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Evaluation of Patients Diagnosed with Ileus in the Emergency Department

Acil Serviste İleus Tanısı Alan Hastaların Değerlendirilmesi

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Abstract

Purpose: In emergency department, a delayed diagnosis and treatment of ileus causes a substantial increase in morbidity and mortality.

Material and Method: In this study we aimed to determine the major risk factors of mortality and hospital stay length in patients with ileus.

Results: It was determined that blood transfusion requirement, lactate, total bilirubin, and C-reactive protein levels, presence of colon cancer, and mean arterial pressure were among the parameters that can be used for predicting mortality in patients with ileus. In addition, qSOFA value and potassium, sodium, and total protein levels were determined to be among the parameters that are effective for determining the need for surgery in patients with ileus.

Conclusion: Considering the study findings, it is possible to reduce both morbidity and mortality and to achieve cost reduction by determining parameters that have effect on mortality, length of hospitalization, and surgical decision in patients with ileus.

Keywords: Abdominal pain, emergency room, ileus, mortality, surgery

Öz

Amaç: Acil serviste ileus tanı ve tedavisindeki gecikme ciddi mobidite ve mortalite artışıyla sonuçlanmaktadır.

Gereç ve Yöntem: Bu çalışmada ileus hastalarında hastanede kalış süreleri ve mortaliteyi etkileyen ana faktörlerin tespiti amaçlanmıştır.

Bulgular: Kan transfüzyonu ihtiyacı, laktat, total bilirubin ve C-reaktif protein seviyelerinin yüksekliği ile kolon kanseri varlığı ve ortalama arter basıncı düşüklüğünün ileus hastalarında mortaliteyi belirlemede etkili olduğu tespit edildi. İlave olarak qSOFA değeri ile sodyum, potasyum ve total protein seviyelerinin ileus hastalarında cerrahi ihtiyacını belirlemede etkili olduğu görüldü.

Sonuç: İleus hastalarında hastanede kalış süreci, cerrahi kararı, mortalitenin tespiti, mortalite ve morbiditenin azaltılması ve tedavi maliyetlerinin azaltılmasında çalışmada tespit edilen parametrelerin kullanımının faydalı olabileceğini düşünmekteyiz.

Anahtar Kelimeler: Acil servis, cerrahi, ileus, karın ağrısı, mortalite

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INTRODUCTION

Abdominal pain is one of the most common conditions that results in the admission of adult patients to the emergency department (ED) with a rate of 4%-8%.[1] Among these types of pain, those that require surgery are referred to as acute abdomen. The term acute abdomen typically refers to the clinical condition that manifests as a complaint of prominent abdominal pain occurring in the past week due to non-traumatic reasons and possibly requiring urgent treatment.[2]

The most common causes of acute abdomen in EDs include acute appendicitis, acute cholecystitis, diverticulitis, intestinal obstruction, pancreatitis, and perforated peptic ulcer.[3] Approximately 15% of all such hospital admissions are caused by ileus.[2] Ileus refers to a slowdown or delay in the distal progression of the intestinal contents in the gastrointestinal system owing to a functional or mechanical reason. Ileus can be divided into two groups: ileus associated with mechanical factors and not associated with mechanical factors. Ileus associated with non-mechanical factors can be classified into two types: adynamic ileus and dynamic ileus. Mechanical factors involved in ileus include extraintestinal pathologies (hernia etc.), intestinal wall pathologies (malignancy etc.), and intraintestinal pathologies.[4] Previously, the most common cause in the etiology of ileus was inguinal hernia, whereas currently the most common reason is the condition caused by postoperative adhesions.[5,6] Delay in diagnosis and treatment in ED can lead to a critically increase in mortality.[7]

In the present study, we aimed to retrospectively examine the sociodemographic characteristics, comorbid diseases, and etiology of patients with ileus in the adult ED and to determine the parameters that can be used in the surgical decision-making, and mortality prediction.

MATERIAL AND METHOD

The study was approved by the ethics committee (protocol number TÜTF-BAEK 2018/168 dated 07.05.2018). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. The patients who were admitted to the Emergency Department of tertiary hospital during a 2-year period and were clinically and radiologically diagnosed with ileus. Data were retrospectively collected from the hospital registry system and ED patient records of the hospital and documented in the previously prepared study form.

During the study period, 316 patients who were clinically and radiologically diagnosed of ileus. In this period a total of 306 patients were diagnosed with ileus. Of these, 64 patients aged <18 years and previously diagnosed with ileus and 55 patients whose complete information was unavailable were excluded from the study. Finally, a total of 197 patients were included in the study. Age, sex, vital signs at the time of admission (systolic–diastolic blood pressure, heart rate, body temperature, respiratory rate), laboratory tests, duration of admission complaints, detailed background information, risk factors (such as malignancy and surgical history), length of hospitalization (for inpatients), type and amount of blood products administered, and quick Sepsis-Related Organ Failure Assessment (qSOFA) scores of the patients were retrospectively reviewed from the records and documented. The hospital registry system was used to evaluate the 30-day mortality rates of patients. For patients who were not discharged within 30 days, mortality was inquired by contacting the patient or their relatives.

Data Analysis

Shapiro–Wilk test was used to examine compliance to normal distribution. Univariate and multivariate logistic regression (Backward 29 Wald method) analyses were used to determine risk factors. First, the effects of all factors were examined using univariate logistic regression, and factors with a p-value of <0.200 were included in the multivariate logistic regression model. ROC analysis (Youden index) was used to evaluate the model performance and determine cut-off points. Simple and multiple linear regression analyses were used to determine the factors affecting a quantitative variable. Multiple linear regression analysis was applied on factors with a p-value of <0.200 in simple linear regression analysis. To avoid the issue of multiple linear correlation in both linear regression and logistic regression, variables that showed high correlation (e.g., r > 0.9) were investigated. Among variables with high correlation with each other, the variable with a lower p-value in the univariate model was included in multiple linear regression and/or multivariate logistic models. In terms of descriptive statistics, in addition to minimum and maximum values for quantitative variables, mean and standard deviation were determined for those that conformed to the normal distribution, median and interquartile range were determined for those that did not conform to the normal distribution, and number and percentage were determined for qualitative variables. The significance level for all statistical analyses was determined as 0.05, and all analyses were conducted using IBM SPSS 23.0 package program, R program gplots package, easyROC, and TURCOSA (Turcosa Analytics Ltd Co, Turkey, www.turcosa.com.tr) statistical software (52).

Group comparisons were performed using Mann–Whitney U test and Student's t-test for quantitative variables that did not conform to the normal distribution. Relationships between qualitative variables were investigated using the Pearson's chi-square test and Fisher's exact test.

RESULTS

Of the patients, 90 (45.7%) were women and 107 (54.3%) were men. Mean patient age was 64.10±15.02 years (min-max:19-97). Although the mean age of men was higher than that of women, a significant difference was not observed (p=0.077). Details regarding mean patient age is provided in **Table 1**.

Table 1. Mean age of patients with ileus

	Mean age (years)	Minimum–maximum (years)
Female	64.3±18.92	19-94
Male	61.6±17.83	20-95
Total	64.10±15.02	19-97

When the history of abdominal surgery of patients was assessed, it was found that 129 (65.5%) patients had previously undergone an abdominal surgery. When the patients were examined in terms of presence of cancer, 87 (44.2%) patients were found to have a previous cancer diagnosis. Of the patients, 29 (14.7%) were previously diagnosed with colon cancer, 14 (7.1%) with liver cancer, and 13 (6.6%) with rectal cancer.

On the examination of qSOFA scores at the time of admission, the score was found to be ≥1 in 28 (13.8%) patients and 0 in 169 (86.2%) patients. Evaluation of the vital and laboratory findings of patients revealed that the mean body temperature was 37°C (min-max: 36°C-38.4°C), mean heart rate was 92 beats/min (min-max:72-148 beats/min), mean systolic arterial blood pressure was 125 mmHg (min-max:70-150 mmHg), mean diastolic arterial blood pressure was 70 mmHg (min-max:40-95 mmHg), and mean arterial blood pressure (MAP) was 90 mmHg (min-max: 50-113 mmHg). The mean values of other laboratory parameters are presented in **Table 2**.

Mortality Prediction Model

It is determined that 25 (12.7%) of the patients died within the 30 days of admission. Statistical models were analyzed to determine parameters that could influence mortality in patients with ileus. In the model analyses, the model created by considering the accuracy rates obtained in predicting mortality with McFadden, Cox, and Snell and Nagelkerke R2 measurements.

According to the Hosmer–Lemeshow test result, the model was found to conform to the data (p=0.266). The logistic regression model results revealed that the parameters such as blood transfusion (p<0.001), lactate level (p=0.029), presence of colon cancer (p=0.001), total bilirubin (TBIL) level (p=0.025), and MAP (p=0.001) showed a significant effect on mortality. Although the effect of C-reactive protein (CRP) level was not significant (p=0.065), it was included in the model owing to its substantial contribution to the model. When the remaining parameters in the model were maintained constant, one unit increase in the number of blood transfusions was found to increase the mortality risk by 1.25 times (95% confidence interval (CI):1,106-1,412), whereas CRP and lactate level increased the mortality risk by 1.068 times (0.1-1.15 and 1.01-1.14, respectively). Similarly, when the other parameters in the model were maintained constant, one unit increase in TBIL level increased the mortality risk 3.521 times (1.171-10.588) and MAP increased this risk by approximately 10%.[odds ratio: 0.9 times (0.848-0.955). Colon cancer is the most important factor that increases mortality risk. It was observed that the mortality risk of patients with colon cancer was approximately 35 times (4.6-171) higher than those without colon cancer.

Table 2. Mean values of vital and laboratory parameters of patients with ileus

Qualitative Variables	Mean (±SD)	Minimum	Maximum
Temperature (°C)	37 (0.5)	36	38.4
Heart rate (beats/min)	92 (14)	72	148
SAP (mmHg)	125 (26.5)	70	150
DAP (mmHg)	70 (12)	40	95
MAP (mmHg)	90 (17)	50	113
HGB (g/dL)	12.5 (2.1)	6.9	19.6
Hematocrit (%)	37.4 (6.5)	19.5	58.2
WBC (10^3/uL)	10.7 (6.4)	1.1	31.8
PLT (10^3/uL)	282 (156)	70	881
AST (U/L)	27 (20.5)	8	239
ALT (U/L)	15 (12)	4	112
Total protein (g/dL)	6.7 (1.0)	4.2	9.5
Albumin (g/dL)	3.6 (0.6)	2.0	5.3
Total bilirubin (mg/dL)	0.7 (0.7)	0.2	7.2
Direct bilirubin (mg/dL)	0.2 (0.3)	0.1	3.4
Indirect bilirubin (mg/dL)	0.5 (0.5)	0.1	3.8
Urea (BUN) (mg/dL)	46 (38.5)	13	247
Creatinine (mg/dL)	0.9 (0.7)	0.2	11.6
Na (mmol/L)	136.6 (4.6)	123.0	151.0
K (mmol/L)	4.3 (0.6)	2.1	5.6
Cl (mmol/L)	101.4 (5.1)	83	116
CRP (mg/dL)	3.1 (2.8)	0.2	53
ALP (U/L)	84 (44)	11	675
GGT (U/L)	24 (25)	7	982
Amylase (U/L)	49 (38)	4	489
Lipase (U/L)	18 (19)	1	297
Glucose (mg/dL)	119 (41)	55	358
pH (blood gas)	7.4 (0.1)	7.2	7.56
HCO_3 (blood gas)	23 (6)	12	44
PO_2 (mmHg)	96 (3)	37	99
Lactate (mg/dL)	13 (11)	2	109
INR	1.13 (0.2)	0.89	4.28

SAP: Systolic arterial pressure, DAP: Diastolic arterial pressure, MAP: Mean arterial pressure, HGB: Hemoglobin, WBC: White blood cell count, PLT: Platelet, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, BUN: Blood urea nitrogen, Na: Sodium, K: Potassium, Cl: Chlorine, CRP: C-reactive protein, ALP: Alkaline phosphatase, GGT: Gamma glutamyl transferase, pH: pH of blood gas, HCO_3: Bicarbonate in blood gas, PO_2: Oxygen in blood gas, LACTATE: Lactate level in blood gas, INR: International normalized ratio

Using the probability estimates obtained as a result of the logistic regression model, it was examined whether the model shows significant difference for distinguishing between the two groups (dead and alive) by ROC analysis. In addition, the performances of the variables MAP and TBIL, CRP, and lactate levels in the final model for distinguishing between both groups (dead and alive) individually were examined.

On examining the area under the curve (AUC) value obtained, it was observed that the prediction model significantly separated the groups (AUC=0.965, p<0.001). Therefore, it is possible to state that the model shows a successful performance in determining mortality. According to the ROC analysis, the cutoff point for probability prediction using the Youden index was determined as 0.588. Performance measures according to this cutoff point were determined as follows: sensitivity was 80% (20/25), selectivity was 100% (172/172), positive predictive value was 100% (20/20), and negative predictive value was 97.2% (172/177).

AUC values of the variables MAP and TBIL, CRP, and lactate levels in the model were obtained as 0.788, 0.766, 0.766, and 0.743, respectively; the AUC values obtained for these variables were significant (p<0.001 for all variables). The cutoff points for the variables MAP and TBIL, CRP, and lactate levels were 80, 0.9, 3.7 and 18, respectively, according to the Youden index. Patients with MAP value of <80 mmHg can be expected to be in the risk group for mortality. According to these cutoff points, sensitivity, selectivity, positive predictive value, and negative predictive value measures were 64%, 87%, 41%, and 95% for MAP; 76%, 60%, 22%, and 95% for TBIL level; 0, 88%, 60%, 25%, and 98% for CRP, and 72%, 74%, 29%, and 95% for lactate, respectively.

Considering these results, the variables MAP and TBIL, CRP, and lactate levels exhibited lower performance in determining risk groups for mortality (range of AUC values:0.70-0.79) when considered individually. However, an AUC value of 0.965 was obtained in the multivariate logistic regression model that included the variables blood transfusion and presence of colon cancer along with the above variables.

In multivariate logistic regression model, it was observed that both AUC value and other performance measures (selectivity, positive predictive value, and negative predictive value) were higher than measures observed individually for the variables. Considering this finding, it can be concluded that instead of using the variables individually for mortality prediction, the use of a prediction model derived from these variables can provide an increase in diagnostic performance. ROC analysis results on mortality prediction are shown in **Table 3**.

Additionally, according to the results of the logistic regression model, blood transfusion, lactate level, presence of colon cancer, TBIL level, MAP, and CRP level were significant variables for mortality prediction. However, the categories of the dependent variable used in the model remain quite unbalanced (dead: 25 (12.7%) and alive: 172 (87.3%).

It should be considered that this unbalance may have negative effects on coefficient prediction and variable selection. It is recommended that the study be repeated with an evenly distributed dependent variable in the future.

Factors affect the length of hospitalization

Overall, 97 (53.3%) of the inpatients were women, and 85 (46.7%) were men. And it was observed that gender did not have a significant effect on the length of hospitalization (p=0.838). The length of hospitalization of patients with blood transfusion was observed to be 3-32 days (median:14 days), whereas the length of hospitalization in those who did not receive blood transfusion was 1-35 days (median:5 days). The length of hospitalization of the patients with a history of cancer diagnosis was 1-35 days (median:10 days), whereas the length of hospitalization for those without a cancer diagnosis was 1-30 days (median:6 days). The length of hospitalization of patients who underwent surgery for ileus was 2-35 days (median:13.5 days), whereas the length of hospitalization in patients who underwent no surgery was 1-21 days (median:4.5 days). The median length of hospitalization of patients with a lactate level of <14 mg/dL was 6 days and ranged between 1 and 35 days, whereas that of patients with a lactate level of >14 mg/dL was 9 days and ranged between 1 and 32 days. The length of hospitalization in patients with a creatinine level of <1.2 mg/dL was 1-35 days (median:7.25 days), whereas that in patients with a level of <1.2 mg/dL was 2-29 days (median:7.5 days).

In the quantitative descriptive statistical evaluation of hospitalized patients, the median age was found to be 64 years (min-max:19-97); however, it was not a significant factor (p=0.201). On evaluating the vital signs of hospitalized patients, the median temperature was 36.9°C (min-max:36°C-38.4°C) but it was not a significant factor (p=0.986). However, the median heart rate of the hospitalized patients was 92 beats/min (min-max:72-148 beats/min) and it was found to be a significant factor (p=0.030). Similarly, the median systolic arterial blood pressure value of hospitalized patients determined as 125 mmHg (min-max:70-150 mmHg) was concluded to be a significant factor (p=0.034). Further, the median albumin level of hospitalized patients 3.6±0.7 g/dL (min-max: 2-5.3 g/dL)) was found to be a significant factor (p<0.001). The median value of TBIL level in hospitalized patients was 0.8 mg/dL (min-max:0.2-7.2 mg/dL); it was found to be a significant factor (p=0.043). The median urea level of hospitalized patients (47 mg/dL (min-max:13-247 mg/dL)) was found to be a significant factor (p=0.003). Likewise, the median creatinine level.[1 mg/dL (min-max:0.2-11.6 mg/dL)] and median CRP level (3.3 mg/dL (minimum-maximum:0.2-53 mg/dL)) of the hospitalized patients were found to be a significant factors (p=0.012 and 0.002, respectively). Further, the median lactate level of the hospitalized patients was determined as 13 mg/dL (min-max:2-109 mg/dL); it was a significant factor (p=0.005). The results of statistical analysis affecting the length of hospitalization of the patients according to other laboratory parameters and their presence are presented in **Table 4**.

Table 3. ROC analysis results for mortality prediction

	AUC	P	Cutoff point	Sensitivity	Selectivity	Positive predictive value	Negative predictive value
MAP	0.788	<0.001	80	0.640	0.866	0.410	0.943
TBIL	0.700	<0.001	0.9	0.760	0.593	0.213	0.944
ROC	0.766	<0.001	3.7	0.880	0.599	0.242	0.972
Lactate	0.743	<0.001	18	0.720	0.733	0.281	0.947
Model	0.965	<0.001	0.588	0.800	1	1	0.972

MAP: Mean arterial pressure, TBIL: Total bilirubin (mg/dL), ROC: Reciever operator characteristics curve

Table 4. Quantitative descriptive statistics of hospitalized patients with ileus

	Mean (± SD)	Min	Max	R2	P
Age	65 (20.3)	19	97	0.009	0.201*
Temperature (°C)	36.9 (0.5)	36	38.4	<0.001	0.986
Heart rate (beats/min)	92 (14)	72	148	0.026	0.030*
SAP (mmHg)	125 (25)	70	150	0.025	0.034
DAP (mmHg)	70 (12)	40	95	0.008	0.221
MAP (mmHg)	90 (16.3)	50	113	0.017	0.084
HGB (g/dL)	12.5±2.1	6.9	19.6	0.017	0.081*
Hematocrit (%)	37.4±6.2	19.5	58.2	0.011	0.167
WBC (10^3/uL)	10.8 (6.7)	1.1	31.8	<0.001	0.938
PLT (10^3/uL)	281 (161.5)	70	881	<0.001	0.991
AST (U/L)	27.5 (22.3)	8	239	<0.001	0.783
ALT (U/L)	16 (12)	4	112	0.003	0.438
Total protein (g/dL)	6.7±1	4.2	9.5	0.004	0.369
Albumin (g/dL)	3.6±0.7	2	5.3	0.081	<0.001*
Total bilirubin (mg/dL)	0.8 (0.7)	0.2	7.2	0.022	0.043*
Urea (BUN) (mg/dL)	47 (37.5)	13	247	0.047	0.003*
Creatinine (mg/dL)	1.0 (0.7)	0.2	11.6	0.035	0.012*
Na (mmol/L)	136.5±4.6	123	151	<0.001	0.565
K (mmol/L)	4.2±0.7	2.1	5.6	<0.001	0.663
Cl (mmol/L)	101.3±5.2	83	116	<0.001	0.166*
CRP (mg/dL)	3.3 (8.3)	0.2	53	0.053	0.002*
ALP (U/L)	83.5 (43.3)	11	675	<0.001	0.448
GGT (U/L)	24 (24.5)	7	982	<0.001	0.780
Amylase (U/L)	48.5 (38)	4	489	<0.001	0.639
Lipase (U/L)	18 (19.3)	1	297	<0.001	0.362
Glucose (mg/dL)	119 (41)	55	358	<0.001	0.813
pH	7.4 (0.1)	7.2	7.56	<0.001	0.431
HCO_3 (mEq/L)	22 (6)	12	44	<0.001	0.457
PO_2 (mmHg)	96 (3)	37	99	<0.001	0.392
Lactate (mg/dL)	13 (10.3)	2	109	0.044	0.005*
Blood transfusion	0 (5)	0	42	0.261	<0.001

SAP: Systolic arterial pressure, DAP: Diastolic arterial pressure, MAP: Mean arterial pressure, HGB: Hemoglobin, WBC: White blood cell count, PLT: Platelet, AST: Aspartate aminotransferase, ALT: Alanine aminotransferase, BUN: Blood urea nitrogen, Na: Sodium, K: Potassium, Cl: Chlorine, CRP: C-reactive protein, ALP: Alkaline Phosphatase, GGT: Gamma glutamyl transferase, pH: pH of blood gas, HCO_3: Bicarbonate in blood gas, PO_2: Oxygen in blood gas, LACTATE: Value Checked in Blood Gas, * Indicates a significance difference at p<0.05.

Further statistical analyses were performed to determine the factors affecting the decision of whether patients require surgery following diagnosis. It was observed that 82 of 197 patients (41.6%) had undergone a surgery following diagnosis, whereas 115 (57.4%) of them had not undergone surgery. Of patients who underwent surgery, 43 were men and 39 were women. Of patients who did not undergo a surgery, 64 were men and 51 were women. The effect of gender on the operation status (i.e., operated vs. non-operated) of patients was not significant (p=0.655).

The mean age of the operated patients was 65±20 years, whereas that of the non-operated patients was 65±19.7 years; the effect of age on the operation status was not significant (p=0.266). It was determined that 56 (14.7%) of the operated patients and 73 (60.1%) of the non-operated patients had a history of abdominal surgery; its effect on the operation status was not significant (p=0.484).

Because the use of the length of hospitalization as the dependent variable provided discrete values and the linear regression assumptions (assuming normal distribution of errors) were not achieved, a logarithmic transformation was applied to the variable length of hospitalization to determine the factors affecting this variable. The model created by multiple linear regression analysis was significant (p<0.001) and explained the difference of 46.4% in the length of hospitalization (with logarithmic transformation). Based on the multiple linear regression analysis results shown in Table 10, the factors that can affect the length of hospitalization with 95% CI were a history of cancer diagnosis (p=0.005), creatinine level (p=0.005), blood transfusion status (p<0.001), and operation status following ileus (p<0.001). Although lactate level (p=0.066) was not significant, it was not excluded from the model owing to its positive contribution to the model. High R2 values in simple linear regression analysis showed that the factors blood transfusion status (R2=0.315) and post ileus status (R2=0.255) demonstrated the greatest effect on the length of hospitalization (**Table 5**). In addition, when the standardized coefficients in the multiple linear regression model were examined, it was determined that blood transfusion status (B=0.561) and post ileus status (B=0.533) were the most important factors that increased the length of hospitalization. Further, the presence of cancer.[R2=0.052; B=0.252) and increased creatinine level (R2=0.035; B=0.089) in a patient were the other important factors that increased the length of hospitalization. Increased lactate level (R2=0.044; B=0.007) also prolonged the length of hospitalization.

Table 5. Model for length of hospitalization in patients with ileus

	Coefficient prediction (B)	Standard error	P
Creatinine level	0.089	0.032	0.005
Lactate level	0.007	0.004	0.066
Blood transfusion status	0.561	0.098	<0.001
Surgery following ileus	0.533	0.094	<0.001
Presence of cancer	0.252	0.089	0.005

In terms of the laboratory findings that affect the operation status of patients, the mean total protein level of operated and non-operated patients was 6.5±1.0 g/dL and 6.9±1.0 g/dL, respectively, and its effect on the operation status was significant (p=0.006). Further, the mean albumin level of operated and non-operated patients was 3.4±0.6 g/dL and 3.7±0.7 g/dL, respectively; the effect of albumin level on the operation status was significant (p=0.002). The mean potassium level of operated and non-operated patients was 4.1 mmol/L and 4.4 mmol/L, respectively; its effect on the operation status was significant (p=0.042). The mean CRP level of operated and non-operated patients was 4.7 mg/dL and 2.6 mg/dL, respectively; the effect of CRP level on the operation status was significant (p=0.023).

Table 6. Multivariate logistic regression analysis results for operation status following diagnosis

	Coefficient prediction	Standard error	Odds ratio	95% Confidence interval		p
				Lower limit	Upper limit	
qSOFA (1)a	1.018	0.459	2.768	1.125	6.810	0.027
K level	-0.462	0.242	0.630	0.392	1.013	0.057
Na level	-0.080	0.035	0.923	0.862	0.989	0.023
Total protein level	-0.362	0.160	0.696	0.509	0.953	0.024

The Hosmer–Lemeshow test was used to determine the goodness of fit of the model; it was observed that the model fit was achieved in the final model (p=0.258). The results of multivariate logistic regression analysis for the operation status following diagnosis are shown in **Table 6.**

Patients with a qSOFA score of 1 have higher risk of requiring surgery than those with a score of 0.[odds ratio: 2.77 (1.13-6.81)] qSOFA score of 1 or higher causes a significant increase in the risk of requiring surgery (p=0.027). In addition, potassium, sodium, and total protein levels have a significant effect on the risk of requiring surgery following ileus (p=0.057, 0.023, and 0.024, respectively). An increase in potassium. [odds ratio: 0.630 (0.392-1.013)], sodium.[odds ratio: 0.923 (0.862-0.989)], and total protein.[odds ratio: 0.696 (0.509-0.953)] levels reduces the risk of requiring surgery.

DISCUSSION

The recent study findings revealed that 25 (12.7%) patients died and 172 (87.3%) survived during their 30-day follow-up period. In the study of Karabulut et al.[7], the mortality rate of the patient who underwent surgery due to ileus was 12.5%, whereas in the study of Çalışkan et al.[8], 4.1%. This variation was attributed to the small number of patients in that study and the difference in age groups. Based on various studies, mortality due to intestinal obstruction was found to be 20%-25% during the 1960s-1970s; however, currently, it has decreased to 3%-7%.[9]

The mean age of patients with ileus varies in the studies. It was 64.1 (19-97) years in our study. The high mean age observed in this study was considered attributable to the inclusion of an elderly population who were diagnosed with cancer in ED, had a history of surgery, experienced chronic diseases, and were followed up in our hospital. A significant effect of age on mortality was observed as a result of the analysis, and it was concluded that the increase in age increases the mortality risk (odds ratio=1.034, p=0.040).

In our study, models that can determine the 30-day mortality of patients diagnosed with ileus in ED were studied. In the literature review, although studies have evaluated the factors affecting mortality, no studies examining models were found. Analysis of the qSOFA score of inpatients revealed that this score significantly affected the length of hospitalization (p<0.001). It was observed that age of the hospitalized patients was not a significant factor (p=0.201).

According to the logistic regression model results, blood transfusion status, lactate level, presence of colon cancer, TBIL level, MAP, and CRP level were found to be significant variables for predicting mortality in our model. However, the categories of the dependent variable used in the model were quite unbalanced (dead: 25 and alive: 172). It should be considered that this situation may have a negative impact on coefficient prediction and variable selection. In the study by Uludağ et al.[10], it was found that male sex, age, presence of comorbid diseases, occurrence of intestinal necrosis, previous abdominal surgery, and malignancy increased the frequency of complications; the development of intestinal necrosis was a factor that increased mortality. In the study of Karabulut et al.[7], it was determined that the patient group with the highest mortality experienced colorectal cancers; hernia was the second most frequent malignancy.

According to the model generated in present study, factors affecting the operation status were the qSOFA score (p=0.027), potassium level (p=0.057), sodium level (p=0.023), and total protein level (p=0.024). A comparative analysis could not be performed because no model for the factors affecting the need for surgery among patients in ED was found in the literature. We expect our model to serve as an example for studies with larger patient groups and to help reduce the number of surgeries; we believe that the use of our model can reduce the cost by decreasing mortality and length of hospitalization.

There are some limitations of the recent study. First of all this study was designed and carried out as a single center format. So data could be supported more centered and comprehensive studies. The second one is demographic characteristics of the patients. In this study most of the patients have comorbid diseases, and isolated ileus cases were limited. It may affect the results.

CONCLUSION

We believe that the parameters obtained as a result of the study can be used in predicting the need for surgery, length of hospitalization, and mortality in patients diagnosed with ileus in ED. Further, these parameters can be used as a scoring system with additional comprehensive studies and will thus contribute to the literature.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study was approved by the clinical research ethics committee of Trakya university. Date: 07.05.2018, number: 08/02.

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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