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REVIEW

Intrauterine Device Complications and Their Management

Melissa G. Myo[1] · **Brian T. Nguyen**[1]

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Abstract

Purpose of Review Individuals are using intrauterine devices (IUDs) increasingly more frequently not only for contraception and emergency contraception, but also, in the case of hormonal IUDs, for the management of heavy menstrual bleeding and endometrial hyperplasia. While IUD complications are rare, their increasing prevalence is inevitably linked to more patients requiring specialized care for these complications. This review summarizes the most common complications, inclusive of perforation, expulsion, concurrent pregnancy, and difficult IUD removal, as well as their management strategies.

Recent Findings The two most recent, large-scale, multi-site cohort studies examining IUD complications were conducted in Europe (European Active Surveillance Study for Intrauterine Devices (EURAS-IUD)) and the USA (Association of Perforation and Expulsion of Intrauterine Devices (APEX-IUD)), confirming the rarity of perforations, occurring in less than 0.5% of individuals over 5 years of follow-up and primarily at the time of or soon after insertion. These studies both confirmed the independent and increased risk of perforation among individuals receiving an IUD in the postpartum state, as well as among breastfeeding individuals. In the APEX-IUD study, the risk of perforation was noted to be elevated even up to 52 weeks postpartum, even when controlling for breastfeeding status. The same study also noted that 10.7% of individuals receiving IUDs within 3 days postpartum expelled their IUDs; while this proportion was significantly elevated compared to those waiting several weeks to receive their IUD, it is remarkably lower than rates seen in previous studies of immediate postpartum IUD insertion. Breastfeeding was protective against IUD expulsion. Additional studies note the incidence of IUD fragmentation and possible differences for rates of fragmentation by device type.

Summary IUD complications are generally rare but can become serious or burdensome for patients if their reproductive healthcare providers are not aware of the possible risks and presentation. Understanding the potential for IUDs to perforate the uterus, be expelled, fail to prevent pregnancy, or be difficult to remove, along with the various risk factors linked to these complications, can help providers improve their counseling and take appropriate precautions with IUD insertion to better avoid them, as well as manage them when they inevitably occur.

Keywords IUD complications · IUD expulsion · IUD perforation · IUD fragmentation · IUD breakage · IUD complication management

Introduction

Given their high levels of effectiveness and user satisfaction over long durations of time, with low potential for user error and few medical contraindications, the use of intrauterine devices (IUDs) in the United States (US) has increased dramatically in the last 20 years. In women aged 15–44 years, the use of the IUD rose from around 1% in 1995 to 7.6% in 2014 [1] and then to 9.7% in 2017 based on data from the National Survey of Family Growth [2]. While complications related to IUD use are rare, the increasing uptake of IUDs is making complications more evident, warranting a review of less routine complications and their management. While research and reporting on IUD complications commonly revolves around cases noted at the time of insertion or within a relatively short follow-up period, this review also examines the role of complications occurring remote from insertion and/or at the time of removal.

In this article, we aim to describe both common and rare complications associated with IUD use. These complications are organized by the timing that the specific complication

✉ Melissa G. Myo
melissa.myo@med.usc.edu

[1] Department of Obstetrics and Gynecology, Division of Family Planning, University of Southern California, Los Angeles, CA, USA

may arise, but, as will be mentioned below, some complications can be discovered at different time points of IUD use. Issues that complicate insertions of IUDs include failed insertions, syncope, and vasovagal reactions during insertions, infection, and perforation. Complications noted during the use of an IUD include expulsion and pregnancy, while the IUD is in situ, and complications that may impact IUD removal include missing strings on exam and IUD fragmentation during the removal process. The goal of this article is to describe these issues generally and also to provide any updates to the understanding of certain complications, which may include improving the recognition of risk factors and introduce new areas of research that has not yet been thoroughly explored.

Complications at Time of Insertion

Failed Insertion

Failed IUD insertion is thought to be uncommon; however, IUD providers should be aware of risk factors that can make insertion difficult without additional procedures, adjunctive imaging, and pain control. Persistent attempts without adjusting, accommodating, or referring in the face of a challenging placement may lead to complications.

Risk factors for failed insertions include nulliparity and prior cesarean sections. In a retrospective cohort study of more than 600 individuals undergoing levonorgestrel intrauterine system (LNG-IUS) insertions, only 3 failures were recorded; however, difficult insertion was described in nearly 20% of cases, with dilators needed in 7.7% versus 3.1% of cases for nulliparous and parous women, respectively [3]. In a similar retrospective cohort study nearly 1177 adolescent, majority nulliparous women, approximately 5% of patients required a second attempt at IUD insertion by another provider, with 4 cases failing the second attempt [4]. Higher rates of insertion failure have been described as well. In a separate retrospective cohort examining 197 IUD insertion attempts by family planning nurse practitioners (mean experience of 14.1 years), 18% of attempts failed, with more failures encountered among nulliparous women [5]. Prior cesarean sections have also been associated with insertion failures; in a randomized clinical trial by Bahamondes et al. examining the utility of misoprostol administration in patients who have a history of IUD insertion failure, insertion failure was associated with the number of cesarean sections [6].

Misoprostol, however, should not be routinely used prior to IUD insertion. In a systematic review of 8 randomized controlled trials examining the effect of misoprostol on ease and success of insertion, none found differences in success between study groups [7]. In individuals with a previous failed IUD insertion, misoprostol improves chance of success during the next attempt. In the RCT mentioned above, 200 mcg of vaginal misoprostol placed at 10 and 4 h prior to clinic among women needing a second attempt after first failed insertion was associated with insertion success when compared to placebo [6].

Syncope and Vasovagal Reactions

Syncope and vasovagal reactions (e.g., bradycardia, diaphoresis, nausea/vomiting) are uncommon, occurring in approximately 2% of IUD insertions [8, 9]. While they are generally mild and self-limited, a syncopal or vasovagal episode can be uncomfortable, embarrassing, and inconvenient, which can have a negative impact on IUD acceptability. In addition, because individuals with cardiac conditions can face more serious consequences from these episodes, IUD providers should be aware of this potential complication and its associated risk factors. Syncope and vasovagal episodes typically occur at the time of IUD insertion or immediately after, primarily related to the patient's reaction to pain. Nulliparity is linked to these episodes, though they are otherwise largely hard to predict. Theoretically, nulliparous patients who require more cervical manipulation might be more likely to experience vasovagal symptoms. Unfortunately, misoprostol has not been shown to improve ease of IUD insertion [7].

When patients exhibit signs and symptoms of a vasovagal reaction, procedures should be stopped and efforts made to calm the patient and encourage counterpressure maneuvers to reduce venous pooling in the extremities (e.g., tensing the arms and legs). Lifting the patient's legs or putting the patient in Trendelenburg position can help to improve blood flow to the brain as well.

Infection

Given the history of the Dalkon Shield being linked to cases of sepsis, significant amounts of research have been conducted examining the link between IUDs and pelvic inflammatory disease (PID), confirming the overall low risk of conventional, T-framed IUDs [10]. In a 1992 WHO-sponsored IUD trial that included nearly 23,000 insertions, PID occurred in 1.6 cases per 1000 person-years of use, over 51,399 person-years of follow up. The highest risk for infection was noted to be during the first 20 days after insertion as compared to after those 20 days (9.7 vs 1.4 per 1000 person-years, respectively) [11]. In another study examining timing of *Neisseria gonorrhea* and *Chlamydia trachomatis* screening in relation to IUD placement, researchers noted the overall risk of PID to be 0.54% in the first 90 days of placement among 57,728 IUD insertions [12]. The same study found that the risk of PID was equivalent among patients screened up to 1 year prior to placement versus those screened on the same day of placement, which suggests that patients do not need additional pre-screening visits prior to IUD placement.

Randomized controlled trials note the lack of benefit to prophylactic antibiotics at the time of IUD placement [13, 14].

If PID is diagnosed in patients with an IUD in place, the Centers for Disease Control and Prevention (CDC) US Selected Practice Recommendations for Contraceptive Use recommend initiating treatment with IUD in place [15]. In a systematic review of studies examining the potential difference in treatment course of IUDs left in situ versus removing the IUD, similar infectious outcomes were noted between both groups of patients [16].

A new area of research examining infectious outcomes as related to IUD placement include possible management of patients who desires immediate postpartum placement of IUDs but develop signs of chorioamnionitis during their delivery. The CDC recommends against IUD placement in the setting of postpartum sepsis based on theoretical concerns for increased complications [15]. In a small retrospective cohort study, researchers examined patients who intended on receiving IUD placements immediately after delivery and developed signs suspicious for chorioamnionitis during their delivery and compared patients who developed signs of infection after having already received their IUD ($n=22$) to patients who had signs of infection prior to their postplacental IUD placement ($n=4$). There were no differences in infectious outcomes including postpartum endometritis, sepsis, or prolonged/repeat antibiotic administration [17]. The study was underpowered but raises the possibility that the recommendations against immediate postpartum IUD placement in patients who are suspected of having chorioamnionitis may be overly cautious and add barriers to contraceptive use in patients who desire them.

Perforation

Uterine perforation is a serious but rare complication of IUD use. Most studies suggest that perforations occur from between 0.3 and 2.6 per 1000 insertions [18–21]. A true estimate of the burden of IUD perforations, however, can be difficult to quantify. Clinical trials take place at sites with trained study personnel, with patients selected for good general health and regular menstrual cycles, which may bias towards lower complication rates due to excluding patients who have underlying risk factors. These studies also represent the burden of detected perforations; in studies conducted over a shorter period of time, patients who have asymptomatic perforations may not be accounted for.

The European Active Surveillance Study for Intrauterine Devices (EURAS-IUD) is one of the largest multicenter, prospective cohort studies, which followed patients for 12 months, documenting the incidence of perforations at 1.4 per 1000 insertions for LNG-IUS users and 1.1 per 1000 insertions for Cu-IUD users [22]. In a follow-up study involving the same cohort of patients, followed for a total of 5 years, researchers identified additional perforations increasing the incidence to 2.1 perforations per 1000 LNG-IUS insertions and 1.6 per 1000 Cu-IUD insertions [23]—the study concluded that perforations primarily occur in close proximity to the time of insertion. The EURAS-IUD study confirmed a subset of patients with asymptomatic IUD perforations, leading to their late presentation and management. In a review of uterine perforations with the LNG-IUS from the adverse drug reaction databases of the Netherlands, New Zealand, Switzerland, and Germany, only 8.4% (47 of 559) of perforations were discovered at time of insertion, with the mean time of detection at 306 days after insertion; 18% of these perforations were discovered at follow-up when strings were missing [24]. While the clinical presentation of these patients was reported in only 41% of these cases, 76% of the reports noted abdominal pain, 27% exhibited abnormal bleeding pattern, and 17.9% had an unintended pregnancy that led to the discovery of uterine perforation. Consequently, a string check alone may not be sufficient to alert the provider to a possible perforation, and patients who present with bleeding and pain with strings present on exam may benefit from a more thorough workup to rule out perforation.

Risk factors for perforation include breastfeeding status at time of placement, interval placement after a delivery, and provider inexperience [24, 25••]. The Association of Perforation and Expulsion of Intrauterine Devices (APEX-IUD) study was a large, multi-site, US cohort study examining the timing of IUD placement postpartum among 326,658 patients. The study noted the highest perforation rates when IUDs were placed between 4 days and 6 weeks or fewer postpartum (5-year cumulative incidence of 1.98%), with increased risk persisting through 52 weeks postpartum when compared to interval, non-postpartum placement. A more recent retrospective cohort study of 24,959 IUD insertions using the Kaiser Permanente Southern California electronic medical record data from 2010 to 2016 suggested that the risk of perforation was statistically significantly higher with placement at 4–8 weeks as compared to 9–36 weeks (0.78% versus 0.46%, respectively), with risk decreasing for IUD placements after 22 weeks postpartum [26••]. The difference in risk of perforation in both studies between earlier and later interval placement remained after controlling for breastfeeding status, and breastfeeding status at time of placement remained an independent risk factor for perforation. The APEX-IUD study suggested that LNG-IUS recipients might be at a slightly higher risk of perforation than Cu-IUD recipients at 1.64 versus 1.27 per 1000 person-years (aHR: 1.49; 95% CI of 1.25–1.78) [27••]. The slight increase in risk was not suggested to be clinically significant.

The management of the perforated IUD is dependent on the degree of perforation—complete versus partial perforation into the myometrium. Partially perforated or embedded IUDs, depending on the degree of embedment, can be

removed transcervically. In our practice, the removal of an IUD that does not appear on imaging to have any part perforating beyond the serosa should begin with an attempt at transcervical removal in the clinic setting using alligator forceps with ultrasound guidance and with a paracervical block for anesthesia. While ultrasound may not always be able to resolve the orientation and depth of IUD perforation [28], skilled providers may be able to avoid the need to take their patients to the operating room for operative hysteroscopy. Cases where the IUD is embedded more deeply may however require the use of the operating room where better pain control can help to facilitate removal [28].

An IUD that is partially perforated but with segments extending beyond the serosa of the uterus may be challenging to remove completely via transcervical route. Attempts to remove these IUDs transcervically can result in the IUD breaking, potentially leaving fragments in the myometrium or the abdominal cavity. In these cases, as well as in completely perforated cases, we recommend laparoscopy, with possible hysteroscopy immediately prior to the laparoscopy to clearly delineate the extent of perforation (in cases of partial perforation) prior to committing the patient to intra-abdominal surgery. Of note, patients who are asymptomatic may not need to have their IUD removed immediately and may forgo the surgery indefinitely versus choose only to undergo removal if undergoing surgery for any other reason.

Complications Post-insertion to Removal

Expulsion

Expulsion of an IUD is reported to occur following 2–10% of interval, non-postpartum insertions during the first year of use [29–31]. The ACCESS-IUS trial, a multicenter, phase 3, open-label clinical trial of the Liletta® LNG-IUS, examined expulsion through 72 months of use, reporting an overall expulsion rate of 4%; more than 75% of these expulsions occurred during the first year of use [32•• 34]. Risk factors for expulsion in non-pregnant patients include abnormal uterine bleeding [33•, 35•] and having had a previous expulsion [29, 34]. Immediate postpartum placement is also associated with complete expulsion; a meta-analysis reported expulsion rates of 27% among LNG-IUS users and 12% Cu-IUD users when the IUD was placed vaginally; much lower rates of expulsion are reported for those receiving an immediate post-placental IUD at the time of cesarean delivery (3.8% for LNG-IUS and 2.3% for Cu-IUD) [35•]. Interestingly, rates of expulsion for patients who receive an IUD several weeks after delivering may be much lower in certain populations—Kaiser Permanente Southern California electronic medical record data from 2010 to 2016 noted expulsion rates around 1% when patients received an IUD at 4–8 weeks postpartum and 9–36 weeks postpartum [27••]. A sub-analysis of the APEX-IUD study also found that breastfeeding lowered expulsion risk among postpartum patients [36]. Patients with risk factors for expulsion should be counseled on the possibility of expulsion, educated on how to suspect expulsion, and be offered follow-up during through the first year of placement, after which the risk of expulsion should be low.

Pregnancy with IUD In Situ

Pregnancy in the setting of IUD use is low, ranging from 0.2 to 0.8% [37]. Risk factors for pregnancy with an IUD in situ include younger age and history of IUD expulsion [38, 39]. In general, patients with an IUD are less likely to experience a pregnancy than patients without an IUD, but if a patient becomes pregnant with an IUD, the pregnancy is more likely to be an ectopic pregnancy [40]. In a secondary analysis of the Contraceptive CHOICE Project, which was a large prospective cohort study examining outcomes for patients who were able to receive the contraceptive method of their choice at no cost, researchers studied rates of ectopic pregnancies among their participants. Ectopic pregnancies occurred at a rate of 6.9 per 1000 women-years among participants who used no methods or condoms, versus 0.5 per 1000 women-years among LNG-IUD users, and 0.46 per 1000 women-years among Cu-IUD users. In the duration of the study, the proportion of ectopic pregnancies in IUD users was higher than that of participants using no method or condoms (7.84% and 4.17% in LNG and Cu-IUD users vs 1.37% in no method/condom users). In other words, IUD use reduced the risk of ectopic pregnancy overall, but in participants who used IUDs and who became pregnant, a higher percentage of them had an ectopic pregnancy [41].

IUD users with a positive pregnancy test should undergo timely pelvic ultrasound to confirm both the location of the pregnancy and the location of the IUD. An IUD may need to be removed for uterine aspiration when diagnosing an ectopic pregnancy. Given the rarity of contraceptive failure with an IUD, pregnancies with an IUD in situ are more likely to be pregnancies that were not diagnosed at the time of insertion. Consequently, in the case of ectopic pregnancies that are managed surgically or medically and without uterine aspiration, a normally positioned IUD may be left in situ. Malpositioned IUDs in the setting of an ectopic pregnancy should be removed given their potential contribution to contraceptive failure. In a study examining ultrasonography findings of patients who experienced an intrauterine pregnancy with the IUD in situ, the IUD was found to be in the cervical canal in 52% of those pregnant patients (13/25) [42]. It is unclear if the displaced IUD is the cause of IUD failure resulting in pregnancy or if the malposition is the result of a growing intrauterine pregnancy.

In the case of an intrauterine pregnancy with IUD in situ, a discussion with the patient regarding their pregnancy desires should guide next steps in management [43]. For undesired pregnancies, the IUD can be removed prior to medication abortion or at the time of surgical abortion. For desired pregnancies presenting in the first trimester, IUDs should be removed if the procedure will not pose significant risk of pregnancy disruption. Retained IUDs that are associated with adverse pregnancy outcomes include spontaneous abortion, preterm delivery, septic abortion, and chorioamnionitis; the removal of the IUD early in the pregnancy decreases risks of these adverse outcomes but does not eliminate them completely, when compared to pregnancies conceived without an IUD [44]. If the IUD strings are visible, they can be grasped and removed gently with traction. Malpositioned IUDs that are displaced into the cervix should be removed; if no strings are visualized and the IUD is located above the cervix, instrumentation of the uterus may risk disrupting the pregnancy. A small number of case series describe gentle hysteroscopic removal of IUDs in the setting of an intrauterine pregnancy. In a review of prior case reports, a total of 153 hysteroscopic removals across nine studies were examined, concluding that cervical dilation can be avoided by using smaller caliber hysteroscopes and that using lower pressure settings may decrease the risk of miscarriage when attempting to remove an IUD hysteroscopically [45]. Hysteroscopic removal of an IUD with a pregnancy in situ should only be offered to patients who acknowledge its use as a novel procedure for which there is very limited data.

Complications at Removal

Missing Strings

Missing strings at follow-up or time of removal are a clinical challenge that may be simply treated or herald more serious complications. Patients presenting with missing strings may have an IUD that is well-positioned but has strings retracted, an IUD that has been expelled, or one that has perforated the uterus. Missing strings are commonly encountered among patients who receive IUDs in the postpartum setting. In these cases, IUDs are placed in a recently gravid uterus where conformational changes can affect uterine position and ultimately the location of the strings. In a prospective cohort study of approximately 350 individuals receiving an immediate postplacental Cu-IUD, cesarean deliveries were noted to be more likely to result in no strings visualized at follow up, as compared to vaginal deliveries [46]. In this study, no perforations were found, and the IUDs were confirmed in situ in all cases.

Any patient with missing strings should be considered to have an expelled IUD until proven otherwise. Accordingly, patients should be ruled out for pregnancy and offered a backup contraceptive method for the duration of the workup. Workup for nonvisualized strings upon diagnosis should include an attempt to sweep the endocervical canal with a cytobrush to catch the strings and direct them out of the cervix. If unsuccessful, the provider should obtain imaging of the uterus via ultrasound to confirm the location of the IUD. While an abdominopelvic X-ray may be useful for confirming the presence of an IUD in the body cavity, it is unable to determine if the IUD is intrauterine or perforated and free within the abdomen or pelvis [43]. Once the IUD is confirmed to be intrauterine, the patient can be reassured; the IUD does not need to be removed in this situation. Removal attempts in the future would likely require the use of an IUD hook or alligator forceps, with or without ultrasound guidance. In our practice, we complete a bedside ultrasound at the desired time of removal to confirm the IUD's location in the uterus and routinely use alligator forceps with ultrasound guidance to target the IUD and minimize repeated attempts and discomfort for the patient.

Incomplete Removal and IUD Fragmentation

A possible complication at the time of removal is an incomplete removal of the IUD, where a portion of the IUD is broken and retained. IUD fragmentation is not well studied; most available literature are case reports where an incomplete IUD is noted at time of removal [47–49]. A recent study examined the Food and Drug Administration Adverse Event Reporting System (FAERS) database from 1998 to 2022 for reports of adverse events associated with IUDs noting more than 6284 cases with disproportionate reports of breakage for copper (9.6%) versus hormonal (1.7%) IUDs [50•]. An increasing number of breakage reports were also reported starting in 2012 for the copper IUD. While the FAERS database is voluntarily reported and does not contain clinical information, which limits estimation of the true incidence of IUD breakage and further understanding of the circumstances associated with fragmentation, the study does highlight providers' increasing concern about this issue.

Theorized reasons for IUD fragmentation include possible structural breakdown of the device over the years the device remains in situ, from contractile forces exerted by the myometrium, or from possible embedment of a portion of the IUD that does not dislodge during the removal process. During an IUD removal attempt, if there is more resistance than anticipated while pulling on the strings, it may be prudent to attempt removal with alligator forceps. Grasping the IUD with the forceps at the junction of the arms and the stem and gently elevating and rotating the IUD could potentially dislodge an embedded arm to facilitate the removal of a complete IUD rather than grasping distally and potentially breaking the IUD in the process of removal. This method of

removal does not prevent an incomplete removal if the IUD was fragmented in situ. If an IUD fragment is left, it can be retrieved via ultrasound-guided removal attempts with an alligator forceps or via hysteroscopy. Removal of a fragment with manual vacuum aspiration has also been described [49]. It is also possible that imaging may reveal the fragment is extrauterine and that the fragmentation was the result of attempting to remove a perforated IUD; laparoscopy may be required for the fragment's removal.

In rare cases, an IUD fragment can become completely embedded in the myometrium or endocervical canal. If neither perforating beyond the serosa nor accessible from the endometrial cavity, removal may require hysterotomy. In asymptomatic patients, the risks of removal in this case may outweigh the benefits. However, for patients with pain, bleeding, or who desire future fertility, individualized counseling may be warranted. There are no prospective studies that characterize the natural history of embedded IUD fragments. In postmenopausal patients, fragments might be expected to stay in place given that these patients do not menstruate. In premenopausal and pregnant patients, however, fragments may migrate with uterine contractions or growth, respectively. For premenopausal patients, the potential for migration of the fragment with menses suggests that expectant management may expel the fragment or allow the fragment to become more accessible such that interval imaging and procedural planning could be considered. For patients who are planning pregnancy in the near future, there is insufficient evidence to guide counseling about the impact of an embedded IUD fragment on conception and pregnancy outcomes. Given the inflammatory effect of foreign bodies, however, and the potential for an IUD fragment to contribute to the risk of pregnancy loss or preterm birth, patients desiring pregnancy may consider more invasive surgical management.

In our clinical practice, deeply embedded fragments can be better localized during hysteroscopy with an intraoperative transabdominal ultrasound, where the depth of the fragment in relation to the endometrial cavity can be better visualized. Operative hysteroscopy with tissue removal systems (e.g., MyoSure®) or resectoscopic techniques can help expose and remove the fragment. Alternatively, a fragment located beneath the serosa can be removed laparoscopically by making a hysterotomy; however, the risks of a uterine incision must be weighed against the benefit of removing a fragment that has not been proven to impact fertility or pregnancy outcomes.

Conclusion

Overall, IUD complications are rare, and IUD use is very safe. Continued research and understanding of various complications is imperative in gynecological care, since some complications can be very serious or distressing to patients. Perforations, for example, occur rarely even in large multisite studies, but certain patients have more risk factors for perforation than others and may warrant additional counseling on their risks and precaution at the time of insertion. Other issues like expulsion, missing strings, and difficult IUD removal may be less serious but are nevertheless concerning and burdensome to patients. Referrals should be made to Complex Family Planning specialists if routine care is not sufficient to manage these complications.

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Compliance with Ethical Standards

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Human and Animal Rights and Informed Consent All reported studies/experiments with human or animal subjects performed by the authors have been previously published and complied with all applicable ethical standards (including the Helsinki declaration and its amendments, institutional/national research committee standards, and international/national/institutional guidelines).

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placement when compred to Cu IUD (27.4% vs 12.4%), with an adjusted risk of 1.90 among immediate placement after vaginal deliveries. Understanding risks of expulsion can help providers better counsel patients and screen for expulsion at follow up.

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