https://doi.org/10.1186/s12245-025-01005-z

International Journal of Emergency Medicine

RESEARCH

Open Access

Effectiveness of a structured triage system in improving timeliness of emergency care in a resource-limited rural hospital in Uganda

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Abstract

Background Triage is essential for optimising resource allocation in emergency care, particularly in low- and middle-income countries. Some triage tools, such as the Interagency Integrated Triage Tool (IITT), have been developed specifically for resource-limited settings, but their implementation and evaluation remain challenging due to shortages of staff, limited training opportunities, and infrastructure constraints. This study aimed to evaluate the impact of implementing a structured triage system adapted from the IITT on the identification of urgent/emergency cases and wait times compared with unstructured nursing assessment alone in a rural general hospital in Uganda.

Methods A prospective quality improvement study was conducted in the outpatient department (OPD) of Dr Ambrosoli Memorial Hospital in Kalongo, Uganda. Data were collected on all patients attending the OPD for 7 consecutive days before and after IITT implementation. Outcomes included changes in emergency/urgent cases identification, proportion of undertriage/overtriage using hospital admission as the gold standard for assessing triage accuracy, OPD wait times and total OPD length of stay. Multivariable regression was used to adjust for confounders.

Results A total of 304 patients in the pre-implementation period and 246 patients in the post-implementation period were included in the analysis. After implementation of the IITT, the proportion of emergency/urgent cases increased from 16.4% to 22.8%, but there was no significant association between IITT implementation and identification of emergency/urgent cases, overtriage and undertriage after adjustment for confounders. IITT implementation was associated with a 23-minute reduction in time to provider (95% CI -35.49 to -12.03, $p < 0.001$) and a 35-minute reduction in total OPD length of stay (95% CI -57.41 to -12.76, $p = 0.002$).

Conclusions A structured triage system adapted from the IITT showed similar proportions of overtriage and undertriage compared with unstructured nursing assessment alone, but improved patient flow by significantly reducing wait times and length of stay in the OPD of a resource-limited rural hospital in Uganda. These findings suggest that structured triage can be feasibly implemented without additional resources in similar low-resource hospitals; however, further studies are needed to fully assess the impact of IITT in this and similar settings.

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Keywords Triage, Emergency medical services, Rural hospitals, Developing countries, Resource-limited settings

Introduction

Low- and middle-income countries (LMICs) face a high burden of acute illness and injury, with morbidity and mortality exacerbated by a lack of organized emergency care systems and limited healthcare resources [1, 2]. Triage systems, which categorise patients according to severity of illness, help to optimise resource allocation and ensure that those in need of immediate care are prioritised [3]. As in other low-income countries, most hospitals in Uganda receive patients with urgent and emergent conditions in the outpatient department (OPD), where the lack of a formal triage protocol might delay their identification among non-urgent patients seeking primary and routine ambulatory care [4, 5].

Triage tools developed for high-resource settings often do not translate well to LMICs due to differences in human resource availability, clinician training and disease epidemiology [3]. A few triage systems have been designed specifically for resource-limited health settings, such as the Interagency Integrated Triage Tool (IITT), which was developed by the World Health Organization (WHO), the International Committee of the Red Cross and Médecins Sans Frontières in 2020, and adopted by the Ugandan Ministry of Health in 2021 [6]. While incorporating the principles of other triage protocols, the IITT is simpler to use and is designed for both adults and children, making it well-suited for providers with minimal formal training [3, 7]. While structured triage systems have shown acceptable levels of reliability and validity in some LMIC emergency settings, only a limited number of moderate-quality studies have examined whether they can improve the quality and timeliness of emergency care [8–14]. In particular, no study has assessed the effect of IITT implementation on OPD wait times. In addition, there are unique challenges in evaluating the feasibility and impact of structured triage systems in rural general hospitals with limited resources [15].

The aim of this study was to evaluate the effectiveness of a structured triage system adapted from the IITT in identifying urgent/emergency cases and reducing wait times and length of stay compared with unstructured nursing assessment alone in the OPD of a rural general hospital in Uganda.

Methods

Study design

This quality improvement study was conducted in the OPD of Dr Ambrosoli Memorial Hospital in Kalongo, Uganda. Data were collected prospectively for 7 consecutive days, excluding weekends, during two distinct time periods: one month before the implementation of a structured triage system adapted from the IITT (14 March 2024 to 22 March 2024) and two months after its implementation (24 June 2024 to 2 July 2024). The study is reported following the Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0).

Setting and participants

Dr Ambrosoli Memorial Hospital is a general hospital located in Kalongo Town Council, Agago District, Northern Uganda. Although being a private not-for-profit facility, the hospital functions as the district referral hospital for almost 400,000 people and faces the same staffing shortages and infrastructure constraints as most rural general hospitals in Uganda. The OPD is the first point of contact for patients seeking medical care at the hospital, and it has a dual role, providing both primary and emergency care. The OPD is staffed by a small nursing team consisting of two registered nurses with a 4-year diploma in nursing, five enrolled nurses with a 2½-year certificate in nursing, and five nursing assistants, all working in shifts.

All patients presenting to Dr Ambrosoli Memorial Hospital OPD during the study period were included. Patients with missing triage data were excluded from the analysis.

Intervention

Prior to the implementation of the IITT, emergency and urgent cases were identified by nurses either through a quick visual assessment upon arrival or during an unstructured nursing assessment that included an evaluation of presenting complaints and vital signs. No severity codes were assigned to patients based on their condition during the pre-implementation period, but emergency and urgent patients identified based on the nurse's subjective judgment were assigned to the emergency care area of the OPD and prioritised for a clinician visit. The remaining non-urgent patients were evaluated in the order of their arrival in the ambulatory care area.

The quality improvement intervention involved the implementation of the IITT, which is based on a three-colour coding system. The tool was adapted into a checklist that was printed on the first page of each patient's OPD chart (Supplementary Fig. 1). Nurses received a brief introduction to the use of the triage checklist and a 2-hour in-person group lecture on IITT prior to structured triage system implementation. During nursing assessment, nurses were asked to use this checklist to assign a triage colour code. To ensure that the assigned code was easily identifiable, a corresponding-coloured reusable fabric wristband (green, yellow or red) was attached to each patient's arm. The triage tool was piloted for two months prior to the post-implementation data collection phase to allow nurses to familiarise themselves with the new system. During the two-month pilot phase, the research team observed OPD activity and provided ad-hoc feedback to reinforce adherence to the checklist. No formal audit tool was used, but informal supervision confirmed that wristbands and checklist coding were consistently applied.

Data collection and measurements

Patient data are routinely collected in the OPD during weekdays by a data entry clerk using a standardised paper-based outpatient register provided by the Ugandan Ministry of Health. Data on patients admitted to the hospital were cross-checked with inpatient registries, and all data were later transferred to an Excel spreadsheet for analysis. For some patients, certain data points were not recorded either because the patient did not see the data entry clerk before leaving the OPD or because the clinician did not record the data in the OPD clinical notes. In such cases, each variable was analysed based on the available data only.

The primary outcome of the study was the proportion of patients classified as emergency or urgent cases before and after the implementation of the IITT. In the pre-implementation period, patients were defined as emergency/urgent cases if assigned by the nurses to the emergency care area. In the post-implementation period, emergency/urgent patients were defined as those with red (emergency) or yellow (urgent) triage codes. Secondary outcomes included the proportion of undertriage, defined as the percentage of non-urgent patients admitted to the hospital, the proportion of overtriage, defined as the percentage of urgent/emergency patients discharged from the OPD, OPD wait times and total OPD length of stay (Fig. 1).

Statistical analysis

Included patients were compared with patients excluded due to missing triage category to assess if missingness was at random. OPD visits with complete triage data recorded before IITT implementation were compared with those in the post-implementation period. Categorical variables are reported as frequencies and percentages, while numerical variables are summarised as medians with interquartile ranges (IQRs). Descriptive statistics were performed using Pearson's chi-squared or Fisher's exact test for categorical variables and the Mann-Whitney U test or Kruskal-Wallis test for numerical variables. Primary and secondary outcomes were analysed using logistic regression for binary outcomes

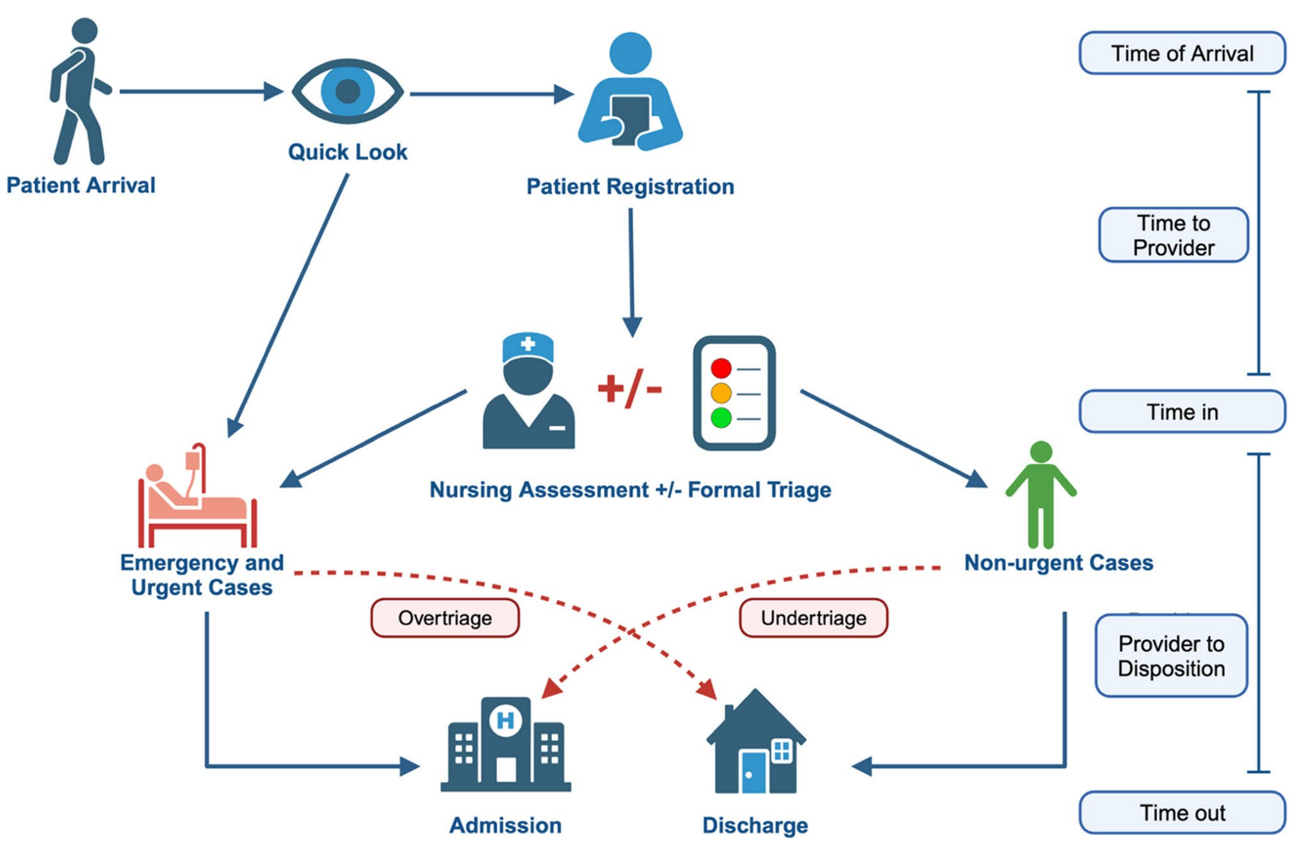

Fig. 1 Patients flow in the outpatient department (OPD) and study metrics. Image created in https://BioRender.com

Table 1 Characteristics of patients included in the two study periods

	Pre-implementation (N=304)	Post-implementation (N=246)	P value
Age – median (IQR)	24 (9–45)	20 (6–43)	0.13
Sex			0.95
Male	108 (35.5%)	88 (35.8%)	
Female	196 (64.5%)	158 (64.2%)	
Return visit	65 (21.4%)	34 (13.8%)	0.022
Diagnosis			
Malaria	33 (10.9%)	57 (27.0%)	< 0.001
Systemic infection	27 (8.9%)	25 (11.8%)	0.28
Respiratory tract infection	29 (9.6%)	27 (12.8%)	0.25
Gastroenteritis/acute watery diarrhoea	15 (5.0%)	16 (7.6%)	0.22
Urinary tract infection	47 (15.5%)	21 (10.0%)	0.067
Genital infection	30 (9.9%)	16 (7.6%)	0.37
Intra-abdominal infection	0 (0.0%)	3 (1.4%)	0.069
Gastritis/peptic ulcer disease	23 (7.6%)	21 (10.0%)	0.35
Trauma/injury	28 (9.2%)	24 (11.4%)	0.43
Pregnancy-related complaints	12 (4.0%)	7 (3.3%)	0.70
Allergy/asthma	3 (1.0%)	5 (2.4%)	0.28
Severe acute malnutrition	5 (1.7%)	3 (1.4%)	1.00
Renal failure	5 (1.7%)	4 (1.9%)	1.00
Liver failure/cirrhosis	2 (0.7%)	3 (1.4%)	0.41
Sickle cell disease	6 (2.0%)	13 (6.2%)	0.013
Hypertension	31 (10.2%)	5 (2.4%)	< 0.001
Diabetes mellitus	13 (4.3%)	6 (2.8%)	0.39
Cardiac disease	3 (1.0%)	4 (1.9%)	0.45
Epilepsy	24 (7.9%)	1 (0.5%)	< 0.001
Other neurological disorder	17 (5.6%)	16 (7.6%)	0.37
Psychiatric disorder/intoxication	3 (1.0%)	6 (2.8%)	0.17
Disposition			0.12
Discharge	243 (79.9%)	183 (74.4%)	
Admission	61 (20.1%)	63 (25.6%)	
Ward of admission	n=61	n=63	0.58
Medical	15 (25%)	17 (27%)	
Surgical	10 (16%)	6 (10%)	
Paediatric	27 (44%)	32 (51%)	
Maternity	7 (11%)	4 (6%)	
High-dependency unit	2 (3%)	4 (6%)	
Length of hospital stay (days)	5 (3, 8) (n=46)	4 (2, 6) (n=53)	0.15
Hospital outcome	n=61	n=63	0.72
Discharge	44 (72%)	50 (79%)	
Transfer out	1 (2%)	2 (3%)	
Death	1 (2%)	3 (5%)	
Not available	15 (25%)	8 (13%)	

and linear regression for continuous outcomes. Multivariable logistic and linear regression analyses were performed to adjust for potential confounding factors such as malaria diagnosis and outpatient re-attendance status, using implementation of IITT as the primary explanatory variable. Results were presented as odds ratios (ORs) with 95% confidence intervals (CIs). To assess the robustness of the results, sensitivity analyses were conducted stratifying patients by age, OPD discharge diagnosis, re-attendance status, disposition decision and triage code. A P value of less than 0.05 was considered statistically significant. All analyses were performed using Stata statistical software, version 17 (StataCorp LLC, College Station, TX, USA).

Ethics

This study was performed in line with the principles of the Declaration of Helsinki. The project was submitted for institutional review and approved by the management of Dr Ambrosoli Memorial Hospital as a quality improvement activity. Patient consent was waived as the study used deidentified data routinely collected for quality improvement purposes in the OPD.

Results

A total of 553 and 535 patients visited Dr Ambrosoli Memorial Hospital OPD during the 7-day pre- and post-implementation periods, respectively. Of these, 304 (55%) patients in the pre-implementation period and 246 (46%) patients in the post-implementation period had complete data on triage category and were included in the analysis (Supplementary Fig. 2). Compared with excluded patients, included patients had a higher proportion of hospitalizations in both periods (20.1% vs. 12% pre-implementation and 25.6% vs. 15.2% post-implementation) (Supplementary Table 1).

Study population characteristics

Demographic, clinical characteristics and outcomes of the 550 included patients are summarized in Table 1. The majority of patients were female in both the pre- (64.5%) and post-implementation periods (64.2%); the median age was 24 (IQR 9–24) years and 20 (IQR 6–43) years in the pre- and post-implementation periods, respectively. The post-implementation population included more patients with malaria (10.9% vs. 27%, $p < 0.001$) and sickle cell disease (2% vs. 6.2%, $p = 0.013$), fewer patients with hypertension (10.2% vs. 2.4%, $p < 0.001$) and epilepsy (7.9% vs. 0.5%, $p < 0.001$), and a lower proportion of patients returning to the OPD for a follow-up visit (21.4% vs. 13.8%, $p = 0.022$). No differences were observed between the two periods with regard to the proportion of hospital admissions (20.1% vs. 25.6%, $p = 0.12$), type of ward and hospital outcome. There were no patient deaths during OPD stay in either study period.

Changes in the proportion of emergency/urgent cases, overtriage and undertriage

After implementation of the IITT, 10 (4.1%) patients were assigned a red code and 46 (18.7%) were assigned a yellow code, resulting in a total of 56 (22.8%) patients identified as urgent/emergent cases, compared to 50 (16.4%) urgent/emergency cases identified in the pre-implementation period. No significant association was observed between IITT implementation and identification of emergency/urgent cases in either unadjusted (OR 1.50, 95% CI 0.98–2.29, $p = 0.063$) or adjusted analyses (OR 1.29, 95% CI 0.81–2.04, $p = 0.283$). Higher proportions of both overtriage (2% vs. 6.1%) and undertriage (5.6% vs. 8.9%) were observed after IITT implementation, but the use of IITT was not significantly associated with a higher risk of either overtriage (OR 2.55, 95% CI 0.88–7.35, $p = 0.083$) or undertriage (OR 1.18, CI 0.57–2.43, $p = 0.44$) after adjustment for potential confounders. When stratified by age, the results of IITT implementation were similar to the overall cohort (Table 2).

Table 2 Association between triage outcomes and Interagency Integrated Triage Tool implementation

	Pre-implementation	Post-implementation	Odds Ratio (95% CI)	
	($N = 304$)	($N = 246$)	Unadjusted	Adjusted*
Emergency/urgent cases	50 (16.4%)	56 (22.8%)	1.50 (0.98–2.29)	1.29 (0.81–2.04)
Overtriage	6 (2%)	15 (6.1%)	3.23 (1.23–8.44)	2.55 (0.88–7.35)
Undertriage	17 (5.6%)	22 (8.9%)	1.66 (0.86–3.12)	1.18 (0.57–2.43)
Age < 12 years	$n = 84$	$n = 85$		
Emergency/urgent cases	18 (21%)	20 (24%)	1.13 (0.55–2.33)	0.89 (0.41–1.96)
Overtriage	1 (1%)	4 (5%)	4.10 (0.45–37.46)	2.25 (0.19–26.32)
Undertriage	10 (12%)	18 (21%)	1.99 (0.86–4.61)	1.84 (0.76–4.50)
Age ≥ 12 years	$n = 220$	$n = 161$		
Emergency/urgent cases	32 (14.5%)	36 (22.4%)	1.69 (1.00-2.87)	1.57 (0.89–2.76)
Overtriage	5 (2.3%)	11 (6.8%)	3.15 (1.07–9.26)	2.77 (0.86–8.96)
Undertriage	7 (3.2%)	4 (2.5%)	0.78 (0.22–2.69)	0.36 (0.09–1.47)

*The logistic regression model was adjusted for malaria diagnosis and outpatient department reattendance status

Trauma patients had a high proportion of overtriage cases both before and after IITT implementation, while among patients presenting with hypertension and pregnancy-related complaints the probability of overtriage increased after IITT implementation. Both before and after IITT implementation, the diagnoses for which undertriage was more common were malaria, pregnancy-related complaints, and renal failure (Fig. 2).

No differences in the primary and secondary outcomes were observed between the two study periods in sensitivity analyses conducted after excluding patients who returned for follow-up visits and after restricting observations to malaria and trauma patients (Supplementary Table 2).

Changes in OPD wait times and total OPD length of stay

OPD wait times decreased with increasing triage code severity in both the pre- and post-implementation periods (Supplementary Fig. 3). Linear regression analysis was performed to assess the effect of IITT implementation on OPD wait times (Table 3). In the adjusted analysis, IITT implementation was associated with a 23-minute reduction in time to provider (β −23.76, 95% CI −35.49 to −12.03, $p < 0.001$) and a 35-minute reduction in total OPD length of stay (β −35.09, 95% CI −57.41 to −12.76, $p = 0.002$), while no significant change was observed in time from provider to disposition (β −5.20, 95% CI −29.63 to 19.23, $p = 0.676$). When stratified by disposition decision, the results remained consistent only for patients discharged home. Similarly, when stratified by triage code, a reduction in time to provider and total OPD length of stay was associated with IITT implementation only in patients classified as non-urgent and, although not statistically significant, there was a trend towards increased time to provider for urgent/emergency cases following IITT implementation (Table 3).

Discussion

This study evaluated the impact of introducing a structured triage tool based on the IITT in the OPD of a rural general hospital in Uganda, as compared with the previous practice of identifying emergency and urgent cases based on unstructured nursing assessment alone. Although the use of a IITT, after adjustment for confounders, was not significantly associated with changes in the proportion of patients classified as urgent or

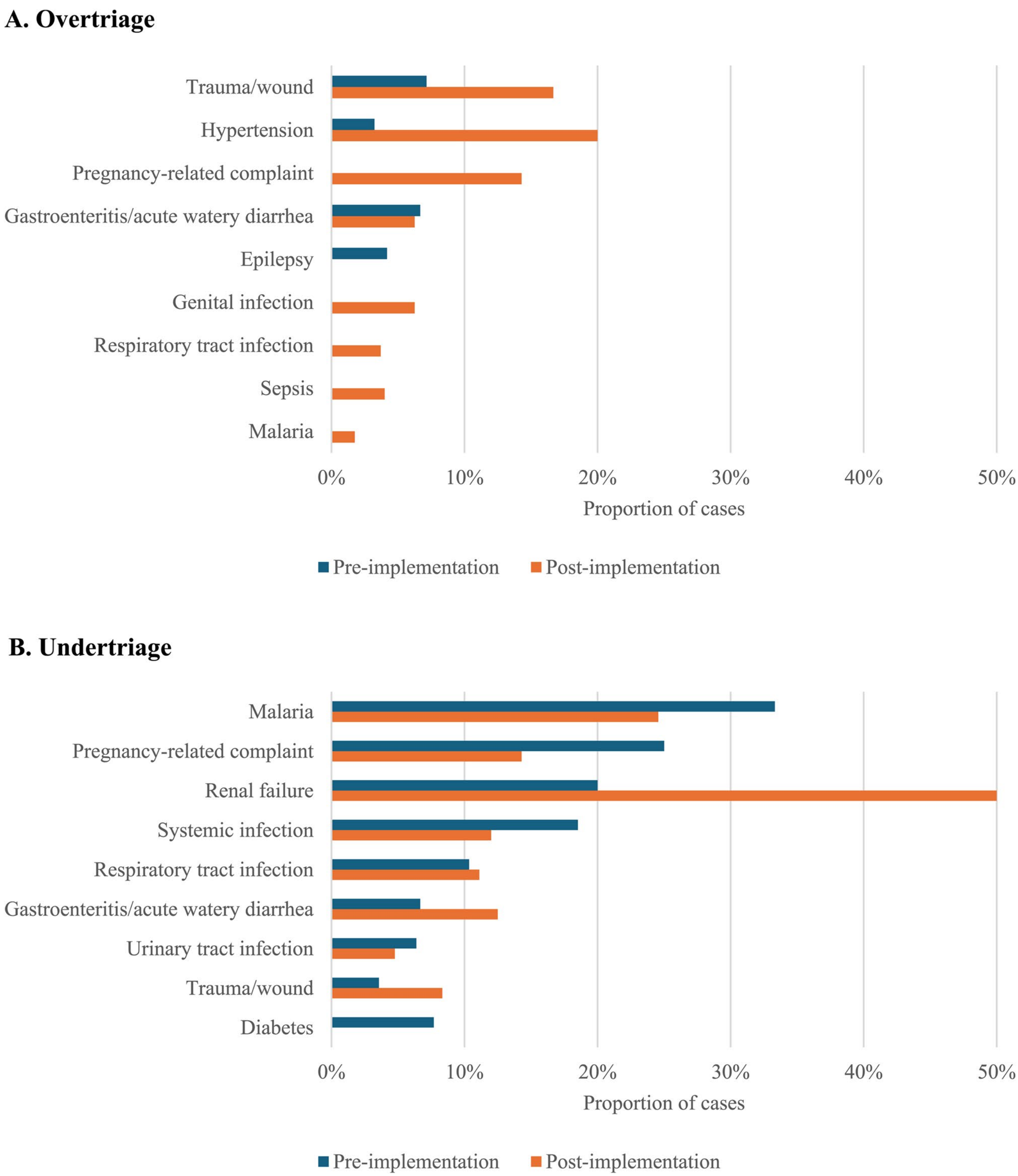

Fig. 2 Outpatient department (OPD) diagnoses associated with overtriage and undertriage. The graph shows the proportion of cases of overtriage (**A**) and undertriage (**B**) for OPD diagnoses with at least one case of overtriage/undertriage in the two study periods

Table 3 Association between outpatient department wait times and Interagency Integrated Triage Tool implementation

	Pre-implementation	Post-implementation	Coefficient (95% CI)	
			Unadjusted	Adjusted*
Time to provider (min)	65.5 (29–103) (*n* = 158)	42.5 (24–68) (*n* = 104)	−23.26 (−34.70 to −11.82)	−23.76 (−35.49 to −12.03)
Provider to disposition (min)	150 (84–231) (*n* = 159)	156 (97.5–227) (*n* = 104)	1.08 (−23.01 to 25.17)	−5.20 (−29.63 to 19.23)
Total length of stay in OPD (min)	206.5 (119–307) (*n* = 280)	177 (111–259) (*n* = 141)	−28.66 (−51.40 to −5.91)	−35.09 (−57.41 to −12.76)
Hospitalization				
Time to provider (min)	30 (9–65) (*n* = 39)	34 (7–62) (*n* = 33)	−5.18 (−25.04 to 14.69)	−6.31 (−26.43 to 13.81)
Provider to disposition (min)	129.5 (70–219) (*n* = 38)	126 (77–164) (*n* = 33)	−11.31 (−53.87 to 31.25)	−21.58 (−64.08 to 20.91)
Total length of stay in OPD (min)	151 (87–251) (*n* = 51)	160 (122–217) (*n* = 35)	−11.78 (−55.79 to 32.23)	−23.27 (−67.01 to 20.54)
Discharge				
Time to provider (min)	75 (39–107) (*n* = 119)	43 (27–71) (*n* = 71)	−28.11 (−41.56 to −14.66)	−29.5 (−43.57 to −15.57)
Provider to disposition (min)	165 (106–235) (*n* = 121)	173 (111–240) (*n* = 71)	9.78 (−19.18 to 38.74)	−4.69 (−33.82 to 24.44)
Total length of stay in OPD (min)	225 (126–312) (*n* = 229)	190 (110–275) (*n* = 106)	−29.93 (−56.15 to −3.72)	−41.62 (−66.57 to −16.68)
Emergency/urgent cases				
Time to provider (min)	15 (7–31) (*n* = 29)	26 (7–58) (*n* = 26)	9.37 (−9.31 to 28.01)	5.62 (−12.96 to 24.20)
Provider to disposition (min)	129 (51–154) (*n* = 28)	119 (63–197) (*n* = 27)	3.54 (−47.95 to 55.02)	−3.88 (−55.73 to 47.97)
Total length of stay in OPD (min)	137 (74–191) (*n* = 41)	132 (85–204) (*n* = 31)	−9.77 (−60.19 to 40.65)	−15.57 (−67.10 to 35.96)
Non-urgent cases				
Time to provider (min)	78 (43–107) (*n* = 129)	45.5 (27–70) (*n* = 78)	−29.18 (−41.79 to −16.57)	−31.44 (−44.47 to −18.41)
Provider to disposition (min)	170 (109–235) (*n* = 131)	167 (114–235) (*n* = 77)	4.55 (−22.72 to 31.82)	−8.43 (−35.63 to 18.76)
Total length of stay in OPD (min)	226 (138–311) (*n* = 239)	195 (121–274) (*n* = 110)	−27.59 (−52.68 to −2.51)	−38.84 (−62.59 to −15.09)

*The linear regression model was adjusted for malaria diagnosis and outpatient department reattendance status. Results are presented as median (IQR)

emergency, nor with changes in the proportion of under- or overtriage cases, it reduced both time to provider and overall length of stay in the OPD, highlighting its potential to improve patient flow and efficiency in resource-limited settings.

Quick look or eyeball triage involves a rapid, non-systematic visual assessment of patients' general appearance to estimate how ill they are [16]. Some studies have debated whether this subjective method is as reliable as more resource-intensive, structured triage systems for identifying patients requiring urgent care [17, 18]. In our study, we found that the informal triage method used in the pre-implementation period had good accuracy, with a proportion of undertriage cases of only 5.6%, which is close to the maximum threshold of 5% recommended by the American College of Surgeons Committee on Trauma [19]. This result may be due to the expertise of the nurses working in the OPD, all of whom had more than one year's experience in patient evaluation in emergency settings. Following the implementation of the IITT, there was a slight increase in the proportion of emergency/urgent cases, but also of undertriage cases, which rose to 8.9% of all cases. However, these differences were not significant after adjusting for the higher incidence of malaria in the post-implementation period. In fact, severe malaria, particularly in children, accounted for most of the undertriage cases. Given the non-specific presentation associated with severe malaria, accurate triage based solely on presenting complaints and vital signs remains challenging [20]. A more effective approach might be to integrate point-of-care malaria rapid diagnostic tests and haemoglobin estimation directly at triage to improve early identification and prioritisation of these high-risk patients [21].

An increase in the proportion of emergency/urgent cases after implementation of IITT may also have been due to a slight increase in overtriage, although this change was not statistically significant in the multivariable analysis probably due to the small sample size. While we would ideally prefer a triage system with high sensitivity at the expense of specificity, excessive overtriage can be problematic. Overtriage of too many non-urgent cases could delay treatment for truly critical patients [22]. Indeed, we observed a trend towards increased time to provider for urgent cases following IITT implementation, suggesting that excessive overtriage could affect the efficiency of care for high-priority patients. The cases with the highest proportion of overtriage were patients presenting with trauma, pregnancy-related conditions and uncontrolled hypertension. These patients do not necessarily require hospitalization, even if they often require to be seen urgently in the emergency department. Assessing the validity of triage scales is difficult because there is no definitive measure of urgency that can be used to clearly define under- and overtriage [23]. Many studies use surrogate measures such as admission and mortality, but these measures have limitations [12–14, 24, 25]. In our study, we used hospitalisation as the gold standard for assessing triage accuracy, as patients at Dr Ambrosoli Memorial Hospital cannot receive definitive treatment such as antimalarials or antibiotics while still in the OPD. We acknowledge that this methodological choice may have led to misclassification of over- and undertriage, since some emergencies can be safely discharged, while some admissions may not be true emergencies. To improve OPD efficiency for patients who do not need to be admitted to the hospital but still need timely care, such as minor trauma and pregnant patients, the implementation of fast-track and nurse-initiated protocols could help ensure that they receive rapid attention without affecting the flow of truly critical cases [26, 27].

Previous studies have shown that the implementation of structured triage systems in emergency departments in LMICs is associated with improved wait times and reduced patient mortality [12–14]. Our study is the first to evaluate the impact of IITT implementation on OPD wait times. While time to provider for urgent and emergency patients was already low in the pre-implementation period, the introduction of the IITT led to a 30-minute reduction in time to provider for non-urgent patients. This improvement may reflect a more efficient nursing assessment process facilitated by the structured triage tool [28].

Implementing and evaluating a structured triage system in resource-limited settings presents unique challenges [3, 7, 15]. Staff shortages, limited equipment, constraints in providing comprehensive training and supervision, and the lack of designated areas for organising patients by triage category are all significant barriers [5, 29, 30]. Despite these limitations, we successfully implemented a structured triage system in a rural general hospital OPD without requiring additional staff, equipment or space and essentially at no cost.

Limitations

This study has several limitations. First, as a pre-post quality improvement study, we could not fully account for temporal effects that may have influenced the results. Although data were collected only a few months apart, with likely minimal changes in clinical practice between periods, the pre- and post-implementation cohorts differed mainly due to seasonal variations, with almost three times the prevalence of malaria in the post-implementation cohort. In addition, data were collected on different days of the week for each period, which affected the prevalence of conditions typically seen at weekly follow-up clinics. To account for these differences, we used multivariable regression to adjust for variations in malaria cases and frequency of follow-up visits. Another limitation was the small sample size and the substantial proportion of missing data, a common challenge in resource-limited settings without electronic health records. Patients with complete data had a higher proportion of hospital admissions, likely because some stable patients left the OPD before being formally discharged. This pattern suggests that missingness may have introduced selection bias; since patients with incomplete data were more often discharged, our estimates of triage performance may be skewed toward sicker patients, thereby limiting the external validity of the findings. Finally, this study did not evaluate the effect of IITT implementation on patient mortality and other outcome measures. This was largely due to the small sample size, which limited our power to detect changes in clinical outcomes, and the lack of follow-up data for patients discharged home. Future research with larger sample sizes, robust study designs such as cluster randomised trials or interrupted time series with use of concurrent control groups, inclusion of patient-centred outcome measures, and of qualitative assessment of provider experience and satisfaction is needed to fully assess the impact of IITT implementation in this and similar settings.

Conclusion

The implementation of a structured triage system adapted from the IITT in the OPD of a rural Ugandan hospital improved patient flow by significantly reducing time to provider and total length of stay. Importantly, the intervention was implemented with existing staff and no additional resources, supporting its feasibility and sustainability in similar LMIC settings. Structured triage implementation did not lead to significant changes in the identification of emergency/urgent cases or in the rates of under- and over-triage compared with unstructured nursing assessment alone after adjustment for confounders. Further research is needed to assess the long-term impact of IITT implementation on clinical outcomes in rural, resource-limited settings, using robust study designs and larger sample sizes.

Abbreviations

IITT	Interagency Integrated Triage Tool
OPD	Outpatient department
LMICs	Low- and middle-income countries
WHO	World Health Organization
IQRs	interquartile ranges
OR	Odds ratio
CI	Confidence interval

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12245-025-01005-z.

Supplementary Material 1.

Acknowledgements

The study team would like to thank James Ochola, who helped with data collection and access, and all the staff at Dr Ambrosoli Memorial Hospital outpatient department and the residents from the University of Milano-Bicocca who participated in this project. We would also like to thank Fondazione Ambrosoli for providing administrative assistance to this project and for supporting Dr Ambrosoli Memorial Hospital Kalongo.

Authors' contributions

All authors: Conceptualization and Writing - review and editing. LR: Data Curation, Formal Analysis, Investigation, Visualization, Writing - original draft. SO: Investigation. SO: Investigation. MO, FF, CO, MB: Supervision. LR had full access to all of the data in the study and takes responsibility for the integrity of the data, the accuracy of the data analysis, and for the paper as a whole. All authors read and approved the final manuscript.

Funding

None.

Data availability

The datasets generated and analysed during the current study are available from the corresponding author on request.

Declarations

Ethics approval and consent to participate

This study was performed in line with the principles of the Declaration of Helsinki. The project was submitted for institutional review and approved by the management of Dr Ambrosoli Memorial Hospital as a quality improvement activity. Patient consent was waived as the study used deidentified data routinely collected for quality improvement purposes in the outpatient department.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Received: 8 July 2025 / Accepted: 11 September 2025
Published online: 03 October 2025

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