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The Intensive Care Unit Admission Criteria For Patients With Poisoning

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Abstract

Introduction: Poisoning is an important health problem in Turkey and all over the world. We believe that the creation of ideal scoring systems for patients with poisoning is essential for the determination of intensive care hospitalization necessity, duration of follow-up, mortality and morbidity.

Materials-Method: In our study, we included over-18-year-old 292 patients with poisoning who were urgently hospitalized into the intensive care unit between January 2016 to December 2017. We have identified some criteria which are named as Ankara Poisoning Criterion. Glasgow Coma Score (GCS) (<15); hypotension (systolic blood pressure< 90 mm Hg); bradycardia (<60 beats/min) or tachycardia (> 100 beats/min); lactate level (2.0); and the pH value (< 7.35 or >7.45). OR *The main decisive factor in the selection of these five criteria (Glaskow coma score <15, systolic blood pressure <90 mm Hg, bradycardia (<60 beats / min) or tachycardia (> 100 beats / min), acidosis (pH < 7,359 or alkalosis (pH> 7,45) and serum lactate level> 2.0 mmol / L),* We anticipated that a patient who meets at least one of these criteria is in need of intensive care hospitalization; and that if s/he does not, there is no need for intensive care hospitalization. The patient's scores of Acute Physiology and Chronic Health Evaluation II (Apachell), Sequential Organ Failure Assessment Score (SOFA), Quick Sequential Organ Failure Assessment (QSOFA), Modified Early Warning Score (MEWS), and Systemic Inflammatory Response Syndrome (SIRS), and length of hospital stay (LOS), inotrop, dialysis, mechanical ventilation, special treatment, and antidote needs were recorded and these parameters were compared with the Ankara Poisoning Criteria.

Results: Of the 292 patients included in the Ankara Poisoning Criteria, 45.5% (n = 133) had zero scores; therefore they did not need to remain in intensive care. We statistically revealed that patients with the LOS ≥2, and need of inotrop, dialysis, mechanical ventilation, special treatment, and antidote, meet at least one of the Ankara Toxicity Criteria (p <0.005). Meanwhile, we statistically observed correlations between the Apache II, SOFA, QSOFA, MEWS, and SIRS scores and revealed criteria (p <0.005).

Conclusion: We concluded that the Ankara Poisoning Criteria, which consists of 5 criteria that can be easily and quickly obtained in the emergency services, can prevent unnecessary intensive care hospitalizations and they will be beneficial for the prognosis and mortality-morbidity of patients.

Keywords: Poisoning, intensive care, admission criteria

Introduction

There have been seen many cases of intentional or accidental poisoning with drugs and chemicals in Turkey and in the world. During the evaluation of patients who come with poisoning, after the hospitalization of the patient, the clinician must answer the questions about whether the patient needs medical treatment and if s/he needs such treatment, what the treatment and follow-up duration must be. It should be pointed out that especially the anamnesis of patients taken too many drugs for suicidal purposes is unreliable. For this group of patients, the uncertainty of what medication, how much and when it was taken makes the follow-up and treatment duration uncertain. Therefore, most of the patients are followed up in intensive care and intermediate intensive care units. However, many of these patients are discharged without the need for intensive care interventions. There are currently no internationally accepted criteria for the ICU admission of patients with poisoning. Yet, evaluations with simple clinical criteria of intensive care patients with poisoning hospitalized in the ICU have shown that hospitalizations can be reduced by 40%[5].

Practical scoring systems are not available for the assessment of cases of poisoning in emergency services. Due to this lack of scoring, there is no objective data about patients' need for intensive care and their conditions of mortality and morbidity.

In 1990s, the Poisoning Severity Score (PSS) was developed in Europe to overcome this shortcoming, but its use has not been widespread. In this rarely used scoring system, misinterpretations and modifications come into question. But now, its clinical usefulness is limited[2].

The prognosis and course of patients admitted to the ICU due to poisoning have not been extensively investigated and therefore there is little literature data on the subject[3].

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We believe that the creation of ideal scoring systems for patients with poisoning is essential for the determination of intensive care hospitalization necessity, duration of follow-up, mortality and morbidity. The aim of this study was to reveal objective criteria related to the intensive care follow-up needs of the patients admitted to the emergency services with the diagnosis of poisoning.

Materials and Methods

Patient Group:

Our study was conducted at the University of Health Sciences Medical School Ankara Health Care Center. Our Center is one of the largest training and research hospitals in the region with approximately 10000 outpatients and 1000 emergency service patients admitted per day. Our patient group consists of patients over 18 years old hospitalized between 2016-2017 in the emergency ICU of University of Health Sciences Medical School Ankara Health Care Center with the diagnosis of poisoning with various chemicals (accidentally or intentionally). In addition, patients with more than one admission and hospitalization during this period were included in the study. Our study was conducted retrospectively by scanning patients' files.

Data collection:

We created a database with suitable cases using a Microsoft program. We saved the following data from the database records of the emergency service and ICU: age, gender, vital signs, blood gas, biochemistry and complete blood counts; GCS, Apache II, SOFA, Qsofa, SIRS, MEWS scores; the needs of mechanical ventilator, positive inotrope, antidote, special treatment, dialysis; drugs or chemical substances caused poisoning and their amounts. We identified the groups of the drugs taken by patients by looking at their names, estimated drug dose, anamnesis, and at the drug boxes left in the scene of accident. We could not measure the serum levels of the active substance in all patients due to the causes of poisoning were different and the levels of some substances could not be determined within hospital facilities.

We designed a tool, consisting of 5 parameters, according to which the decision for hospitalization of a patient into intensive care unit is made. We estimated that if a patient meets one of these parameters, his/her hospitalization in the an ICU is required. We have come up with an idea that the patient group, which does not meet any of those parameters, can be followed up in the outpatient or inpatient settings. While introducing these parameters, we have already taken into account the algorithms published in the literature[2,4,5].

When designing this "decision" tool, we opted for simple parameters that could be quickly and easily accessible in the emergency service and we chose the parameters that could determine all vital functions. We determined the cut-off values from national and international guidelines for ICU admission[6]. We named our developed diagnostic tool as "Ankara Poisoning Criteria" (Table 1).

Table 1: Ankara Poisoning Criteria

1) GCS must be <15,
2) Hypotension (systolic blood pressure must be 90 mm Hg),
3) Bradycardia (must be <60 beats/min) or tachycardia (must be > 100 beats/min),
4) Lactate level must be high (> 2.0)
5) The pH value must be acidotic or alkalotic (< 7.35 or > 7.45).

We compared the patients' scores gotten from the Ankara Poisoning Criteria with their LOS, whether they need inotrop or not, whether the dialysis and mechanical ventilation support were provided, and with the specific treatment and antidote needs.

Outcome:

The primary endpoint of the study is the determination of the validity of the Ankara Poisoning Criteria for patients with poisoning hospitalized in the ICU. Therefore, we compared the presence of treatments performed to patients, such as mechanical ventilation, dialysis, inotropic support and special antidote, which are required the ICU conditions, with the Ankara Poisoning Criteria.

Statistical Analysis:

We thought that all the parameters described in Table 1 are equally important for ICU interventions and admission to ICU. Patients who met one or more of the parameters pre-

Table 2: Distribution of scores of patients from scoring systems

qSOFA	0	% 79,8
	≥1	% 20,2
SOFA	≤4	% 91,8
	≥5	%8,2
SIRS	≤1	% 92,1
	≥2	% 7,9
Apache II	≤6	% 68,5
	≥7	% 31,5
MEWS	≤ 2	%91,4
	≥3	% 8,5

sented in Table 1 were considered by us as a group of patients in need of intensive care. The patient who did not meet any of these 5 parameters was considered by us as a patient who does not need an indication for intensive care admission. Patients' general characteristics, intensive care hospital stay durations, mortality and morbidities, GCS, Apache II, SOFA, Qsofa, SIRS, MEWS scores were compared.

The statistical analysis was performed by using the SPSS 22.0 program (Statistical Package for the Social Sciences Inc., Chicago, IL, USA) in the Windows operating system. The patients' scores gotten from the Ankara Poisoning Criteria were compared with the length of stay and needs of inotrop, dialysis, mechanical ventilation, special treatment and antidote by using the Chi-square and Fisher's Exact Tests. We considered the value of $p<0.05$ being statistically significant at the confidence interval 95%.

Results

We included in our study 316 patients aged ≥18 years hospitalized between 01 January 2016 and 31 December 2017 in the emergency intensive care unit of University of Health Sciences Medical School Ankara Health Care Center with the diagnosis of poisoning. 24 of these patients were excluded from the study because all their data could not be reached. The data obtained from 292 patients were evaluated.

The mean age of the patients was 33,35 (min 18, max 90, st dev: 13,953). 65,4% (n = 191) of the patients were female and 34,6% (n = 101) were male. We share distribution of scores of patients from scoring systems in Table 2. In 77.0% of patients (n = 225) the pH value was in the normal range (7,350 ≤ normal pH ≤ 7,450). There was acidosis or alkalosis in 22.9% (n = 67) of patients. In 28.7% of patients (n = 84) we detected lactate as ≥2.0. 91.8% (n = 268) of the patients were discharged after completing treatment in the intensive care unit. 7,2% (n = 21) of patients were transferred to another department for further treatment or referred to another medical center. Three (1%) (n = 3) of patients died. In table 3, we share LOS, tension, pulse rate, GCS, inotropes, mechanic ventilation and dialysis supports. 1 patient was hospitalized in the Department of Psychiatry due to ongoing suicidal thoughts.

When all patients were evaluated within the scope of the Ankara Poisoning Criteria we concluded that 45.5% (n = 133) of patients had a "zero" point. In this study, we compared of the Ankara poisoning criteria with treatment requirements of patients and values of the Ankara poisoning criteria with the criteria values of another intensive care unit (Table 4,5).

Table 3: General characteristics

Length of Hospital Stay	1 day	%11,9
	2≥ day	%88,1
Pulse rate	<60/ min or 100/min≥	%9,5
	60-100/min	% 90,5
Hypotension	+	%3,7
	-	%96,5
GCS	15	%83,9
	≤14	%16,1
Inotropic support	+	%3,4
	-	%96,6
Mechanic Ventilation	+	%4,4
	-	%95,4
Dialysis	+	%1
	-	%99

Discussion

The aim of this clinical trial is to introduce objective and easy-to-reach criteria that can be applied during the ICU admission of patients with poisoning. The results showed that patients who did not meet the criteria, set as the result of our study, did not need inotropic agents, dialysis, mechanical ventilation, special treatment and antidote, and also showed that patients got low points in scoring systems such as APACHE II, SOFA, QSOFA, MEWS and SIRS. Therefore, we have come to the conclusion that an objective clinical evaluation tool that will evaluate blood gas, vital signs, GCS and whether a patient needs intensive care or not, can be created for patients with poisoning.

The main decisive factor in the selection of these five criteria (Glaskow coma score <15, systolic blood pressure <90 mm Hg, bradycardia (<60 beats / min) or tachycardia (> 100 beats / min), acidosis (pH < 7,359 or alkalosis (pH> 7,45) and serum lactate level> 2.0 mmol / L), collected under the name of "Ankara Poisoning Criteria", was that all these criteria were easily accessible. Another factor affecting our choice is the fact that the GCS represents the patient's state of consciousness, systolic blood pressure and heart rates show hemodynamic problems in the patient if there are any, and the patient's pH and lactate values provide information about the patient's metabolic status.

Today, both the national Advisory Center on Toxicology (114) approach and the general approach around the world show that clinicians should provide the follow-up at least 24 hours[3,9] to patients with poisoning, and even this should be done under intensive care settings. However, when there is no need for intensive care, there are some cases of poisoning that are followed up in the intensive care unit for preventive purposes and as the result, limited number of intensive care beds are occupied, which is an important problem in the whole world's medicine. As a result of this study, we have determined that we can overcome this problem with

Table 4: The Comparison of Values of the Ankara Poisoning Criteria with the Criteria Values of Another Intensive Care Unit

	ANKARA CRITERIA		P value	
	NEGATIVE	POSITIVE		
qSOFA	0	128	105	0,000
	≥1	5	54	
SOFA	≤ 4	129	139	0.003
	≥5	4	20	
SIRS	≤ 1	131	138	0,000
	≥2	2	21	
APACHE II	≤6	108	92	0,000
	≥7	25	67	
MEWS	≤2	133	134	0,000
	≥3	0	25	

Table 5: The Comparison of the Ankara Poisoning Criteria with Treatment Requirements of Patients

	ANKARA CRITERIA		P value	
	NEGATIVE	POSITIVE		
Length of hospital stay (days)	1	24	11	0.004
	≥2	109	148	
Need for Mechanical Ventilation	None	133	146	0,000
	Yes	0	13	
Need for inotropic support	None	132	150	0.024
	Yes	1	9	
Need for Dialysis	None	133	156	0.055
	Yes	0	3	
Special Treatment	None	107	102	0.002
	Yes	26	57	
Antidote	None	133	159	0.001
	Yes	0	9	

the Ankara Poisoning Criteria. With the implementation of the Ankara Poisoning Criteria, we concluded that 45.5% of the patients were not in need of hospitalization in the ICU. When we compare scoring systems such as Apache II, SOFA and QSOFA with the patients' scores obtained from the Ankara Poisoning Criteria, we observed that the Ankara Poisoning Criteria were correlated with other scoring systems ($p < 0.005$). When we reviewed the literature, two studies on this topic show that patients with poisoning (having high Apache 2 score) hospitalized in the intensive care unit have higher mortality and require mechanical ventilation[3,7,10]. Moreover, it has also been found that the Apache 2 score is useful in prognosing patients who are followed up due to poisoning in the intensive care unit[8]. Meanwhile, the high Apache 2 scores in our study also correlated with the Ankara Poisoning Criteria. The criteria we use can be a good alternative to the Apache 2 score in clinical practice because they are more practical and easily remembered.

Previous studies have shown that the scoring systems determined for patients could not compare the clinical status of patients (need of ventilator, dialysis and inotropic support). The previously conducted studies focused mostly on the vital signs of the patients[2,3,7]. The Apache scores of the patients with poisoning hospitalized in the ICU in the studies of both Banderas-Bravo and al., and Alizadeh and al. were compared; however, no other patients' findings were reported about the clinical status of the patients. In our study, patients were assessed in terms of the Ankara Poisoning Criteria, while at the same time it was questioned whether it is possible to predict the need for intensive care treatment of patients by using these criteria.

Also in our study, it was found that systems aimed at predicting the severity of intensive care patients are mostly focused on the evaluation of sepsis patients. The clinical use of the poisoning severity score (PSS)[1,11], which is used in the evaluation of patients with poisoning, has not reached the desired prevalence due to the examination of the large number of parameters.

The most important limitation of our study is that it is done in one center and as the result, it could not be possible to examine some types of poisoning. Since the cases with poisoning vary locally, our developed scoring system needs

to be supported by multicenter studies in different geographical regions. The second limitation might be that our patient group relatively consists of more of patients who are not really in need of intensive care. Therefore, we need to carry out different studies and publish the results of these studies using the Ankara Poisoning Criteria in various centers and intensive care units.

Conclusion

The Ankara Poisoning Criteria, introduced in this study, is an appropriate, simple and practical scoring system that can be used in the decision for the indication of intensive care hospitalization and prognosis prediction in cases with poisoning.

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