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EDUCATION (G BADALATO, SECTION EDITOR)

Urology in Undergraduate Medical Education

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Abstract

Purpose of Review Urology is an essential topic in undergraduate medical education (UME). The objective of this article is to review the current state of exposure to urology in medical school, to discuss why it is critical to maintain a urology curriculum, and to review methods in establishing an effective curriculum for all students with limited resources.

Recent Findings UME curriculum in urology should be geared toward the widest group of students, namely those entering primary care or internal medicine, where patients with urologic complaints are most likely to first present. Hands-on teaching should focus on skills such as the genitourinary exam and Foley catheter placement, while ancillary modules should be utilized for complex concepts.

Summary Medical schools do not sufficiently incorporate didactics in urology as part of their core curriculum. As such, educators in urology must develop curricula that provide fundamental knowledge to all students, especially those pursuing non-urologic specialties who will undoubtedly treat patients with urologic complaints.

Keywords Undergraduate medical education · Urology curriculum · Urologic education · Spaced education

Introduction

As the US population ages, urologic conditions will become increasingly prevalent. One projection estimates that 52 million Americans will be affected by symptomatic urologic conditions by 2025, which represents a 30–40% increase from 2000 [1]. Currently, about 30% of practicing urologists are over the age of 64, and more than half are 55 or older, which indicates a significant proportion of our field is nearing retirement [2]. The number of graduating urology residents will not keep pace with the demand for urological care.

To address this gap, it is imperative that general practitioners, who are on the frontlines of American health care delivery, have exposure to urology during their undergraduate medical education. A strong basic foundation will provide multiple benefits, including allowing generalists to accurately triage urologic issues, to better manage low-complexity urologic problems, to initiate the appropriate work-up of some urologic problems prior to referral, and to better understand the urologic pathology of their patients.

Another critical reason to maintain the presence of urology in medical school is to spark the interest of students to pursue the field. A study by Kutikov et al. surveyed urology residents about their career choice and discovered that strong urology residency programs with effective mentors correlated with higher rates of matched urology students [3]. Another study found that multiple students were more interested in urology after undergoing a simulation for urethral catheter placement [4]. Medical students' undergraduate exposure to urology will ensure that the best and brightest students continue to pursue our field.

Current National Trends Regarding Urology in Undergraduate Medical Education

Despite the increasing demand for urologists, exposure to urology during medical school is decreasing. A recent trend in undergraduate medical education has been to condense early didactics, with many programs shortening the preclinical curriculum in order to provide additional time for clinical rotations, board preparation, and independent research [5]. Surgical subspecialties, including urology, have experienced

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a diminishing presence in the preclinical curriculum [5]. A survey of urology residency program directors in 1956 reported that 79% of medical schools had at least ten formal urology lectures and 99% had at least one [6]. By 2007, 32% did not include any preclinical lectures by urology faculty, and 50% of the schools did not include physical exam lectures by urology faculty [7]. A broader survey of medical schools that participated in the urology match found that only 43% of schools had any preclinical urology exposure [8••].

A mandatory urology *clinical* rotation was previously standard across medical schools but is now virtually nonexistent. In 1956, urology programs reported that 99% of medical schools had a required urology rotation [6]. By 1978, this had decreased to 48%, to 38% by 1988, and to 17% in the following two decades [3, 9, 10]. More recently, in 2013, Slaughenhoupt et al. performed a survey of medical schools to assess urology education and factors that correlated with students matching in urology. They randomly selected medical schools who had matched students in urology between 2006 and 2010 and ultimately included 33 schools, representing an 80% survey response rate. They found an even further decline compared with prior surveys, with only 5% of schools including a mandatory urology rotation [8••]. Elective rotations have been introduced as an alternative, but only a trivial number of students actually enroll. Slaughtenhoupt's study revealed a mean of nine medical students enrolled per class, with about 45% of programs reporting no enrolled students [8••].

The ramifications of this transition from mandatory to underutilized elective urology rotations are nuanced, but the vanishing presence of urology in undergraduate medical education is clear. In a 2008 survey, 65% of program directors stated it was possible for students to graduate from their school without any clinical exposure to urology [7]. It is vital to find new ways to ensure that urology again becomes incorporated into the medical school curriculum to educate future generalists on basic urologic fundamentals. Additionally, undifferentiated medical students can experience the innovative and well-rounded field of urology, potentially become inspired to choose it as their career path.

Urology Curricula

When considering the content of an undergraduate urology curriculum, it is key to identify the target audience. As stated previously, nearly all medical schools provide an elective in urology, but very few students participate [8••]. Those who do rotate on a urology clerkship are likely interested in a future career in surgery and as opposed to choosing it for the opportunity to gain knowledge in a field outside of their future specialty. Therefore, typical content during a urology elective may emphasize aspects of the field that are more pertinent to surgically minded individuals but neglects aspects pertinent to primary care physicians (PCP).

When considering the role PCPs play in recognizing urologic complaints, initiating appropriate work-ups, and managing less complex urologic cases, the strong urologic foundation required for medical students bound for primary care cannot be trivialized. When primary care program directors where asked what urologic conditions their graduates should have proficiency in, they prioritized the management of stone disease, hematuria, urinary tract infection (UTI), benign prostatic hyperplasia (BPH), urinary incontinence (UI), prostate cancer and screening, and testis torsion [11••, 12]. Other topics included the genitourinary (GU) physical exam, catheter placement, pediatric UTIs, and infertility. Understandably, surgical skills and advanced urologic oncology management were of low priority in this group.

The benefits of an established urology curriculum can clearly improve the medical student experience and ensure exposure to predetermined, high-priority objectives. Accordingly, in an effort to provide an accessible, standardized curriculum in basic urology, the American Urologic Association (AUA) published an online medical student curriculum through their AUA University, distinct from their more comprehensive core curriculum for urology residents [13, 14]. The content is based on Kerfoot and Turek's survey of 1859 stakeholders, including program directors from generalist residencies (emergency medicine, family medicine, internal medicine, and pediatrics), urology faculty and residents, and graduating medical students [11••]. There was a 44% overall response rate, with higher rates amongst urology applicants (61%), program directors (67%), and medical students (65%). Using these data to guide content, the site focuses on high-priority topics, such as the acute scrotum, BPH, ED, nephrolithiasis, and GU emergencies. Each module includes foundational reading material followed by one to two cases to illustrate clinical nuance. There are also instructional videos illustrating the male and female GU physical exams, and catheter placement.

About half of all medical schools claim to have an established urology curriculum, and 57% of those utilize the AUA student curriculum as their own [8••]. The benefits of this curriculum, again, include its accessibility independent of internal resources, personnel or case mix, its standardization based on vital urologic topics, and its continuously updated content. The curriculum is not intended to stand in place of a hands-on clinical experience but can provide a baseline fund of knowledge so that students can appreciate clinical nuances and more complex aspects of disease management.

Inherent to urology are sensitive subject matters pertaining to sensitive anatomic regions. Professionalism is stressed throughout medical school, but nevertheless, probing a patient regarding their sexual dysfunction or examining the GU

system can be anxiety-provoking for both patients and physicians. Some students express concerns about embarrassing, offending, or harming a patient while doing so. Worse yet is the tendency to gloss over the topic or avoid it all together leading to missed diagnoses and lack of treatment of real, pressing issues affecting the patient's well-being and quality of life. Opportunities to learn proper techniques, to create a relaxed environment, and to perform a thorough, but comfortable exam can alleviate this stress. Allowing students to practice these skills in a supervised setting with constructive feedback can be most effective.

To address these issues, McDougall's group out of Irvine, CA, established a dedicated 2-day urology block called the genitourinary skills training (GUST) program [15]. Students received 90 min of didactic lectures followed by hands-on sessions teaching male and female Foley catheter placement on silicone models, scrotal and digital rectal exam tutorials with standardized patients, and a review of abnormal physical exam findings. Pre- and post-intervention questionnaires showed an expected increase in student comfort and proficiency after their participation in the GUST. A follow-up evaluation demonstrated the durability of the curriculum and noted similar levels of proficiency persisted following GUST for about 18 months. However, there was no difference when compared with 4th year medical students, with the exception of testicular exam scores which were higher in GUST participants [16]. On narrative feedback, students expressed gratitude to learn a sensitive exam from experts while getting immediate feedback from experts and standardized patients.

Furthermore, in an effort to improve students' understanding of urinary incontinence (UI), Parker-Autry and colleagues developed an electronic learning module (ELM) to teach UI learning objective as recommended by AUGS and APGO [17]. Half of third year medical students rotating on gynecology were randomized to complete the UI-ELM while the other half were limited to their clinical exposures during their clerkship. An additional nested cohort of students randomly assigned to a dedicated uro-gynecology rotation were also included for comparison. A pre- and post-test was used to assess UI-specific knowledge at the end of the rotation. All students showed improvement on their post-test results, but those who rotated on gynecology and participated on the UI-ELM showed a significantly greater improvement over those who did not. The UI-ELM group had similar scores to students who rotated on a uro-gynecology specific rotation, without the intensive immersion (mean score change 4.65 ± 3.45 after UI-ELM compared with 1.92 ± 2.69 after gynecology week and 3.74 ± 3.09 after the uro-gynecology week, $p = 0.05$, maximum score of 22). The durability of ELM has not been assessed, but one can appreciate this resource as an adjunct to clinical experience or to improve student understanding of complex or uncommon conditions that would otherwise require repeated prolonged exposure to garner proficiency.

In another example, Owen and colleagues from the University of Dundee in the UK implemented a standardized urology curriculum for their students with excellent results. They recognized that the National Health System (NHS) clinics are very busy and can strain physician educators who have concurrent roles as doctor and teacher [18]. With a goal of improving student's transition from a paced and controlled classroom into a busy urology clinic, they developed an online preclinical urology curriculum covering basic topics, similar to the AUA core curriculum. Students who participated in the additional curriculum found it accessible and helpful. They outperformed their contemporaries who did not participate in the trial, and when surveyed requested additional modules outside of urology.

Knowledge Assessment and Maintenance

While significant efforts have been made to prepare medical students for their clinical rotations and enhance their overall experience, retention of knowledge after completion of the clerkship is critical. This is of most concern for students who ultimately do not pursue a career in urology and will have infrequent exposure to urologic pathology in their practice. As previously discussed, the UC Irvine GUST curriculum improved students' proficiency with the testicular and digital rectal exams [16]. However, the authors observed that few students actually performed these exams when admitting patients, despite understanding their importance. Without continued reinforcement, these skills will likely continue to wane, and primary care providers will be reticent to assess and manage their patients' urologic complaints.

A short foray into a topic is clearly inadequate. Kerfoot has advocated for the concept of *spaced education* to improve long-term retention of clinical knowledge in urology [19]. Students were randomized into two groups to receive cycles of weekly emails for up to 20 weeks, with learning content pertaining to 1-PSA and prostate cancer, or 2-ED and BPH. Pre- and post-intervention tests on all topics were performed in addition to a delayed test, about 40 weeks after the intervention. In all groups, students scored higher on topics they had continued exposure to. The group randomized to receive spaced education on PSA and prostate cancer continued to do better on the delayed test, though prolonged exposure to BPH and ED content did not improve scores. Spaced education has been successful in reinforcing skills outside of urology such as blood pressure management [20] and even instructing surgical residents on providing medical students with feedback [21]. The effects have been shown to persist for several years, albeit at modest levels [22].

Conclusions

The anticipated volume of urologic pathology that medical providers treat will undoubtedly increase with our aging population. Unfortunately, urology's place in the medical school preclinical and clinical curriculum is waning, often limited to those who actively seek it out. As educators in urology, it is upon us to maximize the learning efficiency medical students experience through our limited, but potentially impactful, interactions. Utilizing a preclinical curriculum, such as that provided by the AUA, is a good compilation of high-yield topics. A comprehensive curriculum will benefit all learners, especially those in primary care, who are unlikely to have structured urologic education during their post-graduate training. Creating hands-on experiences to demonstrate a proper GU exam and basic skills such as catheter placement, while emphasizing consideration of the patient experience, will hopefully alleviate the anxiety of all parties involved. Alternatives to traditional classroom and ward teaching, such as the ELM for complex topics, can augment the breath of the curriculum to extend beyond bread-and-butter urologic pathology. Ultimately, with dedicated and enthusiastic faculty and resident teachers, medical students may be inspired and encouraged to ultimately choose urology for their own career path.

Compliance with Ethical Standards

Conflict of Interest Marianne Casilla-Lennon and Piruz Motamedinia each declare no potential 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.

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