

Chapter 3

Transgender Adolescents and the Gender-Affirming Interventions: Pubertal Suppression, Hormones, Surgery, and Other Pharmacological Interventions



Samantha M. Busa, Scott Leibowitz, and Aron Janssen

Introduction

I think I always just hoped that I would never get my period. I know I was in denial, but I still had this wish that perhaps it would skip me by.

Prior to the beginning stages of puberty, apart from the genitalia, there is little that separates the phenotypic appearance of boys and girls. Prior to this stage of development, it truly is the clothes, hair, and demeanor that identify the boy or girl. For youth with gender dysphoria that intensifies or presents at the onset of puberty and adolescence, it is a time for identity consolidation as well as potential anxiety. It is at this time that the body begins to develop the secondary sex characteristics that differentiate men from women, and just like the teen quoted above, it is a time in which transgender youth must confront change in their bodies that may not be welcome. In this chapter, we will review the physiology of puberty and the medical and surgical interventions available for youth with gender dysphoria. Of note, the use of the term *medical* is in reference to those interventions that require prescriptions and are not provided by psychiatrists. It is important to clarify that psychiatric interventions, even if not exogenous in nature (e.g., psychological interventions),

S. M. Busa, PsyD (✉)
Department of Child and Adolescent Psychiatry, Hassenfeld Children's
Hospital at NYU Langone, New York, NY, USA
e-mail: Samantha.Busa@nyumc.org

S. Leibowitz, MD
Department of Psychiatry, THRIVE Gender and Sex Development Program
Nationwide Children's Hospital, Columbus, OH, USA

Department of Psychiatry, The Ohio State University College of Medicine,
Columbus, OH, USA

A. Janssen, MD
Department of Child and Adolescent Psychiatry, NYU Langone Health,
NYU Child Study Center, New York, NY, USA

can also be considered *medical*; however, for the purposes of clarity, in this chapter, *medical* interventions refer to those interventions distinct from psychological or social interventions described in the previous chapter.

Pubertal Stages, Physical Changes, and Hormonal Changes

Puberty is a stage of life that can be both exciting and anxiety provoking for teens and parents alike and can be especially complicated for those who are gender non-conforming. It is referred to as the developmental stage in which secondary sexual characteristics appear, and children begin to confront changes in their body that differentiate men from women, physically and physiologically. For the youth experiencing gender dysphoria, this is compounded, as these changes may not be welcome and can introduce further confusion and frustration with their bodies. Changes in puberty are typically first noticed in birth-assigned females between 8 and 12 years of age and in birth-assigned males between 9 and 14 years of age, spanning a wide range of ages as well as maturity socially.

Physiologically, puberty begins when the hypothalamo-pituitary-gonadal axis is activated and there is pulsatile secretion of gonadotropin-releasing hormone (GnRH) by the hypothalamus. The secretion of GnRH stimulates the pituitary to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH) by the pituitary, which in turn stimulates the ovaries and testicles to produce estrogens and androgens in both birth-assigned females and birth-assigned males, respectively. For birth-assigned females, FSH is responsible for developing follicles, which contain developing eggs, and also assists with the production of estrogen. For birth-assigned males, FSH stimulates the growth of seminiferous tubules ultimately leading to the production of sperm. LH is responsible for producing androgen male hormone in Leydig cells aiding growth of the seminiferous tubules. Birth-assigned females produce more estrogen and birth-assigned males produce more testosterone during this time. These hormones are increased within the bloodstream, triggering the physical and psychological changes that occur in puberty.

Physical changes are a consequence of the aforementioned physiological and hormonal changes occurring in the body. Adolescents of the two typical binary sexes experience *adrenarche*, the onset of androgen-dependent body changes, such as growth of axillary and pubic hair, body odor, and acne, and *pubarche*, the appearance of sexual hair. Birth-assigned females experience *thelarche*, the onset of breast development; *menarche*, the onset of menstruation; and weight changes. They also experience changes in their breasts. Both typical binary sexes also experience changes to their body shape, muscle content, and fat content. Birth-assigned males experience changes in their penis, scrotum, and an enlargement of testes. In addition, birth-assigned males will experience nocturnal emission, involuntary erection, and eventually will experience their first ejaculation. At this time, they are considered to be capable of procreation. Marshall and Tanner (1969, 1970) [1, 2] defined and mapped the stages of puberty as a means of a common language between

multidisciplinary health providers to describe the physiological, biological, and psychosocial changes that occur during puberty. Tables 3.1 and 3.2 delineate the Tanner stages defined and changes to the external genitalia, pubic hair, and height of individuals in each Tanner stage.

At the onset of Tanner stage II, youth with gender dysphoria begin to experience changes that begin to differentiate their bodies in to binary “categories” that may or may not be congruent with their own gender identity. By definition of those who meet criteria for gender dysphoria, these changes might cause significant distress, as the development of these secondary sex characteristics does not match their gender identity. The ramifications may be significant, as we know that transgender adolescents are at higher risk for a number of challenges at home, school, and socially. Puberty impacts *all* adolescents from the moment they wake up, to when they get dressed in the morning and go to school, until they go to bed at night, and so for these youth in particular it is important to understand the effect that puberty has on their emotional, social, and psychological development.

Table 3.1 Natal male tanner stages

Stage	External genitalia	Pubic hair	Growth
I	Prepubertal	Prepubertal	5–6 cm/year
II	Enlargement of the scrotum and testes; scrotum skin reddens and changes in texture	Sparse growth of slightly pigmented hair at the base of the penis	5–6 cm/year
III	Enlargement of the penis, length and then width; further growth of testes	Darker coarser curlier hair spreading over the pubic area	7–8 cm/year
IV	Increased penis size, growth and development of glans, scrotum and testes enlarge, scrotum skin darkens	Hair continues to look more adult-like, though has not spread to thighs	10 cm/year
V	Adult genitalia	Adult hair in quantity and type	No further increase after 17 years

Table 3.2 Natal female tanner stages

Stage	Breast development	Pubic hair	Growth
I	Prepubertal	Prepubertal	5–6 cm/year
II	Breast bud stage with elevation of breast and papilla; enlargement of areola	Sparse growth of slightly pigmented hair along the labia	7–8 cm/year
III	Further enlargement of breast and areola; no separation of contour	Darker coarser curlier hair spreading over the pubic area	8 cm/year
IV	Areola and papilla from a secondary mound above the level of the breast	Hair continues to look more adult-like, though has not spread to thighs	7 cm/year
V	Mature stage: projection of papilla only, related to recession of areola	Adult hair in quantity and type	No further increase after 16 years

Clinical Vignette

A 13-year-old transgender male (born with female anatomical features) reported that puberty had greatly impacted his view of himself and increased his anxiety socially. He stated, "I get dressed... sometimes I don't wear a binder in the mornings, it's so uncomfortable, I have to wriggle into it because it's tighter. I then have to adjust my breasts because they're fairly large, and if I'm not careful they look weird. I also have to periodically duck into a bathroom and readjust my binder to make sure that my chest looks 'natural' like a cis guys chest would look. I go through my daily routine and then I get on the bus, to go to school, the bus I take takes me very close to my previous school where everyone knew me as female. When that happens I'm always very worried someone will see me and be like 'oh that's deadname, that's her, that is a girl.'" This individual was interested in beginning a medical intervention and sought out help from me to work closely with his family to explore these medical options.

In the following section, we will review the types of interventions and the decision-making process that goes along with these interventions.

Medical Interventions

There are a number of medical interventions that are recommended for adolescents with gender dysphoria, which depend on how far advanced in puberty the adolescent has progressed according to current standards of care and clinical guidelines [3, 4]. These interventions are used to delay or reverse the physiological and visible changes that occur in puberty. We classify these types of interventions on the physical body as reversible, partially reversible, and irreversible.

Reversible interventions include the use of puberty suppression medications, which delay the development of secondary sex characteristics in order to buy time for a younger adolescent to mature into older adolescents who can then assent for more irreversible interventions such as hormones. The puberty-suppressing medications include gonadotropin-releasing hormone analogues (GnRH α), which are more widely used for children with precocious puberty. Other reversible medications that can be used to inhibit the effects of puberty in a pubertal adolescent include spironolactone, which has androgen-blocking properties for birth-assigned males, and oral contraceptive pills (OCP), which is used as menstrual suppression in birth-assigned females. All of the reversible interventions, if discontinued, will then allow the adolescent's body to resume the functioning that had been blocked or inhibited as a result of their use. Partially reversible interventions include the use of sex hormones, specifically testosterone for birth-assigned females and estrogen for birth-assigned males. These hormones lead to the development of secondary sex characteristics of the sex associated with the adolescent's gender identity regardless of the sex at birth. Finally, irreversible interventions include a number of different types of surgery, which will be described later in the chapter. We will examine the history, evidence base, indications, and ethical dilemmas related to each of these interventions.

Puberty Suppression

Medical treatment for gender dysphoria has a relatively short history of use within the medical community. The Amsterdam Gender Clinic in The Netherlands has been at the forefront of puberty suppression treatment in the context of gender dysphoria. This group of clinicians and researchers developed a protocol for the clinical management and treatment of gender dysphoria [5] in adolescents. This protocol recommended the use of GnRHa, a form of puberty suppression medication beginning at 12 years of age, as a means of (1) giving adolescents time to explore their gender, (2) determining whether or not more irreversible interventions would be appropriate for long-term gender transition needs, (3) temporarily ameliorating the distress of gender dysphoria by suppressing the development of irreversible secondary sex characteristics, and (4) preventing the need for more invasive procedures later on, should the adolescent ultimately decide to proceed with gender transition (e.g., without breast development, one need not go through top surgery, a mastectomy).

GnRHa mimic the action of the body's natural GnRH, shutting down the feedback loop in the hypothalamus and pituitary gland. GnRHa stop LH hormone secretion, ultimately preventing testosterone secretion for natal males and estrogen levels for natal females. GNRHa effectively shut down the HPG axis and decrease testosterone and estrogen levels. During treatment, pediatric endocrinologists should monitor adolescents. GNRHa come in the form of intramuscular injections or surgically placed implants. The use of GNRHa has some potential risks of use including impact on fertility and bone mass. There is also little data on the long-term impacts of prolonged use of these puberty-suppressing hormones.

The Amsterdam protocol recommended that pubertal suppression is initiated after the child enters Tanner stage II of development in order to understand how the young adolescent reacts to the changes brought on by puberty, considering the prospective literature at the time indicated that many children with gender dysphoria would ultimately not experience gender dysphoria in adolescence [6]. This protocol stressed the importance of a comprehensive assessment and noted that the potential and actual side effects to pubertal suppression do not outweigh the benefits of GNRHa treatment in appropriately screened youth. The protocol also recommended the use of gender-affirming sex hormones as early as 16 years of age, and finally surgery, if desired at 18 years of age.

Since this initial protocol was described, a number of studies have demonstrated that puberty suppression has a number of advantages when treating gender dysphoria of adolescence [7, 8]. The pause on pubertal progression that leads to the suffering associated with gender dysphoria allows for further gender identity exploration and evaluation in a multidisciplinary setting over time. Current research has continued to demonstrate the benefits of puberty suppression. Prospective data indicates that after being treated with GNRHa and subsequent sex hormone treatment for gender dysphoria, adolescents have comparable psychological adjustment when compared to cisgender adolescent controls [9]. Some adolescents feel that they are

able to be perceived as their true gender more effectively, ultimately leading to positive effects on psychosocial adjustment in young adulthood [10]. Cohen-Kettenis and colleagues [11] conducted a follow-up case study of an adolescent who had puberty suppression treatment at 13 years of age, testosterone treatment at 18 years of age, and finally sex reassignment surgery (also known as gender confirmation surgery) at 20 and 22 years of age. This follow-up evaluated psychological, medical, and physical side effects and long-term effects of puberty suppression. This individual reported no regrets about the treatment protocol and was functioning well psychologically, intellectually, and socially. The individual's metabolic and endocrine tests were all within normal limits, and there were no noted health difficulties. In addition to this case study, de Vries and colleagues [12] conducted a study of changes in adolescent behavioral and emotional health who received puberty suppression between 2000 and 2008. Results of this study indicated that adolescents treated with puberty suppression had decreased behavioral and emotional difficulties, though still experienced body dissatisfaction. Despite this, adolescents in this study experienced fewer depressive symptoms and overall improvement in general functioning. Feelings of anxiety and other mood symptoms (e.g., anger) remained the same however. Taken together, these studies indicate that the long-term psychological effects of puberty suppression may outweigh the negative potential side effects when treating gender dysphoria.

The criteria for use of hormone therapy have been defined by the WPATH [3] and the Endocrine Society Guidelines [4] and state that use of hormone-suppressing therapy is indicated when (1) there is a persistent and pervasive history of gender nonconformity or gender dysphoria; (2) the gender dysphoria emerged or worsened with the onset of puberty; (3) any co-occurring psychological, medical, or social difficulties that might interfere with treatment are addressed; and (4) the adolescent and family have given informed consent. These criteria can be assessed through a psychodiagnostic assessment with an expert in gender-affirming treatments. Expertise in gender development, as described by the 2017 Endocrine Society Guidelines [4], is defined thusly:

“(1) training in child and adolescent developmental psychology and psychopathology, (2) competence in using the DSM and/or the ICD for diagnostic purposes, (3) the ability to make a distinction between GD/gender incongruence and conditions that have similar features (e.g., body dysmorphic disorder), (4) training in diagnosing psychiatric conditions, (5) the ability to undertake or refer for appropriate treatment, (6) the ability to psychosocially assess the person's understanding and social conditions that can impact gender-affirming hormone therapy, (7) a practice of regularly attending relevant professional meetings, and (8) knowledge of the criteria for puberty blocking and gender-affirming hormone treatment in adolescents.”

Despite the fact that puberty blockers are generally considered reversible in nature, there are some concerns and potential risks that should be considered when considering GnRHa for an adolescent who meets criteria for gender dysphoria. The following risks have been described, but it is important to note that the long-term risks have not been fully demonstrated nor studied prospectively. Leibowitz and de Vries [13] summarize these hypothetical risks in a review article. They include the possibility of (1) disrupting the exploration of an individual's experience of the

gender of their birth-assigned sex; (2) impacting brain development and processes mediated by sex hormones that affect cognitive development and affect regulation, in particular for young people with co-occurring neurodevelopmental disorders; (3) impacting bone development and the effect on bone mineral density and fracture risk; (4) limiting genitalia growth, particularly relevant for birth-assigned males, which has implications in the future should the youth want to pursue genital surgery given the fact that sufficient penile tissue is necessary for the typical penile inversion procedure when creating a neovagina; and (5) affecting long-term metabolic processes that are still as of yet unknown.

It is important to note that current research is evaluating some of these potential risks. One fMRI study looked at executive functioning in adolescents with gender dysphoria treated with GnRHa and found no significant changes in a planning task [14]. Of note, none of the youth included in this study had any significant co-occurring neurodevelopmental disorders such as attention deficit hyperactivity disorder or autism spectrum disorder. Additionally, preliminary research on the effects of GnRHa on bone health indicates mild reduction in bone mineral density [15], but the implications on fracture risk were not studied. Anecdotally, it is described that when pubertal suppression is used to buy time to explore these issues, families may view the intervention as one step on a linear pathway for gender transition, without necessarily appreciating the exploration aspect that the premise of using pubertal suppression was originally based on. Therefore, parents may not feel the need to bring their adolescents in for continued exploration of gender in a mental health setting and then several years later may show up again with expectations to begin what they perceive to be the next step in treatment for their adolescents: cross-gender hormone therapy. Youth, parents, and families may have co-occurring psychiatric conditions that go untreated as a result, considering there may be a false attribution of these co-occurring symptoms as a *manifestation of* gender dysphoria instead of a *co-occurring condition* that may or may not exist regardless of the adolescent's gender dysphoria.

Ethical debates around pubertal suppression also exist in terms of timing of initiation of GnRHa, duration of treatment, and fertility implications. The original Amsterdam protocol recommended use of GnRHa begin at no less than age 12, but many youth will enter puberty at ages much younger than that. For those youth, waiting until age 12 (more relevant for the birth-assigned females on average) could mean that many of the benefits of pubertal suppression would be missed considering these youth may be well into the later stages of puberty by that time. However, given the unknowns of how long one can safely suppress puberty medically during a time when an adolescent *is physiologically supposed to be going through puberty*, suppressing puberty at 10 years of age could then introduce additional complex questions down the road regarding the timing of the initiation of hormone treatment considering one does not know how safe or unsafe it is to suppress hormones for an extended period of time, however that is defined. In addition to the medical unknowns, there is no data on psychological outcomes of waiting to initiate puberty at age 16 (whether it is the puberty of the patient's birth-assigned sex due to an unlikely reversal of feelings or whether it is due to the puberty of the patient's affirmed gender due to continued gender dysphoria). While fertility itself is not

impacted by the administration of GnRHa in the event that the GnRHa is discontinued (as the individual will continue to go through their natural puberty), should the adolescent wind up moving directly onto cross-sex hormone therapy, then this could very possibly render an adolescent unable to reproduce biologically since they never would go through their birth-assigned sex puberty sufficient enough to develop mature eggs or sperm. One additional logistical factor that is important to consider is whether or not GnRHa can be covered by insurance, as gender dysphoria is currently an off-label indication and the medication can be extremely expensive to obtain, if not covered [16]. In many situations, even if indicated, lack of access to these medications can prohibit their usage for an adolescent.

Therefore, ultimately multidisciplinary care is optimal when making individual decisions for specific youth, and in the event that a multidisciplinary team is not readily available to the mental health provider, seeking expert consultation on these issues from multidisciplinary gender clinic center providers would be prudent. As with all interventions addressing a health-related concern, weighing the risks and benefits of moving forward with the intervention versus not remains a complex yet important component of the risk-benefit analysis. Discussing the fertility implications, surgical implications, and hypothetical unknown effects with families is important. The purpose of describing these complexities is not to suggest universal withholding of these treatments but to help the provider appreciate the full degree of factors that need to be considered when assisting families and youth.

Reversible Androgen Blocking and Menstrual Suppression

In addition to GnRHa, there are other pharmacological interventions that can be used to suppress the effects of hormones released during puberty. These are discussed in more detail in Nahata, Chelvakumar, and Leibowitz [16]. They may be beneficial to use with adolescents who cannot access GnRHa for either lack of insurance coverage or parental consent reasons.

Spiroonolactone is an antiandrogen agent that can be used as an adjunctive therapy to GnRHa, cross-sex hormones, or as a stand-alone intervention. It is a potassium-sparing diuretic that also has antiandrogen properties, blocking the effects of testosterone on birth-assigned males. Hyperkalemia is a known side effect of these medications, so whoever is prescribing them would typically monitor potassium levels. When used in conjunction with estrogen in a transgender female adolescent, this medication may allow for lower doses of estrogen to be used in order to achieve similar degrees of feminization. Their effectiveness and safety have not been studied in adolescents with gender dysphoria; however anecdotally, they have been used clinically to help adolescents feel their gender dysphoria is being addressed medically [16].

Oral contraceptive pills can be used continuously in birth-assigned females to suppress menstruation, which can be a rather distressing monthly event for the birth-assigned female with gender dysphoria. There are many types of oral contraceptives that can be used to achieve menstrual suppression; however, they should be

prescribed by providers who are familiar with the differences and can monitor the effects safely. Data on the use of these medications for other indications (not gender dysphoria) with adolescents has demonstrated efficacy [17]; however, limited evidence is available on the psychological effectiveness of these medications in the transgender adolescent population [16]. The mental health professional may consider collaborating with a pediatrician or adolescent medicine specialist regarding the use of menstrual suppression to alleviate the distress that menses may have on the psychological well-being of the transgender male patient with gender dysphoria.

Gender-Affirming Sex Hormone Therapy

Gender-affirming sex hormone therapy to treat gender dysphoria includes testosterone for birth-assigned females and estrogen for birth-assigned males. The use of these hormones allows the individual to develop secondary sex characteristics that aligns with their core gender identity. The interventions also reduce endogenous hormone levels. This further affirms the individual's gender identity and is shown to have positive benefits for those who have gender dysphoria. The use of both estrogen and testosterone will potentially impact an individual's emotions as they are essentially going through a second puberty if GnRha were not used or if they are going through puberty for the first time in the event that GnRHa were used. The use of estrogen in birth-assigned males will cause the adolescent to slowly develop breasts, soften their hair, redistribute fat to potentially widen hips, and potentially feminize the face. Feminizing hormone therapy also includes the use of androgen-reducing medications described in the section above, as these medications decrease testosterone activity and help to minimize the dosage of estrogen needed. Testosterone used in birth-assigned females will lead to muscle mass increases, a deepening of the voice, and development of facial hair over time. Tables 3.3 and 3.4

Table 3.3 Estrogen effects and time course [3]

Effect	Onset	Maximum effect
Body fat redistribution	3–6 months	2–5 years
Decreased muscle mass	3–6 months	1–2 years
Softening of skin/decreased oiliness	3–6 months	Unknown
Decreased libido	1–3 months	1–2 years
Decreased spontaneous erections	1–3 months	3–6 months
Male sexual dysfunction	Variable	Variable
Breast growth	3–6 months	2–3 years
Decreased testicular volume	3–6 months	2–3 years
Decreased sperm production	Variable	Variable
Thinning and slowed growth of body and facial hair	6–12 months	More than 3 years
Male pattern baldness	No regrowth, loss stops 1–3 months	1–2 years

Table 3.4 Testosterone effects and time course [3]

Effect	Onset	Maximum effect
Skin oiliness/acne	1–6 months	1–2 years
Facial/body hair growth	3–6 months	3–5 years
Scalp hair loss	>12 months	Variable
Increased muscle mass/strength	6–12 months	2–5 years
Body fat redistribution	3–6 months	2–5 years
Cessation of menses	2–6 months	n/a
Clitoral enlargement	3–6 months	1–2 years
Vaginal atrophy	3–6 months	1–2 years
Deepened voice	3–12 months	1–2 years

show the expected onset of these changes for both estrogen and testosterone as well as the time to expected maximum effect.

The WPATH Standards of Care describe criteria related to treatment initiation. The standards require that individuals must be able to demonstrate capacity to consent to the medication and that any co-occurring psychological/mental health challenges are well controlled. Adolescents also must demonstrate persistent gender dysphoria. These criteria can be assessed through a psychodiagnostic assessment with an expert in gender development, as defined earlier in the chapter. In terms of age of initiation of this intervention, some prior guidelines recommend the use of gender-affirming hormones at 16 [18], though others recommend starting earlier in mid-adolescence [19]. The age requirement can be flexible, though it is recommended that when able, families should work together to support the adolescent seeking this type of intervention. The most recent recommendations from the Endocrine Society state that adolescents younger than the age of 16 should be eligible for gender-affirming hormones and strongly recommend an expert multidisciplinary team of medical and mental health professionals be involved throughout this treatment [4].

The definition of “well-controlled” as it relates to psychiatric co-occurring conditions is also not extremely well defined in the WPATH Standards of Care. Acute psychiatric conditions such as the presence of acute suicidal ideations, a recent psychiatric hospitalization, psychosis, mania, and/or a notable change in the functioning of the individual might be considered “uncontrolled.” Long-standing depression and/or anxiety may very well be a manifestation of the gender dysphoria classification itself, and so therefore these issues could be alleviated with hormone treatment. A key task of the mental health provider is to determine the *relationship* between the gender dysphoria and any co-occurring mental health conditions so that the sequence and timeliness of the treatment intervention are appropriate. The cases in the rest of this casebook will serve to illustrate these complexities and guide the mental health provider when developing a treatment plan that is collaborative and affirming in nature with parents and the youth. On one hand, co-occurring psychiatric conditions could very well complicate the diagnostic picture, and therefore treatment of those conditions would be indicated to achieve a degree of “well-controlledness.” On the other hand, needless delay of hormone treatment could perpetuate some of the psy-

chiatric symptoms of the co-occurring conditions, and therefore it is prudent to determine the relationship between the gender-related concerns and other issues when considering the hormone therapy.

In addition to considering the criteria that are recommended to start gender-affirming hormones, individuals and families also need to consider the medical risks of gender-affirming hormones. These are outlined in the WPATH Standards of Care [3] and the most recent Endocrine Society Guidelines [4]. Estrogen may lead to increased risk for venous thromboembolic disease, cardiovascular disease, changes in lipid levels, liver enzyme elevations, gallstones, type 2 diabetes, hypertension, and prolactinoma. Testosterone can have an increased risk of polycythemia, weight gain, worsening of lipid profiles, and elevations in liver enzymes. In addition to these medical risks studied in adults, there are limited long-term research on these treatments for adolescents. In addition, for individuals who are nonbinary in their gender identity, this decision-making process may become especially difficult (see chapter on nonbinary gender identities in adolescents for further discussion of these complexities). As with all medical interventions, treatment providers and families need to have informed meetings about the risks and benefits of these medications. Since these interventions are partially reversible, families will be involved in a collaborative decision-making process with multiple parties who may have differing priorities.

Surgery

Gender-confirming surgical procedures are often considered the last step in addressing symptoms of gender dysphoria; however, this is not always the case. For many, use of gender-affirming hormones may be sufficient to manage gender dysphoria; however, for many others, gender dysphoria will not resolve until one or more surgical interventions have been sought. In adolescents, the most common surgery that is becoming increasingly recommended worldwide before the age of 18 is top surgery, or a mastectomy, for transgender males or individuals who are transmasculine with gender dysphoria. Genital surgeries are typically reserved for when an individual is 18 years of age or older.

There are a number of studies identifying the benefits of these surgeries including sexual satisfaction (e.g., Klein and Gorzalka [20]), psychological outcomes (e.g., Gijs, van der Putten-Bierman, and De Cuypere [21]), etc. Despite this evidence, there are fewer studies that include adolescents, as recommendations in the past stated that individuals should to be at the age of majority in their respective country for surgeries with case-by-case exceptions [3]. Overall, methodological difficulties related to studying the impact of gender-confirming surgeries add additional complexity to decision-making as many of the studies are retrospective and some of the interventions (e.g., phalloplasty, the creation of a new penis) still have not yet been perfected to the point where a multitude of patients who would normally seek the intervention would do so considering its complication burden.

One difficulty in studying surgical interventions is directly related to the wide range of interventions available. Types of surgery include “top surgeries” and

“bottom surgeries.” The reason why these surgeries are referred to as “top surgery” and “bottom surgery” is because referring to the specific anatomical feature for an individual who is transgender (e.g., breast, instead of chest) can itself be very challenging to hear. Table 3.5 explains the different types of top and bottom surgeries. Top surgeries include surgeries that are related to the chest and include reconstructive chest surgery and breast augmentation. Bottom surgeries are used to alter genitals or internal reproductive organs.

Other types of surgeries are used to change cosmetic appearance (i.e., face, head, and neck procedures). An individual may choose to have one, none, or multiple surgeries to address their gender dysphoria and live a life that they would like to live. These interventions are complicated and costly, ranging from \$5000 to \$50,000 and beyond. Besides monetary considerations, there are a number of potential medical and health risks, both short and long term, that are associated with these interventions. Some or all of these costs may be covered through health insurance, as many insurance companies are starting to classify these surgeries as “medically necessary.” It is also important to consider the cost of not having surgery, which could be high, as many transgender individuals may continue to experience negative ramifications in public and private situations without the surgical interventions.

In regard to criteria necessary to be eligible for surgical interventions, the WPATH [3] recommends that consent can be given at the age of majority depending on the country the individual resides. While this is the recommendation, there are exceptions to this rule, and at times, there are younger individuals who seek out this intervention. Regardless, one letter for chest surgery and two letters for genital surgery are required for these interventions. Letter writers must be well versed in the diagnosis of gender dysphoria, and best practices dictate that surgeons discuss the different techniques available to the patient, the advantages and disadvantages of each technique, the limitations of the techniques, and risks/complications associated with the techniques for that individual. Individual anatomy and health factors are often taken into account. This is known as the informed consent process in order

Table 3.5 Surgery types

Surgery type	Name of surgery	Use
Top	Breast augmentation	Used to increase size of breast
Top	Reconstructive chest surgery	Removal of breast tissue in order to create a male-contorted chest
Bottom	Orchiectomy	Removal of the testicles, which can also eliminate the need for testosterone blockers
Bottom	Penectomy	Removal of the penis
Bottom	Vaginoplasty	Creation of a vagina using the tissue of the shaft of the penis
Bottom	Metoidioplasty	Increase of clitoris or phallus length without the use of tissue grafts
Bottom	Phalloplasty	Creation of a penis and scrotoplasty is the creation of a scrotum

for the patient to have a realistic expectation of the outcomes of their surgery. Some recommendations state that individuals should live continuously in the gender role congruent with their gender identity and adolescent transgender male patients seeking chest surgery should wait until at least 1 year of testosterone treatment is completed according to the WPATH SOC [3]. Collaboration and communication with the surgeon, just as the mental health provider would do with the medical providers, ensure that the patients' unique needs are best addressed. This provides the surgeon with the opportunity to understand the adolescent's psychosocial factors when discussing potential interventions. This also provides the mental health provider with the opportunity to learn about the surgical procedures, pre-, peri-, and postoperative course, potential complications, and other necessary pieces of information about the procedure so that they can assist the patient and family through the process.

One evolving area of clinical practice and research is related to the adolescents with gender dysphoria whose core gender identity is gender nonbinary. Many of these adolescents are seeking chest surgery exclusively and do not want the masculinizing effects of testosterone. It is important to understand what the desires of the patient are and take these factors into account when making recommendations that involve anything that is irreversible. Overall, the guidelines are less clear and require more targeted research to evaluate risks and benefits.

Conclusion

The role of puberty suppression, gender-affirming hormones, and surgical interventions is extremely important in the evaluation, management, and treatment of transgender adolescents. While there is some emerging research, there is still a lack of full understanding of the impact of these interventions medically, psychologically, and psychosocially. de Vries and colleagues [9] conducted a longitudinal cohort study of 55 adolescents who met criteria for gender dysphoria assessed before the start of puberty-suppressing drugs, at the initiation of gender-affirming hormones, and 1 year after gender reassignment surgery. This study indicated improved psychological functioning over time, fewer behavioral and emotional problems after puberty suppression, and finally, gender dysphoria persisted until gender reassignment surgery. While there are some limitations to this study, medical interventions are demonstrated to have an important impact on mental health considerations for adolescents and their families, and further research and advocacy is needed.

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