



# Preoperative and Postoperative Considerations in Gender-Affirming Surgery

Ara A. Salibian<sup>1</sup> · Nathan Levitt<sup>1</sup> · Lee C. Zhao<sup>1,2</sup> · Rachel Bluebond-Langner<sup>1</sup>

Published online: 2 July 2018

© Springer Science+Business Media, LLC, part of Springer Nature 2018

## Abstract

**Purpose of Review** The review is aimed at determining critical factors in the preoperative and postoperative care of transgender patients undergoing gender-affirming surgery. General and procedure-specific considerations are summarized to improve the longitudinal perioperative care of transgender patients.

**Recent Findings** Surgical providers should follow World Professional Association for Transgender Health (WPATH) guidelines regarding eligibility for surgery. Important elements in preoperative evaluation include mental health screening, fertility discussion, and adjustment of hormone replacement therapy. Postoperative considerations include proper cancer screening, mental health support, appropriate outcomes assessment, and awareness of potential procedure specific complications.

**Summary** Proper perioperative care for transgender patients undergoing gender-affirming surgery involves a multidisciplinary approach to healthcare to create a comprehensive treatment environment at an institutional level.

**Keywords** Gender-affirming surgery · Gender-confirmation surgery · Transgender · Gender dysphoria · Vaginoplasty · Phalloplasty

## Introduction

Gender identity is how one identifies their gender, such as male, female, or another category. Gender dysphoria is defined by strong, persistent feelings of identification with a different gender than the sex assigned at birth that results in significant distress or impairment [1]. Around 0.6% of adults in the USA, about 1.4 million people, identify as transgender [2]. The incidence of gender dysphoria is difficult to determine due to heterogeneity in definitions and reporting [3], but has been estimated to be around 4.6 in 100,000 individuals [4].

Gender-affirming surgery aims to restore balance between assigned and identified gender. It includes a broad spectrum of procedures, including genital reconstruction, chest contouring, breast augmentation, body contouring, facial feminization/masculinization, and tracheal shave that have been shown to improve quality of life [5, 6]. Rates of gender-affirming surgery have increased significantly over the last several years [7].

A comprehensive approach to the healthcare needs of transgender patients is still being fully incorporated in today's healthcare system. Regarding gender-affirming surgery, there are multiple factors outside of the technical aspects of these procedures that are critical for patient care. Gender-affirming surgery is at the intersection of medicine, endocrinology, surgery, mental health, and preventative medicine. We review the relevant literature on important aspects of preoperative and postoperative care for gender-affirming procedures with focus on general considerations as well as specific issues for the most common procedures in top surgery (mastectomy and breast augmentation) and bottom surgery (vaginoplasty and phalloplasty).

---

This article is part of the Topical Collection on *Male Sexual Dysfunction and Disorders*

---

✉ Lee C. Zhao  
Lee.zhao@nyumc.org

<sup>1</sup> Hansjörg Wyss Department of Plastic Surgery, New York University Langone Health, New York, NY, USA

<sup>2</sup> Department of Urology, New York University Langone Health, 222 41st Street, 11th Floor, New York, NY 10017, USA

## Preoperative Considerations

### General Considerations

#### World Professional Association for Transgender Health Guidelines

The World Professional Association for Transgender Health (WPATH) has developed standards of care to guide healthcare professionals in providing responsible and safe care for transgender patients. WPATH criteria for individuals undergoing gender affirming surgery include a well-documented persistence of gender dysphoria, the capacity to make fully informed decisions and consent to treatment, and any significant medical or mental health concerns should be established and treated accordingly [8••].

For breast/chest surgery, one referral letter from a qualified mental health professional is needed, whereas two separate referrals from independent mental health providers are needed for genital surgery. Hormone therapy is not a prerequisite for transmasculine mastectomy/chest masculinization. For transwomen undergoing breast augmentation, a minimum of 12 months of hormone therapy is suggested. Patients undergoing genital surgery including metoidioplasty/phalloplasty or vaginoplasty have additional criteria that should be met. These include 12 continuous months of hormone therapy appropriate for the patient's gender goals as well as 12 continuous months of living in a gender role that is congruent with gender identity [9]. Patient's fulfillment of this criteria and compliance with WPATH guidelines should be clearly documented (Table 1).

### Documentation and Training

Proper preoperative care of transgender patients requires appropriate identification and documentation of information on gender identity in the electronic medical record (EMR). The two-step technique is an efficient method of collecting this data by first asking the patient's gender identity followed by their assigned sex at birth [10]. Patients' chosen name, gender identity, and pronoun preferences are documented under demographic variables [11]. It is important to treat these data as demographic information and not a pathologic diagnosis. The WPATH Human Rights Work Group has advocated that diagnoses and treatments should revolve around caring for the healthcare needs of gender-variant patients and not propagating definitions of mental disease [12].

Ensuring all members of a healthcare team treating transgender patients have appropriate cultural sensitivity training and provide affirming care is equally important. Various issues include use of correct name pronouns and maintaining a history of organs present or removed. Complete incorporation of gender identity into medical records and facilitation of

**Table 1** Preoperative considerations in gender-affirming surgery

General considerations
Compliance with WPATH guidelines
Appropriate documentation in medical records (including preferred names and pronouns)
Training of staff in care of non-gender conforming patients
Establishment of social support
Determining insurance coverage
Patient education, counseling, and confirmation of understanding
Preoperative workup
Mental health
Screening for psychopathology
Appropriate referral to mental health providers
Fertility
Discussion of fertility-preservation options in all cases
Referral to appropriate specialists as needed
Cancer screening
Completion of age-based and assigned sex screening requirements
Preemptive discussion on postoperative cancer screening
Hormone recommendations
Testosterone stopped 2 weeks prior to surgery
Estrogen stopped 4 prior to surgery
Mastectomy
History: breast cancer symptoms, mammogram, binding, prior breast surgery
Exam: breast size, ptosis, glandular tissue, skin laxity
Discussion: breast-feeding, nipple sensation, revision
Augmentation mammoplasty
History of free silicone injections
Discussion: implant type, size, and positioning
Vaginoplasty
History: prior prostate surgery, radiation therapy, puberty blockers, or urinary symptoms
Exam: penile length, circumcisions, quantity of scrotal skin
Hair removal
Discussion: dilation regimes
Phalloplasty
Discussion: ability to void standing, ability to have penetrative intercourse, importance of sensation, desired neophallus length, donor site, vaginal preservation, urethral lengthening
Testicular and/or penile implants
Preoperative donor site hair removal

WPATH, the World Professional Association for Transgender Health

transgender care goes beyond departmental effort and requires implementation of institutional integration of care [13].

With an increasing number of gender-affirming procedures performed, resident and fellow exposure to transgender care has similarly increased. Exposure is variable, however, and

remains limited [14, 15]. Formal training for resident education has also been proposed through multiple modalities, including didactics, office and procedural experience, and research [16] as a means of further standardizing care and ensuring future excellence in the treatment of this patient population.

### Social Support

An external support system to help with patient aftercare and recovery is critical to optimize outcomes in gender-affirming surgery. A patient's social support system, including partners, family, and friends should be evaluated early in the preoperative process. Employment status and living environment, including persons to assist at home and proximity to the provider's location, are also important. Social work services are integral to this process and should similarly be involved early on as part of a multidisciplinary management team. A recovery plan can then be created preemptively to address housing, financial, and support needs [17, 18].

### Insurance

The major milestone in achieving coverage for gender-affirming procedures came in 2014 with overturning of the 1981 exclusion of transgender surgical services from Medicare coverage [19]. Since then, federally subsidized health insurance programs as well as third-party private insurers have increasingly provided coverage for certain gender-affirming procedures, most notably chest ("top") and genital ("bottom") surgery. Twelve states and the District of Columbia have affirmative coverage requirements for private plans and Medicaid [20].

Health insurance coverage for transgender individuals is both affordable and cost-effective [21•]. Criteria for coverage are often derived from WPATH guidelines and therefore, familiarity with this information and proper documentation is essential. Certain procedures deemed more cosmetic in nature, such as tracheal shave, facial feminization, and hair transplant and are often not covered [22••]. Understanding state regulations and the extent of coverage for specific procedures is important for patient counseling and expectations.

### Patient Education

Preoperative patient education is necessary to set appropriate patient expectations, responsibly offer gender-affirming procedures and optimize patient satisfaction postoperatively. Studies in the breast literature have demonstrated the importance of patient understanding and the discrepancy between perceived patient understanding and actual retained knowledge [23, 24]. The use of adjunctive educational resources can increase patient understanding of medical conditions and

their treatments in addition to improving patient satisfaction [25, 26].

Shared decision-making between the patient and the provider is needed to arrive upon the best treatment plan for an individual. This involves a thorough explanation of the treatment choices, expected recovery, and required aftercare. In addition, long-term implications of surgery, a discussion of all alternatives to proposed therapies, dedicated time to answer patient questions, and confirmation of patient understanding are all necessary during the preoperative workup. This process of preoperative education and preparation correlates to surgical outcomes in gender-affirming surgery [27].

### Preoperative Workup

Preoperative assessment begins with a complete history and physical as well as specific questions including when the patient transitioned, current (and prior) hormone therapy, starting dates, and the patient's hormone therapy provider. One should make note of any prior surgical and non-surgical gender-affirming treatments including non-FDA approved therapies. Adjustable risk factors, such as smoking and high body-mass index, should also be noted and discussed with the patient as needed when determining candidacy for and timing of surgery. In addition, an organ inventory for patients undergoing gender-affirming surgery should be maintained to guide future screening. For example, an organ inventory in the EMR that attests for the presence of the uterus in a transmasculine patient will alert the provider regarding need for cervical cancer screening or need for pregnancy testing prior to procedures.

### Mental Health

While not all transgender patients seeking gender-affirming surgery have anxiety or stress related to their gender dysphoria, there can be increased psychiatric morbidity due to societal pressures and discrimination. Mental health assessments should be offered prior to initiation of therapy and during treatment as a form of multidisciplinary management to offer responsible and quality care [28].

Studies have shown higher rates of psychiatric morbidity among transgender individuals, particularly depression and anxiety [29]. The psychiatric morbidity may be related to victimization from social stigma, abuse, and discrimination, barriers to health care access, and limited social support [30]. Screening for these conditions, with appropriate and prompt referral to mental health providers with expertise in gender dysphoria, is important to ensure optimal outcomes following gender-affirming surgery. While studies have shown that mental health and quality of life improve with treatment of gender dysphoria [29], monitoring for postoperative depressive symptoms or other psychiatric morbidity is necessary.

## Fertility

Fertility preservation, if desired, is an important discussion for both trans men and trans women. As masculinizing and feminizing hormone therapy affects fertility, these conversations ideally should take place prior to the initiation of hormone therapy, but are nevertheless mandatory before any permanent surgical intervention.

For transgender women, sperm cryopreservation, surgical sperm extraction, and testicular tissue preservation are possible [31]. Studies have suggested that these patients feel that fertility preservation should be discussed prior to surgery [32], and brief cessation of hormone therapy can influence fertility options. Transgender men may undergo oocyte, embryo, or ovarian tissue cryopreservation. Similarly, cessation of testosterone therapy prior to surgery may allow for egg recovery. While these treatments are possible, patients should be made aware of the potentially costly and difficult processes they entail and referred to the appropriate providers as needed [33].

## Cancer Screening

Patients should undergo appropriate cancer surveillance based on age and organs present. The preoperative consultation should also aim to elucidate any personal or family risk factors for cancer by taking an appropriate history and conducting a thorough physical exam. The need for postoperative cancer screening should be discussed with patients preoperatively, including clinical chest exam after mastectomy, cervical exam every 3 years if a cervix is present, and prostate cancer screening per general guidelines.

## Hormone Recommendations

Both feminizing and masculinizing hormones have baseline risks associated with their use such as venous thromboembolism with estrogen use and polycythemia with testosterone use, as well as perioperative risks. Appropriate timing to stop hormones preoperatively and resume postoperatively is still debated, but must be discussed with the patient and communicated to the patient's hormone provider. Estrogen hormone therapy increases the risk of thromboembolic events and is often stopped 4 weeks prior to surgery. Testosterone therapy, on the other hand, may increase the risk of perioperative bleeding and is typically stopped 2 weeks prior to surgery. Patients are encouraged to see their hormone provider 3 weeks after surgery to evaluate the need for medication adjustment.

## Procedure-Specific Considerations

### Mastectomy

Individuals undergoing chest masculinization/mastectomy should have personal and family breast cancer risk factors and prior mammograms (if greater than 40 years old) evaluated. Any history of prior breast surgery is relevant, including prior breast reduction or breast biopsies [34]. Current or prior binding should be noted as skin elasticity may be affected [35]. Binding can also cause local skin irritation and infections.

Breasts should be examined for any palpable masses, skin changes, or nipple retraction/discharge. Breast size, volume of glandular tissue, skin laxity, and ptosis should be documented as well as any breast/chest asymmetry and standard sternal notch-to-nipple and nipple-to-inframammary fold measurements. The Fischer scale, along with the patient's desires, is a useful tool to determine the optimal mastectomy technique (either periareolar or free nipple graft procedures) [36]. Important discussion points with patients aside from standard explanation of risks and benefits include the inability to breast feed, the possibility of loss of nipple sensation, and the need for revision surgery.

### Augmentation Mammoplasty

In preoperative consultation for breast augmentation, an exam should include chest wall symmetry assessment as well as skin laxity, skin pinch, areola size, base width, sternal notch-to-nipple, and nipple-to-inframammary fold measurements. Wide internipple distance should be pointed out to patients. Using these variables combined with patient desires, a process of shared decision-making should be utilized to arrive at treatment decisions, including incision location (peri-areolar versus inframammary) as well as implant type, size, and positioning. Important risks that merit discussion, including implant rupture, malposition, capsular contracture, rippling, asymmetry, revision, and breast implant-associated anaplastic large-cell lymphoma (BIA-ALCL).

Obtaining a history of prior non-medical injections is also important. These injections may refer to a variety of different compounds from medical grade silicone to mineral oil, petroleum, or other industrial substances [37, 38]. These can have several adverse effects, including local inflammatory changes, granulomas, atypical infections, pain, itching, skin changes, migration of fillers, embolization, sepsis, and other systemic complications [39, 40].

### Vaginoplasty

Patients presenting for vaginoplasty should have sexual health and urinary symptoms documented (i.e., ability to have

erections, orgasm, libido, and preferred type of intercourse). On physical exam, penile length, circumcision, and relative quantity of scrotal skin and hair should be assessed. It is important to discuss the need for extragenital skin graft harvest if penile and scrotal skin will be insufficient to line the neovaginal canal in penile-inversion vaginoplasty. If orchiectomy is planned, patients must be made aware that they will be irreversibly infertile after surgery in case they wish to pursue fertility preservation prior to surgery.

Specific risks for discussion include loss of erogenous sensation, inability to orgasm, pain with intercourse, neovaginal stenosis, bowel/bladder fistulas, and urethral injury. It is also critical to educate the patient on need for daily vaginal dilation to prevent stenosis and collapse of the vaginal canal. Prior to surgery, electrolysis or laser hair removal of the central scrotum and base of penis is advised, and the specific areas for hair removal are diagrammed for the patient.

Important considerations with vaginoplasty include the presence of penile and scrotal hypoplasia in patients previously treated with puberty-suppressing hormones [41], which makes penoscrotal inversion vaginoplasty challenging. Alternatives include use of full-thickness skin grafts, pedicled flaps, peritoneum, and sigmoid colon [42]. Non-gender-affirming urologic treatments also have significant implications. Prior prostatectomy can affect continence after vaginoplasty and fibrosis from radiation therapy to the bladder, prostate, or rectum can make the dissection difficult and affect wound healing if an injury were to occur.

### Phalloplasty

Patients seeking consultation for phalloplasty should have a sexual history taken, similar to patients undergoing vaginoplasty. Prior hysterectomy should also be noted. Important discussion points that guide surgical options include desired neophallus length, donor-site morbidity, preservation of the vagina, urethral lengthening, positioning of the clitoris, and desire for scrotoplasty as well as testicular and erectile devices.

At our institution, phalloplasty is a staged procedure with at least 3 to 6 months in between stages. The timeline and extensive nature of these procedures must be communicated to and understood by the patient preoperatively. Important risks relevant to phalloplasty include high risk of urologic complications including strictures and fistulas, flap loss, bowel/bladder injury, loss of erectile device, and donor-site complications. Patients should also be aware that placement of testicular and penile prostheses may not be covered by some insurance providers. Preoperative hair removal on donor sites, such as the thigh for an anterolateral thigh flap or forearm for a radial forearm microvascular free flap, is recommended.

## Special Situations

### Adolescent Patients

As opposed to gender dysphoria children, dysphoria in adolescents tends to persist into adulthood [43]. Interventions for adolescents with gender dysphoria can be divided into three categories: (1) fully reversible interventions (GnRH analogues, progestins, oral contraceptives), (2) partially reversible interventions (masculinizing or feminizing hormone therapy), and (3) irreversible interventions (surgical procedures) [44]. Per WPATH guidelines, genital surgery should not be performed until patients reach the legal age of maturity (18 years old in the USA), though this guideline is debated. Chest surgery in transmasculine patients may be considered earlier. For breast augmentation in transwomen, the FDA regulates the minimum age for silicone implant placement to 22 years or older [45].

## Postoperative Considerations

### Outcomes Reporting

Proper assessment of postoperative results after gender-confirming surgery is crucial to improving techniques, optimizing outcomes and advancing overall care of transgender patients (Table 2). Recently, focus has appropriately shifted to quantifying patient-reported outcomes as measures of operative success [46]. These parameters are particularly important in procedures that aim to align one's physical self with their gender identity. Patient-reported outcomes can be divided into functional status, satisfaction with surgical results, psychosocial parameters, sexual well-being, and different quality of life measures. A recent systematic review found a lack of validated patient-reported outcomes measures for gender-affirming surgery [47••]. As more gender-affirming surgery is performed, application of validated measures will be needed to appropriately evaluate treatment efficacy.

### Cancer Screening

Both transgender women and men are at risk for developing breast cancer [48, 49], though they have been found to be less adherent to mammography screening guidelines than cisgender patients [50], possibly due to discrimination and fear of the healthcare system. Cisgender is a term for people whose gender identity matches the sex that they were assigned at birth. Transgender men who have not had bilateral mastectomy should undergo standard screening for breast cancer, with guidelines for age to start screening and timing are based on studies on cis-gender women [51]. Screening mammography is recommended starting at 50 years of age with



**Table 2** Postoperative considerations in gender-affirming surgery

Outcome reporting
Quality-of-life and patient satisfaction
Validated outcomes measures
Cancer screening
Breast cancer
Screening in transgender men and women
Every 2 years starting at age 50 and after 5–10 years of feminizing hormones (MtF)
Prostate cancer
Screening guidelines per recommendations for cis men
Consider reducing upper limit normal PSA values and digital neovaginal exam (post-vaginoplasty)
Cervical cancer
Screening guidelines per recommendations for cis women
Improvement of patient experience before, during and after office-visit strategies
Early discussion on importance of preventative health maintenance
Mental health
Monitoring for postoperative depression, anxiety, and other mental health disorders
Ongoing mental health support
Mastectomy
Secondary revisions
Breast growth with pregnancy
Augmentation mammoplasty
Long-term complications (capsular contracture, rupture)
BIA-ALCL
Vaginoplasty
Neo-vaginal exam
Sexual function
Dilation
Urinary symptoms
Phalloplasty
Sexual function
Urethral complications
Precautions with genitourinary procedures and urinary catheter insertion

PSA, prostate-specific antigen; MtF, male-to-female; BIA-ALCL, breast implant-associated anaplastic large cell lymphoma

subsequent mammograms every 2 years for transgender women. Duration of feminizing hormone therapy should also be considered, with screening mammography suggested 5 to 10 years after commencement of therapy. Transgender men should be aware that chest masculinization is not a formal mastectomy and that they will need to examine chest for any concerning changes that should be reported to medical

providers. Screening imaging modalities may be unreliable in transgender men that have undergone mastectomy, and there is little reliable evidence on the risks associated with residual breast tissue. In all patients, individual risk factors should be assessed and appropriate screening discussed preemptively.

Prostate cancer is rare in the transgender female population after orchiectomy and estrogen therapy, though has been found to behave aggressively in diagnosed cases [52, 53]. In addition, the reported incidence of prostate cancer may be low due to the lack of rigorous screening. Current recommendations for prostate cancer screen for transgender women are to follow those for cisgender men. While evidence for screening with prostate-specific antigen (PSA) or digital rectal exam (DRE) has been determined to be inadequate by the National Institute of Health [54], studies advocate for prostate monitoring with DRE or transvaginal exams at the age of 50 given the potentially aggressive behavior of prostate cancer in this population [52]. Reducing upper cutoff levels for normal PSA to 1.0 ng/ml may be considered in patients with low serum testosterone [55]. In patients who have undergone vaginoplasty with the prostate anterior to the vaginal wall, a neovaginal exam may be more successful to examine the prostate [56].

Cervical cancer screening guidelines for transgender men follow recommendations for cisgender women. Transgender men have been found to undergo screening less frequently than cisgender women [57]. Low screening rates are likely due to multiple factors, including worsening of gender dysphoria and physical discomfort with examination secondary to atrophic vaginal lining in patients that have not undergone vaginectomy. There are several important considerations in easing the process of cervical cancer screening for transmasculine patients both before, during and after office visits. Strategies for improving patient experiences include use of gender-neutral terms, affirming office environments, decreasing physical discomfort during examination, and following-up to ensure comfort with testing [58]. Non-vaginal sourced specimens for HPV-testing, such as urine testing, may be useful for patients who have undergone vaginoplasty or those with significant physical discomfort with pap smears. Applying measures to improve patient experience as well as appropriate communication of the importance of preventative health prior to gender-affirming interventions may help increase rates of compliance.

## Procedure-Specific Considerations

### Mastectomy

Patients who have undergone mastectomy should be monitored for hematomas postoperatively in the acute setting, with rates being around 5 to 10% [36•]. Secondary revisions are most commonly performed for contour deformities and dog

ears and should be delayed until postoperative swelling has completely resolved. Residual breast tissue after top surgery has implications not only for cancer screening but hormonal changes in this tissue. An effort should be made to remove as much breast tissue as possible. Patients who subsequently become pregnant can experience breast growth and pain, which may lead to recurrent dysmorphia [59].

### Augmentation Mammoplasty

In patients that have undergone implant-based breast augmentation, standard postoperative monitoring of breast implants and their long-term sequelae, such as capsular contracture, should be employed. In addition, BIA-ALCL, a rare implant-associated T-cell lymphoma has been reported in transgender patients [60]. BIA-ALCL usually presents with a delayed-onset seroma, or less commonly breast mass, in patients with textured implants. Suspicious cases require aspiration of periprosthetic fluid and/or biopsy of masses for cytology, histology, flow cytometry, and CD30+ immunohistochemistry [61]. Treatment of confirmed cases includes implant removal and complete capsulectomy.

### Vaginoplasty

Routine examination of the neovagina should be performed after vaginoplasty. Patients are seen weekly in the immediate postoperative period, after which frequency can be decreased. Assessment of the neovagina involves examination of the vaginal canal to assess graft take, granulation tissue, hair, or stenosis. Neovaginal stenosis or loss of depth can be due to either the inherent constrictive forces of the pelvic diaphragm surrounding the neovaginal canal or inadequate dilation postoperatively. The only current solution to maintain the opening in the pelvic diaphragm is lifelong dilation. Dilation protocols must be discussed with the patient preoperatively and adherence to these regimes evaluated postoperatively. Since neovaginal stenosis is inevitable in patients who are noncompliant with dilation, continued assessment of this aspect of postoperative care is critical.

It is also important to evaluate sexual function after vaginoplasty. Patients are initially instructed to refrain from any penetrative intercourse for the first 3 months postoperatively. Adequacy of neovaginal depth should be assessed, as well as pain or discomfort with intercourse and ability to achieve orgasm. Providers should also monitor for other postoperative issues, such as lower urinary tract infections and urinary incontinence, particularly in transgender women with prior prostate surgery. Patients who have undergone vaginoplasty should be cautioned regarding undergoing prostate surgery, since the external urinary sphincter may be affected by the vaginoplasty dissection. If stress incontinence

develops after prostate surgery, treatment of incontinence may be more difficult to the shortened urethra after vaginoplasty.

### Phalloplasty

Assessment of sexual function in phalloplasty patients during postoperative follow-up includes engagement in penetrative sexual intercourse, neophallus function, pain/discomfort, and ability to achieve orgasm. Providers must maintain a high index of suspicion for urethral complications in patients that have undergone urethral lengthening. Complications, such as urinary strictures and fistulas, are not infrequent and should be diagnosed and treated early to avoid significant morbidity. In addition, precautions must be taken during other genitourinary procedures. Incisions around flap pedicles should be avoided and care must be taken with urinary catheter placement in patients with urethral lengthening to avoid injury to the neourethra. Appropriate documentation and communication are critical to prevent avoidable complications when patients are treated by providers who may be unfamiliar with gender-affirming genital reconstruction.

## Conclusions

Gender-confirmation surgery offers a unique opportunity to treat gender dysphoria and improve quality of life among transgender patients. Proper treatment, however, extends far beyond surgery and necessitates comprehensive pre- and postoperative longitudinal care in a safe and affirming environment. Perioperative transgender healthcare requires a multidisciplinary approach to address many of the particular needs of this patient population. Important preoperative considerations include compliance with WPATH guidelines, establishment of social support, patient education and counseling, shared-decision making, and training of all healthcare staff to sensitively care for transgender patients at an institutional level. Postoperatively, specific cancer screening must be maintained as well as ongoing monitoring and support of mental health. Eventually, validated outcomes measures will be critical in evaluating the efficacy of these interventions and improving the overall care of transgender patients.

## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflicts of interest.

**Human and Animal Rights and Informed Consent** This article does not contain any studies with human or animal subjects performed by any of the authors.

## References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Black DW, Grant JE. Gender dysphoria. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, D.C.: American Psychiatric Association; 2014.
2. Flores AR, Herman JL, Gates GJ, Brown T. How many adults identify as transgender in the United States. 2016. <https://williamsinstitute.law.ucla.edu/wp-content/uploads/How-Many-Adults-Identify-as-Transgender-in-the-United-States.pdf>. Accessed May 25, 2018.
3. Collin L, Reisner SL, Tangpricha V, Goodman M. Prevalence of transgender depends on the “case” definition: a systematic review. *J Sex Med.* 2016;13(4):613–26. <https://doi.org/10.1016/j.jsxm.2016.02.001>.
4. Arcelus J, Bouman WP, Van Den Noortgate W, Claes L, Witcomb G, Fernandez-Aranda F. Systematic review and meta-analysis of prevalence studies in transsexualism. *Eur Psychiatry.* 2015;30(6):807–15. <https://doi.org/10.1016/j.eurpsy.2015.04.005>.
5. • Papadopoulos NA, Zavlin D, Lelle JD, Herschbach P, Henrich G, Kovacs L, et al. Male-to-female sex reassignment surgery using the combined technique leads to increased quality of life in a prospective study. *Plast Reconstr Surg.* 2017;140(2):286–94. <https://doi.org/10.1097/PRS.0000000000003529>. **This study analyzed quality of life outcomes in patients that underwent vaginoplasty and demonstrated significant improvement in multiple domains.**
6. Weigert R, Frison E, Sessiecq Q, Al Mutairi K, Casoli V. Patient satisfaction with breasts and psychosocial, sexual, and physical well-being after breast augmentation in male-to-female transsexuals. *Plast Reconstr Surg.* 2013;132(6):1421–9. <https://doi.org/10.1097/01.prs.0000434415.70711.49>.
7. Canner JK, Harfouch O, Kodadek LM, Pelaez D, Coon D, Offodile AC, 2nd et al. Temporal trends in gender-affirming surgery among transgender patients in the United States. *JAMA Surg.* 2018. <https://doi.org/10.1001/jamasurg.2017.6231>.
8. •• The World Professional Association for Transgender Health. Standards of care for the health of transsexual, transgender, and gender nonconforming people. 7th Version. 2011. [https://www.wpath.org/media/cms/Documents/Web\\_Transfer/SOC/Standards\\_of\\_Care\\_V7-2011\\_WPATH.pdf](https://www.wpath.org/media/cms/Documents/Web_Transfer/SOC/Standards_of_Care_V7-2011_WPATH.pdf). Accessed April 10, 2018. **The World Professional Association for Transgender Health Standards of Care outlines the critical guidelines in the medical and surgical care of transgender patients.**
9. Berli JU, Knudson G, Fraser L, Tangpricha V, Ettner R, Ettner FM, et al. What surgeons need to know about gender confirmation surgery when providing care for transgender individuals: a review. *JAMA Surg.* 2017;152(4):394–400. <https://doi.org/10.1001/jamasurg.2016.5549>.
10. Center of Excellence for Transgender Health. How to accurately capture data on trans clients. 2007. <http://www.transhealth.ucsf.edu/trans?page=lib-trans-count>. Accessed April 12, 2018.
11. Deutsch MB, Green J, Keatley J, Mayer G, Hastings J, Hall AM, et al. Electronic medical records and the transgender patient: recommendations from the World Professional Association for Transgender Health EMR Working Group. *J Am Med Inform Assoc.* 2013;20(4):700–3. <https://doi.org/10.1136/amiajnl-2012-001472>.
12. Green J, McGowan S, Levi J, Wallbank R, Whittle S. Recommendations from the WPATH consensus process for revision of the DSM diagnosis of gender identity disorders: implications for human rights. *Int. J. Transgenderism.* 2011;13(1):1–4.
13. Callahan EJ, Sitkin N, Ton H, Eidson-Ton WS, Weckstein J, Latimore D. Introducing sexual orientation and gender identity into the electronic health record: one academic health center’s experience. *Acad Med.* 2015;90(2):154–60. <https://doi.org/10.1097/ACM.0000000000000467>.
14. Morrison SD, Chong HJ, Dy GW, Grant DW, Wilson SC, Brower JP, et al. Educational exposure to transgender patient care in plastic surgery training. *Plast Reconstr Surg.* 2016;138(4):944–53. <https://doi.org/10.1097/PRS.0000000000002559>.
15. Smith JR, Morrison SD, Gottlieb LJ. Are surgical residents prepared for fellowship training in gender-confirming surgery? *J Sex Med.* 2017;14(8):1066–7. <https://doi.org/10.1016/j.jsxm.2017.05.017>.
16. Schechter LS, Cohen M. Gender confirmation surgery: a new frontier in plastic surgery education. *Plast Reconstr Surg.* 2016;138(4):784e–5e. <https://doi.org/10.1097/PRS.0000000000002594>.
17. Davey A, Bouman WP, Arcelus J, Meyer C. Social support and psychological well-being in gender dysphoria: a comparison of patients with matched controls. *J Sex Med.* 2014;11(12):2976–85. <https://doi.org/10.1111/jsm.12681>.
18. Factor RJ, Rothblum ED. A study of transgender adults and their non-transgender siblings on demographic characteristics, social support, and experiences of violence. *J LGBT Health Res.* 2007;3(3):11–30.
19. Green J. Transsexual surgery may be covered by Medicare. *LGBT Health.* 2014;1(4):256–8. <https://doi.org/10.1089/lgbt.2014.0076>.
20. Baker KE. The future of transgender coverage. *N Engl J Med.* 2017;376(19):1801–4. <https://doi.org/10.1056/NEJMp1702427>.
21. • Padula WV, Heru S, Campbell JD. Societal implications of health insurance coverage for medically necessary services in the U.S. transgender population: a cost-effectiveness analysis. *J Gen Intern Med.* 2016;31(4):394–401. <https://doi.org/10.1007/s11606-015-3529-6>. **This study analyzed the implications of health insurance coverage for transgender patients and demonstrated that coverage is affordable and cost-effective.**
22. •• Weissler JM, Chang BL, Carney MJ, Rengifo D, Messa CA, Sarwer DB, et al. Gender-affirming surgery in persons with gender dysphoria. *Plast Reconstr Surg.* 2018;141(3):388e–96e. <https://doi.org/10.1097/PRS.0000000000004123>. **This study outlines the current state of gender-affirming surgery and summarizes the relevant guidelines and recommendations for the perioperative care of transgender patients.**
23. Lee CN, Ubel PA, Deal AM, Blizard LB, Sepucha KR, Ollila DW, et al. How informed is the decision about breast reconstruction after mastectomy?: a prospective, cross-sectional study. *Ann Surg.* 2016;264(6):1103–9. <https://doi.org/10.1097/SLA.0000000000001561>.
24. Lee CN, Deal AM, Huh R, Ubel PA, Liu YJ, Blizard L, et al. Quality of patient decisions about breast reconstruction after mastectomy. *JAMA Surg.* 2017;152(8):741–8. <https://doi.org/10.1001/jamasurg.2017.0977>.
25. Egekeze N, Dubin J, Williams K, Bernhardt M. The age of OrthoInfo: a randomized controlled trial evaluating patient comprehension of informed consent. *J Bone Joint Surg Am.* 2016;98(19):e81. <https://doi.org/10.2106/JBJS.15.01291>.
26. Serpico V, Liepert AE, Boucher K, Fouts DL, Anderson L, Pell J, et al. The effect of Previsit education in breast cancer patients: a study of a shared-decision-making tool. *Am Surg.* 2016;82(3):259–65.
27. Smith YL, Van Goozen SH, Kuiper AJ, Cohen-Kettenis PT. Sex reassignment: outcomes and predictors of treatment for adolescent and adult transsexuals. *Psychol Med.* 2005;35(1):89–99.
28. Selvaggi G, Giordano S. The role of mental health professionals in gender reassignment surgeries: unjust discrimination or responsible



- care? *Aesthet Plast Surg.* 2014;38(6):1177–83. <https://doi.org/10.1007/s00266-014-0409-0>.
29. Dhejne C, Lichtenstein P, Boman M, Johansson AL, Langstrom N, Landen M. Long-term follow-up of transsexual persons undergoing sex reassignment surgery: cohort study in Sweden. *PLoS One.* 2011;6(2):e16885. <https://doi.org/10.1371/journal.pone.0016885>.
  30. Dhejne C, Van Vlerken R, Heylens G, Arcelus J. Mental health and gender dysphoria: a review of the literature. *Int Rev Psychiatry.* 2016;28(1):44–57. <https://doi.org/10.3109/09540261.2015.1115753>.
  31. De Roo C, Tilleman K, T'Sjoen G, De Sutter P. Fertility options in transgender people. *Int Rev Psychiatry.* 2016;28(1):112–9. <https://doi.org/10.3109/09540261.2015.1084275>.
  32. De Sutter P. Reproductive options for transpeople: recommendations for revision of the WPATH's standards of care. *Int. J. Transgenderism.* 2009;11(3):183–5.
  33. T'Sjoen G, Van Caenegem E, Wierckx K. Transgenderism and reproduction. *Curr Opin Endocrinol Diabetes Obes.* 2013;20(6):575–9. <https://doi.org/10.1097/01.med.0000436184.42554.b7>.
  34. Salim A, Metz E, Constant JS, Gurjala A, Yokoo K, Tong WMY. Does previous breast reduction affect the outcome of gender-affirming subcutaneous mastectomy? *Ann Plast Surg.* 2018;80(Suppl 5):S279–S84. <https://doi.org/10.1097/SAP.0000000000001414>.
  35. Hage JJ, Bloem JJ. Chest wall contouring for female-to-male transsexuals: Amsterdam experience. *Ann Plast Surg.* 1995;34(1):59–66.
  36. Bluebond-Langner R, Berli JU, Sabino J, Chopra K, Singh D, Fischer B. Top surgery in transgender men: how far can you push the envelope? *Plast Reconstr Surg.* 2017;139(4):873e–82e. <https://doi.org/10.1097/PRS.0000000000003225>. **This study describes current techniques in top surgery for transgender men and provides useful algorithms for preoperative planning and decision-making.**
  37. Silva-Santisteban A, Raymond HF, Salazar X, Villayzan J, Leon S, McFarland W, et al. Understanding the HIV/AIDS epidemic in transgender women of Lima, Peru: results from a sero-epidemiologic study using respondent driven sampling. *AIDS Behav.* 2012;16(4):872–81. <https://doi.org/10.1007/s10461-011-0053-5>.
  38. Wilson E, Rapues J, Jin H, Raymond HF. The use and correlates of illicit silicone or “fillers” in a population-based sample of transwomen, San Francisco, 2013. *J Sex Med.* 2014;11(7):1717–24.
  39. Bartsich S, Wu JK. Silicon emboli syndrome: a sequela of clandestine liquid silicone injections. A case report and review of the literature. *J Plast Reconstr Aesthet Surg.* 2010;63(1):e1–3. <https://doi.org/10.1016/j.bjps.2009.04.004>.
  40. Hage JJ, Kanhai RC, Oen AL, van Diest PJ, Karim RB. The devastating outcome of massive subcutaneous injection of highly viscous fluids in male-to-female transsexuals. *Plast Reconstr Surg.* 2001;107(3):734–41.
  41. de Vries AL, McGuire JK, Steensma TD, Wagenaar EC, Doreleijers TA, Cohen-Kettenis PT. Young adult psychological outcome after puberty suppression and gender reassignment. *Pediatrics.* 2014;134(4):696–704. <https://doi.org/10.1542/peds.2013-2958>.
  42. Bouman MB, van der Sluis WB, Buncamper ME, Ozer M, Mullender MG, Meijerink WJ. Primary total laparoscopic sigmoid vaginoplasty in transgender women with Penoscrotal hypoplasia: a prospective cohort study of surgical outcomes and follow-up of 42 patients. *Plast Reconstr Surg.* 2016;138(4):614e–23e. <https://doi.org/10.1097/PRS.0000000000002549>.
  43. de Vries AL, Steensma TD, Doreleijers TA, Cohen-Kettenis PT. Puberty suppression in adolescents with gender identity disorder: a prospective follow-up study. *J Sex Med.* 2011;8(8):2276–83. <https://doi.org/10.1111/j.1743-6109.2010.01943.x>.
  44. Hembree WC, Cohen-Kettenis P, Delemarre-van de Waal HA, Gooren LJ, Meyer WJ 3rd, Spack NP, et al. Endocrine treatment of transsexual persons: an Endocrine Society clinical practice guideline. *J Clin Endocrinol Metab.* 2009;94(9):3132–54. <https://doi.org/10.1210/jc.2009-0345>.
  45. U.S. Food and Drug Administration. Silicone gel-filled breast implants. 2018. <https://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ImplantsandProsthetics/BreastImplants/ucm063871.htm>. Accessed April 25, 2018.
  46. Pusic AL, Lemaire V, Klassen AF, Scott AM, Cano SJ. Patient-reported outcome measures in plastic surgery: use and interpretation in evidence-based medicine. *Plast Reconstr Surg.* 2011;127(3):1361–7. <https://doi.org/10.1097/PRS.0b013e3182063276>.
  47. Andreasson M, Georgas K, Elander A, Selvaggi G. Patient-reported outcome measures used in gender confirmation surgery: a systematic review. *Plast Reconstr Surg.* 2018;141(4):1026–39. <https://doi.org/10.1097/PRS.0000000000004254>. **This study reviews the currently available patient-reported outcome measures in gender-affirming surgery and importantly finds a significant needs for validated questionnaires.**
  48. Weyers S, Villeirs G, Vanherreweghe E, Verstraelen H, Monstrey S, Van den Broecke R, et al. Mammography and breast sonography in transsexual women. *Eur J Radiol.* 2010;74(3):508–13. <https://doi.org/10.1016/j.ejrad.2009.03.018>.
  49. Maglione KD, Margolies L, Jaffer S, Szabo J, Schmidt H, Weltz C, et al. Breast cancer in male-to-female transsexuals: use of breast imaging for detection. *AJR Am J Roentgenol.* 2014;203(6):W735–40. <https://doi.org/10.2214/AJR.14.12723>.
  50. Bazzi AR, Whorms DS, King DS, Potter J. Adherence to mammography screening guidelines among transgender persons and sexual minority women. *Am J Public Health.* 2015;105(11):2356–8. <https://doi.org/10.2105/AJPH.2015.302851>.
  51. Moss SM, Wale C, Smith R, Evans A, Cuckle H, Duffy SW. Effect of mammographic screening from age 40 years on breast cancer mortality in the UK Age trial at 17 years' follow-up: a randomised controlled trial. *Lancet Oncol.* 2015;16(9):1123–32. [https://doi.org/10.1016/S1470-2045\(15\)00128-X](https://doi.org/10.1016/S1470-2045(15)00128-X).
  52. Gooren L, Morgentaler A. Prostate cancer incidence in orchidectomised male-to-female transsexual persons treated with oestrogens. *Andrologia.* 2014;46(10):1156–60. <https://doi.org/10.1111/and.12208>.
  53. Hoffman MA, DeWolf WC, Morgentaler A. Is low serum free testosterone a marker for high grade prostate cancer? *J Urol.* 2000;163(3):824–7.
  54. National Cancer Institute. Prostate cancer screening (PDQ®)—health professional version. 2018. <https://www.cancer.gov/types/prostate/hp/prostate-screening-pdq>. Accessed April 12, 2018.
  55. Trum HW, Hoebeke P, Gooren LJ. Sex reassignment of transsexual people from a gynecologist's and urologist's perspective. *Acta Obstet Gynecol Scand.* 2015;94(6):563–7. <https://doi.org/10.1111/aogs.12618>.
  56. Weyers S, De Sutter P, Hoebeke S, Monstrey G, G TS, Verstraelen H, et al. Gynaecological aspects of the treatment and follow-up of transsexual men and women. *Facts Views Vis Obgyn.* 2010;2(1):35–54.
  57. Gatos KC. A literature review of cervical cancer screening in transgender men. *Nurs Womens Health.* 2018;22(1):52–62. <https://doi.org/10.1016/j.nwh.2017.12.008>.
  58. Potter J, Peitzmeier SM, Bernstein I, Reisner SL, Alizaga NM, Agenor M, et al. Cervical cancer screening for patients on the female-to-male spectrum: a narrative review and guide for clinicians. *J Gen Intern Med.* 2015;30(12):1857–64. <https://doi.org/10.1007/s11606-015-3462-8>.
  59. MacDonald T, Noel-Weiss J, West D, Walks M, Biener M, Kibbe A, et al. Transmasculine individuals' experiences with lactation, chestfeeding, and gender identity: a qualitative study. *BMC Pregnancy Childbirth.* 2016;16:106. <https://doi.org/10.1186/s12884-016-0907-y>.

60. Patzelt M, Zarubova L, Klener P, Barta J, Benkova K, Brandejsova A, et al. Anaplastic large-cell lymphoma associated with breast implants: a case report of a transgender female. *Aesthet Plast Surg*. 2018;42(2):451–5. <https://doi.org/10.1007/s00266-017-1012-y>.
61. Clemens MW, Brody GS, Mahabir RC, Miranda RN. How to diagnose and treat breast implant-associated anaplastic large cell lymphoma. *Plast Reconstr Surg*. 2018;141(4):586e–99e. <https://doi.org/10.1097/PRS.0000000000004262>.