

**To Predict Role of Modified Early Warning Score (MEWS) in Evaluating Mortality in Postoperative Period**Kolipey Vijayendra Kumar Babu<sup>1</sup>, Kolipey Harshitha<sup>2</sup>, Gosala Rajani Devi<sup>3</sup><sup>1</sup>Professor (Retd), Dept. of Anaesthesia, Rangaraya Medical College, Kakinada, AP, India<sup>2</sup>Postgraduate, Dept. of General Surgery, Medical college Baroda, Vadodara, Gujarat, India<sup>3</sup>Associate Professor, Dept. of General Surgery, Rangaraya Medical College Kakinada, AP, India

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Conflict of interest: Nil

**Abstract:**

**Background:** Catastrophic deterioration of patients in hospital is frequently preceded by documented deterioration of physiological parameters. Inappropriate action in response to observed abnormal vital signs and suboptimal care prior admission to ICU can lead to increased mortality. The intent of the study is to analyse the role of Modified Early Warning Score (MEWS) in assessment of need of early intervention and SICU admission in patients undergoing elective and emergency major surgical procedures.

**Materials and Methods:** This prospective study incorporated 150 patients who underwent emergency or elective major surgical procedures, with monitoring of physiological parameters in the post operative period with implementation of MEWS. MEWS score of 1- 3: escalation of monitoring done. MEWS of 4 - 5: escalation of monitoring, urgent assessment by the surgical team, shift of patient to ICU if required. MEWS of  $\geq 6$ : Shift of patient to ICU with emergency assessment by the surgical/medical / ICU team. Outcomes were 1) Improvement in patients clinical condition after early goal directed therapies (frequent monitoring, shifting to ICU), 2) Discharged alive from the hospital, 3) Patient death.

**Results:** In our study, all the patients with Modified Early Warning Score from 1 - 7 were discharged alive and all the patients with score above  $\geq 8$  were succumbed to death suggesting MEWS score of  $\geq 8$  implicates the strict need for SICU admission and an increased mortality of the patient in the post operative period. MEWS improved communication between nursing staff, junior doctors with surgical team to "flag - up" and prioritize patients.

**Conclusions:** The Modified Early Warning Score (MEWS) is an important risk management tool that is simple to implement and effective in identifying the early deterioration of the patients, which can be used as routine protocol in postoperative period and assessing the need of ICU for further interventions.

**Keywords:** MEWS, Surgery.**DOI:** 10.25258/ijcpr.18.4.143

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**Introduction**

The field of surgery is essentially a part of art of healing. It is continuously evolving with newer modalities of surgical procedures and changing concepts about diseases. With advanced procedures our ultimate aim is reducing morbidity and mortality in elective and emergency surgeries among our patients. Our goal should be limiting morbidity in elective surgery and reducing mortality in emergency surgery.

Catastrophic deterioration of patients in hospital is frequently preceded by documented deterioration of physiological parameters [1]. Inappropriate action in response to observed abnormal physiological and biochemical variables might lead to avoidable death. Suboptimal care prior

admission to a critical care unit can lead to increased mortality [2].

The post operative mortality and morbidity of the patients undergoing major invasive surgical procedures can be dramatically decreased only by a team guided approach by using various multi modality approach including doctors of various specialities including the operating general surgeon, anesthetist, intensivist and specialist physician and finally nursing care. There are numerous invasive monitoring systems for the monitoring of the physiological parameters in the patient post operatively such as central venous pressure monitoring and intraarterial blood pressure monitoring, but all these invasive monitoring techniques require an iatrogenic access

to the patient and hence can be difficult in operating setups which lack these highly sophisticated Monitoring systems.

There are various scoring systems in evaluating the post operative mortality and morbidity in patients undergoing major invasive surgical procedures. These scoring systems take into account various physiological parameters and finally give an estimate of the various pathological changes occurring in the patient's physiological system. They usually do not require a highly sophisticated setup and can be undertaken using simple and regular clinical examination. The various clinical examination which can be used for the bed side monitoring of the post operative patient are pulse rate, blood pressure, respiratory rate, temperature, level of consciousness and urine output.

These basic physiological parameters can be easily interpreted and charted down by any medical and paramedical personelle and do not require any invasive and sophisticated monitoring equipment. These basic parameters though sound to be simple in monitoring, but play a vital role in assessing and interpreting the prognosis of the patient and can be used widely in assessing the post operative mortality and morbidity.

The scoring systems which include these basic parameters are charted down and summarized to each of the patient undergoing a major surgical procedure in the post operative period and these parameters are closely followed up and interpreted as a final score. The final score is then analysed and interpreted to each of the patient and charted accordingly. According to the scoring system the patients are categorized and treated in the intensive care unit thereby resulting in an early intervention in prevention of the mortality of the patient. Many scoring systems have been developed for monitoring of the physiological parameters in the postoperative period. In 1997 Morgan, Williams and Wright in the UK were first to develop and publish the Early Warning Score (EWS) of five physiological parameters (heart rate, SBP, respiratory rate, temperature, and conscious level). Each parameter had a range of cut points with corresponding colour banded trigger points, not to predict outcome but to serve as a track – and – trigger system to identify early signs of deterioration [3]. In 1999, Stenhouse et al proposed modification of EWS to Modified Early Warning Score (MEWS) which includes original 5 parameters from EWS and oxygen saturation, urine output are added [4]. There are other scoring

systems developed for mortality prediction like APACHE II and mortality prediction model (MPM) which are based on physiological and laboratory parameters. They are tested on subgroups of patients of few medical conditions. The Simplified Acute Physiology Score (SAPS) was introduced to estimate the risk of death for patients in ICU. Most of the available scoring systems does not appears to be suitable for bedside assessment of patients in postoperative ward since most of the scoring systems involve both physiological and laboratory parameters which lack repeatability and feasibility. So I would like to apply MEWS which is purely based on physiological parameters, on patients in postoperative ward who underwent elective or emergency surgery and to assess the role of MEWS in evaluating mortality and morbidity of those patients. There is clear current evidence suggesting that the triad of early detection, timeliness response and competency of the clinical response, is critical to defining clinical outcomes. The use of so-called 'early warning scores' [EWS] or 'track and trigger systems', to efficiently identify and respond to patients who the clinical response to the acutely ill post operative patients could be substantially improved by the routine embedding of simple systems based on two key requirements : a) a systematic method to measure simple physiological parameters in all patients to allow early recognition of those presenting with acute illness or who are deteriorating and b) a clear definition of the appropriate urgency and scale of the clinical response required, tailored to the level of acute- illness severity.

#### Materials and Methods

**Source of data:** Patients who undergo elective and emergency surgeries in all the units of Dept of General Surgery, Medical college Baroda, Vadodara, Gujarat.

**Inclusion Criteria:** Patients undergoing elective and emergency surgeries in all the units of Dept of General Surgery, Medical college Baroda, Vadodara, Gujarat

#### Exclusion Criteria:

1. Age below 18 years
2. Polytrauma
3. Pregnant patients
4. Patients not willing to give informed consent

#### Results

**Gender Distribution of Admissions into Sicu/Ward:**

**Table 1: Gender Distribution**

		SICU / WARD				Total		Chi-square Vale	P Value
		SICU		Ward		No.	%		
		No.	%	No.	%				
Sex	Male	15	68.18	78	60.94	93	62	0.418	0.518
	Female	7	31.82	50	39.06	57	38		
	Total	22	100	128	100	150	100		

From the above tabular column, the total number of major surgeries undertaken in female population are 57 which accounts to 38% of the study population. In which, 7 patients were admitted in the SICU according to the MEWS scoring system which accounts to 31.82% of the study population admitted to SICU and 50 patients were managed postoperatively in the post operative ward which accounts to 39.06% of the study population managed in postoperative ward

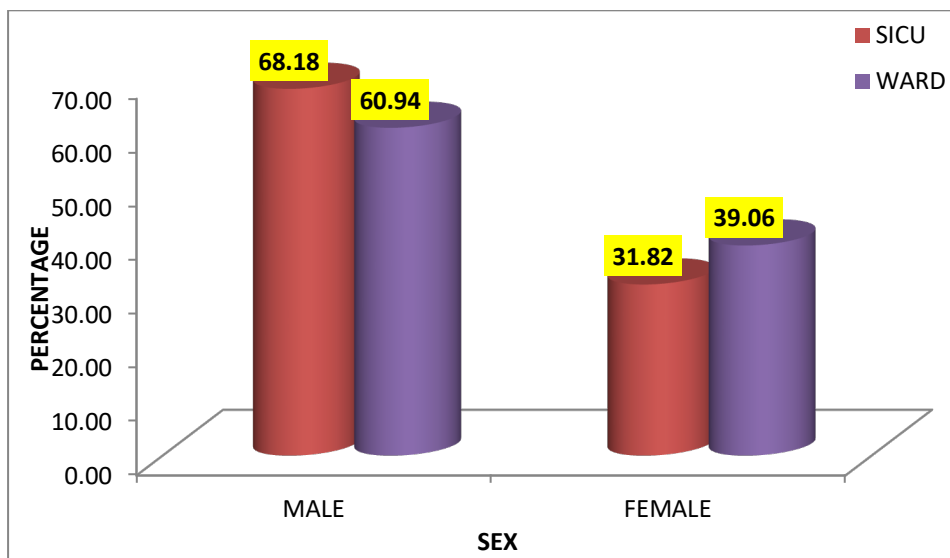
The total number of major surgeries undertaken in the male population are 93 which accounts to 62% of the study population. In which, 15 patients were admitted in the SICU according to the MEWS scoring system which accounts to 68.18% of the study population admitted to SICU and 78 patients

were managed in the post operative ward which accounts to 60.94% of the study population managed in postoperative ward.

The total number of SICU admissions according to the MEWS scoring system were 22 and the total number of patients managed in the post-operative ward are 128.

**Chi-Square Tests:** From the above tabular column the p value of sex distribution of admissions into the SICU ward and post-operative ward were found to less than

0.518 which was found to be insignificant value. The explanation of the above tabular column is given in the graph below as follows.



**Figure 1: Gender Distribution of Admissions into SICU / WARD**

**Types of Anesthesia Used**

**Table 2: Types of Anesthesia Used**

		SICU / WARD				Total		Chi-square Vale	P Value
		SICU		Ward		No.	%		
		No.	%	No.	%				
Anesthesia	GA	21	95.45	30	23.44	51	34	73.39	0.000
	RA	1	4.55	98	76.56	99	66		
	Total	22	100	128	100	150	100		

From the above tabular column, patients who underwent major surgical procedures under general anesthesia followed by admission into the SICU using MEWS scoring system were 21 which

accounts to 95.45% of the study population admitted to SICU. And admission into the post operative ward were 30 which accounts to 23.44% of the study population managed in postoperative

ward. The total number of patients undergoing major surgical procedures under general anesthesia are 51 which accounts to 34% of the study population.

Patients who underwent major surgical procedures under regional anesthesia followed by admission into the SICU using MEWS scoring system were 1 which accounts to 4.55% of the study population admitted to SICU and admission into the post operative ward were 98 which accounts to 76.56% of the study population. The total number of patients undergoing major surgical procedures under regional anesthesia are 99 which accounts to 66% of the study population.

The total number of SICU admissions following major surgical procedures under the two types of anesthesia were 22 and admissions to the post operative ward were 128.

**Chi-Square Tests:** From the above tabular column the p value was found to be less than 0.00 for the admissions into the SICU ward following major surgical procedures under general / regional anesthesia which is found to be significant.

The explanation of the tabular column is given in the graph as follows

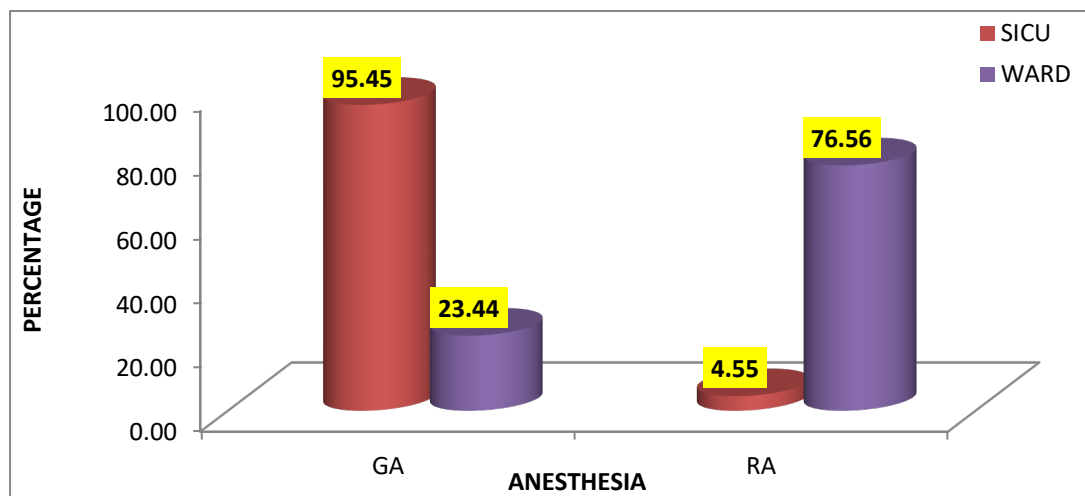


Figure 2: Anesthesia

**Duration of Surgery**

Table 3: Duration of Surgery

		SICU / WARD				Total		Chi-square Vale	P Value
		SICU		Ward		No.	%		
		No.	%	No.	%				
Duration of Surgery (Hours)	1	2	9.09	99	77.34	101	67.33	51.611	0.000
	2	7	31.82	19	14.84	26	17.33		
	3	11	50.00	10	7.81	21	14.00		
	4	2	9.09	0	0.00	2	1.33		
	Total	22	100.00	128	100.00	150	100.00		

From the above tabular column, the total number of patients admitted to SICU with the duration of surgery for 1 hour are 2 (9.09%) and in post operative ward is 99 (77.34%). Total number of patients with duration of surgery of 1 hour are 101 which accounts to 67.33% of the study population.

The total number of patients admitted to SICU with the duration of surgery for 2 hours is 7 (31.82%) and in post operative ward is 19 (14.84%). The total number of patients with duration of surgery of 2 hours are 26 which accounts to 17.33% of the study population.

The total number of patients admitted to SICU with the duration of surgery for 3 hours is 11 (50%) and in post operative ward is 10 (7.81%). The total number of patients with duration of surgery of 3 hours are 21 which accounts to 14% of the study population.

The total number of patients admitted to SICU with the duration of surgery for 4 hours is 2 (9.09%) and in post operative ward is 0. The total number of patients with duration of surgery of 4 hours are 2 which accounts to 1.33% of the study population.

**Chi-Square Tests:** From the above tabular column, the p value of duration of surgery was 0.00 and was found to be significant.

The explanation of the tabular column is given in the graph as follows.

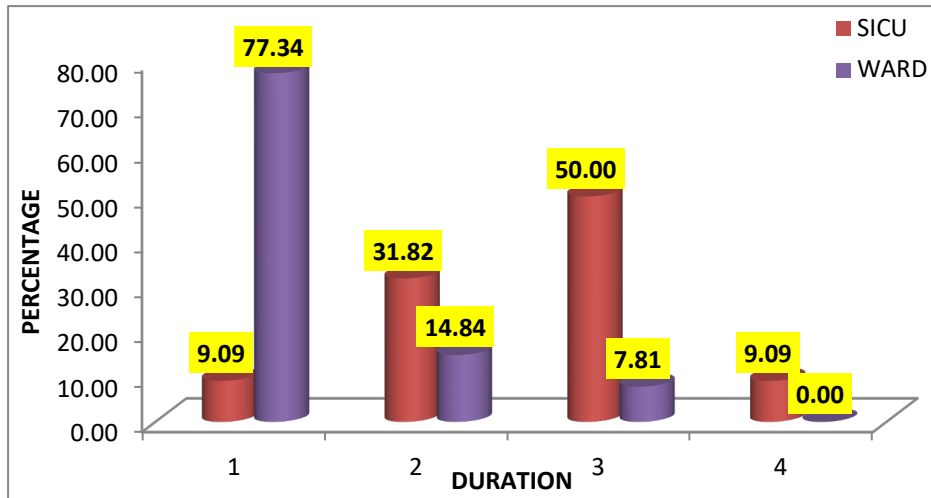


Figure 3: Duration

**Comorbidity**

Table 4: Comorbidity

		SICU / WARD				Total		Chi-square Value	P Value
		SICU		Ward		No.	%		
		No.	%	No.	%				
Comorbidity	Yes	13	59.09	29	22.66	42	28	12.362	0.000
	No	9	40.91	99	77.34	108	72		
	Total	22	100	128	100	150	100		

From the above tabular columns, Comorbid illness is absent in patients with admission to SICU are 9 (40.91%) and in post operative ward are 99 (77.34%) with total number of patients without comorbid illnesses are 108 (72%)

**Discussion**

For a surgeon, postoperative care and monitoring is as important as surgical procedure in preventing mortality. Successful and skillful surgery with inadequate postoperative monitoring leading to death of a patient is certainly unacceptable. Catastrophic deterioration of patients in hospital is frequently preceded by documented deterioration of physiological parameters [1]. Inappropriate action in response to observed abnormal physiological and biochemical variables might lead to avoidable death. Suboptimal care prior admission to a critical care unit can lead to increased mortality [2]. Many scoring systems have been developed for monitoring of the physiological parameters in the postoperative period. In 1997 Morgan, Williams and Wright in the UK were first to develop and publish the Early Warning Score (EWS) of five physiological parameters (heart rate, SBP, respiratory rate, temperature, and conscious level). In 1999, Stenhouse et al proposed modification of EWS to

Modified Early Warning Score (MEWS) which includes original 5 parameters from EWS and oxygen saturation, urine output are added [4].

In the study by J Gardner-Thorpe et al., the sensitivity of the MEWS used with a threshold score of four was 75% for ITU or HDU admission. The specificity was 83%. As expected, increasing the threshold resulted in increased specificity at the expense of sensitivity. The positive predictive value was 22%. That is, one out of every five patients who triggered the mechanism were in fact transferred from the ward to ITU or HDU. The remaining four out of five patients with deranged physiological observations undoubtedly needed review in order to optimise their management on the ward.

Yu, M et al., determined ability of MEWS model to identify post-Whipple patients at risk of complications. Once the MEWS  $\geq 2$ , interventions were needed to minimize the adverse events and data suggest that the MEWS is comparable to the advanced mathematical models, but MEWS is more accessible to perform and more generally applicable. [5]

Somasundaram UR et al., study showed MEWS 1: - 77 patients were alive (51.3%) of the study population. MEWS 8: - 3 patients were alive

(2.1%) and 7 patients died (100%) of the study population. This indicates that the greater MEWS the mortality of the patient rises, and the lesser MEWS score the chances of mortality in the P.O period is very minimal. In this study, they have derived that MEWS score of 7 or 8 implicates the need for SICU admission and it indicates an increased mortality of the patient in the P.O period. [6]

In our study, the total number of SICU admissions according to the MEWS scoring system were 22 and the total number of patients managed in the post operative ward are 128.

**Gender distribution:** The total number of major surgeries undertaken in female population are 57 which accounts to 38% of the study population. In which, 7 (31.82%) patients were admitted in the SICU according to the MEWS scoring system and 50 (30.06%) patients were managed postoperatively in the post operative ward. The total number of major surgeries undertaken in the male population are 93 which accounts to 62% of the study population. In which, 15 (68.18%) patients were admitted in the SICU according to the MEWS scoring system and 78 (60.94%) patients were managed post operatively in the post operative ward.

**Type of Anesthesia:** Patients who underwent major surgical procedures followed by admission into the SICU using MEWS scoring system under general anesthesia were 21(95.45%) and under regional anesthesia was 1 (4.55%). The total number of patients undergoing major surgical procedures under general anesthesia are 51 which accounts to 34% of study population. This indicates that SICU admissions were more common in patients undergoing major surgical procedures under general anesthesia.

**Comorbidity:** Among patients with admission to SICU Comorbid illnesses were absent in 9 (40.91%) and present in 13 (59.09%) and among patients in post operative ward comorbid illnesses were absent in 99 (77.34%) and present in 29 (22.66%) with total number of patients without

comorbid illnesses are 108 (72%) and with comorbid illnesses are 42 (28%). This indicates that the presence of comorbid illnesses like diabetes mellitus and hypertension leads to higher chances of admission to SICU and have an effect on the mortality of the patients.

### Conclusions

The Modified Early Warning Score (MEWS) is an important risk management tool that is simple to implement and effective in identifying the early deterioration of the patients, which can be used as routine protocol in postoperative period and assessing the need of ICU for further interventions.

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