered to detect a difference in pregnancy rates, but pregnancy rates much lower than expected, reducing statistical power. Failure to perform intent-to-treat analysis (inappropriately excluded those who chose IUD and sterilization). High potential for crossover due to OTC levonorgestrel.
Allocation concealment	A – Adequate

Study Jackson 2003

Methods	RCT. Cluster randomization by date of discharge from postpartum care, done with random number generator by separate researcher so clinic staff could not predict day's assignment. Data analyzed by individual, re-evaluated accounting for cluster sampling, no substantial differences. Researchers conducting baseline interviews not masked to group assignment, blinded personnel conducted <i>f/u</i> , data entry, and analysis. 12 mo <i>f/u</i> .
Participants	370 post-partum, low income, racially diverse English- or Spanish-speaking women at public inner-city hospital in San Francisco. Excluded if major contraindications to estrogen use, post-partum tubal ligation or partner with vasectomy, employees of Labor and Delivery at the hospital, enrolled in another study, or difficult to reach for <i>f/u</i> (lack of a phone, psychiatric disorder, untreated substance abuse, plans for relocation).
Interventions	Intervention group received 1 course of Yuzpe regimen (8 tabs 0.15 mg levonorgestrel plus 30 µg ethinyl estradiol), educational session, verbal and written instructions. Additional pills available on request. Control group received routine counseling, which may or may not have included a discussion of EC.
Outcomes	Pregnancy rates, use of EC, frequency of unprotected intercourse, change in contraceptive methods, EC knowledge. Except for pregnancy rates, most outcomes can only be included for six month <i>f/u</i> data, as they were reported separately for the six months prior to the six and twelve-month <i>f/u</i> visits.
Notes	Large loss to <i>f/u</i> (31% at 12 months). All self-reported data. Powered to detect difference in EC use.
Allocation concealment	C – Inadequate

Study Lo 2004

Methods	RCT. Computer generated randomization list, blocks of 10. Sequentially numbered opaque, labeled, sealed envelopes. 12 mo <i>f/u</i> .
---------	---

Characteristics of included studies (Continued)

Participants	1030 women, 18-45 yrs, attending two Hong Kong clinics using "less effective contraceptive methods" (condoms, spermicide, fertility awareness based methods, withdrawal, or nothing).
Interventions	Intervention group received 3 courses (2 tabs 0.75 mg levonorgestrel), to be taken in 2 doses 12 h apart, and up to 3 more courses if needed. Control group received EC on request at clinic.
Outcomes	Pregnancy rates, use of EC, interval between unprotected intercourse and EC use, condom use.
Notes	Small loss to f/u (4%). Pregnancy confirmed by pregnancy test. Powered to detect a 10% difference in EC use, not powered to detect a difference in pregnancy rates.
Allocation concealment	A – Adequate

Study Raine 2005

Methods	RCT. Computer generated randomization sequence assigned participants to 1 of 3 groups before December 2001, to 1 of 2 groups after December 2001 (clinic access group eliminated because pharmacy access instated in CA). We include only data from intervention and clinic access groups (pre 12/2001). Sequentially numbered treatment boxes with labeled study ID, opened after leaving the clinic. 6 mo f/u.
Participants	1228 English or Spanish speaking women, 15-24 yrs, sexually active in past 6 mo, largely uninsured and low-income, at moderately high risk for negative reproductive health outcomes, living in the San Francisco Bay area, attending four California family planning clinics, available for 6 mo f/u. Excluded if pregnant or desiring pregnancy, using hormonal contraception or IUD, or if had unprotected intercourse during the past 3 days or were requesting EC at enrollment.
Interventions	Intervention group received 3 courses (2 tabs 0.75 mg levonorgestrel), to be taken in 2 doses 12 h apart, within 72 hours of intercourse. Control group received EC on demand at a clinic. Although EC is generally available at no cost through the clinic, some study participants ineligible for insurance coverage may have had to pay all or some of the cost of EC at 2 of the 4 study sites.
Outcomes	Pregnancy rates, STI rates (only information on Chlamydia and HSV2 included because these STIs were confirmed by testing at f/u) use of EC, frequency of unprotected intercourse, change in contraceptive methods, condom use.
Notes	Small loss to f/u (7% at 6 months). Some crossover reported. This review excludes information from pharmacy access group as we are interested in comparing advance provision and standard access (before statewide pharmacy access was implemented). Participants differed at baseline by enrollment site, race/ethnicity was linked to enrollment site. Differences controlled for, adjustment did not substantially change results. Powered to detect a difference in pregnancy rates.
Allocation concealment	A – Adequate

Study Raymond 2006

Methods	RCT. Computer generated randomization scheme in blocks of 4, 6, and 8. Sequentially numbered, opaque, sealed envelopes. 12 mo f/u.
Participants	1490 sexually active women, 14-24 yrs, who did not desire pregnancy and were attending clinics in Nevada and North Carolina. Excluded if using or planning on using sterilization, IUD, hormonal contraception, or if pregnant or breastfeeding in past 6 wks.
Interventions	Intervention group received 2 courses (2 tabs of 0.75 mg levonorgestrel) to be taken together in one dose. More courses provided, attempt to ensure two packages on hand at all times. Control group received EC on request at a clinic.
Outcomes	Pregnancy rates, STI rates (gonorrhea, Chlamydia, trichomoniasis), use of EC, interval between unprotected intercourse and EC use, frequency of unprotected intercourse, change in contraceptive methods, condom use.
Notes	Small loss to f/u (6%). Pregnancy and STIs outcomes based primarily on medical chart review plus testing at f/u, some women self-tested at home, sent vaginal samples for confirmation. Powered to detect a difference in

pregnancy rates. More intervention participants had STIs at baseline; differences controlled for, adjustment did not substantially change results.

Allocation concealment A – Adequate

Characteristics of excluded studies

Study	Reason for exclusion
Blanchard 2003	Not a randomized controlled trial.
Ellertson 2001	Proportion of women in each treatment arm who became pregnant during follow up not clearly reported; raw data unavailable
Endres 2000	Not a randomized controlled trial.
Glasier 1998	Not a randomized controlled trial.
Glasier 2004	Not a randomized controlled trial.
Golden 2004	Randomized controlled trial of partner notification, not advance provision. Collected qualitative data on EC interest.
Harper 2005	Based on same data as Raine 2005, restricted to adolescents.
London 2006	Review of Harper 2005.
Lovvorn 2000	Not a randomized controlled trial.
Raine 2000	Not a randomized controlled trial.
Skibiak 1999	Not a randomized controlled trial.
Stehle 1999	Appears on PubMed as a randomized controlled trial, but actually a review of Glasier 1998
Walker 2006	Intervention is not advance provision of emergency contraception
Walsh 2006	Not conducted as a randomized controlled trial since no attempt was made to follow up 70% of randomized participants.

ANALYSES

Comparison 01. Advance provision vs. standard provision of emergency contraception

Outcome title	No. of studies	No. of participants	Statistical method	Effect size
01 Pregnancy (at twelve month follow-up)	4	4690	Odds Ratio (Fixed) 95% CI	1.00 [0.78, 1.29]
02 Pregnancy (at six month follow-up)	7	6035	Odds Ratio (Fixed) 95% CI	0.91 [0.69, 1.19]
03 Pregnancy (at three month follow-up)	1	198	Odds Ratio (Fixed) 95% CI	0.49 [0.09, 2.74]
04 Pregnancy for levonorgestrel regimens only	4	3674	Odds Ratio (Fixed) 95% CI	0.87 [0.67, 1.13]
05 Pregnancy for Yuzpe regimens only	2	513	Odds Ratio (Fixed) 95% CI	0.90 [0.47, 1.74]
06 Pregnancy for mifepristone regimens only	1	1948	Odds Ratio (Fixed) 95% CI	1.20 [0.74, 1.93]
07 Pregnancy for levonorgestrel or Yuzpe regimens	7	4441	Odds Ratio (Fixed) 95% CI	0.87 [0.69, 1.09]
08 Sexually transmitted infections	3	2829	Odds Ratio (Fixed) 95% CI	0.99 [0.73, 1.34]
09 Ever use of emergency contraceptives during trial	7	6327	Odds Ratio (Random) 95% CI	2.52 [1.72, 3.70]

10	Multiple uses of emergency contraceptives during trial	3	4574	Odds Ratio (Random) 95% CI	4.13 [1.77, 9.63]
11	Mean time interval between unprotected intercourse and use of emergency contraception	1	986	Weighted Mean Difference (Fixed) 95% CI	-14.60 [-16.77, -12.43]
12	Ever unprotected intercourse in past two weeks	1	1140	Odds Ratio (Fixed) 95% CI	0.84 [0.66, 1.06]
13	Ever unprotected intercourse in past month	1	254	Odds Ratio (Fixed) 95% CI	0.95 [0.46, 1.94]
14	Ever unprotected intercourse in past 3 months	1	198	Odds Ratio (Fixed) 95% CI	1.28 [0.73, 2.24]
15	Ever unprotected intercourse in past 6 months	3	1531	Odds Ratio (Fixed) 95% CI	0.95 [0.76, 1.19]
16	Condom use at 12 months	3	3766	Odds Ratio (Fixed) 95% CI	1.01 [0.87, 1.16]
17	Condom use at 6 months	2	1247	Odds Ratio (Fixed) 95% CI	0.94 [0.66, 1.34]
18	Condom use in last month	1	254	Odds Ratio (Fixed) 95% CI	1.54 [0.94, 2.53]

COVER SHEET

Title	Advance provision of emergency contraception for pregnancy prevention (full review)
Authors	Polis CB, Schaffer K, Blanchard K, Glasier A, Harper CC, Grimes DA
Contribution of author(s)	Chelsea Polis and Kate Schaffer generated drafts of the protocol, and all authors provided input. Chelsea Polis drafted the data abstraction sheets and conducted the literature search with input from all authors. Chelsea Polis and David Grimes abstracted and entered the data. All authors provided input to the analysis and writing.
Issue protocol first published	2005/4
Review first published	2007/2
Date of most recent amendment	20 February 2007
Date of most recent SUBSTANTIVE amendment	14 January 2007
What's New	Information not supplied by author
Date new studies sought but none found	Information not supplied by author
Date new studies found but not yet included/excluded	Information not supplied by author
Date new studies found and included/excluded	Information not supplied by author
Date authors' conclusions section amended	Information not supplied by author
Contact address	Ms Chelsea Polis Doctoral student Department of Population, Family and Reproductive Health Johns Hopkins Bloomberg School of Public Health Room W4510, 615 N. Wolfe St Baltimore Maryland

21205
 USA
 E-mail: cpolis@jhspsh.edu

DOI 10.1002/14651858.CD005497.pub2
Cochrane Library number CD005497
Editorial group Cochrane Fertility Regulation Group
Editorial group code HM-FERTILREG

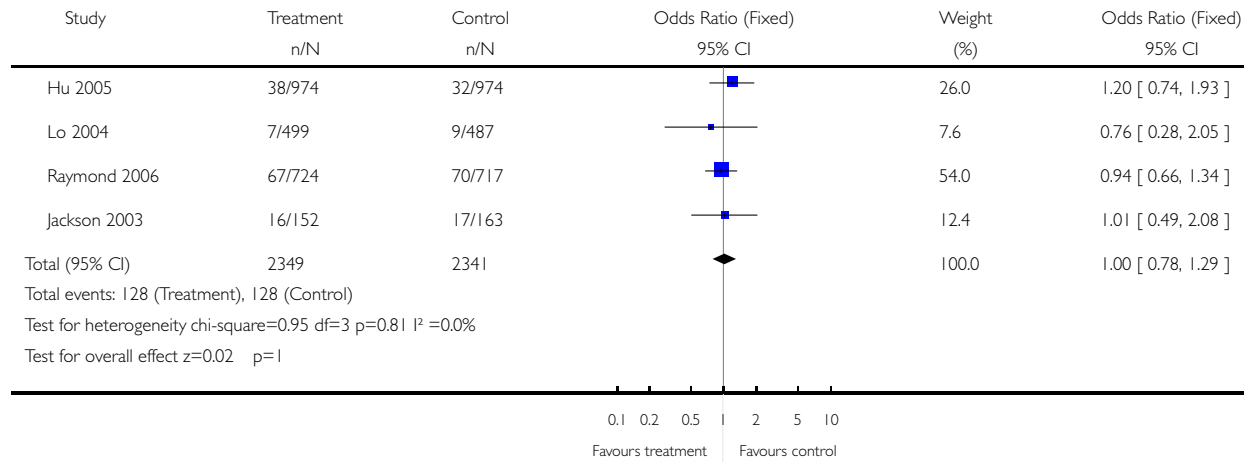
GRAPHS AND OTHER TABLES

Analysis 01.01. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 01 Pregnancy (at twelve month follow-up)

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 01 Pregnancy (at twelve month follow-up)

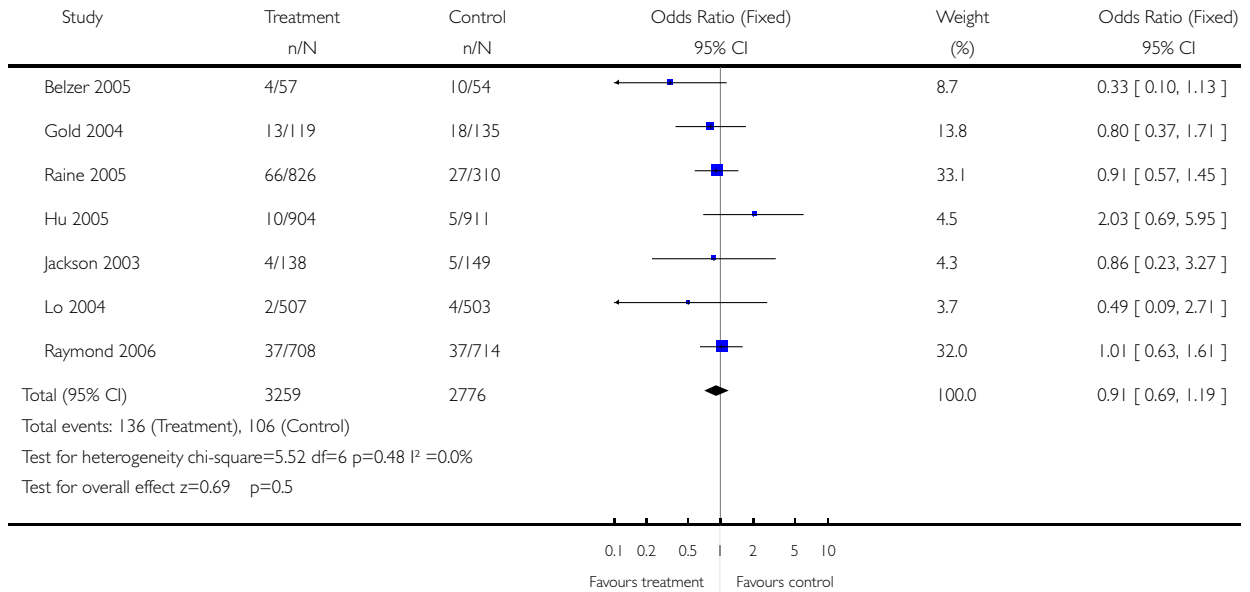


Analysis 01.02. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 02 Pregnancy (at six month follow-up)

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 02 Pregnancy (at six month follow-up)

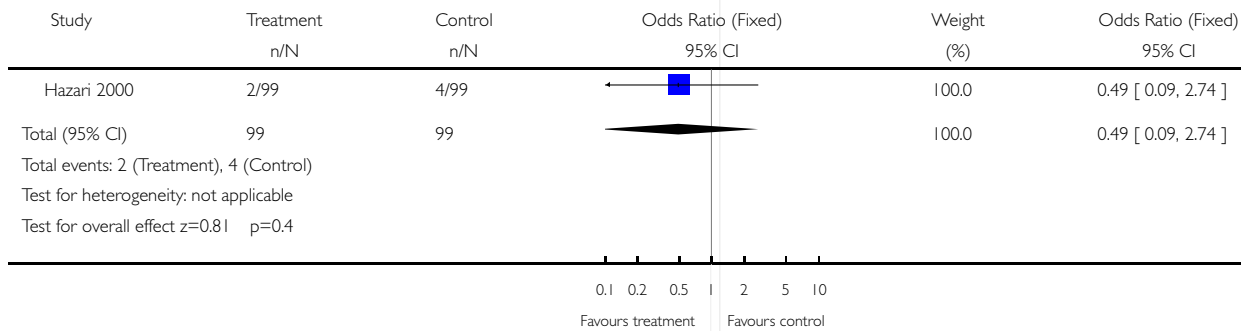


Analysis 01.03. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 03 Pregnancy (at three month follow-up)

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 03 Pregnancy (at three month follow-up)

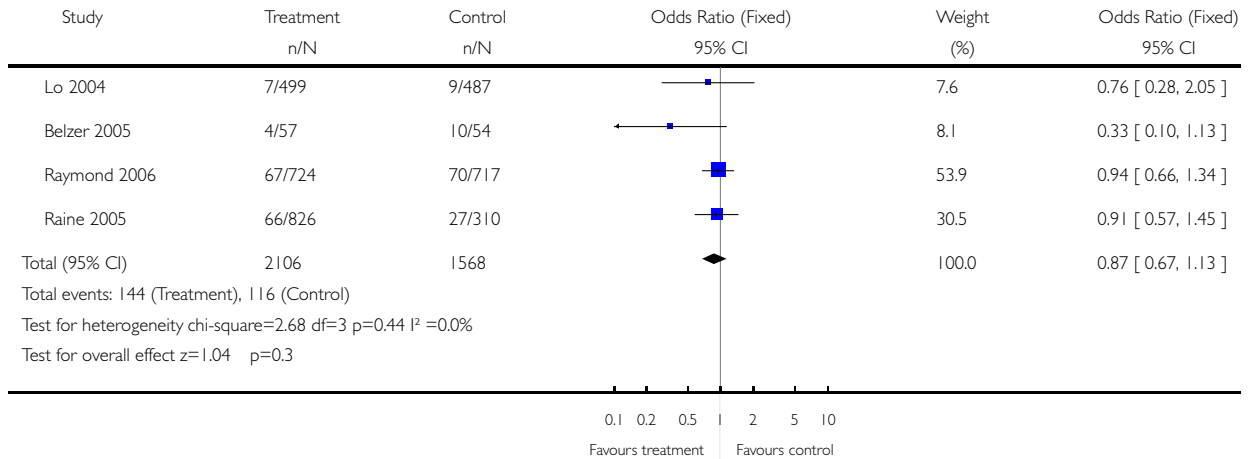


Analysis 01.04. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 04 Pregnancy for levonorgestrel regimens only

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 04 Pregnancy for levonorgestrel regimens only

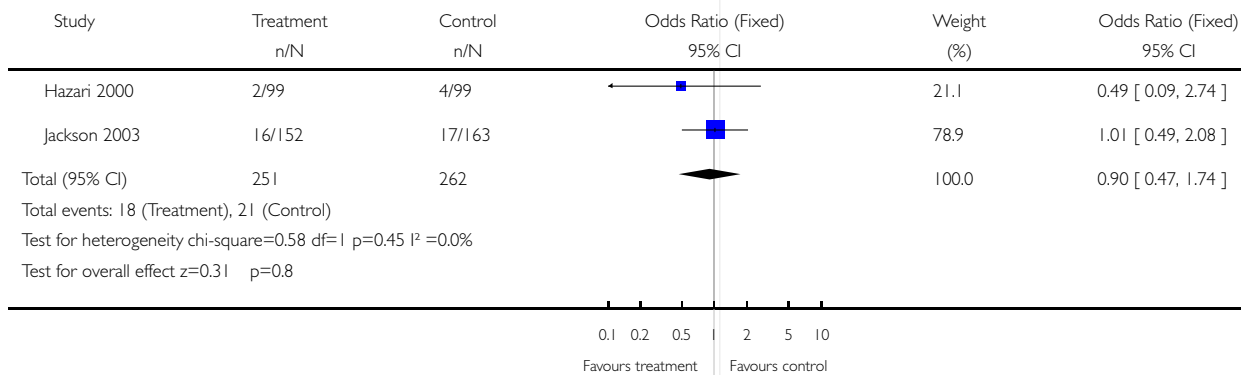


Analysis 01.05. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 05 Pregnancy for Yuzpe regimens only

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

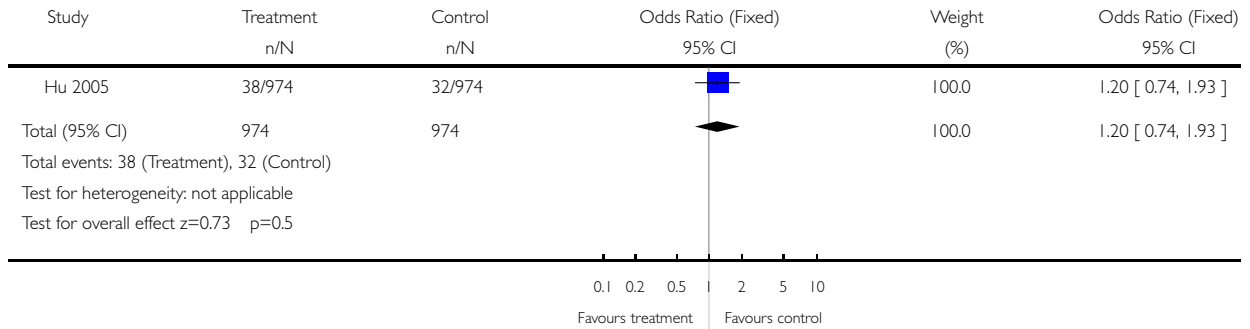
Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 05 Pregnancy for Yuzpe regimens only



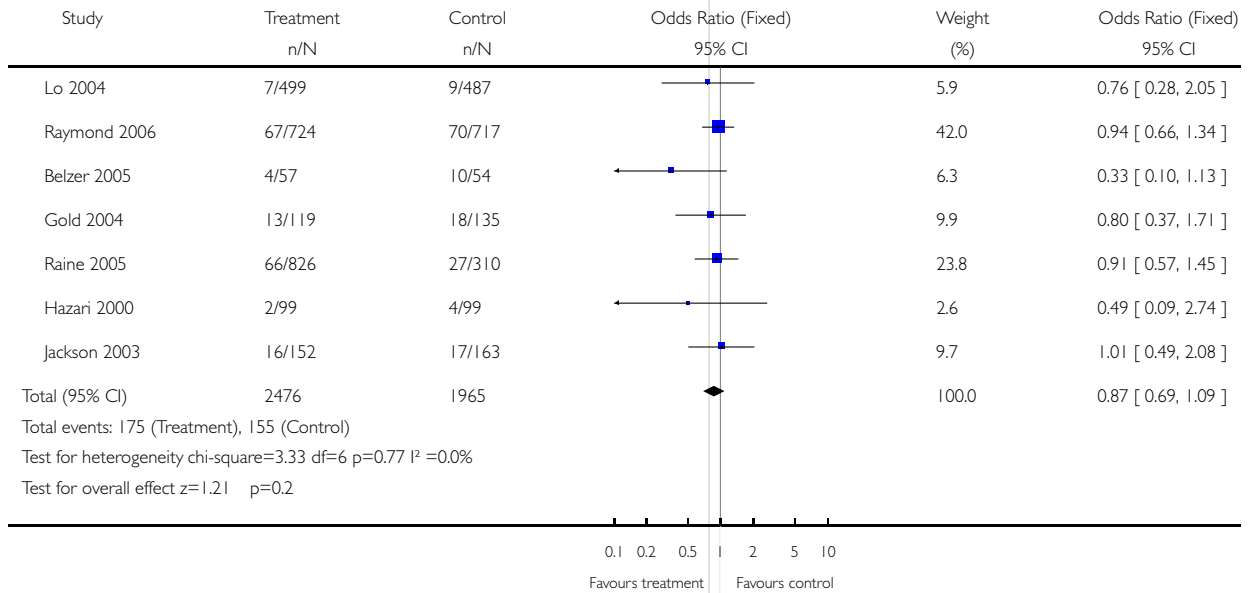
Analysis 01.06. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 06 Pregnancy for mifepristone regimens only

Review: Advance provision of emergency contraception for pregnancy prevention (full review)
 Comparison: 01 Advance provision vs. standard provision of emergency contraception
 Outcome: 06 Pregnancy for mifepristone regimens only



Analysis 01.07. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 07 Pregnancy for levonorgestrel or Yuzpe regimens

Review: Advance provision of emergency contraception for pregnancy prevention (full review)
 Comparison: 01 Advance provision vs. standard provision of emergency contraception
 Outcome: 07 Pregnancy for levonorgestrel or Yuzpe regimens

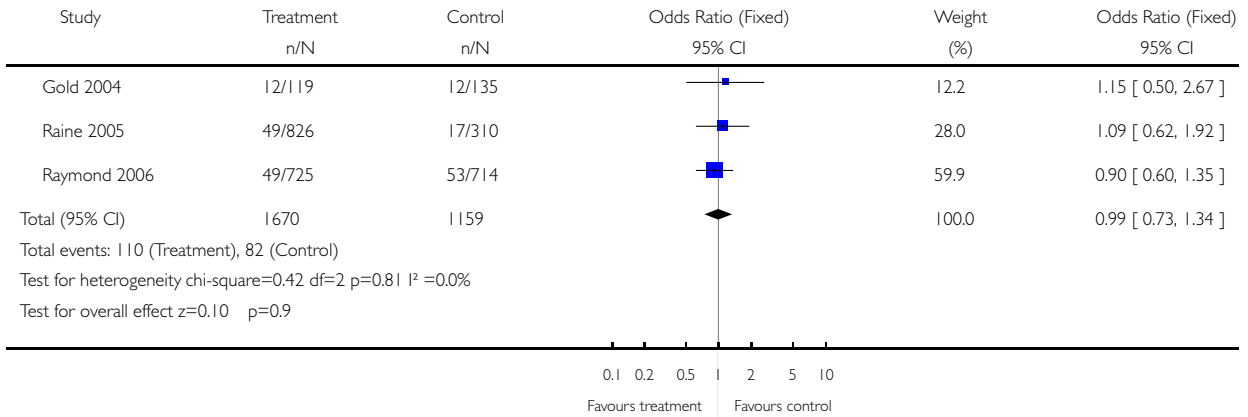


Analysis 01.08. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 08 Sexually transmitted infections

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 08 Sexually transmitted infections

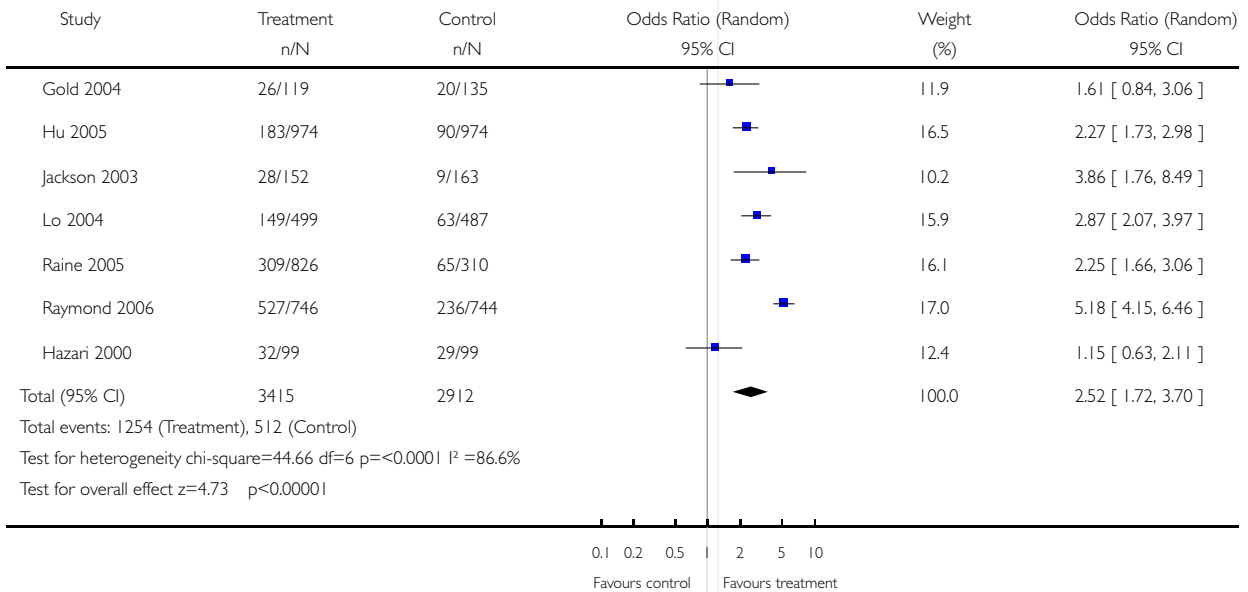


Analysis 01.09. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 09 Ever use of emergency contraceptives during trial

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 09 Ever use of emergency contraceptives during trial

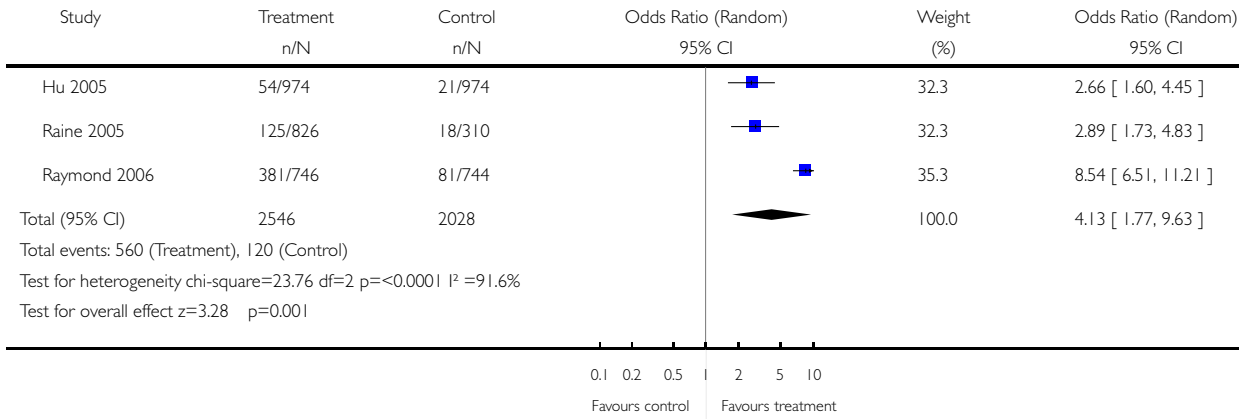


Analysis 01.10. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 10 Multiple uses of emergency contraceptives during trial

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 10 Multiple uses of emergency contraceptives during trial

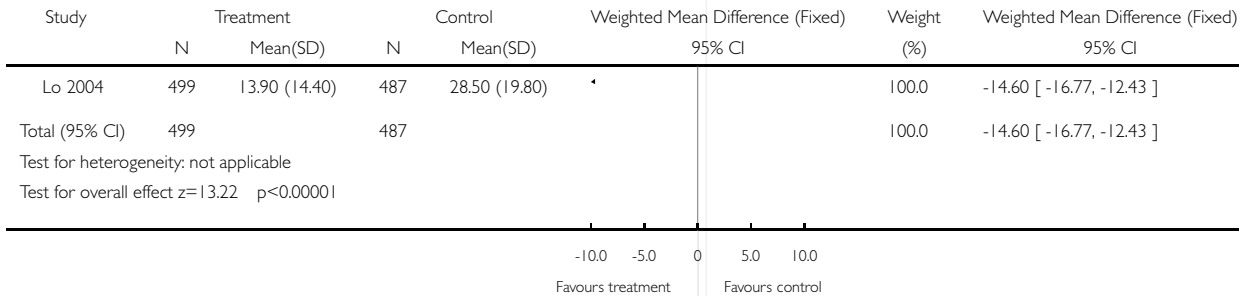


Analysis 01.11. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 11 Mean time interval between unprotected intercourse and use of emergency contraception

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 11 Mean time interval between unprotected intercourse and use of emergency contraception

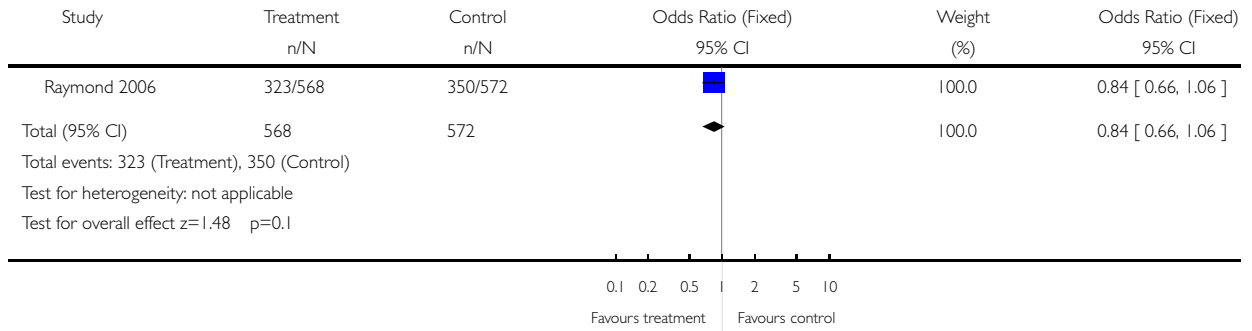


Analysis 01.12. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 12 Ever unprotected intercourse in past two weeks

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 12 Ever unprotected intercourse in past two weeks

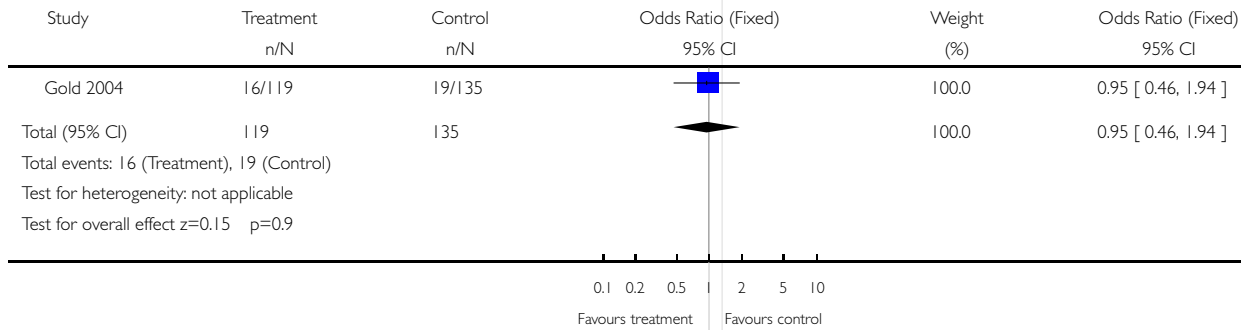


Analysis 01.13. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 13 Ever unprotected intercourse in past month

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 13 Ever unprotected intercourse in past month

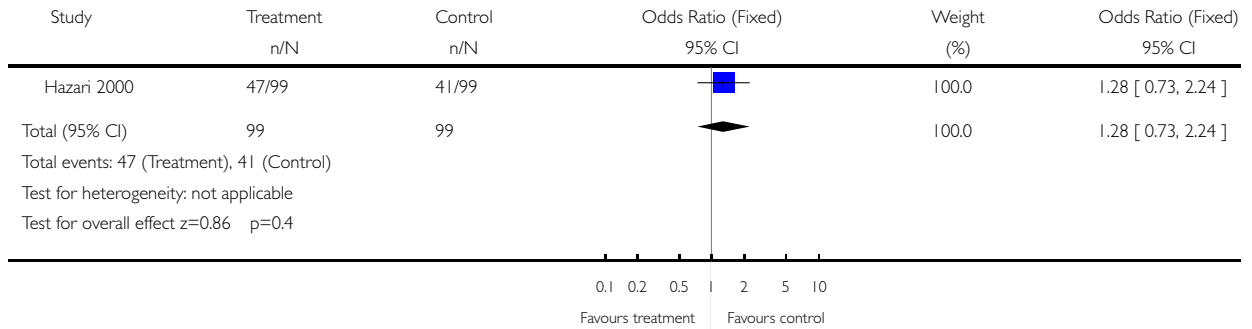


Analysis 01.14. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 14 Ever unprotected intercourse in past 3 months

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 14 Ever unprotected intercourse in past 3 months

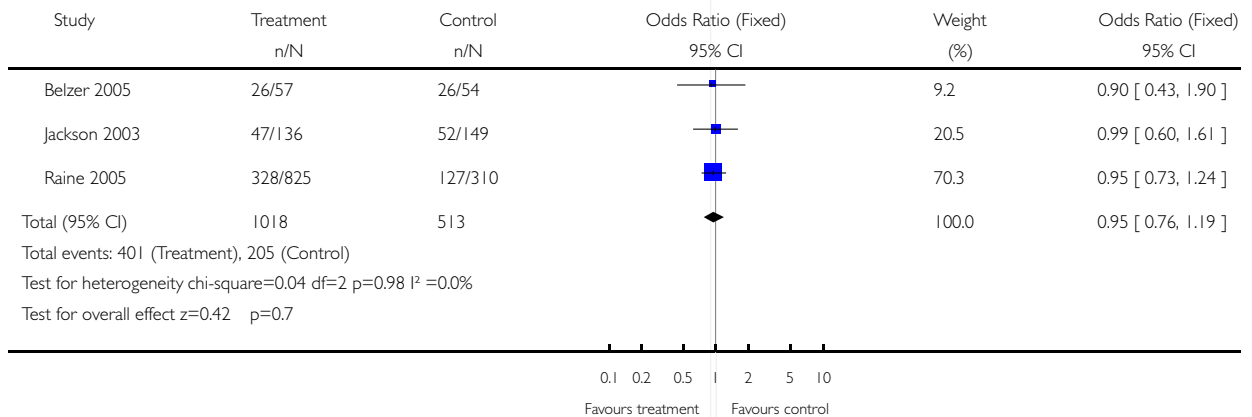


Analysis 01.15. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 15 Ever unprotected intercourse in past 6 months

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 15 Ever unprotected intercourse in past 6 months

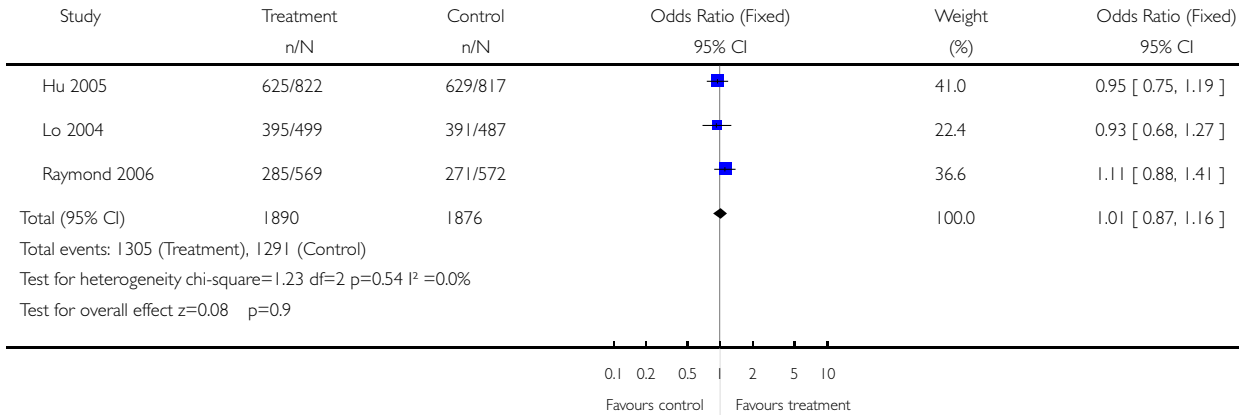


Analysis 01.16. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 16 Condom use at 12 months

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 16 Condom use at 12 months

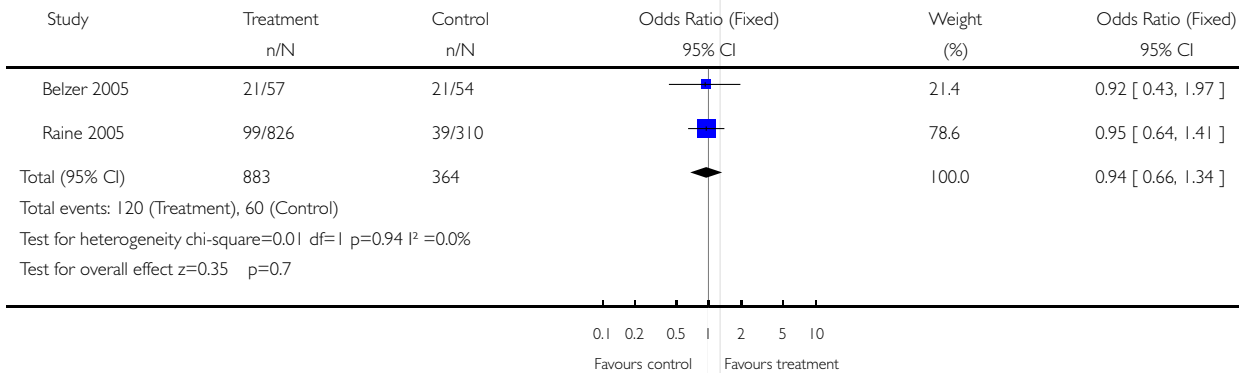


Analysis 01.17. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 17 Condom use at 6 months

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 17 Condom use at 6 months



Analysis 01.18. Comparison 01 Advance provision vs. standard provision of emergency contraception, Outcome 18 Condom use in last month

Review: Advance provision of emergency contraception for pregnancy prevention (full review)

Comparison: 01 Advance provision vs. standard provision of emergency contraception

Outcome: 18 Condom use in last month

