International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

Investigation of Evidence-Based Endotracheal Aspiration Applications in Intensive Care Nurses

Yurdanur Dikmen[1], Nasibe Yağmur Filiz[1], Funda Erol[1], Dilek Yılmaz[2]

[1]Sakarya University Faculty of Health Sciences Nursing Department, Sakarya, Turkey
[2]Uludağ University School of Health Sciences Nursing Department, Uludağ, Turkey

Corresponding Author: Nasibe Yağmur Filiz

ABSTRACT

Introduction: This study was conducted to investigate the level of knowledge and practice status of nurses working in intensive care unit on evidence-based endotracheal aspiration applications.
Methods: The sample of this descriptively planned study was consisted of 67 intensive care nurses who were voluntarily participated and working in Intensive Care Units of a public hospital. The data was collected by reviewing the literature, using Nurse Presentation Form prepared by the researchers to determine the knowledge and application status of nurses about evidence-based endotracheal aspiration applications. In the evaluation of the data, number and percentage calculations were used.
Results: It was determined that the average age of the nurses participating in the study was 26.00±6.01 (min-max:20-45), 58.2% of the nurses had a bachelor's degree, 41.8% were working as an intensive care nurse for 0-1 year. The applications which were most frequently used by nurses in endotracheal aspiration applications were detected as respectively; "Before the aspiration procedure, individual patient evaluation should be done during and after the procedure and the patients should be closely monitored" (95.5%), "The aspiration catheter should not block more than half of the internal diameter of the artificial airway catheter" (91%). When the cases where the nurses know whether the application was evidence-based or not, it was determined respectively; "In patients who were intubated in hospital, aseptic technique should be done while aspiration." (91%), "The duration of aspiration should not be longer than 10-15 seconds" (83.6%).
Conclusion: In this study, it was determined that the rates of knowledge about endotracheal aspiration applications are evidence-based of nurses was moderate, it was concluded as the nurses' knowledge and practices should be supported.

Keywords: intensive care, tracheal aspiration, evidence-based application.

INTRODUCTION

Respiration which is the compulsory essential requirement of individuals is perceived synonymous with life and is known as important and primary to realize the daily activities of individuals in a qualified manner. [1] The first condition for an individual to realize the respiration in a normal way is to have an open airway. When an individual does not have sufficient respiration due to obstacles in the airway or regulation of respiration function, it is necessary to have artificial airway support. In these situations tracheostomy or endotracheal tube practice is preferred to provide and sustain the openness in the airway. [2-4]

Aspiration is defined as to oust respiration system secretions with a vacuum device which works with negative pressure. This is a very common nursing practice using in patients care that needs artificial airway support. [5-8] Ousting respiration system secretions with a vacuum device

which works with negative pressure is called endotracheal aspiration.

To sustain and evaluate the openness in patients' airway is a primary responsibility for nurses. Especially in intensive care units where interventional operations are applied intensively and the rate of morbidity and mortality is very high, corresponding to respiration needs of patients is very important. When airway openness is provided with an artificial way, nurses' knowledge on the indication, complication and caring of this practice is crucial. [9,10]

On the other hand, proof based practice concept is a quite new concept in the nursing and health care system and is defined as "the integration process of research results obtained from clinic expertise and systematic researches". [11,12] Proof based practice; is an approach to use in decisions for individual patient care with combining best proofs obtained from scientific method with experiences and patients requirements. [12,13] Nowadays, the necessity of all health care professionals to base their practices on best proofs to provide best care service is gradually increasing. To put these proofs into practice depends on to make nurses' using proofs a habit and to form a culture having practices base on scientific information. [13]

In the literature under the light of proof based findings it is stated that when endotracheal aspiration practice is not done with a proper method and does not give necessary attention, it causes many complications. [3,4,7,14,15] These complications include pain, mucosa wound, bleeding, hypoxemia, infection, cardiovascular instability, increased pressure inside the head and atelectasis. [3,8,16,17] To solve preventable complications, using proof based knowledge in nursing practices provide many benefits. [18] In addition proof based nursing practices are important to improve the care quality and care results, make a difference in clinical practices and patient care results, standardize the care and increase the satisfaction of nurses. [13,19,20] For this reason, with regards to prevent complications which might occur from endotracheal aspiration it is quite important for nurses to have information and skill for endotracheal aspiration practice done under their responsibility in the hospital. When the literature was analysed; no study was found relating to nurses' proof based endotracheal aspiration practice and knowledge. In accordance with this information, it is believed that this study will make contribution to the proof based nursing literature. The aim of this study is to analyse the proof based endotracheal aspiration practices and knowledge of nurses who work in ICU.

MATERIALS AND METHODS

This study was done to analyze the proof based endotracheal aspiration knowledge level of nurses working in Sakarya University Training and Research Hospital intensive care units. This study was conducted in Sakarya University Training and Research Hospital internal diseases and surgery intensive care units. The study covered 100 nurses who worked in Sakarya University Training and Research Hospital Internal Diseases and Surgery Intensive Care Units between May-August 2016. The sample of the research included 67 nurses (67% participation rate) who wanted to participate to the research.

In this study data collection forms have two parts. In the first part; there are 15 questions relating to the socio demographic characteristics of nurses and knowledge level of them for endotracheal aspiration practices. In the second part, there is a form relating to proof based practices for aspiration technique that created by scanning the relevant literature. Practices in the prepared data collection forms submitted to three lecturers who are expert on nursing field. In this form nurses' knowledge for proof based practices and how they applied were examined. Data collection forms were created by face to face technique with nurses who work in intensive care units.To

conduct the research, firstly institution where the research done was asked for written permission. Also after making statements about the research subject, nurses were asked for permission orally and voluntary nurses participated to the research.

Statistical Analysis

In the evaluation of data, frequency, arithmetic mean and standard deviation analyses were used.

RESULTS

Informative characteristics of nurses in Intensive Care Units (ICU) are in Table 1.Average age of nurses participated to the study is 26.00±6.01 (min-max:20-45) and 83,6% of them is woman and 16,4% of them is man. 58,2% of nurses has bachelor's degree. Length of service for 34,3% of them is 2-5 years, 29,9% of them is 0-1 year, on the other hand length of service in intensive care unit for 41,8% of them is 0-1 year, 34,3% of them is 2-5 years.

Table 1. Finding of characteristics on nurses in Intensive Care Units

Features	n	%
Cinsiyet		
Female	56	83,6
Male	11	16,4
Education status		
Health Professions High School	8	11,9
Associate Degree	16	23,9
License	39	58,2
Postgraduate	4	6,0
Nursing profession working year		
0-1 year	20	29,9
2-5 year	23	34,3
6-10 year	16	23,8
11 year and over	8	12,0
Intensive care unit working year		
0-1 year	28	41,8
2-5 year	23	34,3
6-10 year	11	16,4
11 year and over	5	7,5
Total	**67**	**100**

Table 2. Features of The Working Condition of Nurses

Features	n	%
Sufficient number of nurses in the working section		
Adequate	19	28,4
Inadequate	48	71,6
Average number of patients treated in a shift		
1-3 Patients	46	68,7
4 and over Patients	22	31,3
Weekly working hours		
40 hours	10	14,9
41 hours and over	57	85,1
Total	**67**	**100**

According to 71,6% of nurses, the number of nurses is not enough, it was found that 68,7% of them takes care of 1-3 patients daily and 29,9% of them takes care of 4-6 patients daily (Table 2) .

Information about nurses' scientific research, journal, programs and education levels is in Table 3.53,7% of nurses follow the findings of scientific studies but just 9% of them follow the journals. 40,3% of nurses participates to the scientific meetings and 22,4% of them participates to the meetings as researchers. 46,3% of nurses stated that there is policy about the proof based practices and it was determined that 22,4% of them had training on research methods.

Table 3. Findings of nurses' thoughts on Scientific Activities

Features	n	%
Follow scientific research results		
Yes	36	53,7
No	31	46,3
Follow scientific magazines		
Yes	6	9
No	61	91
Bilimsel toplantılara katılma		
Yes	27	40,3
No	40	59,7
Participation in scientific meetings		
Yes	15	22,4
No	52	77,6
A policy entity that supports evidence based practice in the institution		
Yes	31	46,3
No	36	53,7
Training in scientific research methods		
Yes	15	22,4
No	52	77,6
Total	67	100

The information about knowledge level of nurses about proof based endotracheal aspiration practices and current practices are explained in Table 4. The most common practices relating to endotracheal aspiration in the hospital are determined respectively; "During, before and after the aspiration practice, patient should be evaluated and followed closely" (95,5%), "Aspiration catheter should not block more than half of the diameter of artificial airway catheter" (91%), "The length of aspiration should not be longer than 10-15 seconds" (91%), "When increasing oxygen before the aspiration, nurse should allow the time for the oxygen to reach the patient through the ventilator tubes" (89,6). When the

knowledge of nurses about whether their practices based on proof or not was analyzed, it was determined that nurses stated proof based practices respectively; "In the hospital during the aspiration aseptic technique should be applied for intubated grown up patients." (91%), "The length of aspiration should not be longer than 10-15 seconds" (83,6%), "Aspiration transaction might cause tracheal trauma, hypoxemia, cardiac arrhythmias, increased pressure inside the head." (82,1%), "Increasing the oxygen level of intubated grown up patients before the aspiration might reduce the hypoxemia." (80,6%).

Table 4. The information about knowledge level of nurses about proof based endotracheal aspiration practices and current practices

Evidence Based Practices for Endotracheal Aspiration	Evidence Based Practices				Current Practices			
	Yes		No		Yes		No	
	n	%	n	%	n	%	n	%
During, before and after the aspiration practice, patient should be evaluated and followed closely	51	76.1	16	23.9	64	95.5	3	4.5
Nursing should not saline before the aspiration	21	31.3	46	68.7	13	19.4	54	80.6
Nurses should ensure that the patient receives adequate fluid to facilitate the elimination of airway secretions.	46	68.7	21	31.3	57	85.1	10	14.9
In the hospital during the aspiration aseptic technique should be applied for intubated grown up patients	61	91.0	6	9.0	59	88.1	8	11.9
Aspiration catheter should not block more than half of the diameter of artificial airway catheter	47	70.1	20	29.9	61	91.0	6	9.0
The length of aspiration should not be longer than 10-15 seconds	56	83.6	11	16.4	61	91.0	6	9.0
Increasing the oxygen level of intubated grown up patients before the aspiration might reduce the hypoxemia	54	80.6	13	19.4	55	82.1	12	17.9
When increasing oxygen before the aspiration, nurse should allow the timefor the oxygen to reach the patient through the ventilator tubes	45	67.1	22	32.8	60	89.6	7	10.4
Aspiration operation should be applied successively maximum three times	42	62.7	25	37.3	53	79.1	14	20.9
Aspiration transaction might cause tracheal trauma, hypoxemia, cardiac arrhythmias, increased pressure inside the head	55	82.1	12	17.9	61	91.0	6	9.0
Patients think aspiration as a painful and worrying practice	46	68.7	21	31.3	57	85.1	10	14.9
Repeated aspiration applications using serum physiology have the potential to expose the lower airways to pathogenic bacteria.	30	44.8	37	55.2	30	44.8	37	55.2

DISCUSSION

Proof based practice is a nursing approach to combine the best proofs obtained from scientific method with experiences and the necessities of patients for the decisions relating to individual patient care. [12] Proof based practice aims to use the current and best proofs in the decision making process for the patient's medical care for the patient recovery and planning and conducting the service. [11] Proof based nursing practices are quite important to improve the care quality and results, create difference in the patient care results, standardize the care and increase the nurse satisfaction. [13,19,20] Proof based practices in nursing provide caring to be effective, rationalist, dynamic and increase the clinical judgement to the highest level with using available proofs for individual patient care. [13]

Endotracheal aspiration practice is an invasive method that provides cleaning of secretion in patients and increasing oxygenation, at the same time it is a method that includes more than one complication. [21,22] In the intensive care units where most risky patients stay skill deficiency of nurses to use proof based endotracheal aspiration practice causes complications relating to aspiration. For this reason, as a result of our study which aimed to analyze the knowledge level of nurses for proof based endotracheal aspiration practices and their applications, it was found that "During, before and after the aspiration practice, patient should be evaluated and followed closely", "Aspiration catheter should not block more than half of the diameter of artificial airway catheter", "When increasing oxygen before the aspiration, nurse should allow the time for the oxygen to reach the patient through the ventilator tubes" and "The length of aspiration should not be longer than 10-15 seconds" (Table 4). In the literature, it is explained that during,

before and after the aspiration practice, patient should be evaluated and followed closely, aspiration catheter should not block more than half of the diameter of artificial airway catheter, when increasing oxygen before the aspiration, nurse should allow the time for the oxygen to reach the patient through the ventilator tubes and the length of aspiration should not be longer than 10-15 seconds. [23-25] According to these results it could be said that current applications of nurses for aspiration practice are at the sufficient level.

Before the endotracheal aspiration transaction using of normal saline is a very common practice to dilute the secretion and provide the slickness of catheter. [21,26] But there are studies which state that before the aspiration transaction using of normal saline is not an effective practice and has many side effects. [21,25,27-31] In addition it is stated that repeated applications of normal saline has the possibility of infecting the airways. [21,24,26,32] In a study done by Ozden and his colleagues (2009), 91% of nurses expressed that normal saline soften the secretion and 58% of them expressed that it provides more secretion aspiration with stimulating the coughing and 17% of them expressed that it increases the oxygen saturation. In the same study, as negative effects of normal saline, 82% of nurses expressed lung infection, 49% of them expressed reduction in oxygen saturation. In line with these results, it gave rise to thought that nurses participated to the study are not sufficient with regard to these practices. [33] It was thought that the reasons behind this nurses' insufficiency are not to follow scientific journals, insufficient participation of scientific meetings and not to have supportive policies in their institutions.

According to the research result 91% of nurses knew that practice " In the hospital during the aspiration aseptic technique should be applied for intubated grown up patients." is a proof based practice and it was determined that 88,1% of them do this practice in a clinical place (Table 4). Patients in the intensive care units are under the high infection risk and as a result of this mortality and morbidity rates are gradually increasing. [34,35] In a study done by Korhan and his colleagues (2013) with nurses from intensive care units; it was found that knowledge level relating to prevention of proof based ventilator associated pneumonia is insufficient. [35] In our study it can be said that knowledge level of participant nurses relating to application of aseptic technique that has an important role especially to prevent infections depending on endotracheal aspiration and practices in clinical places are sufficient.

In the studies it is stated that depending on endotracheal aspiration, complications such as include pain, mucosa wound, bleeding, tracheal trauma, hypoxemia, infection, cardiovascular instability, increased pressure inside the head and atelectasis might occur. [7,8,16,17,36] In this study 82,1% of nurses stated that "Aspiration practice might cause tracheal trauma, hypoxemia, cardiac arrhythmia and increased pressure inside the head ." 68,7% stated that "Patients think aspiration as a painful and worrying practice." In the current practice this response rates are 91% and 85,1% respectively (Table 4). Knowledge of majority of nurses about common complications relating to endotracheal aspiration and awareness of them about the unsettling effects of this invasive practice are interpreted as a positive finding.

68,7% of nurses participated to the study stated that "To ease the excretion of airway secretions, patient should be provided enough liquid". 80,6% of them stated that "Increasing the oxygen level of intubated grown up patients before the aspiration might reduce the hypoxemia". 62,7% of them stated that "Aspiration operation should be applied successively maximum three times". It was determined that proof based practices were stated and answer rates of current practices situations are 85.1%, 82.1% and 79.1% respectively (Table 4). Based on these answers, it is seen that proof based knowledge level relating to

successive application in maximum three times is low and according to other practices current proof based practices have low rate. In a study done by Cigerci and his colleagues (2016) with student nurses, 66,1% of student nurses gave the answer aspiration practices should be repeated maximum three times successively. [8] Although sample group is different, the results of this study are similar to our results. In the literature it is explained that aspiration practice should not be done successively more than three times, otherwise risk of hypoxia and mucosal wound might increase. [5,8,23,33,37,38]

CONCLUSION

In this study, it is determined that the nurses' recognition level of proof based endotracheal aspiration practices is medium and it is necessary to support nurses' knowledge and practices. In this regard, it is suggested to develop integrated in-service programs, to form guidebooks which include proof based endotracheal aspiration in intensive care units and to evaluate the reflection of care results of proof based guides.

ACKNOWLEDGMENT

We thank all those who participated in this study.

Ethical issues: None to be declared

Conflict of interests: The authors declare that there is no conflict of interest in publishing this research article.

REFERENCES

1. Akgül S, Öztekin D, Akyolcu N. Hemşirelerin, Endotrakeal Aspirasyonda Serum Fizyolojik Uygulamasına ilişkin Bilgi Durumları. İstanbul Üniversitesi Florence Nightingale Hemşirelik Yüksekokulu Dergisi 2001; 42 (17): 45-55.
2. Day T, Wanwrihgt SP, Wilson-Barnett J. An Evalution of A Teaching İntervention to İmprove The Practice of Endotracheal Suctioning in İntensive Care Units. Journal Of Clinical Nursing 2001; 10: 682-689.
3. Maggiore SM. Endotracheal Suctioning, Ventilatorassociated Pneumonia and Costs: Open or Closed İssue? Intensive Care Medicine 2001; 32: 485-487.
4. Özden D. Kapalı Sistem Aspirasyon Yöntemi. Cumhuriyet Üniversitesi Hemşirelik Yüksekokulu Dergisi 2007; 11(3): 29-37.
5. Kuyurtar F. Solunum Sistemi Uygulamaları. Sağlık Uygulamalarında Temel Kavramlar Ve Beceriler. Ed; Ay Fa. İstanbul : Nobel Tıp Kitabevleri. 2013, p. 541-569.
6. Favretto DO, Silveira RCCP, Canini SRMS et al. Endotracheal Suction in İntubated Critically İll Adult Patients Undergoing Mechanical Ventilation: A Systematic Review. Rev. Latino-Am. Enfermagem 2012; 20(5): 997-1007.
7. Çelik S, Elbaş NÖ. The Standard of Suction for Patients Undergoing Endotracheal İntubation. Intensive and Critical Care Nursing 2000; 16:191-198.
8. Ciğerci Y, Çevik C, Çelebi Ş, Kurt H, Aslan A. Öğrenci Hemşirelerin Endotrakeal Aspirasyona İlişkin Bilgi Düzeyleri. Uluslararası Hakemli Hemşirelik Araştırmaları Dergisi 2016; 6: 128-139.
9. John RE, Malen JF. Contemporary Issues ın Adult Tracheostomy Management. Critical Care Nurse Clinic North America 2004; 16 (3): 413-430.
10. Karaca T. Trakeostomili Hastalarda Hemşirelik Bakımı. International Journal of Human Sciences 2015; 12(2): 1078-1091.
11. Babadağ K, Kara M. Kanıta Dayalı Hemşirelik ve Meslekleşme. Atatürk Üniversitesi Hemşirelik Yüksekokulu Dergisi 2004; 7(2): 112-117.
12. Sackett DL, Rosenberg WMC, Gray JAM, et al. Evidence Based Medicine: What is it And What isn't it? British Medical Journal 1996; 312(7023): 71-72.
13. Şenyuva E. Hemşirelik Eğitimi ve Kanıta Dayalı Uygulamalar. Florence Nightingale Hemşirelik Dergisi 2016; 24(1): 59-65.
14. Mckillop A. Evaluation of the Implementation of A Best Practice İnformation Sheet: Tracheal Suctioning of Adults With an Artificial Airway.

Joanna Briggs Institute Reports 2004; 2: 293-308.
15. Subirana M, Sola I, Garcia JM et al. Closed Tracheal Suctions Systems Versus Open Tracheal Systems for Mechanically Ventilated Adult Patients. The Cochrane Database Of Systematic Reviews 2003; 3: 1-3.
16. Pedersen CM, Nielsen MR, Hjermind J, Egero I. Endotracheal Suctioning of the Adult İntubated Patient-What is The Evidence? Intensive and Critical Care Nursing 2009; 25(1): 21-30.
17. Sönmez Düzkaya D, Kuğuoğlu S. Assessment of Pain During Endotracheal Suction in the Pediatric İntensive Care Unit. Pain Management Nursing 2015; 16(1): 11-19.
18. Uysal N, Eşer İ, Khorsıd L. Hemşirelerin Enteral Beslenme İşlemine Yönelik Uygulama ve Kayıtlarının İncelenmesi. Anadolu Hemşirelik ve Sağlık Bilimleri Dergisi 2011; 14(2): 1-9.
19. Çopur EÖ, Kuru N, Seyman ÇC. Hemşirelikte Kanıta Dayalı Uygulamalara Genel Bakış. Hemşirelikte Araştırma Geliştirme Dergisi 2015; 3: 63-70
20. Youngblut JM, Brooten D. Evidence-Based Nursing Practice: Why is it İmportant? Advanced Critical Care 2001; 12(4): 468-476.
21. Kalender N, Tosun N. Endotrakeal Aspirasyon Öncesinde Tartışmalı ir Uygulama: Serum Fizyolojik Kullanımı Gerekli Mi? Hacettepe Üniversitesi Hemşirelik Fakültesi Dergisi 2015; 82–89.
22. Mckelvie S. Endotracheal Suctioning. Nursing in Critical Care. 1998; 3: 244–248.
23. Başaran H, Dikmen Y. Solunum Sistemi Uygulamaları. Hemşirelik Esasları Klinik Uygulama Rehberleri. Ed; Dikmen Y, Korhan Ea. Ankara: Akademisyen Kitabevi, 2016, p. 131-144.
24. Sepit D. Aspirasyon-Yapay Hava Yolu Bulunan Yetişkinlerde Trakeal Aspirasyon. Hemşirelikte Eğitim ve Araştırma Dergisi 2005; 2(2): 30-34.
25. Şenol S. Solunum Yolu Yönetimi. Klinik Uygulama Becerileri Ve Yöntemleri. Ed; Aştı Ta, Karadağ A. Adana: Nobel Kitabevi 2011, p. 816-876.
26. Lorente L, Blot S, Rello J. New İssues and Controversies in the Prevention of Ventilator-Associated Pneumonia. Am J Respir Crit Care Med 2010; 182: 870-876.
27. Blackwood B. Normal Saline İnstillation With Endotracheal Suctioning: Primum Non Nocere (First Do No Harm). Journal of Advanced Nursing, 1999; 29(4): 928-934.
28. Wood CJ. Endotracheal Suctioning: A Literature Review. Intensive And Critical Care Nursing, 1998;14(9): 124-136.
29. Christensen RD, Henry E, Baer Vl et al. A Low-Sodium Solution For Airway Care: Results Of A Multicenter Trial. Respir Care 2010; 55: 1680-1685.
30. Ji YR, Kim HS, Park JH. Installition of Normal Saline Before Suctioning in Patients with Pneumonia. Yonsei Med J. 2002; 43: 607-612.
31. O'neal PV, Grap MJ, Thompson C, Dudley W. Level Of Dyspnoea Experienced in Mechanically Ventilated Adults with and wihout Saline İnstillation Prior to Endotracheal Suctioning. İntensive Critival Care Nursing 2001; 17: 356-363.
32. Yosunkaya A. Ventilatör İlişkili Pnömoniden Korunma. Selçuk Üniversitesi Tıp Dergisi 2010; 26:160-166.
33. Özden D, Taş Z, Yıldız M. Hemşirelerin Açık Ve Kapalı Sistem Aspirasyon Yönteminde Serum Fizyolojik Uygulama Durumlarının Ve Nedenlerinin Belirlenmesi. Hemşirelikte Araştırma Geliştirme Dergisi 2009; 3: 18-29.
34. Ban KO. The Effectiveness Of An Evidence-Based Nursing Care Program To Reduce Ventilator-Associated Pneumonia İn A Korean Icu. Intensive And Critical Care Nursing 2011; 27: 226–232.
35. Korhan EA, Yönt GH, Kılıç SP, Uzelli D. Knowledge Levels of İntensive Care Nurses on Prevention of Ventilator-Associated Pneumonia. British Association of Critical Care Nurses, 2013; 19(1): 26-33

36. Turan S, Ayık İ, Yamak B, Yavuz S et al. Endotrakeal Aspirasyona Bağlı Olarak Gelişen Trakeal Yaralanma. Türk Anest Rean Der Dergisi 2012; 40(1): 40-46.
37. Kapucu S, Özden G. Ventilatör İlişkili Pnömoni ve Hemşirelik Bakımı. Hacettepe Üniversitesi Hemşirelik Fakültesi Dergisi, *2014;* 99-110.
38. Sabuncu N, Alpar ŞE, Karabacak Ü et al. Solunum Yolu Sekresyonlarını Temizleme. Hemşirelik Esasları- Temel Beceriler Rehberi. İstanbul: Medikal Yayıncılık, 2015, p.113-115.

How to cite this article: Dikmen Y, Filiz NY, Erol F et al. Investigation of evidence-based endotracheal aspiration applications in intensive care nurses. Int J Health Sci Res. 2017; 7(8):234-241.

****