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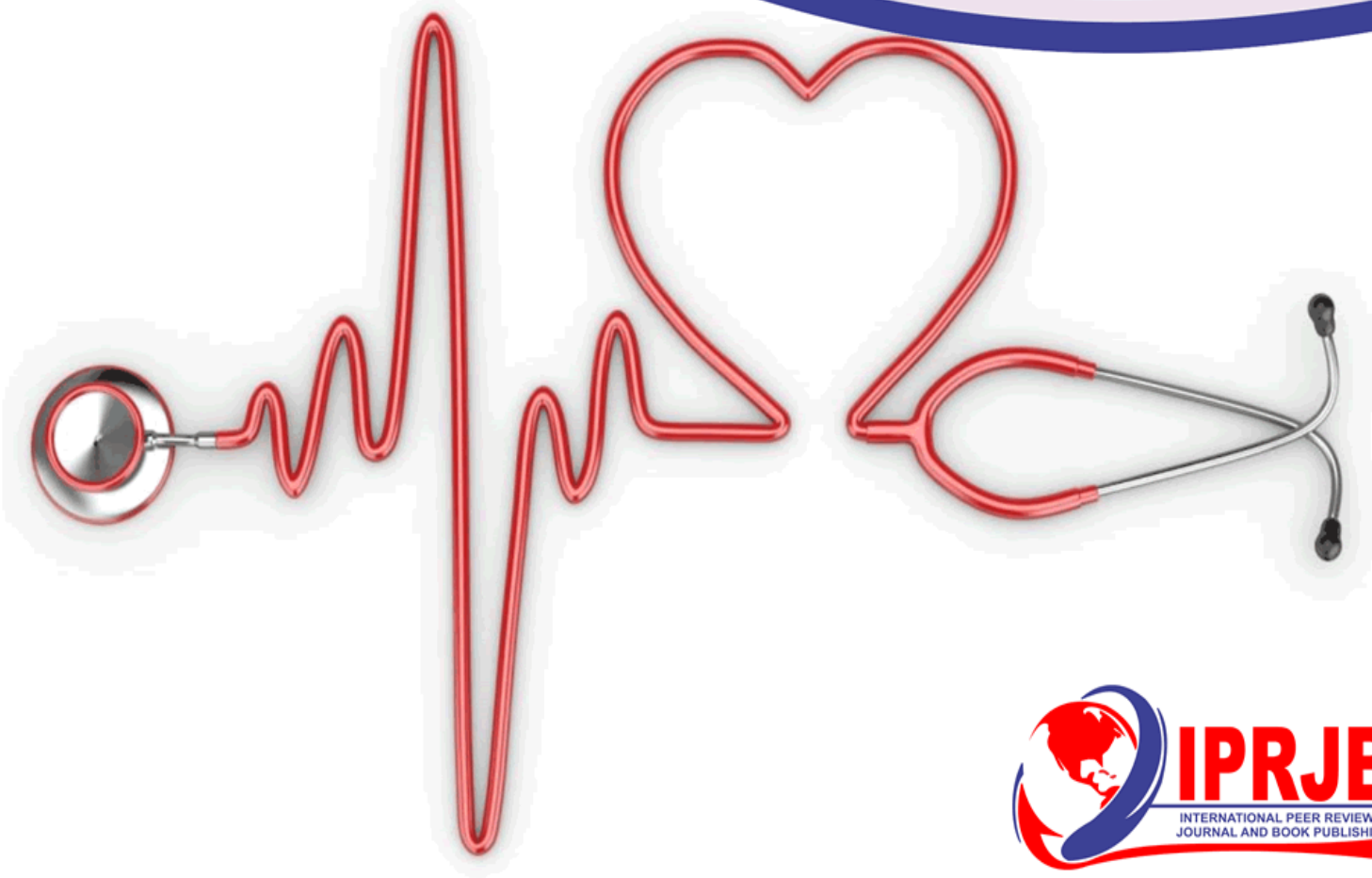

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Compliance on Triaging Traumatic Patients Attending Emergency and Outpatient Surgery Department at University Teaching Hospital of Butare (CHUB), Rwanda: A Quasi-Experimental Study

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Abstract

Purpose: The World Health Organization (WHO) defined triage as the action of sorting and prioritizing patients based on the estimation of the urgency for intervention. This approach is used as the basis for identification of those patients who require immediate medical intervention and those who can safely wait. Locally triage is the process including the initial assessment followed by the prioritization of patients needing emergency care and assigns them according to their actual need or likely benefit from immediate medical treatment. To assess the compliance with triage protocols among healthcare providers managing traumatic patients attending the emergency and outpatient surgery department at University Teaching Hospital of Butare.

Methodology: The total sample size were 109 but the participants enrolled in the study were 101because 8 participants voluntary did not want to participate to the study (they refused to sign consent form) a prospective cross-sectional study was conducted among health workers in the surgical department (CHUB staff 70), and the emergency department (CHUB staff 31), making a total of 101 participants across both departments. The participants 'knowledge of triage tool was assessed and their level of compliance with triaging. The training on the triage tool was provided among healthcare providers managing traumatic patients attending the emergency and outpatient surgery department at University Teaching Hospital of Butare, and after one moth of intervention the reassessment was also done about the level of compliance with triage tool following training received.

Findings: A total of 101 participants were included, the majority being nurses (63.4%). Most respondents reported that the current triage protocols effectively addressed the needs of trauma patients (86.1%) and that adherence to these protocols significantly or somewhat improved patient outcomes (95%). Compliance monitoring was limited, with over one-third (36.6%) stating that outcomes were never reviewed. However, urgent cases were largely well prioritized (89.1%). About one-fifth (20.8%) acknowledged adverse outcomes due to non-compliance with triage protocols. Nearly half (49.5%) of participants reported challenges to implementation, mainly related to lack of training, monitoring, and updated tools. Training interventions were associated with improvements in outcome review practices, prioritization of urgent cases, and reduction of adverse outcomes related to non-compliance.

Unique Contribution to Theory, Practice and Policy: In both department participants emphasized the need for ongoing training and to increase staffing as key strategies for further enhance level of compliance and strengthen the triage process in both the emergency and outpatient surgery departments.

Keywords: *Compliance, Triage, Traumatic Patients*

JEL Codes: *I10, I18, I19*

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INTRODUCTION

The concept of triage was first introduced around 1792 by Dominique Jean Larrey, who was the Surgeon-in-Chief to Napoleon Bonaparte**'s** Imperial Guard. Larrey is credited with designing a mobile field ambulance known as the Ambulance Volante ("flying ambulance") to quickly transport injured soldiers from the battlefield. (Robertson-Steel, 2006) Traumatic injuries are a leading cause of morbidity and mortality globally, with a disproportionate impact on populations in low- and middle-income countries (LMICs). (Nsubuga et al., 2025) Triage involves ranking patients' care needs according to how severe their illness or injury is, their likely outcome, and the resources available. It works well only when healthcare providers have the right knowledge and skills to carry it out.(Twagirayezu et al., 2021) Findings from multiple pre–post intervention studies World Wide Organization indicate that implementing triage helps decrease patient waiting times and lower mortality rates.(Mitchell et al., 2025) Emergency departments commonly employ triage systems to categorize patients according to priority levels. However, these systems often lack clear guidelines on how patients should be routed both across and within the assigned categories. As a result, decision-makers in Emergency departments frequently rely on their own judgment to direct patient flow.(Ding et al., 2019)

A study done in Kingdom of Saudi Arabia showed that the emergency department plays a vital role within the healthcare system. Rising patient visits, including non-urgent cases, highlight the need to prioritize individuals requiring immediate medical attention over those whose conditions allow for delayed care.(Alshurtan et al., 2024) Outpatient department forms the integral part of patient management and is considered to be the shop window of the hospital.(Jain et al., 2025) The triage system shows strong accuracy in managing outpatient cases across all departments and performs particularly well in subspecialty referrals, which may help reduce cancellations and save time.(Yang et al., 2024) Implementing OPD triage can greatly improve the management of patients in overcrowded government outpatient departments. It facilitates proper data management, enhances patient satisfaction, and ensures optimal use of the consultant's time, skills, and expertise.(Gani et al., 2016) The study conducted in UK 2022 found that Out of 3,721 patients, 32 sustained a missed injury during the study period, of which 34% were classified as low risk. The Trauma Triage Clinic (TTC) proved effective in reducing fracture clinic workload, with 23% of patients being discharged directly from the TTC.(Madhusudan et al., 2022) A study done 2021 on trauma care in low- and middle-income countries (LMICs) demonstrated that a total of 45 studies were reviewed. The main challenges in trauma care across low- and middle-income countries were categorized into three broad areas: infrastructure, education, and operational practices.

Potential solutions were proposed, including algorithm-based patient management and the adoption of technology, which could be feasibly implemented in LMIC settings.(Shanthakumar et al., 2021) A study conducted in Ethiopia 2025 showed that the analysis of the triage early warning score components showed the highest completeness for heart rate (98.4%), followed by respiratory rate (96.0%).(Waganew et al., 2025) The study done in Somalia 2025 indicated that tertiary private hospitals, particularly those located in urban areas, demonstrated higher readiness to provide emergency and critical care (ECC) services. The most common barriers to ECC readiness were user fees, lack of essential equipment, and limited 24-hour staff availability.(Njiru et al., 2025) The study conducted at CHUK (University Teaching Hospital of Kigali) Rwanda in 2020 indicated that among geriatric patients falls were the most common mechanism of injury (63%), followed by road traffic accidents (28%) and the deaths rate was 14%. Most result from injury-related complications, with triage colour, Kampala Trauma Score

(KTS), and Glasgow Coma Scale (GCS) identified as significant predictors of mortality.(*College of Medicine and Health Sciences Department of Anesthesiology , Critical Care and Emergency Medicine Epidemiology and Outcomes of Geriatric Trauma Patients Consulting at the CHUK Emergency Department Submitted in Partial Fulfilment of Requirement F*, 2020)

Problem Statement

Timely and accurate triage is essential for improving outcomes in traumatic patients.(Bazyar et al., 2022) However, at University Teaching Hospital of Butare (CHUB) in Rwanda, ensuring consistent compliance with triage protocols remains a persistent challenge. Although standardized triage tools have been introduced at CHUB, their implementation remains suboptimal due to inadequate staff training, inconsistent adherence to established protocols, and weak interdepartmental communication. These gaps hinder effective patient prioritization, contribute to delays in emergency care, and compromise the quality and efficiency of healthcare service delivery. Compliance will be measured using structured observation and self-administered questionnaires assessing healthcare providers' knowledge, correct use of triage criteria, documentation practices, and adherence to prioritization guidelines. Consequently, suboptimal triage compliance may negatively affect patient outcomes, underscoring the need to systematically assess the current level of compliance with triage protocols among healthcare providers managing traumatic patients at CHUB.

METHODOLOGY

Study Design and Study Setting

This study employed a cross-sectional design and was conducted among health workers and clinical trainees (medical students) in the surgical and emergency departments of the University Teaching Hospital of Butare (CHUB). A total of 109 health workers were approached to participate in the study. However, 8 individuals declined to provide informed consent and were therefore excluded. Consequently, 101 participants were enrolled and included in the final analysis. The study assessed participants' level of knowledge on the triage tool, their compliance with triage protocols, and the barriers affecting triage practice.

In addition, both health workers and clinical trainees from the two departments received training on the use of the triage tool. Following the training, a reassessment was carried out to evaluate any improvement in compliance. The training in the emergency department was conducted on June 4th, 2025, with 27 participants, while the surgical department training was conducted on June 5th, 2025, with 28 participants.

Study Population, Eligibility and Exclusion Criteria

The study population consisted of healthcare workers and clinical trainees (medical students) in the surgical and emergency departments of the University Teaching Hospital of Butare (CHUB). This included doctors, nurses, and students who were directly involved in the management of traumatic patients and the use of triage protocols during their clinical rotations.

Eligibility Criteria: Healthcare workers (doctors and nurses) and clinical trainees (medical students) assigned to the surgical or emergency departments at CHUB during the study period, individuals directly involved in patient assessment, triaging, or clinical decision-making and participants who provided informed consent to participate in the study.

Exclusion Criteria: Healthcare workers or students absent or on leave during the data collection period, staff and students not directly engaged in trauma patient management or triage processes (e.g., administrative personnel, cleaners, or security staff) and Individuals who declined to provide informed consent.

Sample Size and Sampling Procedure

Sample size refers to the number of individuals selected from a population from whom the researcher intends to collect data (Evans et al., 2000). For this study, a total of 109 participants, including medical and nursing staff as well as clinical trainees (medical students), were selected.The sample size was determined using Slovin's formula (1960) below (Ellen Stephanie, 2018).

$$n = \frac{N}{1+N(e)^2}$$

Where:

- n = sample size
- N = population size (150), representing the average number of staff and clinical trainees working in the surgical and emergency departments at CHUB
- e = acceptable sampling error (0.05)

$$n = \frac{150}{1+150(0.05)^2} = 109 \text{ participants}$$

Using this calculation, the total sample size for the study was 109 participants, comprising both healthcare professionals and clinical trainees involved in trauma patient management and triage activities.

Data Collection Tool and Procedure

Data were collected using a structured questionnaire developed by the researcher. The questionnaire was divided into five sections: **Section 1:** Socio-demographic characteristics of participants, including department, position, and years of experience. **Section 2:** Questions on the existence, review, and staff training related to triage protocols. **Section 3:** Questions assessing the effectiveness of triage protocols and challenges in their implementation. **Section 4:** Questions regarding the perceived impact of triage protocol adherence on patient outcomes. **Section 5:** Questions on areas for improvement and additional resources required to enhance compliance. Prior to the main study, the questionnaire was pre-tested among a small group of health workers and clinical trainees in a similar setting to ensure clarity, relevance, and reliability. Minor revisions were made based on the pre-test results to improve comprehension and flow.

Data collection was conducted during working hours from February up to April 2025 using trained research assistants under the supervision of the researcher. The research assistants were trained on the objectives of the study, the content of the questionnaire, ethical considerations, and how to administer the tool effectively. The assistants administered the questionnaire directly to the selected participants, which included health workers and clinical trainees in the emergency and surgical departments. Completed questionnaires were collected immediately and securely placed in sealed envelopes to maintain confidentiality.

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Validity and Reliability of the Questionnaire

The validity of the questionnaire was ensured by aligning all items with the study objectives and research questions. Content validity was established through expert review, ensuring that the questions adequately captured all relevant aspects of triage knowledge, compliance, and barriers among health workers and clinical trainees.

Reliability of the tool was assessed through a pre-test conducted among a small group of participants similar to the study population. The pre-test helped identify unclear or ambiguous items, which were subsequently revised to enhance clarity, consistency, and comprehension. This process ensured that the questionnaire would consistently measure the intended variables during the main study.

Statistical Analysis and Data Management

Data analysis involves systematically organizing and summarizing collected information to provide a clear understanding of the study findings. After the completion of data collection and return of all questionnaires, the researcher undertook data cleaning, entry, and validation to ensure accuracy and completeness.

The cleaned data were entered and analyzed using Microsoft Excel. Descriptive statistics were used to summarize the characteristics of participants and study variables. Findings were presented in the form of frequencies and percentages to describe participants' knowledge, compliance with triage protocols, barriers, and perceptions regarding the triage process.

Ethical Considerations

This study was reviewed and approved by the Ethics Committee of the University Teaching Hospital of Butare (CHUB) (Approval No: REC/UTHB/166/2024). Written informed consent was obtained from all participants after they were provided with a clear explanation of the study's objectives, potential benefits, and any risks associated with participation.

Participants' privacy and confidentiality were strictly maintained throughout the study. All data were securely stored, and respondents' identities remained anonymous to ensure protection and adherence to ethical standards. Participation was entirely voluntary, and participants had the right to withdraw from the study at any time without any consequences.

RESULTS

Table 1: Demographic Information

Variables	N=101 (%)
Position of the respondents	
Emergency Physician	5(5)
General Practioner	6(5.9)
Medical students	14(13.9)
Nurses	64(63.4)
Surgeons	12(11.8)
Experience	
<1 year	9(8.9)
1-3 years	35(34.6)
4-6 years	24(23.8)
> 6 years	33(32.7)

Table 1 indicated that the majority were nurses (63.4%), followed by medical students (13.9%) and surgeons (11.8%). This distribution indicates that nurses formed the largest group involved in the study, which reflects their central role in patient care and triage processes within the hospital setting. Regarding work experience, the largest proportion of respondents had 1–3 years of experience (34.6%), followed by those with more than 6 years (32.7%) and those with 4–6 years of experience (23.8%). This suggests that most participants had a substantial duration of clinical exposure, which may contribute positively to their knowledge and compliance with triage practices.

Table 2: Knowledge on Triaging Form for Medical, Nursing Staff and Medical Students

How effectively do you think the current triage protocols address the needs of traumatic patients?	
Very effectively	29(28.7)
Effectively	58(57.4)
Neutral	12(11.9)
Ineffectively	1(1)
Very ineffectively	1(1)
In your opinion, how does adherence to triage protocols impact patient outcomes?	
Significantly improves	51(50.5)
Somehow improves	45(44.5)
No impact	3(3)
Significantly worsens	2(2)

Table 2 presents the participants' perceptions regarding the effectiveness of current triage protocols and their impact on patient outcomes. A majority of respondents believed that the protocols adequately addressed the needs of traumatic patients, with 57.4% rating them as effective and 28.7% as very effective. This indicates that most healthcare providers recognize the triage system as a reliable tool in guiding trauma management. Regarding the impact of adherence to triage protocols on patient outcomes, half of the respondents (50.5%) reported that it significantly improves outcomes, while 44.5% believed it somehow improves outcomes. These findings suggest that participants generally acknowledge the critical role of triage protocols in enhancing patient care and ensuring better clinical outcomes in trauma management.

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Table 3: Level of Compliance on Triaging Form for Medical, Nursing Staff and Medical Students

Variables	N=101 (%)
How often are outcomes and compliance reviewed in relation to triage effectiveness?	
Regularly	30(29.7)
Occasionally	34(33.7)
Never	37(36.6)
How well are urgent cases prioritized in the triage process?	
Very Good	63(62.4)
Good	27(26.7)
Neutral	6(5.9)
Poor	2(2)
Very poor	3(3)
Have there been cases where non-compliance with triage protocols resulted in adverse outcomes?	
Yes	21(20.8)
No	63(62.4)
Not sure	17(16.8)

As shown in Table 3, the frequency of reviewing outcomes and compliance with triage protocols varied among respondents. Only 29.7% reported that reviews were conducted regularly, while 33.7% indicated they were carried out occasionally. Notably, more than one-third (36.6%) stated that compliance was never reviewed; suggesting gaps in monitoring and feedback mechanisms. With regard to prioritization of urgent cases, most respondents rated the triage process positively, with 62.4% describing it as very good and 26.7% as good. indicating partial compliance with how urgent cases are managed through the triage system. When asked whether non-compliance with triage protocols had ever led to adverse outcomes, 20.8% confirmed such occurrences, whereas the majority (62.4%) reported no such cases, and 16.8% were unsure. These findings highlight that while compliance is largely effective, lapses in adherence to triage protocols may still result in negative consequences for patients.

Table 4. The factors Inhibiting medical, nursing staff and medical students to triage patients

Variables	N=101 (%)
Are there common challenges or barriers to implementing triage protocols?	
yes	50(49.5)
No	38(37.6)
Not sure	13(12.9)

As shown in Table 4, nearly half of the respondents (49.5%**)** acknowledged the presence of common challenges or barriers to implementing triage protocols. On the other hand, 37.6% reported no barriers, while 12.9% were not sure. These findings indicate that although many healthcare workers are aware of obstacles that may hinder effective triage, a substantial proportion either do not perceive such barriers or lack sufficient awareness of them. This highlights the importance of identifying and addressing specific challenges such as lack of continuous training, updated protocol and better triage tool that could compromise the efficiency and consistency of triage practices.

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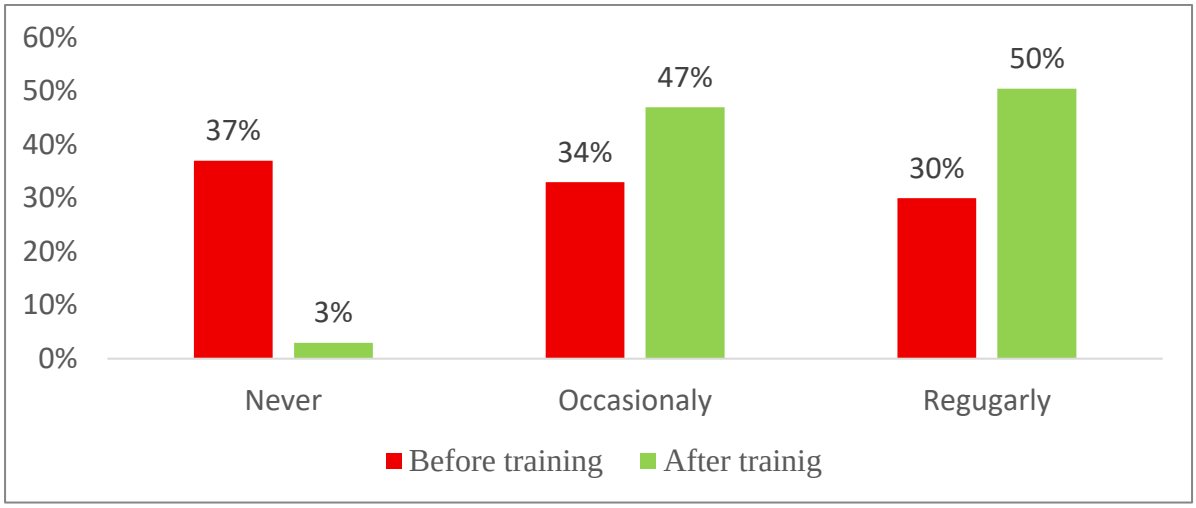

Figure 1: How often are Outcomes and Compliance Reviewed in Relation to Triage Effectiveness before and after Training?

The figure1 illustrates how often medical and nursing staff reviewed outcomes and compliance related to triage effectiveness before and after receiving training. Before training, a significant proportion of staff (37%) reported that outcomes and compliance were never reviewed, while 34% reported occasional review, and only 30% indicated that reviews were conducted regularly. After training, there was a noticeable improvement: only 3% of staff reported never reviewing outcomes and compliance, 47% reported occasional review, and 50% reported regular review. The training on triage protocols was associated with a substantial increase in the regularity of reviewing outcomes and compliance. The proportion of staff regularly reviewing triage effectiveness increased from 30% to 50%, while those who never reviewed decreased sharply from 37% to 3%. This suggests that training not only improved knowledge but also positively influenced staff behavior regarding monitoring and evaluation of triage practices.

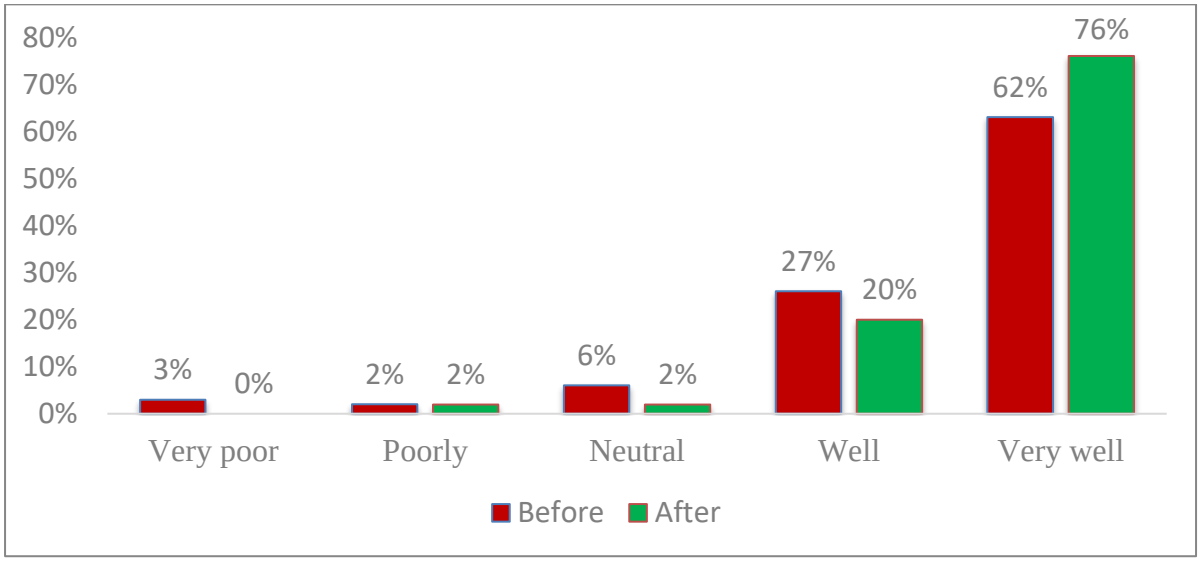

Figure 2: How well are Urgent Cases Prioritized in the Triage Process before and after Training

The figure 2 shows how staff rated the prioritization of urgent cases in the triage process before and after training: Before training, most participants (62%) rated the prioritization as very well, 27% as well, 6% as neutral, 2% as poorly, and 3% as very poor. After training, the proportion of participants rating the prioritization as very well increased to 76%, while those rating it as well decreased slightly to 20%. The percentages for neutral**,** poorly, and very poor decreased or remained minimal (2%, 2%, and 0%, respectively). The results indicate an improvement in staff perception of the triage process after training. The increase in the "very well" category from 62% to 76% suggests that training enhanced staff confidence in effectively prioritizing urgent cases.

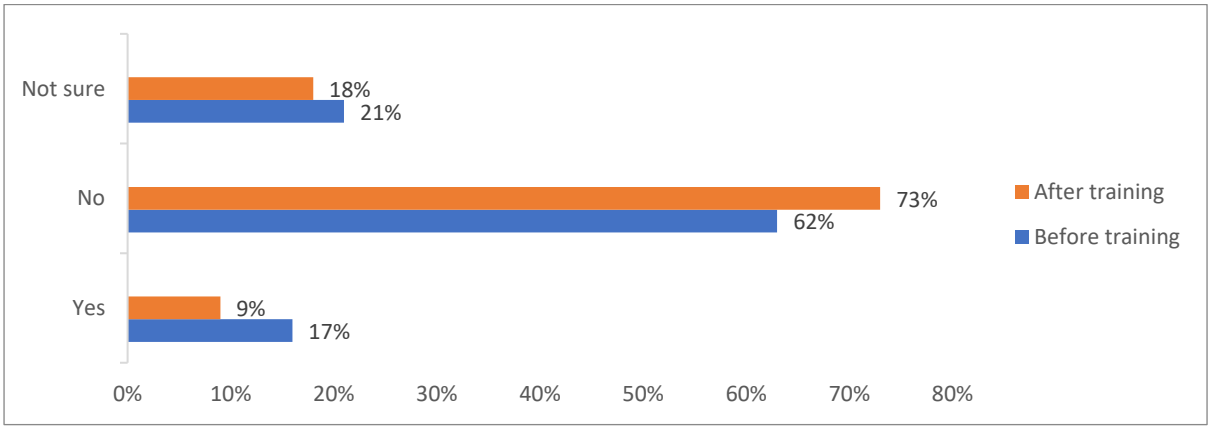

Figure 3: Have there been Cases Where Non-Compliance with Triage Protocols Resulted in Adverse Outcomes before and after Training

The figure 3 depicts the occurrence of adverse outcomes associated with non-compliance to triage protocols before and after staff training: Before training, 17% of participants reported that non-compliance had resulted in adverse outcomes, 62% reported no such cases, and 21% were not sure. After training, the proportion reporting adverse outcomes decreased to 9%, while those reporting no adverse outcomes increased to 73%, and the "not sure" category slightly decreased to 18%. These findings suggest that training on triage protocols contributed to a reduction in adverse outcomes related to non-compliance. The decrease in reported cases from 17% to 9% indicates improved adherence to protocols, while the increase in the "no" category reflects greater confidence and effectiveness in following triage procedures.

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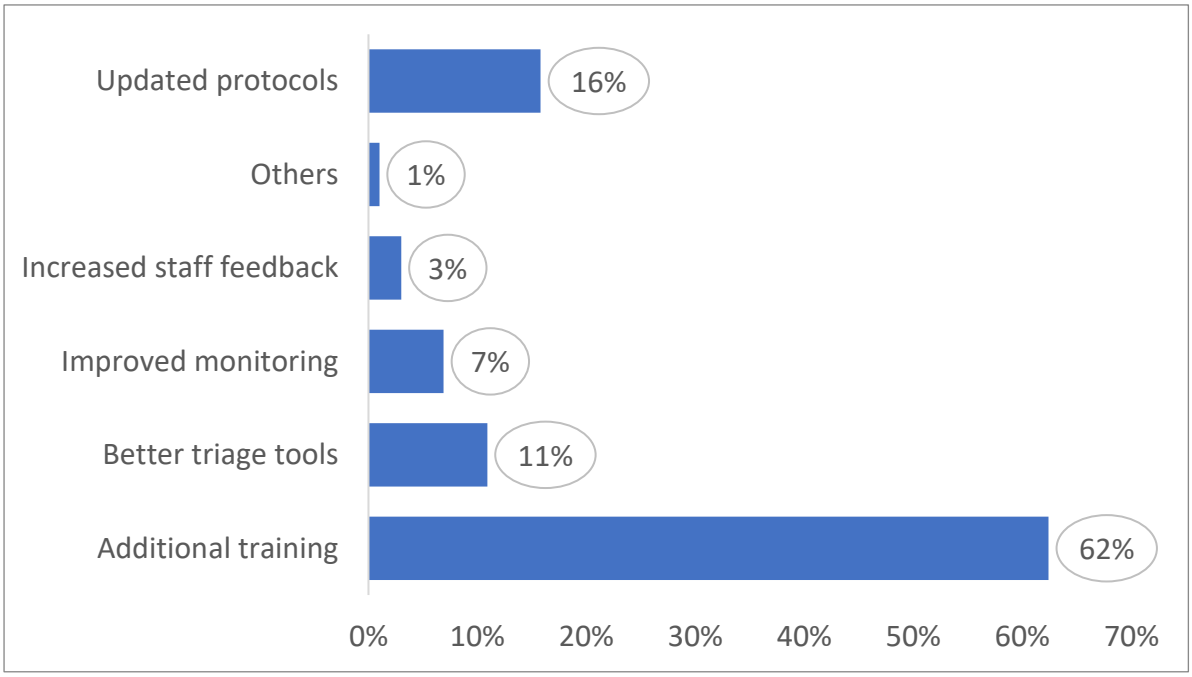

Figure 4: What Improvements could be made to the Current Triage Process?

Figure 4 presents the participants' suggestions on ways to improve the current triage process. The majority (62%) recommended additional training for staff as the most important improvement. Other suggested areas included updated protocols (16%), better triage tools (11%), improved monitoring (7%), and increased staff feedback (3%), while only 1% proposed other unspecified improvements. These results highlight that most staff view capacity-building through training as the key strategy to strengthen triage practices. Although other areas such as protocols, tools, and monitoring were mentioned, their lower frequencies suggest that addressing knowledge and skills gaps through on-going training could have the greatest impact on enhancing triage effectiveness.

Discussion

This study assessed the knowledge, compliance, and barriers related to triage protocols among healthcare workers managing trauma cases at a tertiary hospital. The findings indicate generally good knowledge of triage processes, but also highlight gaps in compliance monitoring and challenges that could undermine effective implementation with similar study done in 2022 from King Fahad Medical City, Saudi Arabia, reported good knowledge levels among emergency nurses, yet highlighted persistent deficits in correct triage practice. This supports the current findings that knowledge alone is insufficient without robust monitoring and institutional support to sustain adherence to protocols. (AlShatarat et al., 2022) The same study findings In 2024 Kathmandu Valley, Nepal, healthcare workers across different levels were familiar with triage, but consistent use of protocols was limited by disparities in training and communication.(Shrestha et al., 2024) the same study findings In 2017 Northern Ethiopia, evaluation of a newly introduced triage system revealed that only 42% of patient charts had triage forms completed, with frequent under- and over-triage, demonstrating poor compliance despite awareness of the system.(Abdelwahab et al., 2017) The same study results in 2024 a systematic review of global pre hospital trauma triage compliance also found wide variability (21–93%), showing that even with established guidelines, compliance is inconsistent in health

care providers.(van Rein et al., 2018) Similarly, study results 2024 on EMS staff triage knowledge showed good general understanding but partial awareness of specific waiting times and criteria, again reflecting knowledge without complete compliance.(Abuljadail et al., 2024).

Contrarily to the current study findings In 2019 Hawassa, Ethiopia, more than half of emergency nurses scored low in triage knowledge, despite perceiving themselves as competent.(Duko et al., 2019) Controversially study in 2021 a study on triage knowledge and skills among nurses in Rwandan referral hospitals, reported that majority (63.6%) of nurse participants had *low* level of triage knowledge, and about *47.9%* had low triage skills.(Twagirayezu et al., 2021) in 2024 a systematic review of triage implementation in low- and middle-income countries, found that while triage systems often led to improved outcomes, their effectiveness was undermined by weak compliance, lack of supervision, and resource constraints.(Mitchell et al., 2024) In contrast to the present study, where gaps in compliance monitoring were observed, research done in 2019 in Kenya evaluating the South African Triage Scale (SATS) in a major East African emergency department demonstrated improved compliance with triage decisions following an educational intervention.(Wangara et al., 2019) and also the study conducted in 2019 found that compliance with trauma triage criteria was generally high for full.(Linder et al., 2019)

Significance of the Study

- The study will contribute to enhancing the quality and timeliness of trauma patient management at University Teaching Hospital of Butare (CHUB) by promoting consistent use of triage protocols in emergency and surgery departments.
- The study will help establish a standardized triage system, reducing variations in patient assessment and documentation.
- Training sessions developed through this study will strengthen the competencies of medical and nursing staff in triage practices, fostering professional development and confidence in handling trauma cases.
- Better triage compliance will promote appropriate prioritization of care, improving workflow efficiency and optimizing the use of limited resources in high-demand departments.
- Enhancing the use of a shared triage tool can strengthen communication and collaboration between emergency and surgical teams, ensuring continuity of care.
- The study will serve as a baseline for future investigations on triage system effectiveness, sustainability, and scalability in other departments or hospitals.

The Limitation

The study was conducted only at University Teaching Hospital of Butare (CHUB), which may limit the generalizability of the findings to other hospitals or settings with different resources and staff structures and limited time.

Conclusion

This study revealed that while triage protocols and standardized tools for traumatic patients are widely available in the emergency and surgical departments of University Teaching Hospital of Butare (CHUB), gaps remain in staff knowledge, compliance, and monitoring practices. Nearly half of the participants reported facing barriers to effective triage implementation, such

as limited training and inconsistent protocol adherence. The introduction of targeted training significantly improved staff knowledge, the prioritization of urgent cases, regular review of compliance, and reduced adverse outcomes related to non-compliance.

These findings underscore the importance of continuous training, regular audits, and effective communication across departments to strengthen adherence to triage protocols. Establishing a structured and consistent triage system can enhance timely decision-making, optimize resource use, and ultimately improve patient outcomes. The study provides a valuable foundation for future initiatives aimed at sustaining and scaling up triage practices within CHUB and potentially in other healthcare settings.

Implications of the Study

This study demonstrated that although standardized triage tools for managing traumatic patients are available in the emergency and surgical departments of CHUB, gaps persist in healthcare workers' knowledge, compliance, and monitoring practices. Nearly half of the participants reported barriers to effective triage implementation, including limited training opportunities and inconsistent adherence to established protocols. However, the introduction of targeted training interventions resulted in measurable improvements in staff knowledge, prioritization of urgent cases, routine review of triage compliance, and a reduction in adverse outcomes related to non-compliance.

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Authors' Contribution

Dorothee NIYONSABA was the primary investigator and led the study design, data collection, data analysis and manuscript preparation, Fidele HAKORIMANA contributed to study design, data analysis, manuscript review and critical revision, Gratien NZAYIKORERA was responsible for study design, data collection and data analysis, Jean Bernard NSENGIYUMVA was responsible for data collection and data analysis, and Amaunel Kidane Andegiorgish was for manuscript review and data analysis. All authors were revised the study with a common understanding.

Conflict of Interest

There are no competing conflicts of interest to disclose.

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