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Original Article

Cuff pressure training competence of nurses working in intensive care units

Yoğun bakım ünitelerinde çalışan hemşirelerin kaf basıncı eğitim yeterliliği

Guler Eraslan Doganay*[1], Mukaddes Kilinc[1], Mustafa Ozgur Cirik[1], Gulsah Yurtseven[1], Ebru Bilgin[2], Esra Arslanoglu[3], Ali Alagoz [1]

[1]Ministry of Health University Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital, Department of Intensive Care, Ankara, Turkey

[2]Ministry of Health University Atatürk Chest Diseases and Thoracic Surgery Training and Research Hospital, Nursing of Intensive Care, Ankara,Turkey

[3]Social Security Institution, Inspector, Mersin, Turkey

Abstract

Aim: The convenient cuff pressure of the endotracheal tube, fixes the tube in the correct position , provides sufficient ventilation, and prevents complications.

In this study, we aimed to evaluate the adequacy of the training and experience of nurses working in the intensive care units on cuff care in patients with intubation and tracheostomy.

Material and Methods: Fifty nurses working in intensive care units in chest diseases hospital agreed to participate in the study. The 10-question questionnaire was asked face-to-face to the participating nurses and their answers were recorded.

Results: Twenty three nurses (46%) surveyed had more than 5 years of intensive care experience. Thirty five nurses (70%) had bachelor's degree.

To the question of 'what is the cuff function?', 72% of the nurses who participated in the survey answered as fixing the tube, 64% as preventing air leakage, and 44% as protecting the lungs from gastric secretions.

According to intensive care unit working time, the rate of training on cuff pressure is statistically significantly higher in people who have worked for 5 years or more than those who have worked for less than 5 years.

In terms of all questions, there is no statistically significant difference according to education level.

Conclusion: The nurses working in our intensive care unit had lack of knowledge and lack of training about cuff pressure monitoring and cuff exercises. Nurses working in intensive care units should be given in-service training on cuff pressure and cuff exercises.

Keywords: Endotracheal tube, cuff pressure, cuff training, cuff exercise

Corresponding Author*: Guler Eraslan Doganay, Department of Anesthesiology and Reanimation University of Health Sciences, Ataturk Chest Diseases and Chest Surgery Training and Research Hospital, Sanatoryum St, 06280, Kecioren, Ankara, Turkey
E-mail: gulerdoganay@hotmail.com.tr
ORCID: 0000-0003-2420-7607
Doi: 10.18663/tjcl.972511
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Öz

Amaç: Endotrakeal tüpün uygun kaf basıncı, tüpü doğru pozisyonda sabitler, yeterli havalandırma sağlar ve komplikasyonları önler.

Bu çalışmada entübasyon ve trakeostomili hastalarda yoğun bakım ünitelerinde çalışan hemşirelerin kaf bakımı konusunda eğitim ve deneyimlerinin yeterliliğini değerlendirmeyi amaçladık.

Gereç ve Yöntemler: Hastanemizde yoğun bakım ünitelerinde çalışan 50 hemşire çalışmaya katılmayı kabul etti. 10 soruluk anket formu yüz yüze görüşme yoluyla sorulmuş ve istatistiksel olarak değerlendirilmiştir.

Bulgular: Ankete katılan yirmi üç hemşire (%46) 5 yıldan fazla yoğun bakım deneyimine sahipti. Otuz beş hemşire (%70) lisans mezunuydu.

Ankete katılan hemşirelerin %72'si "kafın işlevi nedir?" sorusuna tüp sabitleme, %64'ü hava kaçağını önleme ve %44'ü akciğerleri mide salgılarından koruma yanıtını vermiştir.

Yoğun bakım ünitesi çalışma süresine göre 5 yıl ve üzeri çalışmış kişilerde kaf basıncı eğitimi alma oranı 5 yıldan az çalışmış olanlara göre istatistiksel olarak anlamlı derecede yüksektir.

Tüm sorular açısından eğitim düzeyine göre istatistiksel olarak anlamlı bir farklılık yoktur.

Sonuç: Yoğun bakım ünitemizde çalışan hemşirelerin kaf basıncı takibi ve kaf egzersizleri konusunda bilgi ve eğitim eksiklikleri vardı. Yoğun bakım ünitelerinde çalışan hemşirelere manşet basıncı ve manşet egzersizleri konusunda hizmet içi eğitim verilmelidir.

Anahtar Kelimeler: Endotrakeal tüp, kaf basıncı, kaf eğitimi, kaf cimnastiği

Introduction

E The convenient cuff pressure of the endotracheal tube, fixed the tube in the correct position and provides sufficient ventilation. Correct adjustment of pressure and sufficient frequency of cuff exercises prevent complications such as fistula formation, tracheal stenosis, mucosal damage, aspiration and infection. High pressures cause ischemia because of reducing tracheal mucosal blood flow and also while cuff inflated at lower pressure than necessary give rise to inadequate ventilation, aspiration of gastric contents, or extubation due to air leakage [1].

Nosocomial pulmonary infections may occur as a result of insufficient cuff pressure and micro-aspiration of oropharyngeal contents [2]. If the cuffs of intubation tubes are overinflated and their pressure rises above the perfusion pressure, tracheal blood flow will cease. Increase in airway pressures can also increase tracheal tube cuff pressure. As a result, complications ranging from pharyngeal disorders to tracheobronchial fistula and tracheal stenosis may occur [3,4]. After intubation, it is generally recommended that the cuff be inflated during positive pressure ventilation until air leakage from the trachea ceases. Control of cuff pressure by palpation has been demonstrated in some studies in clinical practice [5,6].

The most important etiology of non-malignant tracheoesophageal fistula is cuff-related tracheal injury [7,8]. Laryngeal stenosis can also be seen as a result of pressure necrosis of the laryngeal mucosa due to the high pressure cuff or mechanical abrasion [9,10].

Lomholt et al. reported that the minimum cuff pressure to be used to prevent leakage from the trachea and to prevent aspiration should be 25 cmH2O [11].

In this study, we aimed to evaluate the adequacy of the training and experience of nurses working in the intensive care unit on cuff care in patients with intubation and tracheostomy.

Material and Methods

The study was designed after approval was obtained from the Medical Specialization Training Board of Ataturk Chest Diseases and Thoracic Surgery Training and Research Hospital (approval date & number:11/14/2019, 650).

Fifty nurses working in intensive care units in our hospital agreed to participate in the study. The study was carried out in accordance with the Declaration of Helsinki.

After the participants signed the informed consent form, questions were asked and evaluated through a face-to-face interview with the questionnaire form. The answers were evaluated statistically.

Intensive care nurses who did not want to participate in the survey and nurses working outside the intensive care unit were not included in the study.

Results

Fifty nurses working in the intensive care unit participated in the study.

Twenty three nurses (46%) surveyed had more than 5 years of intensive care experience. Thirty five nurses (70%) had bachelor's degree. To the question of 'what is the cuff function?', 72% of the nurses who participated in the survey answered as fixing the tube, 64% as preventing air leakage, and 44% as protecting the lungs from gastric secretions. While 60% of the nurses say that they can understand the cuff pressure by checking its softness with a finger, only 20% of the nurses use manometer. Those who answered the optimal cuff pressure as 20-30 cmH2O were 56%. To the question of how many times a day should be done cuff gymnastics, 56.1% nurses answered 4 times a day for 15 minutes (Table1).

According to intensive care unit working time, the rate of training on cuff pressure is statistically significantly higher in people who have worked for 5 years or more than those who have worked for less than 5 years.The ratio of those who say that the optimal cuff pressure should be 20-30 cmH2O in those with 5 years or more of Intensive Care experience is statistically significantly higher than those who work less than 5 years.The rate of those who say that the cuff pressure measurement frequency is 1 or 2/day in intensive care workers for 5 years or more is statistically significantly higher than those who have been working for less than 5 years.According to the answers given to the question of how often cuff gymnastics should be done in intensive care workers for 5 years or more, compared to those working for less than 5 years, the rate of those who said 15 minutes 4 times a day was statistically significantly higher. In terms of other questions, there was no statistically significant difference according to the duration of intensive care unit work (p>0.05) (Table 2).

In terms of all questions, there is no statistically significant difference according to education level (p>0.05) (Table 3).

Table 1. Participants' Education and Knowledge Levels about Cuff Pressure

	n (%)
Intensive Care Unit Working Time	4.72±2.56 (1-12)
<5 year	27 (54%)
≥5 years	23 (46%)
Education	
High School	9 (18%)
Bachelor's degree	35 (70%)
Graduate	6 (12%)
What is the cuff function?	
Fixing the tube	36 (72%)
Prevent air leakage	32 (64%)
Protecting the lung from gastrointestinal secretions	22 (44%)
Which technique do you use for cuff inflation?	
Determine softness with fingers	30 (60%)
Inflate with a standard air	10 (20%)
Using manometer	10 (20%)
Have you received training on the cuff pressure?	
Yes	39 (78%)
No	11 (22%)
Have you ever used the manometer in your clinical practice?	
Yes	44 (88%)
No	6 (12%)
What should be the optimal cuff pressure?	
10-20 cmH2O	22 (44%)
20-30 cmH2O	28 (56%)
≥30 cmH2O	-
How often should it be measured?	
At each intubation procedure	9 (18%)
Once a day	15 (30%)
Twice a day	14 (28%)
Three times a day	12 (24%)
Do You Have Information about Cuff Exercises?	
Yes	41 (82%)
No	9 (18%)
How often should cuff exercises be done?	
Twice a day for 15 min	16 (39%)
Four times a day for 15 min	23 (56.1%)
Eight times a day for 15 min	2 (4.9%)

Table 2. Comparison of cuff pressure information according to working time in intensive care unit

	Working time in intensive care unit		p
	<5 years (n:27)	≥5 years (n:23)	
	n (%)	n (%)	
What is the cuff function?			
Fixing the tube	18 (66.7%)	18 (78.3%)	0.363
Prevent air leakage	19 (70.4%)	13 (56.5%)	0.309
Protecting the lung from gastrointestinal secretions	13 (48.1%)	9 (39.1%)	0.522
Which technique do you use for cuff inflation?			
Determine softness with fingers	16 (59.3%)	14 (60.9%)	0.999
Inflate with a standard air	6 (22.2%)	4 (17.4%)	
Using manometer	5 (18.5%)	5 (21.7%)	
Have you received training on the cuff pressure?			
Yes	18 (66.7%)	21 (91.3%)	0.036
No	9 (33.3%)	2 (8.7%)	
Have you ever used the manometer in your clinical practice?			
Yes	22 (81.5%)	22 (95.7%)	0.199
No	5 (18.5%)	1 (4.3%)	
What should be the optimal cuff pressure?			
10-20 cmH2O	16 (59.3%)	6 (26.1%)	0.019
20-30 cmH2O	11 (40.7%)	17 (73.9%)	
≥30 cmH2O	-		
How often should it be measured?			
At each intubation procedure	7 (25.9%)	2 (8.7%)	0.034
Once a day	4 (14.8%)	11 (47.8%)	
Twice a day	7 (25.9%)	7 (30.4%)	
Three times a day	9 (33.3%)	3 (13%)	
Do You Have Information About Cuff Gymnastics?			
Yes	23 (85.2%)	18 (78.2)	0.715
No	4 (14.8%)	5 (21.7%)	
How often should cuff exercises be done?			
Twice a day for 15 min	12 (52.2%)	4 (22.2%)	0.046
Four times a day for 15 min	11 (47.8%)	12 (66.7%)	
Eight times a day for 15 min	-	2 (11.1%)	
The Chi square or fisher exact test was used.			

Table 3: Comparison of cuff pressure information according to Education

	Education			p
	High School (n:9)	Bachelor's degree (n:35)	Graduate (n:6)	
	n (%)	n (%)	n (%)	
What is the cuff function?				
Fixing the tube	5 (55.6)	28 (80%)	3 (50%)	0.148
Prevent air leakage	6 (66.7%)	21 (60%)	5 (83.3%)	0.663
Protecting the lung from gastrointestinal secretions	4 (44.4%)	14 (40%)	4 (66.7%)	0.545
Which technique do you use for cuff inflation?				
Determine softness with fingers	4 (44.4%)	23 (65.7%)	3 (50%)	0.207
Inflate with a standard air	2 (22.2%)	5 (14.3%)	3 (50%)	
Using manometer	3 (33.3%)	7 (20%)	-	
Have you received training on the cuff pressure?				
Yes	7 (77.8%)	27 (77.1%)	5 (83.3%)	0.999
No	2 (22.2%)	8 (22.9%)	1 (16.7%)	
Have you ever used the manometer in your clinical practice?				
Yes	8 (88.9%)	31 (88.6%)	5 (83.3%)	0.816
No	1 (11.1%)	4 (11.4%)	1 (16.7%)	
What should be the optimal cuff pressure?				
10-20 cmH2O	3 (33.3%)	16 (45.7%)	3 (50%)	0.821
20-30 cmH2O	6 (66.7%)	19 (54.3%)	3 (50%)	
≥30 cmH2O	-	-	-	
How often should it be measured?				
At each intubation procedure	3 (33.3%)	5 (14.3%)	1 (16.7%)	0.428
Once a day	4(44.4%)	10 (28.6%)	1(16.7)	
Twice a day	1 (11.1%)	12 (34.3%)	1 (16.7%)	
Three times a day	1 (11.1%)	8 (22.9%)	3(50%)	
Do You Have Information About Cuff Gymnastics?				
Yes	8 (88.9%)	29 (82.9%)	4 (66.7%)	0.619
No	1 (11.1%)	6 (17.1%)	2(33.3%)	
How often should cuff exercises be done?				
Twice a day for 15 min	3 (37.5%)	11 (37.9%)	2 (50%)	0.759
Four times a day for 15 min	4 (50%)	17 (58.6%)	2(50%)	
Eight times a day for 15 min	1 (12.5%)	1 (3.4%)	-	
The Chi square or fisher exact test was used.				

Discussion

Since this study was prepared in the form of a nurse questionnaire, it not only shows the knowledge level of nurses on the subject, but also gives information about their practical approaches in the clinic.

Although the change of the cannulae is the responsibility of the physician, the care of an intubated patient after intubation is the responsibility of the nurses.

Although the hospital management assigns the personnel who received certification on intensive care training in the intensive care unit, the number of non-certified personnel is not negligible.

In addition to the workload, certificated personnel have to control and give training about intubated patient care in a short time.

So without adequate training results inadequate cuff pressure monitoring, and inadequate cuff exercises.It is resulted aspiration, infection, laryngeal stenosis even fistula, mucosa necrosis, insufficient ventilation or non-venting, hypoxia complications. In addition to not spread the manometer use, attempting to ensure the proper cuff pressure with the practice finger measurements daily that results cuff insufficient or excessive pressure to, in this case leads to the tracheal mucosal injury or aspiration [12].

The endotracheal tube cuff pressure must be maintained within an optimal range of 20-30 cmH2O, which ensures ventilation, prevents aspiration of secretions and guarantees a good tracheal perfusion.

In a study conducted by Özcan et al., a decrease in complication rates was observed after the seminar given to personnel about cuff pressure [13]. Therefore it is thought that ,training the nurses during their education about endotracheal cuff maintenence and cuff exercise is so important.

There was not found the study about the relation between frequency of practise manometer or the standard cuff pressure measurement techniques in intensive care unit and complications in Turkey despite the world literature [6,14,15].

Endotracheal tube cuff pressure monitoring to promptly identify deviations from the pressure ranges, allowing their rapid correction [16].

In an article suggest that; the best way to measure the endotracheal tube cuff pressure is to use a cuff manometer, and when it is not available, the minimal occlusive volume would be a better alternative compared to the palpation technique to avoid complications [17].

A study indicate 20% of the nurses stated that they measure that he speaks appropriately once a shift, while more than half of them 52% state that they measure when the mechanical ventilator gives an alarm [18]. In our study %78,6 of participant nurses frequency of measure cuff pressure less then necessary.

Also this study determined that nurses need information about endotracheal or tracheostomy tube cuff pressure practices [18]. Similarly in our study, it was concluded that nurses working in our intensive care unit had lack of knowledge and lack of training about cuff pressure monitoring and cuff exercises, despite they have education degree.

The limitations of our study are that it is single-centred and only intensive care nurses were included as a sample. We suggest survey studies to be conducted in larger sample groups before and after the training.

Conclusion

The nurses working in our intensive care unit had lack of knowledge and lack of training about cuff pressure monitoring and cuff exercises. Cuff pressure gymnastics is an important issue that should be emphasized in intensive care units as it prevents many complications. Although the nurses working in intensive care unit have a degree of education, we believe that in-service training on cuff pressure monitoring and cuff exercises is also necessary.

Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. All persons included in the study signed the informed consent form.

Declaration of conflict of interest

The authors received no financial support for the research and/or authorship of this article. There is no conflict of interest

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Ouestionnaire Form

Evaluation of Intensive Care Nurses Perspectives and Levels of Cuff Pressure Measurement

1.How long do you work in Intensive care unit?

2.Level of education

-High School

-Bachelor's degree

-Graduate

3.What is the cuff function?

-Fixing the tube

- Prevent air leakage

- Protecting the lung from gastrointestinal secretions

4. Have you received training on the cuff pressure?

Yes/ No

5. Which technique do you use for cuff inflation?

- Determine the softness with fingers

-Inflate with a standard air

-Using manometer

6.Have you ever used the manometer in your clinical practice?

Yes/ No

7. What should be the optimal cuff pressure?

-10-20 cmH2O

-20-30 cmH2O

-over 30 cmH2O

8. How often should it be measured?

-In every intubation procedure

-Once a day

-Twice a day

-3 times a day

9.Do you have any knowledge about cuff exercises?

Yes/ No

10. How often should cuff exercise be done?

-15 minutes twice a day

-15 minutes 4 times a day

-15 minutes 8 times a day