

Original Research Article

Early Identification of Patients' at Risk of Deterioration in Hospital: The Roles of Modified Early Warning Scoring System and Rapid Response System in Improving Clinicians' and Nurses' Responses.

"A stitch in time saves nine"

ABSTRACT

Background. Most adverse events in hospitalised patients are often preceded by documented progressive deterioration of physiological parameters without appropriate responses. Modified Early Warning Score (MEWS) is a simple physiological score that was developed to aid early recognition of patient at risk of deterioration and assist in timely response.

Aim: To determine the nurses' and clinicians' responses to abnormal vital signs and to evaluate the usefulness of MEWS in early recognition of patients at risk of adverse outcome.

Methodology: We retrospectively reviewed case notes of 264 patients discharged alive and 243 patients who died in Ladoke Akintola University of Technology Teaching Hospital Ogbomosho. The case notes were randomly selected from the record unit. Patients less than 18 year old and obstetrics and gynaecological patients were excluded. The Patients' relevant data and vital signs were gotten from case notes and were used to calculate Mean MEWS for each patient over 72 hours preceding outcome.

Results. One hundred and fourteen (79.72%) of 143 patients with MEWS of above six were classified to be critically ill and managed in general wards instead of higher care unit. Mean MEWS among the patients discharged alive was statistically significant lower than the dead patients (2.7 ± 0.7 vs. 8.0 ± 2.6 , $P < .001$). Mean MEWS for pulse rate (0.2 ± 0.63 vs. 2.1 ± 1.0 , $P < .001$) and respiratory rate (1.2 ± 0.01 vs. 2.3 ± 0.75 , $P < .001$) were statistical significantly lower for the patients discharged alive. The main reason for calling attention of clinicians to deteriorating patients was gasping in 52.6% of cases which is a late sign. Responses of house officers when called upon to review critically ill patients were to inform registrars in 44.03% of cases. There was a mean delay of 131 (± 66.28) minutes between house officers' review and consultants' inputs.

Comment [c1]: Title is confusing. Authors should revise

Comment [c2]: Title does not show where study was done. Authors should consider that

Comment [c3]: Is there need for this? This is not a qualitative work. Besides title is already far more than 15 words.

Comment [c4]: Justification for study needed please

Comment [c5]: Proof read work please. No need for 'the' here

Comment [c6]: Aim clearer than title. Authors should make title consistent with aim

Comment [c7]: This is abstract section. Just state design, data collection instrument, analysis tool. No need for details. The process is being described but design not mentioned.

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Comment [c9]: Author should confirm whether result is part of abstract in journal's guideline.

30 **Conclusion:** Our study showed delay in recognition of patients at risk of deterioration and significant
31 delay in nurses' and clinicians' responses and decision making process; we thus suggest use of
32 MEWS and introduction of rapid response system to aid early recognition and activation of clinicians
33 with core competence in management of at risk patients.

Comment [c10]: Finding it difficult to connect title to conclusion. Author should take a look at these inconsistencies

34
35 Keywords: *patients, deterioration, response, vital signs, modified early warning score, Rapid response*
36 *system.*

37 INTRODUCTION

38 National Early Warning Score (NEWS) is a simple physiological score that consists of six
39 physiological parameters: pulse rate (PR) in beat per minute, systolic blood pressure (SBP) in
40 millimetres of mercury, respiratory rate (RR) in breath per minute, temperature (T) in degree
41 Celsius and arterial oxygen saturation (SpO₂) and level of consciousness using AVPU system: (A alert,
42 V for responding to voice, P responding to pain and U for unresponsive). This scoring system requires
43 simple monitoring devices that are readily available for during routine monitoring of vital signs at bed

Comment [c11]: Spell first time

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44 side. The scoring system was developed by the Royal College of Physicians (RCP) to aid early
45 recognition of patients at risk of adverse events, through tracking of patients' physiological
46 parameters [1]. A variant of NEWS called Modified Early Warning Score (MEWS) excluded SpO₂ in its
47 parameters, which makes it more easily scored as SpO₂ is not routinely monitored during vital signs
48 assessment, a modification making it more feasible to use in low and middle income countries where
49 pulse oximeter may not be readily available. Deterioration of patients' conditions are often preceded by
50 progressive derangement of physiological parameters several hours prior to adverse events in about
51 80% of cases [2] which are often documented [3, 4, 5, 6, 7, 8, 9] without corresponding early competent
52 clinical response and intervention [10]. Failure of early response and appropriate interventions from
53 physicians with appropriate clinical competencies has been termed "failure to act" by Hillman et al and
54 was associated with exacerbation of acute illness [11] with increased risk of cardio-respiratory arrest
55 and death [12, 13] with a study quoting about 11% mortality [14]. Sub-standard care received by most of
56 patients prior to presentation, due to poor health care services in low and middle income countries, are
57 often associated with poorer prognosis and outcomes. This coupled with delayed initiation of definitive
58 treatment, delayed recognition of progressive derangement of vital signs, lack of continuous automated
59 monitoring devices in most of the wards and lack of dedicated acute medical teams for 24 hours

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60 coverage in a day in many hospitals in most low and middle income countries, further escalate the
61 poorer outcome seen in our patients. Early recognition of at risk patients makes it easier to manage
62 such patients with simple measures such as oxygen support, fluid support, review of medications
63 such as early commencement of antibiotics in patient with sepsis, with minimal cost on scarce health
64 care resources.

Comment [c14]: Work needs professional proof reading please

65 The triad of early detection, timeliness of response and activation of clinicians with appropriate clinical
66 competency has been shown to improve the outcomes of patients at risk of adverse events in
67 hospitals. In order to achieve this triad many hospitals have introduced Rapid Response System
68 (RRS) that consists of two limbs; the afferent limb that utilises a track and trigger systems (TTS) by
69 using a scoring system such as National Early Warning Score or its modification called Modified Early
70 Warning Score (MEWS) that will assist early recognition of patients at risk and the efferent limb
71 system known as Rapid Intervention Team (RIT) that respond to afferent limb activation. This study
72 was borne out of recognition of the advantages and effectiveness of compliance to triad of early
73 detection, timeliness of response and competent clinical response in patients' care. We thus
74 investigated our compliance to the triad, by documenting responses of health care workers to
75 patients' physiological parameters 72 hours preceding discharge or death, to compare MEWS between
76 dead patients and patients discharged alive, and to sensitise and convince health care workers that
77 are directly involve in patients' care about this simple scoring system (MEWS) and its value in
78 achieving the triad.

Comment [c15]: Author stated in previous sections that recognition was done but deaths were due to inaction from nurses and medical officers, and now this? Should connect these sections well.

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79 **METHODS**

80 **Setting**

81 The study was carried out in Ladoke Akintola University of Technology Teaching Hospital
82 Ogbomoso. Ladoke Akintola University of Technology Teaching hospital Ogbomoso is a new tertiary
83 health care centre with facilities for primary, secondary and tertiary health care services. The hospital
84 receives referral from local peripheral hospitals and neighbouring teaching hospitals. The hospital
85 admits an average of about 2150 patients per year with mortality rate of about 5.60% per year on the
86 average. The hospital has about 300 beds, an intensive care unit (ICU): with four functioning
87 ventilator, two consultant anaesthesiologists, six anaesthetic specialist registrars in training and eight
88 non-specialist nurses. The hospital has minimal facilities for managing critically ill patients; making
89 many critically ill patients to be managed in general wards by the managing team with or without

Comment [c17]: Would be more meaningful to compare response of clinicians in both dead and patients who survived after similar scores of MEWS. AUTHORS CAN CONSIDER.

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90 contributions from the anaesthetist, a finding comparable to Bhagwanjee study, who found out that
91 critically ill patients are often managed in general wards in low and middle income countries due to
92 few numbers of available ICU beds[15]. No ward in the hospital has facility for either continuous
93 monitoring of patients physiological parameters or functioning defibrillator.

Comment [c20]: IS AUTHOR DISCUSSING HERE?
NOT ACCEPTABLE

94 **Study design**

95 The study was a retrospective case-control study. Case outcome was mortality (death) while the
96 control outcome was survival (alive). Case notes of 350 patients discharged alive and that of 350
97 patients that died between July 2011 and June, 2016 were randomly selected from the record unit by
98 staffs of the record unit who were not aware of the nature of the study. Out of the selected case notes
99 only 264 and 243 were retrospectively reviewed for analysis for patients discharged alive and patients
100 who died respectively after editing.

102 **Patients**

103 We retrospectively reviewed randomly selected case notes of 264 patients discharged alive
104 and 243 patients who died between July 2011 and June, 2016. The exclusion criteria included patients
105 less than 18 years, pregnant patients because pregnancy is associated with hyperdynamic
106 circulation on its own and NEWS and MEWS are yet to be validated in pregnant women and case notes
107 that lack necessary parameters for calculating MEWS on six occasions preceding outcomes.

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METHODOLOGY?

108 **Data**

109 The data collected included patients' socio-demographic characteristics, clinical diagnosis, patients'
110 wards, and six-sets of each patients' vital signs at 12 hours interval over 72 hours preceding outcome
111 (discharged alive or death). The obtained vital signs were used to calculate six sets of modified early
112 warning score and mean score for each patient. Modified Early Warning Score offive was taken as
113 critical value based on previous finding which showed that MEWS of 5 and above was associated
114 with increased need for ICU admission (OR 5.4, 95% CI 2.8-10.7) and adverse outcome[16]. The
115 mean score for patients that were discharged alive was compared to that of dead patients. The other
116 data retrieved from the case notes included documented nurses' responses to abnormal vital signs,
117 evidence of escalation of treatment or intervention either by the nurses or house officers when called
118 upon, reason(s) for calling the attention of clinicians by nurses prior to patients death, house officers
119 responses and treatment plans, time difference in minutes between house officers' documentation

Comment [c22]: AUTHOR SHOULD READ ON
HOW TO ORGANISE METHODOLOGY SECTION

120 and registrars' documentation, registrars' documentation and consultants' input; time of death and
121 duration of hospital stay.

122 **Modified Early warning Score (MEWS)**

123 Modified Early Warning Score is a modification of the National Early Warning Score developed by the
124 Royal College of Physicians (RCP) with the aim of achieving a universal and objective scoring system
125 that will allow early recognition of patients at risk of adverse events. National Early Warning Scoring
126 system scores seven physiological parameters that include PR,SBP, RR, SpO₂,T,level
127 ofconsciousness and urine output (which is excluded from score calculation),whereas Modified Early
128 Warning Scoring system excluded SpO₂ and Urinary Output (table 1) that are not routinely
129 monitored and charted in vital signs charts. MEWS has minimum and maximum values of 0 and 14
130 respectively with higher score signifying physiological instability.

131

132 Table 1: showing the component of Modified Early Warning Score and grading.

	3	2	1	0	1	2	3
Systolic blood pressure (mmHg)	70	71-80	81-100	101-199		>200	
Pulse rate (beats per minute)		40	41-50	51-100	101-110	111-129	130
Respiratory rate (breaths per minute)		9		9-14	15-20	21-29	30
Temperature (°C)		35		35-38.4		38.5	
AVPU score				A	V	P	U

133

134 AVPU: A, alert; V, responding to voice, P, responding to pain; U, unresponsive

135 Adapted from Subbe et al, 2001.doi:10.1371/journal.pone.0151408.t001 [16].

136

137 **Statistical analysis**

138 Results were presented in form of tables and charts. Socio-demographic characteristics were
139 analysed using descriptive statistics, categorical variables were presented in form of both frequencies
140 and percentages, and mean and standard deviation were used for continuous variables. Chi-square
141 and t- test were used for test of significance for categorical and continuous variables respectively. *P*-
142 values less than .05 were considered to be statistically significant.

143

144 **RESULTS**

145 Case notes of 264 patients discharged alive and 243 dead patients were reviewed. The mean age of
146 the patients was 49.6 (± 26.7)withinterquartile range (IQR) of 34 (Q1=37 and Q3=71).Two hundred
147 and eighty nine (57.0%) of the patients were males. Table 2 shows the socio demographic
148 characteristics of the patients.

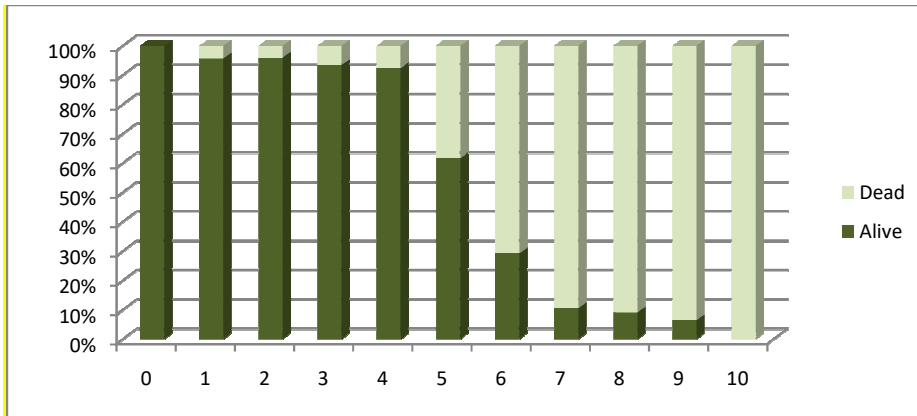
149 Table 2: Showing the socio-demographic characteristics of the patients

Parameters	Alive (n=264)	Dead (n=243)	P value
Age (mean SD)	48.33(± 28.2)	50.80(± 26.2)	.3080
Sex M:F	153:111	136:107	.7175
Wards			
Medical	91	88	
Surgical	101	83	.5782
ICU	13	18	
Emergency	59	54	

150

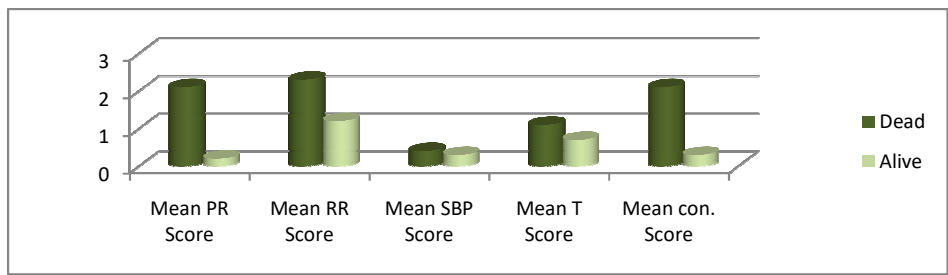
151 Mean modified early warning score for patients discharged alive (PDA) was 2.7 (± 0.6)as compared to
152 mean score of 8.0 (± 2.6) for the dead patients($p < .001$). Further assessment revealed that modified
153 early warning score of 5 and above were significantly associated with higher risk of mortality (RR
154 21.24, $P < .001$) (Fig. 1)

155

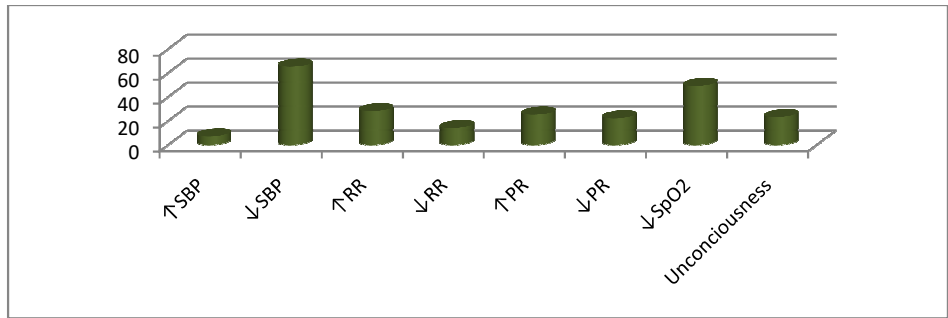


156

157 Fig.1: Showing the outcomes in percentages for different modified early warning score values.
 158 Assessment of vital signs revealed that pulse rate, respiratory rate, temperature and
 159 consciousness scores were statistically significantly higher in dead patients, while systolic blood
 160 pressure shows no statistical significant difference when dead and alive patients were compared.
 161



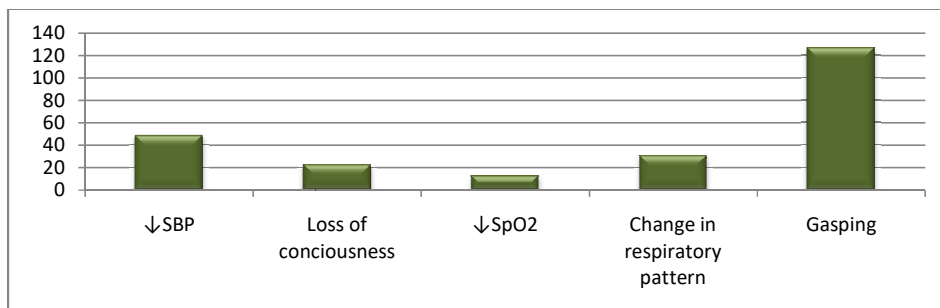
162
 163 Fig.2: Showing the mean scores for each parameter of MEWS between dead and alive patients.
 164 Ninety-four (26.2%) out of 361 patients that have MEWS of 6 and below had documented evidence
 165 of escalation of treatment or increased in frequency of monitoring of their vital signs as compared to
 166 139 (95.2%) out of 146 patients with MEWS of greater than seven. Decreased blood pressure in
 167 65 (30.4%) occasions was responsible for escalation of treatment based on the vital signs and followed
 168 by decreased SpO₂ in 49 (22.9%) occasions (Fig. 3).
 169



170
 171 Fig. 3: Showing changes in vital signs that were associated with escalation of treatment.
 172 ↑ Increased ↓ Decreased
 173 There was a mean delay of 83 minutes between house officers' documentation and registrars' review
 174 following recognition of patients' deterioration by ward nurses and mean delay of about 48 minutes
 175 before consultants' input, making a total delay of 131 minutes before final decisions were taken.

176 Analysis of indication for notifying clinicians prior to patients' demise revealed that in 52.6% of times
177 attentions of clinicians were not drawn to patients until patients started gasping. (Fig. 4)

178

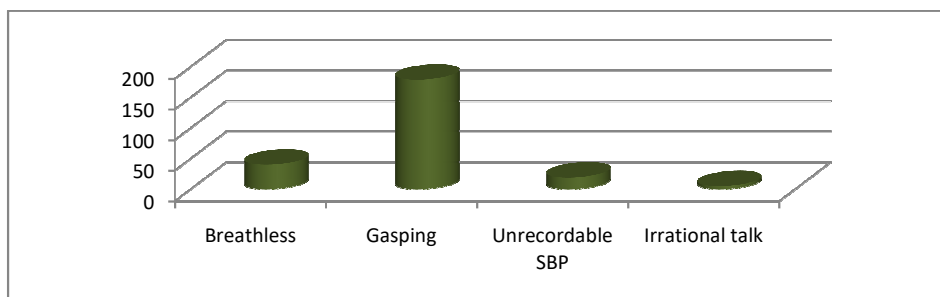


179

180 Fig.4: Reasons for notifying managing team preceding patients' death by nurses

181 Review of the case notes revealed that in 179 (73.7%) out of 243 occasions clinicians met patients
182 gasping and breathless in 40 (16.5%) occasions. (Fig. 5)

183

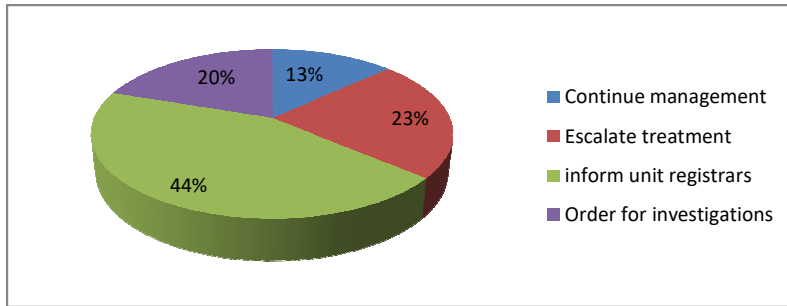


184

185 Fig.5: Showing patients' condition at point of review by clinicians following notification of patients'
186 deterioration by the nursing staff

187 When house officers were informed to review patients following recognition of patients' deterioration;
188 in 107(44.03%) occasions the responses were to inform their unit registrars. (Fig. 6)

189



190

191 Fig.6:Showing the pattern of house officers' responses to deteriorating patients.

192 Admission pattern revealed that 311 (61.3%) out of 507 patients had MEWS of 5 and above. Of 311

193 patients with MEWS of 5 and above 280 (90.0%) were managed in generalwards. Only 29 (20.3%)

194 out of the 143 patients with MEWS of 7 and above were managed in ICU.

195 In none of the case notes was there cleared documentation by clinicians on what to do in case of

196 patients' deterioration or specific value of vital signs that clinicians should be informed.

197 **DISCUSSION**

198 **This** study confirmed previous reports findings on MEWS as a predictor of patients' outcome; and that

199 progressive deterioration of patients' physiological parameters often precede patients' death, which

200 are often documented without appropriate corresponding competent clinical responses. **This** study

201 showed that modified early warning scores of 5 and above was associated with clinical and statistical

202 significant mortality. No patients in **this** study with mean modified early warning score of above eight

203 and those with MEWS of above twelve at any point survived, as compared to one study where some

204 patients with such values survived [17]. Possible explanation for poor outcome in **this** study is

205 probably due to lack of adequate critical care facilities in our centre such as: all round functioning ICU,

206 high dependency unit (HDU) and complete lack of coronary-cardiac unit compared to hospitals in

207 developed countries where modern critical care facilities are readily available and accessible. Other

208 factors that may be responsible for better outcomes in developed countries are: availability of services

209 of emergency medical team (EMT) and activation of rapid response system (RRS) following

210 recognition of patients' deterioration [18]. **This** study also found out that there was appreciable mean

211 delay of about 131 minutes before consultants' inputs into patients' management following recognition

212 of deterioration by nursing staffs. A non documented observation revealed that in about 56% of cases

213 randomly reviewed, consultants' input were often verbal communications over the phone, this rose up

214 to about 95% during the call hours. This time delay becomes more worrisome as it was revealed that

215 house officers' responses in most cases were inadequate and sub-optimal due to lack of adequate
216 knowledge and experiences on management of critically ill patients. In majority of the cases house
217 officers rarely escalate treatments when called upon to review patients at risk of deterioration, but
218 rather waited for their registrars to take decisions who in turn would further need to inform managing
219 consultants before major decisions are taken such as: need to transfer patients to higher care unit or
220 refers to other centre with better facilities.

221 This study revealed that common reasons for escalation of treatment were decrease in blood
222 pressure (un-recordable) followed by decreased SpO₂; these two changes are late signs as initial
223 compensatory mechanism of cardio-respiratory system would have maintained systemic blood
224 pressure and SpO₂ by increasing HR, force of contraction, peripheral vasoconstriction and RR due to
225 activation of sympatho-adrenergic response. This shows lack of basic understanding of
226 pathophysiological changes and physiological compensatory mechanism associated with
227 haemodynamic instability among health care workers.

228 The study showed poor compliance to the triad of early detection, timeliness of response and
229 activation of appropriate clinicians with competent clinical responses which are important factors that
230 influence patients' outcomes. This study also found out that about 62% of patients in medical and
231 surgical wards were considered to need at least an hourly monitoring of vital signs based on the
232 expected response for MEW score of 5 as in the Royal College of Physicians (RCP) guidelines
233 (Table 3). The study further showed that less than one-fifth of patients with MEWS of seven and above
234 were managed in intensive care unit (ICU). This showed that significant percentage of patients that
235 were managed in conventional general wards were patients that required higher care units. The main
236 reasons for this pattern of admissions and management of "potential critically ill patients" in
237 conventional general wards were due to: (1) failure of recognition for need to transfer such patients to
238 higher care units with better monitoring facilities such as high dependency unit or ICU (2) lack of such
239 higher units. Similar reasons were reported from studies from some other low income countries [1920].
240 In none of the case notes was clear documentation of what to do in case of patient's deterioration of
241 vital signs or change in patient's clinical condition. If the clinicians clearly stated critical/specific vital
242 sign values that clinicians' attention should be sought and possibly what to do while waiting
243 for clinicians' review, some adverse events would have been prevented. A similar approach is being
244 used in management of head injured patients when decrease in Glasgow Coma Score (GCS) is

245 considered as an indication to call clinician's attention who has core clinical competency in managing
246 head injured patients; a similar approach is also embraced when writing blood transfusion orders
247 which include what to do when signs and symptoms of transfusion reaction are observed. The main
248 objective of this approach is to avoid inherent danger of delay interventions in such two
249 aforementioned clinical scenarios. This approach can be borrowed in management of patients at risk
250 of adverse event in the general wards.

251 Current evidence has shown that the triad of 1) early detection and recognition, 2) timeliness of
252 response and 3) competency of medical response are factors that determine patient's response and
253 outcome to medical interventions[16,21,22,23,24,25]. Early detection and timeliness of response are
254 possible/feasible through monitoring and early recognition of patients' vital signs deterioration. This
255 triad is essential for good patients' management and outcomes. Failure to monitor vital signs, coupled
256 with delay in recognition of patients' vital signs deterioration have been shown to delay the rapid
257 response system/emergency medical teams[26]with resultant failure to act. Failure to act was
258 reported to be responsible for about 11% of avoidable hospital mortality by National Patients Safety
259 Agency(NPSA)report in 2007[14].

260 Vital signs are complex physiological parameters that are often affected by so many factors other than
261 the clinic-pathological conditions of the patients. Thus holistic approach in the interpretation of vital
262 sign values in context of other vital sign values rather than interpretation of a particular value in
263 isolation may likely predict patients' outcome as derangement of vital signs rarely occur in isolation.
264 When combined and weighted values are used to calculate a single score value it will likely make the
265 interpretation much easier and better. Recognition of this has led the RCP to developed a colour
266 coded scoring system called National Early Warning Score(NEWS) that will help nurses, clinicians
267 and member of emergency medical team or Rapid Response System bridge the gap to recognise and
268 detect early a deteriorating patient through simple bed side physiological parameters. The scoring
269 system also states clearly the expected responses based on the calculated-weighted scores thus
270 allow timely notification of clinicians with appropriate clinical competency as shown in tables 3 and 4.

271 A similar observational track and trigger chart was developed for children use in Victorian Hospital
272 which guides the clinicians whether to escalate patients care based on the vital sign values[27].

273

274

275

Table 3: National Early Warning Scoring System

Parameters	3	2	1	0	1	2	3
Resp. Rate	≤8		9-11	12-20		21-24	≥25
O2 Sat	≤91	92-93	94-95	≥96			
Supp O2		YES		NO			
Temp	≤35.0		35.1-36.0	36.1-38.0	38.1-39	≥39.1	
Systolic BP	≤90	91-100	101-110	111-219			≥220
Heart Rate	≤40		41-50	51-90	91-110	111-130	≥131
Level of conciseness				A			V,U,P

276

277

Table 4: Clinical response to NEWS triggers

Scores	Clinical risk	Monitoring	Response
0	Low	Minimum 12hourly	Continue routine NEWS monitoring
1-4	Low	4-6 hourly	Inform registered nurse to determine if need for Escalation of care
Individual parameter scoring 3 (Red score)	Medium	Increased to a minimum of 1 hourly	Registered nurse to urgently inform managing team With core competencies Clinical care in environment with monitoring facilities
Aggregate 5-6	Medium	Increased to a minimum of 1 hourly	
Aggregate 7or more	High	Continuous monitoring of vital signs	Need specialist review from managing team Clinician with critical care competencies assessment Consider transfer to higher unit

278 Adapted from Royal College of Physicians National Early Warning Score

279

280 This study utilised a modified form of NEWS which has been previously validated and aimed to meet
281 the need of patients in various clinical settings[16, 28]including Africa [29, 30, 31].Modified Early
282 Warning Scoring system excluded patients SpO₂ and hourly urinary output in its scoring. The authors
283 opted for MEWS as SpO₂ are not routinely monitored nor charted in patients' vital signs charts and
284 hourly urine output were not documented in most of the case notes, a common occurrence seen in
285 most low and middle income countries.

286 In order to avoid delay in patients' management as pointed out in this study we suggest introduction
287 and use of modified early warning score, which score patients based on the derangement of vital
288 signs and consciousness level and expected response without delay based on the patients score on
289 colour coded NEWS triggers chart; as many hospitals have no trigger point nor escalation
290 policy. Modified early warning score is highly favoured because of its simplicity, as estimation of
291 peripheral oxygen saturation and oxygen supplementation are not readily available in significant
292 number of time in low and middle income countries..However National Early warning Scoring system
293 which take patients SpO₂ , and oxygen supplementation into consideration to calculate NEWS may
294 be a better predictor of patients outcome in places where facility for SpO₂ is readily available
295 Determination of MEWS for each patient following assessment of vital signs will assist attending
296 health care worker to make a better decision based on the warning score protocol guidelines(table 4)
297 rather than subjective opinion of the observer who may as well be deficient in interpreting the
298 implication of observed values. Though several other scoring systems have been designed, none of
299 them is suitable for bedside scoring and universal as MEWS and NEWS. Modified Early Warning Score
300 can also help in allocation of patients to different level of care especially in low and middle income
301 countries where health care resources are limited in supply. Modified early warning score has also
302 been shown to assist nurses, doctors and other health care professionals that are involved in patients'
303 care to have a protocol based guidelines for frequency of monitoring vital signs. This becomes
304 advantageous in situations where there is low nurse to patient ratio thus avoiding the traditional
305 routine of monitoring vital signs for every patients whether at risk or not thus allowing concentration
306 and more focused attention to patients at risk of deterioration that may need more frequent
307 monitoring and escalation of treatment.

308 Though introduction of MEWS will aid in early detection of patients at risk of progressive deterioration
309 and possibly timely response, the authors still believed that for the third component of the triad to be
310 effective hospitals need to introduce a dedicated acute medical team unit in the form of Rapid
311 Response System (RRS) whose afferent limb will make use of MEWS to activate the efferent limb.
312 The efferent limb will consist of clinicians with core competency in acute care management and trained
313 ICU personnel that will offer immediate response to activation and commence immediate treatment in
314 the ward and plans further escalation of treatment based on patient's MEWS and response.

315 **CONCLUSION**

316 This study showed delay in recognition of patients at risk of deterioration despite obvious
317 documentation of progressive derangement of vital signs and significant **delay in nurses response** and
318 decision making process , **and can be reduced with use of MEWS** we therefore suggest and
319 recommend the use of MEWS assessment for each patients at least **twice a day or more depending on**
320 **patients clinical and haemodynamic stability** with expected corresponding response and introduction
321 of acute medical team in the form of rapid response system (RRS) in our hospitals.

322

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