

Upper Airway Assessment During Conscious Sedation Training Programs For Healthcare Professionals At The Clinical Simulation Center, Qassim University Medical City

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Abstract

Background: Conscious sedation is a state of controlled depression of consciousness. This study aimed to evaluate the effectiveness of a conscious sedation training program delivered by the Continuous Professional Development (CPD) Department at the Qassim University Medical City Clinical Simulation Centre (QUMC-CSC), Saudi Arabia, by comparing participants' anatomical knowledge and clinical skill levels before and after the training and assessing their satisfaction. **Methods:** A total of 173 participants attended the workshops, including physicians (n=30), dentists (n=30), nurses (n=65), hospital technicians (n=9), respiratory therapists (n=3), and students (n=36). The study employed a pre-test/post-test design to evaluate knowledge acquisition, a perception survey to assess participant satisfaction and course applicability, and a SWOT analysis via a focus group to explore participants' experiences. **Results:** The mean post-test scores for all specialties were higher than the mean pre-test scores. This improvement was statistically significant for both male and female nurses and students, but only for female physicians and dentists. Of 173 participants, 117 (67.6%) completed the satisfaction survey, reporting high satisfaction and perceived enhancement of their clinical experience. **Conclusions:** The program successfully increased participants' understanding and confidence in practicing conscious sedation in a safe, simulated environment and highlighted the value of integrating basic anatomical knowledge of the upper respiratory tract with training to improve performance during clinical sessions. Participants acknowledged the value of the experience for consolidating knowledge and identifying learning opportunities.

Keywords: Simulation, respiratory airway, perception; conscious sedation; surveys; training evaluation.

1. Introduction

The conscious sedation program is performed in the Continuous Professional Development Department at Qassim University Medical City-Clinical Simulation Centre (QUMC-CSC) in Saudi Arabia. The program is certified by the Saudi Commission for Health Specialties (SCFHS), which is responsible for licensing healthcare providers. This certification enhances the professional development of healthcare providers. This workshop is an obligatory prerequisite for healthcare specialists at Qassim University Medical City (QUMC) who deal with patients undergoing sedation, such as general physicians, obstetricians, anesthetists, peri-operative nurses, and ICU workers. This requirement is in accordance with both the institutional policy of QUMC and the national standards for safe sedation practice set forth by the Saudi Commission for Health Specialties (SCFHS).

The participants should complete the Basic Life Support (BLS) training before attending the Conscious Sedation program. The term conscious sedation represents a controlled situation of decreased consciousness, while the patients' protective reflexes continue to work. An open airway is maintained independently, and the patients can respond to verbal and physical stimuli properly¹. The conscious sedation process should be accomplished with a broad safety margin to reduce the risk of unintentional loss of consciousness². Increased awareness of the necessity of conscious sedation is crucial due to the increase in the number of patients requiring minor surgical procedures outside the operating room. These procedures that require conscious sedation are accomplished in physicians' offices, imaging wards, emergency departments, subspecialty surgical suites, inpatient settings, and ambulatory surgery centers^{3,4}.

(5) reported that no number of clinical case exposures can guarantee dental graduate competence to deal with patients' psychological and social needs. This includes the ability to assess and manage dental pain and anxiety, and the safe delivery of sedative agents^{6,7}. In addition, a lack of knowledge was reported among dental professionals, hindering the practice of dental management^{8,9} concerning conscious sedation. Therefore, enhancing understanding and confidence in conscious sedation is important¹⁰. It was detected that hands-on learning experiences of conscious sedation are more efficient than passive learning, teacher-centered, traditional instructional approaches. Hands-on engagement enhances readiness, awareness, clinical skill development, and knowledge achievements¹¹⁻¹³. Conscious sedation was detected as challenging in elective circumstances and further complicated in the emergency department due to the patients' critical situations and morbidity. These patients need immediate interventions, but they are not always prepared, and complete medical assessments may not be ready¹⁴. Therefore, the Conscious Sedation program was planned in QUMC to train healthcare providers in handling sedatives for patients while preserving their consciousness and capability to respond to various stimuli. It ensures that the participants are confident and competent in the performance of sedation procedures in a safe and regulated environment before implementing these skills in clinical wards. It provided the participants with theoretical training for understanding the anatomical background of the upper airway¹⁵. In addition, the pharmacology of sedatives regarding their indications, contraindications, complications, and drug interactions is essential. Teaching anatomy enhanced the critical thinking and communication skills of the undergraduate the first year medical students augmenting their clinical sense while dealing with real patients¹⁶. Moreover, it gives hands-on simulation through high-standardized mannequins simulating real-life scenarios, to practice sedation administration and patient monitoring. Full orientation about the anatomical aspects of the upper respiratory tract is mandatory for mastering and managing the most common serious clinical situations such as airway obstruction. The value of deep understanding of the anatomy during conscious sedation is a standard part of medical education. This relationship is clearly addressed in several medical textbooks and articles. The textbook "Practical Conscious Sedation" devotes chapters to "relevant anatomy needed before practicing sedation"¹⁷.

The safety and effectiveness of conscious sedation depend directly on the ability to utilize the anatomical background during clinical tasks such as IV cannulation and airway assessment. (18) describe a course implemented periodically by the University of Florida Health (UF Health) on "Basic Airway Management Course for Dentists" that directly states to educate the dentist on the relevant anatomy of the upper airway needed during patients' sedation. Anatomical knowledge allows practitioners to recognize patients at higher risk of upper airway obstruction, particularly in obese patients, including those with a large tongue, short neck, limited neck extension, or those complaining of obstructive sleep apnea syndrome. In addition, upper respiratory airway evaluation helps in identifying the potential difficulties that could be encountered during sedation¹⁹.

Competency in performing conscious sedation is fundamentally based upon the basic knowledge of the anatomy of the upper respiratory. It is an integral component of the course syllabus that ensures safe practice as the conventional curricula of the part of the "Scientific Basis of Dental Sedation" module in the United Kingdom²⁰. The hands-on clinical training during clinical simulation sessions significantly improved the score of residents and their confidence after preliminary workshops on the anatomy of the upper airway²¹.

(22) found a significant increase in the training scores of residents who practiced virtual anatomy for anatomy training scored during upper airway intubation skills compared to those with conventional training lacking prior anatomy orientation reflecting the impact of teaching anatomy of the performance during clinical simulation settings.

A qualitative study is a powerful analytical resource for examining experience through participant perceptions. It provides viewpoints and understanding while managing important values, knowledge backgrounds, clinical skills, and outcome expectations^{23,24}. Moreover, reflective practice was proven to promote the professionalism and clinical experience of healthcare providers. It enables lifelong learning of basic anatomical concepts on the upper respiratory airway and ongoing clinical competency²⁵. Limited studies were conducted on conscious sedation programs utilizing both qualitative and quantitative research designs^{5,26}, and inadequate evidence recommended that reflection enhances the quality of care through clinical competence, confidence, problem-solving, and communication²⁷. Therefore, the present qualitative and quantitative study on the "Conscious Sedation" program, as a good example of reflective practice, aimed to investigate the healthcare providers' perceptions of the program through the exploration of their reflection on the process and impact of this teaching and hands-on program, and assessment of their gained understanding through comparing their knowledge levels before and after the training and learning experiences.

2. Methods

2.1 Program Development and Study Design

The study was planned to evaluate the effectiveness of the simulation program “Conscious Sedation,” implemented in the Qassim University Medical City-Clinical Simulation Centre (QUMC-CSC), using pre- and post-test interventions. The program aimed to provide the participants with an overview of the concepts of sedation, the effects of related drug interactions, airway management addressing the anatomical knowledge needed for safe practice, different age needs, child sedation, and simulated clinical scenarios (Figure 1). In addition, the study explored the perceptions and attitudes of the participants toward the program through an open-ended questionnaire.

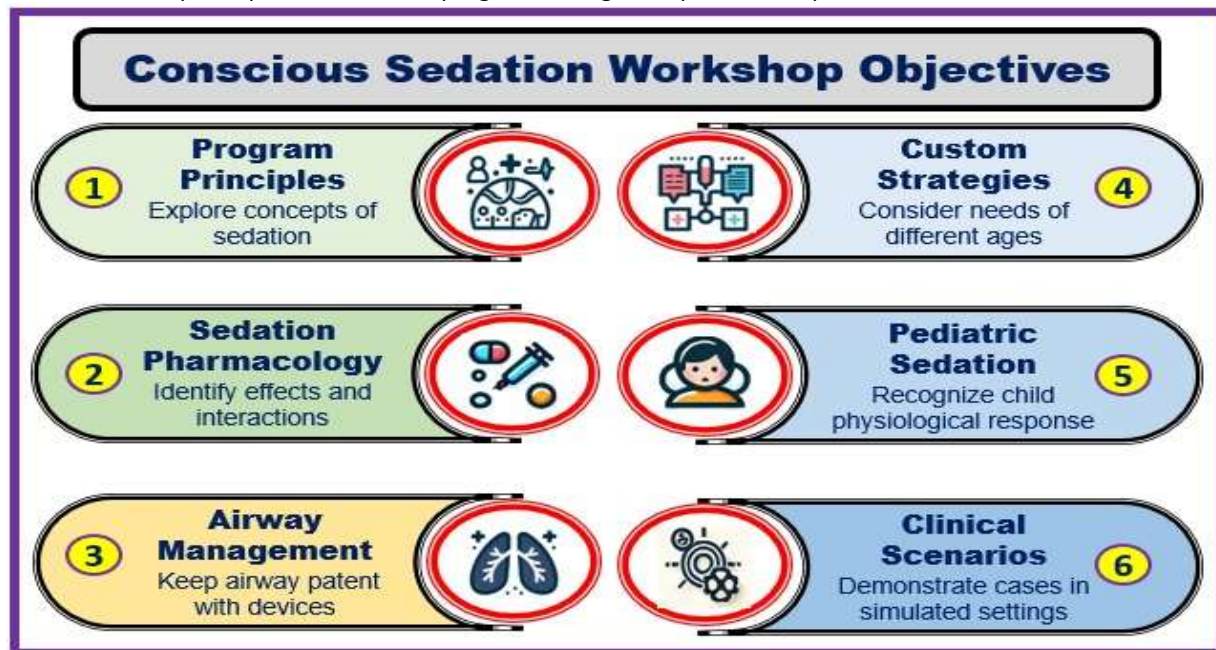


Figure 1: Conscious sedation workshop objectives

2.2 Study Setting and Sampling

The “Conscious Sedation” program is delivered monthly, for eight hours over one day. The study was conducted on the workshop implemented in October 2024, including 173 participants. A Basic Life Support (BLS) course is a program prerequisite. The study received approval from the Committee of Research Ethics, Deanship of Scientific Research, Qassim University. Information about the study goals, objectives, methods, products, and candidates' rights was delivered to the participants, with maintenance of the consent information confidentiality.

2.3 Pre- and Post-Test Intervention

Pre- and post-test intervention is a skill validation implemented before and after the “Conscious Sedation” program to assess the healthcare provider’s ability to achieve sedation successfully and safely. The pre- and post-tests were composed of twenty multiple-choice questions (MCQs). The questions were benchmarked by the Saudi Commission for Health Specialties (SCFHS).

2.4 Data Collection

A comparison was made between the results of the pre-and post-tests to assess the participants' knowledge and practical skills before and after the implementation of the course. Cohen's d-test, which is a quantitative measure of the magnitude of the experimenter effect, was used to measure the effect size to compare the strength of the relationship between the results of the pre-tests and post-tests in all groups. It is determined by calculating the mean difference between the results of the pre-tests that of the post-tests for each health profession, divided by the pooled standard deviation of the data²⁸. It is presumed that the results, even if they are significant, are not by chance.

2.5 Study Questionnaire and SWOT Analysis

A pilot-tested satisfaction survey was administered to participants before the post-test to explore their perceptions and attitudes, using a 5-point Likert scale with 11 questions. The SCFHS pilot-tested the survey with twenty participants. The questions were carefully reviewed to align with the participants' diversity and the program's goals. The survey was collected from the participants to evaluate their perceptions and attitudes towards the "Conscious Sedation" program. A focus group was conducted with 12 participants, selected based on the percentage representation of the specialties in the overall cohort. The group consisted of 4 nurses, 2 physicians, 2 dentists, 2 students, 1 respiratory therapist, and 1 hospital technician. The session was facilitated by one moderator and one observer. The participant group included 6 males and 6 females.

The pre-and post-test results, the satisfaction survey, and the SWOT analysis data were reviewed and interpreted by an independent investigator. The data were analyzed using version 25 of SPSS (Inc., Chicago, IL, USA). Descriptive statistics were applied to determine the quantitative variables and analyzed through paired samples t-tests, with a significant p-value <0.05.

3. Results

The study included 173 participants: 30 physicians (14 males and 16 females), 30 dentists (11 males and 19 females), 65 nurses (22 males and 43 females), 9 hospital technicians (5 males and 4 females), 3 respiratory therapists (0 males and 3 females), and 36 students (15 males and 21 females) from different age groups (Table 1, Figures 2 and 3).

Table 1: Participants' demographic data

	Physicians	Dentists	Nurses	Hospital Technicians	Respiratory therapists	Students	Total
Male	14	11	22	5	0	15	67
Female	16	19	43	4	3	21	106
Total	30	30	65	9	3	36	173

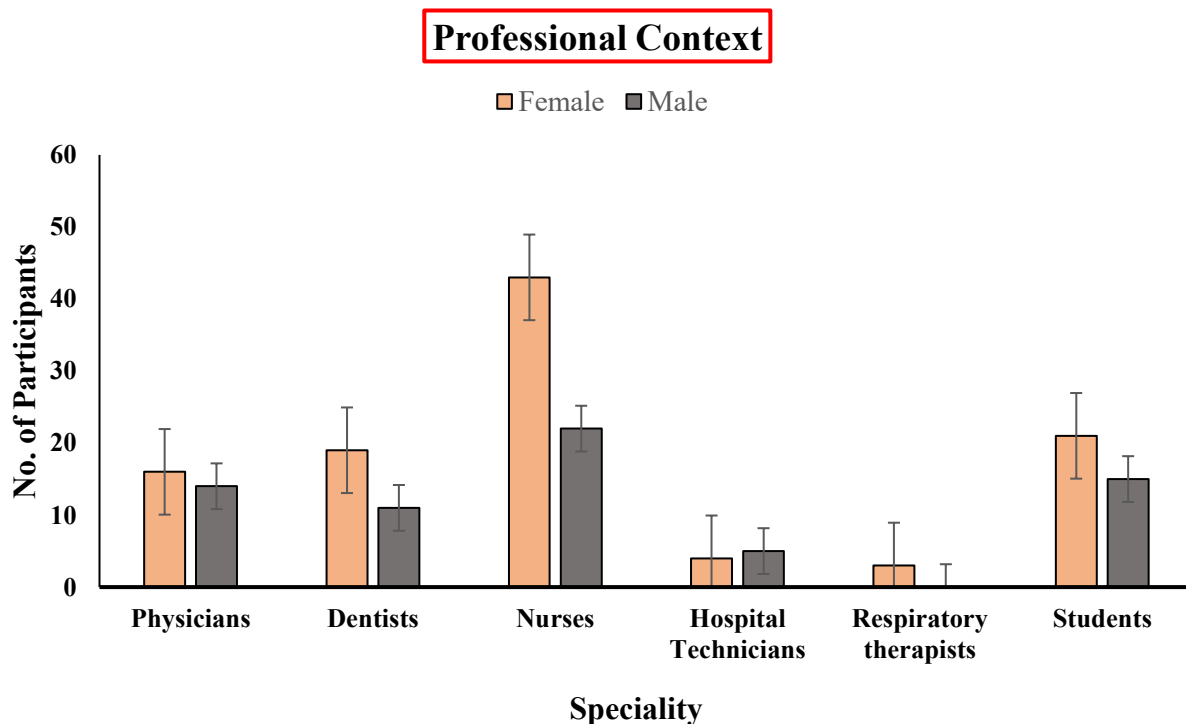


Figure 2: Professional Context

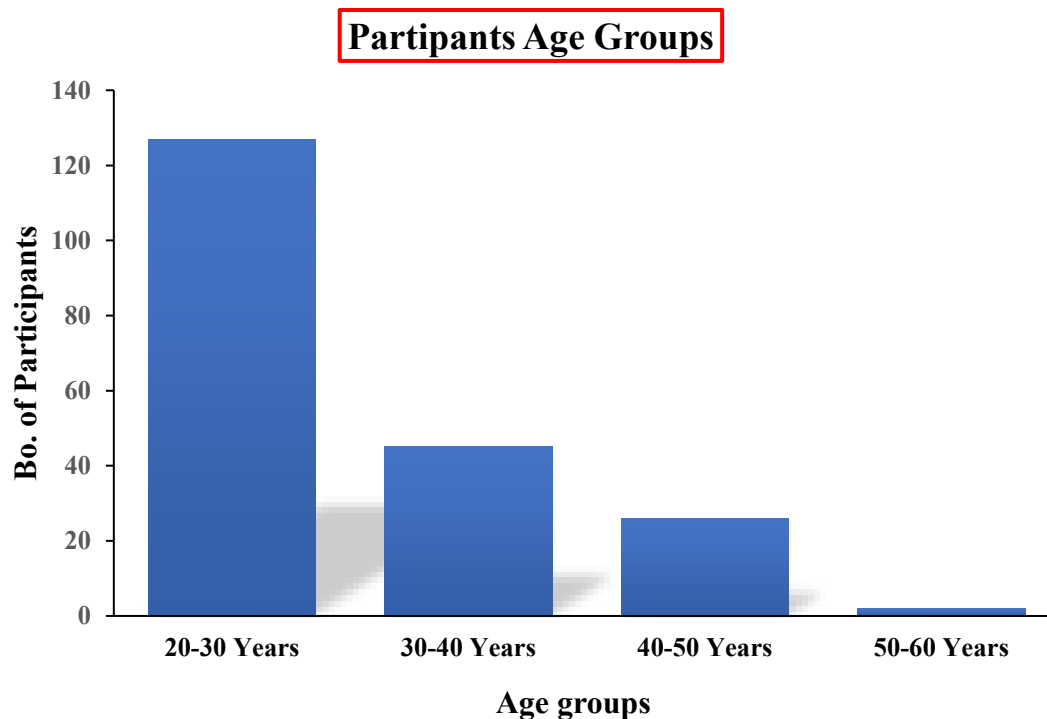


Figure 3: Participants' age groups

The mean of the results of the post-tests of the males and females in all specialties was higher than the mean of the pre-test. It was statistically significant for both genders of nurses and students, but just for female physicians and dentists (Table 2, Figures 4, 5, and 6). The effect size using Cohen's test was more than 0.8 in all groups.

Table 2: Mean and standard error of the results of pre- and post-tests

	Physicians	Dentists	Nurses	Hospital Technicians	Respiratory therapists	Students
Male pre-test	63.36±1.81	66.36±1.92	61.95±1.77*	63.08±4.29	-----	52.73±2.41*
Male post-test	76.71±3.35	78.91±1.72	75.82±1.24*	76.40±3.65	-----	62.67±1.86*
Female pre-test	65.93±2.51*	59.79±1.29*	66.65±1.14*	63.75±3.33	70.33±2.60	53.00±1.20*
Female post-test	80.21±1.25*	73.68±.84*	78.56±.84*	76.75±3.40	79.33±1.20	65.29±1.72*

* Significant difference between the pre- and post-test within the same gender and specialty, p-value <0.05.

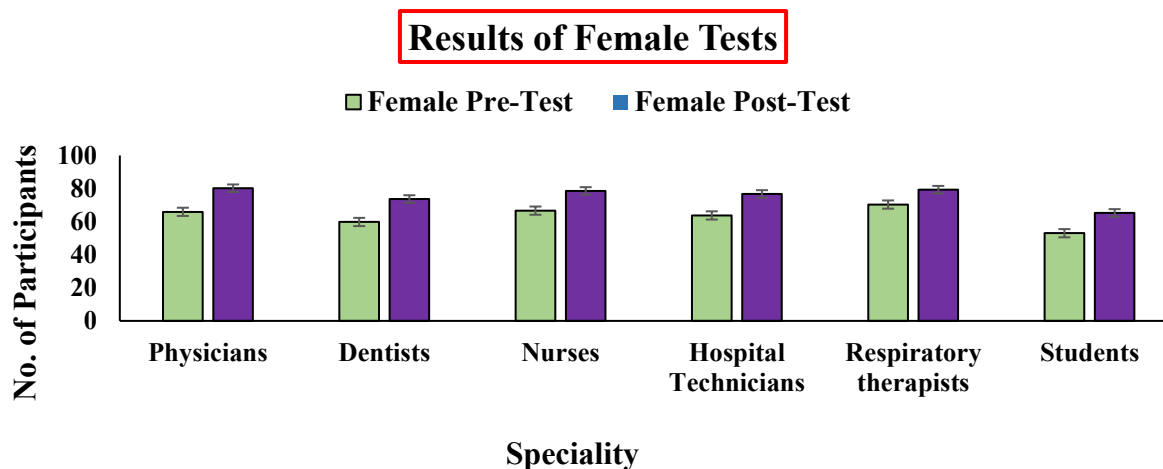


Figure 4: Mean and standard error mean of the results of female pre and post-tests

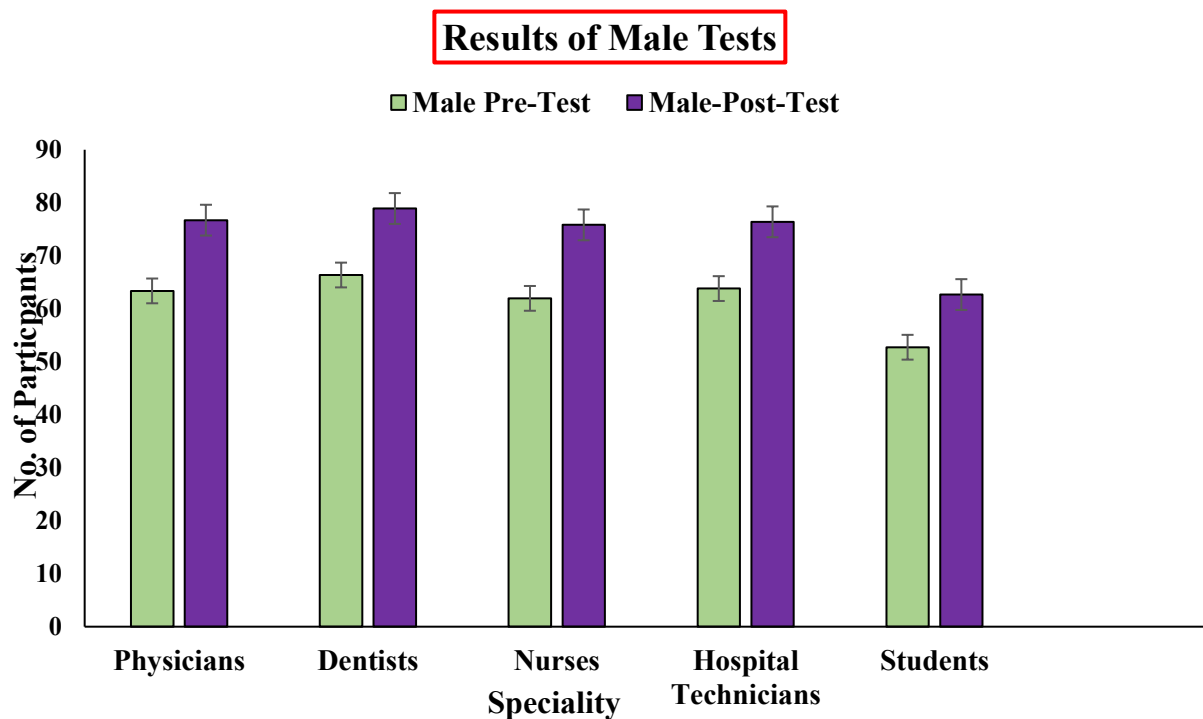


Figure 5: Mean and standard error mean of the results of male pre and post-tests

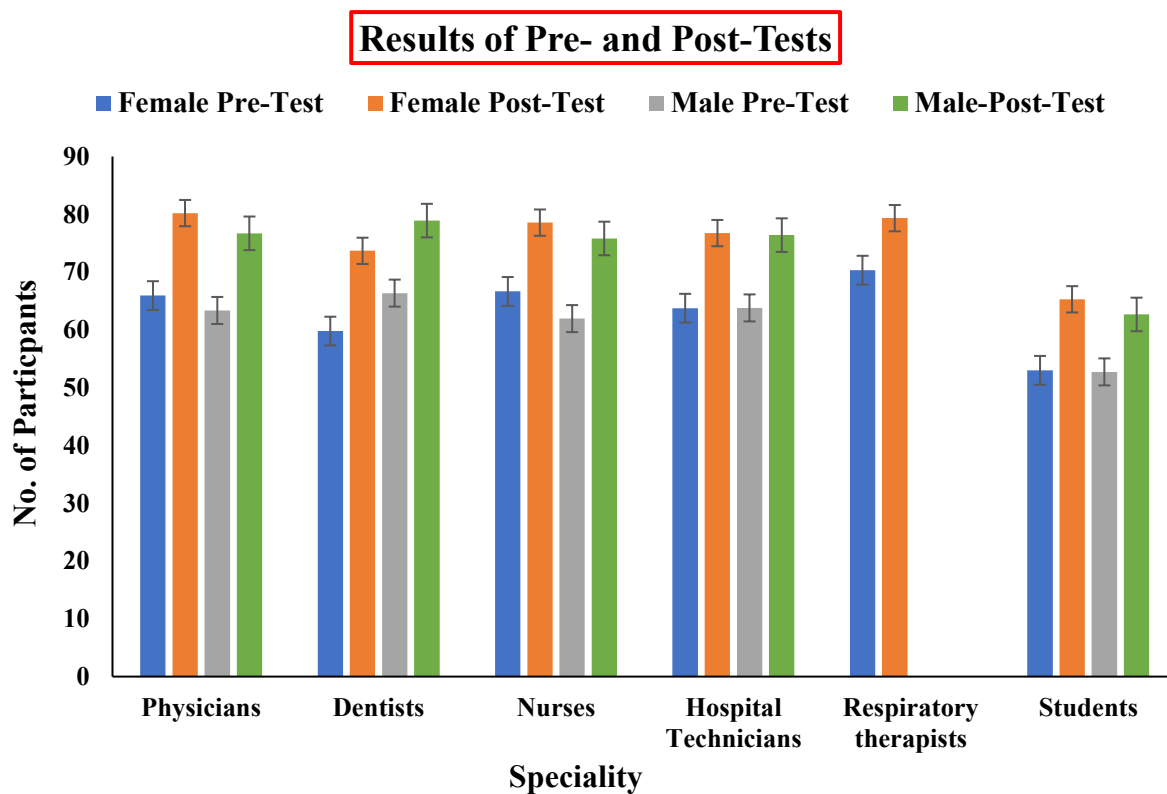


Figure 6: Mean and standard error mean the results of pre and post-tests of all specialities

117 (67.6%) participants completed the study questionnaire. Participants' satisfaction with the conscious sedation workshop experience was reported in Table (3) and Figure (7). The survey questions covered two parts: the general evaluation of the overall attainment of the program's intended learning outcomes. The second part is the trainer's evaluation of the content transfer competency.

Table 3: Participants' survey with conscious sedation workshop experience

Qs	Questions	SA%	A%	N%	D%	SD%
Q1	Practice conduct has changed as a result of training	51.47	27.94	8.82	6.62	5.15
Q2	The environment, structure, and location were satisfactory	52.94	30.88	6.62	3.68	5.88
Q3	Anatomical orientation was essential to promote learning and mastering clinical skills.	52.94	33.09	5.88	4.41	3.68
Q4	Used anatomical models augmenting clinical training	58.09	25.74	8.82	4.41	2.94
Q5	Provided skills were applicable in practical settings	55.15	29.41	6.62	5.15	3.68
Q6	Overall perception about the course was satisfactory	66.18	24.26	4.41	2.94	2.21
Q7	Speakers provided lucid and perceptive answers to queries	54.41	29.41	8.09	5.15	2.94
Q8	Speakers were enthusiastic, respectful, and cooperative	56.62	26.47	5.15	6.62	5.15
Q9	Speakers were well-prepared and well-organized	53.68	30.88	5.88	5.15	4.41
Q10	Speakers spoke clearly and at a suitable tempo	58.09	26.47	6.62	4.41	4.41
Q11	Speakers were knowledgeable about the learning objectives	59.56	27.21	7.35	3.68	2.21

SA: strongly agree, A: agree, N: neither agree or disagree, D: disagree, SD: strongly disagree

Satisfaction Surevy Results

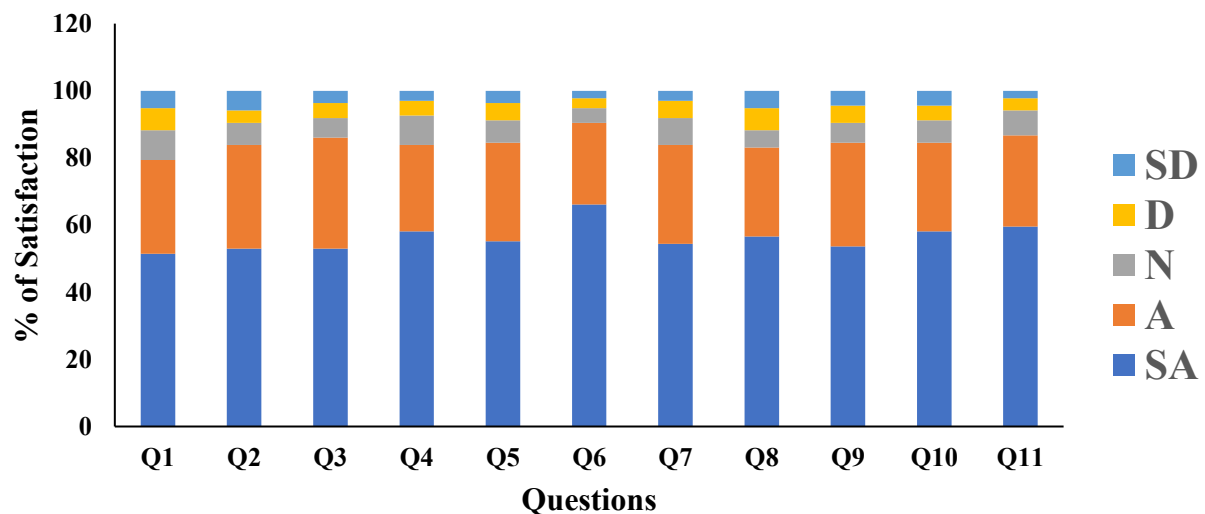


Figure 7: Participants' survey with conscious sedation workshop experience

The focus group discussion was classified into four themes based on SWOT analysis (Figure 8).

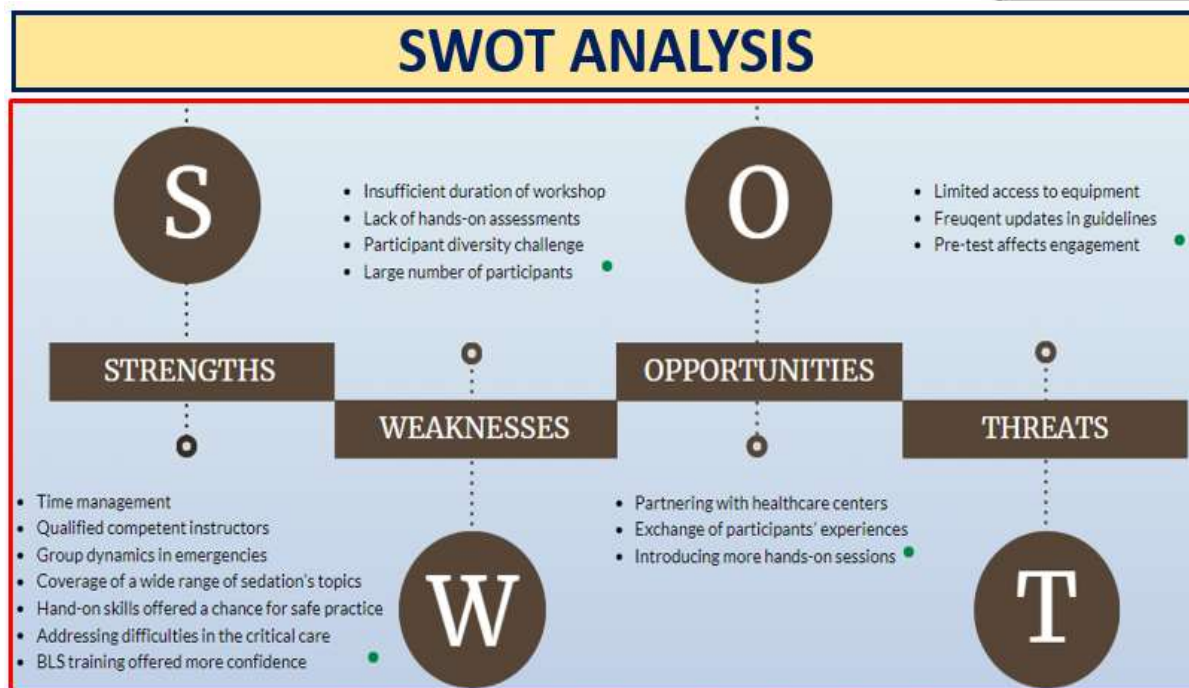


Figure 8: SWOT analysis of the conscious sedation workshop focus group

Regarding the theme of strengths, most participants agreed on the organization and time management of the workshop. They were satisfied with the instructors' qualified competency and group dynamics in an emergency. Many of them appreciated the importance of the orientation of the structure of the respiratory tract, coverage of the wide range of sedation topics and the hands-on skills that offered a chance for safe practice. They were also satisfied with addressing the difficulties in critical care, with much appreciation for the BLS training that gave them more confidence. The points of weakness disclosed by the participants included the limited duration of the training and assessments, the specialty and experience diversity challenges, and the large number of participants. Concerning the opportunities that could be gained, the participants sharing in the focus group approved the partnership with other healthcare centers, acknowledged the exchange of participants' experience, and involvement in more hands-on sessions. Regarding the threats, one participant reflected on the limited access to the equipment and the effect of the pre-test on engagement. Others restricted them to the frequent updates in the workshop guidelines.

4. Discussion

Conscious sedation is a critical component for healthcare providers, enabling them to perform several procedures safely and appropriately with minimal discomfort and anxiety. However, effective management of sedation requires qualified knowledge and skills. Therefore, conscious sedation workshops play a vital role in training healthcare professionals to deal with sedated or anesthetized patients, with the important competencies to manage sedation processes confidently and proficiently. These workshops cover necessary topics such as the anatomy of the upper respiratory airway, which improves the expected outcomes of clinical training and skills needed to master conscious sedation and improves the knowledge required for safe procedural sedation. This was in agreement with 29. In addition, the current study addressed the value of drug administration, airway management, and patient monitoring. These skills ensure the delivery of high-quality care and minimize potential risks. This agrees with previous studies, which reported that hands-on clinical experience with informative supervising instructors is very important for healthcare professionals during their clinical practice^{30,31}. The number of participants in the conscious sedation workshop in QUMC-CSC showed a remarkable increase of up to 4-fold compared with their

number in the first workshop due to the outcomes and effectiveness of the program revealed by the participants. In addition to the increase in the diversity of specialties, both males and females, that registered in the program due to its benefits and efficiency. The theoretical knowledge and clinical skills assessed in the pre and post-tests revealed improvement in the participants' levels in the post-tests compared with the results of the pre-tests. These findings reflect the benefits of hands-on experience and clinical teaching.

The effect size is more than 0.8 when comparing all groups using paired t-tests, which reflects that the difference between results of pre- and post-tests is large enough and consistent to be important and very substantial. Consistent with the findings of the present study, (32) detected a significant increase in the scale scores of nursing confidence after conscious sedation workshop training to deal with complications of sedation. The findings of the present work revealed multiple advantages of the program for the participants, to enhance the understanding and confidence of healthcare providers with conscious sedation, including using simulation and educational situations in the CPD. Concerning the overall fulfillment of the program's intended learning outcomes, the participants revealed great gratefulness for the hands-on experience provided by the workshop to promote their clinical practice. They were satisfied with the program coordination, location, and learning environment, which enhanced their practical levels.

Orientation about anatomical aspects of the upper respiratory tract, tactics, and training equipment was also appreciated, giving them a better understanding of the upper respiratory anatomy and confidence in several aspects of sedation situations. A previous study evaluated the patients' and nurses' satisfaction with the conscious sedation training workshop during digestive endoscopy procedures. High levels of satisfaction were indicated among the nurses, focusing especially on training experience and the practical support they received in the workshop. They reflected more confidence and competence in dealing with the management of sedated patients³³.

Moreover, the participants in the present study were grateful for the way of teaching and engagement. They valued the high relevance of information that increased their knowledge levels and clinical practice.

The integration of basic anatomical knowledge of the upper respiratory tract with training was impressive and helped them master the clinical skills needed to apply conscious sedation programs²¹. These findings emphasize the value and efficacy of dedicated programs to increase the level of awareness of this important topic, which agrees with previous literature¹⁴. The general impression of the participants was highly positive regarding the trainers' performance and competence. They appreciated their respectful and valuable response to their inquiries. They also reflected their enthusiasm with the trainer's encouraging engagement and stimulation of their attention and critical thinking. The participants declared their appreciation towards the smooth delivery of the materials, proper understanding, and active communication as demonstrated by other studies⁵. The authors emphasized the importance of providing a simulation environment with similar clinical experiences where the participants can interact, communicate, and give feedback freely and safely. The findings of the present work represented the diversity of the participants' specialties and experiences that affected their engagement and performance based on the analysis of the satisfaction surveys. These findings align with previous studies, which reported that interprofessional education and team-based training could influence participants' satisfaction levels³⁴. In addition, the participants reported their satisfaction with the addressing of a wide range of sedation topics, the difficulties in critical care, and BLS training which gave them more confidence. Therefore, it could be recommended to include various healthcare professionals in such conscious sedation workshops to acquire more group dynamics and well-adjusted educational strategies for better knowledge exchange, and clinical experience. However, the participants reflected their need to increase the duration of the training and assessments, as one day was limited to practicing hands-on skills. Moreover, the large number of participants was a challenge for the organization and coordination of the workshop that could be solved in future training programs.

A few limitations to data collection involved the number of participants who completed the questionnaire and the study would include significant stakeholders, such as patients and institute administration.

Conclusion

This study demonstrates that the conscious sedation training program at QUMC-CSC significantly improved participants' knowledge, as evidenced by a statistically significant increase in post-test scores across multiple disciplines, particularly among nurses, students, and female physicians and dentists. Quantitative and qualitative analyses revealed high participant satisfaction,

with the hands-on simulation component, expert instruction, and safe learning environment being highlighted as key strengths. One of the major findings is the value of the integration between basic anatomical knowledge of the upper respiratory tract and training in improving performance during clinical sessions. Participants reported increased confidence and perceived enhancement of their clinical practice. The main challenges identified were the workshop's limited duration and large group size. These findings underscore the efficacy of simulation-based training in conscious sedation and support its strategic expansion to include a wider interprofessional audience. Future iterations should consider streamlining participant numbers and extending the course duration to maximize hands-on skill development

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