

Cultivating Professionalism in Saudi Arabian Neurology Residency Programs: The Impact of Case-Based Learning

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Purpose: There is no universally accepted definition of medical professionalism, making it challenging to identify the most effective teaching methods for embedding professionalism within postgraduate residency curricula. This study aimed to evaluate the effectiveness of case-based learning (CBL) in teaching professionalism to neurology residents at two training centers in Saudi Arabia. An additional objective was to assess the residents' knowledge of professionalism.

Methods: A pre- and post-test design was utilized using the Penn State College of Medicine Professionalism Questionnaire, which was administered to all neurology residents at the two participating hospitals. This approach measured the changes in residents' understanding of professionalism before and after they participated in three consecutive weeks of CBL sessions. These sessions included interactive case discussion aimed at enhancing their understanding of professionalism.

Results: Neurology residents exhibited significant improvements in several professionalism domains after interventions. The experimental group showed marked enhancements in accountability ($P=0.002$, effect size=0.59) and duty ($P=0.018$, effect size=0.46). The control group, after CBL sessions, improved significantly in altruism ($P=0.0008$, effect size=0.64) and honor/integrity ($P=0.018$, effect size=0.45). Post-intervention, the experimental group demonstrated superior altruism compared to the control group pre-intervention ($P=0.03$, effect size=0.40).

Conclusion: The observed improvements in various aspects of professionalism indicate that case-based learning is an effective method for bolstering neurology residents' understanding and knowledge of professionalism. This finding supports the inclusion of CBL in residency curricula to foster professional development.

Keywords: medical professionalism, case-based learning, residency programs, neurology education, postgraduate

Introduction

Professionalism is a core competency in medical education frameworks and is essential for accreditation in many countries. Nevertheless, there is a lack of unified teaching approaches in this area, which impacts the effectiveness of medical education in developing professional competence.¹ Therefore, disciplinary actions are mostly taken against medical students, residents, fellows, and physicians owing to the lack of their professionalism.² Medical scientific boards of all countries ensure that new medical graduates are professionally competent to work as physicians. In Saudi Arabia (SA), the Saudi Commission for Health Specialties (SCFHS) is the scientific commission that has adopted the CanMEDS framework for post-graduate training. The CanMEDs model describes seven roles (those of medical expert, communicator, collaborator, leader, health



advocate, scholar, and professional) which competent physicians play in healthcare services.³ At the undergraduate level, the National Commission for Academic Accreditation and Assessment (NCAAA) has developed a similar framework, the SaudiMEDs for graduates of medical colleges, which outlines attributes for graduates in any accredited medicine program in SA. The SaudiMEDs describes six core competencies: scientific approach to practice, patient care, research and scholarship, professionalism, communication and collaboration, and the community-oriented practice.⁴

CanMEDs and SaudiMEDs are frameworks that define professionalism as involving professional commitment and behaviors.^{3,4} Professionalism is defined as the means by which individual doctors fulfill medical profession's contract with society.⁵ It implies pursuing a vocation or calling and providing service to others with particular ethical principles and attributes.⁶ Importance attached to professionalism shows that translating it into a teaching component and integrating it into a training program is not simple.⁷ CanMEDs Tools Guide provides some tips on how professionalism can be taught and assessed in a residency program, but several challenges occur during the teaching of professionalism, such as a lack of suitable teaching and assessment tools or clear objectives for assessment.⁸ Therefore, when teaching a professional role, teachers need to help learners familiarize themselves with the following keywords that are important for this role: professionalism, professional identity, fiduciary relationship, social contract, hidden curriculum, resilience, wellness, burnout, self-care, fatigue management, self-efficacy, self-regulation, and emotional intelligence.³ Professional competency involves more non-cognitive skills than cognitive skills, such as respect, communication, maturity, and responsibility.⁹ There are two views on training professionalism: (1) personal and (2) behavioral. If professionalism focuses on personal characteristics, the training will follow the concept of "the right person doing it". However, if it focuses on the quality of behavior, the training involves professionals' inner personality. Therefore, individuals are considered professional if their behavior meets these criteria.⁷

No consensus exists on what is considered as medical professionalism; thus, determining the most effective teaching methods for integrating professionalism into the medical curriculum is difficult.¹⁰ Teaching professionalism is linked to medical students' personal and professional development (PPD), where traditional methods of teaching professionalism, such as lectures and readings, are proven to be less effective.¹¹ Hence, situated learning theory was found to be more effective in teaching professionalism.¹⁰ In addition, the case-based approach was found to help learners attain professionalism by learning about unprofessional behaviors through academic interaction with others.¹²

To the best of our knowledge, no research within medical education has specifically focused on measuring the effectiveness of CBL in teaching professionalism using a robust pre-test and post-test methodology with a control group. Previous studies focused largely on students' reactions to and satisfaction with their CBL experience. While these studies provide valuable insights into the perceived benefits and enjoyment of the method, they fall short of offering robust empirical evidence on its effectiveness in teaching professionalism.

A limited number of studies have ventured into evaluating the effectiveness of CBL by assessing changes in learners' attitudes or knowledge before and after the intervention.¹³ For instance, some research has demonstrated improvements in students' assessment scores following participation in case discussions tailored to specific learning objectives, such as correcting misconceptions about cellular respiration or enhancing clinical skills.^{14,15} These studies indicate that CBL can be effective in achieving targeted educational outcomes, suggesting its potential utility in a broad array of educational contexts.

We hypothesized that a well-designed CBL that focuses on professional attributes, such as accountability, altruism, duty, excellence, integrity, and respect, would increase residents' knowledge of professionalism. Therefore, this study aimed to measure the effectiveness of teaching professionalism using CBL in a neurology residency program at multiple training centers in Saudi Arabia. The primary objective of this study was to determine the impact of CBL on enhancing residents' knowledge of professionalism. The secondary objective was to assess the overall level of residents' knowledge regarding professionalism.

Materials and Methods

Study Design, Setting, and Participants

This study utilized a quantitative, pre-test, post-test, quasi-experimental design to evaluate the impact of CBL on professionalism among neurology residents. The study was conducted in the neurology departments of two hospitals

in Riyadh: King Abdulaziz Medical City (KAMC) and King Faisal Specialist Hospital and Research Center (KFSHRC). The residents were assigned based on their respective institutions: KAMC was designated as the experimental group, while KFSHRC served as the control group. This institution-based assignment was chosen to simplify the implementation of the CBL sessions. A total of 58 neurology residents participated in the study. Residents were recruited from both institutions using a convenience non-probability sampling technique, and no sample size calculation was made due to the nature of the sampling; the target is to recruit as many participants as possible based on the data collection interval allowed.¹⁶ Inclusion criteria were based on accessibility and willingness to participate, with all eligible residents being invited to join the study during their weekly academic half-days. During their designated weekly academic half-days, residents were engaged and educated regarding the study, subsequently providing their informed consent. Residents had the autonomy to complete the survey or return it unanswered, while still retaining the opportunity to participate in case discussions. Approximately 98% of residents participated in the study and demonstrated a strong willingness to partake in the case discussions facilitated by neurology consultants. Residents who did not complete either the pre- or post-test survey were excluded from the study.

Survey Instrument

The Penn State College of Medicine Professionalism Survey (PSCOMSP) was used to measure residents' attitudes toward professionalism.¹⁷ Permission to use the PSCOMSP was obtained from its original author. The PSCOMSP underwent face validation by three experts in the field of medical education and professionalism. These experts evaluated the survey for relevance, clarity, and comprehensiveness to ensure that each item accurately represented and measured the specific dimensions of professionalism. The survey assesses six core dimensions of professionalism: accountability, altruism, duty, excellence, integrity, and respect. Residents rated 36 item statements on a five-point Likert scale (1 = never, 2 = little, 3 = some, 4 = much, and 5 = great deal), reflecting their perceptions of professionalism. The questionnaire included a modified demographic section capturing additional details such as the residents' country of graduation, grade point average (GPA), and graduation institution (see [supplementary Figure 1](#) for demographic modification).

Procedure

Pre-Test: All participating residents completed the PSCOMSP survey in the same week to establish their baseline knowledge of professionalism.

Intervention: Residents at KAMC (experimental group) participated in CBL sessions immediately following the completion of the survey. The sessions extended over a duration of three consecutive weeks during their academic half-days, with one CBL session per week. These sessions involved interactive case discussions meticulously formulated to enhance their understanding and application of professionalism principles, which were presented and facilitated by consultants in the field of neurology. (see [supplementary data 1](#) and [supplementary data 2](#) for CBL session case examples).

Post-Test (Experimental Group): After completing the last CBL session, the same PSCOMSP survey was administered to the experimental group to assess changes in professionalism knowledge.

Post-Test (Control Group)-Before CBL: The same pre-test results of residents at KFSHRC (control group) were utilized as post-test results since no CBL intervention was administered to them that could influence their responses to the questionnaire.

Post-Test (Control Group)-After CBL: Following the initial post-test for the experimental group, the CBL sessions were introduced to the control group. Subsequently, the control group completed a post-test using the PSCOMSP questionnaire.

Data Analysis

Raw data was collected and initially validated to ensure completeness and accuracy. Records with missing or erroneous data were identified and subsequently deleted. Categorical variables were expressed as frequencies and percentages. Depending on whether the variables followed a parametric or non-parametric distribution, mean $\pm$ standard deviation

(SD) or median and interquartile range (IQR) were reported for numerical variables. The baseline characteristics of the experimental and control groups were compared using the chi-square test, Fisher's exact test, and independent-samples *t*-test. A Mann–Whitney *U*-test of the median scores was applied to assess differences in changes in professionalism knowledge between groups, and the effect size was reported (small effect=0.1, medium effect=0.3, and large effect=0.5).^{18,19} Further, the Wilcoxon signed-rank test was used to assess differences between groups in scores. Given the limited number of comparisons made in our analysis and the robust nature of the non-parametrical statistical tests, we concluded that additional corrections for multiple comparisons were not necessary. Statistical significance was set at *p*-value < 0.05. All statistical analyses were performed using JMP version 8.1 (SAS Institute Inc., Cary, NC, USA).

Ethical Consideration

Informed consent was obtained from all participants. Residents were informed of their right to participate voluntarily and their option to withdraw at any time without penalty. This study was approved by the Institutional Review Board of King Abdullah International Medical Research Center Institutional Review Board on 08 August 2022, (SP22R/142/06).

Results

Baseline Characteristics

A total of 58 neurology residents participated in this study. The baseline characteristics of the experimental and control groups are presented in Table 1. No significant differences were observed in baseline characteristics between the groups. The experimental group comprised 17 adult neurology residents (63.0%) and 10 pediatric neurology residents (37.0%), whereas the control group consisted of 20 adult neurology residents (64.5%) and 11 pediatric neurology residents (35.5%). In terms of gender distribution, the experimental group included 12 males (44.4%) and 15 females (55.6%), whereas the control group comprised 16 males (51.6%) and 15 females (48.4%).

Table 1 Baseline Characteristics of Participants

Variable	All	Group		Test Statistics, p-value
		Experimental (n=27)	Control (n=31)	
	n(%)	n(%)	n(%)	
Specialty				Chi-square test= 0.01, p-value= 0.90
Adult	37(63.8)	17(63.0)	20(64.5)	
Pediatric	21(36.2)	10(37.0)	11(35.5)	
Age, mean±SD (min-max=25-30) years	27.5±1.1	27.4±1.2	27.7±1.1	<i>T</i> -test= 1.3, p-value= 0.19
Sex				
Male	28(48.3)	12(44.4)	16(51.6)	Chi-square test=0.29, p-value= 0.58
Female	30(51.7)	15(55.6)	15(48.4)	
Graduation GPA				
5–4.5	37(63.8)	20(74.1)	17(54.8)	Fisher's exact test= 0.03, p-value= 0.17
4.5–3.75	19(32.8)	7(25.9)	12(38.7)	
3.75–2.75	2(3.4)	0	2(6.5)	

(Continued)

Table 1 (Continued).

Variable	All	Group		Test Statistics, p-value
		Experimental (n=27)	Control (n=31)	
	n(%)	n(%)	n(%)	
Residency Level				
2	10(17.2)	5(18.5)	5(16.1)	Chi-square= 0.99, p-value= 0.80
3	21(36.2)	11(40.7)	10(32.3)	
4	14(24.1)	5(18.5)	9(29.0)	
5	13(22.4)	6(22.2)	7(22.6)	

Abbreviation: SD, standard deviation.

Pre-Test and Post-Test Results

The pre-test and post-test results of the PSCOMSP for the experimental and control groups are shown in Table 2. The Wilcoxon signed-rank test was used to compare pre-test and post-test scores within the same group. As shown in Table 2, the experimental group showed statistically significant improvements in accountability (P -value=0.002, effect size 0.59) and duty (P -value =0.018, effect size 0.46). Furthermore, after CBL sessions were introduced to the control group, the group showed statistically significant improvements in altruism (P -value=0.0008, effect size 0.64) and honor/integrity (P -value=0.018, effect size 0.45).

Table 3 shows the post-test results of the experimental group after the CBL sessions and those of the control group before the CBL session. The experimental group showed a statistically significant improvement in altruism (P -value=0.037, effect size of 0.40) compared to the control group (Before CBL).

Discussion

This study described the effectiveness of teaching professionalism to neurology residents using CBL and measured the residents' knowledge of professionalism. The findings reflect significant improvements in professionalism attributes such as accountability, duty, altruism, and honor/integrity following CBL, which align well with existing studies that have evaluated changes in professionalism across a curriculum or during a specific course.^{20,21} Incorporating CBL into residency programs required careful selection of case scenarios and orientation for instructors and residents to maximize effectiveness.²² In our study, we designed case scenarios in such a way as to address the attributes of professionalism (Accountability, Altruism, Duty, Excellence, Respect, and Honesty/Integrity). Hence, CBL improves the residents'

Table 2 Paired Test Scores

Professional Elements	Experimental		*p-value	Control		*p-value
	Pre-test Score	Post-test Score		Pre-test Score	Post-test Score (After CBL)	
Accountability	42(4)	47(6)	0.002	44(4)	45(8.25)	0.58
Altruism	46(9)	47(7)	0.44	44(4)	48(5)	<0.001
Duty	46(6)	50(7)	0.018	48(5)	49(8.25)	0.39
Excellence	47(5)	48(12)	0.72	46(6)	46(8.5)	0.43
Honor and integrity	46(5)	45(6)	0.60	45(5)	47(6.25)	0.018
Respect	45(5)	43(6)	0.06	44(7)	45(7)	0.69

Note: Median (IQR) were reported. *Wilcoxon signed-rank test.

Table 3 Unpaired Test Scores

Professional Elements	Group Post-test Score		*p-value
	Experimental	Control (Before CBL)	
Accountability	47(6)	44(4)	0.47
Altruism	47(7)	44(4)	0.037
Duty	50(7)	48(5)	0.16
Excellence	48(12)	46(6)	0.19
Honor and integrity	45(6)	45(5)	0.99
Respect	43(6)	44(7)	0.31

Note: Median (IQR) were reported. *Mann–Whitney U-test.

knowledge of professionalism. This improvement is probably due to the fact that the residents were intentionally taught the attributes of professionalism.²³ While CBL shows promise in improving professionalism, it is essential to consider that not all CBL interventions yield uniform-results. Despite our uniform study intervention regarding the cases used for discussion, the duration of the sessions, and the facilitator tutors, there were variations in professionalism attribute scores among the residents. These variations in professionalism are likely unique to individuals within a given group rather than uniform across different groups. This highlights the critical role of personal attributes in shaping professionalism. CBL poses challenges in teaching professionalism due to the complexity of real-life scenarios, making it difficult to navigate ethical dilemmas and professional behaviors.⁵ Additionally, challenges such as group size and preparation time must be addressed to optimize its implementation.²⁴ Some programs report insufficient time dedicated to teaching professionalism, indicating a need for more structured and comprehensive curricula.²⁵ Despite these challenges, CBL offers valuable opportunities for residents to develop critical thinking, empathy, and communication skills essential for professional practice across the medical continuum.⁵

A well-designed CBL session centered around patients can significantly enhance residents' skills in problem-solving, critical thinking, and analysis of complex issues.²² Moreover, the presence of expert tutors who possess deep content knowledge and experience can lead to more effective learning and better alignment with educational objectives.²⁶ Research indicates that the involvement of expert tutors in clinical problem-based learning (CPBL) sessions enhances residents' application of learned material and improves their understanding of complex medical issues.²⁷ Nonetheless, the necessity of expert tutors in CBL remains debatable. Some studies suggest that non-expert tutors may effectively promote learning, yet the evidence is inconclusive.^{26,28} Traditional approaches to teaching professionalism often depend on a hidden curriculum. Conversely, there is an increasing focus on formal educational approaches, such as CBL, to explicitly integrate professionalism attributes into curricula or training programs.^{29,30} Our study agrees with previous studies that CBL enables residents to improve their knowledge about professionalism by discussing ethical issues and challenges and identifying the elements of professionalism explicitly in cases. Additionally, residents should be provided with safe learning environments and thereby encouraged to reflect on their clinical decisions.

Contrastingly, a study that assessed medical students' attitudes toward professionalism across study years revealed no class differences, as professionalism was perceived implicitly by students throughout their medical education and clinical training.³¹ Therefore, using CBL as a teaching approach allows residents to activate their higher-order thinking, such as analyzing and synthesizing.³² Moreover, CBL helps residents understand the elements of professionalism that should be implemented in the case discussion. While the study findings reflect a positive attitude towards professionalism, the challenge remains in translating these attitudes into practice and bridging the gap between theoretical understanding and practical application of professionalism.³³

Limitations

This study has several limitations that should be addressed in future research. First, the study was restricted to two training centers due to the limited study time and accessibility to other neurology residency centers. This limited geographic scope may not be representative of the broader medical community. Additionally, the study exclusively focused on neurology residents, which narrows its applicability. Future studies should aim to include a wider range of medical personnel, including residents from various specialties and other healthcare professionals such as nurses and physician assistants.

Second, the sample size of the study was relatively small, thereby limiting the generalizability and statistical power of the findings. Collaborating with multiple training centers and institutions to increase the participant pool would help in obtaining more robust and representative data.

Third, the intervention was confined to three CBL sessions and one case scenario per week, formulated to address the six ABIM elements of professionalism. This limited number of sessions made it challenging to comprehensively cover all six elements and measure the changes in these elements effectively. Expanding the number of sessions and case scenarios in future studies would allow for a more thorough examination of each element of professionalism.

Although the PSCOMSP showed a positive change in residents' attitudes toward professionalism before and after the CBL sessions, it did not adequately measure the change in their behaviors. It is crucial to note that attitudes alone do not necessarily translate into observable actions. To address this, future research should incorporate tools and methods that measure behavioral changes alongside attitudinal shifts, ensuring a more holistic assessment of professionalism. This could involve longitudinal studies that track changes over a more extended period and include direct observations, peer evaluations, or patient feedback.

Lastly, while the current study provided valuable insights into the potential benefits of CBL in fostering professional values, the limited experimental design restricts the generalizability and promotion value of the findings. Future interventions should be more comprehensive, incorporating a diverse range of case scenarios and more frequent CBL sessions to thoroughly address and exemplify each of the professionalism elements. This would enhance the understanding of how CBL can effectively be integrated into medical education and training programs on a larger scale.

Conclusion

The finding of the study will have wider implications not only for the study setting, but also for medical education outside the region. Based on this finding, we recommend the implementation of a well-designed CBL method for increasing residents' skills in problem-solving, critical thinking, and analysis of complex issues. Since this study reported a statistically significant increase in accountability, altruism, duty, and honor/integrity, with no significant decrease in other professional elements after CBL sessions, we recommend CBL as the best method for teaching professionalism in residency programs.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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