Human immunodeficiency virus and infertility treatment: an Ethics Committee opinion

Ethics Committee of the American Society for Reproductive Medicine

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Human Immunodeficiency Virus is a serious but manageable chronic disease that affects persons of reproductive age, many of whom express a desire for biological parenthood. This document is a revision of the original document of the same name, last published in 2015 (Fertil Steril 2015;104:e1–8). (Fertil Steril® 2021;115:860–9. ©2021 by American Society for Reproductive Medicine.)
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ESSENTIAL POINTS

- HIV is a serious but manageable chronic disease that affects persons of reproductive age, many of whom express a desire for biological parenthood.
- Current treatments for HIV can limit the risk of viral transmission to partners and offspring. Recent studies have shown that in HIV-infected women, the use of antiretroviral therapy and the avoidance of breastfeeding may reduce the chance of infection in a newborn to less than 2%.
- In couples in which the man is infected with HIV, the use of sperm preparation techniques coupled with either intrauterine insemination or in vitro fertilization (IVF) with intracytoplasmic sperm injection (ICSI) have proven to be highly effective in avoiding seroconversion of uninfected women and offspring.
- In serodiscordant couples, pre-exposure prophylaxis with antiretroviral drugs may further reduces the risk of HIV transmission to an HIV-negative female partner.
- There are no reports of HIV infection of laboratory personnel resulting from processing the gametes or embryos of serodiscordant couples using current laboratory protocols. Cross-contamination of the gametes or embryos of other couples in the same laboratory has also not been reported.
- For the abovementioned reasons, there is no ethical reason to withhold fertility services at clinics with the necessary resources to provide care to HIV-infected individuals and to couples who are willing to use recommended risk-reducing therapies. Clinics without sufficient resources or expertise to offer care should assist in making referrals to providers who are equipped to treat such patients.
- In third-party reproduction, the disclosure of an intended parent's HIV status to gamete donors or gestational carriers should be commensurate with the principles of informed consent.

HIV can infect people of all ages, but the largest group affected (86%) consists of persons of reproductive age (15–44 years). Globally, it has been reported that 20%–50% of people with HIV desire children (1, 2). This highlights the importance of minimizing the risk of viral transmission to sexual partners and offspring and providing these patients with access to fertility care. It is important that providers have the available information and technology to minimize the risk of viral transmission to an uninfected partner and offspring.

In 1994, the Ethics Committee of the American Society for Reproductive Medicine (ASRM) set forth ethical guidelines concerning patients with HIV who may request or need reproductive assistance (3). The Committee expressed concern about the potential transmission of the virus to an uninfected partner or to the couple's

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offspring. It also addressed potential problems related to children with 1 or both parents having a chronic medical condition. On the basis of these concerns, the Committee recommended that all couples requesting reproductive assistance be offered to be tested for the presence of HIV. The Committee also recommended that institutions establish their own written policies on infertility treatment for people infected with HIV. It suggested that physicians counsel couples about the consequences of using potentially infected sperm; strategies to minimize transmission risk; and the options of using donor sperm, considering adoption, or not having children.

When this guidance was published in 1994, HIV infection was considered a serious risk to the establishment of a healthy pregnancy. Since then, the treatment of HIV-infected persons and laboratory techniques for the preparation of virus-free sperm for reproductive assistance have improved substantially (4–7). In addition, with the use of modern antiretroviral therapy, people with HIV now have life expectancies equivalent to those of HIV-negative persons (8).

Clinical protocols for minimizing the risk of HIV transmission to partners and offspring have also been developed (9). Initial studies have shown that zidovudine reduces the rate of vertical transmission of infection from 16%–24% to 5%–8% when administered to HIV-infected pregnant women during the second and third trimesters and their newborns for 6 weeks (7, 10–12). More recent data have demonstrated that combination antiretroviral treatment given antenatally to HIV-infected women further reduces the rate of transmission to an offspring to less than 2% (9,13–15).

For serodiscordant couples in which the male partner is HIV-positive, treatment of the male partner with antiretroviral drugs to reduce serum and semen viral loads and preexposure prophylaxis (PrEP) administered to the female partner have been shown to minimize risk to the female partner (7, 16–18). When assisted reproductive technologies (ARTs) are used, both sperm washing with intrauterine insemination (IUI) and in vitro fertilization (IVF) with intracytoplasmic sperm injection (ICSI) have been shown to minimize the risk of seroconversion in the female partner and offspring.

A meta-analysis of studies conducted in North America and Europe has concluded that elective (planned) cesarean section added to antiretroviral treatment decreases the vertical transmission rate of HIV infection to 2% compared with 7.6% in children of treated women who deliver vaginally. Subsequent studies have found that for pregnant women undergoing potent antiretroviral therapy, cesarean section is not needed to lower the risk of transmission if viral levels are undetectable (19–21).

In light of these changes in the treatment of and reproductive consequences for HIV-infected men and women, the Ethics Committee re-examines and periodically continues to review its earlier guidelines. This report addresses ethical issues concerning infertility treatment when 1 partner is infected with HIV; infertility treatment when both partners are infected with HIV, knowingly conceiving a child who might be born with HIV; HIV testing for couples seeking fertility assistance; potential risks to healthcare providers because of HIV-infected patients; improving access to infertility care for HIV-infected individuals; and providing third-party assisted reproductive services to individuals and couples in which 1 or both intended parents are infected with HIV.

INFERTILITY TREATMENT WHEN ONE PARTNER IS INFECTED WITH HIV

It has been recommended that individuals with HIV delay pregnancy attempts until their HIV RNA level is suppressed or until after at least 6 months of antiretroviral therapy (22). In couples that are ready to reproduce, the presence of HIV might affect the reproductive potential of a seropositive person. In infected women, the virus might increase their susceptibility to pelvic infections and affect the ovarian reserve (23, 24). In infected men, HIV and possibly antiretroviral therapy might be associated with semen abnormalities, including low sperm count, motility, and volume (7, 25–28). In addition, antiretroviral therapy has been shown to affect sperm DNA integrity in HIV-infected men, which might be associated with low natural and assisted pregnancy rates and high miscarriage rates (29). For other infected men, the virus has no impact on reproductive functioning unless the person is ill because of an opportunistic infection.

Providing PrEP to HIV-uninfected adults in serodiscordant relationships has been shown to be associated with a 95% reduction in the risk of HIV transmission, with an observed HIV incidence of $<0.5\%$ per year compared with an expected incidence of $>5\%$ per year (30). The risk of viral transmission increases dramatically if an HIV-infected partner's viral load is high or if an HIV-uninfected partner has a concomitant genital infection, inflammation, or abrasions. However, HIV shedding into the seminal plasma has been seen in up to 5.3% of HIV-infected men even when they are on effective antiretroviral therapy (31), and even in men with fully suppressed plasma viral loads, viral shedding in the semen is possible (32). As outlined below, there are various ways in which conception can occur while either eliminating or minimizing the risk of HIV transmission between partners.

Female Partner HIV-Infected, Male Partner HIV-Uninfected

If a woman is infected with HIV and her male partner is uninfected, transmission of infection to the male partner can be avoided by performing self-insemination with the partner's sperm at the time of ovulation. The process is known as homologous insemination (33). There are also considerable data showing that the risk of transmission can be minimized using timed intercourse if the woman's viral load is suppressed to undetectable levels using antiretroviral therapy and/or the uninfected man is administered antiretroviral therapy as PrEP (7). Although clinicians should emphasize that this option may not be as safe as homologous insemination, it does represent an alternative. No head-to-head comparative studies have been conducted comparing homologous insemination with timed intercourse with the uninfected male partner on antiretroviral therapy.

Regardless of the method used for insemination, the resulting pregnancy may still pose some risk to the HIV-

infected woman and her child because opportunistic infections occurring during pregnancy can be devastating for the woman and her fetus. An HIV-infected woman may require medications in the early stages of pregnancy, which might adversely affect the developing fetus. In addition, amniocentesis and chorionic villus sampling may risk viral transmission to the fetus. The US Department of Health and Human Services states that amniocentesis should be performed on women with HIV only when the HIV RNA levels are undetectable after the initiation of an effective antiretroviral regimen and should be done in conjunction with an HIV expert (34). The low risk of viral transmission to the fetus cannot be eliminated. In addition, there is a variable risk of transmission to the newborn in utero, during delivery, and during breastfeeding. If an HIV-infected pregnant woman is not actively treated with antiretroviral drugs, the risk of HIV transmission to the infant is >20%, regardless of her viral load (9). Administration of zidovudine to pregnant women and newborns during the first 6 weeks of life can substantially reduce the risk of HIV transmission to 5%–8%. Administration of combination antiretroviral therapy and avoidance of breastfeeding may further reduce the chance of infection to approximately 2% (7, 9–12). However, there are reports of adverse fetal and offspring outcomes among infants exposed to antiretroviral therapy, although this is not a consistent finding (35, 36).

According to the US Department of Health and Human Services, breastfeeding is not recommended for women with HIV in the United States because most antiretroviral therapies reduce but do not eliminate the risk of HIV transmission via breast milk. In addition, safe and affordable infant-feeding alternatives are available, and there is a paucity of safety data on the effect of most modern antiretroviral medications on breastfeeding (37).

Male Partner HIV-Infected, Female Partner HIV-Uninfected

Limiting sexual intercourse without the use of condoms to days within the peak fertility window appears to decrease but not eliminate the risk of HIV transmission to the female partner (38). In an older study, the seroconversion rate was 4.3% in 92 HIV-uninfected women with HIV-infected partners who were trying to establish pregnancies through timed intercourse; 21 of the 92 men were on antiretroviral therapy at the time of conception, and all women who were seroconverted reported inconsistent condom use (39). Other studies have shown that the risk of transmission to a female partner through unprotected intercourse can be substantially reduced using antiretroviral therapy in the infected male partner (40). A prospective study of 453 HIV-serodiscordant couples reported no transmission in cases where the infected male partner had a plasma viral load of <1,000 copies/mL (41). Although some HIV-discordant couples have established pregnancies using timed unprotected intercourse without infecting the uninfected partner or child, this practice is not recommended.

For clinics working with couples in which the man is HIV-infected and the woman is HIV-uninfected, it has been suggested that the male partner's viral load be undetectable before attempting pregnancy. Patients with chronically detectable viral loads should be encouraged to seek fertility treatment by ART. In general, male viral loads of <200 copies/mL for the preceding 6-month period are generally considered acceptable for ART (42).

In addition to the efficacy of active treatment of an HIV-positive male partner with antiretroviral drugs, there is accumulating evidence supporting the efficacy of PrEP, in which the uninfected female partner is treated with antiretroviral therapy when conception is attempted. In a study of 46 serodiscordant couples in which the woman was treated with oral tenofovir, none of the women became infected with HIV, and pregnancy rates reached 75% after 12 attempts (43). The US Food and Drug Administration (FDA) states that the risks and benefits of PrEP should be discussed with HIV-discordant couples as 1 of several options to protect the uninfected partner during conception and pregnancy so that an informed decision can be made regarding its use (43). The only medication regimen approved by FDA and recommended for PrEP in all populations is tenofovir (300 mg) administered daily with emtricitabine (200 mg). Subspecialists in reproductive endocrinology and infertility should work in collaboration with experts in infectious disease to ensure that patients are adequately counseled regarding the risks and benefits of this therapy and should discuss available alternatives for safer conception.

For HIV-serodiscordant couples in which the male partner is HIV-infected, sperm preparation and testing can substantially reduce the chance of HIV transmission to the female partner and child. This involves sperm washing to isolate the sperm from the seminal plasma and leukocytes (38), which can then be used for IUI, IVF, or ICSI. This is based on the observation that HIV is present in the seminal fluid but is not capable of attaching to or infecting the sperm (33). There have been no reports of mothers or offspring testing positive for HIV when semen samples devoid of HIV were used for insemination (44, 45). Of note, many recent protocols have made slight modifications, including triple-gradient sperm selection with extended centrifugation periods (46) or continuous density gradient with swim up (47). A meta-analysis conducted in 2016 found no cases of HIV transmission following exposure to washed semen among 3,994 women undergoing 11,585 cycles of assisted reproduction. Similarly, in this analysis of studies that provided data on mother-to-child HIV transmission, there were no cases of vertical transmission among 1,026 newborns either at birth or during follow-up evaluation (48). These are highly reassuring data, and these findings have been confirmed in other studies.

On the basis of these highly reassuring data, in 2017, the Centers for Disease Control and Prevention (CDC) stated that "The risk for transmission from an HIV-infected male partner to an HIV-uninfected female partner is low if appropriate risk-reduction strategies are implemented" (49). Similarly, in 2018, the US Department of Health and Human Services issued "Recommendations for the Use of Antiretroviral Drugs in Pregnant Women with HIV Infection and Interventions to

Reduce Perinatal HIV Transmission in the United States," the contents of which have largely been summarized above (50).

In addition, some centers test washed sperm using PCR assay to determine whether the virus is present in the washed sperm preparation, but the utility and effectiveness of this added step have been questioned by other centers that have eliminated PCR from their protocols (6, 7, 44, 51, 52).

Data on the use of IVF with ICSI for preventing HIV transmission to uninfected women are promising. In a 10-year retrospective review of a program offering ART to HIV-discordant couples, 181 couples underwent treatment with IVF and ICSI. There were 116 deliveries of 170 neonates, with no female seroconversions and no infections in any of the offspring (51). Similarly, in 2016, a meta-analysis of infected male partners with seronegative female partners undergoing IVF with ICSI found no cases of HIV transmission to the female partners even in a subset of HIV-infected men without viral suppression at the time of semen washing. Similarly, there were no reported cases of vertical transmission (48).

Data on reproductive outcomes in serodiscordant couples are limited and conflicting. A recent case–control study of HIV-seropositive men with HIV-seronegative partners undergoing a 3-step sperm-washing procedure with ICSI found slightly low fertilization rates for the HIV-seropositive men but otherwise no differences in the number of embryos transferred, cleavage and implantation rates, pregnancy rates per cycle, miscarriage rates, or live birth rates (53). However, another study of HIV-seropositive women versus HIV-seronegative controls undergoing IVF or ICSI found lower rates of clinical pregnancy per transfer (12% vs. 32%), implantation (10% vs. 21%), and live births (7% vs. 19%) in the seropositive women (54).

Although standardized global guidelines are lacking, preventive measures do seem to be effective in countries with a high risk of transmission. When a comprehensive safer conception package (consisting of antiretroviral therapy for HIV-positive partners, oral PrEP for HIV-negative partners, daily fertility and sexual behavior tracking, counseling for self-insemination, voluntary male circumcision, and fertility care) was provided to HIV-serodiscordant couples, the 6- and 12-month cumulative pregnancy rates were 45.3% and 61.9%, respectively. No cases of seroconversion were observed (55).

These statistics are reassuring, but the complete efficacy of these techniques is difficult to guarantee. Couples must still be cautioned about the potential risk of HIV transmission to an uninfected partner and their offspring. It is not possible to guarantee that a female partner will not be infected when using sperm from an HIV-positive man. Options such as donor sperm, adoption (which can be more difficult for HIV-infected prospective parents), or not having children should be discussed as a part of complete counseling. Although federal law prohibits adoption agencies from discriminating prospective adoptive parents based on HIV status, the HIV status of the prospective parents may influence which couple a birth mother selects. When male-positive discordant couples want to have their own genetically related children, they should be informed of available risk-reduction techniques and encouraged to seek assistance at institutions skilled in sperm preparation as well as appropriate tests and treatment necessary to minimize the chance of HIV transmission to the partners and offspring. Recently, in California, a 2019 law made HIV PrEP and post-exposure prophylaxis (PEP) available without a prescription, starting in January 2019, thus providing another opportunity to minimize transmission risks (56).

INFERTILITY TREATMENT WHEN BOTH PARTNERS ARE INFECTED WITH HIV

As with any couple presenting for evaluation and treatment, both members of an HIV-infected couple may have normal fertility potential, or 1 or both members may have impaired fertility. Recent data have shown that HIV-positive individuals in seroconcordant relationships have higher plasma viral loads, with women having higher genital viral loads than their HIV-positive counterparts in serodiscordant relationships, which may translate to faster disease progression and a larger viral reservoir (57). Reproductive data on couples in which both partners are HIV-positive are limited. A study investigated IVF outcomes in seropositive couples. The investigators found that the outcomes were severely reduced, with only 1 birth after 33 cycles (58). If an HIV-infected couple asks for medical advice regarding pregnancy, they must be encouraged to adopt protocols that have been demonstrated to be safe and effective in Institutional Review Board–approved research studies. This will also allow for collection of data on pregnancy and seroconversion outcomes. There have been reports on couples in which both the partners' viral loads were suppressed to undetectable levels who conceived children free of HIV (59).

Although HIV-seroconcordant couples do not have the same concerns about transmission to an uninfected partner as serodiscordant couples, it is important to at least discuss with the couple the possibility of HIV superinfection. Although the data are imperfect, there are increasing reports that an HIV-infected partner can transmit his or her unique strain of HIV to another infected partner (60). The risk of such events is expected to be very low in a setting where both partners have fully suppressed viral loads because of effective antiretroviral therapy, which would be the best way to minimize this risk while optimizing outcomes for the couple and their offspring.

ETHICAL ISSUES RAISED BY KNOWINGLY RISKING THE BIRTH OF A CHILD WITH HIV

The risk of HIV transmission to an offspring when 1 or both parents are seropositive can be greatly reduced but not completely eliminated. According to the American College of Obstetricians and Gynecologists (ACOG), the treatment of HIV-infected pregnant women with combined antiretroviral therapy can result in a 1%–2% (or lower) risk of mother-to-child transmission if maternal viral loads of 1,000 copies/mL are present, independent of delivery route or duration of ruptured membranes before delivery (61). Vaginal delivery is appropriate for HIV-infected pregnant women who have been on combined antiretroviral therapy and those who

have viral loads of ≤1,000 copies/mL at the time of delivery (61). HIV-positive women whose viral loads are >1,000 copies/mL at the time of delivery should be offered scheduled prelabor cesarean delivery (61), with intravenous and oral antiretroviral drugs given to the infant for 6 weeks postpartum to reduce perinatal transmission rates (42). However, this risk is never completely eliminated.

Does a couple's desire to have genetically related offspring justify the risk of transmitting a serious disease to their child? Although the risk can be significantly reduced, and recent data have shown no instances of vertical transmission with the use of sperm preparation with IUI or IVF with ICSI, theoretically, the risk cannot be completely eliminated. Assessing the ethics of assisting such patients to have children includes addressing the question of whether offspring born with HIV are harmed despite taking preventive steps. In situations in which a child might be born with a serious disease, one can argue that individuals do not act unethically in proceeding with reproduction if they have taken all reasonable precautions to prevent disease transmission and are prepared to love and support the child, regardless of the child's medical condition. Similarly, one can argue that healthcare providers do not act unethically if they have taken all reasonable precautions to limit the risk of transmitting HIV to the offspring or to an uninfected partner. However, it would not be ethically acceptable for a physician, clinic, or institution to proceed with reproductive assistance if they lacked the clinical and laboratory resources and expertise needed to effectively care for HIV-infected couples who wish to have a child. In such instances, the medical care provider should refer such couples to a center where these resources and expertise are available.

There are scant data on how young adults with perinatally acquired HIV fare as they transition into parenthood. A study conducted in this regard consisted of structured interviews of young adults with perinatally acquired HIV (62). The participants expressed concerns about not "being there" for their children because of sickness and worries that their children would experience HIV-related discrimination once the parent's HIV status was disclosed. The participants reported the importance of emotional support offered by providers and other social services. Participants who intended to have another child were motivated by a strong desire to create a family of their own as a way to deal with HIV-related losses and stigma. As young adults with perinatally acquired HIV continue to mature, it is important to be aware of the unique needs of families living in the context of intergenerational HIV infection.

TESTING INFERTILE COUPLES FOR HIV

At the end of 2016, CDC estimated that approximately 162,500 people in the United States had undiagnosed HIV (63). Because most of them are of reproductive age, the question arises whether practitioners are required to perform HIV testing for all couples seeking medical or surgical reproductive assistance. In 2013, the US Preventive Services Task Force recommended that clinicians screen all adolescents and adults aged 15–65 years for HIV infection (64). American College of Obstetricians and Gynecologists (65) and CDC (66) have issued similar recommendations.

In the case of gamete donors, testing for HIV and other sexually communicable diseases is ethically justified to protect the health of gamete recipients. FDA mandates that all gamete donors be screened for high-risk factors and undergo testing for HIV and other viral infections (67). The ASRM Practice Committee has recommended that all gamete donors and recipients be tested for HIV and other sexually transmitted diseases and that testing also be offered to the recipients' partners (68). Testing donors and recipients for potentially transmissible infectious conditions can be reassuring to all parties involved in ART and should be strongly encouraged.

Although new guidelines have recommended testing all individuals, repeated testing has been recommended for those at an ongoing risk of HIV infection, such as those with a history of repeated sexually transmitted infections, a known HIV-infected sexually intimate partner, multiple sexual partners without barrier protection, bisexual or homosexual behavior, or intravenous drug use. Knowing the HIV status of an at-risk individual or couple before the establishment of pregnancy could enable healthcare providers to better assist their patients in making safer reproductive choices.

Given the clear data showing that early identification and treatment of HIV-positive pregnant women is the best way to prevent partner seroconversion and neonatal infection, ACOG has recommended that all pregnant women be routinely screened for HIV, unless they decline (opt-out screening), as early as possible during pregnancy (and even before pregnancy). This approach is currently permitted and recommended in every American jurisdiction. Repeat HIV testing in the third trimester has been recommended for pregnant women with initial negative HIV antibody test results who are known to be at a high risk of acquiring HIV infection. Rapid screening during labor and delivery or during the immediate postpartum period using the opt-out approach should be performed in women who have not been tested earlier during the pregnancy or those whose HIV status is otherwise unknown. If a rapid HIV test result during labor is reactive, antiretroviral prophylaxis should be immediately initiated while waiting for supplemental test results (65).

Couples should consider HIV testing as a part of responsible parenting. National guidelines recommending testing for all adolescents and adults should allay concerns that testing is related to suspicions about past sexual or drug-related misbehavior. Clinicians have a responsibility to educate their patients about the possible means by which infections can be acquired and the advantages of knowing the test results before a pregnancy is established.

HIV AND HEALTH PROFESSIONALS

Knowledge of HIV pathophysiology, combined with careful hygienic practices, has enabled health professionals to minimize the risk of HIV transmission. In the late 1990s, CDC identified 56 individuals who had documented occupational transmission of HIV and another 138 with possible occupational transmission (69). Most of them were nurses and

laboratory technicians with accidental exposure to infected needle sticks or with mucocutaneous exposure. None of these cases of HIV transmission occurred in the context of current ART (44). If standard universal precautions are taken, the risk of viral transmission to medical caregivers is very low and is not a valid reason to deny reproductive services to HIV-infected individuals and couples.

Clinicians faced with requests for reproductive assistance from persons who are infected with HIV should be aware of the decision taken by the US Supreme Court in 1998 in Bragdon v. Abbott (70). The court ruled that a person with HIV is considered "disabled" and is, therefore, protected under the federal Americans with Disabilities Act (70, 71). According to this decision, HIV-infected persons are entitled to medical services unless a physician can demonstrate "by objective scientific evidence" that treatment would pose "a significant risk" to the health or safety of others. In the context of ART care, "others" includes healthcare workers, patients receiving care at the same clinic, and embryos or gametes stored in proximity to those of HIV-infected patients.

To date, the absence of any occupational transmission of HIV to ART providers or bystander patients in a treating clinic suggests that the risk to these individuals because of providing ART care to an HIV-infected patient is minimal. Theoretically, the risk to gametes and embryos could arise through cross-contamination in a laboratory setting, although there is no documentation of contamination of stored human tissue. If an HIV-positive woman is planning to undergo IVF or ICSI, ICSI is generally recommended over IVF to reduce the number of granulosa and cumulus cells in culture because these may harbor HIV (42). To avoid even the possibility of cross-contamination, the ASRM Practice Committee has recommended that samples from a viral carrier be processed in a separate laboratory or designated space within the main laboratory and stored in a dedicated storage tank (16). Additional measures may include the use of "double bagging" or sealing techniques to prevent the direct contact of cryocontainers with liquid nitrogen or storage of samples in liquid nitrogen vapor instead of liquid nitrogen (33). Unless healthcare workers show that they lack the skill and facilities to treat HIV-infected patients safely or that the patient refused to undergo reasonable testing and treatment, they may be legally and ethically obligated to provide requested reproductive assistance. A comprehensive article discussing guidelines for risk reduction while handling gametes from HIV-infected individuals was published in 2016, with detailed and specific instructions for handling semen specimens, eggs, and embryos from HIV-positive patients (42).

IMPROVING ACCESS TO CARE FOR HIV-INFECTED INDIVIDUALS

A recent systematic review has found that many individuals in HIV-discordant relationships have fertility desires and intentions, with younger age and a smaller number of children being associated with increased fertility desires and intentions (72). Specifically, a patient survey conducted by a publicly funded US HIV clinic found that approximately one third of respondents expressed fertility desires (73). Interestingly, in a high HIV prevalence area, the initiation of antiretroviral therapy in HIV-positive women was found to correlate with the desire to have a child (adjusted odds ratio, 2.47), suggesting that improved treatments influence the desire for children (74).

Despite improved outcomes with the use of sperm washing with IUI and IVF with ICSI and advances in the prophylactic treatment of uninfected partners to virtually eliminate the risk of vertical and horizontal transmission of HIV, access to these reproductive technologies for seropositive individuals is limited. Fewer than 3% of US ART practices registered with the Society for Assisted Reproductive Technology provide services to couples in whom 1 or both partners are infected with HIV (75). Providers are strongly encouraged to reduce barriers to providing care to make infertility treatment available to HIV-infected individuals. The desire for access to reproductive care for HIV-positive individuals has also been voiced by the HIV community. A 2017 article from the *Journal of the International AIDS Society* states "We strongly believe that fertility care intervention should be the first line treatment, when affordably accessible, over natural conception for HIV-serodiscordant couples to achieve pregnancy in a safe and efficacious manner." The investigators later stated that "Laboratory assisted fertility methods, including IUI, IVF, and ICSI with semen washing should be the first line treatment recommendation for HIV-serodiscordant couples desiring pregnancy" (76).

As noted above, to date, there have been no reported cases of occupational transmission of HIV to ART personnel or contamination of gametes or embryos in a clinic setting that would support the denial of service to HIV-infected individuals or couples. The few centers that provide care have reported seeing happy and grateful families, many of whom have traveled a great distance for access to the safest method of reproduction currently available. A 2018 study was conducted in which "secret shopper" phone calls were made to the Society for Assisted Reproductive Technology-designated infertility clinics; the caller was identified as either a physician calling on behalf of an HIV-positive patient or a patient inquiring about ART for HIV-positive patients. The investigators found that 40% (for patient callers) and 63% (for physician callers) of clinics offered these services, showing progress with respect to access to reproductive care for persons with HIV (77). Similar data have been found in Canadian literature. A study comparing access to Canadian fertility clinics and services for HIV-positive persons in 2007 and 2014 found that 50% of clinics offered a full range of ART services (defined as including IVF). Compared with 2007, more clinics had implemented separate facilities to treat HIV-infected individuals ($P=.028$), offered IVF to HIV-infected women ($P=.013$), provided sperm washing for HIV-infected men ($P=.033$), and provided risk-reduction techniques to couples in which both partners were infected ($P=.006$) (78). Although access to fertility services for people with HIV has improved over time, it remains limited, highlighting the need for continued efforts to optimize access to comprehensive services.

THIRD-PARTY ASSISTED REPRODUCTION FOR HIV-INFECTED INTENDED PARENTS

The presence of HIV infection can be a factor for individuals or couples who engage in third-party reproduction by enlisting assistance from a gamete donor or gestational carrier. In the case of an HIV-infected gamete donor or gestational carrier, state laws, federal regulations, and professional guidelines counsel against, and under certain circumstances prohibit, the engagement of such individuals (68, 79). In the case where 1 or both intended parents are infected with HIV, questions arise regarding the scope of disclosure that should be provided to third parties that are enlisted to assist with a reproductive plan. The principle of informed consent can be instructive in this circumstance.

Informed consent in a medical setting requires that physicians disclose any information that would be material to a person's decision to undergo or refuse treatment. Gamete donors and gestational surrogates do undergo medical treatment and are, thus, entitled to be fully informed of the risks and benefits of the treatment before giving consent. In the case of an HIV-infected intended parent who plans to use their own gametes for third-party reproduction, for example, an HIV-infected man who wishes to use the services of an egg donor or gestational carrier, what are the requirements for disclosure? The medical risk is not the same for the egg donor and gestational carrier because only the woman receiving the gametes is potentially exposed to the virus. Therefore, the disclosure of the intended parent's HIV status would be material to the gestational carrier's treatment decision to be a part of the risks or benefits calculus required by informed consent. Full disclosure of the sperm provider's HIV status must be provided in that case. A gestational carrier who is willing to provide service to an HIV-infected gamete provider and intended parent is entitled to be fully informed of the potential risks to her health just as an HIV-infected man's female partner should be informed about the potential risks associated with reproductive activity using the male partner's sperm. In some jurisdictions, the recipients of gametes from HIV-infected donors must sign a specialized written waiver acknowledging the medical risks associated with such a transfer (80).

In the case of an HIV-infected intended parent who does not plan to use his or her own gametes, the disclosure analysis is more complex. For example, in the case of a same-sex male couple in which 1 or both of the partners are infected with HIV, but the couple does not plan to use either partner's sperm, does the physician (or any other professional actor, such as an agency) have a duty to disclose the HIV status of the infected partner(s) to the egg donor or gestational carrier? Neither the egg donor nor the gestational carrier faces any medical risk by participating in this couple's assisted reproduction. The doctrine of informed consent has been interpreted to include nonmedical information that is considered material to a patient's decision-making, but typically, the information is considered material only when it has a potential impact on the patient's treatment choices and medical outcomes (81). An intended parent's serostatus would not be included in this category.

Arguments exist that a gamete donor or gestational carrier should be informed of an intended parent's HIV infection as part of the specialized informed consent procedure that accompanies third-party reproduction. Since the donor or carrier is providing a service that results in the birth of a child, factors, in addition to the medical risks, associated with treatment may be relevant to any prospective third-party participant. These factors might include the presence of a chronic medical condition, of which HIV is one of many, in an intended parent. The ASRM Ethics Committee has addressed the disclosure of nonmedical information to gamete donors in the context of informing egg donors about whether their donation resulted in pregnancy or the birth of a child (82). The Committee has noted that the disclosure of such information may interfere with a recipient's privacy rights and, thus, encourages clinics to develop written policies regarding the disclosure of the course of treatment of intended parent(s) to donors. We conclude that programs should clearly inform intended parents, gamete donors, and gestational carriers, before their participation, about, if any, non-risk-posing health information about the intended parents. To the extent that a clinic policy requires or forbids the disclosure of an intended parent's health status to a gamete donor or gestational carrier, HIV infection should be regarded the same as any other chronic health condition.

CONCLUSION

HIV infection is classified as a chronic disease. It is treatable but not yet curable. With the use of modern antiretroviral therapy, many people with HIV now have life expectancies equivalent to those of HIV-negative persons. The potential for HIV-infected persons to live long and healthy lives, have uninfected children, and not transmit the virus to their partners has resulted in increasing numbers of individuals seeking optimal means for creating biological families. Healthcare providers and HIV-infected persons together share responsibility for the safety of the uninfected partner and potential offspring. When an affected couple requests assistance to have their own genetically related child, they are best advised to seek care at institutions that are equipped with the personnel and facilities that can provide the most effective evaluation, treatment, and follow-up. Assisted reproduction technology clinics with the necessary resources and expertise to provide care should offer services to HIV-infected individuals and couples who are willing to use recommended risk-reducing therapies. Clinics without sufficient resources or expertise to provide such care should assist with referral to providers equipped to treat such patients. In third-party reproduction, the disclosure of an intended parent's HIV status should conform to the principles of informed consent. When an intended parent's HIV status poses no medical risk to gamete donors or gestational carriers, clinics should follow written policies that clearly define what information, if any, will be provided to each party before the commencement of any treatment. To the extent that a clinic's policy requires or forbids the disclosure of an intended parent's health status to a gamete donor or gestational carrier, HIV infection should be regarded the same as any other chronic health condition.

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