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Society of Family Planning Clinical Recommendation: Prevention of infection after abortion and pregnancy loss★,☆,☆☆

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ABSTRACT

This Clinical Recommendation serves as a revision to the Society of Family Planning's 2010 *Prevention of infection after induced abortion* guidance. It examines infection risk, identifiable risk factors, and prophylactic measures for the prevention of infection associated with procedural and medication management of abortion and pregnancy loss to make evidence-based recommendations for the clinical care of patients. The following are the Society of Family Planning's recommendations: We recommend clinicians test and treat patients for gonorrhea and chlamydia at the time of abortion if there is (1) high clinical suspicion, (2) a positive diagnosis, or (3) the pregnant individual is under 25 years old and due for routine screening according to Centers for Disease Control and Prevention's guidelines; clinicians should not delay abortion while awaiting diagnosis or treatment (GRADE 1C). We recommend against screening for bacterial vaginosis before abortion (GRADE 1C). Since the rate of infection is low for nonprocedural abortion and the number needed to treat is high, coupled with inherent risks associated with antibiotic use, we recommend against the use of universal antibiotic prophylaxis in the setting of medication abortion, medication management of early pregnancy loss, or self-managed abortion (GRADE 1C). We recommend universal antibiotic prophylaxis for patients undergoing procedural abortion across all gestational durations (GRADE 1A). For procedural management of pregnancy loss, we recommend antibiotic prophylaxis (GRADE 1A). We recommend clinicians initiate antibiotic prophylaxis for procedural abortion and procedural management of pregnancy loss before instrumentation to maximize efficacy (GRADE 1B). Antibiotics should be given with adequate time for absorption, but data on the optimal timing for prophylaxis are lacking. In the setting of osmotic cervical dilator use, there is insufficient evidence to recommend for or against routine antibiotic prophylaxis before osmotic cervical dilator placement. We recommend discontinuing antibiotic prophylaxis after the procedure is completed (GRADE 1B). We recommend a single dose of doxycycline 200 mg orally or azithromycin 500 mg orally before a procedural abortion or procedural management of pregnancy loss (GRADE 1B). Metronidazole is a second-line option as it has evidence to suggest a prophylactic effect despite being less effective than doxycycline or azithromycin against aerobic bacteria. We recommend against the use of fluoroquinolones for prophylaxis in the setting of procedural abortion or procedural management of pregnancy loss due to the increased risk of side effects and complications (GRADE 1B). There is insufficient evidence to recommend for or against vaginal preparation with a local antiseptic solution or to recommend a specific vaginal preparation regimen before procedural abortion or procedural management of pregnancy loss.

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1. Background

1.1. Purpose

The risk of upper genital tract infection after medication abortion or procedural abortion is rare, occurring in < 1% of most clinical settings in the United States [1–7]. Death associated with abortion is also very rare (overall 0.7 per 100,000 procedures), and when it occurs, approximately 30% are attributable to infection [8]. Some bacterial contamination is inevitable in procedures that access the endometrial cavity through the cervix [2]. This contamination generally arises from the polymicrobial environment of the lower genital tract, reaching the uterine cavity through ascending infection or by carriage of pathogenic bacteria on procedural instruments [3,4]. Infection prevention includes any intervention performed to avert infection. Evidence-based interventions may include (1) antibiotic prophylaxis before the procedure, (2) aseptic technique, (3) sterilization of instruments, (4) preparation of the surgical field, and (5) proper hand hygiene [1]. Medication and procedural management of abortion and EPL are identical processes, so the same principles apply to the prevention of infection in these clinical scenarios.

To appreciate the risks of infection after abortion, a distinction must be made between safe and unsafe abortion. Safe abortions are those where recommended methods are used by persons with the appropriate skills or training, including self-managed abortion (SMA) [5,6]. Unsafe abortions are those performed by persons lacking the necessary training and skills or those performed in an environment or with instruments that do not meet minimal medical standards. In a systematic review of 43 hospital-based studies of complications after abortion, the reported prevalence of infection associated with unsafe abortion was 24% [9], rather than the < 1% widely observed in a variety of clinical settings associated with safe abortion. It is difficult to interpret the accuracy of this statistic since unsafe abortion is performed outside of the formal health care system. Thus, many outcomes likely remain unrecognized and unreported, and the ones that are captured only include patients who were hospitalized.

This Clinical Recommendation serves as a revision to the Society of Family Planning's 2010 *Prevention of infection after induced abortion* guidance. It examines infection risk, identifiable risk factors, and prophylactic measures for the prevention of infection associated with procedural and medication management of abortion and pregnancy loss to make evidence-based recommendations for the clinical care of patients.

1.2. Definition of postabortion infection

Postabortion infection is defined by the pathologic presence of bacteria in the upper genital tract after abortion or pregnancy loss. Acute sequelae range from unplanned procedures, such as hysterectomy, sepsis, and death. Chronic postabortion infection sequelae can include dyspareunia, chronic pelvic pain, subsequent pregnancy loss, and infertility. Thus, rapid diagnosis and treatment of postabortion infection is paramount. The Centers for Disease Control and Prevention's (CDC) definition of pelvic inflammatory disease (PID) can be used as a general proxy to diagnose postabortion infection. This definition consists of pelvic or lower abdominal pain with no other identifiable cause and at least one of the following: cervical motion tenderness, uterine tenderness, or adnexal tenderness. Additional criteria can be used to enhance the specificity of the minimum clinical criteria and support a PID diagnosis: oral temperature > 38.3 °C (101 °F), abnormal cervical mucopurulent discharge or cervical friability, elevated C-reactive protein, elevated erythrocyte sedimentation rate, leukocytosis on saline microscopy of vaginal fluid, or neutropenia.

1.3. Principles of antibiotic prophylaxis for procedures

Bacterial contamination is inevitable in procedures that access the endometrium through the cervix. Clinically important bacterial contamination of the upper reproductive tract that poses a risk of infection following procedural instrumentation is preventable. The development of the aseptic technique has been associated with a dramatic decrease in infectious risk as it relates to procedural abortion. It is based on minimizing the introduction of exogenous bacteria into the upper genital tract. Antibiotic prophylaxis is defined as the "use of antibiotics before, during, or after a diagnostic, therapeutic, or surgical procedure to prevent infection complications" [10]. Universal antibiotic prophylaxis further reduces infectious risk; it is based on data showing that antibiotics in host tissues at the time of initial exposure to bacteria eliminate the introduced bacteria before they multiply and become pathogenic. Clinical studies have found that only a narrow window exists for prophylaxis; giving the prophylaxis too early does not benefit the patient, whereas delaying the prophylaxis after the start of the procedure decreases the effectiveness of the prophylaxis [8,11].

The features of antibiotics appropriate for use as prophylaxis are (1) low toxicity, (2) established safety record, (3) not routinely used for the treatment of serious infections, (4) spectrum of activity includes microorganisms most likely to cause infection, (5) reaches useful concentration in relevant tissues during the procedure, ideally at the start of the procedure, and (6) administered for a short duration.

2. Clinical questions

2.1. Does the presence of gonorrhea, chlamydia, or bacterial vaginosis impact care related to prevention of infection after abortion?

2.1.1. Gonorrhea and chlamydia

We recommend clinicians test and treat patients for gonorrhea and chlamydia at the time of abortion if there is (1) high clinical suspicion, (2) a positive diagnosis, or (3) the pregnant individual is under 25 years old and due for routine screening according to CDC guidelines; clinicians should not delay abortion while awaiting diagnosis or treatment (GRADE 1C) (Table 1) [12]. If there is clinical concern for cervicitis, diagnostic testing should be performed, and if clinical suspicion is high, empiric treatment should be provided.

★ **Disclaimer**: This publication is designed as a resource to assist clinicians in providing family planning care. It should not be considered inclusive of all proper treatments or serve as the standard of care. It is not intended to substitute for the independent professional judgment of the treating clinician. Variations, based on individual circumstances, may be appropriate. This publication reflects the best available evidence at the time of publication, recognizing that continued research or major changes in the practice environment may impact future recommendations and should be evaluated for incorporation into care. Clinical guidance, grounded in evidence-based research, is distinct from legal requirements and restrictions governing family planning care. Medical recommendations do not vary based on practice location. However, abortion is not legal in all states and circumstances, and this document is not intended to aid in or otherwise advocate for unlawful care. Any updates to this document can be found at https://societyfp.org/clinical/clinical-guidance-library/. The Society and its contributors provide the information contained in this publication "as is" and without any representations or warranties, express or implied, of any kind, whether of accuracy, reliability, or otherwise.

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Table 1
Key for GRADE recommendations[a]

Symbol	Meaning
1	Strong recommendation
2	Weaker recommendation
A	High-quality evidence
B	Moderate quality evidence
C	Low-quality evidence, clinical experience, or expert consensus
Best Practice	A recommendation in which either (1) there is an enormous amount of indirect evidence that clearly justifies a strong recommendation; direct evidence would be a challenging and inefficient use of time and resources to bring together and carefully summarize, or (2) a recommendation to the contrary would be unethical

[a] Society of Family Planning Clinical Recommendations use a modified GRADE system. The GRADE system is described in several publications, with a comprehensive set of articles in the Journal of Clinical Epidemiology (*J Clin Epidemiol*, (2011) 64:383–394, 64:395–400, 64:401–406, 64:407–415, 64:1277–1282, 64:1283–1293, 64:1294–1302, 64:1303–1312, 64:1311–1316, (2013) 66:140–150, 66:151–157, 66:158–172, 66:173–183, 66:719–725, 66:726–735).

Current infection with chlamydia or gonorrhea is associated with the risk of developing PID [13,14]. Thus, there is a theoretical concern that instrumentation through an actively infected cervix, such as with procedural abortion, could facilitate progression to PID. Further, the prevalence of these pathogens in patients presenting for abortion and early pregnancy loss (EPL) is higher than in the general population [15,16]. A cross-sectional study in a large public, urban hospital-based abortion clinic found that 9.6% of patients tested positive for chlamydia, and 1.9% tested positive for gonorrhea [15]. Similarly, in a cross-sectional study of patients presenting to the emergency department for EPL, 10.5% of patients tested positive for chlamydia, and 2.6% tested positive for gonorrhea [16]. Prevalence of these infections varies with demographic characteristics, with relatively higher prevalence measured in individuals who are adolescent, Black, use substances, are incarcerated, have multiple sexual partners or a new sexual partner, engage in transactional sexual practices, or have a previous history of a sexually transmitted infection (STI) [17,18]. These disparities are due to structural factors, including structural racism, rather than any biological or individual behavioral factors. Current literature shows that patients with known cervicitis have higher rates of postabortion infection than patients who do not. This does not necessarily implicate the abortion procedure for this increased risk of PID. In a 1984 cohort study of 1032 patients in Sweden who underwent first-trimester procedural abortion without prophylactic antibiotics, the presence of chlamydia before first-trimester abortion increased the risk of laparoscopically confirmed salpingitis by 30-fold (relative risk [RR] 30, 95% CI 11–85) and of endometritis (without salpingitis) by fourfold (RR 4.1, 95% CI 2.5–6.7) compared to patients without chlamydia [19]. In a randomized, double-blind trial analyzing the use of prophylactic doxycycline in 1077 patients undergoing procedural abortion, the presence of chlamydia increased the risk of PID by ninefold [20]. These studies reinforce that antibiotic prophylaxis is an insufficient treatment for patients with known cervicitis. Instead, patients with known gonorrhea or chlamydia need adequate antibiotic treatment for their infection rather than prophylaxis alone.

2.1.2. Bacterial vaginosis

We recommend against screening for bacterial vaginosis (BV) before abortion (GRADE 1C). BV is common, with a prevalence of approximately 30% in reproductive-age pregnant-capable persons globally [7]. BV is a clinical condition, often not associated with symptoms, in which the vaginal microbiome is dominated by diverse anaerobic species, including *Gardnerella vaginalis*, *Prevotella* species, *Mobiluncus* species, *Atopobium vaginae*, and other BV-associated bacteria, rather than by *Lactobacillus crispatus* and other non-*iners Lactobacillus* species [7]. BV is associated with increased risk for PID (adjusted hazard ratio 1.53, 95% CI 1.05–2.21) and acquisition and transmission of HIV and other STIs [21]. There is no direct evidence, however, that abortion alters the elevated risk of PID in patients with BV. Three randomized controlled trials have evaluated the use of metronidazole and clindamycin perioperatively for patients with diagnosed BV [22–25]. These studies showed no statistically significant differences in postabortion upper genital tract infection when comparing placebo to treatment groups in the setting of standard of care, including administration of prophylactic antibiotics before abortion. None of these studies used a full course of BV treatment before abortion. Another study used treatment dosing for patients with BV using metronidazole 500 mg three times daily orally for 10 days starting 7 days before the abortion procedure, which significantly reduced the risk of developing PID postprocedure [22]. However, these patients did not receive universal prophylactic antibiotics before abortion.

2.2. Does antibiotic prophylaxis lower the risk of infection following medication abortion, medication management of early pregnancy loss, SMA, procedural abortion, and procedural management of pregnancy loss?

2.2.1. Medication abortion and medication management of early pregnancy loss

We recommend against the use of universal antibiotic prophylaxis in the setting of medication abortion (GRADE 1C) given the baseline low risk of infection associated with medication abortion and the resulting large number needed to treat to prevent one serious infection, coupled with inherent risks associated with antibiotic use such as side effects, costs, and promotion of antimicrobial resistance.

In prospective studies of medication abortion before 13 weeks of gestation, postabortion infection is observed in approximately 0.01% to 0.5% [26,27]. Similarly, misoprostol-only protocols are effective with a similarly low risk of infection [28,29]. The risk of serious infections requiring hospitalization after medication abortion is even lower, with rates ranging from 0.03% to 0.09% [27,30]. Data on infections associated with medication abortion at and after 14 0/7 weeks of gestation are more limited. However, evidence suggests the risk is low and similar to the risk associated with medication abortion up to 13 6/7 [31–33]. No randomized controlled trials for the use of antibiotic prophylaxis in medication abortion have been published. A retrospective cohort study from the Planned Parenthood Federation of America found a decreased risk of infection after changing from vaginal to buccal administration of misoprostol. It showed an overall low attributable risk reduction (absolute risk reduction 0.02%). The baseline risk of serious infection was reduced from 0.093% to 0.025% when the misoprostol route was changed from vaginal to buccal. The risk was further reduced to 0.006% with routine antibiotic prophylaxis. It was shown that with this low attributable risk reduction, the number needed to treat is more than 5000 patients to prevent one serious infection, defined as an infection requiring intravenous antibiotics [30].

We recommend against the use of universal antibiotic prophylaxis for medication management of early pregnancy loss (GRADE 1C) given the similar safety and efficacy of mifepristone–misoprostol and misoprostol-only protocols used in the management of early pregnancy loss and medication abortion. Medication management of EPL using similar mifepristone–misoprostol or misoprostol-only protocols is

effective with similarly low rates of infectious complications. The benefit of antibiotic prophylaxis in medication management of EPL using mifepristone–misoprostol and misoprostol-only protocols has not been studied.

2.2.2. Self-managed abortion

We recommend against the use of universal antibiotic prophylaxis in self-managed medication abortion (GRADE 1C) given the limited benefit of antibiotic prophylaxis in medication abortion, as discussed. SMA refers to any action taken to end a pregnancy outside of the formal health care system and includes self-sourcing mifepristone or misoprostol, consuming herbs or botanicals, ingesting toxic substances, and using physical methods [6]. The most effective methods for SMA involve using the same medications as a facility-based medication abortion with mifepristone––misoprostol or misoprostol alone. The lifetime prevalence of SMA was estimated to be 7% in 2017. The prevalence is rising and will likely continue to rise as restrictions against facility-based care increase [34]. A retrospective review showed that among 2797 people undergoing SMA using mifepristone and misoprostol, 1.0% reported treatment for any serious adverse event, 0.5% received intravenous antibiotics (CI 0.3%–0.9%), and no deaths were reported [35]. The prevalence of these complications is similar to the prevalence reported with facility-based medication abortion [34–37]. Another retrospective record review of 1016 patients using misoprostol only for SMA showed similar rates of adverse events, where 2% of patients had one or more serious adverse events, and three patients (0.5%) received intravenous antibiotics [29]. SMA using mifepristone–misoprostol or misoprostol-only shows similar rates of infection as facility-based protocols of medication abortion.

2.2.3. Procedural abortion

We recommend universal antibiotic prophylaxis for patients undergoing procedural abortion across all gestational durations (GRADE 1A).

2.2.3.1. Before 14 0/7 weeks of gestation. In procedural abortions, routine use of antibiotic prophylaxis at the time of procedural abortion before 14 0/7 weeks of gestation significantly reduces the risk of upper genital tract infection [38]. A 2012 meta-analysis of 19 randomized controlled clinical trials evaluated the effect of antibiotic prophylaxis on postabortion upper genital tract infection. Of the studies evaluated, 15 of 19 studies compared an antibiotic regimen to placebo, three trials compared two alternative antibiotic prophylaxis regimens, and one trial compared a screen-and-treat strategy with universal antibiotic prophylaxis where patients were not excluded if they had genital infections at baseline. This meta-analysis showed an average reduction in postabortion upper genital tract infection by 41% (95% CI 25%–54%, random effects model) with the use of antibiotics at the time of first-trimester procedural abortion compared with placebo [38]. Screen-and-treat strategies, where all patients are initially tested for genital infections and treated only if positive for infections, have been evaluated to avoid unnecessary administration of antibiotics and provide an opportunity to screen for other STIs. In one study of 1672 patients randomized to screen-and-treat compared to universal prophylaxis, the incidence of postabortion upper genital tract infection was higher in patients in the screen-and-treat group (RR 1.53, 95% CI.99–2.36) [38]. The screen-and-treat strategy was shown to be more costly, less effective, and may delay care compared with universal prophylaxis [38,39]. Of note, universal prophylaxis does not provide sufficient treatment for chlamydia, gonorrhea, or BV. Appropriate screening according to CDC guidelines and testing for individuals with symptoms or clinical evidence of infection can identify patients and partners needing treatment [12].

2.2.3.2. At and after 14 0/7 weeks of gestation. Procedural abortions at and after 14 0/7 weeks of gestation are safe, with low complication rates of approximately 2.9% [40]. There are no studies available to evaluate the efficacy of antibiotic prophylaxis for procedural abortion via dilation and evacuation [41]. However, the principles of antibiotic prophylaxis are the same as those discussed before 14 0/7 weeks of gestation, and thus prophylaxis is likely beneficial. A cross-sectional survey to evaluate second-trimester practices of US clinicians found that most clinicians (80%) routinely give periprocedural antibiotics before dilator use according to guidelines by national organizations [42].

2.2.4. Procedural management of pregnancy loss

2.2.4.1. Before 14 0/7 weeks gestation. **We recommend antibiotic prophylaxis for procedural management of early pregnancy loss (GRADE 1A).** Infection is a serious consequence of procedural management of EPL, occurring at higher rates in low-income countries. It is estimated to occur in up to 30% of patients, compared with 6% in high-income countries [43]. The Antibiotics in Miscarriage Surgery (AIMS) trial was an international double-blind, placebo-controlled randomized trial that evaluated whether the use of preprocedural prophylactic antibiotics using doxycycline 400 mg orally and metronidazole 400 mg orally, reduced rates of pelvic infection in low- to middle-income countries. The primary outcome was pelvic infection within 14 days after procedural management of EPL with infection defined as the presence of at least two of four clinical features by CDC and WHO guidelines. The rate of pelvic infection based on pragmatic physician judgment criteria was not significantly lower in the antibiotic group (4.1%) compared with the placebo group (5.3% [RR 0.77, 95% CI 0.56–1.04; $p = 0.09$]). When infection was defined according to the a priori CDC and WHO criteria, the rate of pelvic infection was lower in the antibiotic prophylaxis group (1.5%) compared with the placebo group (2.6% [RR 0.60, 95% CI 0.37–0.96]) [44].

Further review of the results of the AIMS trial showed that antibiotic prophylaxis before procedural management of EPL results in fewer pelvic infections within 14 days of the procedure and lower costs compared with the practice of no antibiotic prophylaxis. This study demonstrated that antibiotic prophylaxis is a cost-effective intervention in the four low-income countries where the trial was conducted [43]. A limitation of the AIMS study and cost-effectiveness analysis is that approximately 70% of patients had a procedure with sharp curettage compared with 23% of patients who had a procedure with vacuum aspiration. In patients who underwent vacuum aspiration, infection was diagnosed in 1.3% of patients who received antibiotic prophylaxis compared with 4.1% of patients in the placebo group. In patients who had a sharp curettage procedure, infection was diagnosed in 5.3% of patients who received antibiotic prophylaxis compared with 6.0% of patients in the placebo group [44]. The higher prevalence of sharp curettage for procedural management in these clinical settings limits the generalizability of this study, as the routine use of sharp curettage is not recommended [5]. It also raises further consideration of changing practice as the use of vacuum aspiration may decrease infection rate compared with sharp curettage.

In a 2021 systematic review and meta-analysis of 24 randomized controlled trials, the risk of genital tract infection following procedural management of EPL was significantly lower among those who received prophylactic antibiotics compared to those who did not (RR 0.72, 95% CI 0.58–0.90) [45]. From these 24 trials, universal antibiotic prophylaxis before procedural management significantly reduced the risk of genital tract infection in patients from high-income countries (RR 0.67, 95% CI 0.53–0.84), yet there was no significant effect of reducing genital tract infections with antibiotics in patients in low- and middle-income countries (RR 0.90, 95% CI 0.50–1.62). There is strong evidence in high-income countries but low-quality

evidence in low- and middle-income countries to support universal antibiotic prophylaxis with procedural management of EPL. Significant limitations were noted in a review of the studies conducted in low- and middle-income countries. These studies were low-powered, had substantial heterogeneity between studies, and had significant variations in trial protocols, such as inclusion/exclusion criteria, antibiotics used, antibiotic dosages used, and prophylaxis starting time. Other factors considered by the study were whether low- and middle-income countries have higher antibiotic resistance that may reduce the effectiveness of antibiotic prophylaxis and concern for poor adherence or inadequate antibiotic doses. Further high-quality studies are needed in low- and middle-income countries to determine the effect of prophylactic antibiotics.

2.2.4.2. After 14 0/7 weeks of gestation. There are no data to inform infection prophylaxis in the setting of pregnancy loss or intrauterine fetal demise at or after 14 0/7, it is reasonable to apply the recommendations offered for procedural abortion at these gestation durations, as both are managed similarly.

2.3. When should antibiotics be given to prevent infection with procedural abortion or procedural management of pregnancy loss?

We recommend clinicians initiate antibiotic prophylaxis for procedural abortion and procedural management of pregnancy loss before instrumentation to maximize efficacy (GRADE 1B). Antibiotics should be given with adequate time for absorption, but data on the optimal timing for prophylaxis are lacking. Additional considerations for antibiotic timing include the antibiotic used and its peak concentration when administered (Table 2) [46]. Antibiotics given too early do not protect against bacteria introduced, and delaying antibiotics can result in ineffective prophylaxis. Well-conducted animal studies show that antibiotics given more than 3 hours after direct bacterial inoculation of surgical incisions have virtually no effect on reducing the incidence of infection [11]. In comparison, when animals were given prophylactic antibiotics either 1 hour before or at the time of incision, the animals had the same rate of infection as control animals that were either not inoculated with bacteria or were inoculated with killed bacteria [8]. A meta-analysis of different timing intervals of preoperative antibiotic prophylaxis showed that administration more than 2 hours before or after incision is associated with a higher risk of surgical site infections than administration < 2 hours before incision [46].

While there are limited studies analyzing antibiotic use in procedural abortion and procedural management of pregnancy loss, there are several randomized controlled trials that evaluate the timing of antibiotic prophylaxis with cesarean delivery. The data from these studies provide important principles of prophylaxis for preventing uterine infection to keep in mind when extrapolating for prophylaxis in procedural abortions, although, unlike cesarean delivery, there is no skin incision for procedural abortion. These studies have demonstrated a significant reduction in postsurgical infections, including endometritis, when the prophylactic antibiotics are administered before skin incision compared to after cord clamping [47–49]. A meta-analysis that further evaluated the timing of prophylactic antibiotics for cesarean delivery specifically found that preoperative administration, as compared to the administration following cord clamping, reduced postpartum endometritis by more than 50% (RR 0.47, 95% CI 0.26–0.85) [50]. In major abdominal and gynecologic surgery, prophylactic antibiotics are most effective when given within 1 hour before the surgical start [1].

Only one published study was identified that compared the timing of initiation of antibiotic regimens in patients undergoing procedural abortion [51]. This study assessed treatment regimens rather than pure antibiotic prophylaxis and varied both the regimen and the timing of administration, which challenges interpretation. They randomized 466 people undergoing first-trimester procedural abortion to one of three treatment regimens of prulifloxacin, a fluoroquinolone: (1) a 3-day course starting one day before and continuing 2 days after the abortion, (2) a 3-day course starting immediately postprocedure, and (3) a 5-day course starting immediately postprocedure. Patients were equally distributed based on age, parity, prior delivery type, and history of EPL. Infection was diagnosed in 2.5%, 7.1%, and 10.5% of patients in each group, respectively ($p < 0.05$), demonstrating the critical importance of adherence to the principle that prophylaxis be initiated before instrumentation.

In the setting of osmotic cervical dilator use, there is insufficient evidence to recommend for or against routine antibiotic prophylaxis before osmotic cervical dilator placement. The use of osmotic cervical dilators confers a theoretical concern for bacterial contamination from the upward migration of vaginal and cervical flora. There have been isolated reports of serious infection or anaphylaxis with osmotic cervical dilators [52]. However, these reports were not attributed to problems with sterilization, placement, or retrieval of the osmotic cervical dilators. Reports of infection attributable solely to osmotic devices are uncommon [52]. Given the theoretical risk of introducing bacteria at the time of tissue injury, antibiotic prophylaxis at the time of osmotic cervical dilator placement may be effective in limiting bacterial load prior to additional instrumentation for the abortion procedure. The use of antibiotic prophylaxis prior to osmotic cervical dilators should not replace the use of antibiotic prophylaxis prior to abortion procedure. Further studies are needed to evaluate the use of antibiotic prophylaxis and appropriate antibiotic regimens for osmotic cervical dilator use in cervical preparation.

We recommend discontinuing antibiotic prophylaxis after the procedure is complete (GRADE 1B). The principle of prophylaxis is that a single dose provides protection at the time of surgical exposure when there is potential vulnerability to pathogens. A placebo-controlled doxycycline study found that 100 mg before the procedure followed by 200 mg immediately after the procedure lowered the risk of infection by 87% [20]. In this study, the author chose to delay most of the doxycycline until after the procedure due to the nausea caused by the drug. No studies have specifically compared the length of antibiotic treatment for procedural management of pregnancy loss.

Because no studies have been identified to determine the optimal time to administer these antibiotics, the principles of antibiotic prophylaxis and pharmacokinetics of each antibiotic should be considered for each antibiotic. The pharmacokinetics of commonly used antibiotics for procedural abortions are listed in Table 2. The peak serum concentrations for each listed antibiotic are within 1 to 4 hours, but the minimum inhibitory concentration is likely reached sooner [53]; antibiotics can thus likely be administered within an hour of the procedure with good efficacy.

Table 2
Commonly used antibiotic regimens and characteristics for procedural abortion infection prophylaxis

Antibiotic	Peak concentration	Half-life	Recommended dosage
Azithromycin	2–3 h	68–72 h	500 mg once oral
Doxycycline	1.5–4 h	18–22 h	200 mg once oral
Metronidazole	1–2 h	8 h	500 mg once oral

2.4. Which antibiotics are optimal to prevent postabortion infection in procedural abortion?

We recommend a single dose of doxycycline 200 mg orally or azithromycin 500 mg orally before a procedural abortion or procedural management of pregnancy loss (GRADE 1B). Metronidazole is a second-line option as it has evidence to

suggest a prophylactic effect despite being less effective than doxycycline or azithromycin against aerobic bacteria. We recommend against the use of fluoroquinolones for prophylaxis in the setting of procedural abortion or procedural management of pregnancy loss due to the increased risk of side effects and complications (GRADE 1B).

While multiple antibiotics have demonstrated benefit in preventing postabortion infection, few studies have directly compared various antibiotics. The Cochrane review on first-trimester abortions included independent studies of nitroimidazoles, tetracyclines, beta-lactams, fluoroquinolones, macrolides, and glycosides [38]. In non-direct comparison across studies, nitroimidazoles, penicillins, and tetracyclines were shown to be efficacious against placebo for patients regardless of the subgroup analyzed. This included patients with a history of PID, with no reported history of PID, and patients who tested positive for chlamydia at the time of the procedure [38]. Two studies compared the efficacy of various timing and durations of the same antibiotic (prulifloxacin and doxycycline, respectively) [51,54]. Only one study compared two different antibiotics to each other [55]. None of the studies in this review were conducted in low- or middle-income countries [38].

A Canadian study assessed over 50,000 cases of people from 2001 to 2006 undergoing procedural abortion. People at high risk of infection were screened for STI and given a prophylactic dose of both azithromycin and metronidazole compared to the control group who received a prophylactic dose of metronidazole [56]. The screening measures identified 69% with chlamydia infection [56] and that the antibiotic regimen was associated with a low rate of postoperative infection rate (0.12%), but this study was limited by a low follow-up rate of 27% [56] that may bias the results.

Doxycycline and azithromycin are commonly used given their broad spectrum of activity against aerobic and anaerobic bacteria, low reports of side effects or severe allergic reactions, and cost-effectiveness [57,58]. The most common side effects of both antibiotics are nausea, vomiting, and diarrhea [57]. Doxycycline as prophylaxis should be given as a single-dose regimen as it is rapidly absorbed, showing up in the bloodstream as soon as 15 minutes after oral administration. It has a peak concentration after about 2 hours and a half-life of about 18 hours [57]. Azithromycin as prophylaxis is given as a single-dose regimen with peak concentrations within 2 hours and a half-life of 2 to 4 days. Rarely, azithromycin can cause QTc prolongation and hepatotoxicity [59].

Metronidazole is another commonly used prophylactic antibiotic as a single-dose regimen due to its efficacy against a wide range of anaerobic bacteria [56,60]. Peak concentrations are reached around 1 hour after oral and intravenous formulation administration, and the half-life is relatively short at 8 hours [61]. However, metronidazole notably has no coverage against aerobic bacteria compared to the broad-spectrum capabilities of doxycycline and azithromycin. Despite this, six studies identified in the Cochrane review compared nitroimidazoles to placebo and found strong evidence of prophylactic effect. Of these, all but one trial excluded or treated people with gonorrhea, and two trials excluded or treated people with chlamydia, thus raising concerns about generalizability.

Only one study examined the use of prulifloxacin, a fluoroquinolone, which was shown to be effective [51]. Common side effects of fluoroquinolones include nausea, vomiting, diarrhea, aortic rupture, retinal detachment, and tendon rupture [62,63]. They are associated with higher rates of *Clostridium difficile* infection and higher rates of resistance compared to other antibiotics [64].

2.5. What are the risks of antibiotic prophylaxis for procedural management of abortion and pregnancy loss?

The use of antimicrobial prophylaxis is not without consequences. The most significant concern is that of bacterial resistance [65]. There may be additional concern for allergic reactions, ranging from minor rashes to anaphylaxis, and side effects, such as nausea and vomiting, as discussed in question 2.4 [65]. Longer duration of use generally increases these risks [65]. Appropriate medical screening of prior medication allergy and counseling on antibiotic side effects can limit associated risks.

2.6. Is vaginal preparation with a local antiseptic solution effective in preventing infection at the time of procedural abortion?

There is insufficient evidence to recommend for or against vaginal preparation with a local antiseptic solution or to recommend a specific vaginal preparation regimen before procedural abortion or procedural management of pregnancy loss. Local application of antiseptic solution to the cervix and vagina is common practice to reduce the risk of infection with procedural abortion. It is usually assumed that vaginal preparation with antibacterial solutions is beneficial, but data to support this conclusion is lacking. Generally, povidone-iodine or chlorhexidine gluconate is used for vaginal and cervical preparation. For vaginal application, povidone-iodine is currently the only US Food and Drug Administration-approved antiseptic agent. Chlorhexidine is another safe vaginal antiseptic but can have increased vaginal irritation compared with povidone-iodine.

A double-blind, randomized controlled trial chlorhexidine for vaginal preparation before first-trimester procedural abortion was performed in Sweden [66]. After vulvar cleaning with 4% chlorhexidine, participants were then randomized to routine of 0.05% chlorhexidine vaginal cleansing (n = 246) or no vaginal cleansing (n = 240), and people with positive chlamydia or BV cultures were excluded. In the vaginal cleansing group, 9 (3.7%) had suspected post procedure infection compared with 12 (5.9%) in the no vaginal cleansing group, and the difference was not statistically significant. There was also no difference in rates of *Candida*, BV, or urinary tract infections. Another similar double-blind, randomized controlled trial compared the frequency of postprocedure infection in first-trimester procedural abortion among patients who underwent vaginal cleansing with 0.05% chlorhexidine (n = 305) versus vaginal cleansing with saline (n = 378) [67]. In the chlorhexidine group, 21 (5.6%) had suspected postprocedure infection compared with 16 (4.6%) in the saline group, and the difference was not statistically significant. Of note, no participants in either of these studies received preprocedure antibiotic prophylaxis.

No studies have directly compared vaginal chlorhexidine gluconate to povidone-iodine in the setting of abortion. However, literature examining the effect of these agents in the setting of gynecologic procedures can be used to inform procedural abortion care given that the principles of infection prevention are similar in both settings. Multiple recent studies have shown that vaginal chlorhexidine is superior to povidone-iodine for preventing infection for major gynecologic surgery. A randomized control trial of 10% povidone-iodine and 4% chlorhexidine gluconate before hysterectomy showed that 30 minutes after vaginal cleansing, the povidone-iodine group had 6.1 times RR of contamination compared to the chlorhexidine gluconate group [68]. Therefore, if vaginal preparation is used for procedural abortion, chlorhexidine is likely more effective than povidone-iodine but may cause more irritation.

3. Summary of recommendations

- We recommend clinicians test and treat patients for gonorrhea and chlamydia at the time of abortion if there is (1) high clinical suspicion, (2) a positive diagnosis, or (3) the pregnant individual is under 25 years old and due for routine screening according to CDC guidelines; clinicians should not delay abortion while awaiting diagnosis or treatment (GRADE 1C).

- We recommend against screening for bacterial vaginosis before abortion (GRADE 1C). Symptomatic patients with bacterial vaginosis should be treated, and abortion should not be delayed while awaiting treatment.
- We recommend against the use of universal antibiotic prophylaxis in the setting of medication abortion, medication management of early pregnancy loss, or self-managed abortion (GRADE 1C).
- We recommend universal antibiotic prophylaxis for patients undergoing procedural abortion across all gestational durations and for procedural management of pregnancy loss (GRADE 1A).
- We recommend clinicians initiate antibiotic prophylaxis for procedural abortion and procedural management of pregnancy loss before instrumentation to maximize efficacy (GRADE 1B). Antibiotics should be given with adequate time for absorption, but data on the optimal timing for prophylaxis are lacking.
- In the setting of osmotic cervical dilator use, there is insufficient evidence to recommend for or against routine antibiotic prophylaxis before osmotic cervical dilator placement.
- We recommend discontinuing antibiotic prophylaxis after the procedure is complete (GRADE 1B).
- We recommend a single dose of doxycycline 200 mg orally or azithromycin 500 mg orally before a procedural abortion or procedural management of pregnancy loss (GRADE 1B). Metronidazole is a second-line option as it has evidence to suggest a prophylactic effect despite being less effective than doxycycline or azithromycin against aerobic bacteria.
- We recommend against the use of fluoroquinolones for prophylaxis in the setting of procedural abortion or procedural management of pregnancy loss due to the increased risk of side effects and complications (GRADE 1B).
- There is insufficient evidence to recommend for or against vaginal preparation with a local antiseptic solution or to recommend a specific vaginal preparation regimen before procedural abortion or procedural management of pregnancy loss.

4. Recommendations for future research

- Effectiveness of antibiotic prophylaxis and timing of prophylaxis with osmotic cervical dilator placement. Antibiotic use in the setting of amniotic membrane rupture after osmotic cervical dilator placement. Antibiotic prophylaxis in the setting of abortion for periviable premature rupture of membranes.
- Comparisons of prophylactic effectiveness between various antibiotics, particularly doxycycline, metronidazole, and azithromycin.
- Tissue concentrations of antibiotics within the cervix after antibiotic administration.
- Effectiveness of vaginal preparation using antiseptics before abortion or osmotic cervical dilator placement.

5. Sources

A series of clinical questions was developed by the authors and reviewed by representatives from the Society of Family Planning's Clinical Affairs Committee. We searched the PubMed program of the National Library of Medicine and the Cochrane Library of Clinical Trials to identify relevant articles published between 2010 and July 15, 2023. Search terms included, but were not limited to infection, reproductive tract, genital tract, abortion, induced abortion, spontaneous abortion, SMA, EPL, antibiotic prophylaxis, infections, and health equity. The search was restricted to articles published in the English language. We also identified studies by reviewing the references of relevant articles and clinical guidelines published by organizations or institutions with related recommendations, such as the US Centers for Disease Control and Prevention, the American College of Obstetricians and Gynecologists, and the Society of Family Planning. The content of and references cited in relevant product labels and FDA prescribing information were also considered when developing critical statements on topics involving medications. When relevant evidence was unavailable or was too limited to inform practice, the expert opinion of clinicians with expertise in complex family planning was used to develop the critical statements.

6. Intended audience

This Clinical Recommendation is intended for Society of Family Planning members, family planning and reproductive health service clinicians, family planning and reproductive health researchers, consumers of family planning care, and policymakers.

Authorship

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