Level of Knowledge on the use of Mechanical Ventilation in the Emergency Department; Questionary Study

Acil Serviste Mekanik Ventilasyon Kullanımına İlişkin Bilgi Düzeyi; Anket çalışması

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ABSTRACT

Objective: The number of admissions to emergency services has been increasing in recent years. Therefore, the waiting period of the patients who come with respiratory distress is prolonged due to the hospital's intensity. For this reason, the use of mechanical ventilation (MV) for respiratory support in emergency is also growing. However, data on MV training of emergency physicians are limited. Because of increment use in MV, training and planning on this subject need to be changed. In this study, we aimed to contribute to future regulations by measuring the MV knowledge of physicians in the emergency services.
Methods: A twenty-item questionnaire was filled online by seventy-six emergency physicians between 10/06/2018-20/06/2018. Demographics and information as to the usage of MV were collected via this questionnaire. Data were analyzed using SPSS 25 software.
Results: 76 emergency physicians participated. 51% of our participants work in intensive emergencies where 500-1000 patients are treated, 88.2% following up patients with MV and 76.3% have previously received MV training but this training is not sufficient and standard.
Conclusion: In this study, we found that emergency physicians have a fundamental knowledge of MV. Further, we concluded that the efficacy of this treatment could be increased through more frequent and detailed MV training.

Keywords: Mechanical Ventilation, Emergency Service, Mechanical Ventilation Training

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ÖZET

Amaç: Acil servislere başvuru sayıları son yıllarda giderek artmaktadır. Solunum sıkıntısı ile gelen hastaların bekleme süresi hastanenin yoğunluğundan dolayı uzamaktadır. Solunum desteği için mekanik ventilasyon (MV) kullanımı acil servislerde artmaktadır. Ancak, acil servis hekimlerinin MV eğitimine ilişkin veriler sınırlıdır. Artan MV kullanımı nedeniyle bu konudaki eğitim ve planlamaların değiştirilmesi gerekmektedir. Bu çalışmada acil serviste görev yapan hekimlerin MV bilgilerini ölçerek gelecekteki düzenlemelere katkı sağlamayı amaçladık.
Yöntem: 10/06/2018-20/06/2018 tarihleri arasında yetmiş altı acil hekimi tarafından yirmi maddelik anket online olarak doldurulmuştur. MV kullanımına ilişkin demografik bilgiler ve bilgiler bu anket aracılığıyla toplanmıştır. Veriler SPSS 25 yazılımı kullanılarak analiz edildi.
Bulgular: Anketimize 76 acil hekimi katıldı. Katılımcılarımızın %51'i 500-1000 hastanın tedavi edildiği yoğun acillerde çalışmakta , %88,2'si MV'li hasta takibi yapmakta ve %76.3'ü daha önce MV eğitimi almış olduğunu tespit ettik. Ancak bu eğitim yeterli ve standart değildi.
Sonuç: Bu çalışmada, acil hekimlerinin MV hakkında temel bilgilere sahip olduğunu bulduk. Ayrıca, bu tedavinin etkinliğinin daha sık ve ayrıntılı MV eğitimi ile artırılabileceği sonucuna vardık.

Anahtar Sözcükler: Mekanik Ventilasyon, Acil Servis, Mekanik Ventilasyon Eğitimi

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INTRODUCTION

Admissions to emergency services with respiratory distress have been increasing in every year (1). Several respiratory failures can be seen in the emergency services, including such as chronic obstructive pulmonary disease (COPD), acute decompensated heart failure (ADHF) and metabolic disorders. There has been an increase in the number of patients with respiratory distress since December 2019 with the SARS-CoV-2 (COVID-19) outbreak (2). Hence, emergency services have been affected by these intense admissions. The patients' waiting period is prolonged in the emergency services due to the increase in the admissions and the intensive care unit occupancy. Emergency physicians follow up with the patients who require critical care. Intensive care or critical care areas are established in most emergency services for patients with respiratory failure. Additionally, MV applications are provided to these patients non-invasively or invasively, if necessary. MV applications are vital in patients with asthma, acute respiratory distress syndrome (ARDS) ,acute respiratory failure (dyspnea (respiratory rate >35 minutes), PaCO2 >45 mmHg or PaO2/FiO2 <200 mmHg) (3).(4)(5) Therefore, emergency physicians must have sufficient knowledge of using MV. In this study, we evaluated the level of knowledge of emergency physicians in Turkey by examining their MV training and usage. Thus, we aimed to direct MV training programs, determining physicians' shortcomings and the critical points.

METHODS

Data

The Ethical Committee approved this study of Ankara Numune Training and Research Hospital (Project No: E-18-2042). We electronically created a 2-part, a total of 20 questions questionnaire. This questionnaire was sent by e-mail to the physicians working in the emergency room between 10.06.2018 and 20.06.2018. The answers were collected from physicians who voluntarily participated in the study. The questionnaire consisted of 2 parts: demographics and questions as to MV. Demographic information such as age, gender, academic degree, the institution of employment was asked. Additionally, the patient-related questions such as average admission and intubations, the presence of intensive care units, and the number of inpatient numbers were asked. Various factors were asked to define the current status of emergency services, including the presence of MV and MV training situations, the technique used for hemodynamic monitorization, tidal volume calculations, PaO2 level, situations where NIMV is useful, unsuccessful and contraindicated, NIMV indications in acute respiratory failure and risk factors for ventilator-associated pneumonia.

As we conducted a survey, we accepted that the respondents who answered the survey gave their consent.

Definition

Invasive arterial, venous or pulmonary artery catheterization can be used for hemodynamic monitoring (5). This value could be calculated from 8-10 ml by ideal weight (6). SaO2 should be kept ≥ 90% in order to prevent hypoxia in MV. NIMV is effective in patients with COPD exacerbation, acute cardiogenic pulmonary oedema, and immunosuppressive. (7,8). It is also useful in trauma, ARDS, upper airway obstruction, asthma, and postoperative respiratory failure (9). While NIMV fails in pneumonia, sticky secretions and malnutrition, open consciousness, low apache score and dental problems cause less failure. Arrest cases, encephalopathy, shock, and maxillofacial trauma are contraindicated (10). Dyspnea (tachypnea, respiratory rate >35 minutes), PaCO2 > 45 mm Hg or PaO2 / FiO2 <200 mmHg indicates MV use in acute respiratory failure (11,12). Ventilator-associated pneumonia is hospital-acquired pneumonia that does not occur during intubation and develops within 48 hours after intubation. Risk factors include advanced age, serum albumin 2.2 g / dl, lung disease, lying on the back and transfusion of more than four units of blood product. Obesity and family history are not risk factors (13).

Statistical Analysis

Data were analyzed with SPSS 25 program. Descriptive statistics and results of the study are presented as number (n) and percentage (%). Demographics and MV-related questions were analyzed by using the nonparametric Chi-square test. p <.05 was considered significant.

RESULTS

Seventy-six emergency physicians participated in our study. 30.3% of them were women. 59.2% of the participants were in the 25-35 age range, 36.8% in the 36-45 age range and 3.9% in the 46-55 age range. 31.5% of our participants work as assistants, 52.6% as attending and 15.7% as a faculty member (assistant professors, associate professors, professors). 53.9% had 0-10 years, 32.8% had 11-20 years, and 13.1% had more than 20 years of working experience. 48.6% of the participants work in a training and research hospital, 26.3% in a second-level state hospital, 23.6% in a university hospital and 1.3% in a private hospital. Table 1 shows the number of patients cared for in the emergency services where our participants work.

Table 1. Number of patients treated in 24 hours in emergency services

≤ 200	%19,73
201-500	%9,21
501-1000	%51,31
≥ 1001	%19,73

We divided our participants into two groups as those who do MV training and those who do not. We recruited attendings and faculty members to the training group. When we asked the participants which invasive method, they used for hemodynamic monitoring in MV application, 53.3% were responded not to perform invasive follow-up, and 29.3% were performed central venous catheterization response. We found that 35.5% correct answer was given to the question about tidal volume. We found no difference between those who gave education and those who did not (p = 0.069) in calculating TV. When asked which disease MV is mostly used, 97.4% of the participants answered their COPD attack, and 84.2% answered ADH. When asked what SaO2 level should be in patients using MV, 96.1% of the participants answered: "SaO2 is a value of 90 and above". We found 50% dyspnea and 96.1% hypercapnia (PaCO2> 45 mm Hg) as the indication for NIMV use. The training and receiving group gave the correct answer to this question ultimately. The conditions causing MV failure were 85.5% increased secretion, 57.9% dental problems, 35.5% pneumonia, and no difference between them (p = 0.264). To the question we asked to determine the contraindications about NIMV use, 97.4% of our participants answered cardiopulmonary arrest, 93.4% maxillofacial trauma, 68.4% encephalopathy and 46.1% shock. When looking at risk factors for ventilation-associated pneumonia, 82.9% lung disease, 81.6% advanced age, 44.7% lying on the back, 38.3% serum albumin level ≤ 2.2 g / dl. We got the answer under again the groups gave the correct answer completely. In Table 2, information about the ICU units, MV and intubation numbers of our participants was given.

Table 2: ICU, MV and intubation data

İCU +/-	58	18
MV follow-up +/-	67	9
MV training +/-	58	18
Weekly intubation number		
0-10	43	
11-20	23	
>21	10	
Number of İCU beds		
0-5	1	
6-10	16	
>10	2	
MV number		
0	12	
1	22	
2	20	
>2	22	

DISCUSSION

As a result of the prolongation of human life, the incidence of chronic diseases is increasing. Long waiting periods have been shown to escalation mortality in critically ill patients. A study investigating the waiting times of patients in America has also shown that this is increasing (6).Emergency admissions of patients who may need respiratory support, especially acute respiratory failure, upturn (7). Depending on this situation, the use of MV in emergency services increases (8). These patients who require intensive care hospitalization are followed up in critical care areas created in emergency services due to lack of space (9).For effective MV, it is important to know the use of the device and to choose the appropriate mode and equipment for the patient. Adjusting the device settings according to the patient's exact needs means minimizing iatrogenic complications. Another study states that the use of active MV at the bedside and short-term training (such as 3 hours) can reach the sufficient level of knowledge of physicians. On the other hand, studies indicate that mostly short-term MV training may be a risk in the increase of complications(10)(11). Besides, publications are stating that MV training should be patient-based and should be given in special education rather than increasing the level of knowledge (11).It has been represented that emergency department physicians have knowledge about MV and that it can be improved by modifying during residency training. In the 2019 model of the clinical practice emergency medicine guide, including the American College of Emergency Physicians, MV is among the practical applications integrated into emergency medicine (12) In Turkey, MV emergency medicine training for emergency doctors is given in associations or training hours by their departments. However, these trainings do not have a certain standard. We found that 51.3% of the participants in our study worked in intensive emergencies with 501-1000 patients and 19.7% cared for 1000 or more patients. Looking at our data, we saw that 23.7% of our participants had an emergency-related intensive care area, 84.1% had an MV device and 76.3% of our participants received training on the use of MV and 88.2% of them followed patients with MV in their clinics. Invasive hemodynamic monitoring such as arterial/venous catheter is widely used in patients followed up in MV (13). In emergency services, arterial catheterization is not preferred for hemodynamic follow-up. On the other hand, central venous catheterization is preferred for its easy and fast application. When we asked our participants about the invasive procedure they used for hemodynamic monitoring, we found that 53.3% did not use a method and 29.3% preferred central venous catheterization. In the MV adequate TV should be set for proper oxygenation of the patient. TV should be calculated with the estimated weight of the patients according to height. In one study, the TV values applied to the patient were found to be variable and stated that lung-protective ventilation was generally not performed in the emergency room (14).We got the answer to calculate the TV with the patient's weight at a rate of 57.9%. We interpreted that this way of calculating bedside is faster and more practical. Besides, the patient in MV should not remain hypoxic. Oxygen pressure measurements of 90% and above are required(15) .We set up that our participants achieved an average of 96.1% oxygen saturation. NIMV is commonly used in COPD, ADHF and acute respiratory failure (ARF).(16)(17). In another study, it was stated that early NIMV reduced the need for intubation, hospital stay and elevated survival rates (18)(19). We found that the $PaCO2 \geq 45$ mmHg (%96,1) and dyspnea (%50) were answered to the question of the indication for NIMV use in acute respiratory failure, and this result is consistent with other studies. In cases where NIMV failure was expected, %85,5 intense secretion, %57,9 dental problems were the most preferred options. Studies have also stated that the success of NIMV depends on low apache score, low secretions, improvement in oxygenation and most importantly patient-ventilator relationship. When asked about the contraindications for NIMV we got %97,4 arrest and %93,4 maxillofacial trauma, again consistent with the literature (20). Ventilator-associated pneumonia is hospital-acquired pneumonia that dose not occur during intubation and develops within 48 hours after intubation. Risk factors include advanced age, serum albumin $\leq$2,2 g/dl, lung disease, lying on the back and transfusion of more four units of blood product ((21)

CONCLUSION

We think that providing MV training starting from assistantship period and repeatedly will increase the quality. Studies can be conducted to reveal advanced mechanical ventilation information.

Conflict of interest

No conflict of interest was declared by the authors.

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