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# The Association of Modified Early Warning Score on Patient Outcomes in Medical-Surgical Units in an Academic Medical Center

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## Running head: MODIFIED EARLY WARNING SCORE

## The Association of Modified Early Warning Score on Patient Outcomes in Medical-Surgical Units in an Academic Medical Center

Presented to the Faculty of the School of Nursing

The George Washington University

In partial fulfillment of the

requirements for the degree of

Doctor of Nursing Practice

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#### Abstract

*Background*: A nationwide problem that has been regularly overlooked is poor recognition of deteriorating patients which can lead to increased severity of illness. One way to avoid adverse events is early detection of clinical deterioration using vital signs via Modified Early Warning Score (MEWS). However, the majority of the hospitals across the United States are not utilizing this. MEWS implementation can minimize adverse events by early recognition, which will lead to early intervention and improved patients' outcomes.

*Objective:* The aim of this quasi-experimental study was to determine if MEWS implementation will reduce the number of adverse outcomes.

*Methodology*: The setting is an academic, acute care, level one trauma center in mid-atlantic U.S. with 385 beds. This study used convenient sampling of adult medical surgical patients who had Rapid Response Team (RRT) or Code Blue activation. A total N=281 sample size was obtained, n=102 for the pre-MEWS and n=179 in post-MEWS implementation. A retrospective chart review was conducted to determine if there was a reduction of adverse outcomes such as cardiopulmonary arrest, unplanned ICU admission, unexpected death, or unplanned surgery after implementation.

*Results:* Even though it was not statistically significant, MEWS implementation demonstrated 10% reduction of unplanned ICU admission and 0.42% reduction of unplanned surgery. However, the proportion of patients requiring code blue activation significantly increased in the post-MEWS implementation (0.98% vs 8.9%) with a p value of 0.0074.

*Conclusion:* MEWS implementation is a valid tool to alert nurses in identifying a deteriorating patient condition for timely escalation of care.

#### Introduction

Every year, inpatient cardiac arrest has been determined to occur in more than 200,000 hospitalized patients across the nation and evidence indicates that about 80% of these events have been preceded by one or more instability in vital signs with the use of Modified Early Warning Score [MEWS] (Stewart, Carman, Spegman, & Sabol, 2014). The predictive value of MEWS had a significant impact on patients' safety; a higher MEWS had a predictive value for serious adverse events [SAE] (De Meester, Das, Hellemans, Verbrugghe, Jorens, Verpooten, & Van Bogaert, 2013). If MEWS is utilized, potential adverse events can be recognized early and appropriate intervention can be provided, thus preventing SAE such as cardiopulmonary arrest, unplanned ICU admission, unplanned surgery and unexpected death (Stewart et al., 2014). Currently, the majority of the hospitals across the United States have not utilized MEWS that can signal or predict declining patient's status at an early stage when healthcare providers' interventions can be most effective (Brewer, Hanna, Lockhart, & Davis, 2015).

#### **Problem Statement and Background**

The MEWS is an objective patient acuity scoring system to help the nurse verify deterioration of patient's condition and ascertain to activate the RRT (Brewer et al., 2015). One of the patients' rights is to be safe and if the patient deteriorated there should be an effective and prompt intervention but unfortunately, some patients may receive suboptimal care (Cherry & Jones, 2015). Patients with SAE during their hospitalization could have been detected earlier using the MEWS since they showed clear signs of deterioration with a MEWS value of 3 or greater, as much as 25 hours before the adverse event (Ludikhuize, Smorenburg, de Rooij, & de Jonge, 2012). Clinical deterioration along with physiological deterioration including changes in respiratory rate usually occurs six to eight hours before SAE occurs (Kyriacos, Jelsma, James, &

Jordan, 2015). Failure of the nursing staff to identify this type of deterioration and providing early intervention can lead to severity of illness that can result to worsening morbidity and mortality (Moon, Cosgrove, Lea, Fairs, & Cressey, 2011).

In medical-surgical units, identification of a deteriorating patient is crucial so that timely and effective treatment may be initiated (Jayasundera, Neilly, Smith, & Myint, 2018). Jayasundera et al. (2018) described that increasing MEWS can be utilized to determine if the patient may benefit from a higher level of care which is admission in the Intensive Care Unit (ICU).

Escalation protocols including MEWS were associated with a significant impact on the detection of patients at risk for SAE in medical-surgical units (De Meester et al., 2013). Study findings led to early and organized assistance from clinical experts when a patient's condition begins to deteriorate (De Meester et al., 2013).

#### Purpose

The purpose of this evidence-based practice initiative was to focus on a practice change that may impact healthcare outcomes in preventing SAE in the acute care setting. It has been determined that MEWS was effective in reducing mortality rates and SAE. Negative patient outcomes such as cardiac/respiratory arrest are associated with delayed identification and activation of RRT. In addition, unnecessary ICU admission can be prevented if the proper treatment had been provided in a timely manner thus reducing overall mortality rate (Brewer et al., 2015). Furthermore, the mortality of patients in medical-surgical units is more than 80% but there is evidence that utilizing MEWS can reduce this mortality rate (Churpek, Yuen, Huber, Park, Hall, Edelson, D., & Edelson, D. P, 2012). Kyriacos et al. (2015) also emphasized that MEWS significantly improved detection of clinical deterioration. The results of this initiative were beneficial since early interventions were provided for patients, thus SAE were reduced. These outcomes benefited both patients as well as the organization.

#### Specific Aims and Hypothesis/Research Questions

The aim of this initiative was to reduce the number of SAE after MEWS implementation.

The following study question was pursued: Does the use of MEWS reduce the number of adverse events preventing patient's clinical deterioration on medical-surgical units? Does an education training program implemented to the frontline staff on the use of MEWS decreased SAE on medical-surgical units?

#### **Significance of Problem**

In late 2017, the organization implemented the MEWS as part of the nursing assessment. This system is an objective patient acuity scoring system to help the nurse assess the deterioration of the patient's condition and to activate the RRT (Brewer et al., 2015). The MEWS is easy to use and interpret but most importantly it is successful in predicting patient's condition along with improving patient outcomes (Downey, Tahir, Randell, Brown, & Jayne, 2017). Increased MEWS means that a patient is slowly deteriorating and needs early intervention, and if not addressed this can lead to an increased mortality rate in medical-surgical units (Moon et al., 2011). Early acknowledgment of increased MEWS leads to early RRT activation thus reducing SAE which will improve patient outcomes.

#### **Literature Review**

In medical-surgical units, patient deterioration can result in SAE but can be prevented by MEWS. Zografakis-Sfakianakis et al. (2018) indicated that MEWS is a strong predictor of outcome and using this scoring system is a valuable tool for potentially avoiding patients' mortality along with SAE. The introduction of a multi-faceted intervention including MEWS led

to a 72% relative reduction in unexpected ICU admission and 82% relative reduction in unexpected deaths in a medical-surgical unit from early recognition brought about by this intervention (Mitchell, McKay, Berry, McCutcheon, Avard, &...Lamberth, 2010). In the recent study by Zografakis-Sfakianakis et al. (2018), they indicated that SAE are neither sudden nor unpredictable events but rather there is a progression of slow deterioration that is not being recognized for up to 24 hours before the SAE. The authors emphasized that MEWS is a valuable tool to be used as an alert to recognize early detection of serious deterioration of medicalsurgical patients (Zografakis-Sfakianakis et al., 2018).

In addition, De Meester et al. (2013) concluded that there was a significant reduction in 6-day post-operative mortality and re-surgery after implementing a better nurse observation and escalation protocol using MEWS. Ludikhuize et al. (2014) emphasized that early ICU admission is directly correlated with significant survival and this will only happen if early detection of abnormal vital signs using MEWS has been escalated.

The use of MEWS was used by frontline healthcare providers to recognize early signs of clinical deterioration and trigger more intensive care, more nursing attention which will lead to provider notification or RRT activation (Smith, Chiovaro, O'Neil, Kansagara, Quiñones, Freeman, &...Slatore, 2014). The study of Smith et al. (2014) elucidated that RRT activations significantly increased after MEWS implementation. The use of MEWS has increased and RRT activations to saves lives since the launched of 100K Lives Campaign in 2004 by the Institute for Healthcare Improvement (Smith et al, 2014).

The Institute of Medicine (IOM) recommended that in order to attain high-quality healthcare, there should be an improvement in the delivery of patient-centered care. The patient's values, needs, and preferences are among the top priorities and accurate measurement of the

quality of patient-centered care is essential to quality improvement efforts (Tzelepis, Sanson-Fisher, Zucca, Fradgley, 2015). Patients are well positioned to provide reliable and valid information when it comes to the delivery of patient-centered care. Aside from this, reimbursement will also be based on quality measures and healthcare providers must perform at or above the established quality level. Healthcare providers are only be reimbursed for their quality outcomes and not reimbursed for the amount nor quantity of services provided. In light of this, hospitals can only stay afloat if they are fully reimbursed.

With regards to the financial impact in any organization, the U.S. healthcare costs accounted for more than 17% of gross domestic product (GDP), which is more than twice the average of other developed countries (Shapiro, 2013). Medical-care expenditures represent almost one-fifth of all U.S. economic activity, which has been rising rapidly and has been related to higher prices for medical services (Shapiro, 2013). For healthcare systems of any size, it is imperative to reduce unnecessary costs while maximizing outcomes (Shapiro, 2017).

Since the quality of healthcare plays an important role, the U.S. developed a National Quality Strategy priorities that include three aims (Better Care, Healthy People/Healthy Communities, and Affordable Care) to improve healthcare quality for the nation. The triple aim is invaluable to acute care settings to remain competitive along with staying financially solvent.

Furthermore, since October 2014, hospitals are being paid not based on the volume of patients alone but paid based on the quality and value of care received by the patients. This payment system provides a great incentive for hospitals with better quality outcomes and penalizes other healthcare systems by reduced reimbursement if the quality outcome is substandard (Fos, 2017). The Center for Medicaid and Medicare System (CMS) pay-for-performance structure was based on the principle of reward and punishment, depending on the

numbers of hospital-acquired condition, hospital value-based purchasing program and hospital readmission rates.

Three of the five RCT studies identified through the literature search supported the implementation of MEWS and showed a significant reduction of the number of SAE (De Meester et al., 2013; Ludikhuize et al., 2014 & Mitchell et al., 2010). De Meester et al. (2013) discussed the mortality rate of their 6-days post-operatively which dropped the number of deaths from 19 (pre-MEWS implementation) to four deaths (post-MEWS implementation). With regards to the number of re-surgeries 6-day post-operatively, the number of unplanned surgeries dropped from 141 re-surgeries (pre-MEWS implementation) to 78 re-surgeries (post-MEWS implementation) with MEWS alerting the nurse for early intervention. Ludikhuize et al. (2014) discussed the SAE incidences on protocol wards was 13.4/1,000 hospital admissions, which significantly dropped to 8.5/1,000 the next month after MEWS implementation. Unplanned ICU admission also dropped in their protocolized group using MEWS while control wards had a slight decrease of ICU admission. And lastly, Mitchell et al. (2010) study showed a reduction of unplanned ICU admission and a decreased number of unexpected death with early use of MEWS. When it comes to demographical data, the study of Javasundera et al. (2018) described that there has been an increase in the number of acute medical admission amongst older people. This study showed that 64% of the sample for the post-MEWS implementation was above 61 years of age.

With regards to frequency of vital signs monitoring, it varies substantially between eight and twelve hours. The authors expressed that their study will be more meaningful if they added implementing the frequency of vital signs monitoring at least every 12 hours for every patient (Kyriacos et al., 2015). The authors also discovered that problems arise when nurses are

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technologically competent in monitoring vital signs but limited in clinical knowledge that prohibits them to interpret, appropriately intervene and escalate to the chain of command to make certain that optimum and safe patient care will be provided.

Furthermore, according to National Institute for Health and Care Excellence (NICE) guideline, measuring a full set of six vital signs is considered best practice, however the authors emphasized that it is well known that measuring respiratory rate is not common practice in surgical wards even though its strong predictive power for clinical deterioration (De Meester et al., 2013). Another study from Ludikhuize et al. (2014) also addressed that respiratory rate is often not included in the observation which leads to a miscalculation of MEWS. Mitchell et al. (2010) also found out that respiratory rate was poorly documented and their findings were due to poor observation chart design and limited knowledge of why vital signs such as respiratory rate are being measured.

#### **Theoretical Framework**

The evidence-based translation model that was used for this research proposal is the Iowa Model, which was developed by Marita Titler in the early 1990s. Titler (2007) emphasized the strengths of this model with the use of a variety of evidence that focuses on implementation and evaluation of Evidence Based Practice (EBP) improvements in care along with the integration of EBP towards quality and performance initiatives. The implementation of MEWS will minimize or reverse SAE in hospitalized patients by early recognition. This will lead to early intervention and minimize the length of patients' hospitalization, maximized patients' outcomes, reduced hospital mortality as well as hospital readmission. These outcomes will benefit the patients along with the organization.

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The Iowa Model is a framework to guide healthcare workers to improve patient outcomes, strengthen the nursing practice as well as to monitor the healthcare costs. Brown (2014) described this model in translating research findings into clinical practice with the end goal of improving patient outcomes. The Iowa Model's first step was to establish a knowledgefocused trigger or a problem-focused trigger that will lead to evidence-based change and the providers determine if the problem identified is invaluable for the organization (Brown, 2014). In addition, this model implements the EBP change gradually to the entire organization. It will start in medical-surgical units and once the pilot change achieved the outcome they want and it is sustainable, then it will implement the practice all over the organization (Brown, 2014). (See Appendix 1: Variable Table).

#### **Search Strategy**

In order to ensure that the most relevant clinical trials were included in this research proposal which started in October 2017, two medical databases were utilized: Scopus and CINAHL Plus. Furthermore, additional records were identified through other sources such as those discovered from systematic reviews. In addition, consultation with a research librarian was conducted during the literature search on March 7, 2018, to identify appropriate databases as well as to establish search terms along with search limits. Another consultation was conducted on November 20, 2018, to make certain that all relevant and latest resources were utilized.

When searching CINAHL Plus, the following keywords were utilized "randomized controlled trials" or "RCT" or "randomized trial," "MEWS" or EWS" or "early warning score" or "early warning signs", "adverse events" and "general wards." Both medical databases limits were set-up from 2000 to the present since the concept of EWS or MEWS was developed in 1997.

#### **Inclusion and Exclusion Criteria**

Inclusion criteria included: Randomized Controlled Trials (RCT), quasi-experimental and quantitative studies; patients above 18 year old; patients on medical-surgical units; publication years 2000 to present and English language articles only; study that measures clinical/change in vital signs; patients who endured one of the following SAE: cardiopulmonary arrest, unplanned ICU admission, unexpected death, or unplanned surgery with the use of MEWS, and lastly study time frame should be up to 24 months.

Exclusion criteria: Patients with do not attempt to resuscitate (DNAR) order and patients on palliative care and comfort only.

#### **Gaps in Practice**

The gap in practice that stimulated this study was the lack of using an early warning score system that could alert the staff and provides early intervention and treatment thus preventing adverse events. Brewer et al. (2015) emphasized that the utilization of MEWS can signal or predict declining patient's status at an early stage when healthcare providers' intervention can be most effective. Since the MEWS was just recently implemented, it showed that the compliance rate with utilization and interpretation is still a challenge. Nurses are still adapting to this culture change and needed to have frequent reminders to increase their compliance rate. In addition, tracking staff compliance was also an opportunity for unit leaders. Another study also emphasized that MEWS is easy to use and very convenient when it comes to bedside monitoring tool to recognize if their patients will need an early intervention which is advantageous for the frontline staff (van Galen, Dijkstra, Ludikhuize, Kramer, & Nanayakkara, 2016). Furthermore, MEWS implementation was launched initially by paper charting followed by integration in the electronic medical record (EMR). During the course of implementation, it was also found out

that if there's no entry of patients' level of consciousness around the time the vital signs were taken, there will be no MEWS calculation in the EMR.

#### Methods

#### **Research Design**

This study used a quasi-experimental design. A retrospective review of EMR before and after MEWS implementation and investigated to determine whether there was a reduction in the number of SAE outcome after RRT or Code Blue activation related to a rise in MEWS.

#### **Study Population/Sample**

The study was conducted with adult patient ages 18-year old and above in five Medical Surgical units. Inclusion criteria were 18-years old and above, on medical-surgical units who had RRT and Code Blue activation during the study period. Exclusion criteria were patients with DNAR order, on palliative care and comfort care only. Convenience sampling was performed for this study to ensure all RRT and Code Blue activations were evaluated.

#### **Sample Size and Power analysis**

Since the MEWS was implemented last August of 2017, the sample size for this study was determined by the total numbers of RRT and Code Blue activations during a period of five consecutive months in 2016 and 2018. For the pre-MEWS implementation phase, there were n=102 sample and n=179 sample were evaluated for the post-MEWS implementation phase. MedCalc system was utilized to obtain the significance level of the data collected.

#### **Recruitment of Subjects**

All admitted patients who are 18-years old and above in medical-surgical units who had RRT along with Code Blue activation from June 1, 2016 to October 30, 2016 will be the pre-MEWS intervention group and their records will be analyzed. With the use of EMR, a report will be generated showing all RRT and Code Blue activations and this will be the baseline data. This baseline clinical data was extracted to classify what were the outcomes of these events. It was classified as unplanned ICU admission, unexpected death, unplanned surgery or cardiopulmonary arrest. Post-MEWS implementation period started from June 2018 to October 20, 2018 and the data collected were the same as the pre-MEWS implementation period to obtain a comparison.

#### Setting

The setting for this study was in one of the hospitals in the mid-atlantic U.S. This is a 385-bed acute care hospital with five medical-surgical units consisting of 204 beds. There are 1,000 Registered Nurses employed at this facility. The MEWS was introduced in August 2017 and was fully implemented in EMR on November 15, 2017.

#### Intervention

The intervention that was used in this study is the MEWS which was first introduced in 1997 by Morgan, Williams, and Wright (Stewart et al., 2014). This is a scoring rubric that uses vital signs which is the objective physiologic measurements that detect the earliest indications of patient deterioration. There is compelling evidence that almost 80% of in-hospital cardiac arrests are preceded by a prolonged physiologic instability as manifested by deviation in one or more vital signs (Stewart et al., 2014). Ludikhuize et al. (2012) highlighted that a patient's deterioration could be identified in the 24 hours before this SAE occurs.

Nurses were educated by our clinical educators along with the leaders in every unit on the purpose of MEWS, how to use this system via EMR, how to interpret the score and to guide the nurses with the appropriate intervention. The frontline providers were trained that when a patient's vital signs are evaluated, zero points will be scored to measurements that are within

normal values. An increasing number of points are awarded whenever the measurements deviate outside the established normal vital signs values. The educational content that was provided to nurses was to focus on early identification of patients at risk for clinical deterioration and the nurses will use this as a framework in their decision-making process for RRT activation.

Education was provided with the use of HealthStream Online; this was a mandatory class for all Medical-Surgical nurses and everyone passed the competency exam and successfully completed the module. Roving in-services were also provided for a two-week period by unit leaders to ensure clear understanding. Finally, the educators from the Professional Development and Education department validated all the staff to ensure everyone is competent in using this tool to ensure consistency.

During MEWS implementation, charge nurses randomly verified nurses during the shift to validate the staff MEWS' utilization to make certain that everyone adheres to this and has the knowledge and skills about the MEWS. All nurses were educated, trained and validated to ensure they know how to use this scoring system and activate the appropriate intervention. Lastly, this scoring system is integrated into the hospital's EMR and provides a total score when all the vital signs have been entered electronically.

(See Appendix 3: MEWS Score Record Sheet).

#### **Instrumentation and Measurement**

The EMR and hospital reporting system were used to collect data in this study. Demographic data collected were age, gender, MEWS and the outcome of RRT and Code Blue activation. The total numbers of these activations, as well as the outcomes, were collected as these were the vital information needed for this quality improvement initiative.

#### **Data Collection Procedures**

The data were collected retrospectively pre and post MEWS implementation via EMR and hospital reporting system. All admitted patients in medical-surgical units, 18-years old and above who had RRT and Code Blue activation during this period were included in the sample. The primary investigator (PI) and his CITI trained assistant collected the data with IRB exempt since they determined this is not a research of human subjects. The CITI trained assistant was educated and supervised by the PI on how the methods and process of the study before he received access to the secured data. Few strategies were used as peer debriefing with the CITItrained assistant, consultation with a statistician along with two advisors and triangulate different data sources of information by scrutinizing evidence from the sources to ensure validity and reliability of this study. Data were organized and prepared for analysis which includes transcribing of findings from EMR to sort and arrange the data into different categories such as outcomes of RRT and Code Blue activations related to MEWS implementation. In addition, cross-checking was performed for data accuracies. Data from the spreadsheet were crosschecked. Data were coded to have organized data by bracketing chunks. Lastly, the study was securely stored and managed for retrieval by the PI and his assistant. The data was stored in a password protected computer in a locked office and the spreadsheet is also encrypted.

#### **Data Analysis**

Data were entered by the researcher to an excel spreadsheet. In order to ensure accuracy, data were double-checked by a designated trained assistant. This designated assistant completed the CITI training and was trained by the researcher to ensure the data collected were accurate.

A Biostatistical Consultation was performed last December 14, 2018 to have the appropriate data analysis method for this study. After this initial consultation, a series of consultation was also made to ensure the reliability and validity of the data.

(See Appendix 2: Gantt Study)

#### **Ethical Considerations**

For this retrospective study, the only identifiable data was the Medical Record Number (MRN). All data in this study were de-identified and patient confidentiality was protected. Each subject will be marked by their MRN and each MRN will have a designated case number (coding) that will be assigned by the researcher. In order to ensure and maintain the privacy of the patient, the MRN will be stored on a data worksheet on a password-protected computer in a locked office at the hospital with access to only the principal investigator and his trained assistant. The study was formally determined by the IRB as not human subject research since it was a Quality Improvement project. Institutional ethics committee approval was not obtained since IRB determined that this is not a research of human subjects.

#### Results

Out of N=179 sample in the post-MEWS implementation, RRT activations increased which accounted for 88.9% while RRT upgraded to Code Blue and Code Blue activations accounted for 11.1%. The proportion of patients who stayed in medical-surgical units pre-MEWS and post-MEWS after RRT activations increased at 50.98% vs 53.07%. Even though it was not statistically significant (*p*-value of 0.7363) there was a decreased number of patients that required a higher level of care which can be explained by early recognition of deterioration and provided a timely intervention. The proportion of unplanned surgery post RRT activation was 0.98% vs 0.56% and it was not also significant. However, the study showed a statistically

significant (*p*-value of 0.0072) for patients who had cardiac arrest with a proportion of 0.98% vs 8.94%. This observation can be explained as a failure to rescue. Fifty percent of these patients who had cardiac arrest had ages that ranged between 56-75 and 25% were below and above this range.

		Pre-MEWS		Post-MEWS	
		N=102	%	n=179	%
Gender	М	51	50%	86	48.04%
	F	51	50%	93	51.96%
Age	<55	32	31.37%	47	26.26%
	56-75	52	50.98%	98	54.75%
	>76	18	17.65%	34	18.99%

Table 1. Patient's Demographics

Table 2. Outcomes

Variable	Pre- MEWS		Post- MEWS		Difference	95% CI	Chi- Squared	p- value
	N (102)	%	N (179)	%	%	%		
Stayed in	52	50.98	95	53.07	2.09	-9.8806 to	0.113	0.7363
the Unit						14.0392		
Transferred	48	47.06	67	37.43	9.63	-2.2640 to	2.483	0.1150
to ICU						21.3821		
Unplanned	1	0.98	1	0.56	0.42	-2.2435 to	0.161	0.6878
Surgery						4.8094		
Cardiac	1	0.98	16	8.94	7.96	-2.4502 to	7.173	0.0072
Arrest						13.1109		
Death	0	0	0	0	N/A	N/A	N/A	N/A

### Discussion

One thing that this study demonstrated was the increase of RRT activations that occurred after MEWS implementation. Out of N=179 sample, n=160 of the patients received RRT activations which accounted for 88.9% and 95 patients or 52.77% that did not require transfer to a higher level of care and continued to be stable in medical-surgical units. This was consistent with

the study of Mathukia et al. (2015) which demonstrated that MEWS implementation led to increase RRT activation along with overall better outcome since early recognition led to early intervention and treatment.

The results of this study have the same findings as a recent study done by Stiver et al. (2014) who claimed that an increase in the number of code blue activation post-MEWS implementation was attributed by the higher expected mortality during this phase. The only difference was mortality rates were not included in the scope of this project. Since this was not available, the study findings can be considered as a failure to rescue. High levels of adherence or compliance on MEWS implementation is a necessity in order to have the optimal patient outcomes. Mathukia et al. (2015) emphasized that an institution should take the lead to ensure frontline staff is fully utilizing and accurately using the MEWS. This institution started with paper-based form and manually calculated the score which may lead to incorrect scoring. Fortunately, it was subsequently added in the EMR which eliminated potential errors related to manual calculations (Mathukia et al., 2015)

#### **Study Limitations**

The limitation of this study was the scope of the project in which the overall inpatient mortality rate was not included.

#### **Implications/Recommendations for Practice, Policy and Research**

MEWS implementation is a valid tool for nurses to recognize, respond and provide treatment earlier before patients deteriorate in acute care settings. Early recognition along with early appropriate intervention is the key to prevent SAE. This will maximize patient outcomes and decreased unanticipated inpatient hospital deaths. Culture of change is one of the challenges that nurses are dealing on a daily basis. One thing that is recommended for practice is the

importance of follow-up and follow through after implementation of MEWS. This will facilitate validation of staff compliance every shift and ensure any technology barriers that prohibit from having the appropriate and calculated MEWS. Since MEWS is not being utilized to all hospitals across the U.S., it is recommended by this author that the Department of Health and The Joint Commission make it a mandatory monitoring tool. A proposed policy should be implemented and provide all hospitals a deadline that by 2022, all U.S. hospitals will implement MEWS as part of their assessment tool. The recommended future study would be to review the outcome of those patients who were transferred to ICU and those who had a cardiac arrest. Lastly, a follow-up study is recommended at the end of the year to review June 2019 to October 2019 data to compare the improvement of MEWS implementation.

#### Conclusion

MEWS implementation showed a reduction of unnecessary ICU admissions which means the patients stayed in medical-surgical units and did not require a higher level of care. Although it's not statistically significant, early activation of RRT provided early treatment and intervention before the patient deteriorates. However, this study showed a statistical significance for patients who had a cardiac arrest in medical-surgical units post-MEWS implementation which is considered a failure to rescue and a plan of action is already in place.

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## Appendix 1: Variable Table

Variable	Туре	Theoretical Definition	Operational Definition	Measurement
Modified Early Warning Score (MEWS)	Independent	Objective acuity scoring system to help nurses decide when to activate RRT	<3 = Observe >3 = Intervene / Resuscitate	Nominal
Patient Age	Demographic	Percentage of identified ranges during the study period	1. <55 2. 56-75 3. >76	Ordinal
Patient Gender	Demographic	Percentage of male or female	1.Male 2.Female	Nominal
ICU Admission	Dependent	Reported unplanned ICU admission	All reported unplanned ICU admission during the study period	Ratio
Rapid Response Team (RRT) Activation	Dependent	Reported RRT activation	All reported RRT activation during the study period	Ratio
In –hospital mortality	Dependent	Reported unexpected death	All reported unexpected death during the study period	Ratio
Resuscitation	Dependent	Reported resuscitation activity	All reported resuscitation activity during the study period	Ratio
Medical- Surgical Unit Patients	Demographic	All patients that don't need critical care	Patients that do not require constant care and continuous monitoring	Nominal
Full Code Status	Demographic	Status if resuscitation is indicated per patient's request.	1.with DNAR order 2.full code status	Nominal
Unplanned re- surgery	Dependent	Reported unplanned re-surgery	All reported unplanned re- surgery	Ratio

## **Appendix 2: Gantt Chart**



Sheet
Record
Score
MEWS
endix 3:
App

				NS SCC	RERE			DOWDU	me only		
Date											
VIT	AL SIGNS									INIEF	<b>EVENTION</b>
Time	ESP HF	SBP	L 200	EMP 0.	2 SAT	SUPP 02	TOTAL	None Needed	Charge Notified	Physician/ ouse Sup Notified	H Comments
Score											
Score											
Score											
Score											
Score											
Score											
MEWS Scoring	3	2	-	•	$\vdash$	-	2				MEWS Actions
lool								_		Score :	= 0-1. Maintain standard of care
Respiratory rate	≤4	< 5 - 7	8 - 9	10 - 16	~	9 - 27	28 - 37	^	37		- 7.9. Olin Cun 8 DN according
Heart rate per minute		< 40	40 - 50	51 - 10	0 10	11 - 110	111 - 12	۸ ۵	129	Determ Determ	<ul> <li>- 2-3: Clint Jup &amp; KN assess parterly.</li> <li>nine at risk parameter to monitor, plan tervention. Round in 1 hour.</li> </ul>
Systolic blood	Less than	71 - 80	81 - 100	101 - 15	59 16	0 - 199	200 - 22	^	220		
Conscious level	Unres-	Responds to	Responds to	Alert		New				RRT cc	= 4. Ulin Sup & KN reassess. Consider onsult, call Physician; Clin Sup & RN re-
(AVPU)	ponsive;	Pain;	Voice;		con	fusion or				assess	s in 1 hour.
	comatose	stuporous	lethargic		ē	gitation CAM)				Score :	= 25. Call RRT; call Clin Sup &
Temp in Celsius		≤ 35.0	35.1 - 36	36.1 - 3	38.	1 - 38.5	≥ 38.6				iaii iu eyes un assessineni. Cunsiuer la
02 Saturation	≤ 91%	92 - 93%	94 - 95%	> 96%						Rh	ž
Print Name:			Prir	t Name:	-	-		-	Print Na	ne:	

Signature:

Signature: \*\*\*\*Permanent part of the medical record\*\*\*\* Signature: