

# IUD (Intrauterine Device)

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## IUD (Intrauterine Device)

**Primary Disciplinary Field(s):** Reproductive Health, Contraception, Gynecology

### 1. Core Definition

An **Intrauterine Device (IUD)**, commonly referred to as a "coil" in some regions, represents a highly effective and long-acting reversible contraceptive (LARC) method. It involves the insertion of a small, typically T-shaped device into the uterus to prevent pregnancy. As a form of birth control, its primary function is to create an intrauterine environment that inhibits fertilization, thereby significantly reducing the likelihood of conception.

The IUD stands as one of the most widely used and reliable contraceptive options globally, offering women a non-daily management solution for family planning. Its efficacy is comparable to permanent sterilization methods, yet it maintains complete reversibility, allowing individuals to regain fertility upon removal. This combination of high effectiveness and reversibility makes the IUD a cornerstone of modern reproductive healthcare.

While all IUDs share the common goal of preventing pregnancy, they are broadly categorized into two main types: hormonal and non-hormonal. Each type employs distinct biochemical and physiological mechanisms within the uterus to achieve its contraceptive effect, influencing the choice based on individual health profiles, preferences, and specific medical needs.

### 2. Etymology and Historical Development

The concept of intrauterine contraception, though evolving significantly, possesses a history that dates back several centuries. Early anecdotal evidence suggests that nomadic camel drivers would insert pebbles into the uteri of their female camels to prevent pregnancy during long desert journeys, highlighting an ancient understanding of obstructing conception within the uterus. However, modern scientific development of the IUD began in the early 20th century, marking a pivotal shift towards safer and more predictable methods.

One of the earliest documented designs for human use was the "Richter's ring" in 1909, followed by the "Gräfenberg ring" in the 1920s, which were typically made of silkworm gut or silver wire. These early devices, while pioneering, faced challenges related to infection risk and expulsion. The mid-20th century saw the introduction of plastic IUDs, such as the Lippes Loop and the Dalkon Shield, which aimed to improve safety and efficacy. However, the Dalkon Shield, introduced in the 1970s, became associated with a tragically high incidence of pelvic inflammatory disease (PID) and septic abortions, leading to widespread litigation and a severe decline in IUD use and public trust, particularly in the United States. This period significantly influenced the perception and regulation of intrauterine contraception. For more historical context, refer to the [history of IUDs on](#)

Wikipedia.

The subsequent decades witnessed rigorous research and advancements in materials, design, and understanding of intrauterine physiology, leading to the development of the safer and highly effective copper and hormonal IUDs available today. These modern devices have successfully rehabilitated the IUD's reputation, establishing it as a highly reliable and safe contraceptive option, globally adopted and recommended by leading health organizations for its robust efficacy and low complication rates.

### 3. Types of Intrauterine Devices

Modern intrauterine devices are primarily classified into two distinct categories based on their active components: **non-hormonal copper IUDs** and **hormonal levonorgestrel-releasing IUDs**. Each category offers unique benefits, mechanisms of action, and potential side effect profiles, allowing healthcare providers and patients to select the most appropriate option for individual needs and health considerations.

**Copper IUDs**, also known as non-hormonal IUDs, are typically T-shaped devices made of plastic wrapped with a thin copper wire or sleeves. Brands such as Paragard are prominent examples. These devices continuously release copper ions into the uterus. The primary contraceptive effect of copper IUDs is not hormonal but rather relies on the spermicidal and inflammatory properties of copper. The presence of copper creates an inhospitable environment for sperm, impairing their viability and motility, and preventing them from reaching and fertilizing an egg. The U.S. American College of Obstetricians and Gynecologists (ACOG) provides detailed information on copper IUDs.

Conversely, **Hormonal IUDs** release a synthetic progestin called levonorgestrel directly into the uterus. Popular brands include Mirena, Kyleena, Liletta, and Skyla, which vary in their levonorgestrel dosage and, consequently, their duration of effectiveness. The local delivery of hormones minimizes systemic exposure, leading to fewer systemic side effects compared to oral contraceptives. Hormonal IUDs prevent pregnancy primarily by thickening cervical mucus, which acts as a barrier to sperm, and by thinning the uterine lining (endometrium), making it unsuitable for embryo implantation. While it is not their primary mechanism, some higher-dose hormonal IUDs may also partially suppress ovulation in some users. Planned Parenthood offers a comprehensive explanation on how hormonal IUDs work.

### 4. Mechanisms of Action

The contraceptive effectiveness of both copper and hormonal IUDs stems from their ability to create an intrauterine environment that is hostile to sperm survival and egg fertilization, although their specific physiological pathways differ significantly. Neither type of IUD acts as an abortifacient; rather, they primarily prevent fertilization from occurring or, in some cases, hinder the

ability of a fertilized egg to implant.

For **copper IUDs**, the mechanism is entirely non-hormonal. The continuous release of copper ions into the uterine cavity induces a sterile inflammatory reaction. This localized inflammation leads to an increase in prostaglandins, white blood cells, and copper ions within the uterine and fallopian tube fluids. These substances are highly toxic to sperm, impairing their motility, viability, and capacity to fertilize an egg. Specifically, copper ions interfere with sperm metabolism and enzyme activity, effectively disabling them before they can reach the egg. Additionally, the inflammatory response may also affect egg viability and disrupt the normal uterine environment required for implantation, should fertilization rarely occur. Further details on the mechanism of the [Copper IUD](#) can be found on Wikipedia.

**Hormonal IUDs**, by contrast, exert their contraceptive effects through the localized release of levonorgestrel. The primary mechanism involves thickening the cervical mucus, which forms a formidable physical barrier that prevents sperm from entering the uterus and reaching the fallopian tubes. This thickened mucus makes it virtually impossible for sperm to navigate through the cervix. Furthermore, levonorgestrel thins the lining of the uterus (endometrium), making it unsuitable for the implantation of a fertilized egg. This endometrial atrophy is also responsible for the lighter or absent periods experienced by many users. While not a primary mechanism for all hormonal IUDs, higher-dose devices may also suppress ovulation in some individuals, adding an additional layer of contraceptive protection. The official [Mirena website](#) explains its mechanism of action in detail.

## 5. Efficacy, Duration, and Reversibility

IUDs are recognized globally as one of the most effective forms of reversible contraception, boasting typical use failure rates of less than 1% per year. This exceptional efficacy places them on par with surgical sterilization in terms of pregnancy prevention, yet without the permanence. The high success rate is largely attributed to their "set-it-and-forget-it" nature, which eliminates the potential for user error associated with methods requiring daily or consistent action, such as birth control pills or condoms. While no contraceptive method is 100% reliable, IUDs offer a superior level of protection, significantly reducing the risk of unplanned pregnancies.

A key advantage of IUDs is their long duration of action. Copper IUDs can remain effective for an impressive period, typically up to 10 to 12 years, depending on the specific model. Hormonal IUDs also offer extended protection, with effectiveness lasting from 3 to 8 years, again varying by the specific device and its levonorgestrel dosage. This long-term efficacy provides individuals with years of continuous, reliable contraception, alleviating the need for frequent refills or daily adherence, which can be a significant convenience and cost-saver over time. The Centers for Disease Control and Prevention (CDC) provides detailed information on the [effectiveness of contraceptive methods](#).

Crucially, IUDs are fully reversible. Upon removal by a healthcare provider, fertility typically returns quickly, often within the first menstrual cycle. This makes them an ideal choice for individuals who desire highly effective contraception for a period but plan for future pregnancies. The ease and speed of fertility return after IUD removal offer significant flexibility in family planning, distinguishing them from permanent sterilization methods.

## 6. Benefits and Advantages

The widespread adoption and recommendation of IUDs by medical professionals stem from a multitude of significant benefits they offer beyond their primary contraceptive function. Foremost among these is their unparalleled effectiveness as a long-acting reversible contraceptive (LARC). The "fit-and-forget" nature of IUDs largely eliminates human error, making them significantly more reliable in preventing pregnancy compared to user-dependent methods like oral pills, patches, or condoms. This high efficacy translates into greater reproductive autonomy and reduced rates of unintended pregnancies.

Beyond contraception, hormonal IUDs provide substantial non-contraceptive benefits. The localized release of levonorgestrel can lead to significantly lighter menstrual bleeding, reduced menstrual pain (dysmenorrhea), and in many cases, amenorrhea (absence of periods). This makes hormonal IUDs an effective treatment for conditions such as menorrhagia (heavy menstrual bleeding) and endometriosis-related pain, substantially improving the quality of life for many individuals. Furthermore, copper IUDs can be used as a highly effective form of emergency contraception if inserted within five days of unprotected intercourse. The [NHS outlines several advantages of IUDs](#).

From a practical and economic standpoint, IUDs offer considerable advantages. Despite a higher initial cost compared to a single pack of birth control pills, their extended duration of action makes them highly cost-effective over their lifespan. The convenience of not needing to remember daily doses or manage monthly prescriptions contributes to enhanced compliance and user satisfaction. Moreover, IUDs are a discreet form of contraception, undetectable by partners, and do not interfere with sexual spontaneity, further adding to their appeal as a preferred method for many individuals seeking long-term, reliable birth control.

## 7. Adverse Effects and Risks

While IUDs are generally safe and well-tolerated, potential adverse effects and risks exist, which individuals should discuss with their healthcare provider prior to insertion. The source content accurately identifies pelvic inflammation, ovarian cysts, and abdominal cramps as potential concerns, but a more detailed understanding clarifies the nuances of these and other possible side effects.

**Common Side Effects:** Initially, many individuals experience some degree of discomfort, cramping, or spotting immediately following IUD insertion. For **copper IUDs**, the most commonly reported side effects include heavier, longer, and more painful menstrual periods, especially during the first few months after insertion. This is due to the increased inflammatory response in the uterus. Irregular spotting between periods can also occur. For **hormonal IUDs**, irregular bleeding or spotting is a very common side effect during the first 3-6 months as the body adjusts. Over time, however, many users experience lighter periods or even complete cessation of menstruation (amenorrhea), which can be a desirable outcome for some. Other potential side effects with hormonal IUDs, though typically less systemic than with oral contraceptives due to localized hormone delivery, can include headaches, acne, breast tenderness, and mood changes.

**Serious but Rare Risks:** Although rare, more serious complications can occur. One such risk is **uterine perforation**, where the IUD punctures the uterine wall during insertion. This occurs in approximately 1 in 1,000 to 1 in 10,000 insertions and may require surgical removal. Another potential issue is **expulsion**, where the IUD partially or completely falls out of the uterus, most commonly within the first year after insertion. If unnoticed, expulsion can lead to an unintended pregnancy. While the source mentions "pelvic inflammation," it is important to clarify the risk of **Pelvic Inflammatory Disease (PID)**. The risk of PID is primarily associated with pre-existing sexually transmitted infections (STIs) present at the time of insertion, rather than the IUD itself causing infection. The risk period for PID is highest in the first few weeks following insertion.

Furthermore, if a pregnancy does occur with an IUD in place (which is rare given its high efficacy), there is an increased risk of an **ectopic pregnancy** (a pregnancy outside the uterus). The source's caution that "IUDs (like all methods of artificial birth control) are not 100% reliable and an unplanned pregnancy may still occur" underscores the importance of prompt medical consultation. "In the event of pregnancy symptoms it is imperative to consult a doctor." Lastly, **ovarian cysts** can sometimes develop with hormonal IUDs, though these are typically functional, benign, and resolve on their own without intervention. WebMD offers a comprehensive overview of [IUD side effects](#).

Given these potential effects and risks, comprehensive patient counseling before IUD insertion is essential. Healthcare providers should thoroughly explain what to expect, how to check for the IUD strings, and when to seek medical attention. Regular follow-up appointments are also crucial to ensure the IUD remains in proper position and to address any concerns or side effects that may arise.

## 8. Contraindications and Considerations

While IUDs are suitable for a wide range of individuals, certain medical conditions and circumstances serve as contraindications, making their use either unsafe or less effective. A

thorough medical evaluation by a healthcare provider is essential before IUD insertion to ensure its appropriateness and safety for the individual.

General contraindications for both hormonal and copper IUDs include known or suspected pregnancy, active pelvic infection (such as Pelvic Inflammatory Disease or current sexually transmitted infections like gonorrhea or chlamydia), unexplained vaginal bleeding, certain uterine abnormalities (e.g., severe fibroids or congenital anomalies that distort the uterine cavity), or a history of recurrent pelvic infections. These conditions can either compromise the effectiveness of the IUD, increase the risk of complications, or indicate an underlying issue that needs to be addressed first.

Specific contraindications also apply to each type. For copper IUDs, conditions such as Wilson's disease (a genetic disorder causing copper accumulation) or a rare allergy to copper would preclude its use. For hormonal IUDs, contraindications might include certain liver diseases, current or past breast cancer (due to its hormone-sensitive nature), or a history of specific types of blood clots, although the systemic hormonal exposure with an IUD is significantly lower than with combined hormonal contraceptives, often making them a safer option in some cases where systemic hormones are contraindicated.

Ultimately, the decision to use an IUD, and which type, should be a collaborative one between the individual and their healthcare provider. This involves a comprehensive review of medical history, current health status, lifestyle, and reproductive goals, carefully weighing the significant benefits of IUDs against any potential risks or contraindications to ensure the safest and most effective contraceptive choice.

## 9. Global Impact and Future Directions

The IUD has had a profound global impact on public health and women's reproductive autonomy, particularly in the realm of family planning. As a highly effective and long-acting method, it significantly reduces unintended pregnancies and births, thereby lowering rates of maternal mortality and morbidity. In many low-resource settings, where access to daily contraceptives may be challenging and adherence difficult, the IUD offers a practical, cost-effective, and sustainable solution, empowering women to space births and plan their families more effectively. Its ease of use and high continuation rates contribute significantly to global efforts in achieving reproductive health goals and improving overall societal well-being.

Looking to the future, research and development in IUD technology continue to evolve. Innovations are focused on enhancing user experience, improving safety profiles, and expanding the range of applications. This includes exploring new materials that may reduce side effects or extend duration, developing smaller or easier-to-insert designs, and investigating novel drug delivery systems that could broaden therapeutic uses beyond contraception, such as for the localized

treatment of gynecological conditions.

In conclusion, the IUD stands as a testament to advancements in reproductive medicine, offering a cornerstone technology for modern family planning. Its enduring legacy is characterized by its high efficacy, reversibility, and long-term convenience, solidifying its role as a vital tool in empowering individuals worldwide to make informed decisions about their reproductive lives and contribute to healthier communities globally.

## Further Reading

[History of IUDs \(Wikipedia\)](#)

[Copper IUD \(ACOG\)](#)

[Hormonal IUD \(Planned Parenthood\)](#)

[Copper IUD Mechanism \(Wikipedia\)](#)

[Mirena Mechanism \(Official Site\)](#)

[Effectiveness of Contraceptive Methods \(CDC\)](#)

[IUD Advantages \(NHS\)](#)

[IUD Side Effects \(WebMD\)](#)