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Efficacy and Safety of Long-Acting Reversible Contraception

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Abstract

Long-acting reversible contraception (LARC) includes intrauterine devices (IUDs) and the subdermal implant. These methods are the most effective reversible methods of contraception, and have the additional advantages of being long-lasting, convenient, well liked by users and cost effective. Compared with other user-dependent methods that increase the risk of noncompliance-related method failure, LARC methods can bring ‘typical use’ failure rates more in line with ‘perfect use’ failure rates. LARC methods are ‘forgettable’; they are not dependent on compliance with a pill-taking regimen, remembering to change a patch or ring, or coming back to the clinician for an injection. LARC method failure rates rival that of tubal sterilization at <1% for IUDs and the subdermal implant. For these reasons, we believe that IUDs and implants should be offered as first-line contraception for most women. This article provides a review of the LARC methods that are currently available in the US, including their effectiveness, advantages, disadvantages and contraindications. Additionally, we dispel myths and misconceptions regarding IUDs, and address the barriers to LARC use.

Recent years have seen an expansion in the type of contraceptive options available to women. Long-acting reversible contraception (LARC: intrauterine contraception and subdermal implants) are highly effective and have the additional advantages of being long-lasting, convenient, well liked by users and cost effective.^[1] Compared with shorter-term, user-dependent methods, which increase the risk of noncompliance-related method failure, LARC methods can bring ‘typical use’ failure rates more in line with ‘perfect use’ failure rates. In fact, IUDs and implants are the most effective methods of contraception available today (figure 1 and figure 2). LARC methods are ‘forgettable’; they are not dependent on compliance with a pill-taking regimen, remembering to change a patch or ring, or coming back to the clinician for an injection. An additional unifying characteristic among LARC methods is that they are all estrogen free. Estrogen is the primary hormone associated with thromboembolic events.

Oral contraceptive pills and male condoms are the most commonly used reversible methods of contraception in the US.^[3] However, typical male condom failure rate is approximately 15–18% and oral contraceptive failure rate is 8–9%. At <1%, LARC method failure rates rival that of tubal sterilization.^[1]

Prior to initiating a new contraceptive method, it is important to consider the characteristics of each method, including effectiveness, adverse effects and patient acceptability. Clinicians must also consider a patient’s medical co-morbidities and conditions or behaviours that may

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be absolute or relative contraindications to specific methods. For example, women aged >35 years who smoke are at higher risk for cardiovascular disease and thromboembolic events than younger women, and thus, estrogen-containing methods are not recommended. In this article we provide a review of the LARC methods that are currently available in the US, including their effectiveness, advantages, disadvantages and contraindications.

1. Subdermal Implants

Although different forms of implants are available in other countries, the only subdermal contraceptive implant available in the US is the etonorgestrel-releasing subdermal implant or Implanon® (ENG implant). The ENG implant will soon be replaced by Nexplanon®. The new device will come with a redesigned inserter, intended to reduce implantation errors. It will also contain barium to allow for localization on radiograph or CT scan.

1.1 Etonorgestrel-Releasing Subdermal Implant

The ENG implant is a single-rod, progestin-only contraceptive implant measuring 4 cm in length and 2 mm in diameter that contains 68 mg of the progestin etonorgestrel. Before being approved by the US FDA in 2006, the ENG implant had been used since 1998 in Asia, Europe and Australia. Once inserted just under the skin of a woman's arm, the ENG implant provides contraceptive protection for up to 3 years.

1.1.1 Effectiveness—An integrated analysis of 11 clinical trials in which 942 women were enrolled for 2–4 years, or a total of 20 648 cycles, showed no pregnancies while the ENG implant was in place. However, there were six pregnancies that occurred during the first 14 days following the ENG implant removal. As the FDA requires that any pregnancies occurring within 14 days of cessation of a hormonal method of birth control be considered as possible method failures, the ENG implant has a resulting Pearl Index of 0.38 pregnancies per 100 women-years of use.^[4]

1.1.2 Mechanism of Action—The rod of the ENG implant is composed of an ethylene vinyl acetate (EVA) copolymer core embedded with crystals of etonorgestrel. Surrounding the core is a thin layer of EVA copolymer (0.06 mm thick) that controls the rate at which etonorgestrel is released.^[4] Pharmacokinetic studies show that the etonorgestrel in the ENG implant is released initially at 60–70 µg/day, decreasing to 35–45 µg/day at the end of the first year, to 30–40 µg/day at the end of the second year, and then to 25–30 µg/day at the end of the third year.^[5] These stable levels at the 36-month time point suggest that the method may be effective for longer than 3 years. Indeed, two small studies found no pregnancies in women in their fourth year of use of the ENG implant.^[6,7]

The continuous release of the progestin provides contraception through inhibition of ovulation as well as inhibition of endometrial proliferation and thickening of the cervical mucus. The inhibition of ovulation by the ENG implant has been proven through several small studies. In one study of 244 scans of women who had ENG implants inserted 0–20 months earlier found one ovulation at 16 months.^[8] Another small study of 16 women documented two ovulations at 30 and 33 months after insertion.^[9] The additional mechanisms of cervical mucus changes and altered endometrial structure are thought to contribute to the method's overall effectiveness when ovulation does occur.

1.1.3 Advantages—Advantages of the ENG implant include its high effectiveness (extremely low failure rate: <1%) and its ease of use. Once the method is inserted, no attention is required on the part of the user until the time for removal. Thus, the ENG implant is an excellent method choice for women who are unable to remember to take a pill daily, change a patch or ring as required or use other methods of contraception at the time of

intercourse. The ENG implant is also discrete. Although the implant is usually palpable under the skin and insertion itself leaves a small scar, the woman does not need to keep contraceptive supplies in the home, nor does she need continued resupply or clinical follow-up for contraception.^[1] Like the other LARC methods reviewed in this article, the ENG implant does not contain estrogen and therefore its use may be appropriate in women with certain medical conditions (uncontrolled hypertension, smokers aged >35 years, women with a personal history of venous thrombotic event or a family history of inherited thrombophilia) where estrogen is contraindicated.

The ENG implant has also been implicated in improving acne and relieving symptoms associated with dysmenorrhoea and endometriosis. In one study of women using the ENG implant for up to 2 years, 61% of those with acne at baseline reported decreased acne. Among users who had no acne at baseline there was a 16% incidence of developing new acne.^[10] The same study showed that 48% of women reported decreased dysmenorrhoea following ENG implant insertion, with only 8% reporting an increase in the same symptom.^[10] In a different study evaluating the effects of the ENG implant on women with endometriosis, the mean score for dysmenorrhoea improved from 7.08 ± 2.09 at baseline to 0.84 ± 1.67 at 12 weeks following ENG implant insertion.^[11]

1.1.4 Disadvantages—The main disadvantage of the ENG implant is unscheduled bleeding. Bleeding patterns can range from amenorrhoea and infrequent bleeding to irregular, frequent and prolonged bleeding.^[1] There is no way to predict prior to insertion what sort of bleeding pattern any individual woman may have after insertion. In one meta-analysis that included 780 women and evaluated bleeding over a total of 3315 reference periods of 90 days each during the first 2 years after ENG implant insertion, 22% were found to have amenorrhoea, 34% infrequent bleeding (<3 episodes of bleeding or spotting), 7% frequent bleeding (>5 episodes of bleeding) and 18% prolonged bleeding (1 bleeding episode lasting >14 consecutive days).^[12] Abnormal bleeding leads to early discontinuation of the method in 10–14% of patients.^[4,12] Other reasons for discontinuation include emotional lability 2%, depression 1%, weight increase 2%, acne 1% and headache 2%.^[4] Previous studies on other progestin-only contraceptives have documented that adequately counselling women about bleeding irregularities at the time of method initiation can help to improve method continuation rates.^[13]

Complications from insertion of the ENG implant are rare (<1%) and may include infection, haematoma and local irritation. Patients may experience temporary bruising and soreness at the site immediately after insertion. Expulsion of the implant has been reported rarely and usually occurs in combination with infection.^[14] One of the most common problems with the ENG implant insertion is provider failure to actually insert the rods. This problem is highlighted in an Australian case series of 218 pregnancies among ENG implant users. In 84 of the women no implant was placed at the time of insertion. In some cases the implant was left inside the inserter, in one a placebo implant from a training kit was inserted by mistake and in the other cases the reasons for non-insertion were not documented.^[15] This report stresses the importance of both confirming the presence of the rod within the disposable applicator prior to insertion and confirming proper rod placement within the patient's arm by palpation immediately following the procedure.

An additional area of concern is the use of the ENG implant in overweight women. The initial clinical trials through which the ENG implant obtained FDA approval excluded women who were >130% of their ideal bodyweight.^[4] There is the potential that the ENG implant, especially as the daily etonorgestrel level wanes over time, is not as effective in these women. However, most experts believe that the ENG implant is still highly effective in women who are >130% of their ideal body weight.

1.1.5 Contraindications—Contraindications to use of the ENG implant include pregnancy, hepatic tumour or active liver disease, undiagnosed abnormal vaginal bleeding, breast cancer and hypersensitivity to any components of the ENG implant.^[16] The package insert states that women with a current deep venous thrombosis or pulmonary embolism should not use the ENG implant. However, most experts believe progestin-only methods are fine in women with thromboembolic disease.^[16]

1.1.6 Insertion and Removal—Insertion of the ENG implant is an office procedure done under local anaesthesia. The ideal insertion site is identified approximately 8-10 cm lateral to the medial epicondyle of the humerus, in the groove between the biceps and triceps muscles in the patient's non-dominant arm. After injecting local anaesthetic along the planned track of rod insertion, the insertion needle is then introduced to the anaesthetized area of the patient's arm at an angle not >20°. The insertion needle should be used to tent up the skin to prevent unnecessarily deep insertion. Once the needle has been advanced to its full length the seal on the applicator is broken by pressing downward and the obturator is turned 90° in either direction with respect to the needle. The obturator is then held in place while the canula is withdrawn, leaving the rod under the skin. Immediately after insertion both the patient and the provider should palpate the skin to verify correct placement of the rod. An adhesive closure and then a pressure bandage are placed around the insertion site. A clinician who has been trained in the technique can insert an ENG implant in less than 2–3 minutes.^[17] Providers must complete an approved training course before the manufacturer will supply them with implants for insertion.

Implant removal can also be done in the office under local anaesthesia. A 2–3 mm longitudinal incision is made through the skin over the end of the rod. Cleaning the end of the implant with sharp dissection may be required if a fibrous sheath has formed around the rod. Once the fibrous sheath has been opened, the end of the rod will come into view so that the rod can be grasped with mosquito forceps and pulled out. The rod should be inspected to make sure that it is intact. The skin can be closed with an adhesive strip and covered with a pressure bandage.

In summary, the ENG implant is a highly effective form of LARC that is best suited for women who are able to tolerate the associated unpredictable bleeding profile. This method is very popular in adolescent women who have trouble remembering to use the pill, patch or ring on a consistent basis.

2. The Intrauterine Device (IUD)

There are currently two IUDs available in the US: the levonorgestrel intrauterine system (LNG-IUS or Mirena®) and the copper T 380A (ParaGard®). Despite being one of the most popular contraceptives worldwide, IUDs are still significantly underutilized in the US (figure 3 and figure 4). According to the most recent National Survey of Family Growth, only 5.5% of US women aged 15–44 years using contraception are currently using an IUD.^[19] This is in comparison with other countries such as Norway and China where the rates of IUD use are as high as 27%^[20] and 30%,^[21] respectively. Reasons for the low uptake of the IUD among the US population include lack of trained providers, high initial cost of the methods, and inaccurate knowledge and attitudes about IUD among clinicians and patients.^[22] While the number of trained providers is increasing, opportunities for improvement include correcting the myths and misconceptions regarding the risks of the IUD and addressing which patients are appropriate candidates for an IUD (table I).

The complications surrounding the Dalkon shield in the 1970s have resulted in provider hesitancy with modern IUDs despite a wealth of published literature documenting their

safety.^[23] Some of the more common myths include: (i) IUDs increase the risk of pelvic inflammatory disease (PID); (ii) IUDs cause infertility; (iii) IUDs increase the risk for ectopic pregnancy; and (iv) IUDs are not appropriate for nulliparous women or teenagers. Previous studies have shown that although there is a transient increased risk for PID during the first 21 days following IUD insertion, the overall incidence of PID beyond the first month is not significantly increased in IUD users.^[24] Regarding infertility, the evidence shows us that while a history of *Chlamydia trachomatis* infection is related to infertility, IUD use is not.^[25] Finally, the overall rate of pregnancy is so much lower among IUD users that the ectopic pregnancy rate is significantly lowered as well.^[26,27] However, it is true that a woman who becomes pregnant with an IUD in place is at increased risk for an ectopic pregnancy compared with women using other methods. Thus, early confirmation of the location of the pregnancy is essential.

Nulligravid and adolescent women contribute disproportionately to the high unintended pregnancy rate in the US. However, for many of the erroneous reasons cited previously, they are often inappropriately discouraged from using IUDs as a method of contraception. The WHO, American College of Obstetricians and Gynecologists and American Academy of Pediatrics agree that IUDs may be appropriate for young nulliparous women.^[16,28,29] Additionally, recent studies have indicated that these populations have high rates of satisfaction and continuation.^[30,31]

2.1 The Levonorgestrel Intrauterine System

The LNG-IUS has a T-shaped polyethylene frame containing a total of levonorgestrel 52 mg with a release rate of 20 µg/day for 5 years, after which the daily dose drops by approximately 50%.^[32] The device measures 32 mm in both height and length, and contains barium sulfate, making it easily identifiable on radiograph. Two monofilament polyethylene strings extend from the base to aid in removal.

2.1.1 Effectiveness—This system provides reliable and effective contraception for 5 years, with a first-year failure rate of 0.2% that rivals tubal sterilization. After 5 years, the device releases approximately 14 µg/day of levonorgestrel, which is still sufficient to provide adequate contraception for an additional 2 years,^[33] implying that the LNG-IUS could actually be used effectively for 7 years for contraception. However, the LNG-IUS is only FDA approved for 5 years in the US.

2.1.2 Mechanism of Action—The mechanism by which pregnancy prevention is attained is multifactorial but mainly works by prevention of fertilization. Levonorgestrel thickens cervical mucus, which inhibits sperm motility and capacitation. It also has endometrial effects causing atrophy and eliciting a foreign body reaction. In some women, the minimal systemic absorption can suppress ovulation.^[1]

2.1.3 Advantages—The LNG-IUS has both contraceptive and non-contraceptive benefits. Among the contraceptive benefits, one of the most important is its convenience. Efficacy of contraception relies largely on patient compliance and, unlike other methods which require daily, weekly or monthly regimens, the LNG-IUS (as well as other LARC methods) has no patient demands after the initial insertion. Patient satisfaction and continuation are also essential to maximize method effectiveness. Previous studies have documented high rates of both satisfaction and continuation among all IUD users.^[31] Although there is a high upfront cost, the LNG-IUS is highly cost effective when divided over the life of the contraceptive. Lastly, because this device does not contain estrogen, it can be used in women with most comorbidities (e.g. smokers aged >35 years, thromboembolic disease, etc.) and is safe for use with most medications.^[34,35]

The LNG-IUS has many non-contraceptive health benefits that have led to its increasing popularity. Average monthly blood loss drops by approximately 90% and 20–40% of women become amenorrhoeic at 1 year.^[36-38] This makes the device ideal in women with menorrhagia. In fact, the LNG-IUS often replaces the more invasive interventions of endometrial ablation or hysterectomy. The local delivery of a progestin has also been shown to decrease the volume and size of uterine myoma with a resultant decrease in blood flow.^[39,40] However, the use of the device in such patients may be associated with increased rates of expulsion.^[40] The LNG-IUS can also been used to treat endometrial hyperplasia and, in patients in whom surgery is contraindicated, has been used to manage endometrial adenocarcinoma.^[41,42]

2.1.4 Disadvantages—With the many advantages come some disadvantages. Although many women would consider the potential for amenorrhoea to be an advantage, a certain subset might find this change distressing because of an inability to determine if their lack of menses is due to IUD use or pregnancy. The changes in the bleeding profile caused by the LNG-IUS might, therefore, be considered a disadvantage in this patient population.

Spontaneous expulsion occurs in <10% of IUD users and is most common in the first year of use. Uterine perforation is also a possible complication, although it is limited to the time of insertion. The risk of perforation is <1 per 1000 insertions, and is highly dependent on the experience of the practitioner.^[43] Diagnosis of perforation may be at the time of insertion or some time later when strings are not visualized or palpable. Evaluation of missing strings can include pelvic ultrasound and pelvic radiographs. If perforation is suspected, definitively locating the device can be achieved with hysteroscopy and laparoscopy. Laparoscopic removal of an extrauterine LNG-IUS may be necessary.^[44] If a pregnancy is diagnosed while an IUD is in place, the pregnancy should first be confirmed as intrauterine and followed by prompt removal of the IUD regardless of plans for pregnancy. Early removal has been shown to reduce the risk of spontaneous miscarriage or preterm delivery.^[43]

2.1.5 Contraindications—There are several contraindications to insertion of the LNG-IUS. These include pregnancy, PID within the previous 3 months, active cervicitis, current positive test for *Neisseria gonorrhoeae* or *C. trachomatis*, post-partum or post-abortion sepsis (within the previous 3 months), undiagnosed abnormal uterine bleeding, genital tract malignancy, known pelvic tuberculosis, breast cancer within the preceding 5 years, active liver disease or allergy to any of the components of the device.^[45] It is important to remember that the LNG-IUS does not itself increase the rate of infection. Although the insertion process poses a slight increased risk for transient infection during the first 21 days after insertion, research has not found prophylactic antimicrobials to be beneficial at reducing this risk.^[46] If a woman is diagnosed with a sexually transmitted infection (STI) or PID while an IUD is in place, treatment should be initiated in the standard fashion as recommended by the Centers for Disease Control and Prevention. Removal of the IUD is not required.^[47,48] If the infection is refractory to standard therapy, removal of the IUD should be considered.

2.1.6 Insertion and Removal—Insertion of the LNG-IUS should be preceded by a careful pelvic examination, paying close attention to the size and axis of the uterus. The risk of spontaneous expulsion may increase with a uterus smaller than 6 cm. Most providers clean the cervix with an antiseptic solution, although the data does not support the effectiveness of this practice.^[49] The anterior lip of the cervix is grasped with a tenaculum, and traction is applied to straighten the axis of the endocervical canal. A uterine sound is then passed through the cervical canal to the fundus to determine cervical patency and uterine size. After verifying that the arms of the device are horizontal, the device is drawn into the inserter by pulling on the strings. The flange on the inserter is set to correspond to

the uterine depth previously measured by the sound. The inserter is then advanced into the cervix until the flange is approximately 1.5–2 cm from the cervical os. The IUD arms are then released by pulling back on the slider until it reaches the mark on the inserter handle. The inserter is then advanced until the flange is flush with the cervix, thus positioning the IUD at the uterine fundus. The device is then fully released by pulling back on the slider the remainder of the way. The insertion tube can then be removed and the strings cut approximately 3 cm from the external os of the cervix.

Removal of the LNG-IUS is facilitated by applying gentle steady traction to the strings. Occasionally strings are not visualized and radiographic evidence does not indicate expulsion or perforation. Strings can ascend into the endocervical or even endometrial canal. Endocervical strings can usually be extracted in the office with the assistance of a cotton swab or endocervical brush. If the strings have ascended completely into the endometrial canal, and the plan is for IUD removal, an IUD removal instrument (e.g. IUD hook) can be used. If these modalities are not successful, the IUD can be removed via hysteroscopy.

2.2 Copper IUD

The copper IUD (T 380A or ParaGard®) is a T-shaped, non-hormonal IUD that contains copper (total exposed copper surface area = 380 mm²). The tail or ‘string’ of the IUD is a monofilament polyethylene thread and is tied through the tip or base of the T to aid in detection and removal. The frame of the copper T 380A is made of polyethylene, with barium sulfate to aid in detecting the device with imaging (radiographs). ParaGard® was approved by the FDA in 1984 and has been sold and used in the US since 1988.

The copper IUD, like all LARC methods, should be considered a first-line contraceptive option. Appropriate candidates include women (i) seeking long-term (>1 year), reversible contraception; (ii) who want to avoid hormone use; and (iii) with medical co-morbidities that preclude the use of combined hormonal methods (e.g. breast cancer, hypertension, uncontrolled diabetes mellitus, thromboembolic disease, etc.).

One major, and unrecognized, advantage of the copper IUD is its ability to serve as both emergency contraception and long-term reversible contraception. The copper IUD is more effective than progestin-containing emergency contraceptive methods (e.g. Plan B, Plan B One Step or Next Choice), yet is vastly underutilized for this purpose. The copper IUD can be inserted for emergency contraception for up to 5 days after unprotected intercourse.^[50]

2.2.1 Effectiveness—The continuous release of copper ions into the uterine cavity is responsible for the long-term effectiveness of the copper IUD. The effectiveness rivals tubal sterilization, with a failure rate of 0.6–0.8 per 100 women-years.^[16,51] The key aspect of the IUD as well as all LARC methods is that effectiveness is not dependent on user motivation and adherence. The copper IUD is FDA approved for up to 10 years of contraception but may be highly effective for 12 years or longer.^[52] Patients may have it removed anytime before the 10-year mark, depending on their desire for conception. Because the copper IUD is approved for 10 years of use, it is one of the most cost-effective contraceptive options available today.

2.2.2 Mechanism of Action—The primary mechanism of action of the copper IUD is interference with fertilization. The copper ions appear to be ‘toxic’ to sperm. Sperm entering the uterus and fallopian tube seem to be incapable of fertilizing the ova (egg).^[51] The copper IUD may also prevent the egg from implanting into the uterus.

2.2.3 Advantages—Like other LARC methods the copper IUD has the advantage of being ‘forgettable’, long-term, highly effective contraception. Other advantages include (i)

non-hormonal (for women desiring a non-hormonal option); (ii) rapid return to fertility; (iii) typically regular menses (if the patient was regular prior to insertion); and (iv) prevention against endometrial cancer.^[53-55] Protection against endometrial cancer has been shown for both copper and inert (non-medicated) IUDs,^[55] and is suspected to also be true for the LNG-IUS. As mentioned previously, because of its potential for long duration of use, the copper IUD is one of the most cost-effective methods of contraception.

2.2.4 Disadvantages—While there are many advantages to the copper IUD, there are a few disadvantages. The copper IUD does not protect against STIs, but neither do other non-barrier contraceptive methods. Only consistent and correct barrier method use provides protection from STIs. A visit with a healthcare provider is required for both insertion and removal. Most women experience more bleeding and cramping with menses following insertion of the copper IUD, but this typically improves over time.^[56] Given this finding, women with menses that are already heavy or painful at baseline should be counselled appropriately prior to copper IUD insertion. It is possible for the IUD to expel, but this is a relatively rare event. Partial expulsion into the cervix is also possible and may cause persistent bleeding and cramping.

Infection is very uncommon with today's IUDs. As with the LNG-IUS, the risk of infection is elevated only in the first few weeks after insertion. After this time, the infection risk returns to that of the general population. Perforation through the wall of the uterus is also a rare complication and occurs in 1 of 1000 insertions.

2.2.5 Contraindications—There are few contraindications to copper IUD insertion. Contraindications include (i) known or suspected pregnancy; (ii) mucopurulent cervicitis, cervical/pelvic infection, septic abortion or puerperal infection (within the past 3 months); (iii) abnormal uterine bleeding of unknown cause; (iv) cervical cancer or precancer requiring therapy; (v) marked distortion of the uterine cavity; and (vi) Wilson's disease or allergy to any part of the copper IUD.^[16]

2.2.6 Insertion and Removal—Insertion of the copper IUD is very similar to insertion of the LNG-IUS. The copper IUD is packaged with an insertion tube and a solid white rod in a sterilized pouch. A movable blue flange on the insertion tube aids in gauging the depth of the uterine fundus. The arms of the IUD are first placed inside the insertion tube. This can be done while the IUD is still inside the packaging or with sterile gloves after the packaging has been opened. The insertion tube is inserted into the uterus until the blue flange is flush with the ectocervix. At this point the solid stabilizing rod is held in place, while the insertion tube is gently pulled back. This releases the arms of the T. Once fundal placement is confirmed the solid rod can be removed, followed by the insertion tube. Strings are then trimmed to 3–4 cm and insertion is complete. Removal is identical to the LNG-IUS. The strings are grasped with forceps and firm traction will remove the IUD through the cervical canal.

It is not uncommon for patients to present to their clinician or an emergency room with complaints of cramping and bleeding after IUD insertion. Irregular bleeding and cramping within days or weeks after placement is normal, and reassurance is often all that is necessary. Most cramping and bleeding is not an infection. Only when there is clear evidence of pelvic tenderness and other signs of inflammation should the clinician suspect PID. The current opinion of family planning experts is to treat suspected infection without the removal of the IUD. The patient should be reassessed in 48–72 hours. If signs and symptoms are not improved the clinician should consider IUD removal and treatment with intravenous antibacterial therapy.

3. Conclusion

The low failure rates, ease of use and limited contraindications make LARC an ideal form of contraception for many women. Recent studies have shown high rates of satisfaction and continuation with LARC methods. Most women in the US are using less effective methods, such as oral contraceptive pills and male condoms. However, we strongly believe that IUDs and implants should be offered as first-line contraception for most women. Only when these methods have been excluded should the patient/clinician consider less effective methods of contraception.

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Fig. 1.

First-year failure rates with typical use. **DMPA** = depot medroxyprogesterone acetate; **IUD** = intrauterine device; **LNG** = levonorgestrel.^[1]

Fig. 2.

Comparing typical effectiveness of contraceptive methods. **IUD** = intrauterine device.

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Fig. 3.
Worldwide use of intrauterine contraception.^[18]

Fig. 4. Contraceptive use and non-use in the US. **IUD** = intrauterine device.^[19]

Table I**Myths about intrauterine contraception**

Acts as an abortifacient
Causes pelvic inflammatory disease
Causes infertility
Causes ectopic pregnancy
Cannot be used in nulliparous women
Cannot be used in teenagers