

Special Issue Article: Female Contraception: Types, Effectiveness and Side Effects

# Promoting the Use of Long-Acting Reversible Contraceptives

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## Abstract

Long-acting reversible contraceptives (LARC) have the advantage of high efficacy associated with long duration of action. They include progestogen-only sub-dermal implants, intrauterine systems and copper releasing intra-uterine devices. Although LARC have obvious benefits both for women and the community it is apparent that there is a general lack of knowledge about these methods. In order to increase the use of LARC it is important that both women and health providers have accurate information about these methods. Ensuring clinicians have adequate training in the use of, counselling and insertion of both implants and IUD/IUS through ongoing education will improve access. Availability of same day insertion for women requesting this and encouraging insertion immediately post-abortion or early in the post-partum will also improve access.

However, it is important that women's autonomy to decide about which method of contraception to use is respected despite the emphasis being placed on increasing the use of LARC.

This manuscript will provide information about LARC and discuss barriers to their use and strategies for increasing use.

**Keywords:** Long-acting contraception; Implants; Intrauterine system; Intrauterine device; Efficacy; lifespan; Barriers; Promotion

## Abbreviations

LARC: Long-acting Reversible Contraceptives; LNG: Levonorgestrel; ENG: etonogestrel; IUS: Intrauterine System; IUD: Intrauterine Device; Cu: Copper; µg: microgram; COC: Combined Oral Contraceptive; ACOG: American College of Obstetricians and Gynecologists; PID: Pelvic Inflammatory Disease

## Introduction

An ideal contraceptive method would be: 100% effective, readily reversible, easy to use, not interfere with sexual pleasure, cheap, readily available, without side effects and have additional health benefits. Although many of these attributes have been achieved with the range of methods now available there is no contraceptive which is 100% effective and has no side effects.

Long-acting reversible contraceptives (LARC), which include transdermal implants and intra-uterine systems (IUS) and devices (IUD) come close to the ideal in being almost 100% effective, readily reversible with rapid return of fertility. They require no action on the part of the user once inserted, do not interfere with sexual pleasure and also have some health benefits. Despite these obvious advantages LARC worldwide are underutilised [1,2] although they are being promoted as first-line contraceptives [3,4].

The development of these new delivery systems, transdermal, and intrauterine was prompted by the high unintended pregnancy rates in users of COCs (2-6%) [5], mainly due to the difficulties busy women have in adhering to a daily intake schedule. The implants and the IUS are progestogen-only methods which were developed to

avoid the risk of VTE associated with oestrogen use and to improve compliance. Once inserted, they have lifespans between 3-5 years and require no further action on the part of the user. These newer hormonal methods use technology with a steady release rate over 24 hours, enabling lower doses to be used and providing more stable blood levels than the daily fluctuations produced by COCs [6]. The steady release rates mean that lower doses are required which still provide efficacy rates equivalent to sterilisation. They are suitable for women in whom estrogen is contraindicated (Table 1). The major disadvantage is that all progestogen-only methods cause changes to the menstrual cycle including poor cycle control so that women require careful counselling prior to use [7].

## Sub-dermal Implants

Two sub-dermal implants, a levonorgestrel (LNG) two rod system with a 5 year lifespan and a single etonogestrel (ENG) rod with a three year lifespan, are currently in use. The LNG implant has not been marketed as widely as the ENG device in developed countries but is used widely in under resourced countries, as it is equally as effective but cheaper.

The single-rod subdermal implant is 4 cm long with a diameter of 2 mm and comprising a core of 68 mg of ENG, the active metabolite of desogestrel, and 40% ethylene vinylacetate (EVA) within an EVA membrane. The initial release rate is 60-70 µg/24 hours for the first 3 months which reduces gradually to 40 µg/24 hours by the end of 1 year and 25-30 µg/24 hours at 3 years. Women with lower body weight achieve higher serum levels. Within 1 week of removal ENG levels are undetectable resulting in rapid return of ovulation and fertility [8].

**Table 1:** Contraindications to progestogen releasing Implants and Intrauterine systems and intrauterine devices according to the medical eligibility criteria (MEC).

Progestogen only Implant IUS	MEC 4 Absolute Risks outweigh benefits	MEC 3 Generally risks outweigh benefits	MEC 2 Benefits outweigh risks	MEC 1 No restrictions
	Current breast cancer	Breast cancer No recurrence $\geq$ 5 years Carriers of gene mutations for breast cancer	Unexplained vaginal bleeding CIN or Cx cancer awaiting treatment	
	Diabetes with neuropathy or vascular disease	Diabetes with neuropathy or vascular disease	Diabetes- non vascular disease	History of gestational diabetes
	Acute viral hepatitis	History of cholestasis with CHC use	History of cholestasis pregnancy related	Carrier of chronic viral hepatitis
	Hepatocellular adenoma Malignant liver tumours	Current symptomatic gall bladder disease or medically treated	Focal nodular hyperplasia Asymptomatic gall bladder disease Post cholecystectomy	
	Decompensated cirrhosis of liver			Mild asymptomatic cirrhosis of liver
	Systemic lupus erythematosus positive antiphospholipid antibodies		Systemic lupus erythematosus no antibodies	
IUD/IUS	Pregnancy			Past ectopic
	Immediately post septic abortion	Current PID	Past PID	Past PID
	Current cervical endometrial cancer			
	Distorted uterine cavity			
	Unexplained uterine bleeding		Dysmenorrhoea Endometriosis	
			Anaemia	

The LNG implant system consists of two thin, flexible rods 43 mm long and 2.5 mm in diameter made of silicone tubing each containing 75 mg of LNG in a core mixed with elastomer. It provides low progestogen doses; 40-50  $\mu\text{g}/\text{day}$  at 1 year of use, decreasing to 25-30 $\mu\text{g}/\text{day}$  in the fifth year. Serum levels of LNG at 5 years are 60-65% of levels measured at 1 month of use [9].

Both devices are inserted under the skin in the medial aspect of the upper part of the non-dominant arm from a preloaded sterile applicator. Insertion of the ENG implant under local anaesthetic takes 1-2 minutes while removal takes 2-3 minutes through a 2 mm incision [10]. The LNG implant insertion and removal takes slightly longer. The implants are generally invisible but can be felt under the skin.

The ENG implant prevents the LH surge so that follicular development occurs without ovulation. The LNG implant disrupts follicular growth and the ovulatory process, causing a variety of changes that range from anovulation to insufficient luteal function [11]. Both implants increase the viscosity of cervical mucus and produce an endometrium which is thin but not atrophic with weak proliferation. Both are highly effective methods with a pregnancy rate of 0.01-0.1% per year in typical use [8]. The woman rapidly returns to her normal fertility when the implants are removed. Because the implants contain no oestrogen, the most common side effects are changes in menstrual bleeding patterns [12], the commonest cause of a request for removal [13]. Most other common side effects are similar to those experienced by women who use other hormonal contraceptives. The finding of ovarian cysts or enlarged ovarian follicles during the first year of use of etonogestrel and levonorgestrel implants is common and transient and should not be interpreted as pathologic [14,15].

Recently the introducer mechanism for the ENG implant has been improved [16].

## Intrauterine System (IUS)

The IUS is a T shaped device with a silastic backbone and a column containing 46 mg LNG within a rate-limiting membrane. LNG is released into the uterine cavity at a rate of 20  $\mu\text{g}/24$  hours which reduces to 10  $\mu\text{g}/24$  hours after 5 years, the approved lifespan of the device [6]. Blood levels of LNG are 4-13% of pill levels. Its main mode of action is at uterine level, with endometrial atrophy and an inflammatory response maximal at 3 months and maintained for the life of the device [17,18]. It also increases cervical mucus viscosity impeding sperm penetration and releases glycodeclin A within the uterine glands inhibiting fertilisation and implantation. There is some inhibition of ovulation in the first 12 months but most cycles are ovulatory. Its efficacy is comparable to sterilisation with a pregnancy rate of 0.2% in the first 12 months of use and 0.5-1.1 over 5 years of use [19].

Most women experience irregular bleeding. Spotting and frequent or prolonged bleeding may initially be experienced by up to 35% of users in the first 3-5 months of use. By 9 months 50%, experience infrequent bleeding and amenorrhoea occurs in a further 15%. At 5 years, 23% of women are amenorrhoeic and 77% experience infrequent bleeding [20]. Counseling women about these bleeding disturbances prior to IUS use is important. Hormonal side effects such as mood changes, acne, breast tenderness and headaches may occur in about 3% of users initially but diminish over time [21].

The LNG IUS is suitable for use by nulliparous women but they have a 1.6 fold increased risk of a difficult insertion. Uterine perforation is rare, 0.53/1000 insertions but may be higher in the post-partum or in lactating women [22]. Expulsion of the device occurs usually in the first 3 months of use at a rate of about 0.8% and is no different in nulliparous or parous women. The ectopic pregnancy rate is 0.02 per 100 women years compared with 0.3-0.5 per 100 women years for those not using contraception [19].

The LNGIUS, as well as being a highly effective contraceptive, effectively reduces the amount of menstrual blood loss in women with adenomyosis, uterine fibroids and endometriosis as well as reducing dysmenorrhea and alleviating symptoms associated with endometriosis [15,23].

A lower dose IUS releasing 12µg LNG/24 hours, shorter with a slightly narrower diameter, has just completed phase 3 trials [15]. It should make the IUS more popular for use in nulliparous women

### The Copper Intrauterine Device (IUD)

The copper-bearing IUDs provide a long-acting method for women in whom hormonal methods are contra-indicated or who prefer a non-hormonal method. In copper bearing devices fertilisation is impeded as copper ions are toxic to both sperm and ovum affecting sperm motility and both sperm and ovum transport [24]. All IUDS have a foreign body effect, which produces a marked increase in the number of white cells in the uterine lining, cavity and fallopian tube fluid. The endometrial inflammatory reaction has an anti-implantation effect. The lifespan of a copper IUD is related to the amount of copper (Cu) on the device and varies from 5-10 years depending on the device. It has a failure rate of 0.8% at one year and a 10 year pregnancy rate of 1.9% comparable to female sterilisation [25]. If pregnancy occurs with an IUD insitu, which is not removed, there is a risk of spontaneous abortion, septic abortion and preterm delivery. Removal of the IUD, if the string is accessible, reduces the risk [26]. If a pregnancy occurs it is more likely to be ectopic but as the pregnancy rate is so low the incidence of ectopic pregnancy is still much lower at 0-0.5 /1000 women years compared to 3.25-5.25/1000 WYs in women not using contraception [27].

The Cu IUD produces only local uterine side effects, such as an increase in menstrual bleeding but no general side effects. Uterine perforation is rare and estimated to occur in 0-1.2 cases per 1,000 insertions [28]. Expulsion rates are low. Despite the persistence of concerns about an increased risk of pelvic inflammatory disease in IUD users the evidence does not support this. IUDs do not cause PID although there is a slightly increased risk of PID in the first 20 days post insertion (9/1000 insertions) due to the insertion process [29]. PID in IUD users is related to exposure to STIs, the severity is not increased by the presence of an IUD and should be treated without removal of the IUD [30]. Women should undergo an STI screen at the time of insertion but if positive should be treated without removing the IUD [31].

### Appropriate Candidates for LARC Use

All women desiring highly effective long-lasting but reversible contraception are suitable to use LARC unless they have specific contraindications (Table 1). These include nulliparous women and appropriately counselled adolescents as well as post-partum and lactating women. They are appropriate for women who should avoid oestrogen eg smokers > 35 years old (Table 1) and women who have had problems with other methods such as compliance. However, all women using LARC need to be prepared to accept menstrual changes or amenorrhoea.

To ensure contraceptive cover during the climacteric the IUS and the IUD can be left in situ until 12 months after the woman's last

menstrual period if over 50 years and for 2 years if less than 50. If the woman is over 50 it is possible to check her FSH levels. If this is over 30 on two occasions 6 weeks apart, she is not at risk of pregnancy and the IUD/IUS can be removed. The IUS has an added advantage for women requiring estrogen therapy as it can be left in situ throughout the climacteric to protect the endometrium (Table 2).

**Table 2:** Advantages and disadvantages of LARCs.  
**ENG Implant**

Advantages	Disadvantages
The most highly effective method of contraception No action required on the part of the woman once it is inserted Can be removed if unacceptable side effects occur or woman wishes to discontinue Contains no estrogen so suitable for women who cannot take estrogens Decrease in period pain and acne for many women Fertility returns within 4 weeks of removal	All women have a change in bleeding patterns 15-18% experience amenorrhoea Infrequent light bleeding occurs in 60% frequent or prolonged bleeding occurs in 20% if bleeding patterns do not improve in the first three months unlikely to change Insertion and removal involves a minor surgical procedure Removal may leave a small 3mm scar Some women report side effects such as mood swings, headache, loss of libido Initial high cost but cost effective amortized over lifespan of device No protection against STIs or HIV/aids

### LNG Intrauterine System

Advantages	Disadvantages
Highly effective No daily action Low maintenance Low cost due to 5 year lifespan Reduces menstrual blood loss over time Useful for treatment of heavy menstrual bleeding Can carry women through the perimenopause providing contraception as well as protecting the uterus if they require estrogens to control hot flushes	Requires medical intervention for insertion and removal Erratic bleeding in first 3-6 months May be expelled in up to 10% of women Initial high cost but cost effective amortized over lifespan of device Some women report hormonal side effects No protection against STIs or HIV/aids

### Copper Intrauterine Device

Advantages	Disadvantages
Non-hormonal highly effective method No daily action Low cost due to 5-10 year lifespan Low maintenance If have Copper T380A inserted in early 40s contraceptive cover until menopause Only local uterine side effects no general side effects Rapid return of fertility	Requires medical intervention May increase menstrual bleeding or dysmenorrhoea A small number of women may expel the IUD without noticing Pregnancy with IUD (although rare) increases risk of septic abortion or ectopic pregnancy No protection against STIs or HIV/aids

### Effect of LARC on Unintended Pregnancy Rates

Several programs in the US have succeeded in increasing the use of LARC with a resulting decrease in pregnancy rates. In Colorado training providers and financing LARC provision increased use among 15-24 year olds from 5% to 19%. By 2011 expected fertility rates among low income 15-19 year olds had decreased by 29% and 14% in 20-24 year olds [32]. In the contraceptive Choice project in the St Louis region 75% of participants aged 14-45 years chose a LARC method. Between 2008 to 2010 abortion rates ranged from 4.4-7.5 per1000, far below the national rate of 19.6/1000 [33] Baldwin

and Edelman [34] found that risk of a repeat pregnancy was 35 times greater in adolescents who did not initiate LARC use early after an abortion or post-partum.

## Cost Effectiveness of LARCs

The cost-effectiveness of LARC has been analyzed in several countries. A UK study assessing cost-effectiveness from the British National Health Service perspective found that compared to COCs all LARC methods, despite high initiation costs, were more effective and less costly between 2 and 15 years of use because of their efficacy in preventing pregnancies and their long-life spans [35]. Another UK study, analyzing a dataset of women aged 30 years or older from the General Practice Database, concluded that the LNG IUS was the most cost-effective method [36]. Several US studies have shown that the IUD and IUS are the most cost effective over time followed by implants when compared with all forms of combined hormonal contraceptives and injectables [37,38]. Trussel et al. [38] estimated that if 10% of women aged 20-29 in the US changed to a LARC from COCs total costs would be reduced by \$2,800,000 annually [39]. A Brazilian study, assessing the benefits accruing from use of LARCs, estimated that they resulted in a reduction in incidence of combined maternal mortality and morbidity and child mortality of between 634-853 and a reduction of between 1056 and 1412 in unsafe abortions over a period of 10 years [40].

## Utilization of LARCs

Despite all the advantages of LARC they are underutilized particularly in young women. A cross-sectional study in Norway of women aged 16 -23 years found that only 12% of contraception users were using LARC [2]. In France the number of young women 15-29 using a LARC increased between 2000 and 2010 from 4.6% to 6.4% [41]. In a random sample of women from 14 European countries, the majority over 30 years, only 10% were using LARC [1]. In the US LARC use increased significantly from 2.4% in 2002 to 3.7% in 2007 and 8.5% in 2009 in every age, racial and income group, still lower than Europe but higher than Australia, where only 7% used LARC [42,43].

## Barriers to LARC Use

Although the ACOG Committee on Gynecologic Practice has recommended that LARCs should be offered as first line contraceptives to all women including adolescents and encouraged as options [3,4], it is obvious that only a minority of women are using them. There are a number of barriers which include lack of healthcare provider knowledge or skills, low awareness of the methods by women and high upfront costs. A number of studies in the US and UK and an online survey of healthcare providers in 15 countries indicated that many were reluctant to provide intrauterine contraception to nulliparous women or women post-abortion [44,45]. Many clinicians were unaware of evidence-based recommendations or the Medical Eligibility Criteria (MEC) and concerned about difficulty with insertion and risk of PID. In Texas urban providers were more likely to be aware of the benefits of LARC than their rural counterparts. Provider's misinformation about LARC and reluctance to prescribe them for adolescents, as well as lack of training in insertion techniques, especially in rural areas, limited women's access [46].

Women also lack accurate information about LARC. A survey of women aged 18-30 found that concern about future fertility, the possibility of irregular bleeding and fear of pain during insertion hindered acceptance of LARC even though they recognised the advantages of high efficacy and long duration of action [47]. In a telephone survey of over 500 women, half had heard of the LNG IUS but only 8% were aware of the ENG implant [48].

## Promotion of LARCs

Skills based training for healthcare providers especially in rural areas has been identified as an important strategy for increasing the uptake of LARC.<sup>46</sup> A survey of 3,000 fellows of the American College of Obstetricians and Gynecologists found recent continuing education was most strongly associated with implant insertion [49]. The authors concluded that barriers to LARC provision could be reduced if more gynaecologists received implant training and provided same day IUD insertion. A large national study found that most family physicians providing contraception were not offering LARC but were interested in upgrading their contraceptive skills (LARC project). In the UK women attending a community family planning clinic were more likely to be using LARCs than women attending a private family physician [50]. Despite evidence that insertion of IUDs and implants immediately post abortion is safe and cost effective they are rarely provided in US clinics. High cost to women, logistical concerns and the ongoing need for clinician training in the methods hinder their provision and uptake post-abortion [51]. Since there is agreement that promotion of LARC is of benefit both to women and the community there are a number of strategies which are necessary to encourage their use. Since many women lack knowledge or are misinformed about LARC, healthcare providers should discuss them with all clients. All staff need to be trained in the use of LARC including criteria for use of implants and the IUD/IUS and the correction of common misunderstanding of these methods. Training of clinic staff in troubleshooting, billing and clinic flow is important to ensure efficient service provision. Availability of same day insertion of implants and IUD/IUS, if a client requests this, will also encourage use.

Counselling training is important so that women are provided with accurate information about LARC, and their questions and concerns addressed, so that they can make an informed decision about their use. To encourage uptake of LARC by adolescents and young adults it is necessary to provide youth-friendly contraceptive services which do not require scheduled appointments and have flexible hours. Staff at these clinics should provide information on all methods as well as being able to dispel misconceptions about LARC and be trained in insertion of LARC.

## Conclusion

Although LARC have obvious benefits both for women and the community due to their high efficacy, long lifespan and convenience, it is apparent that there is a lack of knowledge about their advantages in the community. In order to increase the use of LARCs it is important that both women and health providers have accurate information about these methods. However, women's autonomy to decide about which method of contraception to use should be respected despite emphasis being placed on increasing the use of LARC.



Ensuring clinicians have adequate training in the use of, counselling and insertion of both implants and IUD/IUS through ongoing education will improve access. Availability of same day insertion for women requesting this and encouraging insertion immediately post-abortion or early in the post-partum will also improve access.

Up front cost is a major barrier to use of LARCs, despite their cost-effectiveness over time due to their long lifespan. It has been shown that providing cost free contraception increases uptake so that communities need to address this issue, taking into account that this cost will be balanced by savings resulting from a reduction in unintended pregnancies.

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