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Asynchronous Modules on Transgender, Gender Diverse, and Intersex Patient Care in an Obstetrics and Gynecology Clerkship: A Retrospective Pre-Post Study

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Abstract

Background.

Gaps in medical education on transgender and gender diverse (TGD) and intersex patient care are well documented, yet few studies describe the development and evaluation of required educational interventions targeting both populations within a single clinical clerkship. We describe two asynchronous modules on TGD and intersex patient care embedded in a required obstetrics and gynecology (OBGYN) clerkship and report their impact on medical student knowledge and comfort.

Methods.

We conducted a retrospective pre-post study from January through December 2024 at an allopathic United States medical school. Two 15-minute asynchronous modules on TGD and intersex patient care were developed using a formal institutional needs assessment and aligned to Association of American Medical Colleges (AAMC) competency frameworks. Modules were supplemented by a synchronous live "Patient as Professor" session. After module completion, students completed anonymous retrospective pre-post surveys (TGD module: 8 items; intersex module: 10 items; both rated on a 5-point Likert scale) and a graded 10-item clinical vignette-based knowledge assessment. Data were analyzed using descriptive statistics and Wilcoxon signed rank tests with Benjamini-Hochberg post-hoc correction (false discovery rate 0.05).

Results.

A total of 134 students completed the OBGYN clerkship during the study period. Students reported statistically significant gains in self-reported knowledge and comfort across all learning objectives after completing both modules ($p < 0.001$). After completing the modules, 95.6% and 94.6% of students agreed or strongly agreed that their knowledge of TGD and intersex care, respectively, had improved. On the graded knowledge assessment, students ($n = 133$) scored a mean of 90.4% (standard deviation [SD] 0.9%).

Conclusions.

Brief, required asynchronous modules produced significant and consistent gains in medical student knowledge and comfort with TGD and intersex patient care. The needs assessment-informed, community-engaged design and multi-modal assessment approach offer a scalable model for addressing persistent gaps in lesbian, gay, bisexual, transgender, queer, and intersex (LGBTQI) health professions education that other institutions may adapt to their own clerkship curricula.

Background

Gaps in health professions education on the care of transgender and gender diverse (TGD) and intersex patients are well documented. In one national study of United States medical students, 76.7% felt not competent or somewhat not competent treating gender minority patients, a figure that rose to 81% when asked about treating intersex patients.[1] Over half of students perceived that their medical school did not adequately prepare them to care for TGD and intersex patients,[1] and more than half of medical schools offer no instruction at all on lesbian, gay, bisexual, transgender, queer, and intersex (LGBTQI) issues.[2]

These educational deficits have direct clinical consequences. TGD and intersex individuals experience significant barriers to healthcare access, including discrimination in clinical settings and lack of provider knowledge.[3,4] Almost half of transgender adults have experienced discrimination in healthcare settings, and both TGD adults and individuals with intersex traits report avoiding care due to concerns about mistreatment.[3,5,6,7] A national survey of obstetrics and gynecology (OBGYN) residents found that while 40% had cared for TGD patients, only 22% felt competent to do so; however, more than 90% desired further training on TGD-related health topics.[8]

Curricular interventions targeting TGD and intersex health have been reported, but many are elective, single-session, or limited to one patient population.[9,10] Embedding structured, required educational content within core clinical clerkships represents an opportunity to reach all trainees at a teachable moment — when students are actively applying knowledge in direct patient care. Asynchronous formats are particularly well-suited to the clinical learning environment, where scheduling constraints limit synchronous didactic time. We describe a needs assessment-driven, dual-module curricular intervention on TGD and intersex patient care developed for the OBGYN clerkship at an allopathic United States medical school, and report its impact on student knowledge and comfort.

Methods

We conducted a retrospective pre-post study from January through December 2024 at Columbia University Vagelos College of Physicians and Surgeons (VP&S), an allopathic medical school in the United States. The VP&S Educational Advisory Group (EAG) sub-committee reviewed and evaluated this project and waived the need for ethics review and approval and for informed consent, determining that the project meets the university's criteria for Educational Quality Improvement according to the Columbia University Guidance for the Classification of Quality Improvement Activities versus Research with Human Subjects. This ethical oversight covers both the 2021 needs assessment and the 2024 curricular intervention and their associated data collection and reporting.

Needs assessment

In 2021, a needs assessment survey was distributed to all medical students at our institution (N = 560) to identify gaps in the curriculum's coverage of topics related to the health of LGBTQI patients. The

survey was covered by the same EAG ethical oversight described above. Students were asked to rate on a 5-point scale (1 = Not well at all, 2 = Poor, 3 = Fair, 4 = Good, 5 = Excellent) how well they believed the school had performed in teaching students about LGBTQI-specific topics. Students were asked to indicate whether they identified as lesbian, gay, bisexual, transgender, queer, and/or intersex. M1–M4 designations refer to the four years of the medical school curriculum (M1 = first year through M4 = fourth year).

The needs assessment comprised two sections: the first contained 11 items assessing perceptions of LGBTQI-specific teaching content, and the second contained 3 items assessing the inclusion of LGBTQI patients in various curricular formats. Responses from LGBTQI-identifying students were compared to those from students who identified as heterosexual/cisgender by calculating the mean difference between these groups. The findings directly informed the selection of learning objectives for the modules described below.

Curricular intervention framework and development

The modules were developed by two fourth-year medical students (A.-S.v.W. and O.C.) with experience providing trauma-informed care for LGBTQI patient populations, under faculty supervision. Learning objectives were derived from the needs assessment findings and aligned with the AAMC *Diversity, Equity, and Inclusion Competencies Across the Learning Continuum* report.[11] Each module was approximately 15 minutes in length, delivered through the Articulate platform (New York, New York, USA) as a linear, self-paced, asynchronous resource, and was embedded as a required component of the OBGYN clerkship.

The TGD module addressed the following learning objectives: differentiate sex assigned at birth, gender identity, and sexual orientation; recognize health disparities among TGD patients and how factors such as race and socioeconomic status affect these disparities; explain barriers to OBGYN care for TGD individuals at the institutional, organizational, and individual levels; describe three unique medical needs of TGD patients in the OBGYN setting; identify methods for creating an inclusive clinical environment; and apply trauma-informed care principles to the TGD patient population.

The intersex module addressed the following learning objectives: define intersex and distinguish it from TGD identities; recognize the prevalence of intersex traits within the general population; describe three or more conditions associated with intersex traits; explain barriers to OBGYN care for patients with intersex traits; identify three unique medical needs of patients with intersex traits in the OBGYN setting; and apply trauma-informed care principles to the intersex patient population.

To ground both modules in patient experience, the intersex module incorporated first-hand perspectives from three individuals with intersex traits through quotations and video excerpts focused on their healthcare experiences. Feedback was sought from community stakeholders including members of InterACT, a non-profit advocacy organization for intersex rights.[12] For the TGD module, a synchronous live “Patient as Professor” session complemented the asynchronous content: students heard directly

from a community member who identifies as a transgender woman as she shared her healthcare experiences in an open, conversational format.

Participants

Participants were medical students (n = 134) rotating in the OBGYN clinical clerkship at VP&S from January through December 2024. All students were required to complete the modules and Patient as Professor session as part of the standard clerkship requirements.

Assessment

After completing the modules, students completed an anonymous retrospective pre-post survey that self-assessed their knowledge and comfort with TGD- and intersex-specific health needs. Survey items were developed de novo and mapped directly to each module's learning objectives. The TGD module survey comprised 8 items and the intersex module survey comprised 10 items, each rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). An open free-response text box at the end of each survey allowed students to provide qualitative feedback. Surveys were administered via Qualtrics (Provo, Utah, USA). Students also completed a graded knowledge assessment of 10 clinical vignette-based multiple-choice questions, each scored as correct or incorrect with a percentage correct score calculated per student.

Statistical analysis

We utilized descriptive statistics and Wilcoxon signed rank tests with Benjamini-Hochberg post-hoc correction (false discovery rate of 0.05) to compare pre- and post-module responses for each survey item. All analyses were conducted using Statistical Package for the Social Sciences (SPSS) software (Version 29.0, IBM Corp., Armonk, New York, USA).

Results

A total of 91 students (33.7% identifying as LGBTQ) responded to the 2021 needs assessment. Across all items, mean scores fell below 3 (Fair) on the 5-point scale, indicating that students broadly perceived the curriculum to be performing poorly in teaching LGBTQI-related content. Items related to intersex issues (mean 1.73) and legal and policy issues faced by LGBTQ patients (mean 1.60) received the lowest ratings. Students who identified as LGBTQI tended to rate the curriculum lower than students who identified as heterosexual/cisgender across most items. These findings informed the development of the TGD and intersex patient care modules described here (Table 1).

Table 1
Needs assessment survey results (N = 91).

	All	[LGBTQ respondents – Students identifying as heterosexual/cisgender]	M1[a]	M2	M3	M4
***Based on your experience as a VP&S student so far, how well do you believe that Columbia has performed in teaching students the following in its curriculum*:**						
How to ask about gender identity, sexual anatomy, sexual development, sexual history, and sexual orientation	2.79	−0.44	2.57	2.73	2.86	3.11
Health disparities affecting LGBTQ individuals	2.15	−0.33	2.09	1.93	2.43	2.61
The historical context of the treatment of LGBTQ patients	1.67	−0.23	1.50	1.55	1.93	1.89
How to recognize and mitigate biases towards LGBTQ patients in a clinical setting	2.26	−0.49	2.36	2.00	2.97	2.50
Legal and policy issues (e.g., insurance limitations, partner benefits, visitation rights) faced by LGBTQ patients	1.60	−0.17	1.50	1.38	1.93	2.00
How to take a comprehensive sexual history using gender-neutral terms and inclusive language	2.79	−0.44	2.33	2.75	2.86	3.22
Terminology used by LGBTQ patients	2.34	−0.02	2.00	2.15	2.57	2.94
Intersex issues	1.73	−0.12	1.71	1.48	2.00	2.22
Transgender healthcare, including hormones used in transitioning and the delaying of puberty, appropriate screenings based on anatomy and sexual behavior, and surgical options for transitioning	2.01	0.15	1.38	1.53	3.00	2.72
How race, ethnicity, and culture intersect with queer identity in the lives of LGBTQ patients	1.87	−0.23	1.44	1.70	2.43	2.17
Teaching students about trauma-informed care in the context of the physical exam for transgender patients	2.09	−0.30	1.43	2.10	2.29	2.33

	All	[LGBTQ respondents − Students identifying as heterosexual/cisgender]	M1[a]	M2	M3	M4
***Based on your experience as a VP&S student so far, how well do you believe that Columbia has performed in teaching students the following in its curriculum*:**						
Regarding the inclusion of LGBTQ patients in the curriculum, how well do you believe VP&S has performed in the following:						
Including LGBTQ patients in vignettes where their sexual or gender identity is unrelated to the illness being presented	2.60	0.07	2.33	2.54	2.71	2.89
Including LGBTQ patients in patient-as-professor sessions	2.24	0.34	1.25	2.38	2.42	2.28
Including LGBTQ patients in standardized patient cases	2.63	−0.21	1.00	2.44	3.29	2.89

Potential scores: 1 = Not well at all, 2 = Poor, 3 = Fair, 4 = Good, 5 = Excellent. a Very high non-response rate among M1 class for individual items. LGBTQ: lesbian, gay, bisexual, transgender, and queer; M1–M4: years 1–4 of the medical school curriculum; VP&S: Vagelos College of Physicians and Surgeons.

From the 134 medical students completing the OBGYN clerkship in 2024, we received 134 responses to the TGD module survey and 130 responses to the intersex module survey. After completing the modules, nearly all students agreed or strongly agreed that they had improved their knowledge to effectively provide medical care for patients who identify as gender minorities (95.6%) and intersex (94.6%). Students reported a statistically significant increase ($p < 0.001$) in their knowledge and comfort with all TGD and intersex learning objectives, including recognizing specific needs of these populations and creating a more comfortable clinical environment for them (Tables 2 and 3).

Table 2
Pre-post survey results for students who completed the TGD module (n = 135).

Statement	Before		After		p Value
	Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)	
I understood the differences between sex assigned at birth, gender identity, and sexual orientation	4.45 ± 0.70	5 (4–5)	4.78 ± 0.44	5 (5–5)	< 0.001
I could identify at least two healthcare disparities that gender minority patients experience	3.96 ± 0.84	4 (4–5)	4.73 ± 0.52	5 (5–5)	< 0.001
I could identify at least three reasons why patients who are gender minorities may have difficulty accessing healthcare	3.73 ± 0.89	4 (3–4)	4.70 ± 0.54	5 (4–5)	< 0.001
I could identify at least three ways to create a more comfortable clinical environment for gender minority patients	3.59 ± 0.94	4 (3–4)	4.62 ± 0.57	5 (4–5)	< 0.001
I could identify at least two specific needs that gender minority patients may have in an obstetrics and gynecology (OB/GYN) setting	3.49 ± 0.99	4 (3–4)	4.64 ± 0.56	5 (4–5)	< 0.001
I recognized how certain language used in clinical encounters could be uncomfortable or traumatic for patients who identify as gender minorities	3.99 ± 0.94	4 (4–5)	4.67 ± 0.55	5 (4–5)	< 0.001
I felt comfortable using non-gendered terms to refer to a patient's anatomy	3.24 ± 1.02	3 (3–4)	4.49 ± 0.60	5 (4–5)	< 0.001
After completing this module, I believe I have improved my knowledge to effectively provide medical care for patients who identify as gender minorities	NA	NA	4.56 ± 0.63	5 (4–5)	NA

Participants rated their agreement with each statement on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Statistical comparison via Wilcoxon signed rank tests with Benjamini-Hochberg post-hoc correction (false discovery rate 0.05). SD: standard deviation; IQR: interquartile range; OB/GYN: obstetrics and gynecology; NA: not applicable; TGD: transgender and gender diverse.

Table 3
Pre-post survey results for students who completed the intersex module (n = 130).

Statement	Before		After		p Value
	Mean ± SD	Median (IQR)	Mean ± SD	Median (IQR)	
I understood the difference between "intersex" and "transgender"	3.95 ± 1.01	4 (3–5)	4.72 ± 0.47	5 (4–5)	< 0.001
I knew the prevalence rate of intersex traits within the general population	2.63 ± 1.06	2 (2–4)	4.38 ± 0.74	4.5 (4–5)	< 0.001
I understood the embryonic development of sex organs	3.30 ± 0.95	4 (3–4)	4.38 ± 0.60	4 (4–5)	< 0.001
I could describe the genitourinary anatomy associated with androgen insensitivity syndrome	3.08 ± 1.03	3 (2–4)	4.32 ± 0.53	4 (4–5)	< 0.001
I could describe the genitourinary anatomy associated with congenital adrenal hyperplasia	2.95 ± 0.98	3 (2–4)	4.29 ± 0.55	4 (4–5)	< 0.001
I could describe the genitourinary anatomy associated with 5-alpha reductase deficiency	3.02 ± 1.04	3 (2–4)	4.29 ± 0.55	4 (4–5)	< 0.001
I could describe how medically unnecessary, non-consensual intersex surgeries that occur in childhood can affect the health of people with intersex traits later on in life	2.99 ± 1.01	3 (2–4)	4.37 ± 0.64	4 (4–5)	< 0.001
I could identify at least two specific needs that patients with intersex traits may have in an OB/GYN setting	3.08 ± 0.91	3 (2–4)	4.32 ± 0.71	4 (4–5)	< 0.001
I recognized how certain language used in clinical encounters could be uncomfortable or traumatic for patients who identify as intersex	3.52 ± 0.96	4 (3–4)	4.49 ± 0.61	5 (4–5)	< 0.001
After completing this module, I believe I have improved my knowledge to effectively provide medical care for patients who identify as intersex	NA	NA	4.57 ± 0.60	5 (4–5)	NA

SD: standard deviation; IQR: interquartile range; OB/GYN: obstetrics and gynecology; NA: not applicable.

On the graded knowledge assessment, students (n = 133) scored an average of 90.4% (SD 0.9%), with 20.3% achieving a full score. All students (100.0%) correctly answered the question about the cervical cancer screening schedule in a nonbinary person assigned female at birth. Students most frequently missed the question asking them to recognize 5-alpha reductase deficiency from a clinical vignette, with 74.4% answering correctly and 18.0% choosing congenital adrenal hyperplasia instead.

When presented with a clinical vignette of congenital adrenal hyperplasia, almost all (97.7%) students answered correctly. For the open-ended question asking students to recommend cancer screening for a 65-year-old transgender woman assigned male at birth on estrogen for 20 years, almost all students (97.7%) correctly recommended breast cancer screening, 75.9% correctly recommended colon cancer screening, and 40.6% correctly recommended prostate cancer screening. All students (100.0%) were able to recommend at least one appropriate screening, and 32.3% correctly recommended all three screenings (Table 4).

Table 4
Graded knowledge assessment results by question (n = 133).

Question	Answer choices	% students
Q1. A 50-year-old transgender man presents to the office for routine care. Medical and surgical histories are notable for anxiety and an open appendectomy. His only active medication is testosterone, which was initiated 3 years ago. A lipid panel and complete blood count were normal 3 months prior to presentation. Cervical cancer screening has always been normal and was last performed with human papillomavirus testing and cytology 3 years ago. Which of the following tests should be offered at this visit?	Dual-energy X-ray absorptiometry scan	0.0%
	Screening mammography[b]	94.7%
	Lipid panel and complete blood count	3.0%
	Cervical human papillomavirus testing alone	2.2%
Q2. A 34-year-old nonbinary person assigned female at birth comes to the office for a routine checkup. They have no significant past medical or surgical history. They have been taking testosterone for the past 15 years. They have completed the HPV vaccination series, and their most recent Pap test was normal at age 29. Should they receive a Pap test today?	No, because they had a normal Pap 5 years ago	0.0%
	No, because they have received the HPV vaccine	0.0%
	Yes, because testosterone raises their risk of cervical cancer	0.0%
	Yes, because it has been 5 years since their last Pap[b]	100.0%
	No, because testosterone causes vaginal stenosis	0.0%
Q3. A 65-year-old transgender woman assigned male at birth visits her primary care doctor for an annual visit. She has been taking estrogen for 20 years. Her surgical history is notable for breast augmentation 5 years ago. She has never had any recommended cancer screening. Which cancer screenings should be offered at this visit?	Breast cancer screening[b]	97.7%

Question	Answer choices	% students
	Colon cancer screening[b]	75.9%
	Prostate cancer screening[b]	40.6%
Q4. A 24-year-old patient presents with a request to start gender-affirming estrogen therapy. The patient explains that she was assigned male at birth and identifies as a transgender woman. She has shared her identity with friends and family, and she has strong social support for her transition. When counseling her on the risks and benefits of gender-affirming estrogen therapy, which of the following is a potential adverse effect that you should discuss?	Need for self-administered injections	0.0%
	Thinning of hair on the scalp	0.8%
	Deep venous thrombosis (DVT)b	99.2%
	Polycythemia	0.0%
Q5. A 33-year-old transgender man presents for a routine visit. Medical and surgical histories are notable for major depressive disorder and top surgery (bilateral mastectomy). His active medications are escitalopram, which he has taken for 5 years, and testosterone, which he has taken for 2 years. He has continued to have periods while on testosterone and reports gender dysphoria related to his period. He is extremely averse to genital exams and has previously declined Pap tests for this reason. He is sexually active with a monogamous male-bodied partner, and he reports having receptive vaginal intercourse. What is the best contraceptive choice for this patient?	No contraception needed because he is taking testosterone	0.0%
	Condoms	0.0%
	Continuous-use combined oral contraceptive[b]	94.0%
	Copper intrauterine device (IUD)	0.8%
	Tubal ligation	5.3%

Question	Answer choices	% students
Q6. A 15-year-old girl comes to the office because she has never gotten her period. She is sexually active and has been taking combined oral contraceptives for the past year. On exam, she has Tanner stage V breast development, sparse axillary and pubic hair, and typical female external genitalia. A speculum exam is notable for a blind pouch at the end of the vagina. You discuss your findings with the patient, and she wants to know which internal reproductive organs she has. Select the best option:	No gonads or uterus	9.0%
	Testes and ovaries	0.0%
	Uterus and ovaries	0.8%
	Testes only[b]	90.2%
Q7. After you discuss your findings, the girl from the previous question asks why she was able to develop breasts if she does not have any female reproductive organs. Which of the following choices best explains why breast development still occurs in people with complete androgen insensitivity syndrome (AIS)?	This patient's breast development was caused by her oral contraceptive pill, which contains estrogen	0.0%
	People with AIS produce androgens that are converted to estrogen in adipose tissue[b]	95.5%
	People with AIS do not produce any androgens that would suppress breast development	4.5%
	Some people with AIS have genetic mosaicism with an XX/XY karyotype	0.0%
Q8. A 14-year-old girl presents to the office because she does not have any breast development and is concerned that she is "behind" compared to her friends at school. She has also never had a menstrual period. On physical exam, you notice that the patient has extensive nodulocystic acne over her face, chest, and back. There are no palpable breast buds and no axillary hair growth. You discuss these findings with the patient and explain that you would like to perform a genital exam to inform your assessment. The patient says that "everything is normal down there" but agrees to an exam. On external exam, you see that the clitoris is protruding from the clitoral hood and you palpate bilateral masses in the labia majora; there is no pubic hair growth. Which of the following is the most likely underlying condition for this patient's physical findings?	Turner syndrome	0.0%

Question	Answer choices	% students
	Congenital adrenal hyperplasia	18.0%
	5-alpha reductase deficiency[b]	74.4%
	Müllerian agenesis (Mayer-Rokitansky-Küster-Hauser syndrome)	0.0%
	Androgen insensitivity syndrome	7.5%
Q9. While you are prerounding on the postpartum floor, a 34-year-old G1P1001 woman tells you that she has a concern about her 1-day-old baby. While changing the baby's diaper, she noticed that the baby's genitalia looked "different." At her request, you take a look and observe that the baby has fused labioscrotal folds and a small, curved phallus. During your exam, the baby urinates on you, and you notice that the urethral meatus is at the base of the phallus. You are not able to palpate the gonads. Since the mother is your primary patient, you know that her pregnancy was uncomplicated, her only medication was a prenatal vitamin, and non-invasive prenatal testing (NIPT) showed that the fetus had an XX karyotype. You also note that the mother does not have any acne or facial hair. The next day, you follow up with the pediatric team and learn that the baby has an undetectably high serum testosterone level. Which of the following is the most likely underlying condition associated with this baby's physical findings?	Placental aromatase deficiency	0.8%
	Androgen insensitivity syndrome	0.8%
	Klinefelter syndrome	0.0%
	Congenital adrenal hyperplasia[b]	97.7%
	5-alpha reductase deficiency	0.8%
Q10. The mother from the previous question is about to be discharged. She and her partner (the baby's biological father) are in touch with a pediatric endocrinologist to manage the baby's medical needs, and they have decided to join a group for parents of children with congenital adrenal hyperplasia (CAH) to learn how they can best support their baby's physical and social development. They are planning to have more biological children in the future, and they ask you what the chances are that a future	0%	6.8%

Question	Answer choices	% students
child would also be affected by CAH. Which of the following is the most accurate estimate?		
	25%[b]	87.2%
	50%	6.0%
	100%	0.0%

b Indicates correct answer. HPV: human papillomavirus; DVT: deep venous thrombosis; IUD: intrauterine device; AIS: androgen insensitivity syndrome; NIPT: non-invasive prenatal testing; CAH: congenital adrenal hyperplasia.

Discussion

We describe a needs assessment-driven, dual-module curricular intervention that produced significant and consistent gains in medical student knowledge and comfort with TGD and intersex patient care. Embedding both modules as required components of the OBGYN clerkship ensured that all rotating students received this content regardless of prior exposure or personal interest. The 15-minute asynchronous format accommodates the scheduling constraints of clinical rotations while preserving structured, objective-mapped learning — an approach that may be more feasible for widespread adoption than synchronous alternatives.

Several features of our design merit attention for educators seeking to replicate or adapt this intervention. First, the modules were grounded in a formal institutional needs assessment, allowing learning objectives to target the specific gaps students themselves identified — notably, intersex issues and legal and policy topics received the lowest ratings and were accordingly prioritized. Second, both modules incorporated patient and community perspectives: the intersex module used first-hand video accounts from individuals with intersex traits, and the TGD module was supplemented by a live “Patient as Professor” session. Centering patient voice in medical education has been associated with improved learner empathy and more durable attitude change.[13] Third, each module’s survey items were mapped directly to its learning objectives, allowing assessment to confirm that the specific competencies targeted were the ones that improved.

The graded knowledge assessment results are encouraging. An average score of 90.4% across 10 clinical vignette-based questions suggests that 15 minutes of asynchronous content can produce meaningful gains in applied clinical knowledge. The pattern of responses also offers diagnostic value: the relatively lower performance on the 5-alpha reductase deficiency question compared to the congenital adrenal hyperplasia question suggests that distinguishing between intersex conditions in clinically ambiguous presentations remains a teachable gap that future iterations could address.

We have begun sharing these modules with other medical schools in the United States, and we believe the design is readily transferable. The content is anchored in established guidelines[11] and developed with community input, and the Articulate platform is widely available in academic medical centers. Institutions with different curricular structures could adapt the modules to other required clerkships beyond OBGYN, such as internal medicine or family medicine, where TGD and intersex patients are also frequently encountered.

This study has several limitations. First, we relied on a retrospective pre-post survey design, which is subject to recall and hindsight bias and may overestimate learning gains. Second, this was a single-institution study, limiting generalizability to medical schools with different curricular structures or student demographics. Third, while students performed well on the graded assessment, we did not assess long-term retention or the application of knowledge in actual clinical encounters with TGD and intersex patients. Future work should evaluate whether gains are sustained over time and whether they translate to measurable differences in clinical behavior.

Conclusions

Brief, asynchronous, needs assessment-driven modules embedded within a required OBGYN clerkship produced significant improvements in medical student knowledge and comfort with TGD and intersex patient care. The modular design, community-informed content, and multi-modal assessment approach offer a scalable and adaptable model for other institutions seeking to address documented gaps in LGBTQI health professions education. By addressing these gaps earlier and more consistently in training, curricula such as ours have the potential to contribute to more equitable care for TGD and intersex patients over time.

Abbreviations

AAMC
Association of American Medical Colleges
AIS
androgen insensitivity syndrome
CAH
congenital adrenal hyperplasia
DVT
deep venous thrombosis
EAG
Educational Advisory Group
HPV
human papillomavirus
IQR
interquartile range

IUD
intrauterine device
LGBTQI
lesbian, gay, bisexual, transgender, queer, and intersex
NA
not applicable
NIPT
non-invasive prenatal testing
OBGYN
obstetrics and gynecology
SD
standard deviation
SPSS
Statistical Package for the Social Sciences
TGD
transgender and gender diverse
VP&S
Vagelos College of Physicians and Surgeons

Declarations

Ethics approval and consent to participate.

The VP&S Educational Advisory Group sub-committee reviewed and evaluated this project and waived the need for ethics review, approval, and informed consent, determining that the project meets the university's criteria for Educational Quality Improvement according to the Columbia University Guidance for the Classification of Quality Improvement Activities versus Research with Human Subjects. This waiver covers both the 2021 needs assessment and the 2024 curricular intervention and their associated data collection and reporting.

Consent for publication.

Not applicable.

Competing interests.

The authors declare that they have no competing interests.

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Author Contribution

O.C. and A.-S.v.W. contributed equally to this work. O.C.: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – Original Draft, Writing – Review and Editing. A.-S.v.W.: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – Original Draft, Writing – Review and Editing. M.L.S.: Data Curation, Formal Analysis, Software, Visualization, Writing – Original Draft, Writing – Review and Editing. S.S.S.: Supervision, Validation, Writing – Review and Editing. T.B.S.: Conceptualization, Funding Acquisition, Investigation, Methodology, Project Administration, Supervision, Validation, Writing – Review and Editing. All authors read and approved the final manuscript.

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Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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