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Prognosis of patients with tracheal intubation in the emergency department

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ABSTRACT

Background: Intubation of critically ill patients is one of the increasing emergency procedures. We designed this study to determine age and sex-related mortality rates after emergency intubation.
Methods: This retrospective study collected and analyzed non-trauma intubated patients in a referral hospital from the years 2017–2019 and before the appearance of COVID-19. Patients who were intubated outside of emergency by EMS technicians were excluded. We recorded data of intubated patients, like sex, age, length of being intubated and final diagnosis. P values of less than 0.05 were significant.
Results: Data of 520 non-trauma intubated patients were collected and analyzed. More than 64% of the patients were over 65 years old and had a higher mortality rate (86.7%; $P < 0.001$) than younger patients. The overall in-hospital mortality rate was 80%. More than three quarters of the decedents died within a week of intubation ($P < 0.001$). There was no significant relationship between sex and mortality rate ($P = 0.535$).
Conclusion: Our data showed that with increased age there was a decrease in the chance of being extubated.

1. Introduction

Intubation is one of the most important lifesaving procedures used in critically ill patients, with unstable conditions. However, not all of the intubations save lives. This procedure substantially increased between 2001 and 2020 [1,2]. As life expectancy increases, the amount of emergency unit visits will increase and more elderly patients seek medical treatments, including some lifesaving procedures such as tracheal intubation. Studies have shown that elderly patients use the emergency medical care services twice as often as younger adults and they need more lifesaving interventions and medications [3,4].

Staff experience, equipment and monitoring factors are risk factors for failure or patient harm [5], which would affect the in hospital prognosis more, especially amongst the elderly patients. Considering the importance of intubation, unfortunately, insufficient information exists about the outcome of those patients who were intubated in the hospital. The patients who are intubated, may be deceased or extubated in long-term. Therefore, investigating and analyzing the characteristics of intubated patients and their prognosis may help to identify the factors that affect the prognosis of these patients. Therefore, in this study we collected and analyzed the data of intubated patients to evaluate the mortality rate according to their demographic and clinical characteristics such as sex, age, length of being intubated and final diagnosis.

2. Methods

This retrospective cohort study assessed the mortality rate of patients who were intubated in the emergency department of Bou-Ali hospital, a referral non-trauma hospital in Qazvin province (population: 1,200,000), Iran. This study was approved by ethical committee in Qazvin University of Medical Sciences with approval ID of IR.QUMS.REC.1398.126. The requirement for informed consent

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was waived, because of the observational nature of the study. Patient's characteristics data and information was anonymized prior to analysis.

Patients' data were extracted from the health information system database of the hospital and included demographics (age, sex), length of being intubated, mortality status and final diagnosis. The information of this database is collected from hospital patients' records. The study period was from March 2017 to March 2019. Included were patients who were intubated in the emergency department with all available information. Excluded were patients who were intubated out of the hospital, trauma patients, and unavailable information.

The primary outcome was the mortality rate of patients who were intubated in the hospital emergency department. The secondary outcomes were the duration of intubation at the hospital and predictors of in-hospital mortality. Based on prior research, the patients ages were divided into six groups [6]. According to the diagnosis of the patients, final diagnosis were divided into seven groups. We had to add a category of unspecified diagnosis which consisted of 27 patients who died before diagnostic procedures revealed a specific reason.

2.1. Statistics

We used IBM SPSS statistics 22 software for all analysis. In hospital mortality was our primary outcome. We analyzed the bivariate association of each candidate predictor with this outcome, using $\chi 2$. Variables significantly associated with our outcome ($p < 0.05$) were included in the multivariable logistic regression model. These were: age, sex and final diagnosis.

3. Results

We identified 594 patients who were intubated in the emergency department during the study period. Data of 74 patients were excluded due to unknown outcomes. We evaluated the data of 520 intubated patients in the final analysis (Fig. 1). Most (64.5%) of the patients were in the age group of more than 65-years. The overall in-hospital mortality rate was 80%. Eighty-two percent of the decedents, died within 7 days of intubation. The median length of being intubated was 62 h (interquartile range (IQR): 15–208 h). Median length intubation was 236 h (IQR: 111–421) for extubated patients and 40 h (IQR: 11–120) for decedents ($p < 0.001$) (Table 2).

Only 13.6% of the intubated patients were transferred to a critical care unit but most of them (46.1%) stayed in the emergency department, observation units, or an unequipped ward (40.3%); however no statistical difference was found between the discharge unit and outcome or age category (chi square test; $P > 0.05$).

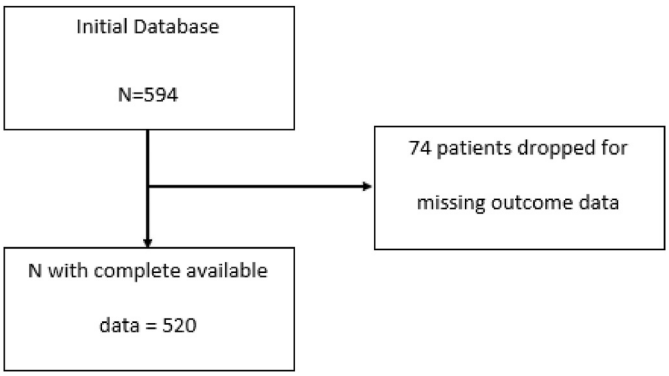

Fig. 1. Cohort selection.

There was a significant relationship between outcome of the intubated patients with age, length of being intubated and final diagnosis ($P < 0.001$ for all comparisons) (Table 2). Sex was not significantly different between decedents and extubated patients who were intubated ($P = 0.535$). Both, extubated patients and decedents were predominately men.

Table 1 demonstrates the demographic and clinical predictors of in-hospital death with odds of in-hospital mortality. As compared with those aged more than 75+, those aged 25–44 had 0.264 lower odds of death (95%CI, 0.121–0.580).

4. Discussion

Intubation was applied in a small number of patients but the difference in mortality rate according to their characteristics include age, length of being intubated and final diagnosis was statistically significant. Eighty percent of intubated patients died in the hospital, most of them during the first 2 days.

Our data show that the median length of being intubated for decedents was about 40 h with a wide range. More than three quarters of them died within a week of intubation. Length of stay in the emergency department of intubated patients were related to a higher risk of developing pneumonia [1]; even with head elevation, peptic ulcer and venous thrombosis prophylaxis [7–9]. In contrast, these times in our study were significantly longer for extubated patients, maybe because of poor prognosis of neurologic and medical diseases associated with mortality.

In the present study, the mortality rate increased markedly with age, which corresponds to earlier studies which reported a significant relationship between high in-hospital mortality and increased age [10]. We found that 86% of patients over the age of 75 died in our study. Ouchi et al. reported in a multicenter study from the USA, an inpatient mortality of 34% for 75–79 year old patients, 40% for those of 80–84 years, 43% for those 85–89 years, and 50% for those over 90 years of age. The strikingly two-fold higher mortality rates in our study seem to indicate that the populations studied or care delivered were substantially different in these two studies and therefore needs further investigation and discussion.

Although we discovered a low rate of ICU admission in our study (only 13.6% of the intubated patients) due to shortage of critical care beds in our hospital, mortality rate in out-of-ICU patients was not higher than those admitted into the ICU. Usually the demand for specialized medical care in an intensive care unit exceeds the number of the available beds worldwide [11,12] and leads to hospitalization of the critical patients outside the ICU. When critical bed availability is decreased, several factors, such as illness severity, age, and medical diagnosis may be used to triage patients [13,14]; In our hospital, anesthesiologists were responsible for ICU admission which usually triage the patients according to the severity of the illness and number of available beds in ICU, and age or gender were not determining factors.

The most frequent final diagnosis for decedents were neurologic and internal-medicine disease with serious chronic conditions like obstructive pulmonary disease, kidney failure or acute hemorrhagic cerebrovascular insults. Both of these groups have poor prognosis even if they are treated effectively. By the progression of these disease, the patient is going to critical status and being intubated. Because of neurological and respiratory deterioration and occurring the irreversible damage in these two groups of disease, the prognosis is poor [15,16]. On the other hand, intubated patients with poisoning have good prognosis. Our study may show some predictors for prognosis of the intubated patients but further studies with more population are recommended.

Our study has some limitations. We performed a retrospective observational study and included all available patients' records

Table 1
Demographic and clinical predicators with odds of in-hospital mortality.

Factors	Mortality Rate	Odds of In-Hospital Mortality	
		OR	P Value
Sex			
Female (221, 42.5%)	78.7%	0.706 (0.429–1.162)	0.171
Male (n = 299, 57.5%)	80.9%	Reference	
Age Group			
<15 (n = 4, 0.8%)	50.0%	0.100 (0.008–1.192)	0.069
15-24 (n = 19, 3.7%)	47.4%	0.325 (0.086–1.228)	0.097
25-44 (n = 56, 10.8%)	60.7%	0.264 (0.121–0.580)	0.001[a]
45-64 (n = 106, 20.4%)	81.1%	0.548 (0.282–1.065)	0.076
65-74 (n = 110, 21.2%)	81.8%	0.645 (0.338–1.232)	0.184
75+ (n = 225, 43.3%)	86.7%	Reference	
Final Diagnosis			
Cardiovascular (n = 127, 24.4%)	79.5%	0.429 (0.127–1.449)	0.173
Internal (n = 100, 19.2%)	87.0%	0.937 (0.262–3.355)	0.920
Infectious (n = 86, 16.5%)	76.7%	0.365 (0.106–1.258)	0.110
Neurologic (n = 122, 23.5%)	86.1%	0.790 (0.227–2.746)	0.711
Poisoning (n = 25, 4.8%)	24.0%	0.140 (0.035–0.564)	0.006[a]
Unspecified (n = 27, 5.2%)	77.8%	Reference	
Other (n = 33, 6.3%)	90.9%	2.680 (0.565–12.707)	0.214

[a] P value less than 0.05 is significant.

Table 2
Clinical characteristics of intubated patients.

Characteristics	All patients (n = 520)	Mortality status		P
		Alive (104)	Dead (416)	Value
Length of being intubated (hours)				
Median (interquartile range)	61.50 (15.25–208.00)	236.00 (111.00–421.25)	39.50 (11.00–120.00)	<0.001
Sex				
Female	221 (42.5%)	47 (45.2%)	174 (41.8%)	0.535
Male	299 (57.5%)	57 (54.8%)	242 (58.2%)	
Age Group				
<15	4 (0.8%)	2 (1.9%)	2 (0.5%)	<0.001
15–24	19 (3.7%)	10 (9.6%)	9 (2.2%)	
25–44	56 (10.8%)	22 (21.2%)	34 (8.2%)	
45–64	106 (20.4%)	20 (19.2%)	86 (20.7%)	
65–74	110 (21.2%)	20 (19.2%)	90 (21.6%)	
75+	225 (43.3%)	30 (28.8%)	195 (46.9%)	
Final Diagnosis				
Cardiovascular	127 (24.4%)	26 (25.0%)	101 (24.3%)	<0.001
Internal	100 (19.2%)	13 (12.5%)	87 (20.9%)	
Infectious	86 (16.5%)	20 (19.2%)	66 (15.9%)	
Neurologic	122 (23.5%)	17 (16.3%)	105 (25.2%)	
Poisoning	25 (4.8%)	19 (18.3%)	6 (1.4%)	
Unspecified	27 (5.2%)	6 (5.8%)	21 (5.0%)	
Other	33 (6.3%)	3 (2.9%)	30 (7.2%)	

P value less than 0.05 is significant.

over the study period. As for the retrospective nature of the studies, we might have encountered limited data or were unable to collect more specific variables such as comorbidity of the patients, indications for intubation by the bedside physician, data on extubation time and intubation complications which would affect the prognosis of the patients.

5. Conclusions

This retrospective single center observational study revealed that the prognosis of the intubated patients reversely relates with the age. As the age increases, the chance of being extubated decreased. Most (82%) of decedents died within a week of intubation. Higher mortality rate was detected with internal and neurological diseases, less with poisoning. There was no significant relationship between sex and outcome of intubated patients.

CRediT authorship contribution statement

Ali Sarbazi-Golezari: Methodology, Writing – original draft, Writing – review & editing. **Peyman Namdar:** Acquisition of the financial support for the project leading to this publication. **Shiva Yousefian:** Conceptualization, Supervision. **Monirsadat Mirzadeh:** Methodology. **Afsaneh Farnood:** Software, Data curation. **Ehsan Modirian:** Conceptualization, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

There is no conflict of interest for any of the authors to be mentioned for this manuscript.

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