

# New context, new content—Rethinking genital anatomy in textbooks

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## Abstract

It has been widely claimed that reductions in allocated teaching time and the widespread implementation of short-cut teaching methodologies have led to a shortfall in anatomy knowledge among graduating doctors. This decline in knowledge is evident in the failure of anatomy content to prepare graduates for contemporary clinical practice. The implications for postgraduate surgical training are addressed in the numerous extracurricular anatomy courses available to surgical candidates. This paper focuses on genital diversity and its relevance to non-surgical graduates, thus highlighting another potential impact of this knowledge shortfall on frontline clinic consultations. As the gender revolution and female genital cosmetic surgery industry flourish, nothing in contemporary anatomy textbooks addresses issues of diversification of female genitalia nor gives medical graduates a realistic view of what is normal regarding female genital appearance.

## KEYWORDS

anatomical variations, anatomy textbooks, female genitalia, gross anatomy education, normal appearance, vocational relevance, vulva

## INTRODUCTION

Modern society is undergoing a gender revolution, as evidenced by the heightened visibility of nonbinary gender identities within media and politics (Allen et al., 2021). There have been calls for more inclusive gender-aware medical curricula that encourage students to sensitively explore the nuances of working with people who identify as LGBTQIA+ (lesbian, gay, bisexual, transgender, queer/questioning, intersex, asexual/aromantic/agender) and foster knowledge and attitudes appropriate to the evolving patient population (Morrison et al., 2017; Dubin et al., 2018; James & Sylvester, 2018).

Anatomy is said to be a prime example of a curricular component that has not evolved in response to this movement in societal norms (Finn et al., 2021). Traditionally taught in a binary context of male and female with a heteronormative presentation of genitalia

and their function, the surface and transformed anatomy of post-operative transitioning individuals is not explicitly taught within curricula nor advocated for inclusion by regulators or accrediting bodies (Finn et al., 2021). Examples cited to illustrate the importance for practitioner awareness of transgender anatomy include “the need to differentiate between inflammation or infection in the clitoris and labia of a woman against the clitoromegaly and labial atrophy of a trans man who has undergone hormone therapy” (Finn et al., 2021, p. 30). An example of a consideration for a transgender woman is that a neovagina is a more posteriorly situated blind cuff, lacking a cervix and fornices, and better examined with an anoscope (Finn et al., 2021). Although this postsurgical detail may be considered beyond the remit of medical anatomy education (and surgery is not a prerequisite for transgenderism), there is a danger of creating a hidden curriculum of binarism and exclusion if alternative

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anatomies are not acknowledged in inclusive, compassionate, and ethical curricula.

Even for “bodies with vaginas” (Davis, 2021, p. 1124), the anatomy is far from uniform. An emerging and increasing interest in normal female genital anatomy, driven by the rapidly expanding international market for female genital cosmetic surgeries, has highlighted the lack of accurate information on typical female genital dimensions (Crouch, 2018). The most popular of the female genital cosmetic surgeries is labiaplasty, which involves cutting back the labia minora so that they sit flush with, or are entirely hidden by, the labia majora (Iglesia, 2012). According to a report released by the International Society of Aesthetic Plastic Surgery, 164,667 labiaplasty operations were performed in 110 countries in 2019 (ISAPS, 2020) to achieve the single slit appearance promulgated as normal in media images (McDougall, 2013). However, these statistics are merely indicative because labiaplasty is also performed by gynecologists, and procedures performed in the private sector are not routinely recorded in all countries (McDougall, 2021).

“The slit-like genital hiatus with the labia minora and labia majora coming together in the midline” (Iglesia, 2012, p. 1083) is a socially constructed normal rather than an objective fact. The anatomical boundaries of normal labia have been investigated in an analysis of ten studies published from 2005 to 2020 (Hayes & Temple-Smith, 2021). The analysis showed significant variation in labial length (range 5–100 mm) and width (range 1–60 mm). Labia minora were wider in premenopausal women than in postmenopausal women, protruding labia minora were more common than not, and asymmetry between right and left labia was common (Hayes & Temple-Smith, 2021).

As the first point of contact in the healthcare system, general practitioners have an important role in answering questions about the range of genital appearances, function of genital structures, and risks associated with genital surgery. A recently published survey of 433 Australian general practitioners found that 97% had been asked by women of all ages about genital normality, 50% had been asked for a referral for labiaplasty surgery, and only 75% were confident in assessing genital appearance (Simonis et al., 2016). The general practitioners in this survey were all female with an interest in women's health; therefore, these findings cannot be generalized to the broader general practitioner population in which the level of knowledge and confidence would probably be lower. An audit of 48 referral letters in a National Health Service gynecology clinic in the United Kingdom showed that only 77% of the referrers reported examining the patient and 25% of referrals contained non-scientific pejorative language such as “leathery” or “pendulous” (Deans et al., 2011, p. 99).

Appreciation of the range of normality and variation in the human body is traditionally gained by medical students over several years. It begins in the dissection room, and it is reinforced on the hospital wards. However, contemporary medical students “may never see the inside of a dissecting room” (Standing, 2009, p. 53). Instead, they increasingly rely on plastic models, “where all organs are color coordinated and impeccably shaped” (Sugand et al., 2010,

p. 87), and new electronic resources, many of which are based on the Visible Human Project (NLM, 2019) that originally looked at only one male and one postmenopausal female body. Contemporary medical students also spend fewer hours on the wards than students did in the past (Standing, 2009), which reduces their opportunistic anatomy experience, resulting in newly graduated doctors who rely more than ever on the concepts and clinical relevance of normal range and variations being presented to them.

Previous research showed that women were underrepresented in anatomy texts—with a narrow stereotypical representation of ethnicity, age, and body type—and were primarily identified by their reproductive attributes (Giacomini et al., 1986; Lawrence & Bendixon, 1992; Mendelsohn et al., 1994; Petersen, 1998; Morgan et al., 2014; Murciano-Goroff, 2015). Labia minora were significantly less protuberant in anatomy textbooks and online pornography when compared with feminist publications (Howarth et al., 2010). Only one study reviewed genital descriptions and illustrations in textbooks. Andrikopoulou et al. (2013) analyzed one edition of 30 anatomy textbooks and 29 gynecology textbooks and found that “No anatomy textbook provided measurements for the labia minora or the labia majora ... None of the textbooks included more than one picture or suggested in text and illustration appearance variability” (Andrikopoulou et al., 2013, p. 648–649).

Despite human anatomy often being considered as immutable, descriptions of the labia and clitoris in the sociopolitical and scientific literature have varied considerably over the last 200 years. In the nineteenth century, anthropologists described labial protrusion as a feature peculiar to non-white races (Gilman, 1985) before the medical literature shifted the gaze away from race and toward a theory of sexual perversion, arguing that hypertrophy of the labia was the result of masturbation (Dickenson, 1902). In the mid-twentieth century, Kinsey shifted the focus away from abnormality to the role of the labia minora in sexual arousal (Kinsey et al., 1953). This provided impetus for the second wave feminist rebellion and the development of radical texts such as *A New View of a Woman's Body* (Federation of Feminist Women's Health Centers, 1981) which offered fully developed alternative feminist anatomies. More recently, Helen O'Connell, Australia's first female urologist, used magnetic resonance imaging technology to provide a comprehensive picture of the structure of the clitoris (O'Connell et al., 2005).

Descriptive and visual portrayals of the vulva in historic anatomy textbooks were analyzed in this study to determine whether these anthropological, sexual, feminist, and surgical publications had influenced the content of anatomy textbooks at the time. In exposing past and present representational practices, the aim was to create impetus for reimagining the spectrum of genital morphology as a continuous sequence in which all variations are depicted equally.

## MATERIALS AND METHODS

The methodology provided a descriptive analysis of the vulva as portrayed in textbooks throughout the nineteenth and twentieth

centuries and contemporarily. For this reason, textbooks published in series spanning multiple editions were analyzed.

Firstly, the most commonly prescribed or recommended anatomy textbooks for anatomy subjects in Australian medical schools (AMC, 2020), as identified from current online course information and from transcripts of interviews conducted with Australian anatomists in 2021 (work in progress) were examined.

By way of historical comparison, *Gray's Anatomy* provided the best opportunity to map the changing representation of genital anatomy over multiple periods of substantial change in medical knowledge and social values. Multiple editions of three further historical texts were selected for analysis on the basis that they too were published in a number of series over the nineteenth and twentieth centuries.

Systematic examination of the texts was performed by the first author (J.A.H.). The preface of each was analyzed to determine the text's target audience; the index was searched for the terms "normal and anatomical variation," "vulva" (and individual component structures), "orgasm," "erection," and "ejaculation." Textual descriptions and images of the vulva and component structures were analyzed and compared across each textbook series for references to variability and function, and change between editions. Textual descriptions of breast anatomy were compared because the breasts are morphologically variable structures also under (re)construction in contemporary society.

Results of analyses were reported according to three contexts: (1) textual descriptions and illustrations of the vulva; (2) whether "normal variation" was included and, if so, how; and (3) remit of the text.

## RESULTS

In total, 78 textbooks were analyzed. These comprised:

- four historical texts, consisting of 40 of the 42 editions of *Gray's Anatomy*, plus multiple editions of *Cunningham's Textbook of Anatomy*, *Quain's Elements of Anatomy*, and *Buchanan's Manual of Anatomy*
- four contemporary anatomy texts commonly prescribed in Australian medical schools: *Clinically Oriented Anatomy*, *Gray's Anatomy for Students*, *Gray's Anatomy*, and *Last's Anatomy*.

In [Table 1](#), each text is summarized regarding its inclusion of the terms "vulva," "normal," and "anatomical variation" in its index, the details in textual and visual representation of the vulva, and the details of the remit of the text as given in the preface.

The analysis of *Gray's Anatomy* is presented first, followed by other historical texts and, last, contemporary texts.

### Gray's Anatomy (42 editions, 1858–2021)

No anatomy textbook matches *Gray's Anatomy* in terms of longevity; it spans the period 1858 to the present day and comprises 42

editions (Gray & Carter, 1858, 1860; Holmes, 1864, 1866, 1869, 1872, 1875, 1877, 1880; Pick, 1883, 1887, 1890, 1893, 1897; Pick & Howden, 1901, 1905; Howden, 1909, 1913, 1916, 1918, 1920, 1923, 1926; Johnston, 1930, 1932, 1935; Johnston & Whillis, 1938, 1942, 1946, 1949, 1954; Johnston et al., 1958; Davies & Davies, 1962; Davies & Coupland, 1967; Warwick & Williams, 1973; Williams & Warwick, 1980; Williams, 1989, 1995; Standing, 2005, 2008, 2015, 2021). Of those 42 editions, 40 were available for analysis in this research (see [Table 1](#)).

Previous analyses of *Gray's Anatomy* have highlighted the consistency with which the male body has been posited as the standard in textual descriptions and illustrations across all editions (Laqueur, 1992; Petersen, 1998). In early editions, "male generative organs" were presented first, followed by "female organs of generation" with reference to the homologous male genital structure:

The labia are analogous to the scrotum in the male ... The clitoris is an erectile structure, analogous to the corpus cavernosum of the penis ... They are analogous to Cowper's glands in the male and are called the *glands of Bartholine*. (Gray & Carter, 1858, p. 683)

In the single black-and-white image of the vulva in the first edition of *Gray's Anatomy* ([Figure 1A](#)), the clitoris was relatively prominent, with both the glans and body labeled (Gray & Carter, 1858, p. 1491). By the thirteenth edition ([Figure 1B](#)), the clitoris was proportionally smaller compared with other component vulval structures (Pick, 1893, p. 1047), and by the eighteenth edition ([Figure 1C](#)), only one label "clitoris" remained (Howden, 1913, p. 1170). The image remained unchanged in all subsequent twentieth-century editions until the fortieth edition ([Figure 1D](#)) in which a new multipart illustration was included comprising a color line drawing and three-color photographs of a vulva with all clitoral components labeled (Standing, 2005, p. 1355).

In early editions of *Gray's Anatomy*, the descriptive text accompanying the images focused on structure and the relationship of the labia minora to the labia majora and clitoris. There was no reference to morphological variation or function. Little changed until the thirty-eighth edition (Williams, 1995), in which a reference to labium tertium had been added: "Sometimes an extra labial fold (labium tertium) is found on one or both sides between the labia minora and majora" (p. 1876). In the thirty-ninth edition, reference to "age-related changes" was added at the end of the section on female genital organs (and included in the index): "After the menopause, pubic hair thins, and labial tissues atrophy slightly" (Standing, 2005, p. 1355).

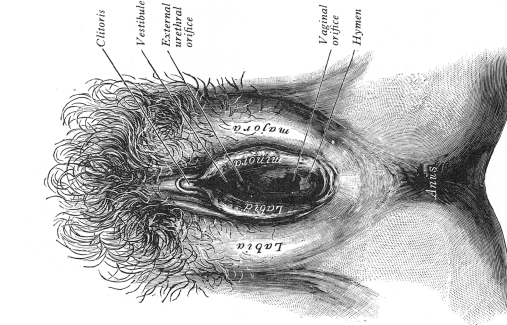
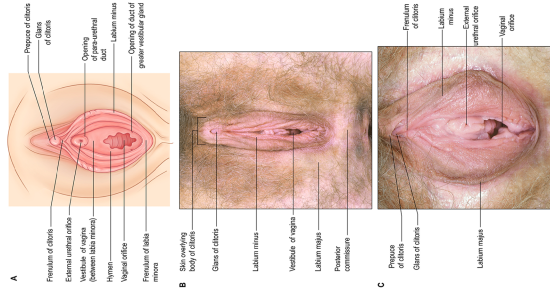
The convention of homologous organs persisted in *Gray's Anatomy* until the fortieth edition when the clitoris was no longer represented as homologous to the penis but rather as "important in sexual responses" (Standing, 2008, p. 1280). Two further anatomical variations were added in subsequent editions: adhesions between the labia minora in prepubertal girls in the forty-first edition (Standing, 2015), and severe atrophy in postmenopausal females in the forty-second edition (Standing, 2021).

TABLE 1 Summary of textbook analysis

Textbook	Index	Image	Description	Remit from preface
<b>Gray's Anatomy</b> 42 editions 1858–2021 (40 editions analyzed) Davies and Davies (1962) Davies and Coupland (1967) Gray and Carter (1858, 1860) Holmes (1864, 1869, 1872, 1875, 1877) Howden (1909, 1913, 1916, 1918, 1920, 1923, 1926) Johnston (1930, 1932, 1935) Johnston and Whillis (1938, 1942, 1946, 1949, 1954) Johnston et al. (1958) Pick (1883, 1887, 1890, 1893, 1897) Pick and Howden (1901, 1905) Standing (2005, 2008, 2015, 2021) Warwick and Williams (1973) Williams (1989, 1995) Williams and Warwick (1980)	Vulva and all its component structures indexed Normal and (anatomical) variation not indexed Erection and ejaculation indexed, but not orgasm	Single black-and-white line drawing in editions 1–39 Clitoris diminished in size in 13th edition Labeling of clitoris reduced, and labia minora diminished in size in 18th edition Multipart color illustration with photos introduced in 40th edition	Heavily detailed descriptive text with minimal change between editions 1–37 Labium tertium added in 38th edition Changes with aging added in 39th edition Homology removed in 40th edition Adhesions between labia minora added in 41st edition Severe atrophy in postmenopausal females added in 42nd edition	To provide the student and practitioner with an accurate view of the anatomy of the human body and its application to practical surgery
<b>Cunningham's Textbook of Anatomy</b> 12 editions 1902–1981 (12 editions analyzed) Cunningham (1902, 1905, 1909) Robinson (1913, 1918, 1931) Brash and Jamieson (1937, 1943) Brash (1951) Romanes (1964, 1972, 1981)	Vulva and all its component structures indexed Normal and (anatomical) variation not indexed	Same black-and-white line drawing in all 12 editions	Heavily detailed descriptive text with minimal change between editions No mention of diversity, protrusion, or function	For undergraduate students but also for postgraduate studies
<b>Quain's Elements of Anatomy</b> 11 editions 1828–1914 (4 editions analyzed) Quain and Sharpey (1848) Sharpey et al. (1882) Sharpey and Thane (1890) Schäfer et al. (1908)	Vulva and all its component structures indexed Normal and (anatomical) variation not indexed, but "varieties" is a subheading under "vulva" in 11th edition (Schäfer et al., 1908)	Variable black-and-white line drawing	Description of labial protrusion and changes with aging added to 11th edition (Schäfer et al., 1908) Separate paragraph on varieties seen in external female genitalia added to 11th edition (Schäfer et al., 1908)	Not specified

TABLE 1 (Continued)

Textbook	Index	Image	Description	Remit from preface
<b>Buchanan's Manual of Anatomy</b> 8 editions 1906-1950 (5 editions analyzed) Buchanan (1906) Barclay-Smith et al. (1925) Frazer (1937) Wood Jones (1946, 1949)	The term "vulva" not indexed, but all of its component structures indexed Normal and (anatomical) variation not indexed	Black-and-white line drawing (possibly sourced from <i>Gray's Anatomy</i> )	Description of labial protrusion in all editions Hottentot apron referenced in editions 1-6, then removed from future editions	A guide to the structure of the human body as it is revealed in the process of dissection
<b>Last's Anatomy</b> 12 editions 1959-2011 (7 editions analyzed) Last (1959, 1984) McMinn (1990, 1994) Sinnatamby (1999, 2006, 2011)	Labia not included in the index until 8th edition (McMinn, 1990); vulva not included until 10th edition (Sinnatamby, 1999) Normal and (anatomical) variation not indexed Erection, ejaculation, and orgasm - male and female - indexed	No image in any edition	Homology between female and male structures included in editions 1-7 The term vulva and a list of female external genitalia included from 8th edition (McMinn, 1990) onwards Reference to labia minora in paragraph on female orgasm included in editions 8-11, then removed	For students in basic and higher surgical training programs and for practicing surgeons
<b>Moore's Clinically Oriented Anatomy</b> 7 editions 1980-2014 (7 editions analyzed) Moore (1980, 1985, 1992) Moore and Dalley (1999, 2006) Moore et al. (2010, 2014)	Vulva and all its component structures indexed Normal not indexed Anomaly (arteries/bones/ muscles/nerves/ other) indexed in 1st and 2nd editions, then removed in 3rd edition Anatomical variation indexed and defined/ described in editions 4-7 Erection indexed (relates to penis); ejaculation and orgasm not indexed	Black-and-white line drawing and dissection drawings (from Grant's Atlas of Anatomy) in editions 1-3 Line drawing changed to color in 4th edition (Moore & Dalley, 1999); dissection drawings changed to color in 5th edition (Moore & Dalley, 2006) Multipart illustration of vulva in editions 6 and 7, including three photos of a vulva with labia minora protruding beyond the labia majora	Description of labial protrusion in editions 1-3 List of functions included in 4th edition (Moore & Dalley, 1999) onwards, but reference to labial protrusion removed	For health science students
<b>Gray's Anatomy for Students</b> 4 editions 2005-2020 (3 editions analyzed) Drake et al. (2005, 2015, 2020)	The term "vulva" is not indexed, but all of its component structures are Normal and (anatomical) variation not indexed Erection (of penis and clitoris) indexed	Color line drawing (overview and close-up), with the labia labelled Three color photos show visible labia minora	Vulva/labia described in two separate areas of the text: regional anatomy and surface anatomy No mention of diversity, protrusion, or function	For students in a variety of professional programs (medical, dental, chiropractic, and physical therapy)



8.189 Female external genitalia, with the labia majora separated.

FIG. 362.—The vulva. External female organs of generation.

FIG. 411.—The vulva. External female organs of generation.

**A** Edition 1-12 **B** Edition 13-14 **C** Edition 15-17 **D** Edition 18-39 **E** Edition 40-42  
**A** 1858-1890 **B** 1893-1897 **C** 1901-1909 **D** 1913-2005 **E** 2008-2021

**FIGURE 1** Depictions of vulval anatomy included in editions 1–42 of Gray's Anatomy, 1858–2021. A single black-and-white line drawing in the first 39 editions was replaced by a multipart color illustration with photographs in the fortieth edition, 2008. Images are reproduced with the permission of Elsevier. (A) This labeled black-and-white diagram of vulval anatomy was reproduced in Gray's Anatomy, 1858–1890, editions 1–12 (Gray & Carter, 1858, 1860; Holmes, 1864, 1866, 1869, 1872, 1875, 1877, 1880; Pick, 1883, 1887, 1890); (B) This labeled black-and-white diagram of vulval anatomy was reproduced in Gray's Anatomy, 1893–1897, editions 13 and 14 (Pick, 1893, 1897); (C) This labeled black-and-white diagram of vulval anatomy was reproduced in Gray's Anatomy, 1901–1909, editions 15–17 (Pick & Howden, 1901, 1905; Howden, 1909); (D) This labeled black-and-white diagram of vulval anatomy was reproduced in Gray's Anatomy, 1913–2005, editions 18–39 (Howden, 1913, 1916, 1918, 1920, 1923, 1926; Johnston & Whillis, 1938, 1942, 1946, 1949, 1954; Johnston et al., 1958; Davies & Davies, 1962; Davies & Coupland, 1967; Warwick & Williams, 1973; Williams & Warwick, 1980; Williams, 1989, 1995; Standing, 2005); and (E) This labeled, colored multipart image of vulval anatomy was reproduced in Gray's Anatomy, 2008–2021, editions 40–42 (Standing, 2008, 2015, 2021)

### Cunningham's Textbook of Anatomy (12 editions, 1902–1981)

*Cunningham's Textbook of Anatomy* was first published in 1902 (Cunningham, 1902) and rivaled the popularity of *Gray's Anatomy*. A total of 12 editions (1902–1981) have been published under various editors (Cunningham, 1902, 1905, 1909; Robinson, 1913, 1918, 1931; Brash & Jamieson, 1937, 1943, Brash, 1951; Romanes, 1964, 1972, 1981). All 12 were analyzed in this research (see Table 1). Each edition included a single black-and-white image of the vulva—an image that remained unchanged in all editions—accompanied by highly detailed textual descriptions that did not include any reference to morphological diversity or function.

### Quain's Elements of Anatomy (11 editions, 1828–1914)

*Quain's Elements of Anatomy* predated *Gray's Anatomy*; indeed, Henry Gray was accused of plagiarizing some of its content (Richardson, 2016). A total of 11 editions (1828–1914) were published under various editors (Quain, 1828, 1832, 1834, 1837; Quain & Sharpey, 1848; Sharpey & Ellis, 1856; Sharpey et al., 1867; Sharpey et al., 1878; Schäfer et al., 1882; Schäfer & Thane, 1890; Schäfer et al., 1908). Four editions were available for analysis in this research (see Table 1).

Unlike *Gray's Anatomy* and *Cunningham's Textbook of Anatomy*, the textual description of the vulva in *Quain's Anatomy* changed significantly between editions, and later editions included reference to labial protrusion and changes with aging:

The labia majora, by their contact, generally conceal the other parts of the external genitals; not infrequently, however, in old persons, the labia minora project forwards between the labia majora, so as to be visible externally ... In young subjects, the labia minora are of a rose-red colour and look like a mucous membrane; but as age advances, they become darker in colour and more like skin. (Schäfer et al., 1908, p. 299)

### Buchanan's Manual of Anatomy (8 editions, 1906–1950)

*Buchanan's Manual of Anatomy* was a highly regarded text with an established place among British anatomy textbooks. A total of eight editions (1906–1950) were published under various editors (Buchanan, 1906, 1914, 1916, 1919; Barclay-Smith et al., 1925; Frazer, 1937; Wood Jones, 1946, 1949). Five editions were available for analysis in this research (see Table 1). In those five editions, the single black-and-white image of the external genital organs was

identical to that in *Gray's Anatomy* (image sharing was a common practice), but of great interest was the accompanying text about labia minora:

They sometimes attain a large degree of development, in which cases they project through the urogenital fissure. In some African women they become so much developed as to reach down to the knees. When this occurs they form what has been called the apron of Hottentots. (Buchanan, 1906, p. 594)

Although the Hottentot reference was removed in the seventh edition in 1946 by Frederick Wood Jones, reference to labia minora protrusion was retained: “They [the labia minora] sometimes attain a large degree of development, in which cases they project from the urogenital cleft” (Wood Jones, 1946, p. 699).

### Last's Anatomy (12 editions, 1954–2011)

*Last's Anatomy*, written for surgeons and surgical candidates, was designed “to be read only with the appropriate prosected parts, a museum specimen and the relevant bones close at hand” (Last, 1984, preface). A total of 12 editions (1954–2011) have been published (Last, 1954, 1959, 1963, 1966, 1972, 1978, 1984; McMinn, 1990, 1994; Sinnatamby, 1999, 2006, 2011). Of these 12 editions, seven were available for analysis in this research (see Table 1). An image of the vulva was not included in any edition; in fact, the vulva was not indexed in early editions, and the component structures were presented as homologies of male structures. Editorial change for the eighth edition in 1990 coincided with the inclusion of “vulva” and “labia” in the index and with a newly added detailed description of the labia, including reference to their role in female orgasm. However, that reference was removed in the last two editions (Sinnatamby, 2006, 2011).

### Moore's Clinically Oriented Anatomy (7 editions, 1980–2014)

It was very clear that the remit of *Clinically Oriented Anatomy* extended beyond students and practitioners of surgery:

The structures described in this book are those which are deemed likely to be of importance to the general practitioner of medicine, dentistry or other health professions. (Moore, 1985, p. vii)

A total of seven editions (1980–2014) have been published (Moore, 1980, 1985, 1992; Moore & Dalley, 1999, 2006; Moore et al., 2010, 2014), and all seven were available for analysis in this research (see Table 1). It is the only textbook series that included *anatomical variation* in the index and provided a general definition and specific examples:

Anatomy books describe (initially at least) the structure of the body as it is usually observed in people—that is, the most common pattern. However, occasionally a particular structure demonstrates so much variation within the normal range that the most common pattern is found in less than half the time! (Moore et al., 2014, p. 12)

Information about anatomical variation was separately categorized, and “the clinical importance of awareness of such variations” was emphasized (Moore et al., 2014, p. viii). In the first two editions of *Clinically Oriented Anatomy*, the term *anomaly* was used, but subsequent editions replaced this with *anatomical variation*, possibly because *anomaly*, as with the term *malformation*, is commonly associated with structural abnormality.

*Clinically Oriented Anatomy* was the first of the textbook series to add color photographs of “living anatomy” (Moore, 1992, p. vii). Editions 1–3 described labial protrusion in parous women, although this was removed in later editions:

In young females and virgins (women who have not engaged in sexual intercourse) the labia minora are usually covered by the labia majora, but in parous women (ones who have borne children) they may protrude. (Moore, 1980, p. 326)

The labeling of vulval structures did not change between editions (Figure 2). A list of functions of the vulva was included from the fourth edition. The sixth and seventh editions included photographs of protruding labia minora, but the accompanying text did not reference the protrusion (Figure 2C; Table 1).

### Gray's Anatomy for Students (4 editions 2005–2020)

*Gray's Anatomy for Students* was intended to be “a student-oriented companion text for *Gray's Anatomy*,” written “primarily for students in a variety of professional programs” (Drake et al., 2005, p. xxiii). A total of four editions (2005–2020) have been published (Drake et al., 2005, 2010, 2015, 2020), of which three were available for analysis in this research (see Table 1). In *Gray's Anatomy*, the recent change to a colored illustration of the vulva and the addition of photographs is the result of image sharing with *Gray's Anatomy for Students*. No reference was made to labial protrusion or function, but the color photographs showed protruding labia despite it not being mentioned in the text.

### Remit

All of the earlier texts were written for surgeons and surgical students to be read as complementary to the process of dissection, whereas the specified readership for contemporary texts such as

*Clinically Oriented Anatomy* and *Gray's Anatomy for Students* was non-surgical students, as noted in the prefaces (Table 1).

### Anatomical variation

A general discussion about anatomical variation was included in one text only, *Clinically Oriented Anatomy*. Surgically relevant anatomical variations such as brachial plexus variation (*Gray's Anatomy* and *Clinically Oriented Anatomy*) and accessory renal artery (*Gray's Anatomy*, *Clinically Oriented Anatomy*, *Last's Anatomy*, and *Gray's Anatomy for Students*) were variably included in the contemporary texts. Morphological variation in size, shape, and symmetry of the breast was covered to varying degrees in both historical and contemporary texts, for example, “Their weight and dimensions differ at different periods of life, and in different individuals” (Pick & Howden, 1901, p. 1022) and “The female breasts vary in the size, shape and symmetry—even in the same person” (Moore et al., 2014, p. 103).

### Textual description of the vulva

Early textbook descriptions of the vulva were detailed and included neurovascular supply and homologous male structures, but no reference was made to function apart from a role in female orgasm, which was included in some editions of *Last's Anatomy*. Both *Quain's Elements of Anatomy* and *Buchanan's Manual of Anatomy* described labial protrusion as associated with age or race. Early editions of *Clinically Oriented Anatomy* described labial protrusion, but that reference was removed in later editions. *Gray's Anatomy* described labium tertium, adhesions, and severe postmenopausal atrophy but did not mention normal morphological diversity.

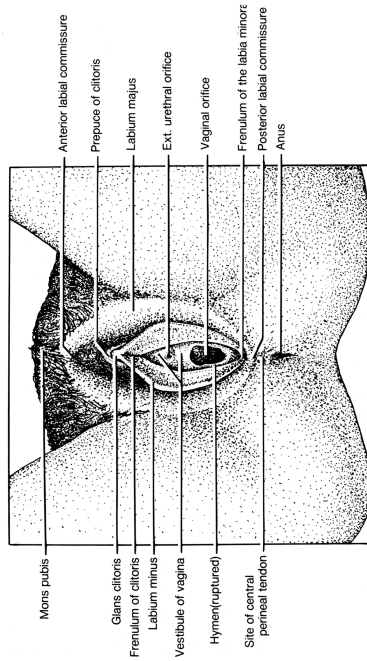
### Images of the vulva

Apart from *Last's Anatomy*, which never included an image of a vulva, all of the early texts included one labeled black-and-white line drawing of the vulva. Later inclusions of color photographs or “living anatomy” in *Gray's Anatomy*, *Gray's Anatomy for Students*, and *Clinically Oriented Anatomy* resulted in labeled images that included protruding labia minora (unsurprising given the incidence in the general population), but no textual references to the protrusions were included.

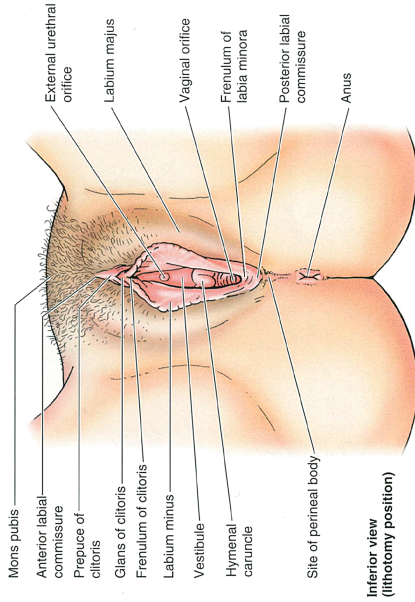
## DISCUSSION

Firstly, in terms of textual description and illustrations of the vulva, there exists an historical precedent for change in response to socio-political commentaries of the nineteenth and twentieth centuries, and a clear need to adapt contemporary content to the spectrum of normal as constructed by the gender revolution and published evidence base. Secondly, the concept of normal variation was rarely

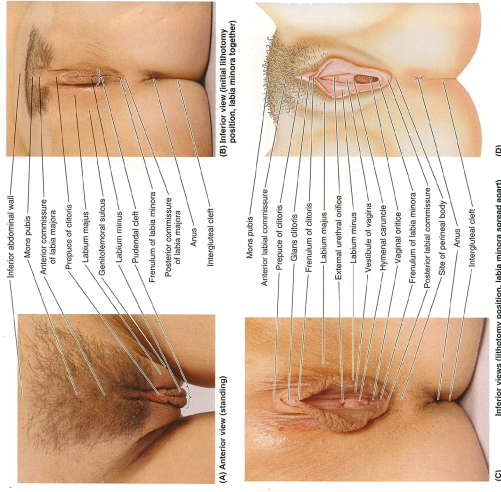




**Figure 3-36.** Drawing of the perineum of a woman as seen in the lithotomy position (Fig. 3-1). The labia majora and minora are spread apart to show the vestibule of the vagina, which leads to both the urethral and vaginal orifices. Examine the different parts of the external genitalia. Known collectively as the vulva or pudendum.



**Figure 3-52. Female external genitalia.** The labia majora and minora are separated to show the vestibule, into which the external urethral orifice and the vaginal orifice open.



**FIGURE 3.47.** Female external genitalia. A-C: Surface anatomy of vulva (pudendum) of vagina demonstrated in three positions. D: Illustration of vulva, similar to C. Moisture typically keeps the labia minora loosely apposed, keeping the vestibule of vagina closed (B) unless spread apart as in (C).

**C 7th Edition 2014**

**B 5th Edition 2005**

**A 2nd Edition 1980**

**FIGURE 2** Depictions of vulval anatomy included in *Clinically Oriented Anatomy*, 1980–2014. Images are reproduced with the permission of Wolters Kluwer Health, Inc. (A) This labeled black-and-white diagram of vulval anatomy was reproduced in *Clinically Oriented Anatomy*, edition 2 (Moore, 1985); (B) This labeled black-and-white diagram of vulval anatomy was reproduced in *Clinically Oriented Anatomy*, edition 5 (Moore & Dalley, 2006); and (C) This labeled and colored multipart image of vulval anatomy was reproduced in *Clinically Oriented Anatomy*, edition 7 (Moore et al., 2014)

addressed formally in textbooks but was covered as occasional references to time-honored and surgically important variations that are common to all texts and eras. Thirdly, the remit of the texts that were analyzed was varied or unclear, which might explain the disconnection with contemporary, non-surgical practice.

These findings reinforce that vulval diversity is poorly represented in contemporary anatomy textbooks, a factor that may contribute to entrenching nonrepresentational social norms. In the contemporary anatomy textbooks that were analyzed, there was nothing to give medical graduates a realistic view of the range of normal for female genital appearance. Not one of the textbook series referenced vulval diversity, asymmetry, or measurements. However, some of the current editions did show labial protrusion but with no accompanying description (*Clinically Oriented Anatomy* and *Gray's Anatomy for Students*), listed functions of the vulva (*Clinically Oriented Anatomy*), or described changes with aging (*Gray's Anatomy*).

By contrast, unique references to labial protrusion were made in earlier texts, such as *Quain's Elements of Anatomy* and *Buchanan's Manual of Anatomy*, which were likely influenced by the medical literature of the nineteenth century when discussions of genital anatomy were dominated by race and sexuality. In the twentieth century, newly constructed feminist anatomies seem to have provoked, if anything, "a backlash of deletion" (Moore & Clarke, 1995, p. 290). The clitoris was depicted as less prominent and labeled less frequently in images of the vulva in twentieth-century editions of *Gray's Anatomy*, and it remained under the heading *female reproductive anatomy* despite Kinsey and feminist scholars of the time reasserting the clitoris as the primary orgasmic site and outside of reproductive function (Bennett, 1993).

The linking of sexual function with reproductive function is problematic, particularly considering the gender revolution. Given that "labels hold power" (Moore & Clarke, 1995, p. 292), associating the clitoris and contiguous labia minora with the reproductive system is highly reductive, especially given that the narrative of orgasm in *Gray's Anatomy* pertains solely to the penis. Texts organized by regions rather than by systems of the body included vulval structures in the urogenital region (*Clinically Oriented Anatomy*, *Gray's Anatomy for Students*, and *Last's Anatomy*) and thus avoided the labels "sexual," "generative," and "reproductive."

The convention of homologous organs—"the clitoris is an erectile structure, homologous with the penis" (Gray & Carter, 1858, p. 683)—persisted in *Gray's Anatomy* until the fortieth edition, when it was removed and replaced by a single phrase relating to clitoral function: "important in sexual responses" (Standing, 2008, p. 1280). By contrast, the penile processes of "erection" and "ejaculation" were included in the index and described in detail. *Gray's Anatomy for Students* listed both clitoris and penis under the generic heading of "erectile structures," with the penis described before the clitoris in early editions (Drake et al., 2005), but the order was later switched, with clitoris preceding penis in later and current editions (Drake et al., 2020).

In the twenty-first century, medical framing has once again resulted in the erasure of a sexually responsive structure, the labia minora, and this time as outside the range of normal. If early textbook illustrations were constrained by their educational function, and labia minora protruded to the extent where they could be labeled but not

to the point where they could obscure other features, then the move to photographs and the recent publication of normative data sets has created the potential for the inclusion of numerous vulval images in textbooks that reflect the diversity of the general population.

Medical students will already be familiar with the concept of variability in visible structures such as the breast. All texts analyzed covered variation in size, shape, and symmetry of the breasts to differing degrees, whether the texts were published before or during the era of breast augmentation and reduction surgery. The first breast augmentation was performed in 1962 (Coombs et al., 2019). Prior to that, breasts were never surgically enlarged, probably because, as with labia, small breasts were considered youthful while larger, pendulous breasts were regarded as "primitive" and a deformity. Not until the 1950s were small breasts transformed into a medical problem, much as protruding labia have been today (Gilman, 1999).

In 1988, Professor Keith Moore lamented "the frequent lack of awareness of variation by medical and dental practitioners" and concluded, "students should be taught about the variations that are deemed likely to be of importance to the general practitioner of medicine or dentistry" (Moore, 1989, p. 239). However, instead of labial protrusion and asymmetry, recent editions of *Gray's Anatomy* includes labium tertium, a rarely reported anatomical variation with a prevalence of 5.3% (Göttlicher, 1994); labial adhesions, with an estimated prevalence of 0.6%–5% and a peak incidence between 13 and 23 months of age (Bacon et al., 2015); and "post-menopausal females with severe atrophy" (Standing, 2021, p. 1308). *Gray's Anatomy* ignores the most common morphological variations and functions of vulval structures, knowledge that is required for contemporary clinical, including surgical, practice. It reinforces that anatomy has become a "contested domain" (Moore & Clarke, 1995, p. 257) between the descriptions provided in textbooks and the understandings that users and consumers must construe from other sources.

In 2005, urologist Helen O'Connell described the lack of detail about female sexual anatomy in major anatomy textbooks as "blinker" (O'Connell et al., 2005, p. 1194). In 2016, the editor of *Gray's Anatomy*, Professor Susan Standing, described examples of anatomical knowledge remaining incomplete or controversial as a "work in progress," and in this she included recognition in textbooks of the ranges of normal anatomical variation (Standing, 2016, p. 56).

Readers of the major anatomy texts have become aware of the mismatch between the academic texts and social reality. Two young Norwegian medical students presented a TED talk titled *The Virginity Fraud* (Brochmann & Dahl, 2018a), which received more than two million views. They later published *The Wonder Down Under: A User's Guide to the Vagina* (Brochmann & Dahl, 2018b) after realizing they had previously "misled women by following a medical curriculum that was incorrect even though it was written by doctors" (Rumbelow, 2018).

It is accepted that within the area of anatomy there is "competition for space and time" (Grković et al., 2009, p. 50) and that the absence of national or international agreed core syllabuses complicates any discussion about what is relevant and what does not need to be taught (Moxham & Pais, 2017; Koppes et al., 2020).

Has this deficiency in anatomy teaching been addressed in other ways? Peer physical examination is sometimes used as an adjunct

when learning anatomy, allowing medical students to bridge the gap between basic anatomical knowledge and physical examination. Classmates are readily available subjects on whom to learn normal living anatomy and to practice clinical skills. A high level of acceptability of peer physical examinations of non-intimate regions among medical students, especially among students of the same gender, is supported by several publications (Chang & Power, 2000; Power & Center, 2005; Wearn et al., 2008; Rees et al., 2009; Chen et al., 2011; Consorti et al., 2013). However, only one paper has reported the possibility of using peer physical examination for socially sensitive areas of the body, such as breasts and genitals (Metcalf et al., 1982).

Gynecological teaching associate (GTA) programs use standardized patient methodology to train medical students to conduct patient-centered pelvic examinations (Hopkins et al., 2021). These programs have been the norm in medical curricula since the mid-1980s (Dugoff et al., 2016; Underman, 2020). The role of the GTA as both educator and examiner provides an opportunity to discuss sensitive topics that might not otherwise be addressed. There are, for example, queer-focused GTA programs that provide pelvic examination instruction in a way that emphasizes gender-affirming skills (MacFife, 2019). Similarly, the GTA program might provide students the opportunity to appreciate and discuss the range of genital diversity they will encounter in practice. The combination of a medical anatomy program that introduces a range of genital anatomies and the inclusion of diverse GTAs in sensitive examination programs has the potential for significant pedagogical progress despite each representing “fleeting moments in multi-year medical education” (MacFife, 2019, p. 7).

### Limitation of the study

The present investigation had some limitations, due to its focus on selected established textbook series published in each of the nineteenth, twentieth, and twenty-first centuries. Further research might establish whether individual anatomists are sufficiently well versed in contemporary issues to include genital diversity in their planned curricula or whether it is reasonable and appropriate for diversity of vulval morphology and function to fall outside the crowded field of medical anatomy.

### CONCLUSIONS

Contemporary medical anatomy textbooks need to evolve, not only to reflect the increasing diversification of society but also to prepare graduates for all aspects of patient care they may encounter. Anatomy textbooks are not only used by future surgeons but also by non-surgical graduates, those for whom postgraduate training does not include anatomy. Currently, anatomy textbooks not only fail to give medical graduates a realistic view of what constitutes “normal” in female genital appearance but also present genital anatomy as binary and do not attempt to address issues of diversification.

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