ORIGINAL ARTICLE

Early Warning Scoring System and in-hospital Mortality

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ABSTRACT

Objective: To evaluate the impact of standardized scoring system on in-hospital mortality in patients admitted to the hospital.

Methods: Physiological parameters of standardized early warning score were recorded at the time of admission. These parameters included oxygen saturation, respiratory rate, temperature, blood pressure, heart rate and Glasgow coma scale. Total 136 patients were enrolled.

Result: Out of 136 patients, 10 patients expired. 116 patients had SEWS of <4 on admission and mortality was 3%. 20 patients had SEWS >4 with a 35% mortality rate. Among the individual parameters, progressively worsening oxygen saturation with abnormal respiratory rate and deteriorating Glasgow coma scale were better predictors of in-hospital mortality than other parameters.

Conclusion: - Early Warning Scoring System recorded at admission is a reliable predictor of in-hospital mortality. Recording SEWS at admission thus identifies patients who require additional care.

Key words: Early warning scoring system, in-hospital mortality.

INTRODUCTION

Pakistan is a poor country with meager resources and to make the matter worse the health care spending is less than 1 % of gross domestic product[1,2]. Public sector hospitals are very few in number and are under staffed. Consequently emergency departments are over crowded. Over crowding of emergency department has been linked to decreased quality of care and increased costs[3,4,5]. So there is need for identifying the sick hospital patients who would require additional care to prevent deterioration and irreversible organ failure and mortality.

There is increasing evidence showing that physiological deterioration precedes irreversible organ failure and mortality[6,7,8,9,10,11]. A physiological scoring system is based on vital signs measurement plus other parameters. First such score was developed by Morgan and Colleagues in 1997[12]. Modifications have been suggested in this score and new scores have been developed[13,14]. Many other physiological scoring systems have been developed and are in use in Western Countries. These are simple observations that can be performed by a doctor, a nurse or other trained staff. Standardized Early Warning Scoring System (SEWS) is a simple scoring parameter and has been evaluated in UK[15]**.**

We wanted to evaluate this simple scoring system in Pakistan as all these scores were developed and evaluated in the developed countries. We replaced the mental status evaluation of SEWs by APVU response with Glasgow coma scale which is more objective and reproducible.

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METHOD

Ghurki Trust Teaching Hospital is a general hospital in Suburban Lahore and is attached with Lahore Medical and Dental College, Lahore. It has 50 bed medical unit and 20 bed ICU having facilities of cardiac monitoring, invasive and non-invasive ventilation, etc.

All patients presenting to emergency department and admitted to the hospital in one month period were included in the study, regardless of the place of admission (Medical Ward or ICU). Patients presenting to emergency and dying within 30 minutes were excluded.

Five parameters were immediately recorded upon their admission. All parameters were immediately recordable at admission and needed no laboratory facility.

Out of these 5 parameters, 4 parameters were continuous variable (Respiratory rate, Oxygen saturation, Temperature, Blood pressure, Heart rate) while one parameter was categorical variable (Glosgow Coma Scale). For the purpose of study, continuous variables were partitioned by cut off points and converted to categorical variables.

Medical and nursing staff did not receive any special training on measuring these vital signs. Respiratory rate and pulse rate were recorded manually. Oxygen saturation was recorded by pulse oxymeter. Body temperature was recorded by a standard mercury thermometer placed in axilla for one minute. Blood pressure was recorded manually by palpatory method followed by auscultatory method.

Glasgow coma scale was recorded by a medical officer working in the emergency department.

RESULTS

Total 136 patients were admitted and 72 were male and 64 were female patients. Out of these 136 patients, 10 patients expired during their hospital stay and the rest of the patients were discharged home.

In hospital mortality was 2.58% in patients having score less than 4, but it rose to 35% if admission score was 4 or more, a 13 fold rise in mortality (P <0.001). Of 3 patients who died with SEWS Score of less than 4, one patient was suffering from carcinoma colon with metastasis in the liver. He was a male of 65 years. Second patient was a 55 years old male who presented with Bronchogenic carcinoma and 3rd was a female with chronic renal failure, who had acute myocardial infarction during her hospital stay.

Early Warning scoring system

Parameter	Score						
	3	2	1	0	1	2	3
Respiratory rate (breaths/m)	≥36	31-35	21-30	9-20			≤8
Blood pressure (mm Hg)		≥ 200		100-199	80-99	70-70	≤69
Temperature (F°)		≥102.2	100.4-102.1	96.8-100.3	95-96.7	93.2-94.9	≤93.1
Heart rate (beats/m)	≥130	110-129	100-109	50-99	40-49	30-39	≤29
Sa O2 (%)	<85	85-89	90-92	≥ 93			
GCS (points)				15	10-14	9-5	≤4

Table 1: Oxygen Saturation Score and Mortality

Score	Total Patients	Expired	% age
0	96	Zero	Zero
1	28	6	21
2	2	Zero	Zero
3	8	4	50

Table 2: Respiratory Score and Mortality

Score	Total Patients	Expired	% age
0	118	5	4%
1	14	4	29%
2	2	Zero	Zero
3	2	1	50%

Table3: GCS Score and Mortality

Score	Total Patients	Expired	% age
0	110	3	3%
1	8	1	13%
2	10	1	10%
3	8	5	63%

Table 4: Total SEWS Score and Mortality

Score	Total Patients	Expired	%
0-3	116	3	3%
>4	20	7	35%

Mortality and Oxygen Saturation

- 118 patients had zero score for oxygen saturation on admission and mortality in this group was 4%.
- 14 patients had a score of 1, mortality was 28%
- 2 patients had a score of 2 and both of these were discharged home.
- 2 patients had a score of 3 and one patient died during stay in the hospital.

Glasgow Coma Score and Mortality

- 110 patients had a zero score for GCS on SEWS scale(GCS 15/15), mortality in this group was 2.7%
- 8 patients had score of 1 for GCS on SEWS scale (GCS 10-14) and mortality in this group was 12.5 % as one patient expired in this group.
- 10 patients had a SEWS score of 2 for GCS and one patient died in hospital. 10 % mortality
- 8 patients had a SEWS score of 3 for GCS and 5 patients expired in this group. The mortality was 62 %.

DISCUSSION

SEWS is a simple clinical score that not only identifies patients at the extreme low risk of death but it also points out patients who require additional care.

The advantage of this score is that it dose not require any laboratory parameters[16,17], unlike other scoring systems such as APACHE and SAPS II.

This score is simple and dose not requires any staff training and extra skills. And there are no significant chances of intra and inter rater reliability error. Among the other factors O_2 saturation and respiratory rate were the independent predictors of in hospital mortality.

This has been validated in a study published in 2004[18]. J Kellet and B-Deane have shown that O_2 saturation graphed into 5% decrements showed a dramatic increase in 30 Day mortality when it drops from 96-100% to 90-95% and approximately doubles when saturation falls below 90% which approximately doubles below O_2 saturation of 90%[19]. Similarly in our study, all patients with O_2 saturation >93 survived but 90-92% saturation had mortality of 21.4% and O_2 saturation less than 85% the mortality jumped to 50%.

Disturbance in the conscious level as measured by Glasgow coma scale is also an independent predictor of in hospital mortality. We used Glasgow coma scale instead of AUPU as GCS is more reproducible. Decreasing GCS score is associated with increasing mortality. This has also been shown by other studies[19]. Systolic blood pressure was not a good predictor of mortality. All patients who died

scored zero for the blood pressure parameter. Only patient who died had hypertension and scored 2 for this parameter. We suggest changing the scoring for systolic blood pressure parameter, assigning zero for normal blood pressure, 1 for high blood pressure (>180 systolic and > 120 diastolic), 2 for hypotension. This may increase the overall sensitivity and specificity of the score. Pulse rate and temperature are also not good predictors of mortality. This has been the findings of two other studies[19].

Since O_2 saturation is the most important independent predictor of mortality, this parameter should be more carefully documented. Different studies conclude that it is the most important predictor, but all use different cut-off points for scoring. For example in our study 94% O_2 saturation would score zero but Kellet and colleague would put it in second class[17]. Second, some patients have chronically low O_2 saturation, as in COPD. What is the relative contribution of O_2 saturation in these cases, and should slightly lower cutoff points be used, remains unclear.

One draw back of this score is that it is totally blind to the in hospital course of events. One of our patient had low SEWS at admission but later she suffered from acute Myocardial Infarction and died of it later on. Whether recording the SEWS daily further improves the sensitivity and specificity remains unclear, and needs to be looked at.

CONCLUSION

Standardized early warning score recorded at the time of admission is a reliable predictor of in-hospital mortality. It identifies patients who are high risk, thus providing them with additional care. Introduction of SEWS to the clinical practice can help in customizing and economizing resources especially in poor countries.

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