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CLINICAL REVIEW

Abortion

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Every year, millions of women around the world decide to end a pregnancy through abortion (defined as removal of a fetus or embryo from the uterus before the stage of viability[1]). The global abortion rate is estimated at 28 per 1000 women of childbearing age but varies by and within regions.[2] For example, western Europe has the lowest subregional rate at 12 abortions per 1000 women but eastern Europe has the highest at 43 per 1000.[2] About 185 000 abortions are performed for residents of England and Wales annually—16.5 per 1000 women aged 15-44 years.[3]

Worldwide, just under half of all pregnancies are unintended and half of these end in abortion.[4] The reasons women give for choosing abortion over adoption or parenthood are complex. Common themes include an understanding of the responsibilities of parenthood, financial constraints, and lack of partner support.[4] Teenagers, economically disadvantaged women, and those who did not suspect they were pregnant or who face barriers to services are more likely to undergo abortion in the second trimester.[5 6]

A small but important proportion of abortions are performed for serious maternal medical conditions or fetal indications. Most terminations for fetal anomaly occur during the second trimester, before fetal viability. In rare circumstances, they are performed later in pregnancy. In England and Wales, 1-2% of terminations are performed on the basis of fetal anomaly, of which 0.1% occur after 24 weeks' gestation.[3]

Modern medical and surgical abortion methods are highly effective, with a low risk of complications. Several randomised trials and systematic reviews, as well as national and international guidelines, are available to support evidence based decision making.[7 8] Here, we review the management of women seeking abortion up to 24 weeks' gestation. Abortion for fetal or maternal indications or where abortion is legally restricted is not considered in detail.

Who can perform abortions?

The stipulation that only doctors can perform abortions is a feature of many abortion laws and public health policies. This may reflect the skills needed to conduct the medical and surgical procedures available at the time that the regulations were drafted or attempts to protect the public from untrained practitioners. Unfortunately, many countries have a shortage of doctors trained or willing to provide abortions, which means that this requirement can be a barrier to abortion care.

Sharing the provision of abortion with other types of clinicians can increase access and cost effectiveness without compromising performance. Randomised trials and cohort studies have found that midlevel providers (such as midwives, nurses, and physician assistants) can provide first trimester surgical and medical abortion with equivalent outcomes to doctors.[9 10] A few countries (South Africa, Vietnam, Bangladesh, Cambodia, and Mozambique) and some American states allow midlevel providers to perform first trimester surgical abortion, but more task shifting has occurred with medical abortion. Medical abortion may be entirely provided by midwives, as in Sweden, or organised to minimise the doctor's role, as in France and the United Kingdom.[11]

Although not all clinicians will choose to provide abortions, given the incidence of unplanned pregnancy, most are likely to encounter patients who need or have had an abortion. Doctors with a conscientious objection to abortion have an ethical duty to advise women of their position and refer them promptly to a clinician who has no such objection.[12]

What is the role of counselling before abortion?

Most women will have decided to have an abortion before seeking medical help and will be certain about their decision.[13] Such women need only an explanation of abortion options and prompt referral for treatment. Compulsory counselling is not recommended because it may be viewed as intrusive and delays treatment.[7] For those who seek out a discussion with a clinician or are ambivalent, a non-judgmental exploration of the meaning of the pregnancy in the context of the woman's life and her options can help facilitate an informed choice.[13]

The normal range of emotions that women experience during and after abortion includes relief, sadness, anger, guilt, and regret.[14] However, the likelihood of adverse mental health outcomes after an abortion is no greater than if a woman continues an unintended pregnancy and is most reliably predicted by a history of mental health problems.[15] The most

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Summary points

- Abortion is a common feature in the reproductive lives of women around the world
- Most women seeking an abortion have made their decision before consulting with a healthcare provider and require unbiased information and prompt referral for services
- Medical and surgical abortions are both highly effective, with low rates of complications; a choice of procedures should be offered
- Uncomplicated abortions are not associated with long term psychological or physical sequelae
- Women who wish to use a contraceptive method after abortion should start as soon as possible after the abortion and preferably on the day of the procedure

Sources and selection criteria

We based this article on peer reviewed original research, systematic reviews, and meta-analyses identified through PubMed, the Cochrane Database, and personal archives. Searches were limited to publications in English. We prioritised randomised trials and systematic reviews and also consulted evidence based guidelines.

common emotions that women expect to feel after abortion are relief (63%) and confidence (52%), but 3% anticipate coping poorly.[16] Supportive counselling before and after an abortion should therefore be available for those who request it.[7]

What medical assessment is required?

The first step, which can be completed by a general practitioner if consulted, is to confirm that the woman is pregnant by establishing a history of amenorrhoea and early pregnancy symptoms such as nausea, breast tenderness, and fatigue or by documenting a positive urine pregnancy test. Further medical assessment by the abortion provider should focus on determining the gestational age, whether any contraindications to choice of method or anaesthesia exist, and if the abortion needs to be performed in hospital.

The duration of pregnancy is often established by ultrasound if readily available. However, if not available, this should not be a barrier to service provision because its routine use does not improve the safety or efficacy of abortion.[17] The date of the last menstrual period and a pelvic examination are sufficient in most cases, with the selective use of ultrasound if there is a discrepancy between the last menstrual period and uterine size or if ectopic pregnancy is suspected.

The clinical history should include a review of general health; observations; height and weight; allergies; obstetric and gynaecological history, including previous ectopic pregnancy and sexually transmitted infections; and a history of relevant medical conditions and drugs. Indications for treatment in hospital include conditions that necessitate prolonged or intensive monitoring, such as severe cardiopulmonary disease, and those that place the woman at high risk of haemorrhage, such as placenta accreta or coagulopathy. Some conditions, such as obesity or uterine anomalies including large fibroids, can make surgical abortion more challenging so prior knowledge is useful for procedure planning.

Routine laboratory testing is not a prerequisite for abortion services.[7] Measuring haemoglobin or haematocrit levels may be useful if there is a concern for haemorrhage. Tests for rhesus (Rh) blood group should be provided when feasible.[7] A structured review found little evidence for isoimmunisation at the time of first trimester abortion.[18] Despite the weak evidence to support the use of rhesus immunoglobulin after early abortion, its administration involves little risk and there is theoretical evidence of its necessity. Therefore, most services in high resource settings obtain evidence of rhesus (D) antigen status regardless of gestational age and give anti-D immunoglobulin to Rh negative women.[7 8]

Opportunistic screening for sexually transmitted infections, including HIV, or abnormal cervical cytology may also be performed.

What methods are available?

Surgical abortion

Vacuum aspiration is the recommended method of first trimester surgical abortion because of its superior efficiency, effectiveness, and safety compared with sharp curettage.[7 8] Either an electric or manual vacuum device can be used; manual devices use a valve and locking plunger in a 60 mL handheld syringe. A systematic review of randomised trials found no differences between techniques in terms of complications or patient satisfaction.[19] Some providers find manual aspiration less acceptable after nine weeks' gestation because the device must be emptied many times to complete the procedure.[19]

Administration of 400 µg of the prostaglandin analogue misoprostol sublingually for two hours or vaginally for three hours before surgery softens and dilates the cervix.[20] This leads to a slightly faster aspiration but may also cause side effects such as pain and bleeding.[20] One placebo controlled randomised trial found a decrease in cervical lacerations (four fewer/1000) and decreased need for uterine re-evacuation (15 fewer/1000) in women who received misoprostol.[21] However, given the rarity of complications with vacuum aspiration, the benefit of its routine use remains unclear.

Dilatation and evacuation is performed from 14-15 weeks' gestation. The cervix is prepared several hours to one or more days before specialised forceps are used to remove the fetus and placenta. Misoprostol can be used for cervical ripening, although a Cochrane review of randomised trials found that osmotic dilators provide superior cervical dilatation throughout the second trimester and a greater reduction in procedure time in the early second trimester.[22] Two types of osmotic dilators are available: laminaria made of compressed seaweed and Dilapan-S made of polyacrylate based hydrogel. After insertion into the cervical canal, these devices swell to cause expansion of the os. They also induce the release of natural prostaglandins and lead to cervical softening.

Hysterotomy and hysterectomy are outdated methods used only when a transcervical approach is not possible—for example, when the cervix is obstructed by a large tumour.

Medical abortion

The development of simple highly effective drug regimens for abortion has transformed abortion care in the past 30 years. Use of the progesterone antagonist RU-486 (now known as

mifepristone) followed by misoprostol is the most efficacious, well tolerated, and cost effective regimen in the first and second trimesters.[23 24] Misoprostol can be used alone but is less effective.

On the basis of randomised trials, the recommended regimen up to 63 days' gestation is mifepristone 200 mg orally, followed 24-48 hours later by misoprostol 800 µg, administered by the buccal, vaginal, or sublingual routes.[7 8] Most women abort two to six hours after administration of misoprostol. A meta-analysis of randomised trials found no difference in overall efficacy with an interval between mifepristone and misoprostol of 0-72 hours, but there was a trend towards slightly lower success rates with intervals of less than eight hours.[25]

Medical abortion protocols typically require women to take mifepristone in the clinic, and in some countries, such as the UK, there are legal restrictions on the places where both mifepristone and misoprostol can be given. In a study where women had a choice of clinic versus home use of mifepristone, there were no differences in rates of efficacy or complications between groups, but women who took the drug at home were more likely to say they would choose that option again and to recommend it to a friend.[26] Women can also safely and effectively self administer misoprostol at home and manage the abortion themselves. A systematic review of prospective cohort studies across countries found no differences in effectiveness or satisfaction between women who chose home based medical abortion and those who returned to the clinic and stayed several hours after taking misoprostol.[27]

Information must be provided about pain management, vaginal bleeding, and the expulsion of products of conception after misoprostol use, as well as the signs of possible complications and whom to contact should they occur. Vaginal bleeding that soaks more than two sanitary pads for two consecutive hours; temperature persistently greater than 38°C; severe abdominal pain unrelieved by analgesics; nausea, vomiting, or diarrhoea that continues more than 24 hours after misoprostol administration; and persistent pregnancy symptoms one to two weeks after drug use are indications to contact a health professional for advice.

In studies of medical abortion after nine weeks' gestation, women returned to the health facility for administration of misoprostol and remained until the pregnancy was expelled. The regimen for which there is the most evidence is 200 mg mifepristone administered orally, followed 36-48 hours later by a single 800 µg dose of misoprostol given vaginally and then 400 µg every three hours until delivery. In a consecutive series of 1002 women at 13-21 weeks' gestation, 97% aborted within five doses of misoprostol and the median induction to abortion time was 6.25 h (range 0-67.5).[28]

Contraindications to the use of mifepristone-misoprostol include chronic adrenal failure, inherited porphyria, previous allergic reaction to mifepristone or misoprostol, and known or suspected ectopic pregnancy. Because mifepristone is also an antiglucocorticoid, caution and clinical judgment are needed for women using corticosteroids long term. Mifepristone blocks negative feedback mechanisms that control cortisol secretion. Therefore, in women with adrenocorticotrophin-adrenal suppression, exposure to mifepristone may reduce the effectiveness of corticosteroids or interfere with steroid management of exacerbations—for example, in women with severe poorly controlled asthma.[29] The quality of this evidence is low—data come from experimental and animal studies only.

Which method of abortion is preferable?

The determinants of preference for an individual woman are not always clear. Some prefer surgical methods because they are quick, can be performed with a general anaesthetic, and have a low risk of complications. Others prefer medical abortion because it does not involve surgical instrumentation or anaesthesia and is perceived to be more natural. The small number of randomised trials available found that medical abortion was less acceptable than surgical abortion mainly due to greater pain and prolonged or heavier bleeding.[30 31] However, cohort studies have shown that acceptability and satisfaction with either method is greatest when women are able to receive the type of abortion they want.[32] Thus, it is recommended that services with appropriately trained providers make both methods available at all gestational ages for which abortion is offered.[7 8]

How is pain managed during abortion?

Pain management options for vacuum aspiration include general anaesthesia and local cervical anaesthesia, with or without oral or intravenous analgesics and sedatives. Second trimester surgical procedures are usually conducted with general anaesthesia. Advantages of local anaesthesia include lower cost; faster recovery; a greater sense of control for the woman; and a reduction in procedural risks, such as haemorrhage and cervical laceration.[33] Local anaesthesia does not eliminate discomfort, however, and some women may find being awake unacceptable. Women's preference, risk factors for anaesthetic complications, setting, and resources should be considered when choosing a method of pain control during surgical abortion.

Pain is a feature of first and second trimester medical abortion, yet few studies examine its management. A systemic review found the existing data too limited to make definitive recommendations.[34] Many clinicians alternate a mild oral opiate with non-steroidal anti-inflammatory drugs or use parenteral opioids, especially in the second trimester. The few randomised trials available show that ibuprofen is more effective than paracetamol for pain reduction with early medical abortion,[35] and that diclofenac given with the first dose of misoprostol between 13 and 22 weeks of gestation does not interfere with the action of the misoprostol and reduces the need for opioid injections.[36]

What are the risks associated with abortion?

In countries where abortion is safe and legal and modern methods are used, women can be reassured that major complications and mortality are rare at all gestations.

The mortality rate is 0.6 deaths per 100 000 abortions—far lower than that associated with childbirth.[37] The same cannot be said when abortion is provided unsafely, where it accounts for 13% of all maternal deaths (box).[38]

Major complications occur in 0.7 per 1000 first trimester vacuum aspirations,[44] and hospital admission or blood transfusions are needed in four of every 1000 women undergoing early medical abortion.[45] Rates increase for both medical and surgical abortion as gestational age advances. About one in 100 second trimester medical or surgical abortions is associated with a major complication.[28 46 47]

Women need to be informed of the risks of the methods of abortion being considered, including anaesthetic risks and complications that may require additional interventions such as laparoscopy, laparotomy, or blood transfusion.

Unsafe abortion: a public health problem

Roughly 25% of the world's population resides in countries with laws that prohibit abortion entirely or permit it only to save a woman's life.[39] Illegality does not deter women from seeking abortion but results in the provision of abortion in unsafe conditions.

Unsafe abortion is "a procedure for terminating an unwanted pregnancy either by persons lacking the necessary skills or in an environment lacking the minimal medical standards or both."[40] Each year 47 000 women die and millions are admitted to hospital as a consequence of undergoing abortions in dangerous conditions.[38] This burden disproportionately affects young women in developing countries, where 98% of all unsafe abortions occur. Restrictive abortion laws, a muted international response, negative attitudes towards women's autonomy, and limited access to contraception all contribute to this public health problem.

The World Health Organization outlines a human rights based approach to safe abortion care in its latest technical guidance.[8] Legalisation is "an essential pre-requisite."[41] Other requirements include training in modern abortion methods, prompt and non-judgmental management of incomplete abortion, and accessible and adequate facilities. Using telemedicine to deliver medical abortion and harm reduction models to help women use misoprostol correctly can also mitigate risks where safe services do not exist.[42 43] To advance these efforts, a conscientious commitment by the medical community, policy makers, and law makers to eliminating unsafe abortion and advancing reproductive freedom is urgently needed.

Ongoing pregnancy

Continuing pregnancy after surgical abortion occurs in 0.2% of procedures performed at a gestation of 12 weeks or less.[48] Procedures in multiparous women and those conducted at six weeks' gestation or less, particularly when small suction cannulae are used, are at increased risk for failure. Failures are also more likely when abortions are performed by inexperienced surgeons and in women with uterine abnormalities.

The ongoing pregnancy rate for early medical abortion with recommended mifepristone-misoprostol regimens is 0.5-0.7%.[45] Continuing pregnancies are more common with the use of oral or lower doses of misoprostol. In such cases, vacuum aspiration is the treatment of choice because another dose of misoprostol is effective in less than 40% of cases.[49] The largest case series of medical abortions with mifepristone and misoprostol after nine weeks' gestation reported failure to pass the products of conception in 0.2% of cases.[28]

Incomplete abortion

Incomplete evacuation of the products of conception is a common complication of medical and surgical abortion. It leads to prolonged bleeding and uterine cramping and is usually treated by vacuum aspiration or misoprostol. The frequency of reaspiration after first and second trimester surgical abortion is 0.3-2% and 0.4-3%, respectively.[50]

In clinical trials using a variety of mifepristone-misoprostol regimens and treatment protocols, fewer than 5% of women needed surgery to complete the abortion.[45] This figure included retention of viable and non-viable pregnancies and tissue. With second trimester medical abortions, surgical removal of retained placenta occurred in 7% of cases and retained tissue was identified after discharge in 0.7%.[28] Many studies report routine operative removal of the placenta at a specified time after the fetus is delivered. In the absence of bleeding, however, it is safe (and preferable) to wait for spontaneous expulsion.[51]

Haemorrhage

After first trimester vacuum aspiration, vaginal bleeding severe enough to require hospital admission occurs in 0.007% of procedures.[44] In the second trimester, blood loss greater than 500 mL is seen in 0.9% of cases and transfusion is needed in 0.09-0.2%.[52]

The necessity for a blood transfusion after early medical abortion is 0.1%[45] and slightly higher after later medical abortions (0.7%).[28]

Uterine perforation and cervical laceration

Uterine perforation occurs in 0.1-0.4% of surgical abortions and the risk of damage to the external os is no greater than 1%.[7] These risks are lower for first trimester abortions and those performed by experienced clinicians. Although cervical and uterine injury is largely obviated with medical abortion because of the lack of instrumentation, uterine rupture can occur with second trimester medical abortion and is associated with a history of caesarean delivery. A systematic review estimated the risk of uterine rupture in women with previous caesarean delivery at 0.3% (95% confidence interval 0.08% to 1%).[53] The risk of uterine rupture in women without previous caesarean delivery is estimated at 0.04% (0.01% to 0.20%).

Infection

The incidence of upper genital tract infection after induced abortion, regardless of method, is less than 1% but infection can have serious consequences such as chronic pelvic pain, infertility, and ectopic pregnancy.[54] The presence of *Chlamydia trachomatis*, *Neisseria gonorrhoea*, and bacterial vaginosis increase the risk of post-procedural infection. Antibiotic prophylaxis at the time of surgical abortion significantly reduces the likelihood of infection compared with placebo (relative risk 0.59, 0.46 to 0.75) and is more effective and less expensive than a screen and treat approach.[55] Evidence for the optimal regimen is poor. Recommended regimens vary from a single dose or short (three day) course of doxycycline to presumptive treatment of chlamydia and bacterial vaginosis.[7 56]

The evidence for routine antibiotic prophylaxis with medical abortion is less clear—no randomised controlled trials have been performed. Rare deaths have been reported mainly as a result of *Clostridium* spp.[57] One before and after study of 227 823 women in the United States showed a 93% reduction in serious infection when two simultaneous changes were made: implementation of routine seven day course of doxycycline and a switch from the vaginal to buccal route of misoprostol.[58]

Recommendations for antibiotic prophylaxis with medical abortion vary greatly, with some advisory bodies concluding that the limited evidence does not support its use.[8 56]

Long term sequelae

No associations between induced abortion and ectopic pregnancy, infertility, placenta previa, or miscarriage have been proved.[7] Medical abortion does not differ from surgical abortion with respect to these risks.[59] A link between surgical but not medical abortion and a subsequent preterm birth has been reported,[60] but a causal association has not been established.

What follow-up is needed?

When a surgical or medical abortion is uncomplicated and the success of the procedure is immediately verified, routine follow-up is not necessary.[7 8 61] Women should be given a follow-up visit if requested, however, and should be advised to return if they have signs of ongoing pregnancy or other problems

such as prolonged heavy bleeding, fever, and persistent or severe pain.

The World Health Organization has concluded that routine follow-up is not needed when mifepristone-misoprostol is used for abortion up to 63 days' gestation because of its high efficacy.[8] However, in many settings or where misoprostol is used alone, the woman is asked to return seven to 14 days after treatment to confirm that she is no longer pregnant. Detection of an ongoing pregnancy is usually by ultrasound examination,[62] but a history consistent with expulsion and a pelvic examination can be used if this technology is not available.[8] Where ultrasound is used, measurement of endometrial thickness as an indicator of incomplete abortion is not recommended because it is an unreliable predictor of the need for surgical evacuation and can lead to unnecessary interventions.[63]

Much research has gone into determining whether women can be followed up after an early medical abortion without returning to the healthcare facility. Alternatives include self administered symptom questionnaires and telephone follow-up with low and high sensitivity urine pregnancy tests two to four weeks after treatment.[64] Urine pregnancy tests are affordable, readily available, and user friendly, but caution is needed when interpreting a positive result. Even though β human chorionic gonadotrophin drops precipitously after abortion, highly sensitive tests (25 mIU/mL) are still inconclusive or falsely positive 66% and 20% of the time at two weeks and four weeks after abortion, respectively.[65 66] In these cases, ultrasound can be performed to determine whether the pregnancy is continuing. The results of a recent study of self assessment with a semi-quantitative urine pregnancy test that measures β human chorionic gonadotrophin at cut-off values of 25, 100, 500, 2000, and 10 000 mIU/mL were promising.[67] In a prospective open label trial, the test was performed before and one week after medical abortion, and pregnancy was considered ongoing if the follow-up reading was the same or higher than baseline results. Sensitivity and specificity were calculated at 100% and 97%, respectively, and 91% of participants found the test to be "very easy" or "easy" to use.

What contraceptive methods can be started after an abortion?

Ovulation can resume eight to 14 days after abortion.[68] Therefore, women who wish to use a contraceptive method should start as soon as possible after the procedure. The practice of providing long acting reversible contraception, particularly intrauterine devices, immediately after abortion has attracted considerable attention because of its high effectiveness and potential to prevent subsequent unintended pregnancy and abortion.[69 70] A Cochrane review found that insertion of an intrauterine device immediately after a surgical abortion is not associated with an increased risk of complications compared with insertion two to six weeks later.[71] Older randomised trials showed significantly higher expulsion rates, especially when the device was inserted after second trimester surgical abortion. A meta-analysis of more recent randomised trials found expulsion by six months to be similar with immediate or delayed insertion, but that receipt and continued use of the device was significantly greater in the immediate insertion group (relative risk 1.18, 1.08 to 1.28.[71] Recent studies have also examined the insertion of intrauterine devices after early medical abortion once expulsion is known to be complete. Although the evidence is limited, one randomised trial found no difference in the expulsion rate with immediate compared with delayed insertion.[72]

Hormonal methods, including an injection or implant, can be started on the same day as a surgical abortion at any gestation. Similarly, women can start hormonal contraception when the first pill of a medical abortion regimen is given,[8] or on the day misoprostol is given.[7] The quality of the evidence for this recommendation is low because of the lack of randomised controlled trials, but several are in the pipeline.

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Questions for future research and ongoing studies

Which type of abortion—medical or surgical—is associated with fewer complications?

What is the most effective and cost effective regimen for antibiotic prophylaxis? Is antibiotic prophylaxis warranted for medical abortion?

What is the best regimen for pain management during medical abortion?

The optimal method of cervical preparation before second trimester surgical abortion remains unknown, although a multicentre randomised trial to assess this question is under way (ClinicalTrials.gov identifier: NCT01751087)

A multisite randomised equivalence trial in Sweden and the UK (ClinicalTrials.gov identifier: NCT01920022) is comparing initiation of a progestogen-only contraceptive implant on the day of mifepristone administration versus two to three weeks later. The effects on abortion outcome, complications, bleeding patterns, insertion rates, and unplanned pregnancy at one year will be studied

A multi-country randomised trial is under way in which either a contraceptive implant or depot medroxyprogesterone acetate is initiated on the day that mifepristone is administered (ClinicalTrials.gov identifier: NCDT01902485)

Additional educational resources

Resources for healthcare professionals

Advancing New Standards in Reproductive Health. Early abortion training workbook (www.ansirh.org/training/workbook.php)—Free resource, registration not needed

Ipas University (www.ipasu.org/home)—Self paced learning site for reproductive healthcare providers, mainly in the developing world, with a focus on safe abortion care and post-abortion care. Free resource, registration required

Innovating Education in Reproductive Health (www.innovating-education.org)—Research and teaching tools about reproductive health, including abortion. Free resource, registration not needed

Royal College of Obstetricians and Gynaecologists (www.rcog.org.uk/stratog/page/introduction-fertility-control-contraception-and-family-planning)—StratOG—the RCOG's online learning resource. Tutorial on fertility control, contraception, and family planning. Paid resource, registration required

Resources for patients

National Abortion Federation (www.prochoice.org/Pregnant/index.html)—Are you Pregnant? Free pregnancy options resource, registration not required

Brook (www.brook.org.uk)—Free information on reproductive health from UK charity focused on people aged under 25 years; registration not needed

International Consortium for Medical Abortion (www.medicalabortionconsortium.org)—Free, registration not needed

Women on Web (www.womenonweb.org)—Abortion help service that can provide information, medical guidance, and a medical abortion to women living in countries where safe abortion is not accessible. Registration and donation required for medical abortion services, otherwise information is free and registration not needed

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