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ORIGINAL ARTICLE

Knowledge, Attitude, and Practice Toward Prolonged Intubation among Healthcare Providers

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Abstract

Introduction: Intubation is a preferred and reliable procedure to support the airways during mechanical ventilation. However, it is associated with several complications. The present study aimed to evaluate the knowledge, attitude, and practice of the Intensive Care Unit (ICU) staff regarding the complications of prolonged intubation among health providers.

Methods: This study followed the descriptive-analytical approach. The study population included the personnel of the ICU and the emergency department of Valiasr University Hospital in Birjand University of Medical Sciences (Iran), including nurses, physicians, as well as assistants of anesthesiology, internal medicine, and neurology in 2018-2019. Participants were included in the study through the census method. In order to collect data, a researcher-made questionnaire was used in four sections: personal characteristics, knowledge, attitude, and practice. Data were analyzed using the SPSS (version 18) software, which used a one-way analysis of variance, Kruskal-Wallis, and Chi-square test. The level of significance was set at α=0.05.

Results: A total of 60 individuals participated in the study: 9 specialists, 16 assistants, 4 masters, and 31 bachelors of nursing. Findings revealed that 26 (21.66%), 32 (53.33%), and 15 (25%) of the participants had good, moderate, and poor knowledge, respectively, toward prolonged intubation. In addition, it was shown that 39 people (65%) had a good attitude, and 12 people (20%) had good practice in the field. The participants' mean knowledge and practice scores were significantly different by educational level ($P<0.05$). Moreover, there was a significant difference between the mean score of participants' knowledge based on their work experience ($P<0.05$).

Conclusion: Considering the knowledge and practice gap, ICU care providers, policymakers, and medical professionals require much effort to raise the knowledge and break the health providers' old beliefs regarding prolonged intubation complications.

Key words: Attitude, Intensive Care Units, Intubation, Knowledge, Practice

Introduction

Tracheal intubation involves the insertion of a flexible tube into the trachea, a procedure introduced by Macewen in the 1880s (1). The technique is adopted when a patient requires mechanical breathing or where aspiration should be prevented. A candidate for tracheal intubation is usually unconscious due to illness or anesthesia (2). Despite advances in medicine and anesthesiology,

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intubation is still a preferred and reliable technique to keep the airways open during mechanical ventilation (3). Intubation has been recognized as the gold standard for airway support by the American Heart Association in 2000. However, it is a potentially invasive and dangerous procedure with complications, including those that may occur during or after the intubation, as well as after extubation. Complications during intubation include laryngotracheal injuries like inflammation, edema, vocal cord ulceration, paralysis, laryngospasm (4,5), bronchospasm, and cardiac dysrhythmias (6). Airway damage, infection (4), endotracheal tube obstruction, cuff leakage, and bleeding are the post-intubation complications. Other complications, such as laryngeal spasm or edema, tracheomalacia, subglottic stenosis, and paralysis of the vocal cords, are related to the extubation period (6). Another complication is tracheal stenosis at the site of the endotracheal tube cuff. The major pathophysiology of this type of tracheal stenosis is tubular cuff pressure, chronic inflammation, and fibrosis (7). Some of these complications, such as airway stenosis after intubation, can complicate the treatment course of patients who need intubation, leading to increased mortality in this group of patients (8). Therefore, large-volume, low-pressure cuffs are suggested to reduce the risk of cuff injury (9). The other predisposing factors for tracheal stenosis include traumatic intubation, high tracheostomy site, severe reflux, high-dose corticosteroid therapy, as well as prolonged intubation (5,10), which is defined as intubation last more than seven days, with 25% of patients extubated at 7 days, 50% at 13 days, and 75% at 31 days (11). It is recognized as one of the most significant causes of acquired tracheomalacia, which is identified as an important clinical condition that increases mortality and health costs (12,13).

If the intubation lasts longer than seven days, it may also cause other complications, such as tracheal ulcer (40% of cases), dysphagia, hoarseness (11), and laryngeal granuloma upon vocal cord abrasion due to intubation or pressure (5,14), and all of them require prevention and further investigation (11) because complications of prolonged intubation are associated with morbidity and mortality and require life-threatening surgical treatments at a high cost. According to several studies, tracheal stenosis is the most common complication of prolonged intubation, with a mortality rate of nearly 10-22% (15). It is accompanied by shortness of breath in 73% of patients, stridor in 5%, and hoarseness in 3% of cases (6). In Khoshsirat et al.'s study of 197 patients with tracheal stenosis, 20.4% had a history of intubation for less than a week, and 25.5% had intubation between 7 and 14 days (6). Meanwhile, diagnostic and therapeutic measures for tracheal stenosis, including surgical intervention, tracheal resection, and anastomosis (16,17) in 76% (17) to 98% of cases (6) are not available in most centers, and the patient should be transferred to an equipped center with a large spatial dimension (18). At the time of referral, the bad condition of patients with tracheal stenosis limits the medical staff's time for diagnostic and therapeutic measures or transferring the patient to equipped centers. Therefore, the need to prevent these deadly complications should be a priority in any special care center. In the meantime, providing sufficient information for early action to change the airway from intubation to tracheostomy is the most effective intervention to prevent stenosis. Therefore, endoscopic airway evaluation is recommended in adults approximately seven days after intubation to convert endotracheal intubation to tracheostomy. This procedure is often performed outside the operating room in an uncontrolled emergency room and intensive care unit (ICU) by less trained personnel other than anesthesiologists or otolaryngologists, leading to an increased risk of these complications. Therefore, different studies have highlighted varying training methods for this skill (19–21) and diagnostic strategies to prevent complications of this procedure (19). Overall, educating and training all personnel involved in intubation and care provision of intubated patients is essential.

While Simsek et al. (2021) report that ICU care providers need to be aware of these conditions (12), some questions are raised: (1) How can these complications be reduced? (2) How well is the practice of healthcare providers in reducing complications during intubation? (3) What conditions aggravate complications?

This research was designed and implemented to answer these questions and clarify ambiguities. Knowledge, attitude, and practice research are commonly employed to identify knowledge gaps and behavioral patterns among demographic and social groups to implement effective public health interventions (22). The present work was designed and conducted since few studies have been conducted on the personnel's knowledge, attitude, and practice in intubated patient care.

Methods

The present study followed the descriptive-analytical approach. The study population included

the personnel of the ICU and the emergency department of Valiasr University Hospital in Birjand University of Medical Sciences (Iran), including nurses, physicians, as well as assistants of anesthesiology, internal medicine, and neurology in 2018-2019. Participants were included in the study through the census method. Inclusion criteria were working in the ICU and having informed consent for participation in the study. The research protocol was approved by the Research Council and the Ethics Committee of Birjand University of Medical Sciences, Iran (ethics code: IR.BUMS.REC. 1397.015).

The knowledge, attitude, and practice of ICU nurses, physicians, and assistants toward prolonged intubation were assessed through the questionnaire. The research population in this study, a crucial group of physicians, nurses, and physicians dealing with intubated patients in intensive care and anesthesia wards, was of significant importance. This group, involving 60 people at the time of the survey, formed the backbone of our research. Therefore, the inclusion criteria included all nurses, medical assistants, and physicians who worked in respiratory care or anesthesia departments and had at least six months of work experience in the intubation and respiratory care fields. Moreover, the exclusion criterion included unwillingness to participate in the study. All individuals were included in the study through census sampling, a method involving every population member. All participants filled out the questionnaire.

The researcher designed a four-part questionnaire by reviewing related literature and consulting with experts. The first section collected data on personal characteristics, including age, gender, field of study, academic rank, and work experience. The second section assessed the knowledge dimension of participants and included six multiple-choice questions. In this section, the respondent was asked about the safe duration of intubation and its complications. The participants were given a score of 1 for a correct answer and 0 for a wrong answer. Therefore, one's score could range between 0 and 6 in the knowledge dimension. The knowledge scores were categorized into good (scores of 5 and 6), moderate (scores of 3 and 4), and poor (scores of 0, 1, and 2). The third section was related to the attitude dimension, which examined an individual's attitude toward intubated patient care and the process of guiding the patient's family in choosing timely tracheostomy and other care. It included 15 questions on a Likert scale (from 1 = completely disagree to 5 = completely agree). The minimum and maximum scores of the attitude section were 5 and 75, respectively. The attitude scores on a scale of 1 to 70 were categorized into good (50 to 75), moderate (20 to 50), and poor (scores below 20).

Finally, the fourth section of our questionnaire assessed participants' practice and included eight multiple-choice questions, each with one score. As a result, they could get a score between 0 and 8 from this section. Participants who took scores of 0, 1, 2, and 3 were considered poor, 4 and 5 were moderate, as well as 6, 7, and 8 were taken into account as good.

The content validity of this questionnaire was confirmed by experts. The questionnaire was distributed among ten experts in the field, and their opinions were collected regarding the necessity, relevance, simplicity, and clarity of each item. The collected data were analyzed in Excel software (version 2018), and Content Validity Ratio (CVR) and Content Validity Index (CVI) coefficients were calculated for each item. The acceptable CVR coefficient for a sample size of n=10 respondents was considered to be higher than 0.62. As the CVR coefficients for all items were higher than 0.62, all items were considered necessary. In the next step, the CVI coefficient was calculated for all items, which were greater than 0.79.

The questionnaire was piloted on 25 people from the target group, who were chosen through stratified sampling to assess its reliability. The items of the practice domains were on a 0-1 scoring scale. The Kuder-Richardson Formula 20 (KR-20) showed a reliability coefficient value of 0.93 for this domain. Moreover, the reliability of the questionnaire's knowledge and attitude domains, measured using Cronbach's alpha, was 0.76. Therefore, the reliability of all domains was confirmed.

The data were analyzed in SPSS (version 18) software, and the results were reported as mean, standard deviation, and relative frequency distribution. Shapiro-Wilk test was used to examine the normal distribution of data. One-way analysis of variance (ANOVA) and the Kruskal- Wallis test were used to analyze the data with normal and without normal distribution, respectively. In addition, the Chi-square test was applied to investigate the association between variables (knowledge, attitude, and practice). The level of significance was set at α=0.05.

Results

In the present study, 60 medical staff of the ICU of Valiasr University Hospital in Birjand University of Medical Sciences (Iran) were evaluated. The mean age of participants was 33.5±7.77 years. They

included 19 (31.7%) males and 41 (68.3%) females. Among 60 participants, 9 (15%), 16 (26.66%), 4 (6.7%), and 31 (51.7%) were specialists, assistants, masters of nursing, and bachelors in nursing, respectively. Table 1 includes the frequency of participants' responses according to knowledge, attitude, and performance areas.

The results of the Shapiro-Wilk test demonstrated that the knowledge and practice scores did not have a normal distribution. Therefore, the nonparametric Kruskal-Wallis test was employed to compare the means. In contrast, since the distribution of attitude scores among participants was normal, a one-way ANOVA was used to compare the means. The mean scores of knowledge, attitude, and practice in the case of participants' educational level are displayed in Table 2.

Table 1. Frequency of participants' responses according to knowledge, attitude, and performance areas

Knowledge

	Question	Right Answer n(%)	Wrong Answer n(%)
1	What do you think is the maximum time allowed to change an endotracheal tube?	33(55)	27(455)
2	Which of the following is not a complication of long-term intubation?	45(75)	15(25)
3	Which of the following do you think is correct regarding the complication of tracheitis?	23(38.3)	37(61.7)
4	Which of the following do you think is correct regarding the complication of subglottic stenosis?	49(81.7)	11(18.3)
5	Which of the following do you think is correct regarding the complications of pneumonia?	31(51.7)	29(48.3)
6	Which of the following do you think is correct regarding the complications of tracheoesophageal fistula?	17(28.3)	43(71.7)

Attitude

	Phrase	Completely Agree n(%)	Partially Agree n(%)	No Opinion n(%)	Partially Disagree n(%)	Completely Disagree n(%)
1	When obtaining consent for a tracheostomy or subsequent care of a tracheostomized patient, I inform the patient and their family about this procedure's possible benefits and complications.	31(51.7)	19(31.7)	9(15)	1(1.6)	-
2	Caring for a tracheostomy patient is very difficult for me.	10(16.7)	14(23.3)	22(36.6)	7(11.7)	7(11.7)
3	It is very difficult for me to take care of an intubated patient.	9(15)	16(26.7)	14(23.3)	16(26.7)	5(8.3)
4	If the patient is one of my family and requires an airway, I would recommend a tracheostomy to his or her companions, despite being aware of the possible complications.	10(16.7)	22(36.6)	19(31.7)	7(11.7)	2(3.3)
5	If the patient is someone I know and needs an airway, I would suggest intubation to his or her companions despite being aware of the possible complications.	15(25)	16(26.7)	18(30)	10(16.7)	1(1.6)
6	In any case, I consider myself obligated to care for the intubated patient and	42(70)	14(23.3)	3(5)	1(1.6)	-

	believe that my positive performance will significantly reduce many complications.					
7	In any case, I consider myself obligated to care for the tracheostomy patient and believe that my positive performance will significantly reduce many complications.	39(65)	19(31.7)	2(3.3)	-	-
8	In my opinion, intubation and tracheostomy are very complicated, and I would not recommend them to others under any circumstances.	23(38.3)	26(43.3)	6(10)	3(5)	2(3.3)
9	I am completely satisfied with the performance of my colleagues and other medical personnel in guiding the patient's companions and providing secondary care to the intubated patient.	13(21.7)	20(33.3)	20(33.3)	6(10)	1(1.6)
10	Most complications of long-term intubation for the patient are due to negligence and errors in the treatment and care system.	9(15)	8(13.3)	14(23.3)	19(31.7)	10(16.7)
11	Many complications of long-term intubation and tracheostomy are unavoidable, so even if I take the necessary care in this area, these complications will still occur.	9(15)	13(21.7)	12(20)	17(28.3)	9(15)
12	I am not aware of many of the possible complications of long-term intubation and tracheostomy.	6(10)	18(30)	21(35)	7(11.7)	8(13.3)
13	I always monitor the patient for signs of complications of long-term intubation.	14(23.3)	24(40)	17(28.3)	5(8.3)	-
14	I am aware of ways to prevent complications of intubation.	15(25)	22(36.7)	18(30)	4(6.67)	1(1.6)
15	I know that knowing how to prevent complications of intubation is so important that I consider myself obligated to always expand my knowledge on this subject.	28(46.7)	20(33.3)	12(20)	-	-

Practice

	Phrase	Right Answer n(%)	Wrong Answer n(%)
1	I check the cuff pressure every 8 h, which should not exceed 20 mmHg.	41(68.3)	19(31.7)

2	I deflate the endotracheal tube cuff for 5 min every hour.	12(20)	48(80)
3	To prevent complications from long-term intubation, I perform suctioning according to protocol.	41(68.3)	19(31.7)
4	I change the position of the endotracheal tube in the mouth and on the lips at least every 24 h.	37(61.7)	23(38.3)
5	I replace the tubes, humidifier, and vaporizer tank of the ventilator every 24 h.	9(15)	51(85)
6	Before performing any invasive procedure, I inform the patient and their family about the treatment process or the need to change it.	32(53.3)	28(46.7)
7	According to the protocol, I perform respiratory physiotherapy for the patient.	46(76.7)	14(23.3)
8	After one to two weeks of intubation, I guide the patient's companions in choosing a tracheostomy.	46(76.7)	14(23.3)

Table 2. Comparison of the mean score of knowledge, attitude, and practice of participants based on their educational level

Variable	Medical Specialist $\bar{X}$±SD	Medical Assistant $\bar{X}$±SD	Master of Nursing $\bar{X}$±SD	Bachelor of Nursing $\bar{X}$±SD	P-value
Knowledge	3.88±2.02	3.87±1.31	3.5±0.57	2.87±1.33	X2=7.609 P=0.055*
Attitude	51.44±4.12	54.37±4.64	51±5.09	51.67±7.09	F=0.859 P=0.468**
Practice	5.55±1.13	1.23±4.06	3.25±1.7	3.45±1.62	X2=12.041 P=0.007*

* Kruskal- Wallis Test; ** One-way ANOVA

The results of the Shapiro-Wilk test showed that the knowledge and practice scores did not have a normal distribution; therefore, the nonparametric Kruskal-Wallis test was used to compare the means. In contrast, since the distribution of attitude scores among participants was normal, a one-way ANOVA was used to compare means. The total scores for knowledge, attitude, and practice were 3.3±1.47, 52.32±6.03, and 3.92±1.62, in respective order. In addition, the participants' knowledge, attitudes, and practices based on their educational level and experience are reported in Tables 3 and 4, respectively.

Table 3. Participants' knowledge, attitudes, and practice based on their educational level

Participants' Degree	Parameters	Good n (%)	Moderate n (%)	Poor n (%)
Medical Specialist (n=9)	Knowledge	5 (55.55)	1 (11.11)	3 (33.33)
	Attitude	6 (66.66)	3 (33.34)	-
	Practice	5 (55.55)	4 (44.44)	-
Assistant (n=16)	Knowledge	5 (31.25)	8 (50)	3 (18.75)
	Attitude	13 (81.25)	3 (18.75)	-
	Practice	3 (18.75)	7 (43.75)	6 (37.5)
Master (n=4)	Knowledge	-	4 (100)	-
	Attitude	2 (50)	2 (50)	-
	Practice	-	2 (50)	2(50)
Bachelor (n=31)	Knowledge	3 (9.67)	19 (61.29)	9 (29.03)
	Attitude	18 (58.07)	13 (41.93)	-
	Practice	4 (12.90)	12 (38.7)	15 (48.38)
Total (n=60)	Knowledge	13 (21.66)	32 (53.33)	15 (25)
	Attitude	39 (65)	21 (35)	-
	Practice	12 (20)	24 (40)	23 (38.23)

Table 4. Participants' knowledge, attitudes, and practice in case of work experience

Work Experience	Parameter	Good n (%)	Moderate n (%)	Poor n (%)
1-5 Years (n=34)	Knowledge	4 (11.76)	20 (58.82)	10 (29.41)
	Attitude	21 (61.76)	13 (38.23)	-
	Practice	7 (20.58)	15 (44.11)	12 (35.29)
5-10 Years (n=9)	Knowledge	3 (33.33)	3 (33.33)	3 (33.33)
	Attitude	7 (77.78)	2 (22.22)	-
	Practice	3 (33.33)	2 (22.22)	4 (44.44)
≥10 Years (n=17)	Knowledge	6 (35.29)	9 (52.94)	2 (11.76)
	Attitude	11 (64.71)	6 (35.29)	-
	Practice	2 (11.76)	8 (47.05)	7 (41.17)

Table 5. Comparison of the mean score of knowledge, attitude, and practice of participants based on their work experience

Variable	1-5 Years $\bar{X}$±SD	5-10 Years $\bar{X}$±SD	≥10 Years $\bar{X}$±SD	P-value*
Knowledge	3.10±1.36	3.3±1.56	4±1.26	F=2.16 P=0.07
Attitude	51.83±5.1	53.4±7.57	53.5±6.67	F=0.66 P=0.65
Practice	4.03±1.13	3.5±2.17	4.00±1.41	F=0.29 P=0.92

* One-way ANOVA

According to Table 3, 26 (21.66%), 32 (53.33%), and 15 (25%) of the participants had good, moderate, and poor knowledge, respectively. The highest knowledge score was in the group of specialists with 34 (55.5%), and the lowest was in the bachelors group with 6 (9.67%). Regarding attitude, 39 (65%) of participants scored good. The highest attitude score was obtained in the group of assistants and the lowest in the group of masters.

Table 4 shows the participants' knowledge, attitude, and performance based on their work experience. In the group with 1 to 5 years of experience, most individuals (58.82%) have average knowledge, and only 11.76% have good knowledge. The attitude of this group is positive, with 61.76% demonstrating a good attitude. In terms of performance, 20.58% have good performance, while 35.29% have poor performance. In the group with 5 to 10 years of experience, the distribution of knowledge is equal among good, average, and poor categories (33.33% each), but a positive attitude (77.78%) remains high. Regarding performance, 33.33% have good performance, and 44.44% have poor performance. Finally, in the group with more than 10 years of experience, 35.29% have good knowledge, and 52.94% have average knowledge. Positive attitudes (64.71%) and poor performance (41.17%) are also observed in this group. Table 5 shows that, compared to different work experiences, the average scores of participants' knowledge, attitude, and performance did not differ significantly.

In the study of participants' knowledge per question, only 33 (55%) had completely correct knowledge regarding the duration of safe intubation, and 49 (81.7%) answered correctly about the subglottic stenosis complication. Nonetheless, the respondents' knowledge of other complications was low.

In the analysis of the attitude questions, only 32 (53%) stated that they recommended tracheostomy to a close relative of theirs. Moreover, 23 (38.8%) stated that tracheostomy is very complicated, and they never recommend it to others. The analysis of practice questions revealed that 46 (76.7%) of the respondents would guide the patient's companions to choose a tracheostomy after one to two weeks of intubation.

Another result of this study was the relationship between the variables of knowledge, attitude, and skill. The Chi-square test showed that the association between knowledge and attitude was not significant (P=0.0992, R=0.001), and the association between knowledge and practice was also not significant (P=0.018, R=0.304). There was no significant difference between the participants' mean knowledge and attitude scores according to their educational levels (P>0.05). However, the mean practice score of specialists was significantly higher than that of other participants in the study (P<0.05). According to the results, there was a significant difference between the participants' mean scores of knowledge and practice in relation to their degree (P<0.05). However, the mean score of attitude was not significantly different between physicians and non-physicians (P>0.05). There was a significant difference between the mean knowledge and work experience scores across groups (P<0.05). Participants with more than ten years of tenure had a substantially higher level of knowledge. There was no significant difference between the work experience of the participants and their mean scores of attitude and practice (P>0.05).

Discussion

Our results revealed that while almost a quarter of the participants had good knowledge, most of them had a good attitude toward intubated patient care. In terms of practice, the result of the study was not favorable so that only one-fifth of the participants had good performance. The relationship between knowledge and attitude indicated that participants with higher knowledge did not necessarily have a favorable attitude. Nevertheless, in the practice dimension, they gained higher points.

In the present study, three-quarters of the participants identified tracheomalacia as a complication of prolonged intubation. Nevertheless, regarding the attitude toward the proposition that

these complications could be prevented with timely care of the intubated patient, only 22 participants (from 60) agreed. However, according to other research, some contributors to tracheomalacia, such as cuff pressure higher than 25 mmHg or mucosal inflammation, can be prevented during prolonged intubation (6).

In the present study, while the majority of participants (81.7%) had correct awareness regarding the complication of subglottic stenosis after prolonged intubation, only 55% chose one week as the period to start the intervention. Awareness of low-risk time for intubation and complications, such as tracheitis and the tracheoesophageal fistula, was poor. In the attitude dimension, half of the participants demonstrated the need to increase their knowledge concerning the prevention of intubation complications.

Similar results have been found in a study by Ozen et al., examining ICU nurses' knowledge of preventing ventilator-associated pneumonia. Their study also emphasizes periodic and regular training to prevent this complication (23).

In the present study, the mean scores of participants' knowledge and attitude were not significantly associated with their educational level. Indeed, the mean score of knowledge in specialists and assistants was higher than that of other participants, yet this difference was insignificant. The mean attitude score in assistants was higher than in other groups, although the mean attitude score did not differ significantly across groups. Considering that specialists and assistants have studied for a more extended period in the university than other participants, this increase in the mean score of knowledge and attitude in this group was not far from expected and seemed logical.

There was a significant relationship between the mean score of practice and the participants' educational level in the study. The specialists' mean score of practice was higher than that of other respondents. As specialists study longer than other participants and are well aware of the significance of observing all the necessary items when using intubation, and as the responsibility for the patient's recovery or non-recovery is on the physician, the physicians' mean practice score was higher than that of other groups. The results of this study are consistent with those of a study conducted by Qaljeh et al., who assessed the knowledge and practice of physicians and nurses regarding compliance with the Charter of Patients' Rights. Similarly, Qaljeh reported a significantly higher physician practice score regarding patients' rights (24).

The present study revealed no significant relationship between the mean score of attitude and practice of participants and the length of work experience. Nonetheless, there was a significant difference between knowledge and work experience, which fails to correspond with the study conducted by Borhani et al. regarding the attitude of physicians and nurses at hospitals affiliated with Shahid Beheshti University of Medical Sciences in Iran in terms of cooperation with each other. As stated in Borhani et al.'s study, there was a significant difference between individuals' mean scores of attitude and work experience (25).

This study found that ICU personnel's knowledge, attitude, and practice regarding prolonged intubation complications were lower than acceptable. It is recommended that similar studies be conducted at a larger scale and with larger sample sizes. Such studies need to assess baseline knowledge, attitude, and practice levels, perform interventional programs and educational workshops, and reassess the personnel. Moreover, we suggest conducting similar research concerning important treatment and patient care parameters. Highly important are suggestions for revising the otorhinolaryngology syllabi for medical students, assistants, nursing and anesthesiology students, and other related groups, as well as the inclusion of relevant topics to achieve a training program that is accountable to medical needs. It is also recommended that these topics be incorporated into the continuing education programs for the target groups and the professional development of graduates in related fields to enhance their knowledge.

Additionally, the results of this study indicated that the knowledge and attitude of participants do not necessarily have a linear relationship. Therefore, it cannot be expected that a change in attitude or behavior can happen by merely teaching theoretical issues. Accordingly, the use of appropriate training methods, such as role-playing, is recommended to change the attitude and behavior of students and medical staff. Indeed, role-playing is recommended as an educational method to acquire knowledge, attitudes, and skills in an extensive range of disciplines for different age groups (26). In order to achieve optimal results in patient care, the ICU needs to use maximum scientific and functional capacity. Continuous intra-departmental studies with continuous training and reporting of morbidity cases will improve knowledge, attitude, and practice. Routine use of an intubation checklist is essential for safe and effective airway management and promotion of the practice (27).

The most important limitation of this study is the lack of evaluation regarding the background

information of participants. In future studies, it is also suggested that the identification of respondents' prior awareness and misconceptions be considered in the study's design.

Conclusions

The present work revealed that the knowledge and attitude of ICU care providers regarding the complications of prolonged intubation were not completely desirable. Holding training courses in this field and among health officials and policymakers must promote knowledge and efficacy belief. Future interventions and policies should also be developed to target subgroups and close the gap of KAP toward prolonged intubation. A routine intubation checklist is essential for safe and effective airway management and promotion of practice.

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Conflict of Interest

The authors declare that there is no conflict of interest.

References

1. Asai T. History of tracheal intubation: 1. first application of tracheal intubation during general anesthesia. Japanese J Anesthesiol (Masui). 2017;66(1):99–104.
2. Bexfield N, Riggs J (editor). Endotracheal intubation. In: BSAVA Guide to Procedures in Small Animal Practice. British Small Animal Veterinary Association; 2024: 158–161.
3. Yadav P, Gupta A, Sharma R, Gupta N. Endotracheal intubation: direct and video laryngoscope guided techniques. In Book: The Airway Manual. Singapore: Springer Nature Singapore. 2023: 317–332.
4. Jung H. A comprehensive review of difficult airway management strategies for patient safety. Anesth Pain Med (Seoul). 2023;18(4):331–339.
5. Menon R, Vasani SS, Widdicombe NJ, Lipman J. Laryngeal injury following endotracheal intubation: Have you considered reflux? Anaesth Intensive Care. 2023;51(1):14–19.
6. Khoshsirat SH, Esmaili S, Tajik A. Evaluation of post intubation tracheal stenosis in Masih-Daneshvari hospital during 1999-2006. J Med Council Islamic Republic of Iran. 2006;24(4):393–398.
7. Zagalo C, Santiago N, Grande NR, Martins dos Santos J, Brito J, Aguas AP. Morphology of trachea in benign human tracheal stenosis: a clinicopathological study of 20 patients undergoing surgery. Surg Radiol Anat. 2002 ;24(3–4):160–168.
8. Alaga A, Simhan V, Lokeshwaran S, Kumar KS, Chetana Shanmukhappa S. Management of postintubation tracheal stenosis with bronchoscope methods—An experience from two centers. Respirol Case Rep. 2024;12(9):e70014.
9. Elsayed H, Mostafa A, Soliman S, Shoukry T, El-Nori A, El-Bawab H. First-line tracheal resection and primary anastomosis for postintubation tracheal stenosis. Ann R Coll Surg Engl. 2016 ;98(6):425–430.
10. Su Z, Li S, Zhou Z, Chen X, Gu Y, Chen Y, et al. A canine model of tracheal stenosis induced by cuffed endotracheal intubation. Sci Rep. 2017;7(1):45357.
11. Thomas CE, Mayer SA, Gungor Y, Swarup R, Webster EA, Chang I, et al. Myasthenic crisis: clinical features, mortality, complications, and risk factors for prolonged intubation. Neurology. 1997;48(5):1253–1260.
12. Ozer Simsek Z, Elay G, Temel S, Sungur M, Gundogan K. Retrospective evaluation of frequency and factors affecting development of tracheomalacia in critically ill patients with prolonged intubation. J Crit Intensive Care. 2021;12:102–103.
13. Zias N, Chroneou A, Tabba MK, Gonzalez A V, Gray AW, Lamb CR, et al. Post tracheostomy and post intubation tracheal stenosis: report of 31 cases and review of the literature. BMC Pulm Med. 2008;8(1):18.
14. Ikebe T, Ozawa H, Iida M, Shimamoto T, Handa K, Komachi Y. Long-term prognosis after stroke: a community-based study in Japan. J Epidemiol. 2001;11(1):8–15.
15. Patel M, Patel H, Voong C. Severe tracheal stenosis in a patient with history of prolonged intubation. Am J Respir Crit Care Med. 2022;205: A4138.
16. Gulilat D, Genetu A, Kejela S, Kassa S, Bekele A, Tizazu A. Nonmalignant tracheal stenosis: presentation, management and outcome in limited resources setting. J Cardiothorac Surg. 2024;19(1):21.
17. Dzuberová I, Sabaková L, Juráková O, Harustiak S, Majer I. High frequency jet ventilation in trachea reconstructions--its advantages in our experience. Acta Chir Hung. 1999;38(1):31–34.
18. Rusakov MA, Parshin AV, Pryanikov PD, Parshin VV, Ursov MA, Mariyko AV . About tracheostomy for tracheal scar cicatricial stenosis. Head Neck Russian J. 2024;12(2).
19. Klotz JJ, Dooley-Hash SL, House JB, Andreatta PB. Pediatric and neonatal intubation training gap analysis: instruction, assessment, and technology. Simul Healthcare. 2014;9(6):377–383.
20. Gross IT, Abrahan DG, Kumar A, Noether J, Shilkofski NA, Pell P, et al. Rapid cycle deliberate practice (RCDP) as a method to improve airway management skills – A

randomized controlled simulation study. Cureus. 2019;11(9):e5546.
21. Miller AG. Endotracheal intubation training and skill maintenance for respiratory therapists. Respir Care. 2017;62(2):156-162.
22. Papagiannis D, Malli F, Raptis DG, Papathanasiou I V., Fradelos EC, Daniil Z, et al. Assessment of knowledge, attitudes, and practices towards new coronavirus (SARS-CoV-2) of health care professionals in Greece before the outbreak period. Int J Environ Res Public Health. 2020;17(14):4925.
23. Ozen N, Armutcu B. Knowledge levels of critical care nurses on evidence-based practices for the prevention of ventilator-associated pneumonia. J Med Surg Intensive Care. 2018;9(3):78–83.
24. Ghaljeh M, Zakeri Z, Rezaee N, Abedzadeh R. Physicians and nurses awareness and function about patients right charter in Zahedan. Iran J Med Ethics History Med. 2010;3(5, 1):69–75.
25. Borhani F, Abbasi M, Abbaszadeh A, Mousavi S. Attitudes of nurses and physicians of the hospitals affiliated with Shahid Beheshti University of Medical Sciences toward collaboration with each other. Iran J Med Ethics History Med. 2014;7(3):69–77.
26. Nestel D, Tierney T. Role-play for medical students learning about communication: guidelines for maximising benefits. BMC Med Educ. 2007;7(1):3.
27. Hohlrieder M, Brimacombe J, von Goedecke A, Keller C. Guided insertion of the ProSeal laryngeal mask airway Is superior to conventional tracheal intubation by first-month anesthesia residents after brief manikin-only training. Anesth Analg. 2006;103(2):458–462.