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Evaluation of the Fast Hug Implementation Effect on the Mortality and Length of Stay in Admitted Patient in Intensive Care Unit (ICU) of a Hospital

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Abstract
Objective: We aimed to determine new version of the FAST HUG implementation effect on the mortality and length of stay in admitted patient in Intensive Care Unit (ICU) of a hospital.
Methods: We conducted a prospective cohort study on 406 patients who admitted in medical and surgical ICU of Imam Hossein Hospital of Tehran province in Iran from July 1, 2022, to September 30, 2022. We identified predictors of ICU mortality by logistic regression model, predictors of 28-day mortality/re-hospitalization/recovery by generalized ordered logit model, predictors of length of stay (LOS) by linear regression, predictors of mechanical ventilation by generalized ordered logit and predictors of SOFA score by hurdle model.
Result: This mnemonic had protective impact (OR = 0.56, *P*-value = 0.01) on the 28-days mortality. One unit increase in mean of FAST HUG score had a preventive effect on the outcome of death (OR = 0.21). Surgical admission type (Coefficient = –3.24, *P*-value = 0.00) and FAST HUG implementation (Coefficient =1.58, *P*-value= 0.0) were strongest factors on the LOS.
Conclusion: Our study results approved the importance of the FAST HUG implementation on the decrease of patient mortality in ICU and 28 days after discharge. Additionally, this checklist had a statistically significant role in declining SOFA scores in ICU patients.
Keywords: Fasthug, ICU

Introduction

Some clinical checklists have been designed for managing and improving clinical care in Intensive care unit (ICU) settings, like FAST-HUG BID.[1]

FAST-HUG (Feeding, Analgesia, Sedation, Thromboembolic prevention, Head the bed elevation, stress Ulcer prophylaxis, and Glucose control) is a simple guide to check the key elements of general care for ICU patients timely and safely. This checklist improves the quality of care.[2] Nutritional support has a significant impact on mortality and morbidity in ICU patients.[3] Studies show that pain relievers can minimize the use of sedatives. It has been shown that it can be a suitable method for providing adequate pain management while being restrained. In this method, pain is controlled and the use of analgesics is prioritized to reduce the side effects of sedative drugs. In most studies, analgosedation has led to a reduction in the length of mechanical ventilation and less stay in the ICU.[4] Constipation occurs in about 70% of ICU patients,[5] which can cause abdominal distension and enteral feeding intolerance, increasing the length of hospitalization and the number of days of mechanical ventilation. In these patients, the cause of constipation (failure to defecate for >3 consecutive days) is multifactorial, which includes immobility, electrolyte disturbances, drug side effects, and sepsis.[6] Hence, we decided to replace the letter S, which stands for Sedation in FAST-HUG, with Stool (bowel care). Thromboembolism events affect about 30% of patients who do not receive thromboembolism prophylaxis. For prevention, pharmacological (Unfractionated Heparin-Low Molecular Weight Heparin) and mechanical (Intermittent Pneumatic Compression-Graduated Compression Stocking) methods can be used.[7] Head elevation (>30°) is recommended to reduce the incidence of reflux and pulmonary aspiration.[8] Gastrointestinal stress ulcer occurs in critically ill patients and can be associated with significant complications and mortality.[9] Accurate glucose control in patients who receive early parenteral nutrition is safe and effective.[10] The American Diabetes Association recommended the initiation of insulin treatment for persistent hyperglycemia (>180 mg/dl) and then attainment to the target glucose range (140–180mg/dl).[11]

To evaluate the healing process and classify the severity of the disease, some clinical assessment tools such as Sequential Organ Failure Assessment (SOFA) and Chronic Health Disease Classification System II (APACHE2 II) scales have also been developed.[12,13] Little research has been done on the benefits of introducing FAST HUG on ICU mortality. Several studies have shown that FAST HUG significantly reduced mortality and length of stay in critically ill patients.[14,15]

In this study, we aimed to evaluate the impact of the implementation of FAST HUG on the mortality, length of stay, and length of mechanical ventilation in admitted patients in the Intensive Care Unit (ICU) of the hospital. We also change the protocol and replace S (sedation) with S (stool or bowel care) in this new version of FAST HUG.

Methods

The present research was designed with ethical code IR.SBMU.MSP.REC.1401.247 as a prospective cohort study on the admitted patients in Imam Hossein Hospital of Tehran

province in Iran from July 1, 2022, to September 30, 2022. We collected information on 406 patients that were hospitalized because of medical or surgical reasons in the ICU.

Patients who were aged over 18 years and admitted to the ICU for more than 48 hours were included in the study. The data contains the patient's demographic variables (age, gender, BMI), past medical history conditions (diabetes, hypertension, cancer, smoking), cause of ICU hospitalization (medical or surgical), length of stay and duration of mechanical ventilation, FAST HUG items, SOFA score, and APACHE2 score information. The age variable was categorized into 5 interval years.

The FAST HUG checklist, which includes 7 items and SOFA score, was assessed and filled by the researcher on the 1st, 3rd, and 7th days following ICU admission and then weekly up to the 10th week of patient discharge time from the hospital. Based on the information obtained on the first day of admission, the APACHE2 score was calculated according to questionnaire items. Mortality or hospital discharge rates were assessed for all patients. All patients discharged from the ICU were followed for 28 days after discharge and their status (recovery, readmission, death) recorded by telephone.

The primary outcomes were mortality, length of stay, and duration of mechanical ventilation in the ICU. The secondary outcomes were mortality, re-hospitalization, or recovery within 28 days of follow-up.

Statistical Analysis

The sample size for estimating a 12% difference in mortality for a 2-unit difference in FAST-HUG score with 80% power and the alpha error rate of 5% was 395 patients.

Descriptive analyses of baseline characteristics of patients were reported as mean and standard deviation or frequency and percentage for continuous and categorical outcomes respectively. The t-test and chi-square test were used to compare quantitative and qualitative variables.

FAST HUG items were coded 1 or 0 according to their implementation and they were summed to get the total score for each day that they were assessed. The total numbers were averaged to get the average FASTHUG score. This average–FASTHUG score was used (once as a continuous variable and once categorized into 3 subgroups: under 5, 5.1–6.25, and 6.26–7) to evaluate the effect of the total score on each outcome. To evaluate the effect of each item on each outcome, we also calculated the percentage of the implementation of each item in the total days that the patients were assessed.

In-ICU Mortality

A logistic regression model was used to investigate the effect of each variable on in-ICU mortality.

28-Days Mortality

Because the outcome had 3 levels (mortality, rehospitalization, and recovery) we used a generalized ordered logistic regression model to assess the effect of predictors on the outcome.

Generalized ordered logit or partial proportional odds models are well-known methods for the ordinal variable outcome. We checked the proportional odds model, partial proportional odds model, and also the logistic regression model and reported the best model.[16]

Length of Stay in ICU

A linear regression model was applied to predict the length of stay in the ICU in patients.

Duration of Mechanical Ventilation

Duration of mechanical ventilation is a count variable with a high frequency of zeros. Four Poisson regression models were used, including zero-extended Poisson regression, zero-extended negative binomial regression, Hurdel model, and negative binomial Poisson regression.

According to the Akaike information criterion, the hurdle model had a better fit than other models and was chosen as the best model.

Effect of Fast-hug on Sofa Score

Mixed-effects ML regression model was used to evaluate the effect of the SOFA score on the total FAST HUG score. Generalized linear mixed models are a popular method that is applied to a wide range of data types and does not need normality assumption. These methods consider the correlation of variables in the nested data.[17]

The significance level for all variables was considered lower than 0.05 and all analyses were performed by Stata software.

Results

There was a significant difference in the mean age of the mortality and recovery groups, and the patients with the outcome of death were 8 years older than the recovered group. The percentage of recovery in the surgical group (85%) was higher than in the medical group (66%). The deceased patients were hospitalized for a longer period (3.31 more days) and had a higher APACHE2 score (6.1 more scores). The duration of mechanical ventilation in the mortality group was 6.43 days more than recovered (Table 1).

The mean/percentage of implemented items of the FASH HUG checklist are shown in Table 2.

The mean of applied FAST-HUG items for patients was 5.64 items. Ulcer prophylaxis was the most received item in ICU patients. The lowest received factor was Bowel care and its mean/percentage was 0.47.

Baseline Characteristics of the Following Patients

About 81% of the followed patient recovered and the rest of the patients were relatively equal in the mortality and re-hospitalized groups (9% and 10%) (Figure 1).

For the Comparison of Continues predictors, we considered recovered patients as a reference subgroup and re-hospitalized and deceased groups were compared with the reference.

The mean age of patients with mortality outcome was 66.68 years, while re-hospitalized and recovered groups had lower mean ages (53.50 and 49.45), respectively. Re- the hospitalized group had the highest duration length of stay (18 days) as compared to patients with death- (12 days) and recovery (8 days) outcomes. The time of mechanical ventilation was significantly more in the re-hospitalized group. The highest and lowest value of Apache score (13.25 vs. 8.92) belonged to deceased and readmitted cases (Table 3).

Table 1. **Characteristics of patients referred to ICU**

Variables	Group	Recover		Death		*P*-value
		N	Mean (SD)/ %	*N*	Mean (SD)/ %	
Age		306	51.56536 (19.34)	100	59.33 (19.14)	0.000
Gender	Female	136	76.84%	41	23.16%	0.546
	Male	170	74.24%	59	25.76%	
Group	Medical	125	66.14%	64	33.86%	0.000
	Surgical	181	83.41%	36	16.59%	
Los		306	9.14 (10.038)	100	12.45 (10.32)	0.000
APACHE2_first		305	9.73 (5.44)	100	15.83 (6.78)	0.000
BMI		306	25.38 (4.72)	100	24.19 (3.47)	0.020
Smoke	No	231	72.19%	89	27.81%	0.005
	Yes	74	87.06%	11	12.94%	
Hypertension	No	216	73.72%	77	26.28%	0.214
	Yes	90	79.65%	23	20.35%	
Cancer	No	250	74.63%	85	25.37	0.451
	Yes	56	78.87%	15	21.13%	
Ventilation duration		306	4.03 (9.52)	100	10.46 (11.03)	0.000
Diabetes	No	247	76%	78	24%	0.555
	Yes	59	72.84%	22	27.16%	

Table 2. **Mean/percentage of FAST-HUG and SOFA parameters**

Variables	Observation	Mean/percentage	Std. dev	Min	Max
Average of FAST-HUG	406	5.64	0.89	3	7
Percentage of feed	406	0.87	0.27	0	1
Percentage of analgesia	406	0.77	0.37	0	1
Percentage of thrombus prophylaxis	406	0.81	0.33	0	1
Percentage head elevation	406	0.91	0.22	0	1
Percentage ulcer prophylaxis	406	0.99	0.08	0	1
Percentage of glucose control	406	0.81	0.33	0	1
Percentage of bowel care	406	0.47	0.40	0	1
Average of SOFA score	406	3.04	3.06	0	16

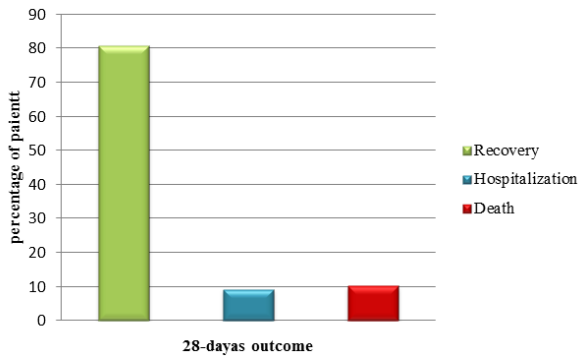

Fig. 1 **Patient Outcomes.**

In ICU Mortality

The results of the logistic model showed the surgical group and hypertensive patients had lower mortality odds (OR = 0.96 and OR = 9.25, *P*-value = 0.00). APACHE2 score was the most important predictor (OR = 1.22, *P*-value = 0.00) of the death. One unit increase in the mean of the FAST HUG score had a preventive effect on the outcome of death (OR = 0.21) (Table 4).

We also modeled the percentage of all FAST HUG items and all items except analgosedation had a protective role (OR range = 0.05–0.32, *P*-value < 0.05). In this model, similar to the previous model, the APACHE2 score was a risk factor for (OR = 1.19, *P*-value = 0.05) in ICU mortality (Table 5).

Table 3. **Characteristics of followed patients**

Variables	Group	Recover	Hospitalization	Death	*P*-value
		%(*N*)/ Mean(SD)	%(*N*)/ Mean(SD)	%(*N*)/ Mean(SD)	
Sex	Female	80.88 (110)	8.09 (11)	11.03 (15)	0.780
	Male	80.59 (137)	10 (17)	9.41 (16)	
Group	Medical	72 (90)	8 (10)	20 (25)	0.000
	Surgical	86.74 (157)	9.94 (18)	3.31 (6)	
Smoke	No	78.79 (182)	10.39 (24)	10.82 (25)	0.311
	Yes	86.49 (64)	5.41(4)	8.11 (6)	
Hypertension	No	85.65 (185)	6.94 (15)	7.41 (16)	0.003
	Yes	68.89 (62)	14.44 (13)	16.67 (15)	
Diabetes	No	82.59 (204)	8.91 (22)	8.5 (21)	0.136
	Yes	72.88 (43)	10.17 (6)	16.95 (10)	
Cancer	No	80 (200)	9.6 (24)	10.4 (26)	0.784
	Yes	83.93 (47)	7.14 (4)	8.93 (5)	
Age		49.45 (1.19)	66.68 (3.73)	–	0.278
		49.45 (1.19)	–	53.50 (3.56)	0.000
Los		7.94 (0.62)	16.36 (1.94)	–	0.000
		7.94 (0.62)	–	12.16 (1.85)	0.023
BMI		25.43 (0.30)	25.90 (94)	–	0.616
		25.43 (0.30)	–	25.43 (90)	0.316
Apache2_first		8.92 (0.33)	12.89 (1.04)	–	0.000
		8.92 (0.33)	–	13.25 (0.99)	0.000
Ventilation duration		2.89 (0.58)	12.29 (1.82)	–	0.000
		2.89 (0.58)	–	5.68 (1.74)	0.110

Table 4. **Results of multivariate logistic regression analysis of patient variables on recovery or death during ICU-hospitalization**

Variables	Odds ratio	Standard error	*P*-value	Confidence interval	
Age 5	0.96	0.05	0.41	0.87	1.06
Group					
Surgical	0.16	0.06	0.00	0.07	0.35
Average fast-hug	0.21	0.05	0.00	0.14	0.33
APACHE2_first	1.22	0.04	0.00	1.14	1.29
Smoke	0.52	0.22	0.12	0.23	1.18
Hypertension	0.25	0.10	0.00	0.12	0.54
Diabetes	0.59	0.22	0.17	0.28	1.25
BMI	0.99	0.04	0.77	0.91	1.07
Cancer	1.36	0.64	0.51	0.55	3.41

We classified the mean of the fast-hug score into 3 groups: under 5, 5.1 to 6.25, and 6.26 to 7 (reference). The odds of death in patients with an under 5 score was 17.8 (6.8–46.8) times more than the reference classification. In patients with 5.1 to 6.25 scores odds of outcome were also 2.8, *P*-value = 0.000) compared to the 6.26 to 7 score.

28-Days Mortality

The secondary outcome was death versus readmission or recovery during 30 days follow-up after discharge. In the generalized ordinal logistic model variables such as age and APACHE2 score; the mean of fast-hug implementation did not violate the proportional odds assumption. Per unit increase in mean of FAST HUG, the chance of death was 0.56 times versus recovery or re-hospitalization and also odds of death or re-hospitalization versus recovery was 0.56. Similarly, for every five years of aging, the odds of death were 1.02 time of recovery or re-hospitalization, and the chance of death or re-hospitalization versus recovery was 1.02 times.

Table 5. **Results of multivariate logistic regression analysis of patient variables on recovery or death during ICU hospitalization**

Variables	Odds ratio	Standard error	*P*-value	Upper confidence interval	Lower confidence interval
Age 5	0.97	0.05	0.55	0.87	1.08
Group					
Surgical	0.12	0.05	0.00	0.05	0.29
Glucose control	0.07	0.03	0.00	0.02	0.18
Head elevation	0.10	0.07	0.00	0.03	0.39
Thrombo-prophylaxis	0.28	0.16	0.02	0.09	0.83
Bowel care	0.32	0.15	0.02	0.12	0.82
Analgesia	0.76	0.36	0.57	0.30	1.92
Feed	0.05	0.03	0.00	0.02	0.19
APACHE2_first	1.19	0.04	0.00	1.12	1.27
Smoke	0.46	0.21	0.08	0.19	1.11
Hypertension	0.32	0.13	0.01	0.14	0.72
Diabetes	0.37	0.17	0.03	0.15	0.92

Table 6. **Results of generalized ordered logistic regression of patient variables on recovery, re-hospitalization or death after 30 days follow-up**

Variables	Odds ratio	Standard error	*P*-value	Upper confidence interval	Lower confidence interval
Recover					
Age 5	1.02	0.05	0.66	0.92	1.13
Group	0.49	0.19	0.07	0.22	1.06
Average fast-hug	0.56	0.13	0.01	0.36	0.87
APACHE2_first	1.13	0.04	0.00	1.06	1.21
Smoke	0.73	0.29	0.44	0.33	1.61
Hypertension	1.60	0.54	0.16	0.82	3.12
Diabetes	0.89	0.34	0.77	0.42	1.90
BMI	0.99	0.03	0.72	0.92	1.06
Cancer	1.17	0.57	0.75	0.45	3.02
Re-hospitalization					
Age 5	1.02	0.05	0.66	0.92	1.13
Group	0.07	0.05	0.00	0.02	0.27
Average fast-hug	0.56	0.13	0.01	0.36	0.87
APACHE2_first	1.13	0.04	0.00	1.06	1.21
Smoke	0.73	0.29	0.44	0.33	1.61
Hypertension	1.60	0.54	0.16	0.82	3.12
Diabetes	0.89	0.34	0.77	0.42	1.90
BMI	0.99	0.03	0.72	0.92	1.06
Cancer	5.71	4.08	0.02	1.41	23.13

Because the type of admission (surgical vs. medical) and cancer comorbidity violated the proportional odds assumption, there were different odds ratio values for both recovered and readmitted patients. For example, in the surgical group chance of death in comparison to recovery or re-hospitalization was 0.07 times. Also, the chance of death and re-hospitalization against recovery was 0.48 times of medical cases. In the patients who suffer from cancer, mortality odds versus recovery or re-hospitalization was 5.71 times but the chance of death and re-hospitalization as opposed to recovery was 1.71 times for patients without cancer (Table 6).

Length of Stay in ICU

The results of the linear regression model showed that there is a significant relationship between age and length of stay (LOS) that is per 5 years of aging, the average LOS decreased by 0.30 days. In the surgery group, the LOS was 3.24 days less than in

the medical group. Also, the length of stay was prolonged with an increase in the mean of fast-hug implementation and the APACHE2 score (Table 7).

Duration of Mechanical Ventilation

Duration of mechanical ventilation (MV) analyzed by hurdel Poisson regression. Between enrolled variables, the type of hospitalization group, APACHE2 score, and cancer had a significant effect. The most effective variable in this model was the APACHE2 score, and it increase (IRR = 1.18, *P*-value = 0.00) the length of MV. Also, in the group hospitalized due to surgery, the number of days of MV was 0.56 times less than the medical group. Patients with cancer had a short length of mechanical ventilation (IRR = 0.4, *P*-value = 0.00) in comparison to patients without cancer (Table 8).

Association of SOFA Score and FAST HUG

The results of the generalized linear mixed effect analysis showed that the age, hospitalization type, gender, and APACHE2 score had a significant relationship with the SOFA score. In the surgery group, the mean SOFA score was 1.8 lower (B = –1.8, *P*-value = 0.00) than medical causes. One unit increase in the FAST HUG score had a statistically significant negative impact (B = –0.71, *P*-value = 0.00) on the SOFA score (Table 9).

Discussion

Assessment of in-ICU mortality conducted by logistic regression and its results showed that the higher value of APACHE2 score significantly (OR = 1.22, *P*-value = 0.00) raises the Odds of the outcome. Also, a study by olive et al. showed that the increase in APACHE2 II score raises the odds of death (OR = 1.1, 95% CI = 1.005–1.25).[18]

We evaluated the FAST HUG score effect in two ways, general impact (average of implementation) and effect of each item.

In our study, the use of FAST HUG actions decreased the odds of mortality (OR = 0.21, *P*-value = 0.00) and items such as head elevation, glucose control, thromboembolic prophylaxis, bowel care, and feed implementation had a protective role against the mortality.

Jiménez et al. evaluated the FAST HUG strategy's impact on mortality and reported factors including feeding, thrombus prophylaxis, and sedation had statistically significant effects on hospital mortality. They concluded that applying at least three items on the checklist protected patients from death.[15]

Table 7. **Results of linear regression model of patient variables on length of hospitalization**

Variables	Coefficient	Standard error	*P*-value	Lower confidence interval	Upper confidence interval
All patient					
Age5	–0.30	0.16	0.06	–0.61	0.01
Group					
Surgical	–3.24	1.12	0.00	–5.45	–1.03
Average fast-hug	1.58	0.58	0.01	0.45	2.72
APACHE2_first	0.54	0.09	0.00	0.37	0.72
Smoke	1.90	1.21	0.12	–0.47	4.27
Hypertension	–1.18	1.15	0.31	–3.44	1.09
Diabetes	–1.49	1.30	0.25	–4.04	1.06
BMI	0.01	0.11	0.91	–0.21	0.23
Cancer	–1.50	1.36	0.27	–4.17	1.18

Table 8. **Results of hurdle binomial poisson regression of the variables on the length of ventilation**

Variables	IRR	Standard error	*P*-value	Upper confidence interval	Lower confidence interval
Age	0.96	0.03	0.25	0.89	1.03
Group					
Surgical	0.57	0.16	0.05	0.33	0.99
Average fast-hug	1.01	0.16	0.96	0.74	1.37
APACHE2_first	1.18	0.03	0.00	1.13	1.24
Smoke	1.03	0.29	0.90	0.60	1.78
Hypertension	0.58	0.16	0.05	0.34	1.01
Diabetes	0.57	0.18	0.08	0.31	1.06
BMI	1.02	0.03	0.47	0.96	1.08
Cancer	0.40	0.13	0.00	0.21	0.74

Table 9. **Results of mixed-effects ML regression**

Variables	coefficient	Standard Error	*P*-value	Lower confidence interval	Upper confidence interval
Fast-hug	–0.71	0.06	0.00	–0.82	–0.60
Age 5	–0.14	0.03	0.000	–0.20	–0.07
gender	0.47	0.22	0.03	0.05	0.9
Group					
Surgical	–1.8	0.24	0.00	–2.29	–1.33
Apache2_first	0.29	0.03	0.00	0.25	0.32
Random-effects	**parameters**	**Estimate**	**Std.err.**	**upper confidence interval**	**Lower confidence interval**
id: Identity					
	var (_cons)	3.32	0.74	2.8	3.99
	var (Residual)	2.33	0.15	2.07	2.61

Ferreira et al. found that using this strategy had a significant protective effect on in-hospital death (OR = 0.27, *P*-value = 0.01).[14]

In a prospective observational study conducted by JC CERDA et al. in Mexico, they examined the relationship between FAST-HUG and APACHE2 SCORE with the mortality rate in 129 patients hospitalized in ICU, for 3 months; they found that the use of FAST-HUG reduces mortality rate and length of hospitalization significantly in patients that their APACHE2 score was 11–25.[19]

Glucose control significantly reduced all-cause mortality (OR: 0.89; 95% CI: 0.80-1.00; *P* = 0.04).[20] Early enteral feeding was associated with approximately 20% decreased ICU mortality and 25% decrease in-hospital mortality.[21]

The results of a prospective study showed that monitoring the frequency of Bowel care in patients and preventing constipation reduces the risk of death in the ICU.[22] As well as mortality risk in a patient who received thrombus prophylaxis was lower (HR = 0.81, CI = 0.79–0.84) than a patient who was not provided.[23]

In our study, diabetic and hypertensive patients had lower odds of death (OR = 0.32, *P*-value =0.01 and OR = 0.37, *P*-value = 0.03). Diabetes is one of the most important risk factors for the development of cardiovascular death, kidney disease, and amputation, but several studies have confirmed that diabetes can be a protective factor against death.[24,25]

Graham and colleagues conducted a cohort study in two centers and their research confirm the mortality rate in diabetic cases was lower than those without diabetics (First dataset, OR = 0.75, *P* < 0.001; second dataset, OR = 0.88, *P* = 0.022).[26] Also Chang et al. reported a lower risk of mortality in diabetic patients (Adjusted HR: 0.764, 95% CI: 0.669–0.872, *P* < 0.001).[27] This may be because these patients tolerate a wider range of glucose fluctuations compared to non-diabetics.[28] We observed a similar effect in hypertensive patients and consistent with our findings, other researchers observed hypertension comorbidity brought a lower risk of death in the ICU ward (HR: 0.738, 95% CI: 0.686–0.794).[29]

In our study surgical admission in ICU had lower odds of death than medical type and similarly, Lin et al. noted surgical treatment (OR = 0.121, 0.031–0.342) was a protective predictor for in-ICU mortality.[30]

Determinants of outcome (death, readmission, and recovery) 28 days after ICU discharge were evaluated by generalized ordered logistic regression. Predictors such as the APACHE2 score were a risk factor and FAST HUG was a protective factor for the 28-day outcome.

In the following patients, cancer comorbidity enhanced (OR = 5.71, *P*-value = 0.02) the mortality or re-hospitalization versus recovery. As Vijenthira et al. noted cancer was a risk factor for decease and readmission after 1-month discharge, respectively (OR = 2.18, 95% CI: 1.77, 2.70-OR = 4.06; 95% CI; 2.01–8.2).[31,32]

LOS

Aging and hospitalization type (surgery vs. medical) were predictors that reduced the length of stay in the ICU. Other research approved there was an adverse relationship between age (50 to >75) and LOS (Coefficient = 0.55, *P* < 0.05).[33] As well as non-trauma surgical patients had a short duration of LOS (OR = 0.3, *P* = 0.00).[34]

FAST-HUG and APACHE2 scores in this study were strong predictors of LOS. In previous studies, the APACHE2 score had a statistically significant effect on length of ICU stay.[35] In a cohort study, Balsera et al. examined the relationship between FAST-HUG, APACHE2 SCORE, and SAPS3 SCORE with the mortality rate. They found that the length of Hospitalization in the ICU was significantly decreased in patients who followed all FAST-HUG procedures.[36]

Although few studies have evaluated the importance of FAST HUG for ICU patients, we have observed that this strategy can shorten hospital stays by reducing deaths in the ICU.

Similar to our study results, smoking was reported as a risk factor (Coefficient: 3.99, p=0.023) for increasing LOS in previous studies.[37]

In our study, the APACHE2 score was a strong predictor (IRR=1.18, p-value=0.0) of the length of mechanical ventilation. Other studies confirmed higher values of APACHE2 score increased the time of MV (OR 1.20, 95% CI 1.08–1.33, *P* < 0.001).[38]

SOFA Score

Predictors such as age hospitalization type (surgical vs. medical) and FAST HUG implementation had negative effects on SOFA score while gender (male vs. female) and APACHE2 score had positive roles.

Previous study results showed an inverse association between SOFA and age (spearman r= –0.33, *P*-value = 0.00), also men in comparison to women significantly had higher SOFA scores than females.[39] Other researchers noted men had a higher mean of SOFA in admission (male: 5.5 ± 4.1 vs. female: 4.6 ± 3.6, *P* = <0.001).[40]

In different studies, SOFA score and APACHE2 score were strong scoring systems for mortality in ICU[41,42] and the result of this study indicated there was a significate relationship between APACHE2 score and SOFA score.

There were limitations in this study. First, this research was conducted as a single-center study in one hospital, and multi-center designs improve the generalizability of the models. The second duration of follow-up was limited to 28 days.

Conclusion

Our study results approved the importance of the FAST HUG implementation on the decrease of patient mortality in ICU and 28 days after discharge. Using items such as head elevation, glucose control, thromboembolic prophylaxis, bowel care and feed by healthcare professionals prevented the mortality of the critically ill patient. Additionally, this checklist had a statistically significant role in declining SOFA scores in ICU patients.

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