

A PROSPECTIVE OBSERVATIONAL STUDY TO ANALYSE THE
UTILITY OF NATIONAL EARLY WARNING SCOPE (NEWS) IN
PREDICTING THE OUTCOME OF PATIENTS PRESENTING TO THE
EMERGENCY DEPARTMENT.

By

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EMERGENCY MEDICINE

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**“A PROSPECTIVE OBSERVATIONAL STUDY TO ANALYSE
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**DOCTOR OF MEDICINE (M.D.)
In
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LIST OF ABBREVIATIONS

ICU	Intensive Care Unit
UK	United Kingdom
EMD	Emergency Medicine Department
ED	Emergency Department
HDU	High Dependency Unit
Min	Minute
O2	Oxygen
IHD	Ischemic Heart Disease
DKA	Diabetic Ketoacidosis
CVA	Cerebrovascular Accident
ADD	Acute Diarrheal Disease
ARDS	Acute Respiratory Distress Syndrome
CKD	Chronic Kidney Disease
GBS	Guillain Barre Syndrome
CLD	Chronic Liver Disease
GI	Gastro intestinal
COPD	Chronic Obstructive Pulmonary Disease

ABSTRACT

Background:

The triaging of patients coming to the emergency departments (EDs) is crucial in providing sufficient. Several triage systems have been developed in the ED, like the Emergency Severity Index (ESI) and the Manchester Triage Scale (MTS). These systems render a way of categorising all incoming ED patients by level of understanding ranging from life-threatening to non-urgent and dictate how quickly patients should be seen.

The National Early Warning Score (NEWS), formulated in conjunction with the Royal College of Physicians of London, has been more rigorously tested and performs better than any of the 33 published systems commonly in use. Prediction of factors like the need for ICU admission, length of hospital stay, and patient's long-term outcome using NEWS can, to a certain extent, help in intensifying the management and early anticipatory counselling of patient attendees. NEWS has an excellent ability to discriminate ward patients at risk of cardiac arrest, death or unexpected intensive care unit (ICU) admission, and it is currently being promoted as a standardised system across the UK.

The utility of NEWS still needs to be adequately studied in an emergency department in India.

Objective:

To analyse the NEWS in the emergency department in predicting patient outcomes.

Design/ Method:

A prospective observational study.

Patients aged more than 18 years with an Emergency Severity Index (ESI) of 2,3 and 4 were eligible.

Intervention:

NEWS was noted at 4 points - on arrival (T0), an hour after arrival (T1), 2 hours after arrival (T2) and at transfer to the ward/ICU (T3). The upshots of interest were: the need for hospital admission, the need for ICU admission, the length of hospital stay and the patient's outcome (after 45 days).

Results:

A total of 560 patients were assessed. The NEWS at various points correlated well with the outcomes of interest like the need for hospital admission, the need for ICU admission, the length of hospital stay and the patient's outcome (after 45 days).

Conclusion:

All the associations were found to be significant. So, patients with a higher NEWS at various stages of the triage system had a higher risk of bad prognosis and outcomes compared to those with a lower NEWS. Thus, NEWS is found to be an efficient predictor of the outcomes in the patients presenting to the ED.

Keywords:

NEWS, ED, Monitoring, Vital parameters.

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INTRODUCTION

The triaging of patients while they present to the emergency departments (EDs) is vital for their proper management. The triage is essential in identifying the priorities and categorising patients accordingly. This is crucial in managing the patient load at the emergency department and also in ensuring appropriate and timely care for the patients based on the priorities assigned. This will help in saving lives with necessary active interventions on time. The triage system also paves the way for the effective utilisation of resources and plays a huge role in reducing resource wastage. An accurate triage system will greatly affect emergency service quality to a great extent¹.

Precise triaging of patients is not easy and requires expertise. Inter-observer variability can be there in triaging²⁻⁴. Various triage protocols are there for utilisation in the emergency department (ED), including the Emergency Severity Index (ESI), the Australasian triage system, the Canadian and Manchester Triage Scales. These systems ensure a systematic way of sorting out all emergency patients into different categories ranging from severe to stable cases and deciding how seriously patients must be treated. While every ED implements triage protocols to decide treatment anteriority, it is obvious that minimal care is given to the horizontal assessment of patients. There are no proper scoring systems specifically implemented to anticipate deterioration or the probability of intensive care admission or grave risk in ED cases. Further, various single-centre studies have shown that horizontal assessment of vital parameters in EDs is poor.

These factors point to the fact that worsening patients could be at peril of being undiscovered in the ED and are hence prone to developing severe untoward events such as sudden unexplainable cardiopulmonary arrest and ICU admission, with greater depletion of resources through prolonged hospitalisation.^{6,7}

The National Early Warning Score (NEWS), formulated in colligation with the RCP, London in 2012, has been trialled and executes better than any of the other commonly used ones.⁸

Prediction of factors like the need for ICU admission, length of hospital stay, and patient's long-term outcome using NEWS can, to a certain extent, help in intensifying the management and also in early anticipatory counselling of patient attendees. NEWS has the potential to distinguish patients at risk of cardiopulmonary arrest, death or unexpected ICU admission, and it is utilised as an accepted system across the UK.⁹

In India, the serviceability of NEWS in predicting the outcomes of covid patients has been explored to some extent, given the pandemic scenario. Several prospective and retrospective studies have been undertaken on this aspect.^{10,11} But there is a crack in the literature exploring the utility of NEWS in other settings, especially among patients attending an emergency department in India.

There is a need for efforts to fill this gap in research so that the capability of NEWS can be utilised to the maximum if it could be proven as an effective tool in predicting the outcomes of patients in the emergency department. Hence this study has been undertaken to evaluate the efficiency of NEWS in predicting the outcome of patients presenting to the ED in a tertiary care medical college in Karnataka.

OBJECTIVES

Primary objective – To analyse the NEWS in the emergency department in predicting patient outcomes

Secondary objectives – To find out the correlation between NEWS (at T0, T1, T2 and T3) with patient's:

1. Need for emergency ward admission
2. Need for ICU admission
3. Length of hospital stay (in days)
4. 45-day outcome:
 - a) Improved
 - b) Deteriorated
 - c) Died

(T0 – on arrival to EMD)

T1 – after 1 hour

T2 – after 2 hours

T3 – when shifting from EMD)

REVIEW OF LITERATURE

1. Emergency medicine

Emergency medicine is a broad speciality, and emergency physicians are the first contact doctors for patients in a hospital setting in many countries. They play an important role in the initial decision-making and timely action in an emergency medical situation. This has a significant impact on preventing deaths or disabilities. Emergency physicians often have to start acting in the pre-hospital setting itself.¹²

In many countries, the speciality exists as its own. In some countries, the role of emergency physicians is being handled by anaesthesiologists, critical care specialists and specialists in internal medicine. Thus, emergency medicine is an evolving speciality of medicine.

2. Triage

Triage is an essential component in emergency health care services. The word triage originated from the French word 'trier', which means to sort out or organise things. In the health care field, triage is used to categorise critical patients and order them in accordance with the need for care and monitoring. Triage was initially practised mainly by military doctors. They used to quickly categorise the wounded soldiers and give care accordingly. The triage system is said to be implemented in hospitals for the first time in 1964. It was following the publication by Weinerman et al. on the interpretation of the scope of triaging in civilian emergency departments. Over the years, triaging has been closely integrated into emergency medical care.¹³ Triage happens in three phases:

1. Pre-hospital triage
2. Triage at the scene of an event
3. Triage on arrival to the ED.¹⁴

There have been a lot of triage systems implemented in various parts of the world.

The following are a few of them:

2.1. Emergency Severity Index (ESI) Triage Algorithm

The triage nurse assesses the condition of patients by looking at whether the patient has a patent airway, a palpable pulse and breathing effort. She also looks for oxygen saturation, acute mental status changes and unresponsiveness etc. This evaluation helps in determining whether the patient is hemodynamically stable and if there's a need for immediate intervention. The patients are categorised into level 1 or level 2. Level 1

patients need immediate life-saving therapy. The ESI algorithm is depicted in figure 1. Another scale used for this categorisation is the AVPU (Alert, Verbal, Pain, Unresponsive).¹⁵

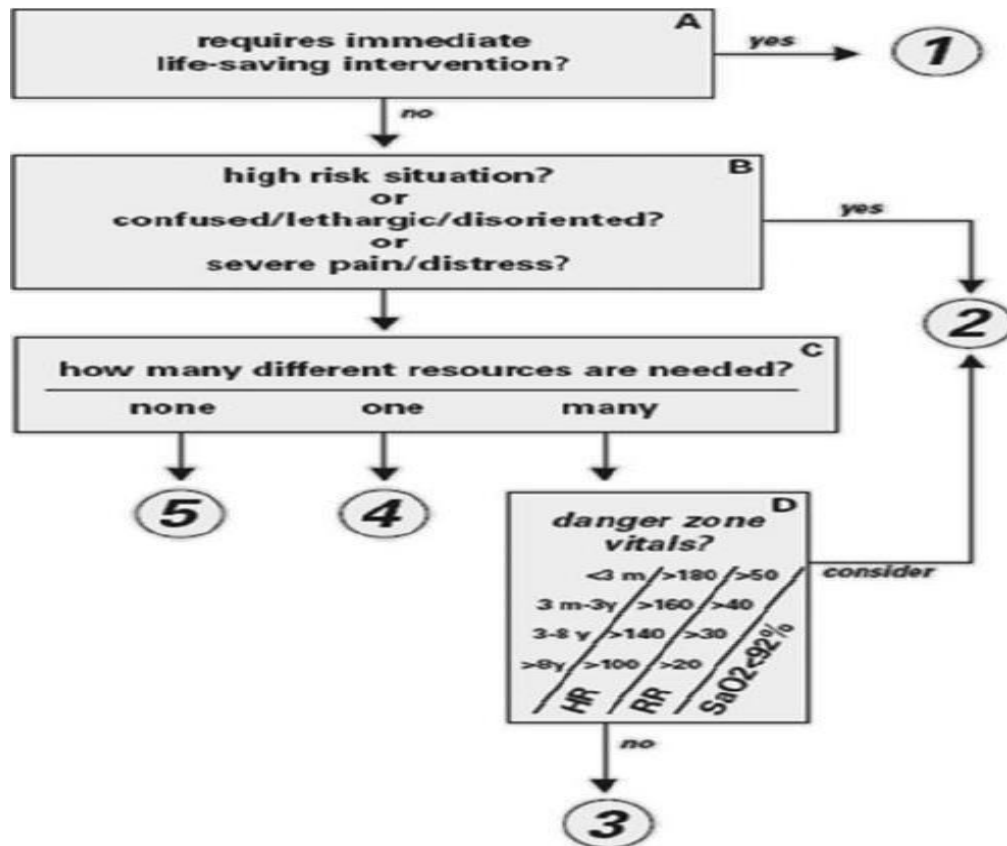


Fig 1: Emergency Severity Index triage algorithm¹⁶.

2.2. The Australasian Triage Scale

The Australasian triage scale (ATS) was initially known as the International Triage Scale (ITS). This is based on a five-level categorical scale. It was previously used in the BH Hospital in Victoria. Later, in 1993, the Australian College of Emergency medicine adopted ITS as the national triage scale. This was after several successful trials of the same.¹⁷ The ATS looks into the patient's appearance, problems, physiological parameters, etc.¹⁸

Australasian Triage Scale Category	Response Time	Category Description	Clinical Indicators
Category 1 (RED)	Seen Immediately	Life Threatening Conditions	Cardiac/Respiratory Arrest Immediate risk of airway, respiratory rate < 10/min, Extreme Respiratory Distress. BP less than 80 in adult. Severe shock in child/infant GCS scale less than 9 Prolonged seizure IV overdose Severe behavioral disorder
Category 2 (ORANGE)	Seen within 10 minutes	Imminently life threatening, time sensitive treatment needed, or Severe pain.	Airway risk (stridor) Circulatory Compromise (HR less than 50 or greater than 150, Hypotension, severe blood loss, poor perfusion). Chest pain likely cardiac related Suspected sepsis, Febrile Neutropenia, Fever with lethargy Acute Stroke GCS less than 13 Suspected Testicular Torsion High Risk History (toxic ingestion, venomous bite, pain suggesting PE, AAA, ectopic pregnancy).
Category 3 (GREEN)	Seen within 30 minutes	Potentially life threatening, situational urgency, or severe pain	Severe Hypertension, Moderate blood loss Moderate Shortness of breath Vomiting Dehydration Seizure (post ictal), Head Injury with LOC (now alert) Physiologically stable suspected sepsis Severe pain Limb injury consisting of limb deformity or severe laceration, altered sensation, absent pulse. Potential child abuse Behavioral/Psychiatric patient very distressed, risk of self-harm, potentially aggressive.
Category 4 (BLUE)	Seen within 60 minutes	Potentially serious condition, situational urgency or complex case	Mild Hemorrhage Foreign Body Aspiration without respiratory distress Chest injury without rib pain or respiratory distress Minor head injury without LOC Moderate pain Vomiting or diarrhea without dehydration Inflammation or foreign body in eye without vision changes Minor limb trauma (ankle sprain, fracture, uncomplicated laceration with normal vital signs) Swollen, erythematous joint Semi Urgent mental health problems with no immediate risk to personnel.
Category 5 (white)	Seen within 120 minutes	Less urgent or Clinical-Administrative problems	Minimal pain with no risk factors Low risk history Minor symptoms of illness Minor symptoms of low risk condition Abrasions or minor laceration Scheduled revisit Immunizations Patient with chronic psychiatric symptoms in social crisis.

Fig 2: The Australasian triage scale¹⁵

2.3. The Canadian Triage System

This is also called the Canadian Triage and Acuity Scale (CTAS). This system was developed based on the Australian NTS. It is a five-level triage methodology. It depends on the severeness of the malady and the time required before the intervention, along with a list of exhibiting complaints of the patient. Level 1 includes the most severe patients, and level 5 includes non-urgent cases. The five levels are shown in figure 3.

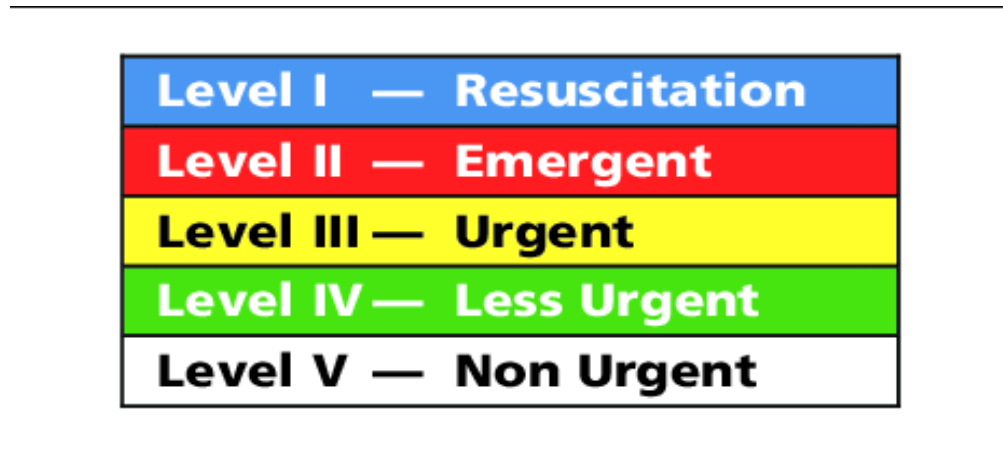


Fig 3: The Canadian triage system¹⁹.

2.4. Manchester triage system

In Europe, the Manchester triage system is a commonly used triage system. It uses 52 flowcharts. These are based on the patient's presenting complaints. Further, there are additional signs and symptoms for each flow chart. These are termed the 'discriminators'. They are ranked based on priority from most severe to least severe. Finally, the patients fall into categories ranging from immediate to non-urgent.^{20,21} An example is depicted in figure 4.

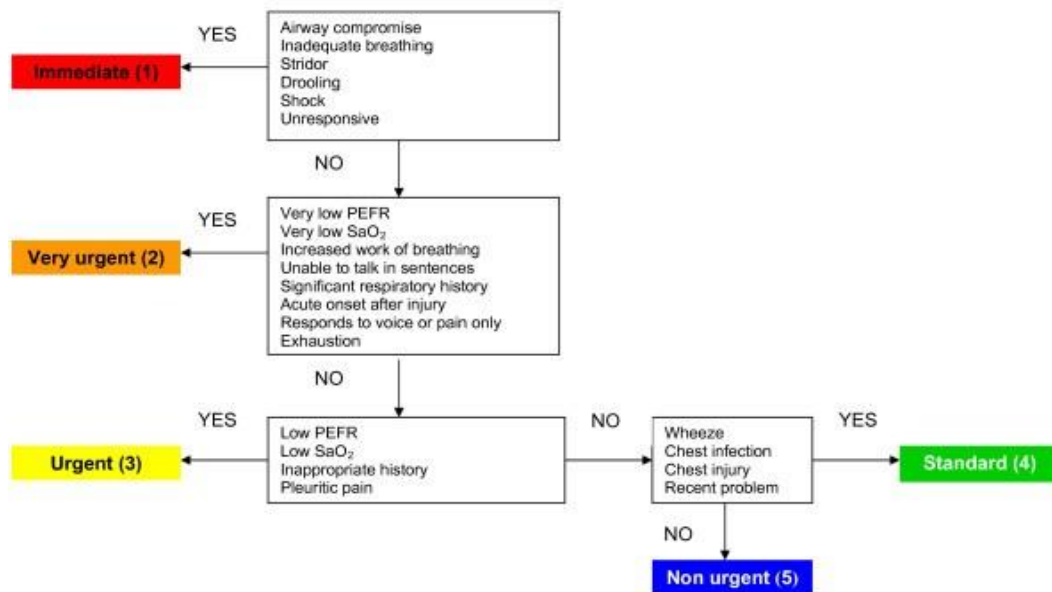


Fig. 4: The Manchester triage system for shortness of breath in paediatric population²².

2.5. Field & disaster triage.

Emergency Medicine Services (EMS) are the first medical personnel to care the patients during a disaster or mass casualty event. Their decision-making has got a crucial role in patient outcomes. They have to sort out the patients regarding who needs to be cared for first, who can wait and who can't be saved. The EMS make use of different algorithms for this purpose.¹⁵

2.6. START algorithm

This is one of the many algorithms used in field triage. START intends 'simple triage and rapid transport'. The victims are made to walk to a special area designated for care by the emergency responders. Those who are able to walk will be classified as 'minor' and given a green tag. The rest of the victims are assessed based on the RPM (Respirations, Perfusion, and Mental status).¹⁵ The Algorithm is shown in figure 5.

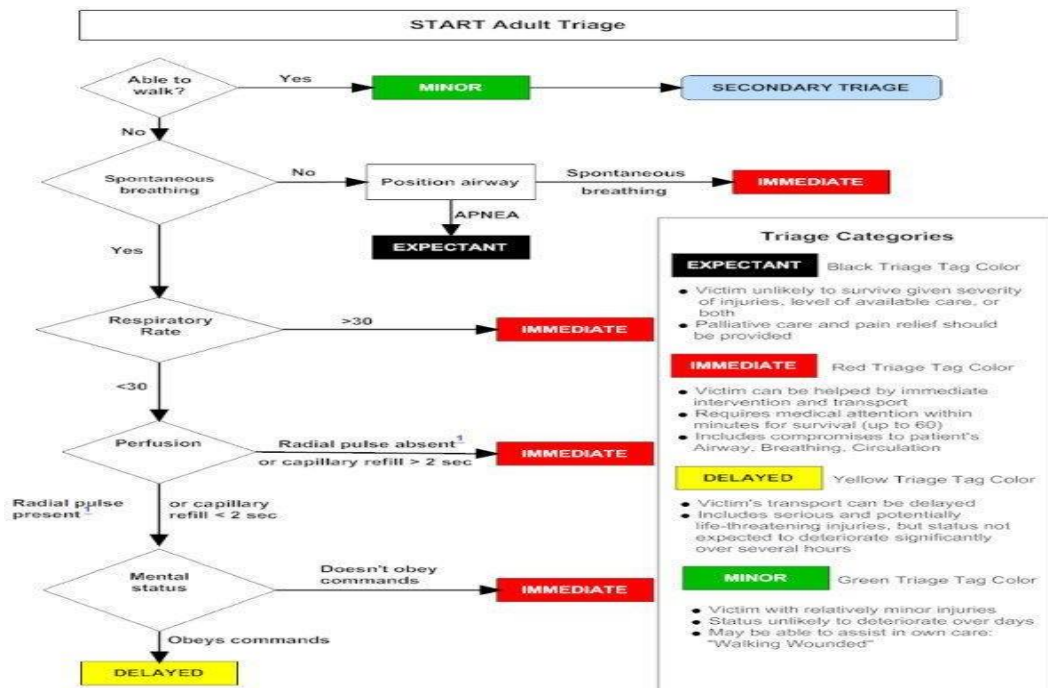


Fig 5: The START triage algorithm²³.

2.7. Early Warning Scores (EWS)

Early warning scores (EWS) were implemented because of fears about the failure to pick worsening vital parameters in ward cases. They are focussed on the case's vital parameters and coupled to 'triggers', which necessitate the increment of periodic assessment.²⁴

2.8. Modified Early Warning Score (MEWS)

The Modified Early Warning Score (MEWS) is another scoring system. It is based on various factors like systolic pressure, heart rate, temperature, rate of breathing, and consciousness. It has been established as a simple bedside tool. Due to its simplicity, it is very helpful to be used in a busy clinical setup. Calculating the MEWS score for emergency cases will be beneficial in triage settings to distinguish patients at risk of worsening and those needing more intensified care.²⁵

2.9 The quick Sepsis Related Organ Failure Assessment (qSOFA)

This is a scoring system recommended by the Third International Consensus Definitions Task Force.²⁶ It is proven to be of high predictive value for in-hospital mortality. It is specifically helpful for the outcome assessment for the cases with suspected infection outside the ICU.²⁷

2.10 National Early Warning Score (NEWS)

The National Early Warning Score (NEWS) was brought by the National Early Warning Score Development and Implementation Group (NEWSDIG) in the UK. This scoring system which was developed in 2012 is being used by the National Health Service (NHS) widely. It was updated in December 2017. NEWS-2 is the latest updated version. This helps to find out the deterioration of in-patients and predict in-patient grave risk.

NEWS has been implemented as a means of making sure that where a patient is at risk of acute worsening, then vital parameters are monitored at a frequency adequate to the clinical scenario and that increment of treatment is timely and appropriate where it is required. Afterwards, it has been used also as a communication device enveloping a summary of a patient's condition.^{9,28}

NEWS takes into consideration the physiological parameters, level of consciousness and oxygen supplement. All these parameters are simple to measure and are accessible. The vital parameters include systolic blood pressure, rate, respiratory rate, temperature and oxygen. Factors like alertness, voice, pain and unresponsiveness assess the level of consciousness.²⁸

Physiological Parameters	3	2	1	0	1	2	3
Respiration Rate (BPM)	≤8		9-11	12-20		21-24	≥25
Oxygen Saturations (%)	≤91	92-93	94-95	≥96			
Any Supplemental Oxygen		Yes		No			
Temperature (°C)	≤35		35.1-36.0	36.1-38.0	38.1-39.0	≥39.1	
Systolic Blood Pressure (mmHg)	≤90	91-100	101-110	111-219			≥220
Heart Rate (BPM)	≤40		41-50	51-90	91-110	111-130	≥131
Level of Consciousness				A			V, P or U

NEWS Scores	Clinical Risk
0	Low
Aggregate 1 - 4 RED Score* (Individual parameter scoring 3)	Medium
Aggregate 5 - 6	
Aggregate 7 or more	High

Fig 6. National Early Warning Score²⁸.

2.11 Triage by machine learning models.

The triage systems have also been used to predict the outcome of patients who get into the emergency medicine department. Apart from the various triage systems mentioned above, machine learning algorithms are also now being explored for the same purpose. One of the main drawbacks of the different triage scales is the chance of interobserver variability in assessing the patient's condition, which in turn will reflect in the total scoring and thus heavily affects the prediction of the outcome. Machine learning algorithms are expected to overcome this disadvantage.

Extreme Gradient Boosting (XGB) and Deep Neural Networks (DNN) are two machine learning algorithms. They found it to have many advantages. In large data sets, they fit the non-linear relationship between the predictors and outcomes.²⁹

A systematic review of 92 machine-learning models from 25 studies has concluded that the machine-learning models are accurate in triaging patients in the emergency care system. This systematic review had taken into account two outcomes mainly: hospitalisation and the need for critical care.³⁰

3. Utility of NEWS in triaging

Chen L et al. conducted a retrospective cohort study in China to know the utility of NEWS among general emergency patients. The NEWS was found to be significantly associated with ED (emergency department) mortality. They also found out that the NEWS was better at discriminating outcomes like ED mortality, observation in ED, ICU admission and in-hospital mortality. NEWS is now being used in many countries. It is thought to have a better ability to sort out patients at risk of outcomes like cardiac arrest, unanticipated ICU admission or death within a day. Apart from its use in the general population, the utility of NEWS in certain specific populations attending ED, like geriatric patients or patients with sepsis etc., is now gaining importance.³¹

In a prospective observational feasibility study by Alam N et al. at the ED of the VU Medical Centre, an academic urban tertiary care centre in Amsterdam, 300 patients with ESI (Emergency Severity Index) 2 and 3 were assessed. And it was concluded that NEWS assessed at different time intervals were a good predictor of patient outcomes and can be of additional value in the ED to longitudinally monitor patients in the ED and in the hospital.³²

In a prospective cohort single centre study by Spagnolli W et al. on 2,677 unselected patients admitted from July 2013 to March 2015 in the Internal Medicine ward of the hospital of Trento, Italy, it was concluded that NEWS assessed onward admission may help in stratifying risk of clinical worsening and can be a good indicator of in-hospital critical adverse events, although sudden cardiopulmonary events and chronic hypoxia could constitute some limits.³³

In a prospective one-month cohort study by Kivipuro et al. in TU Hospital's ED, Finland, ED-NEWSs were assessed for all patients more than 18 years without treatment limitations, and control (ward) NEWSs were further assessed for the ED ward ICU and ED ward patients, and it was concluded that NEWS correlated well with in-hospital and 30-day mortality.³⁴

In Finland, a prospective observational study was undertaken to evaluate the NEWS-2 and 3-level triage scales as risk predictors in frail older adults attending the emergency department. The data were collected over a 6-month period. A total of 1711 ED visits were included in the study. They found that the NEWS-2 and the 3-level scale were poor in predicting 30-day mortality and HDU admission. NEWS 2 was found to predict hospital admission.³⁵

In a tertiary care centre in Columbia, a cohort study was done to validate the NEWS-2 for adults. The result was the NEWS-2 score was not inferior in predicting mortality when considering the area under the curve. The cut-off value for predicting in-hospital mortality was higher.³⁶

In Norway, the usefulness of NEWS was evaluated among dyspnoeic patients presenting to the ED by Bente Bilben et al. They included 246 patients in the study. NEWS was found to be closely correlated with the Manchester Triage Scale category and maximum in a hospital level of care, which consisted of care at ED, ward, HDU and ICU. Increased NEWS was also found to have a correlation with decreased 30-day and in-hospital survival. A reduced probability of directly being discharged home was also found to be correlated with higher NEWS.³⁷

In the scenario of the covid-19 pandemic, these scoring systems had been specifically utilised for predicting the outcome of covid patients. Several studies have explored this aspect of early warning scores.

Chikhalkar B, Gosain D, Gaikwad S, et al., in their prospective study among 814 confirmed covid cases over three months, have found that the NEWS-2 has a positive correlation with covid-19 patients' mortality. The NEWS score of ≥ 6 showed a sensitivity of 93.24% and a specificity of 98.91%. Being an easy, quick and reliable scoring system, they recommend using NEWS-2 to triage covid patients on admission¹⁰.

A similar study among 399 hospitalised covid patients also has found the utility of the NEWS-2 score in predicting the outcome among these patients. A NEWS-2 score with a cut-off of 5 was found to have a good sensitivity in predicting poor outcomes.¹¹

Modified NEWS (NEWS-C) was reported to be the most accurate early warning score to predict the early worsening of pulmonary function and the requirement for intensive respiratory support among covid patients in China, as per the study by Su Y et al.³⁸

A retrospective analysis in a tertiary centre in Uttarakhand has also reported the utility of various EWS like NEWS and MEWS in predicting the severity and death among covid patients.³⁹

MATERIALS AND METHODS

Type of study:

A prospective observational study

NEWS

Parameters	3	2	1	0	1	2	3
Respiratory Rate (per min)	≤ 8		9-11	12-20		21-24	≥ 25
Spo2 (% in room air)	≤ 91	92-93	94-95	≥ 96			
Need for O2 Supplementation		Yes		No			
Temperature (C)	≤ 35		35.1-36	36.1-38	38.1-39	≥ 39.1	
Systolic Blood Pressure (mmHg)	≤ 90	91-100	101-110	111-219			≥ 220
Heart Rate (per min)	≤ 40		41-50	51-90	91-110	111-130	≥ 131
Level of Consciousness				A			V, P, U

A – Alert

V- Verbal

P- Pain

U- Unresponsive

NEWS are assessed at four time intervals - at arrival to ED (T0), one hour after arrival(T1), two hours after arrival (T2) and when the patient is getting shifted from ED (T3). The outcomes of interest: hospital admission, ICU admission, length of hospital stay and 45-day mortality.

Study Population

INCLUSION CRITERIA:

1. Age > 18 years
2. ESI criteria 2,3 and 4

EXCLUSION CRITERIA:

1. Pregnant women with gestational age more than 20 months

Sample size:

Sample size is calculated with nMaster version 2.0.

As per the reference study done by Alam et al⁴⁰, the AUC curve was more than 0.5, so assuming same sensitivity of at least 50%, with 95% confidence interval and 5% absolute precision the final estimated sample size is 384.

With assumptions of 20 % non-response, we estimated a sample size of 456.

Statistical Analysis

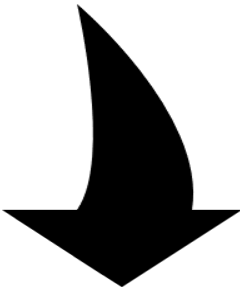
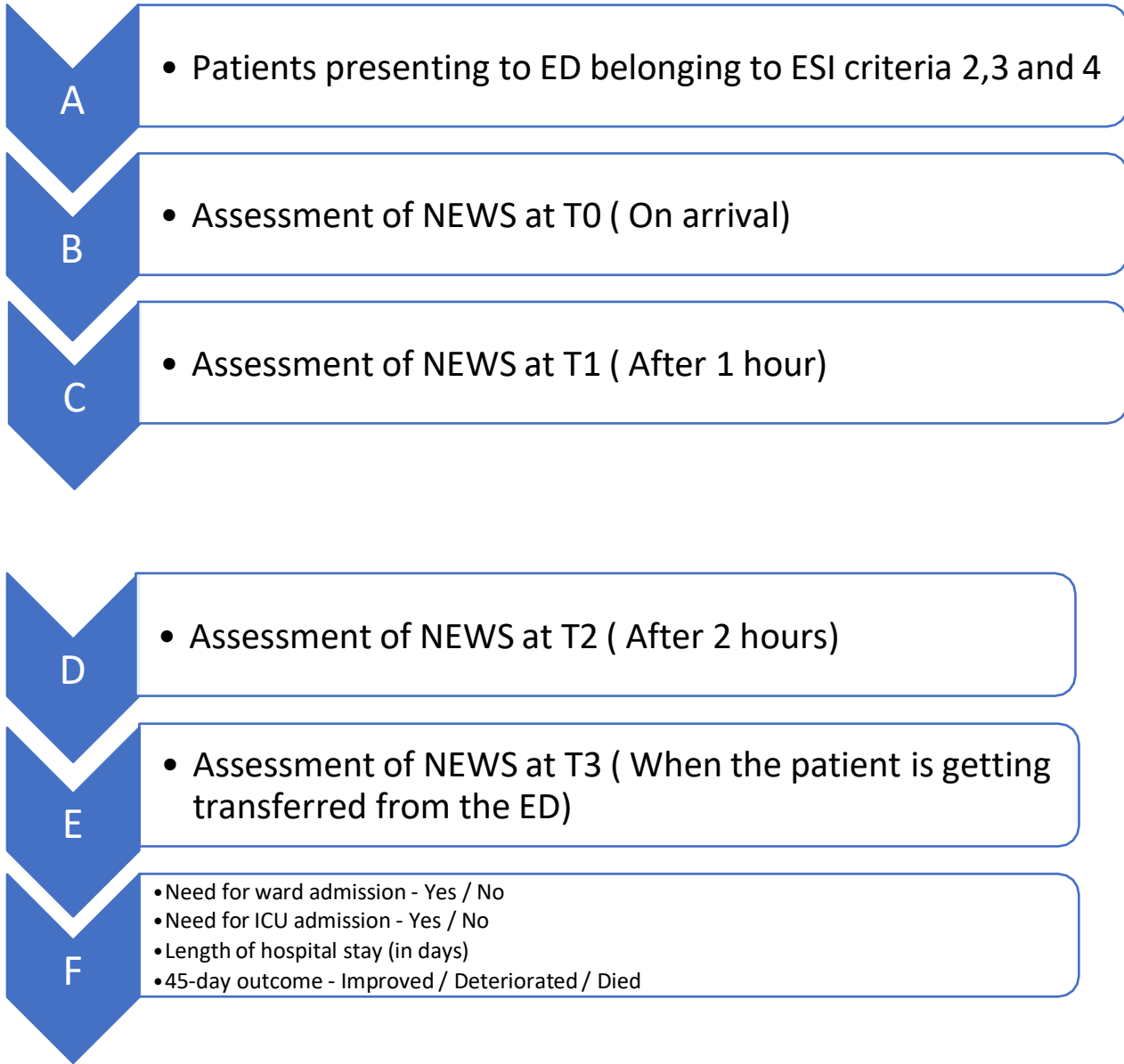
- The data obtained will be collected in a Microsoft Excel sheet, and statistical analysis will be done using statistical package for the social sciences (Version 20).
- Results will be presented as Mean (Median) \pm SD, counts and percentages and diagrams.
- For normally distributed continuous variables, data will be compared using independent t test. For not normally distributed variables, Mann Whitney U test will be used. Categorical variables will be compared using Chi square test. Receiver Operating Characteristic (ROC) analysis will be utilised to identify the NEWS for the Sensitivity.
- $p < 0.05$ will be considered statistically significant.

Descriptive statistics will be utilised to evaluate patient characteristics (presented as mean \pm SD)

The NEWS are divided into three aggregates,

1. Aggregate 0-7: Low-medium clinical risk
2. Aggregate ≥ 7 : High clinical risk, for the purposes of this study and according to the NEWS thresholds and triggers.

METHODOLOGY – FLOW CHART



Correlation of B, C, D and E with each constituent in F is assessed

RESULTS

TABLE 1: AGE DISTRIBUTION OF STUDY POPULATION

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	560	18	79	46.46	17.119

The mean age of the study population was found to be 46.46± 17.12 years

TABLE 2: GENDER DISTRIBUTION

	Frequency	Percent
Female	287	51.3
Male	273	48.8
Total	560	100.0

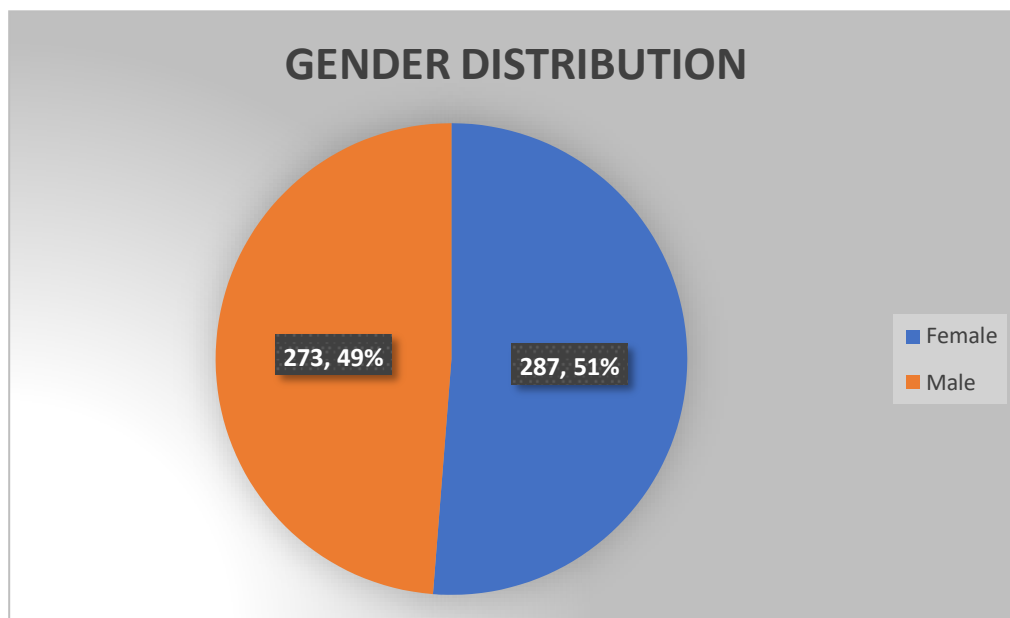


Figure 7: Gender distribution of the study population

The current study found that the gender distribution was even with 51% being females and 49% males.

TABLE 3: ESI CRITERIA

		Frequency	Percent
	2	250	44.6
	3	177	31.6
	4	133	23.8
	Total	560	100.0

44.6% of the study population belonged to ESI criteria 2 followed by ESI 3 and ESI 4.

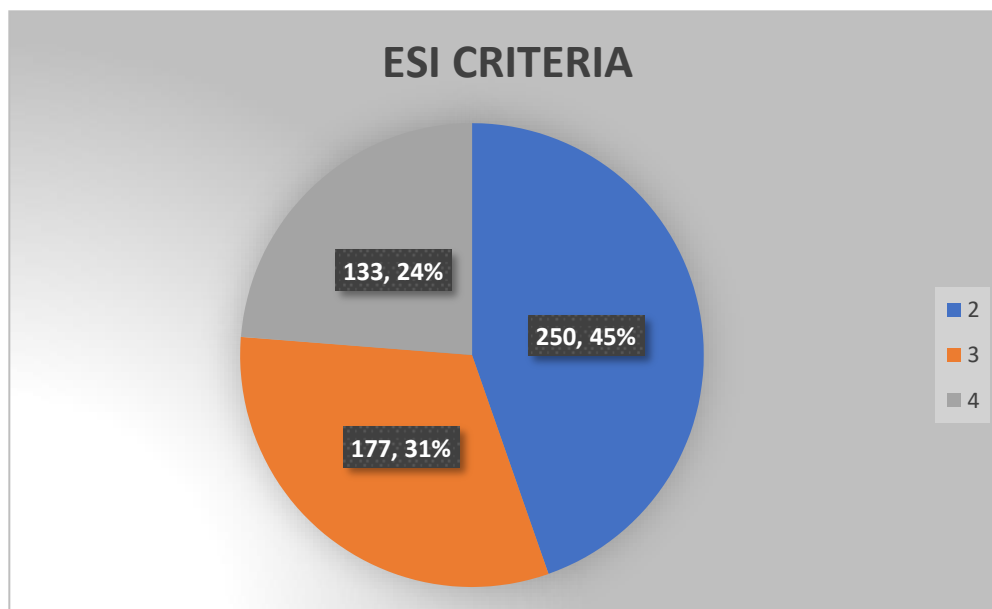


Figure 8: ESI criteria – Pie chart

TABLE 4: VITAL PARAMETERS OF THE STUDY POPULATION

4.1 Descriptive Statistics at T0					
	N	Minimum	Maximum	Mean	Std. Deviation
Respiratory rate/min_	560	14	36	19.71	6.119
SpO2	560	32	100	94.14	12.564
Temperature	560	34.1000	39.4000	37.329464	1.0313371
Systolic BP	546	60	190	119.03	32.528
Heart rate	560	64	130	91.14	19.822

4.2 Descriptive Statistics at T1

	N	Minimum	Maximum	Mean	Std. Deviation
Respiratory rate/min_	560	14	28	17.52	4.900
SpO2	560	90	100	98.71	2.179
Temperature	560	36.0000	39.2000	37.412857	.8046460
Systolic BP	560	70	190	122.31	25.946
Heart rate	560	65	132	91.00	17.772

4.3 Descriptive Statistics at T2

	N	Minimum	Maximum	Mean	Std. Deviation
Respiratory rate/min_	560	14	30	16.98	4.985
SpO2	560	94	100	99.28	1.582
Temperature	560	36.0000	39.2000	37.370000	.7322570
Systolic BP	560	76	186	123.22	23.306
Heart rate	560	64	134	90.40	18.082

4.4 Descriptive Statistics-T3					
	N	Minimum	Maximum	Mean	Std. Deviation
Respiratory rate/min_	560	14	26	16.92	3.582
SpO2	560	96	100	99.32	1.115
Temperature	560	36.2000	39.2000	37.344643	.6499813
Systolic BP	560	80	180	123.52	21.101
Heart rate	560	70	134	90.38	17.341

The vital parameters of the study subjects were assessed at different time intervals of T0, T1, T2, T3.

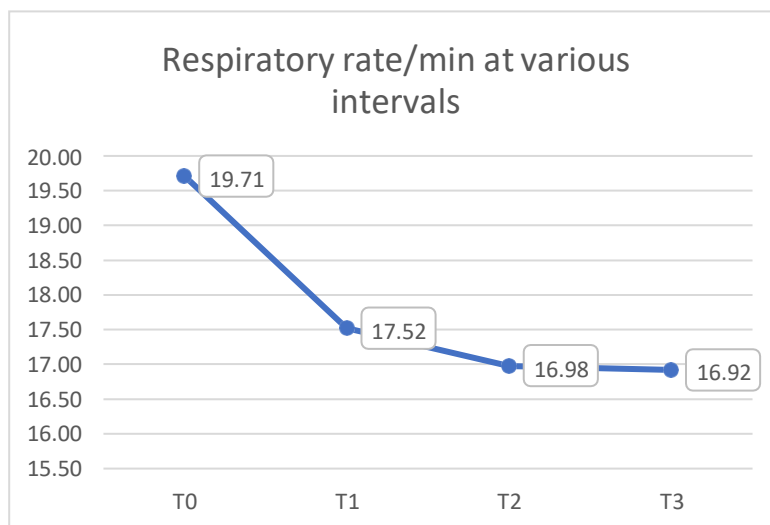


Figure 9: Mean Respiratory rate at various intervals- line diagram

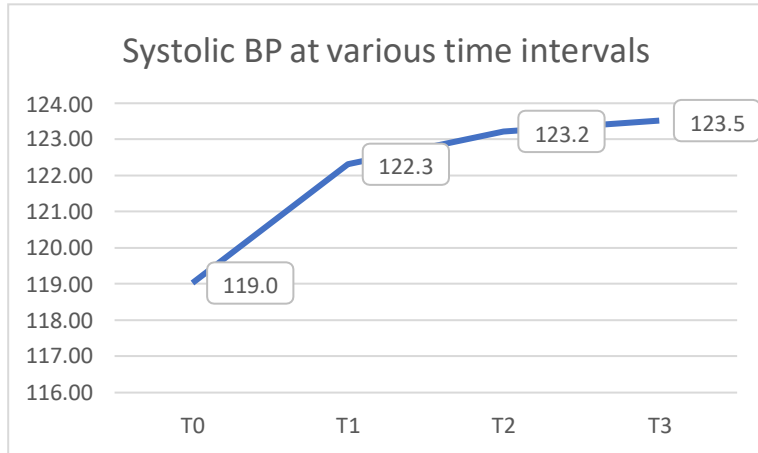


Figure 10: Mean Systolic blood pressure at various intervals- line diagram

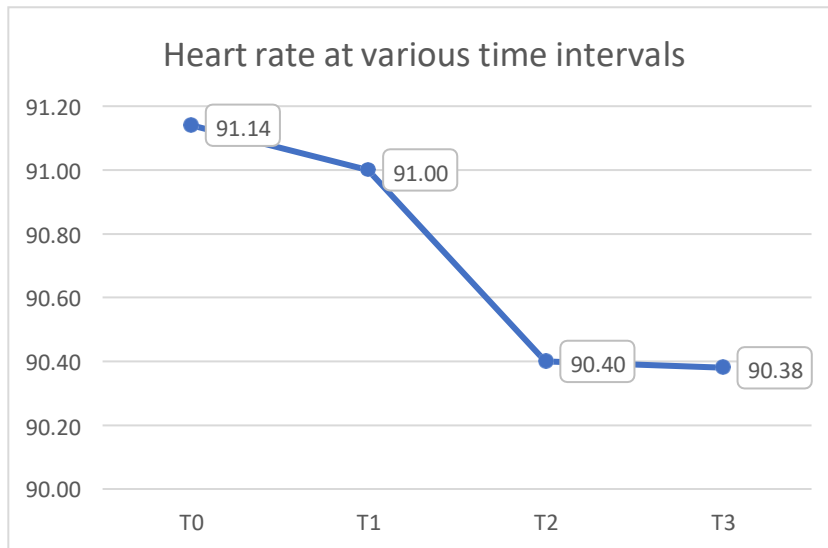
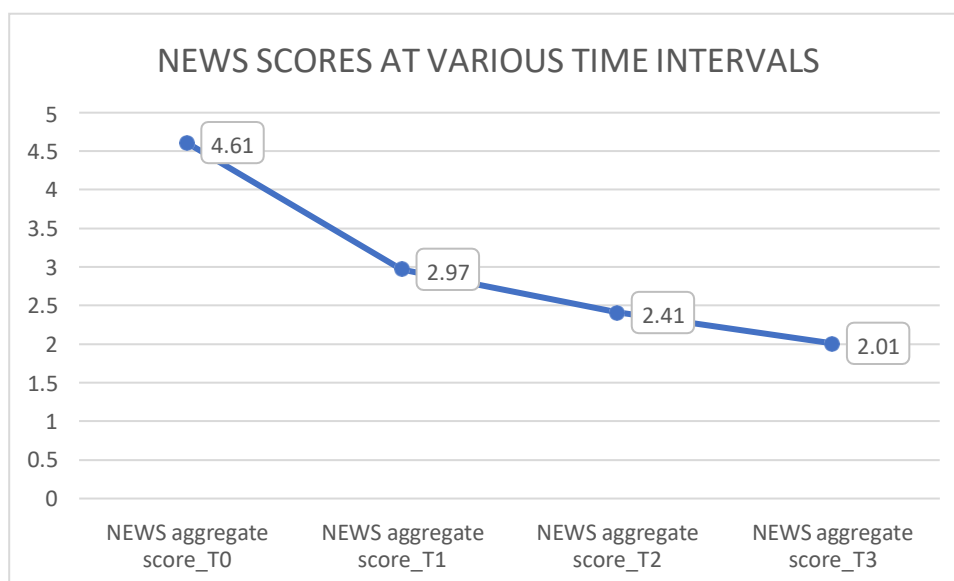


Figure 11: Mean heart rate at various intervals- line diagram

It was found that mean SBP was increasing from T0 to T3, whereas mean heart rates and respiratory rates were decreasing.

TABLE 5: NEWS OF THE STUDY POPULATION

Descriptive Statistics- NEWS -MEAN SCORES					
	N	Minimum	Maximum	Mean	Std. Deviation
NEWS aggregate score_T0	560	0	12	4.61	3.793
NEWS aggregate score_T1	560	0	13	2.97	3.447
NEWS aggregate score_T2	560	0	12	2.41	2.969
NEWS aggregate score_T3	560	0	10	2.01	2.650

*Figure 12: NEWS at various time intervals- line diagram*

The NEWS scores were assessed at different time intervals, it was found that T0 score improved from T0 to T3. The scores improved from 4.61 to 2.01.

TABLE 6: DESCRIPTIVE STATISTICS- HOSPITAL ADMISSION DAYS

	N	Minimum	Maximum	Mean	Std. Deviation
In ICU	505	0	14	3.29	3.987

The ICU admission day was found as 3.29 ± 3.987 days.

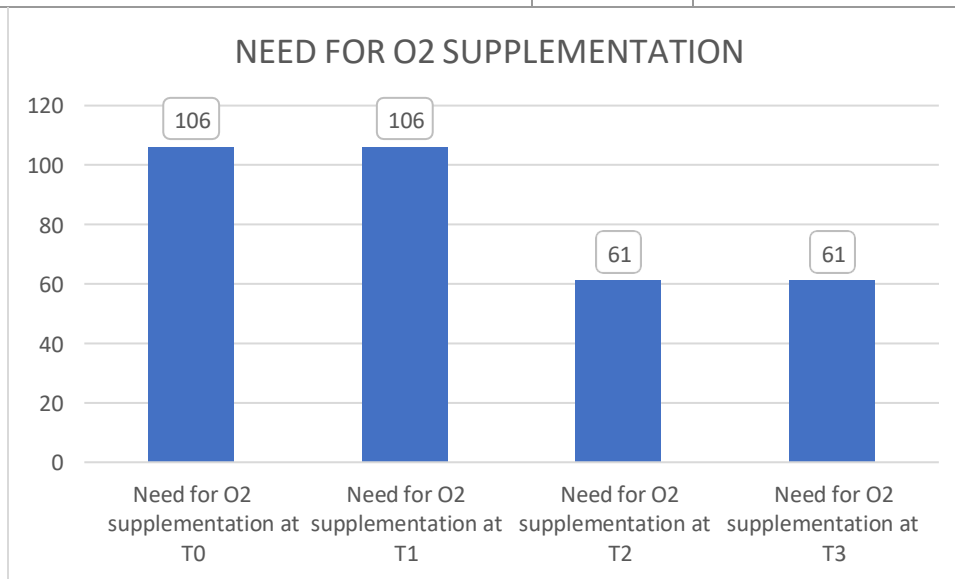
TABLE 7: DIAGNOSIS FREQUENCY

	Frequency	Percent
OP poisoning	33	5.89
Herbicide Consumption	26	4.64
Head injury (traumatic)	31	5.54
Soft tissue injury (traumatic)	40	7.14
Sepsis	34	6.07
Septic shock	20	3.57
IHD	19	3.39
Cardiogenic shock	10	1.79
Hypertensive emergency	8	1.43
DKA	12	2.14
Snake bite	24	4.29
Blunt trauma abdomen	4	0.71
CVA	35	6.25
Electrocution	12	2.14
febrile illness	24	4.29
Hypoglycaemia	22	3.93

ADD	33	5.89
Anaphylaxis	12	2.14
Meningitis / Meningo-encephalitis	11	1.96
ARDS	34	6.07
Scorpion Sting	5	0.89
CKD	16	2.86
Acute abdomen	15	2.68
GBS	3	0.54
CLD	20	3.57
COPD/Bronchial asthma	24	4.29
Epistaxis	7	1.25
Upper GI bleed	7	1.25
Seizure	19	3.39
Total	560	100.00

TABLE 8: NEED FOR O2 SUPPLEMENTATION

		Frequency	Percent
Need for O2 supplementation at T0	No	454	81.1
	Yes	106	18.9
Need for O2 supplementation at T1	No	454	81.1
	Yes	106	18.9
Need for O2 supplementation at T2	No	499	89.1
	Yes	61	10.9
Need for O2 supplementation at T3	No	499	89.1
	Yes	61	10.9
	Total	560	100.0

*Figure 13: Need for O2 supplementation at various time intervals- bar diagram*

The need for O2 supplementation was higher during T0 and T1 compared to T2 and T3. (See fig:7)

TABLE 9: LEVEL OF CONSCIOUSNESS

		Frequency	Percent
Level of consciousness at T0	A	370	66.1
	P	59	10.5
	U	58	10.4
	V	73	13.0
Level of consciousness at T1	A	455	81.3
	P	59	10.5
	V	46	8.2
Level of consciousness at T2	A	455	81.3
	P	59	10.5
	V	46	8.2
Level of consciousness at T3	A	455	81.3
	P	59	10.5
	V	46	8.2
	Total	560	100.0

The level of consciousness was divided into 4 categories. 81.3% of the study population had alert response at T1, T2, T3 intervals of time. The alertness was 66.1% during T0.

TABLE 10: NEED FOR HOSPITAL ADMISSION

		Frequency	Percent
	NO	55	9.8
	YES	505	90.2
	Total	560	100.0

90.2% of the study participants required hospital admission.

TABLE 11: NEED FOR ICU ADMISSION

		Frequency	Percent
	NO	239	42.7
	YES	321	57.3
	Total	560	100.0

57.3%(n=321) among the study participants needed ICU admission during the study.

TABLE 12: NON-INVASIVE VENTILATION

		Frequency	Percent
	YES	14	2.5
	NO	546	97.5
	Total	560	100.0

Only 2.5% among the study participants required non-invasive ventilation.

TABLE 13: INVASIVE VENTILATION

		Frequency	Percent
	NO	499	89.1
	YES	61	10.9
	Total	560	100.0

Among the study participants only 10.9%(n=61) required invasive ventilation

TABLE 14: INOTROPIC SUPPORT

		Frequency	Percent
	NO	425	75.9
	YES	135	24.1
	Total	560	100.0

The need for inotropes was 24.1%(n=135) among the study population.

TABLE 15: 45-DAY OUTCOME

		Frequency	Percent
	Deteriorated	27	4.8
	Died	28	5.0
	Improved	505	90.2
	Total	560	100.0

The 45-day outcome of the study population was assessed and it was found that 90.2% improved from the initial condition whereas 5% died and 4.8% deteriorated from the initial condition

TABLE 16.1: CLASSIFICATION OF NEWS AT TIME INTERVALS

		Frequency	Percent
NEWS at T0	0-7	427	76.3
	>7	133	23.8
NEWS at T1	0-7	513	91.6
	>7	47	8.4
NEWS at T2	0-7	546	97.5
	>7	14	2.5
NEWS at T3	0-7	527	94.1
	>7	33	5.9
	Total	560	100.0

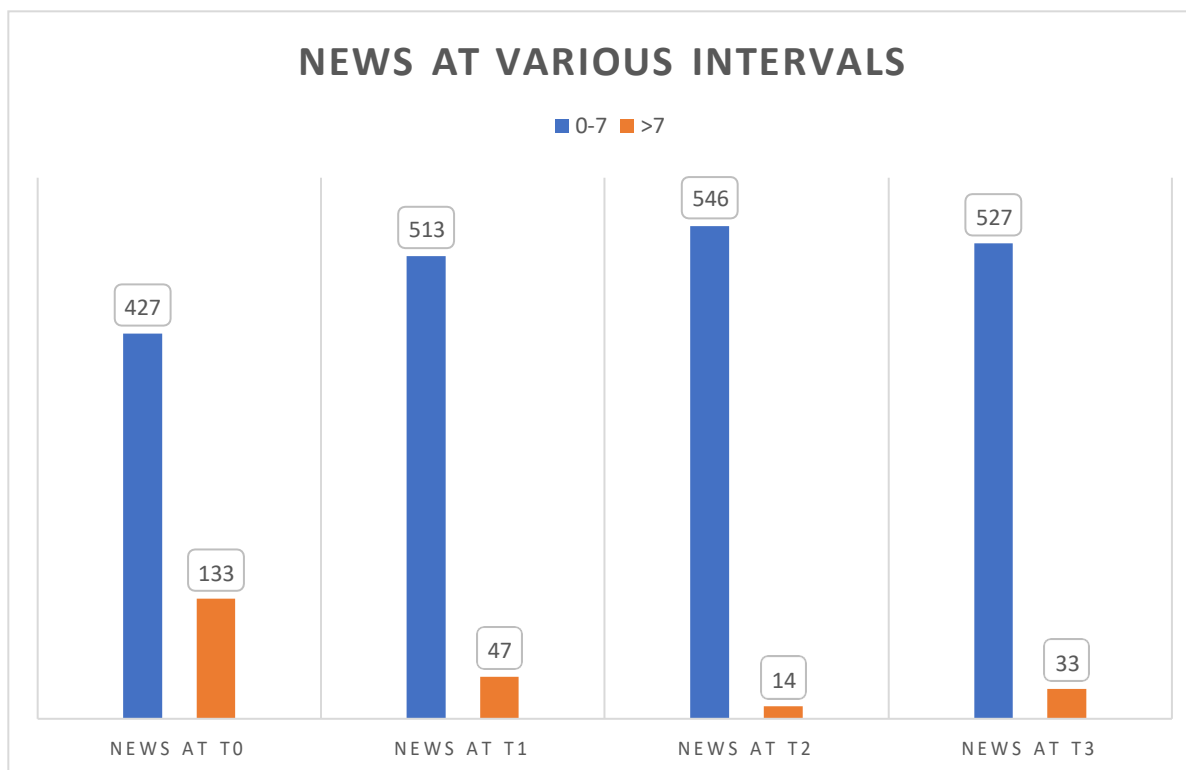


Figure 14

The NEWS scores at each interval were calculated and it was found that there was an improvement in NEWS score category from T0 to T3. The scores greater than 7 reduced from 133(23.8%) at T0 to 33 at T3(5.9%)

TABLE 16.2

		Frequency	Percent
T0	0-4	328	58.6
	5-6	54	9.6
	≥ 7	178	31.8
T1	0-4	400	71.4
	5-6	54	9.6
	≥ 7	106	18.9
T2	0-4	427	76.3
	5-6	41	7.3
	≥ 7	92	16.4
T3	0-4	468	83.6
	5-6	32	5.7
	≥ 7	60	10.7
	Total	560	100.0

TABLE 17: COMPARISON OF 45 DAY OUTCOME WITH NEWS AT T0

		45 Day outcome			Total	P value
		deteriorated	died	Improved		
NEWS at T0	0-7	27(6.3%)	0(0.0%)	400(93.7%)	427(100.0%)	<0.001
	>7	0(0.0%)	28(21.1%)	105(78.9%)	133(100.0%)	
Total		27(4.8%)	28(5.0%)	505(90.2%)	560(100.0%)	

The study found that NEWS scores at T0 had significant association with 45-day outcome. Among the participants with a NEWS score >7, 21.1% succumbed to death whereas it was 0.0% among those with NEWS <7. This result had a statistically significant association (p<0.05)

TABLE 18: COMPARISON OF 45 DAY OUTCOME WITH NEWS AT T1

		45 Day outcome			Total	P value
		deteriorated	died	improved		
NEWS at T1	0-7	27(5.3%)	0(0.0%)	486(94.7%)	513(100.0%)	<0.001
	>7	0(0.0%)	28(59.6%)	19(40.4%)	47(100.0%)	
Total		27(4.8%)	28(5.0%)	505(90.2%)	560(100.0%)	

TABLE 19: COMPARISON OF 45 DAY OUTCOME WITH NEWS AT T2

		45 Day outcome			Total	P value
		deteriorated	died	improved		
NEWS at T2	0-7	27(4.9%)	14(2.6%)	505(92.5%)	546(100.0%)	<0.001
	>7	0(0.0%)	14(100.0%)	0(0.0%)	14(100.0%)	
Total		27(4.8%)	28(5.0%)	505(90.2%)	560(100.0%)	

TABLE 20: COMPARISON OF 45 DAY OUTCOME WITH NEWS AT T3

		45-Day outcome			Total	P value
		deteriorated	died	improved		
NEWS at T3	0-7	27(5.1%)	14(2.7%)	486(92.2%)	527(100.0%)	<0.001
	>7	0(0.0%)	14(42.4%)	19(57.6%)	33(100.0%)	
Total		27(4.8%)	28(5.0%)	505(90.2%)	560(100.0%)	

Similarly, from Table 17, 18, 19 and 20, its clear that, those who had a NEWS greater than 7 had proportion of deaths higher than that of those with NEWS less than 7. This relation had a significant statistical association also as proved by the chi-square test ($p < 0.05$)

TABLE 21: COMPARISON OF NEED FOR HOSPITAL ADMISSION WITH NEWS

		Need for hospital admission		Total	P value
		No	Yes		
NEWS at T0	0-7	55(12.9%)	372(87.1%)	427(100.0%)	<0.001
	>7	0(0.0%)	133(100.0%)	133(100.0%)	
NEWS at T1	0-7	55(10.7%)	458(89.3%)	513(100.0%)	0.006
	>7	0(0.0%)	47(100.0%)	47(100.0%)	
NEWS at T2	0-7	55(10.1%)	491(89.9%)	546(100.0%)	0.231
	>7	0(0.0%)	14(100.0%)	14(100.0%)	
NEWS at T3	0-7	55(10.4%)	472(89.6%)	527(100.0%)	0.030
	>7	0(0.0%)	33(100.0%)	33(100.0%)	
Total		55(9.8%)	505(90.2%)	560(100.0%)	

The need for hospitalisation was compared with the NEWS scores at different intervals of time (T0, T1, T2, T3). It was observed that 100% of the study population with NEWS scores >7 required hospital admission. Whereas those with scores below 7 had hospital admission less than 100%. This difference in admission rates had a statistically significant association in all intervals of time except for T2 where the p value was >0.05(p=0.231). For all other instances of time the p value was found to be <0.05

TABLE 22: COMPARISON OF NEED FOR ICU ADMISSION WITH NEWS

		Need for ICU admission		Total	
		No	Yes		
NEWS at T0	0-7	234(54.8%)	193 (45.2%)	427(100.0%)	<0.001
	>7	5(3.8%)	128(96.2%)	133(100.0%)	
NEWS at T1	0-7	239(46.6%)	274 (53.4%)	513(100.0%)	<0.001
	>7	0(0.0%)	47(100.0%)	47(100.0%)	
NEWS at T2	0-7	239(43.8%)	307(56.2%)	546(100.0%)	<0.001
	>7	0(0.0%)	14(100.0%)	14(100.0%)	
NEWS at T3	0-7	239(45.4%)	288(54.6%)	527(100.0%)	<0.001
	>7	0(0.0%)	33(100.0%)	33(100.0%)	
Total		239(42.7%)	321(57.3%)	560(100.0%)	

The need for ICU admission was comparatively higher among those with NEWS score greater than 7(>7). (See table 21). This difference in admission rates in both groups (NEWS>7 and NEWS<7) at all instances of time interval had statistically significant association as the chi-square test revealed p value to be <0.05.

TABLE 23: COMPARISON OF INVASIVE VENTILATION WITH NEWS

		Invasive ventilation		Total	P value
		No	Yes		
NEWS at T0	0-7	427(100.0%)	0(0.0%)	427(100.0%)	<0.001
	>7	72(54.1%)	61(45.9%)	133(100.0%)	
NEWS at T1	0-7	499(97.3%)	14(2.7%)	513(100.0%)	<0.001
	>7	0(0.0%)	47(100.0%)	47(100.0%)	
NEWS at T2	0-7	499(91.4%)	47(8.6%)	546(100.0%)	<0.001
	>7	0(100.0%)	14(100.0%)	14(100.0%)	
NEWS at T3	0-7	499(94.7%)	28(5.3%)	527(100.0%)	<0.001
	>7	0(0.0%)	33(100.0%)	33(100.0%)	
Total		499	61	560	

The comparison of need for invasive ventilation revealed a statistically significant association between NEWS scores. ($p < 0.05$). The proportion of those requiring invasive ventilation was higher among the group with NEWS scores > 7 at each time interval.

TABLE 24: COMPARISON OF NEED FOR NON-INVASIVE VENTILATION WITH NEWS

		Non-invasive ventilation		Total	
		Yes	No		
NEWS at T0	0-7	0(0.0%)	427(100.0%)	427(100.0%)	<0.001
	>7	14(10.5%)	119(89.5%)	133(100.0%)	
NEWS at T1	0-7	0(0.0%)	513(100.0%)	513(100.0%)	<0.001
	>7	14(29.8%)	33(70.2%)	47(100.0%)	
NEWS at T2	0-7	14(2.6%)	532(97.4%)	546(100.0%)	0.544
	>7	0(0.0%)	14(100.0%)	14(100.0%)	
NEWS at T3	0-7	14(2.7%)	513(97.3%)	527(100.0%)	0.343
	>7	0(0.0%)	33(100.0%)	33(100.0%)	
Total		14(2.5%)	546(97.5%)	560(100.0%)	

The study observed that none of the participants with NEWS score below 7 required non-invasive ventilation at time intervals T0 and T1. This result had a statistically significant association as the p value was <0.05.

TABLE 25: COMPARISON OF NEED FOR INOTROPES WITH NEWS

		Inotropes given		Total	P value
		No	Yes		
NEWS at T0	0-7	387(90.6%)	40(9.4%)	427(100.0%)	<0.001
	>7	38(28.6%)	95(71.4%)	133(100.0%)	
NEWS at T1	0-7	406(79.1%)	107(20.9%)	513(100.0%)	<0.001
	>7	19(40.4%)	28(59.6%)	47(100.0%)	
NEWS at T2	0-7	425(77.8%)	121(22.2%)	546(100.0%)	<0.001
	>7	0(0.0%)	14(100.0%)	14(100.0%)	
NEWS at T3	0-7	406(77.0%)	121(23.0%)	527(100.0%)	0.011
	>7	19(57.6%)	14(42.4%)	33(100.0%)	
Total		425(75.9%)	135(24.1%)	560(100.0%)	

It was found from the present study that at all time intervals the proportion of study participants requiring inotropes were higher among the group with NEWS scores >7. This difference in requirement of inotropes was statistically significant at all time intervals($p<0.05$).

Table 26: Correlation between length of hospital stay and NEWS

Length of stay in ICU	NEWS_0	NEWS_1	NEWS_T2	NEWS_T3
Sig. (2-tailed)	.000	.000	.004	.000

The Spearman log rank test for correlation found a statistically significant correlation with length of hospital stay and NEWS scores at all time intervals.

DISCUSSION

The provision of safe patient care depends on the triage of patients when they first appear in emergency departments (EDs). Intensifying the treatment and early anticipatory counselling of the patient's caregivers can aid to some extent when factors like the necessity for ICU admission, length of hospital stay, and patient's long-term outcome are predicted utilising NEWS in the triage phase. In order to prioritise patients' needs and classify them appropriately, triage is crucial. This is essential managing patients in the emergency room and ensuring that they receive prompt, appropriate care based on the priorities set.

The present study was aimed at providing insight into "Predicting the outcome of patients presenting to the ED using NEWS". A prospective observational study was conducted in order to assess the same.

Further, the study also looked into determining the relationship between NEWS (at T0, T1, T2, and T3) and the patient's need for hospital admission, need for ICU admission (need for non-invasive ventilation, need for invasive ventilation, and need for inotropes), length of hospital stay, and outcome. During the study, basic patient data, NEWS score at T0 (at arrival on ED), T1 (after 1 hour), T2 (after 2 hours), and T3 (when shifting from ED) were taken. The outcome of interest was collected during the study. The outcomes of the patients were correlated with these findings.

Predicting the outcome of patients presenting to the emergency department using National Early Warning Score (NEWS)

1. Descriptive characteristics

In the present study, a total of 560 patients were considered. Since our study is based on the NEWS scoring system, all the respondents in the present study were from the hospital section presenting to the emergency department. The majority of the respondents were in the age group of 30 to 50 years. The mean age of the population was 46.4 years. The majority of our study population was male (51.3%). Among the 560 study participants, 90.2% needed hospital admission, and 57.3% were admitted to ICU. On outcome, around 90% of patients improved, and 5% died in 45 days.

Meanwhile, the average age of the 340 patients enrolled in the *Hai-Jiang Zhou et al.* study was 76 years. The majority of the patients were between the ages of 61 and 84, which may account for the significant disparity in mean age. Participants in our study ranged in age from 18 to 79. In contrast to our study's 5% mortality rate, their study's mortality rate was 26.5%. The disparity may be explained by the fact that our

study included participants starting at 18, whereas their study included more older participants. Several studies have found that as age advances, there are more chances of having the severity of getting ICU admission and comorbidities. Contrary to that, only 18.2% of their research participants received ICU admissions. In our study about 57.3% of the individuals in our study were admitted to the ICU. The disparity in disease conditions' severity and the triage strategy could cause the variance. This may be impacted by various elements, including the patient's stage at the time the study was conducted, the presence of patients' coexisting conditions, the readiness and maturity of the healthcare system, and the presence of nursing homes, where disease can spread more quickly.⁴¹

Chen et al. discovered that the mean age of their study participants was 47.4 years, which is similar to what we found. But compared to us, they had a higher percentage of female participants (56%). The mean systolic blood pressure at T0, T1, T2, and T3 was nearly identical in both investigations. (119, 122, 123, and 123, respectively). At T0, T1, T2, T3, and T4, the respiratory rate, oxygen saturation, and pulse rate likewise appeared similar in the two experiments. The APUV response score for consciousness showed variations. In our study, about 80% of participants were awake versus 98% in their study. Both studies' mean NEWS scores were comparable. At T0, T1, T2, T3, and T4, the aggregate NEWS for our study were 4.61, 2.9, 2.41, and 2. The total mean NEWS score is 3, which is equivalent to the *Chen et al.* study. The use of the same methodology, a comparable geographic environment, and a comparable study design may explain the similarities between the two studies.³¹ *Bente Bilden et al.* conducted a prospective study that is similar to ours. Due to the fact that their study had a larger percentage of older age groups, their mean age was greater. Genders were evenly represented, with a slightly higher male predominance (51%), similar to our study. This may be because more male patients are generally present in emergency rooms than female patients. The mortality rate (6.5%) was similar to that of our study. In our study, the average ICU stay was 3.29 days, which is similar to this study (4 days). At T0, T1, T2, and T3, the mean NEWS score was 5, which was greater than ours. In our study, 2.5% of participants needed NIV, but in their study, 8% of people needed NIV. Additionally, compared to our analysis, their investigation found that ICU admissions were higher (71%). The disparities may be explained by their study participants' older age group and more comorbidities.⁴²

Ata Mahmoodpoor et al. carried out a similar study on 410 patients who visited a hospital's emergency room. The patients' median age was 59 years, which was older than it was in our study. Males made up the majority (56%), similar to our study. The cumulative mean NEWS score was 4, which is similar to the results of our investigation (Mean NEWS score of the present study - 3). Comparing results were discovered on the length of ICU stay, the requirement for mechanical ventilation, and other descriptor criteria. The similarity between the two studies' demographics and sample sizes may be the cause.⁸ Similar

methodology was used in a retrospective cohort research conducted by *Sang Hyuk Kim et al.* All patients' average ages were higher than those in our study, at 72.6 years. Comparable to our study, there were 60.2% of men in this population. While oxygen saturation appeared to be similar to our study, respiratory rate and systolic blood pressure were on the upper side.¹⁵ The high diversity of the socio-demographic variables may be the cause of the results' disagreement. The discrepancy in results may also be ascribed to the geographical and rural-urban variations in the study population.

2. To determine the relationship between NEWS (at T0, T1, T2, and T3) and the patient's need for hospital admission, ICU admission, length of hospital stay, and outcome.

The current study sought to ascertain the association between NEWS (at T0, T1, T2, and T3) and the patient's requirement for hospital admission, the requirement for ICU admission (requirement for non-invasive ventilation, requirement for invasive ventilation, and requirement for inotropes), the requirement for the length of hospital stay, and outcome. A score of 1-4 is regarded as low risk, a score of 5-6 as medium risk, and a score of more than seven as high risks in accordance with the NEWS rating system. Here, for convenience, we define low risk as 0-7 and high risk as more than 7. Need for hospital admission and ICU admission: Present investigation discovered a relationship between the need for hospital admission and the NEWS score at T0, T1, T2, and T3. A higher proportion of patients (100% vs 87%, 100% vs 89%, 100% vs 90%, and 100% vs 89%) who require hospital admission belonged to have a NEWS score of more than seven compared to those with a score less than seven at T0, T1, T2, and T3. The present investigation discovered a relationship between the need for ICU admission and the NEWS score at T0, T1, T2, and T3. At T0, T1, T2, and T3, a greater proportion of patients (97 % vs 45%, 100 % vs 53%, 100 % vs 56%, and 100 % vs 54%) who needed hospital admission belonged to have a NEWS score of more than seven compared to those with a score less than 7. An analogous retrospective cohort research by *Chen L. et al.* was done with individuals who had received general emergency care. The rate of hospital admissions from the ED (emergency department) was shown to be significantly correlated with the NEWS. Additionally, they discovered that the NEWS performed better in outcomes like ED mortality, observation in ED, ICU admission, and hospital mortality.³¹ Similar results were found in research by *Bende Bilben et al.* In accordance with their findings, 31% of patients had a NEWS of less than 7, and the median NEWS on ED entry was 5. 30% of them received ICU care. Patients getting mechanical ventilatory assistance comparable to our research had higher NEWS at arrival.⁴² A study by *Hai, Jiang Zhou, et al.* discovered a similar correlation. The study by *Hai-Jiang Zhou et al.* found a high correlation between NEWS score and patient admission to the intensive care unit and mechanical ventilation.⁴¹ Similar findings were made in a

prospective one-month cohort study conducted in Finland by *Kivipuro et al.* Similar to our study, they discovered that both early and late ICU entrants had similar NEWSs at admission. They came to the conclusion that NEWS can serve as an accurate predictor for ICU admission in cases like ours.³⁴ Due to the similar sample size and geographic location, identical results have been achieved compared to our study. In a similar study, *Ata Mahmoodpoor et al.* discovered that a higher NEWS score of more than 4 predicts hospital admission and ICU admission in 410 individuals. After being discharged to the general ward, ICU readmission was similarly linked to a higher score. There was statistical significance for every finding. The results corroborated our findings.⁴³ The increased NEWS in cases at ICU release was the predicted indicator of ICU readmission, according to research by *Klepstad et al.*⁴⁴ A NEWS of more than 7.5 at the time of ICU discharge also indicates a significant likelihood of ICU readmission during the initial 48 hours, according to the research by *Dogru et al.* Higher NEWS scores were linked to ICU admission in both studies, and a higher NEWS score at discharge served as a predictor of ICU readmission as well.⁴⁵ We did not examine the ICU readmission factor in our study. However, the outcomes supported our conclusions in the admission case for the ICU. The National Early Warning Score (NEWS) for outcome prediction in emergency department patients was the subject of research by *Diana Sbiti et al.* According to their calculations; NEWS has a fair amount of predictive value for 30-day ICU admission. According to one study, an ICU admission was predicted by a NEWS score greater than 7. Results were significant even after adjusting for the patient population's high burden of comorbidities and somewhat advanced age. This key finding validates the regular application of NEWS to emergency medicine patients.⁴⁶ Similar results were obtained in a retrospective cohort analysis done by *Sang Hyuk Kim et al.* NEWS has a high level of predictive power for unanticipated ICU admission and length of hospital stay. However, it was marginally more effective in patients 80 years of age or older. The ROC curves proved that NEWS had a moderately good capacity to predict unplanned ICU admission, with an area under the curve of 0.650 and a 95% confidence range of 0.619–0.680. As a result, it is possible to forecast ICU and hospital admission using the NEWS score.⁴⁷ In a meta-analytic study by *Gigi Guan et al.*, the diagnostic odds ratio (DOR) for NEWS at a cut-off point of 6 was found to be 4.92 (95% CI 2.71-8.96) for predicting ICU admission, length of hospital stay and 30-day mortality. In a pre-hospital setting, NEWS at a cut-off point of 7 had a DOR of 11.63 for predicting short-term mortality. News has a high degree of predictability for ICU at various times, which is similar to our study.⁴⁸ In a related prospective observational feasibility research, 300 patients were evaluated at the emergency department of an academic urban tertiary care facility in Amsterdam by *Alam N et al.* Their outcomes agreed with what we discovered. They also came to the conclusion that NEWS, as measured at various time points, was a reliable indicator of patient outcomes such as hospital admission, ICU admission, length of stay in the hospital, and length of stay in the ICU. In line with our findings, they

also recommend that NEWS can be used in the ED to longitudinally follow patients over the course of their hospital and ED stays.³² A prospective observational research with a comparable goal was conducted in Finland by *Kemp et al.* However, they discovered that, in contrast to our findings, the NEWS-level scale was ineffective at forecasting 30-day death, length of hospital stay, hospital admission, and ICU admission.³⁵ Our analysis could not identify the specific scenario, maybe due to the smaller sample size. Intra-observer variation is connected to NEWS scoring as well. A significant amount of training is needed for the score to be calculated. Due to their lack of cognitive understanding and psychomotor skills, various observers may have slightly varying rating values. The discrepancy may also be caused by some hospitals' adoption of various metrics or testing cut-offs.

The outcome of the patient

Our study found a statistically significant relation between the NEWS score and the 45 days outcome of the patients. Majority of patients with NEWS severe category (more than 7) at T0, T1, T2, and T3 were admitted to ICU (96.7%, 100%, 100%, 100% respectively) followed by dead (21%, 60%, 100%, 43% respectively). Meanwhile, majority of patients with NEWS low-risk category (less than 7) at T0, T1, T2, and T3 conditions were improved (93.7%, 95%, 93%, and 92%, respectively). All the associations were found to be significant. So, patients with a high score in NEWS at various stages of the triage system had a higher risk of mortality, while patients with a low score in NEWS at different stages of the triage system had a lower risk. Thus, the NEWS score is an efficient predictor of the outcomes in the patients presenting to the emergency department. A study done by *Chen L. et al.* found that excellent effectiveness was shown by the NEWS score in predicting the outcome of the patient. According to that study, as for in-hospital deaths, the AUC for the NEWS was 0.805 (95% CI: 0.802–0.808) with high sensitivity and specificity.³¹ In a study by *Hai-Jiang Zhou et al.*, it was found that the NEWS score had a high degree of sensitivity in predicting the patient's 30-day prognosis and length of hospital stay. A higher NEWS score is indicative of a more severe problem.⁴¹ **Due to the comparable methodology and statistical techniques used, these findings are in agreement with those of our study**

Similar results were found on patients' outcomes in research by *Bende Bilben et al.* In accordance with our findings, Patients who arrived at the ED with a NEWS of 5 also had a worse 90-day survival rate than those who arrived with a NEWS of 5. Despite using seven as the cut-off threshold, those with high NEWS scores had poor 45-day outcomes in our study. In both investigations, patients with low NEWS scores had high and comparable survival rates. Their research, along with our study, suggests that the NEWS score can be used to predict the severity and make a great replacement for the triage process.⁴² When the area under the

curve was taken into account, it was discovered in a comparable cohort research conducted in Columbia by *Vergara et al.* that the NEWS-2 score was not worse at predicting death. They propose that NEWS can be utilised as a predictor for mortality because the cut-off value for predicting in-hospital mortality was higher. Results matched those of our study.³⁶ In their prospective study, *Chikhalkar B, Gosain D, Gaikwad S, et al.* discovered a positive association between the NEWS-2 and the death of covid-19 patients. The sensitivity and specificity of the NEWS score of 6 were determined to be 93.24% and 98.91%, respectively.³⁷ The ability of the NEWS score at T2 in predicting the outcome among covid patients was also discovered by *Vannidesen et al.* in related research of these patients. It was discovered that a NEWS score at T2 with a cut-off of 5 had good sensitivity for predicting unfavourable outcomes.¹¹ Both researchers advise using the NEWS-2 rating system to prioritise COVID patients upon admission because it is simple, rapid, and accurate. Although the cut-off value and patient types were different, the results of these studies were consistent with our investigation.

A similar prospective cohort single-centre study conducted by *Spagnolli W. et al.* on 2,677 patients came to the ED of a hospital in Trento, Italy, found that the NEWS, which is assessed upon ward admission, may help in risk stratification of clinical worsening and can be a good indicator of in-hospital adverse outcomes, although there may be some limitations due to sudden cardiac events and chronic hypoxia.³³ NEWS was created for hospital wards to identify people who are more likely to expire or need an unforeseen ICU stay. But studies by *Abbott TEF et al. and Corfield AR et al.* have shown equal prognostic results in ED patients in general medical and septic populations. These findings could not be generalised from our study to all critically sick patients who presented to the ED. In our study, the distribution of NEWS values among patients who were hospitalised in the ED at the time points T0, T1, T2, T3, and T4 were comparable to that of patients who got admitted aseptically to the ICU by *Abbott TEF et al.* However, the definition, accessibility, and utilisation of ICU and critical beds in a health system will affect the average NEWS values in ICU patients and critically sick patients.^{49,50} The precise scenario was not revealed in our investigation, possibly because of the smaller sample size. Different technicians may have slightly different psychomotor skills. Additionally, different hospitals and physicians utilise various cut-offs for the NEWS score. Previously, some people utilised a NEWS severity cut-off of 5 as their standard. Some use a NEWS score of 7 as the threshold for severity, while others use a NEWS score of 9. The convenience and ineffective skill training may be to blame for the scoring discrepancy even when an approved cut-off range has been defined. The use of various other measures or testing methods by some hospitals could result in a non-uniformity which also be attributed to the disparity.

According to *Su Y et al.*'s findings in a study done in China, NEWS scoring can be utilised to forecast the early decline of pulmonary function and the requirement for intensive respiratory support among patients

with severe respiratory disease. The efficacy of several early warning scores, such as NEWS, in predicting the severity, length of hospital stay and death among severely ill patients has also been documented by *Kaeley N et al.* in a retrospective study conducted in a tertiary medical facility in Uttarakhand.^{38,39} Although the research participants varied, both studies' methodologies were identical to those used in our investigation. The outcomes supported our conclusions. Similar sample sizes and methodological approaches used by research may be to account for similarities in conclusions. Comparable socio-demographic traits among the participants, such as similar mean age, may also play a role in obtaining similar outcomes. Similar results were obtained in a retrospective cohort analysis conducted by *Sang Hyuk Kim et al.* NEWS had a strong capacity to predict patient mortality and length of hospital stay. But among older individuals, this was more pronounced. The ROC curves showed that NEWS had a somewhat acceptable capacity to predict in-hospital mortality, with an area under the curve of 0.661 (95% CI 0.641-0.680). The NEWS cut-off values for unplanned ICU admission, ICU mortality, and in-hospital mortality in patients 80 years of age or older were 9, 10, and 9, correspondingly. This indicates that the NEWS score may be used to predict in-hospital mortality.⁴⁷ There were a few minor variations in the outcomes as well. However, the vast majority of the results are similar. Such variation in the outcome may be caused by methodological variations in the models and techniques employed.

Whether severely sick patients are discharged to palliative care, transferred to higher-level care, or remain in the hospital depends on the hospital. As a result, it is unreliable to compare rough in-hospital survival rates. NEWS score was found to predict short-term (24 or 48 hours) and in-hospital survival rates up to 10 days in earlier investigations by *Smith GB et al.*⁵¹ However, our study kept track of each patient's out-of-hospital survival status and showed that NEWS at the ED showed a 45-day survival prediction, even after adjusting for age. Those who had NEWS scores greater than 7 had a poorer 45-day outcome. This is consistent with research conducted by *Tirkkonen J et al.* on Finnish hospital ward patients. With a mean age of about 47 years, the majority of the patients in our study were young. However, illness conditions were more severe than average. Overall mortality was high, and the majority of deaths happened after being treated. There is a clear demand for information on outside-of-hospital survival in scientific investigations. Decisions regarding treatment limitations were not noted or assessed in the study.⁵² There were a few minor variations in the outcomes as well. However, the vast majority of the results are similar. Such variation in the outcome may be caused by methodological variations in the models and techniques employed. *Kivipuro et al.* in Tampere University Hospital's Emergency Department, Finland, found that NEWS correlated well with in-hospital and 30-day deaths with acceptable discrimination capability. Even though we looked at the outcomes after 45 days, the findings from the two trials are consistent.³⁴ The same methodology and same geographic structure could account for the closeness in outcomes. Early warning

scores, including NEWS and others, are allegedly being implemented in Norwegian community health services, according to *Jorghild Charlotte Jensen, Randi Skar, et al.* They discovered that the scoring system creates the potential for a “shared language” that can enhance communication throughout the acute care chain. For instance, between an ED, pre-hospital service, and a nursing facility. On the other hand, if an evaluation is included, reports of in-hospital NEWS in patient discharge forms will be helpful to community physicians and nurses. They can gauge the prognosis and gauge the survival percentage. Similar recommendations from our study can assist in forecasting the patient’s overall progress even after the patient is discharged from the hospital.⁵³

In a related study, *Ata Mahmoodpoor et al.* found that patients with multiple organ failure, readmitted patients, patients with lower (less than 4 days) readmission days, patients who underwent mechanical ventilation, and patients with higher (more than 6) days of MV all had median NEWS scores that were significantly higher than those who survived. A higher NEWS score was linked to a greater mortality risk in a univariable study (OR: 18.58, 95% CI: 8.45-40.86, p-value 0.001). The cut-off value with the highest sensitivity and specificity (>4) was 4. In assessing the mortality risk for patients discharged from the intensive care unit, the study found that National Early Warning Score values of >4 indicated good sensitivity and specificity.⁴³ The comparable Socio-demographic traits of the study population may be reprimanded for the similarity in the results. The results of our study indicate that the NEWS scoring system can be used to predict the course of a patient’s condition. Both *Liu et al.’s* and *Desai N. et al.* studies produced similar findings. According to them, incorporating EWS into clinical practice that is centred on detecting and managing patients at risk for bad outcomes may be improved by using a scores system that includes a points-based risk score, such as the NEWS.^{54,55}

Additionally, *Pimentel et al.* demonstrated that NEWS had a considerable ability to distinguish between ICU admission and in-hospital death. Indicators that foretell severe outcomes in cases identified as high-risk using NEWS are, however, poorly understood. Our research could serve as a guide for treating patients who have been referred by the ED, and risk stratification can be done.⁵⁶ With NEWS seven or above, one is thought to be at significant risk of deterioration, increased length of hospital stay and death, according to research conducted by *Ehara J et al.* and *Subbed et al.* They recommend that the emergency department employ NEWS score frequently for risk prediction at various times.^{57,58} The findings of our investigation are consistent with those of their studies. The receiver operating characteristic curve of a study by *Rong Xin Wang et al.* revealed that the index and sensitivity of the national early warning score were much higher. They concluded that NEWS scores were more accurate at predicting patients’ prognoses, particularly those of elderly patients.⁵⁹ Similar findings were also found by *Auto Loisa et al.*, who conducted a study to determine the trajectory of NEWS score in predicting the length of hospital stay and death. In every

outcome category, the expired cases had higher beginning NEWS scores (all $p < 0.001$). In contrast to the survivors, who had a declining trend in their NEWS values across all outcome categories, the non-survivors had a rising trend in all of the outcome categories.⁶⁰

The results of our research refer to the possibility of using NEWS in conjunction with emergency triage to more accurately identify individuals in need of immediate care and perhaps hasten admittance to the medical wards and intensive care. Thus, the patient flow through the ED will be improved. As opposed to earlier studies, ours assessed the NEWS at various intervals (T0, T1, T2, T3) throughout a patient's stay in the ED. One of the causes of bias is interobserver variance. Furthermore, to reduce the bias, the measurements were carried out by enthusiastic and qualified experts. Training and staff motivation is crucial for the appropriate adoption and application of the NEWS score in the future. However, the uniformity of the score presents many chances for simpler application, particularly in the medical degree program.

Even though there are many commonalities, some studies reveal very slight variations in the final outcome. The difference observed in the parameters assessed by our analysis could be attributed to the comparatively smaller sample size, different study designs, geography, socio-economic variations, the difference in assessment scales used for NEWS scoring, intra-observer variation, and lack of psychomotor skills. Research has its limitations all the time. The limitations and shortcomings are an inevitable result of not having unlimited resources, funding, access to information, or a flawless system to follow. We have some limitations in our research. We could only include a small number of cases because this was a one-centre study; therefore, the sample size is smaller. We couldn't see the reason for admission considered as a variable because the patient selection criteria were inclusive (all patients aged more than 18 years presenting to ED). This results in a pretty varied research population. The vital parameters that were considered in the NEWS individually have not been statistically examined; it would be fascinating to know which of these characteristics had a stronger predictive value than the others. The patients who required diagnostic tests and did not present to the ED for further assessment at time point T1 or who were otherwise evacuated straight from the ED to the ward prevented us from obtaining complete data sets at all subsequent time points (T2). Unknown confounding variables that might have affected long-term mortality after hospital admission were not taken into account. Finally, it is important to take into account any other variables that may affect the course of the disease, such as lifestyle choices and the use of self-reporting or underreporting of comorbidities. However, in order to increase the precision and applicability of NEWS, additional disease-specific research will be needed due to the variable performance of NEWS in other research.

CONCLUSION

The NEWS assessed at various time intervals was a good indicator of patient outcomes. It correlated significantly well with all the results of interest - the need for hospital admission, the need for ICU admission, the length of hospital stay and the 45-day outcome. So, the NEWS can be used as a helpful tool to longitudinally monitor patients in the ED as well as in the hospital. It can serve as a prognostic indicator, enhancing the quality of patient care.

SUMMARY

While most of the EDs use triage systems to ascertain treatment priority, less attention is given to periodic monitoring and assessment of patients once they are in the ED. The NEWS has been more accurately tested and performs better than any of the published systems routinely used. It is currently being considered a standardised system across the UK.

The applicability of NEWS has not yet been adequately evaluated in an emergency department in India.

So this study aimed to evaluate the efficiency of NEWS in predicting the outcome of patients presenting to the ED. A prospective observational study has been done, wherein 560 patients were assessed. The scores at various time intervals correlated significantly with all the outcomes of interest, like the need for hospital admission, the need for ICU admission, the length of hospital stay and the 45-day outcome. Hence, the NEWS, as a prognostic indicator, can be a helpful tool in the longitudinal monitoring of patients in the ED and the hospital.

As far as is known, this is probably the first prospective study conducted in an ED in India to evaluate the performance of the NEWS.

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B.L.D.E. (DEEMED TO BE UNIVERSITY)

IEC/NO-09/2021
Date-22/01/2021

(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)

The Constituent College

SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11-00 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: A prospective observational study to analyze the utility of national early warning score (News) in the emergency department in predicting patients outcome

Name of PG student: DrKrishna Dayal.B, Department of Emergency Medicine

Name of Guide/Co-investigator: Dr Ravi.B.Patil, Professor & HOD of
Emergency Medicine

DR .S.V.PATIL
CHAIRMAN,IEC

Institutional Ethical Committee
B L D E (Deemed to be University)
Shri B. M. Patil Medical College,
VIJAYAPURA-577100 (Karnataka)

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

PROFORMA:**Name of the patient –****Age/Sex –****Contact number -****Patient's ID –****ESI criteria -****Diagnosis –****D.O.A –****D.O.D –****Cause of death (if died) -**

Parameters	T0	T1	T2	T3
Respiratory rate (per min)				
Spo2 (% in room air)				
Need for O2 supplementation				
Temperature (C)				
Systolic blood pressure (mmHg)				
Heart rate (per min)				
Level of consciousness				
NEWS				

- **Hospital admission – YES/NO**
- **ICU admission – YES/ NO**
- **Length of hospital stay –**
- **45-day outcome: Improved/Deteriorated/Die**

236	Rabnit	75	2	3	13	14	99	no	35.9	80	120	A	6	16	99	no	36	92	110	A	3	16	100	no	36.4	100	106	A	3	16	100	no	36.4	104	108	A	2	es	3	2	es	no	no	es	improved	
237	Aapshi	19	1	3	2	10	90	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	es	improved	
238	Aspara	20	1	2	9	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	no	37	120	80	A	0	es	2	es	no	no	es	no	es	no	no	es	no	es	deteriorated			
239	Moideen	64	1	2	11	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39	130	110	P	7	es	3	12	es	no	no	es	improved	
240	Sagun	60	1	4	5	15	98	no	37	120	72	A	0	14	99	no	37	122	75	A	0	15	100	no	37	120	72	A	0	14	100	no	37	120	72	A	0	no	0	es	no	no	es	improved		
241	Aarabhi	20	1	3	9	28	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	es	improved	
242	Gayathri	18	1	3	3	16	98	no	37.4	134	70	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	es	no	no	es	improved	
243	Rachmal	37	3	3	5	16	100	no	37.4	190	88	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	es	no	no	es	improved	
244	Aaradhya	64	1	3	2	30	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	es	improved	
245	Aaradhi	69	1	2	5	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	no	37	120	80	A	0	15	100	no	37	120	80	A	0	es	2	es	no	no	es	improved		
246	Musthafa	43	2	2	1	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39	130	110	P	7	es	3	6	es	no	no	es	improved	
247	Rachit	36	2	3	13	16	98	no	37.4	134	70	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	es	no	no	es	improved	
248	Radesh	20	2	2	14	16	100	no	37.4	190	88	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	es	no	no	es	improved	
249	Ramesh	50	2	2	3	32	60	Yes	37	130	68	U	11	25	94	Yes	37	122	110	V	10	15	100	Yes	37	118	130	V	7	15	99	Yes	37.6	120	134	V	8	Yes	2	7	es	no	ye	o	improved	
250	Preeja	25	2	3	10	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	no	37	120	80	A	0	15	100	no	37	120	80	A	0	es	1	0	es	no	no	es	improved	
251	Dharanna	20	2	2	3	14	96	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39	130	110	P	7	es	2	0	es	no	no	es	improved	
252	Sudeer	29	2	2	1	16	98	no	37.4	134	70	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	3	2	es	no	no	es	improved	
253	Radhakrs	21	2	3	2	22	98	no	37.2	126	102	A	3	16	100	no	37.2	120	100	A	1	16	98	no	37.2	120	98	A	1	16	98	no	37.2	120	98	A	1	Yes	3	2	es	no	no	es	improved	
254	Keerthana	27	2	2	8	32	60	Yes	37	130	68	U	11	25	94	Yes	37	122	110	V	10	15	100	Yes	37	118	130	V	7	15	99	Yes	37.6	120	134	V	8	Yes	2	7	es	no	ye	o	improved	
255	Aaradhita	56	1	2	14	36	32	Yes	34.1	NR	120	A	11	26	90	Yes	37	80	112	A	11	22	94	Yes	37	100	100	A	7	20	96	Yes	37	110	98	A	2	es	8	es	ye	es	die!			
256	Radhav	63	2	4	15	20	100	no	37.2	130	110	A	1	16	100	no	37.1	126	100	A	1	16	100	no	37	120	90	A	0	16	100	no	37	120	90	A	0	no	0	es	no	no	es	improved		
257	Radhaval	61	2	4	6	20	99	no	37.4	120	90	A	0	18	98	no	37.4	120	90	A	0	14	100	no	37.2	120	88	A	0	14	100	no	37.2	120	88	A	0	no	0	es	no	no	es	improved		
258	Radhesh	62	2	2	10	30	98	yes	39.2	60	130	A	12	28	98	yes	39	70	132	A	13	28	100	yes	38.6	76	134	A	12	24	100	yes	38	80	130	A	10	es	4	es	no	ye	es	die!		
259	Radhes	54	2	2	5	14	99	no	38.6	110	108	A	3	14	100	no	38.4	110	102	A	3	14	100	no	38.2	108	100	A	3	15	99	no	38	110	100	A	3	es	3	0	es	no	no	es	improved	
260	Radhey	34	2	2	10	28	82	yes	37.4	126	74	P	9	22	98	yes	38.4	118	70	P	7	18	98	yes	37.2	120	70	P	5	18	98	yes	37.2	120	76	P	5	es	14	es	no	ye	o	improved		
261	Aaradhya	41	1	2	14	22	96	yes	37	122	110	A	3	18	98	no	37	120	102	A	1	16	99	no	37	120	102	A	1	18	98	no	37	120	90	A	0	es	2	2	es	no	no	es	improved	
262	Radheya	50	2	4	3	14	99	no	37.8	118	76	A	0	16	100	no	37.8	116	78	A	0	14	100	no	37.6	116	80	A	0	16	100	no	37.6	116	80	A	0	es	1	0	es	no	no	es	improved	
263	Radite	72	2	3	3	14	98	no	37.4	134	66	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	es	no	no	es	improved	
264	Mahanges	32	2	2	4	6	16	100	no	37.4	190	90	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.2	180	90	A	0	es	2	0	es	no	no	es	improved
265	Ragav	36	2	2	2	22	92	no	35.6	82	126	A	10	20	94	no	36	90	124	A	6	20	94	no	36	92	120	A	5	20	96	no	36.2	94	120	A	4	es	2	10	es	no	no	es	improved	
266	Ragavend	56	2	3	15	15	97	no	38.2	114	99	V	5	14	99	no	38	114	94	V	5	14	100	no	38	114	90	V	4	14	100	no	37.8	114	90	V	3	es	3	6	es	no	no	es	improved	
267	Aaradhya	52	1	2	4	16	98	no	37.6	118	64	V	3	14	100	no	37.6	120	65	A	0	15	99	no	37.6	118	64	A	0	16	100	no	37.4	116	70	A	0	es	2	0	es	no	no	es	improved	
268	Aaradhya	31	1	3	12	14	99	no	35.9	80	120	A	6	16	99	no	36	92	110	A	6	15	100	no	36.4	100	106	A	3	15	100	no	36.4	104	108	A	2	es	3	2	es	no	no	es	improved	
269	Ragdar	62	2	3	9	30	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	es	improved	
270	Ragesh	54	2	2	6	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	no	37	120	80	A	0	15	100	no	37	120	80	A	0	es	2	es	no	no	es	improved		
271	Esvari	27	1	2	9	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39.2	130	110	P	7	es	3	12	es	no	no	es	deteriorated	
272	Aaranya	31	1	4	8	15	98	no	37	120	72	A	0	14	99	no	37	122	75	A	0	15	100	no	37	120	72	A	0	14	100	no	37	120	72	A	0	no	0	es	no	no	es	improved		
273	Aarashi	19	1	2	11	22	96	no	37	122	110	A	3	18	98	no	37	120	102	A	1	16	99	no	37	120	102	A	1	18	98	no	37	120	90	A	0	es	2	2	es	no	no	es	improved	
274	Ragesh	59	2	4	13	14	99	no	37.8	118	76	A	0	16	100	no	37.8	116	78	A	0	14	100	no	37.6	116	80	A	0	16	100	no	37.6	116	80	A	0	es	1	0	es	no	no	es	improved	
275	Raghav	29	2	3																																										

359	Rahul	25	2	3	8	14	98	no	37.4	134	66	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	o	no	no	o	improved
360	Bhoomik	33	2	4	5	16	100	no	37.4	190	90	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	o	no	no	o	improved
361	Bhoomish	21	2	2	10	22	92	no	35.6	82	126	A	10	20	94	no	36	90	124	A	6	20	94	no	36	92	120	A	5	20	96	no	36.2	94	118	A	4	es	2	10	es	no	no	o	improved
362	Saavi	46	3	3	2	15	99	no	38.2	114	99	V	5	14	99	no	38	114	94	V	5	14	100	no	38	114	90	V	4	14	100	no	37.8	114	90	V	3	es	3	6	es	no	no	o	improved
363	Bhooopal	60	2	4	13	16	98	no	37.6	118	64	V	3	14	100	no	37.6	120	65	A	0	15	99	no	37.6	118	64	V	0	16	100	no	37.4	116	70	A	0	es	2	0	o	no	no	o	improved
364	Lakshmi	61	1	3	5	16	99	no	35.9	80	120	A	6	16	99	no	36	92	110	A	3	16	100	no	36.4	100	106	A	3	16	100	no	36.4	104	108	A	2	es	3	2	es	no	no	o	improved
365	Saavtri	39	1	3	5	30	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	o	improved
366	Bhooapat	35	2	2	9	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	yes	37	120	80	A	0	15	100	no	37	120	80	A	0	es	2	es	no	no	o	improved	
367	Saaya	22	1	2	7	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39	130	110	P	7	es	3	12	es	no	no	o	deteriorated
368	Bhooapati	41	2	4	13	15	98	no	37	120	72	A	0	14	99	no	37	122	75	A	0	15	100	no	37	120	72	A	0	14	100	no	37	120	72	A	0	es	0	no	no	o	no	o	improved
369	Saaya	43	1	3	11	18	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	o	improved
370	Upendra	44	2	3	3	16	98	no	37.4	134	70	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	o	no	no	o	improved
371	Bhooshan	52	2	3	2	16	100	no	37.4	190	88	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	o	no	no	o	improved
372	Sushama	37	2	3	2	30	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	o	improved
373	Nithin	24	1	2	5	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	yes	37	120	80	A	0	15	100	no	37	120	80	A	0	es	2	es	no	no	o	improved	
374	Sabita	66	1	2	12	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39	130	110	P	7	es	3	6	es	no	no	o	improved
375	Babitha	48	1	3	11	16	98	no	37.4	134	70	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	o	no	no	o	improved
376	Savtri	65	1	2	12	16	98	no	37.4	190	88	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	o	no	no	o	improved
377	Sarrang	31	1	3	9	22	98	no	37.2	126	102	A	3	16	100	no	37.2	120	100	A	1	14	98	no	37.2	120	98	A	1	16	98	no	37.2	120	98	A	1	Yes	3	2	es	no	no	o	improved
378	Sadri	65	2	8	32	60	Yes	37	130	68	V	11	25	94	Yes	37	122	110	V	10	15	100	Yes	37	118	130	V	7	15	99	Yes	37.6	120	134	V	8	Yes	2	7	es	no	ye	o	improved	
379	Sachi	37	1	2	7	30	32	Yes	34.1	NR	120	A	11	26	90	Yes	37	80	112	A	11	22	94	Yes	37	100	100	A	7	20	96	Yes	37	110	98	A	2	es	-	8	es	ye	es	improved	
380	Mohamm	62	2	4	15	20	100	no	37.2	130	110	A	1	16	100	no	37.1	126	100	A	1	16	100	no	37.2	120	90	A	0	16	100	no	37	120	90	A	0	es	0	no	no	o	no	o	improved
381	Ninganna	20	2	4	2	20	99	no	37.4	120	90	A	0	18	98	no	37.4	120	90	A	0	14	100	no	37.2	120	88	A	0	14	100	no	37.2	120	88	A	0	es	0	no	no	o	no	o	improved
382	Maandhar	26	2	2	3	16	98	yes	39.2	60	130	A	12	28	98	yes	39	70	132	A	13	28	100	yes	38.6	76	134	A	12	24	100	yes	38	80	130	A	10	es	4	es	no	ye	es	improved	
383	Maanik	64	2	4	15	14	99	no	38.6	110	108	A	3	14	100	no	38.4	110	102	A	3	14	100	no	38.2	108	100	A	3	15	99	no	38	110	100	A	3	es	3	0	o	no	no	o	improved
384	Sachin	49	1	2	9	28	82	yes	37.4	126	74	P	9	22	98	yes	38.4	118	70	P	7	18	98	yes	37.2	120	76	P	5	18	99	yes	37.2	120	76	P	5	es	14	es	no	ye	o	improved	
385	Sangappa	75	1	2	8	22	96	no	37	122	110	A	3	18	98	no	37	120	102	A	1	16	99	no	37	120	102	A	1	18	98	no	37	120	90	A	0	es	2	es	no	no	o	improved	
386	Maanikya	74	2	4	11	14	99	no	37.8	118	76	A	0	16	100	no	37.8	116	78	A	0	14	100	no	37.6	116	80	A	0	16	100	no	37.6	116	80	A	0	es	1	0	o	no	no	o	improved
387	Sachita	34	1	3	1	24	98	no	37.4	134	66	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	o	no	no	o	improved
388	Sadaa	75	1	4	14	16	100	no	37.4	190	90	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.2	180	90	A	0	es	2	0	o	no	no	o	improved
389	Maansuk	40	2	2	14	22	92	no	35.6	82	126	A	10	20	94	no	36	90	124	A	6	20	94	no	36	92	120	A	5	20	96	no	36.2	94	120	A	4	es	2	10	es	no	no	o	improved
390	Sudabhujia	21	3	1	5	15	97	no	38.2	114	99	V	5	14	99	no	38	114	94	V	5	14	100	no	38	114	90	V	4	14	99	no	37.8	114	90	V	3	es	3	6	es	no	no	o	improved
391	Hassan	66	2	4	16	98	no	37.6	118	64	V	3	14	100	no	37.6	120	65	A	0	15	99	no	37.6	118	64	V	0	16	100	no	37.4	116	70	A	0	es	2	0	o	no	no	o	improved	
392	Maanyar	68	2	3	9	14	99	no	35.9	80	120	A	6	16	99	no	36	92	110	A	3	16	100	no	36.4	100	106	A	3	16	100	no	36.4	104	104	A	2	es	3	2	es	no	no	o	improved
393	Maargin	72	2	3	9	30	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	o	improved
394	Janaki	61	1	2	8	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	yes	37	120	80	A	0	15	100	no	37	120	80	A	0	es	2	es	no	no	o	improved	
395	Zahira	60	1	2	3	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39.2	130	110	P	7	es	3	12	es	no	no	o	deteriorated
396	Boramma	61	1	4	3	15	98	no	37	120	72	A	0	14	99	no	37	122	75	A	0	15	100	no	37	120	72	A	0	14	100	no	37	120	72	A	0	es	0	no	no	o	no	o	improved
397	Sadhana	49	1	2	7	22	96	no	37	122	110	A	3	18	98	no	37	120	102	A	1	16	99	no	37	120	102	A	1	18	98	no	37	120	90	A	0	es	2	es	no	no	o	improved	
398	Sadhika	58																																											

482	Madhusoo	63	2	4	13	14	99	no	37.8	118	76	A	0	16	100	no	37.8	116	78	A	0	14	100	no	37.6	116	80	A	0	16	100	no	37.6	116	80	A	0	es	1	0	0	no	no	o	mproved
483	Nagnika	57	1	3	12	14	98	no	37.4	134	66	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	0	no	no	o	mproved
484	Madhusud	50	2	4	6	16	100	no	37.4	190	90	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	0	no	no	o	mproved
485	Nagapoo	26	1	2	2	22	92	no	35.6	82	126	A	10	20	94	no	36	90	124	A	6	20	94	no	36	92	120	A	5	20	96	no	36.2	94	118	A	4	es	2	10	es	no	no	es	mproved
486	Madhusud	41	2	3	10	15	97	no	38.2	114	99	V	5	14	99	no	38	114	94	V	5	14	100	no	38	114	90	V	4	14	100	no	37.8	114	90	V	3	es	3	6	es	no	no	es	mproved
487	Nagashree	63	1	4	2	16	98	no	37.6	118	64	V	3	14	100	no	37.6	120	65	A	0	15	99	no	37.6	118	64	V	0	16	100	no	37.4	116	70	A	0	es	2	0	0	no	no	o	mproved
488	Madhuve	33	2	3	2	14	99	no	35.9	80	120	A	6	16	99	no	36	92	110	A	3	16	100	no	36.4	100	106	A	3	16	100	no	36.4	104	108	A	2	es	3	2	es	no	no	es	mproved
489	Madhyam	64	2	3	8	30	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	es	mproved
490	Madin	45	2	2	6	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	no	37	120	80	A	0	15	100	no	37	120	80	A	0	es	2	es	no	no	es	mproved	
491	Nagaveni	72	2	2	13	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39	130	110	P	7	es	3	12	es	no	no	o	deteriorated
492	Madir	26	2	4	4	15	98	no	37	120	72	A	0	14	99	no	37	122	75	A	0	15	100	no	37	120	72	A	0	14	100	no	37	120	72	A	0	es	0	0	0	no	no	o	mproved
493	Nageshwa	36	1	3	4	28	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	o	mproved
494	Madul	67	2	3	11	16	98	no	37.4	134	70	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	0	no	no	o	mproved
495	Nageswar	23	1	3	9	16	100	no	37.4	190	88	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	0	no	no	o	mproved
496	Bocamma	62	1	3	3	30	100	no	37	120	80	A	3	28	100	no	37	120	80	A	3	30	100	no	37	120	80	A	3	26	100	no	37	120	80	A	3	es	3	2	es	no	no	o	mproved
497	Sheela	59	1	2	14	22	90	yes	37	60	80	A	10	14	100	yes	37	112	82	A	2	14	100	no	37	120	80	A	0	15	100	no	37	120	80	A	0	es	2	es	no	no	es	mproved	
498	Manohari	74	1	2	1	14	98	no	39.4	130	110	P	7	14	98	no	39.2	130	110	P	7	14	99	no	39.2	130	110	P	7	15	99	no	39	130	110	P	5	es	3	6	es	no	no	es	mproved
499	Madur	49	2	3	15	16	98	no	37.4	134	70	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	0	no	no	o	mproved
500	Nahar	29	1	2	6	16	100	no	37.4	190	88	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	0	no	no	o	mproved
501	Naidhrua	39	1	2	5	22	98	no	37.2	126	102	A	3	16	100	no	37.2	120	100	A	1	16	98	no	37.2	120	98	A	1	16	98	no	37.2	120	98	A	1	es	3	2	es	no	no	o	mproved
502	Naija	55	1	2	10	32	60	Yes	37	130	68	V	11	25	94	Yes	37	122	110	V	10	15	100	Yes	37	118	130	V	7	15	99	Yes	37.6	120	134	V	8	es	2	7	es	no	ye	es	mproved
503	Madursan	38	2	2	11	36	32	Yes	34.1	NR	120	A	11	26	90	Yes	37	80	112	A	11	22	94	Yes	37	100	100	A	7	20	96	Yes	37.6	110	98	A	2	es	8	es	no	ye	es	ied	
504	Madvan	35	2	3	6	20	100	no	37.2	130	110	A	1	16	100	no	37.1	126	100	A	1	16	100	no	37	120	90	A	0	16	100	no	37	120	90	A	0	es	0	0	0	no	no	o	mproved
505	Magadh	39	2	2	6	20	99	no	37.4	120	90	A	0	18	98	no	37.4	120	90	A	0	14	100	no	37.2	120	88	A	0	16	100	no	37.2	120	88	A	0	es	0	0	0	no	no	o	mproved
506	Magadha	39	2	2	9	30	98	yes	39.2	60	130	A	12	28	98	yes	39	70	132	A	13	28	100	yes	38.6	76	134	A	12	24	100	yes	38	80	130	A	10	es	4	es	no	ye	es	ied	
507	Nailika	38	1	4	12	14	99	no	38.6	110	108	A	3	14	100	no	38.4	110	102	A	3	14	100	no	38.2	108	100	A	3	15	99	no	38	110	100	A	3	es	3	0	0	no	no	o	mproved
508	Naima	42	1	2	13	28	82	yes	37.4	126	74	P	9	22	98	yes	38.4	118	70	P	7	18	98	yes	37.2	120	76	P	5	18	99	yes	37.2	120	76	P	5	es	14	es	no	ye	es	mproved	
509	Magan	43	2	2	15	22	96	no	37	122	110	A	3	18	98	no	37	120	102	A	1	16	99	no	37	120	102	A	1	18	98	no	37	120	90	A	0	es	2	2	es	no	no	o	mproved
510	Magath	29	2	2	13	14	99	no	37.8	118	76	A	0	16	100	no	37.8	116	78	A	0	14	100	no	37.6	116	80	A	0	16	100	no	37.6	116	80	A	0	es	1	0	0	no	no	o	mproved
511	Ravi	26	2	3	12	14	98	no	37.4	134	66	U	3	14	100	no	37.4	130	68	A	0	15	100	no	37.4	130	70	A	0	14	99	no	37.4	132	70	A	0	es	1	0	0	no	no	o	mproved
512	Naimisha	44	1	2	9	16	100	no	37.4	190	90	A	0	15	100	no	37.4	190	88	A	0	14	100	no	37.4	186	88	A	0	16	100	no	37.4	180	90	A	0	es	2	0	0	no	no	o	mproved
513	Rishabh	57	2	2	7	22	92	no	35.6	82	126	A	10	20	94	no	36	90	124	A	6	20	94	no	36	92	120	A	5	20	96	no	36.2	94	120	A	4	es	2	10	es	no	no	es	mproved
514	Lakshmi	71	1	2	13	15	97	no	38.2	114	99	V	5	14	99	no	38	114	94	V	5	14	100	no	38	114	90	V	4	14	100	no	37.8	114	90	V	3	es	3	6	es	no	no	o	mproved
515	Nairi	51	2	2	6	16	98	no	37.6	118	64	V	3	14	100	no	37.6	120	65	A	0	15	99	no	37.6	118	64	V	0	16	100	no	37.4	116	70	A	0	es	2	0	0	no	no	o	

A PROSPECTIVE OBSERVATIONAL STUDY TO ANALYSE THE UTILITY OF NATIONAL EARLY WARNING SCORE (NEWS) IN PREDICTING THE OUTCOME OF PATIENTS PRESENTING TO THE EMERGENCY DEPARTMENT

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