Fertility Considerations for Gender Diverse Youth

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The number of transgender and gender diverse (TGD) youth presenting for both medical and surgical care related to gender dysphoria is steadily increasing [1, 2]. More attention is thus being paid to the potential for future treatment-related adverse effects including the potential for impaired fertility. The majority of fertility-related studies have been conducted in adolescents and young adults with cancer undergoing gonadotoxic chemotherapy and radiation [3, 4]. While less is known about fertility-related issues in non-oncologic populations, an expanding body of scholarship underscores the importance of considering fertility and reproductive health more broadly across pediatrics [5, 6]. We recognize that terminology continue to evolve over time, and will use "transgender and gender diverse (TGD)," "cisgender," and "birth assigned" for the purposes of this chapter.

The literature suggests that cancer survivors who declined or were not offered fertility preservation (FP) measures prior to initiating potentially gonadotoxic therapies later regretted their inability to have biologically related children [7, 8]. Recent studies in transgender adults also demonstrate a desire for biological children [9–13]. In this context, medical organizations such as the World Professional Association for Transgender Health (WPATH), the Endocrine Society, and the

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American Society for Reproductive Medicine have published guidelines recommending the discussion of FP options with TGD youth and their families prior to initiating any therapies, hormonal or surgical, that may have the potential to cause future impaired fertility [14–16].

This chapter will focus on potential risks of fertility impairment associated with the three most common hormonal therapies used in TGD youth (gonadotropin-releasing hormone agonists, estrogen, and testosterone), FP options related to pubertal stage and birth-assigned gender, attitudes toward FP in the TGD population, as well as both ethical and financial considerations related to FP.

Potential for Infertility Secondary to Hormonal Therapies

Gonadotropin-Releasing Hormone Agonists

Little is known about the impact of hormonal therapies on fertility; specifically no studies have been conducted to examine future fertility outcomes in individuals who began hormonal interventions in adolescence. TGD individuals may be candidates for gonadotropin-releasing hormone agonists (GnRHa), otherwise known as "puberty blockers," once they have begun endogenous puberty (Tanner stage 2). GnRHa are used to suppress the hypothalamic–pituitary–gonadal axis (the hormone cascade responsible for the production of sex steroids). They prevent germ cell maturation and both reversible and irreversible phenotypic changes of puberty. These agents are commonly used to treat precocious puberty (testicular enlargement prior to age 9 years in birth-assigned males, and breast development prior to age 8 years in birth-assigned females) and are not known to cause fertility impairment directly [17]. Historically, pediatric endocrinologists have reassured families about future fertility when pursuing GnRHa treatment in precocious puberty populations. One study that followed youth with central precocious puberty treated with GnRHa showed all patients over the age of 12 years achieved complete sexual maturity by 5 years post-treatment as defined by their hormone levels and clinical Tanner stages; no impairment of reproductive function was seen in adulthood [18]. However, given that GnRHa are used to suppress the hypothalamic–pituitary–gonadal axis, they prevent germ cell maturation and there have been reports of decreased testicular size in birth-assigned males [19]. Keeping this in mind, TGD youth on GnRHa would potentially require a period of time between the cessation of GnRHa and initiation of gender-affirming hormones to allow for further endogenous pubertal development if FP were desired. For TGD youth who want to continue GAH, this may be a barrier to FP as they began GnRHa for that express purpose of preventing permanent phenotypic changes of puberty. These changes would likely occur to some degree if this pause in GAH to allow FP was initiated.

Impact of Testosterone

Studies have shown inconsistent results about the impact of testosterone therapy on ovarian tissue removed from transgender men, partially associated with the duration of exposure. When used for shorter periods of time (~6–21 months), studies have

shown little to no effect on the function and architecture of ovarian tissue [20]. Long-term testosterone use, however, can cause cystic follicles, collagenization, and stromal hyperplasia, much like what is seen in polycystic ovarian syndrome (PCOS), which is itself a hyperandrogenic state [21]. When considering the rates of fertility impairment in birth-assigned females with PCOS, exposure to higher levels of testosterone as the cause of these observed changes could serve as a potential mechanism to explain lower fertility rates [21]. Another theory suggests that follicular atresia is promoted by testosterone exposure, and can thereby negatively impact fertility [22]. One study assessing testosterone levels in birth-assigned females before and after starting exogenous testosterone therapy found that many of the individuals (40%) had pre-treatment testosterone levels consistent with those seen in PCOS, suggesting that this cohort may be at higher risk for infertility prior to initiating treatment with gender-affirming hormones [23]. Studies in individuals with PCOS who have higher than physiologic levels of circulating testosterone show the potential for fertility after ovarian stimulation, with successful pregnancies described in 30–40% who use clomiphene, and up to 82% in those who are treated with human menopausal gonadotropins [24].

Despite these reports of changed ovarian architecture, there have been documented pregnancies in transgender males who have previously been on testosterone therapy [25]. One study described pregnancies in most (88%) of their cohort that were achieved using their own oocytes, even after over half of them had taken exogenous testosterone prior to getting pregnant; age of testosterone initiation was 17–35 years and length of testosterone use ranged from <1 year (in 40% of patients) to >10 years (in 20% of patients) [25]. Of those who achieved pregnancy, 7% required fertility drugs and 12% used assisted reproductive technology including artificial insemination, in vitro fertilization, and gamete intrafallopian transfer [25]. Notably, however, this study only included individuals who had a live birth and the overall conception/miscarriage rates in this population remain unknown. There are also no data on the health outcomes of the neonates that resulted from these pregnancies. This study is also notable for the rates of unintended or unplanned pregnancies for TGD persons on testosterone that imitate rates (approximately half) in cisgender populations [26]. Counseling for TGD youth should thus highlight that even with cessation of menses and regular testosterone use, TGD engaged in sex that involves both sperm and oocytes need contraception to prevent unintended pregnancy.

Impact of Estrogen

Limited research has examined the impact of estrogen on sperm production, and again results have been variable. Men with a history of prolonged estrogen exposure secondary to estrogen secreting tumors have had evidence of spermatogenesis after tumor removal [27]. However, men treated with estrogen for prostate cancer have been shown to develop impaired spermatogenesis, which can lead to reduced fertility [28]. The extent to which these findings can be applied to clinical use of 17B estradiol used to create average cisgender physiologic levels in TGD feminized patients remains unclear.

Few studies have been conducted examining the effect of estrogen in TGD populations, and these are generally limited by small sample sizes. Some studies have shown architectural changes in testes examined microscopically after gonadectomy performed on transgender females exposed to estrogen, which have the potential to affect spermatogenesis, whereas others show less of an impact [29–32]. In one larger study of 108 gender diverse adults currently or previously treated with estrogen, results were heterogeneous. Normal spermatogenesis was found in 24% of individuals, with some level of impairment in spermatogenesis in the rest, including meiotic arrest in 24%, spermatogonial arrest in 35%, Sertoli-cell-only in 15% and tubular shadows in 2% [33]. Those who had been exposed to estrogen therapy up until gonadectomy had higher rates of these abnormalities as compared to those who had discontinued estrogen therapy weeks prior to the tissue collection [33]. Future research is needed to examine implications of these findings on actual fertility rates.

Fertility Preservation Options

TGD youth may seek hormonal interventions at various stages of pubertal development, impacting the availability of FP options. Youth in early stages of puberty may only have access to experimental options (which may or may not be appropriate or accessible), whereas those in later Tanner stages could consider established FP options [34].

Fertility Preservation for Birth-Assigned Females

In birth-assigned females who have achieved menarche, FP options include those commonly used in cisgender women who struggle with infertility. One technique commonly employed by reproductive endocrinologists is oocyte stimulation and retrieval, with subsequent cryopreservation. This process includes hormonal stimulation for 8–14 days, after which oocytes are retrieved trans-vaginally via needle aspiration with ultrasound guidance, and cryopreserved for future use [35]. Embryo cryopreservation is another option after oocyte retrieval, though less practical in pediatrics, as this technique requires a sperm donor [36]. While oocyte cryopreservation has been successfully described in adolescent birth-assigned females, it is important to remember that the injections and method of retrieval may be more difficult for TGD individuals; consideration of possible psychological ramifications (associated with invasiveness of procedures and hormonal stimulation) of pursuing this route is crucial. Procedural risks should also be discussed including ovarian hyperstimulation syndrome and intra-abdominal bleeding [37, 38]. The need to come off blockers to begin some degree of endogenous puberty and the resultant changes, or the delay in starting testosterone based GAH could be a barrier to considering FP [39].

Birth-assigned females in earlier stages of puberty do not have the same FP options as those having already achieved menarche; their gonadal tissue is less mature, so they

can consider only the experimental option of ovarian tissue cryopreservation (OTC). This generally involves a laparoscopic unilateral oophorectomy, followed by cryopreservation of the retrieved ovarian tissue [40, 41]. This procedure is being increasingly utilized in oncology prior to chemotherapy and radiation known to be gonadotoxic, with promising data regarding live births in post-pubertal women [40, 41].

Several points should be discussed when considering OTC in TGD youth. First, while this method has now resulted in over 80–100 reported live births, the majority of cases were in women treated for cancer who underwent FP after menarche and opted for OTC (e.g., to avoid treatment delays required for oocyte retrieval and cryopreservation) [40, 41]. Less is known about the effectiveness of OTC in early stages of puberty, and thus it is still considered investigational [42, 43]. Second, live births have been reported only with tissue reimplanted into the donor (once they are cancer free), allowing for the tissue to mature via endogenous gonadotropin signaling. Reimplantation is not safe in some oncologic settings, such as in youth with malignant spread to their ovaries [43]. It may also be undesirable for individuals with gender dysphoria who may not want to experience the hormonal ramifications of reintroducing a natal ovary which may start to produce estrogen and progesterone in a cyclical manner, potentially leading to physical changes inconsistent with their gender identity [37]. Maturation of oocytes in vitro after prepubertal oophorectomy is currently being studied and refined as a technique that may be more viable in the future [44, 45]. Third, concerns have been raised that removal of an ovary could in itself negatively impact reproductive potential and it is thus only considered in patients with cancer at moderate-high risk of infertility; as described above, there is uncertainty as to whether or not exogenous testosterone administration will indeed lead to infertility in this cohort [39].

As referred to previously, pregnancies in transgender men assigned female at birth have also been described after the discontinuation of testosterone [25]. In this context, there are clinical and ethical dilemmas related to removing an ovary in a child in the early stages of puberty as this could theoretically decrease future endogenous fertility by decreasing ovarian reserve. Peripubertal TGD youth may not be able to fully understand the future implications of this decision, or be completely sure of the medical and surgical interventions they may opt for in the future. Thus, at this point, there is limited evidence to support offering OTC to TGD individuals, with the exception of adults who are planning to undergo gender-affirming gonadectomy [39]. When choosing the method that is best for each individual, it is important to consider medical risks and financial implications associated with general anesthesia and invasive procedures. As technology advances, new assisted reproductive technologies may become available.

Fertility Preservation for Birth-Assigned Males

For birth-assigned males who have achieved at least Tanner stage 2–3, the least invasive and cost-effective FP option is sperm cryopreservation from an ejaculated semen sample [34]. Once the sample is collected, a cryopreservation facility can store the sample until the individual is ready to use it. While this option may be

feasible for some TGD adolescents, others may find the process of masturbation to supply a semen sample too psychologically difficult given their gender dysphoria. In addition, personal, cultural, and religious beliefs/teachings that discourage masturbation may also have a negative impact on an adolescent's ability to produce a sample for cryopreservation and/or pose additional challenges to communication between providers, patients, and families about FP [46].

The pediatric oncology community has described these barriers in cisgender males who are to undergo gonadotoxic chemotherapy or radiation, who are unable to comfortably use this method secondary to embarrassment, shame, and/or sexual inexperience making the process too difficult [46–50]. For peripubertal or post pubertal birth-assigned males, sperm extraction techniques may be employed in those still interested in FP by way of electroejaculation (EEJ), testicular/epididymal sperm extraction (TESE) or testicular/epididymal sperm aspiration (TESA) [51, 52]. For EEJ, a rectal probe is used to apply a gentle electrical current in order to stimulate ejaculation [51]. This procedure is usually performed under general anesthesia. TESE and TESA is usually done under anesthesia in the operating room, and involves either a biopsy or needle aspiration of semen from the testes/epididymis in order to isolate sperm for cryopreservation [52]. Spontaneous ejaculation for sperm cryopreservation has been described successfully in birth-assigned males as young as 13 years of age, and extraction techniques in those with testes measuring as small as 6 mL [53, 54]. When choosing the method that is best for each individual, it is important to consider medical risks and financial implications associated with general anesthesia and invasive procedures.

As is the case with birth-assigned females, FP options in prepubertal/early pubertal birth-assigned males are newer and less well described [55]. Due to the lack of mature sperm in prepubertal testes, any extraction techniques employed cannot guarantee viable sperm for future use for fertilization. Testicular tissue cryopreservation (TTC) is an investigational procedure in which tissue is extracted from prepubertal testes in the hope that immature gametes in the form of spermatogonial stem cells can be isolated and cryopreserved in either Sertoli cell containing tissue or in suspension [56]. The goal is to be able to induce these cells via tailored media to mature in vitro to produce viable sperm that may be used in intracytoplasmic sperm injection during in vitro fertilization in the future [57]. While there have been successful animal models described, no live human births have been reported using this technique, and the recommendation is to only pursue this option under an IRB-approved protocol [43].

Attitudes and Psychosocial Complexities

Research on attitudes toward fertility and parenthood goals in the transgender community is emerging. The literature to date portrays the adult transgender population as heterogeneous with regard to parenting goals and acceptance of reproductive technologies [13, 58], though significant percentages of transgender individuals do express a desire for biological children [9–13]. For instance, Wierckx and

colleagues reported responses from a questionnaire completed by 50 transgender men (mean age = 37) who had undergone gender-affirming surgery [10]. Of the 39 participants who were not parents already, 54% reported wanting to have children; this study did not distinguish between ways of becoming a parent (biological children versus adoption, for example). Approximately 37.5% of respondents reported that they would have considered freezing their germ cells if that had been an option for them [10]. Another survey was conducted among 160 transgender or gender diverse adults (26.9% described their gender identity as male, 51.5% described their gender identity as female, and 21.6% characterized their gender in a variety of ways that were classified as gender diverse) [59]. Approximately 25% of respondents were already parents at the time of survey completion, with the majority having children prior to transitioning (59%) [59]. Eighteen percent of participants without children reported a desire to have children in the future (29% were unsure); of these, a higher percentage of identified males indicated a desire to have children (53%) than identified females (33%) or gender diverse (14%) participants. Younger respondents were more likely to express a desire for future parenthood and only 4 reported a desire to give birth [59]. In a recent survey of 99 transgender women and 90 transgender men, 70% of transgender women and 47% of transgender men wanted children in the future; 76% of each group said that they had thought about FP but less than 10% had completed FP [13].

Von Doussa and colleagues conducted qualitative interviews and found that prevailing notions of family and parenthood impacted respondents' own vision of options, and they tended to create families in less traditional ways (e.g., becoming step or foster parents) [12]. Some participant responses suggested misgivings about the lack of ability to be a biological parent, with one transgender man reporting feelings of "regret" about engaging in a physical transition without adequate counseling about fertility options [12]. Another recent study showed attitudinal differences between adult transgender men ($n = 24$) and women ($n = 8$), all childless but reporting a desire to become parents at a future point [11]. Transgender men more often reported a desire to become a parent by means of sexual intercourse or pregnancy (58.3%), while 75% of transgender women reported preferring to become a parent through adoption [11]. These results are noteworthy in light of the extra burden of cost, duration, and invasiveness associated with FP interventions for transgender men (birth-assigned females), which could conflict with their desires and parenthood goals.

In addition to this research involving transgender adults, recent studies have begun to investigate attitudes toward fertility in transgender youth. Consistent with adults, youth responses depict some attitudinal heterogeneity, with a subset of transgender youth expressing a desire for future biological children. For instance, Chen and colleagues conducted an online survey of sexual and gender minority teens aged 14–17 years, finding that 25% of transgender youth respondents expressed a desire for biological parenthood (as opposed to 43.8% of gender diverse or non-binary participants) [60]. Nevertheless, approximately 60% indicated a wish for more information related to fertility, with a minority of youth (13.5%) reporting having ever had a conversation with healthcare providers about the impact of

hormones on fertility [60]. Strang and colleagues also examined transgender youth and parent attitudes toward fertility of those attending a gender clinic using a survey methodology [61]. Their results (similar to Chen et al.), indicated that about one quarter of transgender adolescents aspired to be a biological parent in the future, and slightly more than half expressed a wish to be a future parent through some means; one-third of respondents expressed uncertainty about parenthood goals [60, 61]. Notably, many of the TGD youth acknowledged that their parenthood goals may change in the future [61]. These attitudes are somewhat inconsistent with actual levels of FP utilization, with two recent retrospective reviews showing that less than 5% of youth receiving hormonal interventions opt for FP [62, 63].

As of yet, the factors that impact parenthood goals, and actual FP utilization, have not been systematically examined. Preliminary findings point to a number of barriers to FP, including social/cultural/family norms and expectations, inadequate counseling, desire to be a parent through alternate means (e.g., adoption), as well as cost, invasiveness, and gender dysphoria [12, 60, 62]. None of the studies on attitudes toward parenthood in youth or adults explored the possible interaction of mental health co-occurrences and parenthood desire; yet, numerous studies find the risks of a variety of psychological diagnoses, as well as suicidality, to be elevated in many transgender youth [64, 65]. Gender-affirming interventions are associated with alleviation of mental health morbidities [66], and therefore, delaying such intervention could be harmful to TGD youth and contraindicated in some circumstances when the anticipated negative ramifications of postponing intervention are significant. On the other hand, as Nahata et al. suggest, mental health concerns have the potential to impact perspectives, desires, goals, and future thinking [62]. For instance, youth with low self-worth may not have the ability to imagine being a competent parent, and thoughts of suicide may be inconsistent with contemplation of future desires. Research suggests that for many transgender individuals, gender dysphoria dissipates with gender-affirming medical treatments. As mental health status improves, perspectives on fertility and parenthood may evolve. In addition, normative perspectives on parenting likely modify with development from adolescence to young adulthood. However, as of yet, research has not examined stability and change in parenthood goals over time in transgender individuals, integrating developmental and psychosocial perspectives, which is an important priority for future research.

Ethical Considerations

Numerous ethical complexities are associated with medical treatments that have the potential to diminish fertility and/or cause infertility in TGD youth, and these issues are increasingly recognized [67–69]. These include the ability of youth to adequately engage in medical decision-making, parental legal rights to make decisions on behalf of their children's best interest, healthcare provider obligations to counsel about fertility even if they are aware that access to FP interventions may be blocked due to cost, the impact of mental-health distress and body dysphoria on

decision-making, and cultural and parental wishes and values that may subtly or overtly impact adolescents beliefs and choices.

A significant body of literature addresses adolescent judgment and decision-making [70, 71]. Studies have examined adolescent cognitive capacities versus adult counterparts (how they think) as well as psychosocial differences between adolescents and adults. In general, findings suggest that logical abilities are generally mature by the age of 16 years. Reproductive health frameworks in the United States have recognized adolescents as competent to assent or consent to various important reproductive health decisions such as contraception, STI testing and treatment, as well as abortion and/or substance use [72]; although laws regarding confidentiality and consent with pediatric populations vary across states in the United States, in all states, minors are able to consent to sexually transmitted infection testing and interventions. The American Academy of Pediatrics (AAP) has also published guidelines on informed consent and decision-making in pediatrics, supporting appropriateness of providing care for a child's needs even if incompatible with parental desires [73]. This is important, as recent research suggests that TGD youth may feel pressured to have biological children and/or feel that they are disappointing their parents if they decide against this option [61]. It is important to ensure that parents remain focused on their youth's perspective and needs, while acknowledging their own concerns and sometimes grief about not having biological grandchildren, understanding that refusing GAH for a clearly asserted TGD individual is not a neutral option and can be associated with poorer mental health outcomes [61].

The AAP also provides a nuanced view of adolescent decision-making capacity, noting that the determination of maturity is not always straightforward, although capacity "is presumed but may be rebutted at age 14 or older" [73]. An element of reproductive decision-making and judgment involves non-cognitive abilities, and the broad characteristics of responsibility (self-reliance; independence), perspective (consideration of context), and temperance (thinking before acting), with researchers concluding that adolescents perform significantly worse than adults in these latter, non-cognitive realms, although there is variability within youth [71]. The AAP also notes that the prefrontal cortex, associated with executive function and risk-taking, is still developing in adolescents, possibly impacting decision-making. Normative decisional differences between adolescents and adults may be compounded by mental health distress and/or developmental differences, when present [74]. It is unclear as to how this might impact decision-making regarding fertility in TGD youth. As noted above, available research indicates that TGD youth receiving gender-affirming medical care experience improved mental health. Nevertheless, there is a disparity between reported low rates of FP utilization in youth [62, 63] and increased rates of reported desires for biological children reported among transgender adults [9–11, 13]. This highlights a need for further research into possible sources of this discrepancy. Given the potentially enduring implications of rejecting FP, decisional regret could result if counseling is inadequate or if youth are unable to anticipate their adult parenthood goals, issues that could equally apply to all adolescents with potentially fertility-impacting treatments (e.g., oncology patients), although more research is needed. Counseling may need to account for

possible perspective limitations and the potential for impulsive responding, and both assess for and balance these concerns with the possible risks of delaying TGD youth gender-affirming medical care. As of yet, we lack a thorough understanding of best counseling practices for adolescents in the setting of desire for medical intervention and psychological distress of gender dysphoria, the benefits of affirming therapies and the unique perspectives that TGD youth may have in comparison to their cisgender counterparts. In addition, research thus far has examined decision-making and judgment in cisgender adolescents, but has yet to investigate whether similar impulsive tendencies are also found in TGD youth.

The ethical issues involving younger children in the early stages of puberty are no less profound. Puberty blockers enable youth to function in alignment with an affirmed gender, without progression through a distressing, biologically programmed puberty at odds with their gender identity. Nevertheless, because established FP options are unavailable at this stage, parents are in the position of needing to make a choice to support their child's gender identity and minimize dysphoria, or preserve fertility while possibly placing their child at psychological risk. In other instances, parent and child wishes may clash [69], and children may feel compelled to go along with parental desires to preserve fertility due to psychological factors such as guilt and desire to please, or more concrete factors such as financial dependence on parents for medical treatments. In other scenarios, youth who opt for expensive FP interventions may ultimately feel compelled to have a biological child, given the cost incurred to their families. A thorough understanding of ethical issues should help inform best practices so that, ultimately, TGD individuals feel comfortable with their choices and parents who are assisting them in this complex decision-making process feel supported.

Financial Considerations

Due to the wide range of FP options available, cost can vary greatly and potentially serve as a significant barrier for gender diverse youth and their families trying to access FP, especially given the fact that insurance coverage of FP in the United States is often lacking [75, 76]. FP and assisted reproductive technology costs may vary widely between centers and regions, so the following ranges are just estimates. Sperm cryopreservation is the least expensive option, generally ranging from $500 to $1500 for initial processing with yearly storage fees of $300–$500, assuming that a sample can be provided by masturbation [39]. If EEJ or TESE/TESA is required to retrieve a semen sample, procedural costs need to be considered; this can range from $1000 to $10,000. For birth-assigned females, the financial burden associated with oocyte retrieval is significantly higher, with the procedure costing anywhere from $5000 to $20,000 in addition to annual storage fees of $300–$500 for continued cryopreservation [39, 77]. The cost for future fertility therapeutics involving using preserved oocytes are estimated to cost approximately $10,000 [39]. The costs of experimental options vary between institutions and regions.

As science and technologies improve, it is hopeful that there will be more FP options that will be more easily integrated into gender-affirming care. Additionally, policy and insurers may adopt more trans-affirming policies that offer fertility coverage. In Rhode Island, legislation was signed that protects medically induced fertility. While this bill was passed with oncology patients in mind, this bill could also offer expanded insurance coverage and protections for TGD persons seeking fertility preservation.

It is important to remember that families of TGD youth, without even considering FP, are many times facing large out-of-pocket expenses for hormones, as coverage of these therapies is often denied or only partially paid for by insurance companies [65]. That being said, each patient and family deserves a comprehensive discussion surrounding FP. Informed consent to start GAH or surgery requires a thorough discussion about known and unknown fertility outcomes with TGD youth. Studies in oncology have shown higher overall satisfaction with care when FP is discussed and offered prior to starting gonadotoxic therapy [78]. Recently, several states have introduced legislature to mandate FP coverage for individuals undergoing gonadotoxic therapy [79].

Conclusions and Future Directions

The long-term impact of partially irreversible hormonal interventions, estradiol and testosterone, on future fertility remains poorly understood. As with patients using GnRHa for precocious puberty, there is no reason to suspect that TGD youth who start puberty blockers, but return to their endogenous hormones and birth-assigned gender would suffer any adverse or end effects of adult fertility.

For partially reversible GAH, research continues to grow that looks at FP options. At present, TGD youth and adults are generally limited to established methods that are low-risk and known to be effective [39]. Most of the current data guiding FP practices in TGD youth are derived from either studies in transgender adults or the pediatric oncology population, leaving many opportunities for research in gender diverse youth and how their needs and perspectives on FP may differ. Distress associated with gender dysphoria and other mental health comorbidities, urgency to start hormone therapy, and financial barriers could all play roles in lower FP utilization in this group [62, 63, 65], but there may be other factors specific to the transgender population that may influence their decision to forego FP prior to starting hormones.

Despite these knowledge gaps, clinical guidelines emphasize the importance of FP counseling for TGD youth prior to the partially irreversible medical and more permanent surgical interventions that may impact fertility [14, 15]. Counseling regarding parenthood goals can take place individually for each adolescent and young adult, including information about FP options as well as diverse ways to parent and build family over time for interested patients [60, 62]. Presenting current data and allowing adequate time for processing and decision-making could improve patient satisfaction and the quality of care being delivered. Physicians and mental health

professionals involved in TGD patient care can offer counseling that incorporates decision-making about FP as they review both the benefits and risks of starting GAH. Mental health professionals experienced in working with TGD can also offer support, resources, and information for youth and parents to design a plan that best fits each individual. Gender-affirming consent-based care requires that we should offer a thorough explanation of FP options as a standard of care when starting gender-affirming therapies that may or may not impact future fertility. The benefits of GAH supporting more immediate and sometimes life-threatening gender needs can be incorporated as appropriate so that TGD youth and families understand that providers are working toward providing the fullest array of family-building options for the future.

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