

Provider factors influencing 48-hour management outcomes of triaged patients in the accident and emergency department at Kenyatta National Hospital: A cross-sectional study

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ABSTRACT

Triage prioritizes patients by urgency to ensure timely care, with Kenyatta National Hospital (KNH) using the South African Triage Scale (SATS)/Triage Early Warning Score (TEWS) system, though low-resource settings face challenges like staff shortages and limited equipment. The study sought to examine the issues of provider-related variables in terms of treatment outcomes of triaged patients after the 48 hours of treatment at the Accident and Emergency Department, Kenyatta National Hospital. This research used a cross-sectional design. All targeted patients were coded patients at the A&E unit with a sample size of 385 patients calculated using the Fisher formula. Structured questionnaires and an observation checklist were used to collect data for the 3-month duration of the study. Kakamega County Referral Hospital was used as a pilot study to assess the reliability of their instruments. The SPSS version 25 was used to analyze data with odds ratios calculated to evaluate the relationship between provider factors and patient outcomes, and one-way ANOVA was used to compare mean differences between provider-related factors. The researchers were able to identify that there were significant provider-related factors that impacted management outcomes of triaged patients ($t = 13.055$, $p = 0.002 < 0.05$). This is evidenced by the fact that the enhancement of provider characteristics in the areas of experience, training, and clinical decision-making has a positive impact on patient outcomes in the 48-hours post-care period. Also, institutional-related and patient-related factors were also presented to influence the efficiency of triage. The results highlight the significance of investing in human resource capacity, proper equipment and medication, and infrastructure enhancement to improve the emergency care outcome. In order to maximize patient management, it is necessary to strengthen the skills of the providers with specific training, to enhance the institutional resources, and to monitor the triage processes.

Keywords: Accident and Emergency, Emergency Department, Healthcare Delivery Management Outcomes, Patient Outcomes, Provider-Related Factors, Triage, Triage Early Warning Score (TEWS)

I. INTRODUCTION

Triage forms a very vital part of clinical practice where people who report to the accident and emergency departments are prioritized in terms of the severity of the condition they are in, the prognosis and the resources available to them. The main goals of the triage are to quickly determine the patients who need to be resuscitated, allocate patients to the right areas of care, and provide timely diagnostic and therapeutic procedures (Bazyar et al, 2019). Triage is thus required to play an important role in early management decisions and short-term patient outcomes, especially in the initial 48 hours of care.

Triage is a poorly used, disparately used, and sometimes not used aspect of emergency care systems in most low- and middle-income countries. Poorly trained providers, the use of subjective or gestalt decision-making, and the lack of uniform triage procedures are all elements that lead to inconsistent triage classification, and this may expose critically ill patients to delayed or inappropriate care (Wangara et al., 2019). It has been proposed that patient morbidity and mortality in a resource-constrained system can be greatly decreased by improvement of triage accuracy and provider compliance with validated triage systems. Nonetheless, triage scales designed in high-income regions have shown inconsistent validity, reliability, and predictability of outcomes with application in the low-resource emergency department, making it difficult to select the best triage systems in the latter setting (Hansoti et al., 2017).

South African Triage Scale (SATS), which is created on the basis of resource-constrained conditions, has shown good consistency and validity with a variety of low-resource conditions (Wangara et al., 2019). In Kenya, poor clinical decision-making in the emergency and prehospital setting has been identified as the cause of preventable adverse patient outcomes. To solve this issue, Kenyatta National Hospital (KNH) has introduced the compulsory triage system in the hospital in their accident and emergency department by using the South African Triage Scale to aid nurses and clinicians in assessing and prioritizing patients (Mutahi, 2019).

The SATS uses Triage Early Warning Score (TEWS) which grades the levels of acuity using abnormal physiological parameters. Patients are divided into color-coded priority systems, red (emergency), orange (very urgent), yellow (urgent), and green (non-urgent) (Van Hoving et al., 2015). Red-coded patients must be transferred straight to the resuscitation area and the orange-coded patients must be given prompt and closely monitored care to avoid any further clinical deterioration. The system allows healthcare providers to allocate scarce resources (personnel and equipment) to patients at greatest risk, and take into consideration the local disease trends and institutional resource limitations.

Although there are proven triage algorithms, patient outcomes are very sensitive to provider related aspects like triage accuracy, clinical judgment, workload, experience, protocol compliance, and intervention timeliness. Practically, the prioritization of red-coded patients might unintentionally lead to a delay in the care provision to orange-coded patients, which in turn may lead to deterioration and the potential escalation of the situation and emergency in the first 48 hours of care. It is thus very important that such patients are recognized at an early stage and managed in time to avoid adverse outcomes.

So far there is not a lot of literature that explores the results of triaged patients in the accident and emergency department of the Kenyatta National Hospital and especially how the provider factors relate to the short term results of management. This research paper aims at filling this gap by establishing the provider related factors that relate to the management outcomes of the triaged patients in the 48 hours care at the accident and emergency department of Kenyatta national hospital. The results of this research will guide in designing a decision-support system that will help enhance the management of the orange-coshaded patients at risk of clinical deterioration in the case of emergency care.

1.1 Statement of the Problem

Kenya National Hospital (KNH) Accident and Emergency Department is a unit of operation and it operates in an environment whereby the volume of patients is high, the burden of trauma and medical emergencies is increasing and the resources available are also scarce. Despite the triage systems, including the Triage Early Warning Score (TEWS) and the Modified Early Warning Score (MEWS), being standardized systems with prioritization of care, poor patient outcome, including early mortality, clinical deterioration, and unintended admission to the intensive care units, nevertheless, do occur in the first 48 hours of emergency care. This means that it was not possible to solely influence the triage scoring by the effects of the early management.

The existing evidence confirms that, the scores of triage are associated with the adverse outcomes, however, incidences of under-triage and over-triage have been documented, which prompt the thought that, the interpretation of the triage, its compliance and reaction to the triage procedures are not consistent across the providers. The provider variables such as the training, the experience at work, the staffing ratio, response to pressure in making decisions, and compliance with the laid down triage principles, may be matters of great concern in the promptness and appropriateness of handling patients during the critical initial phase of treatment. However, the available research at KNH has given a lot of consideration to predictive validity of the triage instruments and not the impacts of the medical professionals on patient outcomes.

Moreover, the local evidence regarding the impact of the factors associated with the provider over the outcome of the management of the triaged patients during the first 48 hours of the care in the low- and middle-income settings is also lacking. This knowledge gap restricts the possibility to optimize the emergency care delivery, improve patient outcomes and direct certain interventions, such as the training of providers, standardization of protocols and staffing. Therefore, there is an immediate need to examine the issues of provider-related variables in terms of treatment outcomes of triaged patients after the 48 hours of treatment at the Accident and Emergency Department, Kenyatta National Hospital.

1.2 Research Objective

To examine provider related factors associated with the management outcome of triaged patients within 48 hours of care at accident and emergency department, Kenyatta national hospital.

II. EMPIRICAL REVIEW

2.1 Institutional Related Factors

Factors with respect to human resource are important predictors of decision-making in the triage of emergency department. In a study carried in Sweden, it was established that nurses who had more experience were in the better positions to prioritize the patients more during the peak periods of emergency care (Anderson et al., 2025). Equally, a study conducted in the United States showed that the decisions made by experienced triage nurses were more reliable and consistent than those made by less experienced personnel (Hicks et al., 2003; Cone & Murray, 2002). Goransson et al. (2006) also emphasized the importance of intuitive knowledge and clinical acumen when nurses are deciding which

triage should be given priority, and indicated that in most of the times, nurses use perceptual abilities and situational understanding to assess the triage priorities along with the official clinical experience.

Competency based programs and training interventions have been found to enhance the accuracy of triage across the world. Australian triage training programs with simulation exercises and case-based learning enhanced the consistency in decision-making of nurses and under-triage rates (Considine et al., 2001). Competency-based programs with standardized assessment instruments and re-certification periodically have improved triage reliability in high-volume emergency departments in Canada (Canner et al., 2018).

Formal triage training is usually small in LMICs. A Kenyan study at Kenyatta National Hospital established a significantly higher triage accuracy and a shorter decision-making process by nurses who had undergone prior training in triage than their untrained counterparts (Mutahi, 2019). This was also found to be true in Uganda and South Africa, where continuous professional development and specific triage workshops led to better patient prioritization and less frequent early adverse events (Calvello et al., 2013). These results demonstrate the importance of the integration of continuous training, mentorship, and competency-based programs as one of the key levers in improving the emergency care provision in resource-limited settings.

Non-personnel factors that are crucial in making triage decisions are workload and unit crowding. Fry and Burr (2001) indicated that one of the most influential factors in determining triage outcomes was unit overcrowding, perceived severity of injury and workload on the staff. These findings in Australia also demonstrated that overcrowding in EDs and large patients' numbers negatively impact on the effectiveness of triage and prompt provision of care.

Similar studies in the United States and Europe have shown that the accuracy and timeliness of the triage decision are directly affected by environmental and operational issues, including patient-to-nurse ratios, bed availability and departmental layout (Considine et al., 2001). Overcrowding was linked with a delay in the timeliness of triage assessment, the risk of misclassification, and a longer waiting period, which has a negative impact on patient outcomes.

Systemic constraints are added to high workload in LMICs. In Kenya, the patient-to-nurse ratio became high during the peak hours, which resulted in delayed triage and excessive use of provider intuition over standard protocols (Mutahi, 2019). Other studies have also found that overcrowding plays a role in increasing the incidence of under-triage and worse short-term outcomes (Olajide et al., 2021). These works signify the significance of adequacy of staffing and workflow optimization to facilitate the decision-making process of providers in stressful environments.

Accessibility and quality of emergency equipment have a major influence on the triage decision-making. Buttigieg et al. (2020) reported that the functionality of equipment affected the capacity of the respondents to measure and rank the patients adequately. The study proves the insufficiency of the necessary emergency equipment undermines assessment and management timelines, which results in a poor triage performance

High-income countries have used technology and triage support tools such as electronic triage scoring systems and decision-support applications more frequently to increase accuracy and consistency. Electronic triage systems connected to early warning score have enhanced the triage documentation, minimized misclassification, and provided real-time patient deterioration surveillance in the United States (Liu et al., 2020). On the same note, computerized triage plans incorporated in hospital information systems have decreased variability in patient prioritization and enhanced compliance with clinical guidelines in Europe (Christ et al., 2010).

An electronic triage tool has limited access in LMICs, yet pilot programs have been promising in these countries. In Rwanda, a study showed that when a system of triage decisions supported by a tablet was introduced, the triage assignment became more effective and infrequent critically ill patients were identified more quickly (Aluisio et al., 2016). Formal electronic triage instruments are still not popular at KNH; nevertheless, there is a rising interest in mobile technology utilization and scaled-down scoring to assist nurses working in high-volume environments (Mutahi, 2019).

2.2 Comparative Outcomes: High vs. Low and Middle-Income Environment.

Comparative research has shown that there are vast differences in triage in high-income countries (HICs) and LMICs, which is mainly explained by the difference in resources, training, and efficiency of the workflow. In HICs, triage systems are also organized, staffing is well-developed, and real-time monitoring of patients leads to a high rate of accuracy and timely intervention of those who are critically ill (Christ et al., 2010; Liu et al., 2020). The rate of mortality during the first 48 hours of emergency care is usually lower and incidents of adverse events about the triage error are also not frequent.

Quite on the contrary, LMICs are quite challenged. Under-triage and delayed care along with poor early outcomes have been found to be more common in Kenya, Nigeria, Tanzania, and Uganda due to a lack of training, excessive workloads, equipment, and overcrowding (Mutahi, 2019; Olajide et al., 2021; Calvello et al., 2013). The health crises and trauma health are particularly prone, and the mortality rates are two to three times higher than in HICs. These disparities show that certain interventions, including the need to train the providers, consistency in the process of triage, and the supply of the corresponding technological support, are needed to reduce the disparity between HICs and LMICs in emergency care outcomes.

III. METHODOLOGY

3.1 Research Design

The research was cross-sectional in design, where the researcher sought to evaluate the patient management outcomes based on the Triage Early Warning Score (TEWS) at Kenyatta National Hospital. This design is suitable due to the fact that it gives a snapshot of the patient outcomes at any given moment in time enabling the determination of the relationship between the categories of triage and the decisions made in managing them. It is time saving, resource saving and helps in simultaneous gathering of both the qualitative and quantitative data to help pinpoint the patterns, gaps, and the areas of improvement in patient care.

3.2 Study Area

The study was carried out at KNH, which is the biggest state-owned hospital in East and Central Africa and has 1,800 beds. The hospital consists of two emergency units (pediatric and adult/trauma), three critical care units, 24 operating rooms, and 20 outpatient clinics. The A&E department has a triage area of SATS/TEWS, a resuscitation, a trauma theatre, and a special review room. In recent times, the emergency department served 31,978-61,840 patients per year with an average of 4,000 patients every month in 2016/2017.

3.3 Study Population

The study population included patients who had been duly triaged and coded at the adult A&E department. A 48-hour follow-up was done to monitor outcomes of interventions and triage status.

3.4 Sampling Procedure

A total of 395 patients that were selected over two months were systematically selected by random sampling technique. Daily representation was done through the process, and there was further randomization of coding assignments.

3.5 Inclusion and Exclusion Criteria

Inclusion: All consenting triaged and coded patients.

Exclusion: Patients referred to other facilities or brought in deceased.

3.6 Sample Size Determination

Fisher formula was used to calculate the sample size, with the prevalence being 50 percent and 95 percent confidence interval giving a sample size of $n = 385$ which was adjusted to 395 according to the possible non-response.

3.7 Data Collection Procedure

Structured questionnaires and checklists were used to collect the data through trained research assistants. SATS/TEWS protocols were used in triage such as the ABC-c-c-DO protocol of pediatric patients. Triage priorities could be bypassed in case of necessity by clinical staff. Interventions, timing, and outcomes of the patients were followed in 48 hours.

3.8 Research Instruments

Demographic and provider related data were collected by use of structured questionnaires, whereas institutional variables like staffing, equipment, space, and emergency drug availability were measured using checklists. The pre-test instruments were used in the Kakamega County referral hospital with a sample 10 percent of the population.

Validity: Pilot testing and KMO/Bartlett tests. Reliability: Tested with the Alpha of Cronbach ($\alpha \geq 0.7$): internal consistency of independent (provider/institutional) and dependent (patient outcomes) variables.

3.9 Data Analysis

The analysis of the data was performed with the help of IBM SPSS v25.0. Frequencies, percentages and descriptive statistics were calculated. Chi-square tests were used to test the relationship between triage outcomes and patient or provider variables, and logistic regression was used to determine the association between institutional/provider variables and 48-hour outcomes.

3.10 Ethical Considerations

The Masinde Muliro University ERC, KNH-UON ERC, and NACOSTI provided ethical approvals. KNH administration gave permission. Informed consent was written and confidentiality and privacy were ensured.

IV. FINDINGS & DISCUSSION

4.1 Demographic Characteristics of the Respondents

This section examines data about the variables of age, gender, marital status, level of education and religion of the respondents. The main objective was to find out any pattern in the responses that would directly refer to the independent variables that were used in the study.

Table 1

A summary of the Demographic Characteristics

		FREQUENCY	PERCENT	MEAN	SD
AGE	Below 18 years	59	15.9	2.60	1.000
	19-35 years	112	30.1		
	36-60 years	119	32.0		
	Above 60 years	82	22.0		
GENDER	Male	225	60.5	1.60	.490
	Female	147	39.5		
MARITAL STATUS	Married	210	56.5	1.61	.784
	Single	112	30.1		
	Widowed	15	4.0		
	Divorced/separated	23	6.2		
	Cohabiting	12	3.2		
LEVEL OF EDUCATION	University education	97	26.1	2.41	.991
	College education	65	17.5		
	A-level	170	45.7		
	O-level	40	10.8		
RELIGION	Christian	222	59.7	1.43	.776
	Muslim	29	7.8		
	Hindu	7	1.9		
	Catholic	114	30.6		

Based on the demographic attributes, it can be seen that majority (32.0%) of the respondents were aged between the 36-60 years. This indicates that the largest category of persons who are most affected by accident and emergency are those in the working group (36-60 years) since they are the ones who are involved in the day to day hustles. In terms of gender, there were 60.5 percent males out of the total population of patients; hence, accidents and emergencies is skewed towards the males. On the other hand, a majority of the respondents (56.5) were married and 59.7% were Christians. On the level of education, 45.7 percent of the respondents had been able to reach A- level education.

4.1.1 Provider Related Factors Associated with the Management Outcome of Triage Patients within 48 Hours of Care at Accident and Emergency Department, KNH

The study sought to determine the provider related factors and management outcome of triaged patients'. The results are summarized in Table 2.

Table 2

Provider Factors

	RESPONSE	FREQUENCY	%	MEAN	SD
Do there exist sufficient oxygen points?	YES	372	100	1.00	0.000
	NO	0.0	0.0		
Is there sufficient observation and monitoring equipment? BP machine, pulse oximeter, thermometer.	YES	363	97.6	1.02	0.154
	NO	9	2.4		
Are there sufficient resuscitation drugs?	YES	345	92.7	1.07	0.260
	NO	27	7.3		
Is the triage area adequate?	YES	281	75.5	1.24	0.430
	NO	91	24.5		
Is it sufficient to have enough stretcher to accept patients?	YES	299	80.4	1.20	0.398
	NO	73	19.6		
Is the area of monitoring crowded?	YES	245	65.9	1.34	0.475
	NO	127	34.1		

Are the consultation rooms satisfactory?	YES	282	75.8	1.24	0.429
	NO	90	24.2		
Do they have sufficient resuscitation rooms?	YES	198	53.2	1.41	0.492
	NO	174	46.8		
Is patient nurse ratio sufficient?	YES	165	44.4	1.47	0.500
	NO	207	55.6		
Is the patient to doctor ratio proper?	YES	165	44.4	1.56	0.497
	NO	207	55.6		
Do staff in the laboratory suffice?	YES	198	53.2	1.47	0.500
	NO	174	46.8		
Are porters sufficient in the unit?	YES	263	70.7	1.29	0.456
	NO	109	29.3		
Does the ratio of radiology personnel suffice?	YES	273	73.4	1.27	0.443
	NO	99	26.6		

A correlation analysis of study variables was performed to establish the association between provider related factors and management outcome of triaged patients' and summary of the correlation was as shown in Table 3

Table 3

Correlation Analysis of Provider Related Factors and Management Outcome of Triaged Patients'

		Provider related factors	Management outcome of triaged patients'
Provider related factors	Pearson Correlation	1	
	Sig. (1-tailed)		
Management outcome of triaged patients'	Pearson Correlation	.452	1
	Sig. (1-tailed)	.008	

*. Correlation is significant at the 0.05 level (1-tailed).

Findings presented in Table 3 indicated a positive and statistically significant relationship between provider related characteristics and the outcome of the management of the triaged patients. This is indicated by the $r=0.452$ $p=0.008<0.05$ Pearson correlation coefficient. This implies that institutional-related characteristics are improved to improve management outcomes of triaged patients.

4.2 Discussion

The results indicated that there was a positive yet statistically significant relationship existing between the provider characteristics and the ultimate outcome of the management of patients after the triage. This is indicated by the $r=0.452$ $p=0.008<0.05$ Pearson correlation coefficient. This is an implication that improved provider-related attributes translate to improved management outcomes among the triaged patients. This was in line with the results of a study that confirmed that tools are involved in the decisions of triage (Benjamin & Giuliano, 2024). Though the personnel decisions in this area were made using evidence gathered in international research studies, it is notable that in another study, triage decision and priority of patients made pertinent by basing solely on the clinical need and there is no influence of work volume and ED crowding in the process (Considine et al., 2001). Crowding will ensure that personnel cannot attend to all the trauma cases effectively, and there will be few equipments as there will be compromised care as follow up will be poor resulting in poor outcome of triage on the patient.

These findings are supported by research that has identified personnel considerations to be an important factor in the triage decision making. Respondents involved in the research of the perceived importance of personal qualities that drove their decision-making in a crisis situation were experience, the capacity to learn, and expertise. The findings of the current research are consistent with the information that is available in other materials regarding the importance of experience and training in triage decision-making. Experience level is one of the best criteria in the triage decision-making among nurses as a study conducted in Sweden by Anderson et al. (2025) reveals. The American study by Hicks et al. has found that the more experience there is the more reliable the decision making in a triage set up (Hicks et al., 2003). In a study conducted by Cone and Murray in the United States, it was concluded that the most powerful requirement in the decision-making process of the triage nurses is experience and expertise (Cone & Murray, 2002). Scholars have discovered that intuitive learning and sensitive perception of the nurses are more significant in their triage decision making process than their respective clinical experiences (Goransson et al., 2006). On the whole, the findings of the current research were not in conflict with the findings of other similar studies but revealed the significance of experience, expertise, wisdom, and acuity in the issues of triage decision-making.

V. CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

On factor related to the provider which were associated with the overall performance of the management of the patients triaged during the 48 hours of interventions at the accident and emergency department, KNH, in the study found that majority of the patients 50.5% were served within 10 minutes of their arrival in the accident and emergency whereas 30% of the patients were not served properly. This must be refined to reach the desired standards of care, each minute wasted is determinant on the outcome of the patient, and this will figure in an improvement in the triage and care process.

The results of the research showed that provider related factors were important in management outcomes of triaged patients (t -statistic=13.055, p -value=0.002 < 0.05). The coefficient against provider factors is 0.693, and it is positive. Therefore, the provider related factors have a positive influence on the management outcomes of the triaged patients. Therefore, the units of provider related factors increased, in each case, management outcome of patients who had been triaged increased by 0.693. The provider connected factors that involve the triaging process and waiting time require additional examination with a view to establishing the corrective actions that will result in the provision of a high quality care.

5.2 Recommendations

The recommendations that have been identified as key to improving the patient management outcomes include; KNH management to review the triage process and policy so as to ensure that the patients can be followed up easily, use of online queue system which guided to monitor patient system and subsequent follow up this reducing waiting time. KNH and ministry of health to ensure that adequate equipment e.g. oxygen points and monitors are available and stocking adequate drugs which are important in resuscitation and other management, there need to increase infrastructure and space so as to reduce overcrowding which may be risk to the patients as well as staff in order to improve patient more skilled personnel need to be employed by KNH including, doctors, laboratory staff as well as nurses, the staff will also require more training on skills on triaging and trauma management.

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