Assessing knowledge and preparedness in airway management among senior medical students in Al-Baha University

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Abstract

Background: Airway management is the basis for resuscitation. As such, it is imperative that all physicians become proficient in this critical ability. The purpose of this study was to examine medical students' perceptions, knowledge, and preparedness for airway management.

Method: Our research was a prospective, cross-sectional study. Focused on the clinical years (fourth, fifth, sixth, and internship years) of medical students at the Al-Baha Faculty of Medicine in Al-Baha University, Al-Baha Saudi Arabia. The data processing and analysis was done using SPSS version 24, with the mean ± standard deviation being used for continuous variables and frequency and percentage for categorical variables.

Result: 156 students were involved in our investigation, 63.5% were male. Over 50% of the participants completed all three modules at once. With 51.4 and 59.2%, respectively, the participants who completed the modules in tandem demonstrated the highest degree of good and moderate grade point average. The modality type used, and overall degree of confidence were shown to be significantly correlated (p value 0.002). Additionally, the modality type used, and overall level of preparedness were shown to be significantly correlated (p value 0.016). However, there was no discernible correlation found between the modality type used and overall effectiveness.

Conclusion: Enhancement of the participants' expertise in executing endotracheal intubation and supraglottic airways devices is necessary, in addition to their readiness for both emergency department and elective operating room intubations.

Keywords: airway management, students' knowledge assessment, preparedness

Background

Airway management is a vital clinical skill for any medical student. Severe consequences, including death, are linked to lung ventilation incapacity. During a crisis, physicians should be able to use a variety of procedures to quickly and definitively manage the airway. There are several published evidence-based practice guidelines for airway management that offer suggestions for safe airway management (1–3). All of these recommendations emphasize anticipating difficult airways, maintaining oxygenation, using different airway adjuncts promptly, utilizing supraglottic airway devices as rescue or final measures, surgical airways for complete ventilation failure, and coordinated teamwork, effective communication, even though their methods may vary slightly.

Anesthesia and emergency medicine, among other clinical specialties, have benefited greatly from the extensive **use of simulation based learning in medical education. Inadequate treatment of airways continues to be a major source of morbidity and mortality and has long been seen as one of the most difýcult responsibilities facing healthcare professionals. A few studies have been conducted on the application of simulation based learning to train medical students in different facets of airway management (4–6). Notably, a systematic review conducted by Y Sun et al. revealed that SBT was linked to improvements in learner behavior, performance, and an increase in learner interest and satisfaction when compared to non-SBT. However, there was no discernible impact on the acquisition of information for airway management (7).**

From the very beginning of training, it is crucial to provide both normal and difýcult airways with sustainable airway management training. In addition to non-simulation-based training techniques like classroom lectures, video demonstrations, problem-based learning, case discussions, and traditional airway training methods involve bedside instruction on patients under supervision. It might not be sufýcient, though, as an unexpectedly difýcult airway is uncommon.

Objectives

Our study aimed to examine the foundational knowledge, self-assurance, and comfort levels of medical students in airway management, to assess the students' knowledge of different airway tools and procedures and to examine how various learning methods affect students' proficiency with airway management.

Method

Study design
Our study was cross sectional prospective study.

Study area
Al-Baha faculty of medicine, Al-Baha, Saudi Arabia.

Study population.
Our research focused on medical students in their clinical years (fourth, fifth, sixth, and internship year) to guarantee a varied sample that would represent different training stages**.**

Sample size and sampling technique.
We included 156 students who represent all fourth, fifth, sixth year as well as internship students in the training program.

Study period
Study was conducted in March 2024.

Data collection tool
Information was collected using a questionnaire, which was filled in by participants in Google form. The questionnaire contains questions regarding; (Gender; study level; participant GPA; Module taken; knowledge, confidence, preparedness and effectiveness assessment questions).

Statistical consideration
SPSS version 24 was used for data analysis and processing, frequency and percentage were used for categorical variable, while mean ± standard deviation was used for continuous variables. Sum tool in SPSS was used calculate the total levels of knowledge, preparedness, confidence and effectiveness, by calculating mean of the domains of each parameter. Chi squire with Fisher exact test were used to find the relation between the modality taken by participants and total level of knowledge, preparedness, confidence and effectiveness.

Ethical consideration
Ethical approval was obtained from Al-Baha medical faculty, ethical review board with IIRB approval number REC/SUR/BU-FM/2024/23

Expected outcomes
• Determine where medical students' airway management skills need to be improved and where knowledge gaps exist.
• Evaluate how various teaching modalities affect students' readiness and self-assurance.
• Give medical educators advice on how to improve training programmers and curricula for airway management.

Results

In our study we included 156 participants, 63.5% were male. Of the overall participants 43.6% were in the Sixth year medical school, 21.2% in the Fourth year, 18.6% in the Fifth year, and 16.7 in internship (Table 1). Providing that A+ score was the maximum and F was the minimum score (in a scale from 0 to 8), the mean participant GPA was 5.6±1.5. The majority of the participant's score, 44 (28.2%), was B+, while the least score was D (1.3%). More than half of the participants took the 3 modules together (Intensive care module, ENT (otolaryngology) module and emergency medicine module), 19.2% had ENT (otolaryngology) module only, 4.5% had Emergency medicine module and 1.3% had Intensive care and emergency medicine modules together, while no module taken in 19.8% of them.

Table 1: characteristics of included participants

		Frequency	Percent
Gender	Male	99	63.5
	Female	57	36.5
Study level	Fourth year	33	21.2
	Fifth year	29	18.6
	Sixth year	68	43.6
	Intern	26	16.7
Participant GPA	D	2	1.3
	D+	2	1.3
	C	9	5.8
	C+	25	16.0
	B	29	18.6
	B+	44	28.2
	A	23	14.7
	A+	22	14.1
Which Module have you already taken	ENT (otolaryngology) module	30	19.2
	Intensive care module; ENT (otolaryngology) module	2	1.3
	Intensive care module; ENT (otolaryngology) module; emergency medicine module	82	52.6
	Intensive care module; emergency medicine module	2	1.3
	ENT (otolaryngology) module; emergency medicine module	1	.6
	Emergency medicine module	7	4.5
	Intensive care module	1	.6
	No module taken	31	19.87
GPA; grade point average			

Regarding the emergency medicine module which was taken by 100 participants the mean ± SD score was (5.5 ± 1.4), the most prevalent score was B+ (17.9%) and the least one was D (0.6%). Intensive care unit module was taken by 94 participants and its mean score was (5.7±1.5), and the most prevalent score was B+ also. The mean score of ENT module was (7.6±0.7) providing that ENT module got the highest mean score among the others (Table 2).

Table 2: grade of participants in each module

Grade/ Module	Emergency medicine module N (%)	Grade in Intensive Care Module N (%)	ENT (Otolaryngology) Module N (%)
M ± SD	5.5 ± 1.4	5.7±1.5	7.6±0.7
1.00 D	1 (0.6)	1 (0.6)	NA
2.00 D+	4 (2.6)	1 (0.6)	NA
3.00 C	3 (1.9)	7 (45)	NA
4.00 C+	13 (8.3)	10 (6.4)	2 (1.3)
5.00 B	25 (16.0)	20 (12.8)	
6.00 B+	28 (17.9)	25 (16.0)	7 (4.5)
7.00 A	19 (12.2)	18 (11.5)	21 (13.5)
8.00 A+	7 (4.5)	12 (7.7)	92 (59.0)
Module not taken	56 (35.9)	62 (39.7)	34 (21.8)
Abbreviation ; NA; not available, M; mean, SD; standard deviation			

Each of the 4 domains assessed in the questionnaire in a scale was as follows; (very poor, poor, moderate, good, and very good). Table 3 demonstrates the frequency and percentages of questions used to assess the 4 domains.

Table 3: frequency and percentage of evaluation parameters in knowledge, conýdence, preparedness and effectiveness domains

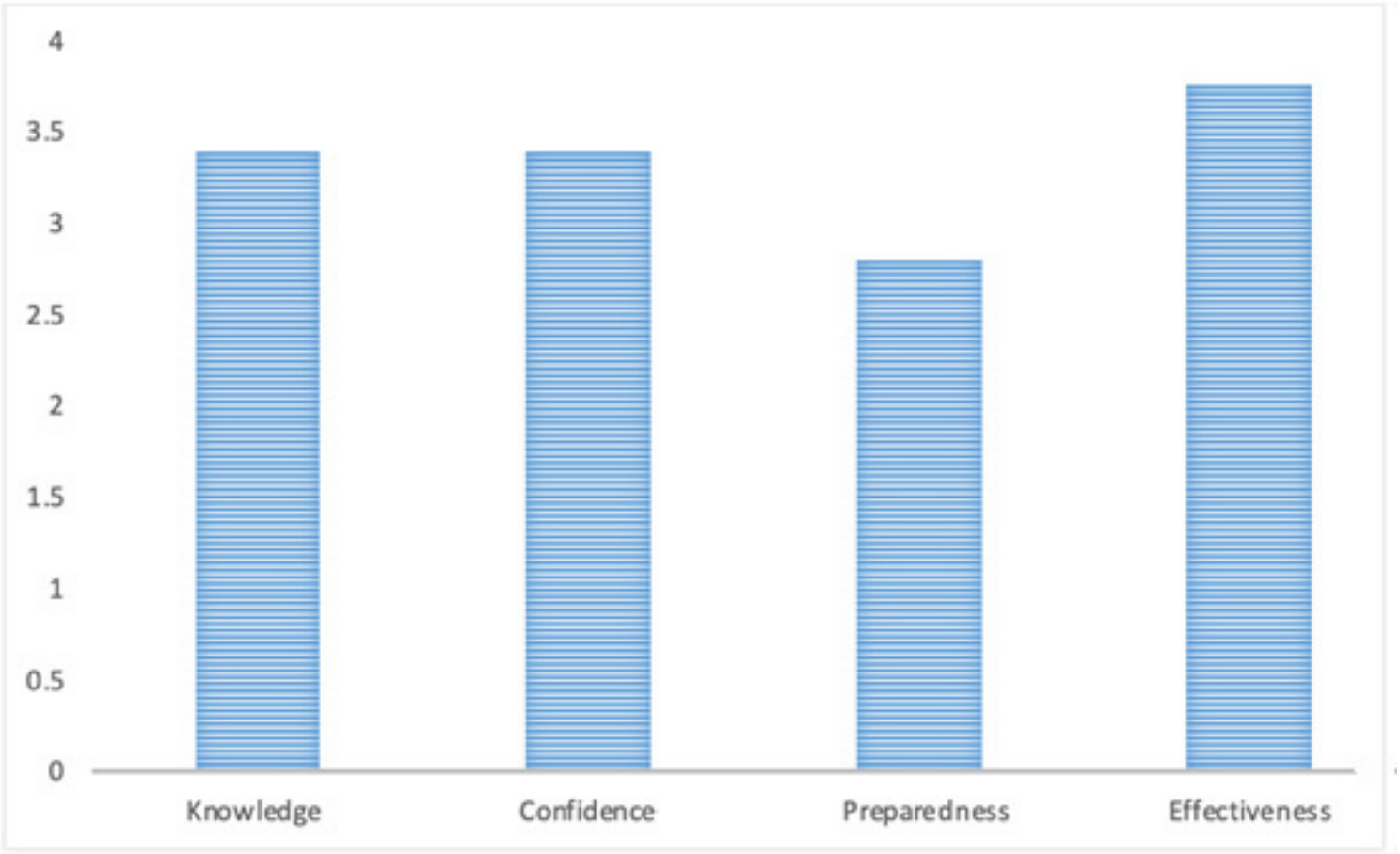
		Very poor	Poor	Moderate	Good	Very good
Confidence to perform Bag-mask ventilation	N	9	16	26	49	56
	%	5.8	10.3	16.7	31.4	35.9
Confidence to perform Endotracheal intubation	N	28	34	40	31	23
	%	17.9	21.8	25.6	19.9	14.7
Confidence to perform supraglottic airway devices	N	25	42	47	27	15
	%	16	26.9	30.1	17.3	9.6
Level of knowledge in Anatomy of the respiratory system	N	2	8	46	67	33
	%	1.28	5.13	29.5	42.95	21.2
Level of knowledge Physiology of respiration	N	3	20	55	50	28
	%	1.92	12.8	35.3	32.05	17.9
Level of knowledge Airway assessment techniques	N	2	7	38	54	55
	%	1.28	4.49	24.4	34.62	35.3
Level of knowledge Techniques for airway management	N	5	27	31	44	49
	%	3.21	17.3	19.9	28.21	31.4
Prepared to perform elective intubation in the operating room	N	37	34	44	24	17
	%	23.7	21.8	28.2	15.38	10.9
Prepared to perform Emergency intubation in the emergency department	N	33	45	41	23	14
	%	21.2	28.8	26.3	14.74	8.97
Prepared for Management of a failed airway situation	N	29	49	45	26	7
	%	18.6	31.4	28.8	16.67	4.49
Effectiveness of Self-directed learning	N	26	25	51	32	22
	%	16.7	16	32.7	20.51	14.1
Effectiveness of Case-based learning	N	15	25	50	33	33
	%	9.62	16	32.1	21.15	21.2
Effectiveness of Clinical sessions	N	7	8	32	36	73
	%	4.49	5.13	20.5	23.08	46.8
Effectiveness of Lectures	N	7	20	51	51	27
	%	4.49	12.8	32.7	32.69	17.3

Total knowledge was obtained by adding all the 4 components of knowledge in the questionnaire (Anatomy of the respiratory system, physiology of respiration, airway assessment techniques, and techniques for airway management) and the mean of total score was calculated and classified into (very poor, poor, moderate, good, very good). Participants who took the modules together had the highest level of good and moderate total knowledge 51.4 and 59.2% respectively (Table 4). Total confidence was obtained by adding all the 3 components of confidence in the questionnaire (confidence to perform Bag-mask ventilation, confidence to perform endotracheal intubation and confidence to perform supraglottic airway devices) and the mean of total score was calculated and classified into (very poor, poor, moderate, good, very good). We found a significant association between the modality type taken and total level of confidence (p value 0.002) (Table 4). Total preparedness was obtained by adding all the 3 components of preparedness in the questionnaire (prepared to do elective intubation in the operating room, prepared to do emergency intubation in the emergency department, and prepared to manage failed airway situation) and the mean of total score was calculated and classified into (very poor, poor, moderate, good, very good). We found a significant association between the modality type taken and total level of preparedness (p value 0.016) (Table 4). Total effectiveness was obtained by adding all the 4 components of effectiveness in the questionnaire (effectiveness of Self-directed learning, effectiveness of Case-based learning, effectiveness of Clinical sessions, effectiveness of Lectures) and the mean of total score was calculated and classified into (very poor, poor, moderate, good, very good). We found no significant association between the modality type taken and total level of effectiveness. Comparison of the mean values for total levels of knowledge, preparedness, confidence and effectiveness is presented in Figure 1.

Table 4: chi square test of (module taken VS total knowledge, preparedness and confidence)

		ENT (otolaryngology) module, n (%)	Intensive care module; ENT (otolaryngology) module, n (%)	Intensive care module; ENT (otolaryngology) module; emergency medicine module, n (%)	Intensive care module; emergency medicine module, n (%)	ENT (otolaryngology) module; emergency medicine module, n (%)	Emergency medicine module, n (%)	Intensive care module, n (%)	No module taken	P value
Total knowledge	Poor	3 (30)	0 (0)	2 (20)	1 (10)	0 (0)	1 (10)	0 (0)	3 (30)	0.291
	Moderate	13 (17.6)	1 (1.4)	38 (51.4)	0 (0)	1 (1.4)	2 (2.7)	1 (1.4)	18 (24.3)	
	Good	14 (19.4)	1 (1.4)	42 (58.3))	1 (1.4)	0 (0)	4 (5.6)	0 (0)	10 (13.9)	
Total confidence	Very poor confidence	1 (25)	0 (0)	0 (0)	00 (0)	0 (0)	00 (0)	0 (0)	3 (75)	0.002
	Poor confidence	9 (33.3)	0 (0)	3 (11.1)	1 (3.7)	0 (0)	3 (11.1)	0(0)	11 (40.7)	
	Moderate	11 (22.4)	0 (0)	22 (44.9)	0 (0)	1 (1.8)	3 (6.1)	1 (2)	12 (24.5)	
	Good confidence	9 (16.4)	0	40 (72.7)	1 (1.8)	0 (0)	1 (1.8)	0 (0)	3 (5.5)	
	Very good confidence	0 (0)	2 (9.5)	17 (81)	0 (0)	0 (0)	0 (0)	0 (0)	2 (9.5)	
Total Preparedness	Very poor preparedness	4 (28.6)	0 (0)	2 (14.3)	0 (0)	0 (0)	1 (7.1)	0 (0)	7 (50)	0.016
	Poor preparedness	9 (20.9)	0 (00	17 (39.5)	0 (0)	0 (0)	2 (4.7)	0 (0)	15 (34.9)	
	Moderate	13 (22)	1 (1.7)	35 (59.3)	0 (0)	00 (0)	4 (6.8)	1 (1.7)	5 (8.5)	
	Good preparedness	4 (13.8)	0 (0)	20 (69)	2 (6.9)	1 (3.4)	00 (0)	0 (0)	2 (6.9)	
	Very good preparedness	0 (0)	1 (9.1)	8 (72.7)	0 (0)	0 (0)	0 (0)	0 (0)	2 (18.2)	
Total effectiveness	Very poor effectiveness	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0.352
	Poor effectiveness	3 (30)	0 (0)	3 (30)	0 (0)	0 (0)	2 (20)	0 (0)	2 (20)	
	Moderate	9 (20.5)	0 (0)	19 (43.2)	1 (2.3)	0 (0)	3 (6.8)	1 (2.3)	11 (25)	
	Good effectiveness	14 (19.7)	0 (0)	40 (56.3)	1 (1.4)	1 (1.4)	2 (2.8)	0 (0)	13 (18.3)	
	Very good effectiveness	4 (13.3)	2 (6.7)	20 (66.7)	0 (0)	0 (0)	0 (0)	0 (0)	4 (13.3)	

Figure 1: mean scores of total levels of knowledge, preparedness, conýdence and effectiveness



Discussion

The knowledge of the participants was evaluated in the following four domains: 1. anatomy of the respiratory system; 2. physiology of respiration; 3. procedures for airway assessment; and 4. techniques for airway management. The majority of participants had a moderate and good level of knowledge, 47.4% and 46.2% respectively. The greatest degree of good and moderate overall knowledge (51.4 and 59.2%, respectively) was attained by participants who completed the 3 modules collectively. In 2021, a study on fifth and sixth grade students at the Faculty of Medicine was carried out to assess the knowledge level regarding airway treatment in maxillofacial injuries. A third of the students reported performing laryngeal mask airway, nasoendotracheal intubation (17%), and orotracheal intubation (61%). Out of the students, thirty-four percent said they didn't use any of these applications. Merely 52% of them reported using a conventional laryngoscope equipped with Macintosh blades. Although 74% of the students believed that a patient with craniofacial injuries lacked the training and expertise to execute intubation comfortably, 81% of the students said they never performed any intubation on a patient with this type of trauma (8). As well as our study, Ömer et al., 2021 study findings show that students' proficiency and understanding of airway management in situations like craniofacial trauma were inadequate.

A patient's airway should be assessed as quickly and accurately as feasible. The patient should be transferred right away to a room with all the necessary equipment when the doctor determines the best course of action for achieving airway control. Physicians should possess not only theoretical knowledge but also the ability to identify and operate tools used in airway care. In our study 35.3% and 34.6% had a very good and good knowledge respectively, regarding Airway assessment techniques.

A number of researchers looking on Turkish doctors' knowledge and proficiency in airway management have been conducted recently. Sixty percent of doctors who serve in ambulances for emergency services in Turkey responded to a poll asking about their training, which included 27 doctors. Furthermore, it was noted that following graduation, none of the doctors had any additional training in airway care (9). More than 80% of participants in a different study that examined research assistants' experiences with airway management during medical specialization training in Turkey said that their first exposure to airway equipment and its use occurred during their internship in anesthesiology and reanimation at the medical faculty. 13.4% of the participants said they had never used the airway, one of the most basic airway devices, whereas 34.3% of them said they had performed their first endotracheal intubation after graduating from medical school (10). In our study only 14.7% had very good confidence in endotracheal intubation.

We evaluated students' confidence in their ability to use supraglottic airway devices, endotracheal intubation, and bag-mask ventilation in our study. 35.9 of the students had very good confidence in Confidence to perform Bag-mask ventilation. 21.8% and 17.9% had poor and very poor Confidence respectively to perform endotracheal intubation. Regarding the performance of supraglottic airway devices 26.9

had poor confidence and only 9.6% had very good confidence to perform. In order to determine how well learning strategies for intubation during the COVID-19 pandemic worked, a study was carried out in 2023, which found that for students at the Faculty of Medicine, the modified and traditional Peyton Four-Step Approach learning technique was equally effective in teaching the fundamentals of endotracheal intubation (11). According to Chugh et al.'s, 2020 study, medical students' information retention was statistically enhanced by spaced instruction combined with extended time learning (12). A study was conducted in 2020 comparing the effectiveness of two widely used supraglottic airway devices, classic LMA and I-gel, in securing airway. Following a brief training period, the study discovered that while overall success was the same, first-attempt success rate was higher than in I-gel's if compared to cLMA's. Most of the participants had the ability to secure airway more quickly and readily with I-gel than cLMA, according to the authors' conclusion, and over 90% of participants preferred I-gel (13).

In the advanced resuscitation, maintaining airway patency during cardiopulmonary resuscitation and implementing optimum ventilation are crucial components. In an earlier study, 52.4% of participants had received practical training on supraglottic airway devices (SADs), compared to 63.4% of participants who had received theoretical instruction on SADs. When performing cardiopulmonary resuscitation on an adult, 81.7% of participants would use a supraglottic breathing device to keep the airway patency open; in the event that a paediatric patient went into cardiac arrest, 71.9% of participants would use the same device (14).

In our study 67.3 of students having either good or very good confidence in performing bag mask ventilation, these findings were similar to a previous study by Lin et al., 2009, where they found the majority of students in the study were aware of the appropriate head placement techniques in both trauma-related and non-trauma-related instances (72% and 93%, respectively) (15).

Conclusion

Participants' confidence in performing endotracheal intubation, supraglottic airways devices once they have to do it, needs to be improved, as well as their preparedness in elective intubation in the operating room and emergency intubation in the emergency department. On the other hand, participants' knowledge in anatomy of the respiratory system, physiology of respiration and airway assessment techniques was good.

More studies and simulated modules improvements in the medical clinical year should be focused on, to ensure graduation of safe efficient students prepared to manage life threatening situations like airway issues.

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