Assessing Canadian medical students' confidence in undergraduate urologic training and preferences for teaching methods

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ABSTRACT

Introduction: Given the aging population, urologic conditions are increasingly prevalent in primary care, necessitating well-prepared medical graduates to recognize and manage essential complaints. This study assessed medical students' confidence in managing common urologic conditions, identified preferred teaching methods, and examined the role of the Canadian Undergraduate Urological Curriculum (CanUUC) in their education.

Methods: A survey was distributed to third- and fourth-year Canadian medical students,

KEY MESSAGES

- Medical students report variable confidence levels in handling urologic conditions.
- Completion of a urology rotation significantly improved confidence scores.
- Clinical exposure, simulation sessions, and case-based group discussions are the preferred teaching methods in medical school.
- There is minimal awareness and adoption of the Canadian Undergraduate Urology Curriculum (CanUUC) among medical students.

assessing their self-confidence in history taking, diagnosis, management planning, and physical examination for 12 urologic conditions. The survey also explored preferred teaching methods and awareness of the CanUUC. Statistical analysis included ANOVA and t-tests to determine significant differences in confidence across various factors.

Results: A total of 117 medical students and 10 first-year urology residents responded. Students felt equally confident about taking histories (3.51±1.19), proposing diagnoses (3.38±1.19), and performing physical examinations (3.58±1.16) while demonstrating lower confidence ($p<0.001$) for management planning (3.16±1.25). Confidence was highest for urinary tract infections and lowest for male infertility. Furthermore, students who completed urology rotations reported higher confidence in history taking (3.67±0.69, $p=0.003$) and management planning (3.35±0.66, $p=0.003$). Direct clinical exposure, simulations, and case-based discussions were the preferred learning methods. Only seven (6%) students were aware of CanUUC, with five (4.3%) using it.

Conclusions: Medical students have moderate confidence in handling urologic conditions, with higher comfort among those who completed urology rotations. Implementing targeted curriculum enhancements and integrating resources like the CanUUC could address these educational gaps and lead to improved patient outcomes.

INTRODUCTION

Urological complaints are very common in primary care and their prevalence is expected to increase given the aging population.[1, 2] In fact, genitourinary tract problems account for 5-10% of primary care consultations.[3] Additionally, acute urologic presentations to emergency departments have significantly increased over the past decade compared to other non-urological presentations.[4] Given these trends, it is imperative that all medical graduates, regardless of their chosen specialty, receive comprehensive urological training to appropriately manage these prevalent conditions. However, concerns have been raised that urological conditions and their management are not well emphasized in the Canadian medical curriculum.[5]

In fact, 64.7% of Canadian undergraduate urology education directors expressed their concerns about the insufficient time dedicated to urology in their respective medical schools.[5] Additionally, only 29.1% of Canadian family medicine residents reported feeling adequately prepared to manage urological complaints.[3] Surveys of medical students consistently reveal that less than half found their exposure to urology to be adequate, with reported rates of 55.8% and 39%.[6, 7] Such drawbacks of the curriculum exist despite initiatives such as the Canadian Undergraduate Urology Curriculum (CanUUC),[8] designed by the Canadian Urological Association (CUA) for medical students to address any knowledge gaps in urology.

Despite being welcomed by most of the undergraduate urology education directors,[5] CanUUC's utility and impact among medical students remains unclear. Moreover, no nationwide study has assessed Canadian medical students' confidence levels regarding common urological

complaints nor their preferred teaching methods. Therefore, the current study aims to evaluate the effectiveness of the Canadian medical curricula in teaching urology by assessing medical students' confidence levels, identifying their preferred teaching methods, and examining the role of CanUUC in their studying.

METHODS

Survey development and dissemination

We constructed a cross-sectional survey consisting of 12 questions to assess trainees' confidence levels and their preferred teaching methods (Appendix I).[9] The urological conditions used for assessing respondents' confidence in performing clinical skills (i.e., history taking, physical examinations, providing correct assessments, and providing management plans) were selected from topics covered in the CanUUC (Appendix II).[8]

The survey was distributed from February to June 2024 with the help of medical student colleagues, who shared it with their third- and fourth-year peers (i.e., clerks) mainly through social media cohort groups. The Canadian Urology Student Interest Group (CUSIG) also assisted with survey dissemination by sending it to third- and fourth-year medical student representatives across Canada.[10] Additionally, postgraduate year-1 (PGY-1) urology residents piloted the study and completed the survey to internally validate the hypothesis that increased clinical exposure leads to higher confidence scores.

Institutional ethics approval was obtained from Université de Montréal's ethics board to create and distribute the survey targeting all third- and fourth-year medical students across Canada. First- and second-year students were excluded due to their limited exposure to urology and hands-on clinical experience. Study data were collected and managed using Research Electronic Data Capture (REDCap) tools hosted at Université de Montréal Health Center.[11, 12] Incomplete survey completions were discarded.

Survey content

The first aim of the project was to measure the confidence levels of students in performing history taking, providing correct diagnoses, and proposing appropriate management plans for 12 common urological conditions (Appendix II). The respondents' confidence levels in performing physical examinations were also assessed (Appendix II). A five-point Likert scale with 1 being least comfortable and 5 being most comfortable was used for the first aim. We further sought to identify differences in confidence levels across the following comparisons: between history taking, diagnosis, management plan, and physical examination, between main and satellite campus students, between students who had completed a urology rotation and those who had not, between students who had incorporated the CanUUC into their studies and those who either had no awareness of the curriculum or had not incorporated it into their studies, and between PGY-1 urology residents and medical students.

The next aim of our study was to identify the students' preferred teaching methods in medical school by asking the respondents to rank eight teaching methods, where the first and the

eight ranks represented least preferred and most preferred methods, respectively. The teaching methods included didactic lectures, case-based group discussions, simulation sessions, online videos, podcasts, online case vignettes, direct clinical exposure (e.g., rounds, consults, clinics, operating room, etc.) and reading materials.

The final aim of the survey consisted of quantifying the number of students who were aware of CanUUC, identifying the sources from which respondents had learned about CanUUC, establishing the most useful learning materials from the curriculum, and collecting feedback on potential improvements and desired additions to the curriculum.

Statistical analysis

The mean scores and standard deviations (SD) of confidence levels were calculated for urological conditions, skills (i.e., history taking, diagnosis, management plan, and physical exam), and assessed learning methods. To evaluate the differences in confidence levels between the four clinical skills, a one-way analysis of variance (ANOVA) with repeated measures was performed with Holm-Sidak test for post hoc comparisons. When data were not normally distributed, a one-way ANOVA on ranks was performed with post hoc Dunn's test. Additionally, when appropriate, the differences in confidence levels were identified via two-sampled t-test and Mann-Whitney U test for normally distributed and non-normally distributed data, respectively. All data are represented as means (SD) unless specified otherwise. For all tests, differences will be considered significant if the null hypothesis is rejected at a two-sided $p < 0.05$. Statistical analyses were conducted using Sigmaplot (version 14, Systat Software Inc., San Jose, CA, USA).

RESULTS

Respondents' profiles

Table 1 highlights the profiles of respondents including language, location of study, and exposure to urology in both academic and clinical settings. A total of 188 respondents started the survey, with 117 medical students fully completing it (72% in English and 28% in French). Incomplete survey completions were discarded. The respondents represented 12 out of 17 medical schools across Canada, and 77% studied at the main campus of their respective universities. Most students were first taught urological content in their first and second years of medical school (50% and 46% students, respectively), and a minority (4%) had their initial exposure in the third year. With regards to urology rotations, 52% had undertaken rotations in urology either as electives, mandatory rotations, or both.

Confidence levels in assessing urological conditions

The mean scores of confidence levels for the assessment of each urological condition as well as sum totals for history taking, diagnosis, and management plan are listed in Table 2, and Table 3 displays the respondents' confidence levels for physical exams. From the listed conditions, the highest scores belonged to urinary tract infections (UTI) (history taking: 4.62, diagnosis: 4.50,

and management plan: 4.35, Table 2), while male infertility had the lowest scores (history taking: 2.26, diagnosis: 2.15, and management plan: 1.99, Table 2). The mean scores were significantly different between UTI and male infertility for each clinical skill (history taking, diagnosis, and management plan: all $p < 0.001$). The highest and lowest physical examination confidence scores were for female and male external genitalia examinations (3.74 and 3.38, respectively), which were significantly different from each other ($p = 0.039$).

Our next goal was to determine if there were any differences between history taking, diagnosis, management plan, and physical examination. Figure 1 shows group data comparing the distribution of mean confidence scores across the four assessed clinical skills. The mean scores for history taking and diagnosis were significantly higher than that of management plan ($p < 0.001$ and $p = 0.002$), while there was no difference between the former two ($p = 0.18$). Physical examination's mean score was significantly higher than management plan's ($p < 0.001$), but not those of history taking nor diagnosis (all $p > 0.05$). That is, the respondents felt equally confident about taking histories, proposing diagnoses, and performing physical examinations, while demonstrating lower confidence levels for proposing management plans.

Next, we aimed to determine whether factors including study site, completion of urology rotations, use of learning materials from CanUUC, and the education level of respondents – i.e., clerks versus PGY-1's – had any effect on the confidence scores. The results are summarized in Table 4. There was no significant difference in mean confidence scores across the clinical skills between respondents who were studying at their university's main campus and those who were at a satellite site (all $p \geq 0.54$, Table 4). Further, the respondents who had completed urology rotation(s), had higher mean scores for history taking ($t_{115} = 2.983$, $p = 0.003$) and proposing management plans ($t_{115} = 3.051$, $p = 0.003$). That is, undertaking rotations in urology is associated with higher confidence levels regarding history taking and especially management plan proposals, which was associated with the lowest score among the four clinical skills (Tables 2 & 3 and Fig. 1). Whether or not respondents had implemented the CanUUC into their study routines had no effect on the confidence scores (all $p \geq 0.086$, Table 4). With regards to the education level of the respondents, PGY-1's, on average, selected higher scores for history taking ($t_{125} = -2.083$, $p = 0.039$) and proposing management plans compared the clerks ($t_{125} = -2.040$, $p = 0.043$) as shown in Table 4.

Preferred learning methods in medical school

For the second aim of our study, we surveyed our respondents on the method of teaching that they preferred in medical school, and the results are displayed in Table 5. The top 3 highest ranked teaching methods were, in descending order, direct clinical exposure, simulation sessions, and case-based group discussions (Table 5). Didactic lectures, reading materials, and podcasts constituted the lowest three preferred methods.

The Canadian undergraduate urological curriculum

We then aimed to assess the medical students' awareness of CanUUC, and to gather feedback on the curriculum. Of the 117 respondents, seven had prior knowledge of CanUUC, and five had integrated the curriculum into their studies. The respondents had learned about the curriculum from curricular resources (n = 1), urology attendings or residents (n = 2), non-urology residents or attendings (n = 1), medical students (n = 1), and online (n = 2). Additionally, the most useful learning materials as identified by the respondents were PowerPoint presentations (n = 3), self-assessment quizzes (n = 1), and technical skills/physical exam videos (n = 1). Lastly, the suggestions for improvement included: coverage of more topics, guidance on the scope of practice for different providers regarding urological complaints, and the expected competency level for different stages of training (from pre-clerkship to urology residency).

DISCUSSION

The findings of the current study illustrate variability in confidence levels across urological conditions and clinical skills, indicating areas where medical curricula may need improvements. Respondents were most confident for history taking, diagnosis, and management of UTI, followed by kidney stones (Table 2). Indeed, a study assessing family medicine residents' confidence when facing urologic complaints also found they felt most confident managing UTI and kidney stone problems.[3] The prevalence of these two conditions, which are among the most common and non-malignant urological conditions,[13] likely contributes to their increased coverage within the urology curriculum. The emphasis on these conditions in the curriculum is further supported by findings from Kreshover *et al*., who noted that UTI and kidney stones are the most frequently taught topics during both pre-clinical and clinical years in the United States.[9] Although this focus ensures that students are well-prepared to manage the most common conditions, it emphasizes the need to broaden the training to include less frequently covered but equally important urological issues, ensuring a more comprehensive and well-rounded urological education.

Furthermore, the lowest scores were reported for male infertility, erectile dysfunction, urological emergencies, and genitourinary trauma. This finding is consistent with other studies, which similarly highlight these conditions as areas of low confidence. In fact, students rated their confidence in managing erectile dysfunction 2.66 on a scale of 1 to 5,[14] and only a minority felt comfortable handling this condition.[3] Also, it is reported that American medical students are least exposed to infertility, urological emergencies, erectile dysfunction, and bladder drainage,[9] consistent with our findings. Such results are particularly worrying as these conditions are prevalent and often encountered by primary care physicians or other non-urology specialists.[3] Male infertility rates in North America range from 4.5 to 6%, while in Australia and Europe the rates are as high as 9%.[15] Also, erectile dysfunction affects 20.7% of men aged 30 to 79 years-old,[16] and is highly prevalent (20 to 85%) among male diabetic patients.[17] Accordingly, addressing these deficits via methods such as the addition of training modules is important to develop a comprehensive urological education for medical trainees given the prevalence of the mentioned conditions.

Regarding confidence levels in performing clinical skills, respondents reported significantly lower scores for proposing management plans ($p < 0.001$), while no significant differences were observed in history taking, diagnosing, or conducting physical exams. This finding may not be unique to urology, as the pre-clinical years tend to emphasize diagnostic skills, leading to greater confidence in these areas, whereas management skills are typically developed later during clerkship and residency. Nonetheless, it highlights a critical area for improvement and may be addressed by incorporating real-life clinical scenarios and simulations focused on decision-making and management planning during the pre-clinical years. Importantly, however, the confidence scores varied depending on the completion of urology rotations and trainee level. Students who completed a urology rotation reported significantly higher confidence levels in history taking and management than those who did not (Table 4). Additionally, PGY-1 urology residents reported higher confidence levels in those same skills compared to medical students, internally validating the hypothesis that increased clinical exposure leads to higher confidence scores. This result is aligned with previous studies that highlight the positive impact of clinical rotations on students' confidence and competence in managing and investigating common urological problems.[18, 19]

Nevertheless, no significant differences in confidence levels were noted between main and satellite campus students, suggesting comparable quality of education across different training sites. This finding is encouraging and highlights the success of standardized educational practices. The use of CanUUC, designed to cover all the essential aspects of urology, did not significantly impact students' confidence levels (Table 4). This result should be interpreted with caution as only seven (out of 117) students were aware of the curriculum, and just five respondents had incorporated it into their studies. Such limited use of CanUUC highlights the need for its increased promotion and integration into medical education. It is important to consider that students may be directed toward established third-party resources, which underscores the importance of positioning the CanUUC as a central reference for Canadian urology education. While third-party resources can be convenient, they may not be comprehensive and may fail to cover the entirety of the curriculum.[20] To encourage greater adoption of the CanUUC, efforts could focus on increasing awareness among attendings and residents, who can actively promote its use among rotating clerks. Additionally, national student interest groups, such as the CUSIG, could play a key role in advocating and disseminating this comprehensive resource.[10] Students could therefore benefit from its structured approach to urology training, ultimately leading to competent medical graduates.

Finally, the respondents ranked direct clinical exposure the highest when asked about their preferred teaching method in medical school as shown in Table 5, followed by simulation sessions and case-based group discussions. This result emphasizes the importance of hands-on learning, which could serve a key role in ensuring that medical students are better equipped to handle real-life clinical challenges. As such, medical schools should prioritize incorporating the teaching methods highlighted in our study, as this would not only improve students' confidence,

competence, and preparedness in managing urological complaints but also positively impact other specialties. Adapting the curriculums to align with students' preferred learning methods can support their overall development and readiness across various medical fields. Moreover, given that the CanUUC is largely based on didactic material, these findings suggest that while it is a useful study resource, it could be enhanced by incorporating more interactive and practical elements, such as case-based scenarios to lead discussions or practical tools such as question banks or flashcards. Those innovative tools have proven to be useful and could represent a great opportunity to consolidate learning materials through active recall.[21, 22]

Strengths and limitations

The strengths of our study consist of its nationwide scope, encompassing 12 out of 17 Canadian medical schools, across both main and satellite campuses, as well as including Anglophone and Francophone students. Such broad coverage enhances the generalizability of our findings in the context of Canadian medical education. However, our survey dissemination method, which relied on social media cohort groups, made it difficult to assess the exact number of students solicited, since not all students have social medial and not every group member necessarily viewed the REDCap link. The voluntary nature of the survey participation and the fact that survey distribution was partially conducted by the CUSIG pose as sources of selection bias (i.e., students with a strong interest in urology may have been more inclined to complete the survey), potentially over-estimating the actual confidence of students in addressing urologic complaints. Moreover, self-reported data introduces subjectivity into results such that the responses may overestimate the students' actual competence or knowledge. Also, it is difficult to predict how confidence scores translate to clinical aptitude, and the scores are largely an assessment of students' preparedness rather than ability. Further, the relatively small sample size given the total number of Canadian medical school clerks and the uneven representation of medical schools (i.e., different number of respondents for each school) could further limit the applicability of our findings. Nevertheless, the study offers invaluable insight into the current state of urological education in Canadian medical schools and serves as a foundation for future research. Further studies with larger sample sizes and more objective measures of competence could provide a more complete understanding of the current situation.

CONCLUSIONS

This study highlights the need for enhanced urological education in medical schools, especially given the rising prevalence of urological conditions and their significant impact on healthcare. The variability in confidence levels when assessing urological conditions underscores the necessity for a more comprehensive curriculum, particularly in underrepresented and crucial areas such as urological emergencies. Our findings also indicate that medical students highly prefer direct clinical exposure and hands-on learning as teaching methods. Furthermore, the limited awareness of the CanUUC suggest the need for encouraging the adoption of this national comprehensive urology training program. Addressing these educational gaps through targeted

curriculum enhancements, alongside increased clinical exposure, could significantly improve students' preparedness to manage diverse urological conditions in their future medical practice, ultimately leading to improved patient outcomes.

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FIGURES AND TABLES

Figure 1. Group data comparing the confidence scores between four clinical skills. Box and whisker plots show individual and group data (median [solid line], mean [dashed line], and 25th and 75th percentiles [whiskers]) for confidence scores. Each urologic condition's mean is indicated by a different symbol for history taking, diagnosis, and management plan. Different symbols also indicate the three physical exam maneuvers. *p<0.05.

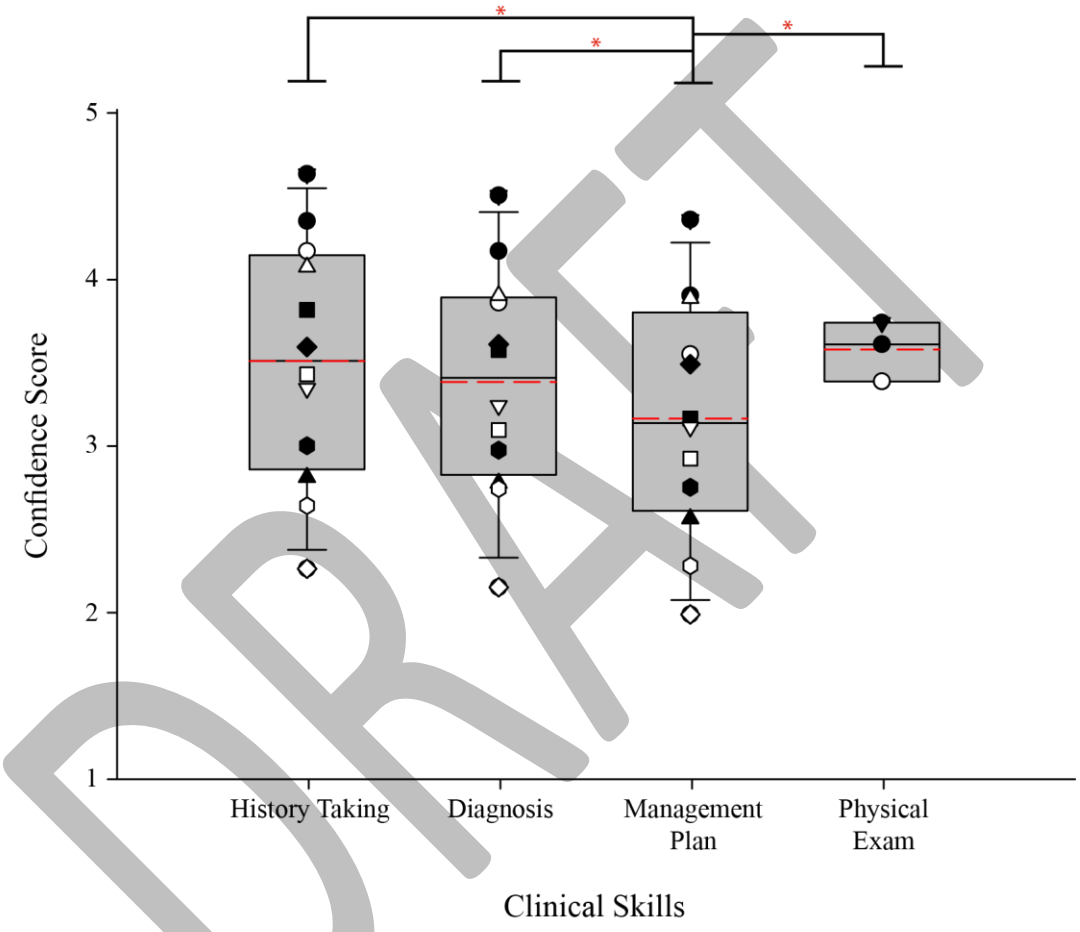

Table 1. Respondents' profiles and extents of exposure to urology (n=117)			
Survey question	**Response**	**Count (n)**	**Count (%)**
Language			
	English	84	72
	French	33	28
Campus location			
	Main	90	77

	Satellite	27	23
Initial exposure to urological content			
	1st year	58	50
	2nd year	54	46
	3rd year	5	4
Completion of urology rotations			
	Elective	13	11
	Mandatory rotation	41	35
	Both	7	6
	None	56	48

Table 2. Medical students' confidence levels in history taking, diagnosis, and proposing management plans for common urologic pathologies (n=117)*

Urologic conditions	**History taking**	**Diagnosis**	**Management plan**
Kidney stones	4.34 (0.76)	4.16 (0.77)	3.90 (1.00)
Hematuria	4.16 (0.80)	3.85 (0.91)	3.55 (1.02)
Urinary tract infection	4.62 (0.54)	4.50 (0.65)	4.35 (0.79)
Benign prostatic hyperplasia	4.07 (0.90)	3.90 (0.94)	3.88 (0.93)
Urinary incontinence	3.81 (0.93)	3.57 (0.96)	3.16 (1.07)
Prostate cancer	3.43 (0.97)	3.09 (1.04)	2.92 (1.12)
Testicular torsion	3.59 (0.94)	3.61 (1.03)	3.49 (1.18)
Male infertility	2.26 (0.98)	2.15 (1.01)	1.99 (0.98)
Urologic emergencies	2.81 (1.17)	2.78 (1.19)	2.56 (1.10)
Acute urinary retention	3.34 (1.18)	3.24 (1.16)	3.11 (1.24)
Erectile disfunction	3.00 (1.16)	2.97 (1.16)	2.75 (1.16)
Genitourinary trauma	2.64 (1.06)	2.74 (1.08)	2.28 (1.04)
Total	3.51 (1.19)	3.38 (1.19)	3.16 (1.25)

*A score of 5 denotes most confident and a score of 1 denotes least confident.

Table 3. Medical students' confidence levels in performing physical examinations in urology (n=117)*	
Physical exam maneuvers	**Scores**
Digital rectal examination	3.61 (1.14)
Male external genitalia	3.38 (1.13)
Female external genitalia	3.74 (1.20)
Total	3.58 (1.16)

*A score of 5 denotes most confident and a score of 1 denotes least confident.

Table 4. The effect of study site, urology rotation completion, CanUUC incorporation, and trainee education level on clinical skills' confidence scores

Clinical skill	**Study site**			**Urology rotation**			**CanUUC**			**Trainee level**		
	Main (n=90)	Satellite (n=27)	p	Yes (n=61)	No (n=56)	p	Yes (n=5)	No (n=112)	p	Clerk (n=117)	PGY-1 (n=10)	
History taking	3.53 (0.63)	3.44 (0.66)	0.54	3.67 (0.69)	3.33 (0.67)	0.003	3.98 (0.38)	3.49 (0.64)	0.086	3.51 (0.64)	3.95 (0.77)	0.039
Diagnosis	3.39 (0.68)	3.37 (0.69)	0.91	3.47 (0.64)	3.28 (0.71)	0.12	3.53 (0.74)	3.37 (0.68)	0.61	3.38 (0.68)	3.75 (1.16)	0.13
Management plan	3.16 (0.74)	3.18 (0.71)	0.89	3.35 (0.66)	2.96 (0.74)	0.003	3.57 (0.54)	3.14 (0.73)	0.21	3.16 (0.73)	3.68 (1.12)	0.043
Physical examination	3.60 (0.87)	3.48 (0.99)	0.54	3.67 (0.85)	3.48 (0.94)	0.23	3.73 (0.44)	3.57 (0.91)	0.62	3.58 (0.89)	3.83 (1.19)	0.23

Table 5. Preference scores for teaching methods used in medical schools (n = 117)*	
Teaching method	**Scores**
Direct clinical exposure	7.38 (1.41)
Simulation sessions	5.80 (1.50)
Case-based group discussions	5.06 (1.89)
Online videos	4.17 (1.65)
Online case vignettes	4.13 (1.84)
Didactic lectures	4.00 (2.04)
Reading materials	2.74 (1.93)
Podcasts	2.71 (1.81)

* A score of 1 denotes least preferred and a score of 8 denotes most preferred.