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The survey of airways management equipments of emergency medical centers in Mazandaran Province

Yousef Mortazavi[1], Ebrahim Nasiri*[2], Hossein Babatabar Darzi[3], Hosein Mahmoudi[3]

1. Babol University of Medical Sciences, Allied Health Faculty, Anesthesiology *and Operation Department, Babol, Iran*

2. Mazandaran University of Medical Sciences, Faculty Member Department of Anesthesiology-Traditional and Complementary Medicine Research Center, Sari, Iran

3. Baqiyatallah University of Medical Sciences, Nursing Faculty, Tehran, Iran

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ABSTRACT

Aims: In the critical life threatening situations, efforts of the emergency centers personnel are to eliminate the threatening factors, to keep airways open and save the victim life. To achieve these aims, proper equipments such as instruments for opening and keeping airways open are important. The aim of this study was to survey the status of equipment which are used for airway management of victims in critical situations by personnel of Mazandaran emergent teams.

Methods: By using a descriptive study design, Mazandaran province divided into three geographic zones included West, East and Center zone. Three cities randomly chosen from each zone. Emergency centers of these selected cities visited research team members and by using of a checklist, all airways management equipments such as endotracheal tubes, airways, and Ambu bag, a flexible reservoir bag connected by tubing and a non-rebreathing valve to a face mask or endotracheal tube which used for artificial ventilation, surveyed.

Results: Data analysis indicated, there is some deficiency in the airways management equipments. There were no infants endotracheal tubes with internal diameter size of 2.5-3.5 mm in the 30% of centers. In the 95% of the centers there were adult endotracheal tubes with internal diameter size of 6-7.5 mm. There were Ambu bag and oropharynx airways in the 86% and 84% of centers respectively. There weren't any nasopharynx airways. Only 84% of centers had proper endotracheal suction equipments.

Conlusions: It is necessary to revise the list of equipment and also to provide new devices or/and repair some the airways management equipments of emergency centers.

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1. Introduction

Emergency units are among the most important component of health care systems all over the world. Any improvement in this part of the health care system can bring about positive change in other parts as well [1]. Using

*Correspondence Author: Ebrahim Nasiri Mazandaran University of Medical Sciences, Faculty Member Department of Anesthesiology-Traditional and Complementary Medicine Research Center, Sari, Iran.
Tel: +981513543247
Email: enasiri@mazums.ac.ir

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properly working equipments, manpower efficiency and skill are among the factors contributing to a better caring system [2]. Manpower constitutes the most basic element in offering the necessary services to victims of trauma and emergency patients. In addition to a sound theoretical knowledge and practical skills, controlling and keeping airways open requires the use of properly working equipments [3]. This is because any threat against the airways poses a serious risk to the respiratory system, which in turn leads to an increase of death rate among emergency patients [4].

Given the importance of keeping the airway open for emergency patients under critical conditions, and also given the limited time available for airway management in the case of such patients, Opening and managing the airway, including tracheal intubation is the best way to provide proper ventilation and also to prevent pulmonary aspiration [5].

Opening the airway and tracheal intubation is not always an easy procedure in emergency cases or situations, and requires to use of some special equipments such as Ambu bag, laryngeal mask airway (LMA) [6]. The first Cardiopulmonary resuscitation (CPR) bag valve mask was invented and dubbed the "Ambu bag. Furthermore, controlling and opening the airway is one of the most task in post-operation conditions. According to various reports, only 63% of attempts made by medical personnel and paramedics for tracheal intubation outside the hospital have been reported successful [7]. There are also reports indicating that airway obstruction is the cause of 85% of pre-hospital deaths among patients [8].

Therefore, controlling and managing the airway in emergency patients is a highly important issue, success in which can be life-saving. Indeed, the presence of fully functional and working equipments in emergency units based on the standards set by the American Anesthesia Association, along with a highly skilled and experienced manpower can have a crucial influence on the performance of these units in controlling the airway, thus saving the lives of patients. Furthermore, the use of replacement equipments for tracheal intubation such as face masks, Ambu bag, oropharynx and nasopharynx airways are also recommended. Using these equipments reduce respiratory side effects, brain damages and mortality rate up to 30-40% [9-12]. Thus, given the important points mentioned above, and also given the lack of sufficiently centralized data on the issue, the present study was carried out with the aim of investigating the status of airway controlling equipments in emergency departments in Mazandaran, Iran.

2. Methods

In this descriptive study, the sample was consisted of the emergency departments in various cities of the Mazandaran province. Initially the province divided into the western, central and eastern areas. This was due to Mazandaran's large area and the rather varied cultural and social life across this province. Three cities randomly selected from each of these three geographic areas: Ramsar, Nowshahr and Tonekabon from the western area, Babol, Amol and Babolsar from the central area, and Sari, Qa'emshahr and Juybar from the eastern area. The data collected through direct observation and making the necessary arrangements with respective authorities and the management office of each city's emergency department. The data related to airway management equipments, replacement equipments and, the presence or lack of deficiency in the equipments, all recorded in the data collection cheklist.

Given the nationwide standards for emergency departments, different situations defined for each equipment as follows. The fully functional status of the equipments in the current study refers to a situation in which at least three pieces of equipment are available. Partial functionality of an equipment refers to a situation in which fewer than three pieces of

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that equipment are available or the equipment shows partial functionality. The unavailability if a piece of equipment in the present study refers to a situation in which that piece of equipment is either unavailable or not functioning due to technical problems.

The data collection checklist included five sections: 1) the area's demographic information,

2) oropharynx and nasopharynx airways, facemasks for proper ventilation, laryngoscope with a curved blade and tracheal tubes, 3) assistive equipments for complicate intubation such as laryngoscope with a perpendicular blade, stylet and fibro-optic laryngoscope, 4) replacement equipments for non-aggressive ventilation of the airway such as Ambu bag, LMA, the intubating laryngeal mask airway (ILMA), combitube and laryngitube, and finally, and 5) aggressive equipments for opening the airway such as "cricothyrotomy," tracheostomy, and jet-ventilation equipments. The relevant data have been presented in a separate table, results were compared, and the status of each of the emergency departments was analyzed.

3. Results

According to the findings, the siz of 6-7.5 tubes were the biggest ones available in the studied emergency departments (35 centers, 95%). But only 26 centers (70%) were equipped with fully functional the siz of 2.5-3.5 tubes. Six centers (16%) were also partly equipped with these tubes. Based on findings from this study, there was no significant difference between the three areas. Table 1 illustrates the distribution of emergency departments in the three areas of the Mazandaran province in terms of the number and status of airway equipments.

In 14% (5 centers) of cases, the size of 2.5-3.5 tracheal tubes were not available. 6-7.5 tracheal tubes had the most availability (95%). Furthermore, in 41% of cases, Laryngoscope with a perpendicular blade, particularly size 1-2, for complicated intubating was not available. Table 2 illustrates the status of airway management equipments in emergency departments across the Mazandaran province . This study also indicated that laryngoscopes with perpendicular blades as one of the most crucial instruments for opening the airway for children were not fully functional in all the centers, and sometimes were partly functional. Based on the results of this study regarding the status of non-aggressive airway controlling equipments including IMLA and laryngeal tube indicate that none of the studied emergency departments were equipped with such equipments, but two centers were fully equipped with LMA, and another one was partially equipped. As regards fully functional suction pumps, results show that this pump is functioning in most of the studied centers. Styled as a simple but important instrument for complicated intubations could not be found in any of the centers. Furthermore, adult-sized oral airway was available in all the centers, but its availability in children and infant sizes has not been complete. Nasal airways could not be found in any of the centers. Adult-sized Ambu bag as a highly necessary instrument in establishing artificial respiration was available in 32 centers. The children and infant sizes of this instrument was found in 26 (70%) and only 12 (33%) of the centers respectively. Furthermore, the results of this study also indicate that aggressive equipments for opening the airway such as cricothyrotomy, tracheostomy and jet-ventilation equipments were not available in any of the emergency departments, and there was no difference to be observed among the various emergency departments on that account. Disposable equipments such as sterile bandages and gloves and disinfectant solutions were found in all the centers at an optimum level.

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4. Discussion

The results of the current study indicate that more than 70% of emergency departments in the province of Mazandaran are fully equipped with instruments for opening the airway. But some of the centers each of the three designated areas were not fully equipped. Paying sufficient attention to standard procedures when establishing emergency departments and making these centers equipped with proper airway equipments are highly crucial. This can have far-reaching implications in terms of providing medical services under emergency circumstances, particularly in the case of

Table 1: The number of equipments functionality of centers according to geographic areas

Geographic Classification of Emergency Centers	Number of Centers	Equipment Status	
		Fully Functional	Partly Functional
Central Area Emergency Centers	15	8	7
Western Area Emergency Centers	12	6	6
Eastern Area Emergency Centers	10	4	6

Table 2. Frequency of equipments according to availability

Status Type of equipments	Standard	Number of Centers	Fully Functional Nubber(%)	Partly Functional Nubber(%)	Unavailable Nubber(%)
Oropharynx airway	3	37	31(84)	6(16)	-
Nasopharynx airway	1	37	-	-	37(100)
Mask(infant-adult size)	1	37	28(76)	6(16)	3(8)
Adults ambobag	1	37	32(86)	5(14)	-
Infants ambobag	1	37	26(70)	11(30)	-
Laryngoscope with a curved blade Number(1-4)	1	37	35(93)	2(5)	-
Laryngoscope with an orthogonal blade Number(1-4)	1	37	22(59)	8(22)	7(19)
Tracheal tube 2.5-3.5	1	37	26(70)	6(16)	5(14)
Tracheal tube 4-5.5	2	37	30(81)	3(8)	4(11)
Tracheal tube 6-7.5	2	37	35(93)	2(5)	-
Tracheal tube 8-9.5	2	37	35(93)	2(5)	-
Tracheal tube connection	1	37	24(65)	4(11)	9(24)
Stylet	1	37	8(49)	-	19(51)
Laryngo mask	1	37	2(5)	1(3)	34(92)
Laryngo tube	1	37	-	-	37(100)
Combitube	1	37	-	-	37(100)
Oxygen capsule portable manometer	2	37	37(100)	-	-
Oxygen capsule fixed manometer	1	37	35(93)	2(5)	-
Portable suction pump	1	37	32(86)	5(14)	-
Fixed suction pump	1	37	33(89)	4(11)	-
Jet-ventilation	1	37	-	-	37(100)
ventilator	1	37	5(14)	-	32(86)

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trauma patients, and can mitigate the intensity of damages, thus reducing the mortality rate among them [13]. The results of this study also indicate that the situation in terms of available medical equipments in some of the emergency departments is well below the national standard, requiring more rigorous supervision on the one hand, and optimum allocation of financial resources by the authorities on the other hand. It goes without saying that access to properly working medical equipments in emergency departments can contribute to the welfare and comfort of both the citizens and the staff. As the findings of this study indicate, the lack of equipments such as tracheal tubes (2.5-3.5) in some of the emergency departments may cause more serious problems under critical circumstances or increase the likelihood of using nonstandard tubes. This will inevitably take more time on the emergency team by increasing the likelihood of possible side effects. This may cause time as an important factor under emergency circumstances to be lost. Furthermore, laryngoscope with a perpendicular blade, particularly at 1-2 sizes, for difficult tubing was not available. Consequently, children in need of airway controllers in emergency circumstances cannot use standard medical services. Styled as a simple but necessary instrument in difficult tubing was not available in 19 emergency departments. Adult-sized Ambu bags as a very important instrument in establishing artificial respiration were available for use in 86% of the emergency departments. But the availability of the same instruments for children and infants was 70% and 55% respectively.

Since tracheal tubing and gaining access to airways in post-operation conditions is very difficult or even impossible, and since more than 70% of airway management cases for emergency patients are carried out through direct laryngoscopy and tracheal intubation, the availability of laryngoscope with proper blades (curved and perpendicular) in various sizes along having access to sufficient and proper lighting, and also the use of properly working tracheal tubes in various sizes in emergency departments can guarantee access to airways [14]. Furthermore, the availability of fibro-optic laryngoscope as a very helpful instrument in emergency departments is necessary for difficult intubations [15]. Richard M. et al. have reported that the availability of LMA and combitube devices in emergency departments is 26% while that of retrograde instruments is 45% [16]. The results of this study are quite different from those obtained in ours. For instance, in our study, MLA was available in 5% of the emergency departments, while combitubes were not available in any of the emergency departments. Given the benefits of using these instruments, it is highly recommended that all emergency departments across the country should be equipped with them.

Sahari et al. Howe pointed out that the availability of airway management equipments in emergency departments consists of an availability of 17% for Stylets, 48% for fibro-optic Laryngoscope and 38% for ILMA. Based on results from the same study, the availability of aggressive equipments for opening the airway such as the crikotritomy kit has been only 11.5%. Furthermore, the use of non-aggressive equipments were found to be 30% in non-emergency conditions and 25% in emergency conditions [17].

5. Conclusions

Given the points mentioned above, it should be noted that emergency departments play a crucial role in saving the lives of emergency patients as a link in the treatment chain. Therefore, any deficiency in terms of such equipments, particularly airway management equipments, can pose a serious threat against patients' lives as a weak link. It is highly recommended that malfunctioning equipments should be improved, and more emphasis should be placed on the use of airway replacement equipments as a substitution for tracheal tubes.

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