



**St. Paul's Hospital
Millennium Medical College**

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**ASSESSMENT OF THE PERFORMANCE OF THE PEDIATRIC
TRIAGE SYSTEM OF ST PAUL'S HOSPITAL MILLENNIUM
MEDICAL COLLEGE AS PER THE NATIONAL ETAT
GUIDLINE**

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**Assessment of The Performance of The Pediatric Triage System of St Paul's
Hospital Millennium Medical College as per The National ETAT Guideline, Addis
Ababa, Ethiopia**

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ACRONYMS AND ABBREVIATIONS

ED-----	Emergency Department
ER-----	Emergency Room
ETAT-----	Emergency Triage, Assessment and Treatment
HCWs-----	Health care workers
LICs-----	Low Income Countries
SPHMMC-----	Saint Paul’s Hospital Millennium Medical College
SPSS-----	Statistical Package for Social Sciences
WHO-----	World Health Organization

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Abstract

Background

In the emergency department, it is important to identify and prioritize who requires an urgent intervention in a short period of time. Triage helps recognize the urgency among patients. An accurate triage decision helps patients receive the emergency service in the most appropriate time and triage errors creates opportunity for increased morbidity and mortality.

Objective

The objective of this study is to assess the performance of pediatric emergency triage system and associated factors with under-triaging and over-triaging in SPHMMC as per the national ETAT guideline from July 15 to September 15, 2021.

Methods

A cross sectional study design was performed in children visited pediatric emergency in SPHMMC. Data was collected by chart review of all children who visited the ER and underwent triage during the study period and questionnaires including case scenarios were evaluated. Triage documentation based on ETAT (Emergency triage, assessment and treatment) and questionnaires containing case scenarios were reviewed and coded. Data was entered and analyzed using SPSS version 26.

Result

From the total of 384 cases, only 166 (43.2%) cases were correctly categorized according to the ETAT+ Ethiopia guideline. 38% of the cases were under triaged. 27.3% were labeled as urgent while the sick child has emergency signs. The study also revealed 18.5% rate of over triaging. During the study time frame, there were essential medicines and laboratory test in only 26.6% and 21.6% of the cases respectively for their immediate use. Essential emergency equipment were available at the time of triaging a sick child in 87.8% of the cases

Conclusion

This study indicated that the overall performance of pediatric emergency triage system is poor.

Introduction

Background

Triage is the process of determining the priority of patient's treatments by the severity of their condition or likelihood of recovery with and without treatment.

The purpose of triage in the emergency department (ED) is to prioritize incoming patients and to identify those who cannot wait to be seen. Deaths of children in hospital often occur within the first 24 hr. of admission. Many of these deaths could be prevented if very sick children were identified soon after their arrival in the health facility and appropriate treatment started immediately. This can be facilitated by rapid triage of all children arriving at a hospital to determine whether emergency or priority signs are present [2, 3].

The most widely used ED triage tools employ a five level triage scale and include the Australian Triage Scale, Canadian Triage and Acuity Scale (CTAS), Manchester Triage Scale (MTS), and the Emergency Severity Index (ESI). WHO has developed Emergency Triage, Assessment and Treatment (ETAT) guidelines mainly for low-resource settings. These are adapted from the Advanced Pediatric Life Support guidelines used in western countries. Using the guideline allows for the immediate identification of children with life-threatening conditions which are most frequently seen in developing countries, such as obstruction of the airway and other breathing problems caused by infections, shock, neurologic emergencies (coma or convulsions), and severe dehydration. The generic WHO guidelines were developed in Malawi, and were field-tested in several other countries including Angola, Brazil, Cambodia, Indonesia, Kenya and Niger [4, 5].

Ethiopia adapted the WHO generic ETAT manual as the ETAT training manual with the addition of common pediatrics emergencies in Ethiopia based on recommendations of experts from different health facilities and universities in Ethiopia [5]. St Paul's Hospital Millennium Medical College, pediatrics emergency department practices ETAT+ Ethiopia guideline.

Possible barriers to the effective emergency care of children include overcrowded emergency care areas, poor facilities for children, long waiting times for and limited access to hospital beds, poor staff training for pediatric emergency conditions, insufficient or inadequate equipment and supplies, lack of child-specific policies and guidelines [6].

The triage performance can represent the quality of emergency service, but there is a lack of adequate review studies addressing this topic. The performance of Triage system using ETAT + Ethiopia guideline in St. Paul's Hospital millennium medical college, pediatric emergency department is not evaluated. Hence, assessment of the status of triage system at emergency room(ER) is required to improve quality of service. We also tried to assess factors associated with over-triage and under-triage of children seeking medical care.

Statement of the problem

St. Paul's Hospital Millennium Medical College is one of the tertiary hospitals found in Ethiopia. Pediatrics emergency department is one of the emergency departments with estimated annual visits of more than 18582(including repeat cases). It has three working areas (Red, yellow/orange and green) with assigned health professionals and one triage room with waiting area at the front.

The department practices World Health Organization (WHO) pediatric emergency triage, assessment and treatment (ETAT) guideline for low-resource settings with Ethiopian version (ETAT+ Ethiopia). Quality of Pediatric emergency triage directly affects the outcome of the child being triaged. Over-triage results in diversion of limited time and resources from patients most in need and inappropriate allocation to those with less severe illness, unnecessary hospital stay, increases morbidity (stress to the child and hospital acquired infection). Under- triage has also an impact on the outcome of the treatment of the child; increases morbidity and mortality. There are different proposed factors that affect the quality of pediatric emergency triage; age, vital signs, nurse experience, working time (day, evening and night) and resource [7].

As to the researchers knowledge, there is no study done to assess the triage performance of pediatrics emergency triage using ETAT + Ethiopia guideline in SPHMMC, pediatric emergency department and this study aims to provide baseline information of the current status of the practice and assesses factors associated with triage quality so that action can be taken to improve the triage performance as per the national ETAT guideline.

Significance of the study

The purpose of this study is to assess the performance of the pediatric triage system and associated factors with under-triaging and over-triaging in SPHMMC. Currently SPHMMC pediatric emergency department uses the ETAT+ Ethiopia guideline for triage and the triage performance of the unit is not evaluated before. Over-triaging results in wastage of resource and under-triaging has a direct relationship with patient morbidity and mortality. Therefore, both over triaging and under triaging should be avoided as much as possible as it will be reflected in terms of life loss and resource wastage. Assessing the pediatric emergency triage system performance as per the national ETAT guideline is important as it helps to take the necessary corrective measure. Both under triaging and over triaging can be improved by

training the staff and availing the necessary triage equipment. Therefore, the current study will aim to evaluate the status of the performance of the pediatric emergency triage service in the department of Pediatrics and Child Health of SPHMMC and will try to identify gaps so that corrective measures will be taken to improve the service quality.

Literature review

Acute respiratory infections, diarrhea and fever are very common in children below the age of five years. All children suffer from these illnesses several times each year. However, during natural disasters like floods children are even more vulnerable to these diseases and death. Pneumonia, diarrhea, measles and malaria, and associated malnutrition, are responsible for over 60% deaths in children under five. During an emergency the proportion of children dying of the above mentioned diseases may be higher [8].

Inadequate literature on triage systems from LICs (low income countries) further amplifies the crisis during rush hours in ED and may lead to missed critical patients hence delays in their management [9].

In a study of 21 hospitals in Asia and Africa that evaluated the management of 131 children, more than half were under treated or inappropriately treated with antibiotics, fluids, feeding, or oxygen. Inadequate triage and assessment, poor treatment, and insufficient monitoring may adversely affect the outcome of a significant proportion of hospitalized children, and result in unnecessary suffering or avoidable death for many children each year. In some other settings over-hospitalization, over-diagnosis of severe illness and over-medication has adverse consequences for health outcomes and in wasted health expenditure [10].

Because the priority of care often is based on triage categorization, consistent and appropriate triage decision making has important implications for health care delivery in emergency departments (EDs). Knowledge and experience with both common and life-threatening illness are essential for accurate patient assessment [11].

Owing to its dynamic nature, triage guidelines must be plausible, understandable and measurable, and should be developed by experienced health care providers. Depending on the need and local experiences, many countries developed their own functional triage systems. A few examples include the Australian Triage Scale (ATS), the Canadian Triage and Acuity Scale (CTAS), the Manchester Triage Scale (MTS), the South African Triage System (SATS) and the Emergency Severity Index (ESI) [9].

Triage in low income countries (LIC) is based on the need of clinical condition and should be able to predict severity and outcomes of disease, along with resource requirements. World health organization has devised triage system for low-resource setting since 2005.

Its validity and reliability has been studied against Advanced Pediatric Life support guideline and has shown sensitivity of 90-95 % and specificity of 85-90 % in many studies [3, 9].

In Brazil, Porto Alegere Teaching hospital retrospective study of 96071 study sample, 49.1% were triaged as moderate acuity (level 3) on ED arrival, roughly one third (32.5%) were triaged as low acuity (ESI level 4 or 5), and only 18.3% were triaged as high acuity (ESI level 1 or 2) [2].

Another study in Tanzania showed 33% (20/60) of the respondents were not knowledgeable about triage. Thirteen percent of the respondents reported that although they had attended workshops, there had been a lack of information on how to triage patients. More than half (52%) of the respondents were not able to allocate the patient to the appropriate triage category. Fifty eight percent (35/60) of the respondents had no knowledge on waiting time limits for the triaged categories. Among four hospitals observed, only one had nurses specifically allocated for patients' triage. The respiratory rate of patients was not assessed by 84% of the triage nurses observed [11].

In Ethiopia, Wolaita zone, facility based cross-sectional study of 178 health care workers (HCW) indicated that 41.7% of HCWs did not correctly define triage, 81% did not know triage duration, 85.7% did not identify all triage categories and 64% did not categorize child with urgent signs. Only 32.57% of HCWs were able to categorize child with the emergent condition. One hundred forty one (80.6%) of HCWs stated that work overload affects quality care. The frequently reported problems were lack of availability of ETAT+ guidelines 150 (85.7%) and absence of ETAT training 150 (85.7%), lack of familiarity with guidelines 152 (86.9%), lack of support 136 (77.7%), lack of protocols and standards 139 (79.9%), absence of separate triage or emergency area for children 148 (84.6%), poor communication among staff 115 (65.7%) and overcrowding 145 (82.9%) are factors affecting pediatric triage quality as responded by HCWs in their health facilities [12].

Objective

General objective

To assess the performance of pediatric emergency triage system of St Paul's Hospital Millennium Medical College as per the national ETAT guideline from July 15, 2021 to Sep 15, 2021

Specific objectives

To evaluate the rate of under triaging and over triaging

To assess factors associated with under-triaging and over-triaging

Method

Study design and period

Single center cross sectional study using case scenarios and review of medical records of patients that were seen in the pediatric emergency during the period from July 15, 2021 to Sep 15, 2021 were included in the study.

Source population

All pediatric patients triaged at SPHMMC, pediatric emergency department and all nurses working at the pediatric emergency department.

Study population

All pediatric patients triaged at the emergency department during the period July 15, 2021 to Sep 15, 2021 and triage nurses who responded to case scenarios

Inclusion criteria

All pediatric cases triaged at SPHMMC, pediatric emergency department during the study period having complete data and a complete response to questionnaire containing case scenarios by pediatric emergency triage nurses.

Exclusion criteria

Any lost medical charts and incomplete response to case scenarios were excluded

Sampling technique

All children triaged at pediatric emergency triage during the study period were taken until sample size is achieved. The calculation of sample size was based on the following assumption:

1. The proportion of the performance of the triage system in the study area is not known. Therefore 50% was taken
2. The level of significance is taken as 5% (95% CI)

3. The desired margin of error (d) is estimated to be 5%

$$n = \frac{Z^2_{(1-\alpha/2)} (P (1-P))}{d^2}$$

$$d^2$$

$$n = \frac{(1.96)^2 (0.5 (0.5))}{0.05^2} = 384$$

n= sample size, P= estimate of proportion,

$Z^2_{(1-\alpha/2)}$ =1.96 at 95 % CI , d= desired precision (margin of error)

Data collection procedure

All children triaged at SPHMMC, pediatric emergency department were included in the data collection procedure till sample size is achieved. Data was collected from patient medical record by staff nurses after triaging. Triage area and availability of essential drugs, triage equipment and lab tests were daily checked. Questionnaires provided to all nurses working in pediatric emergency department were retrieved and coded for data entry.

Data entry and analysis technique

Data was analyzed by descriptive statistics. Questionnaires containing demographic data of the respondent and case scenarios were coded and analyzed.

After data collection, each data was checked for completeness based on codes given during data collection process. Data was entered in to SPSS, statistical package for Social Sciences Version 26. Descriptive analysis was used to analyze the study variables. A confidence limit of 95% and p value of less than 0.05 was taken as statistically significant. Chi-square test was applied to see association between study variables.

Data quality assurance

The principal investigator supervised the data collector during data collection process. Each day data was checked for accuracy and completeness. Collected data was put in a secure location.

Operational definition

Under triage: Labeling a child as urgent while the child has signs of emergent or labeling a child non-urgent while the child has signs of urgent with adherence to ETAT+ Ethiopia guideline. The American College of Surgeons, committee on trauma suggests acceptable rate of under triage to be less than 5 percent. Most studies use this cut off point although it is for trauma patients. Since trauma patients tend to be over triaged, its validity for non-trauma patients is questionable [14].

Over triage: Labeling a child as emergent while the child has signs of urgent or labeling a child emergent while the child has signs of non-urgent or labeling a child urgent while the child has the signs of no-urgent (priority sign) in adherence to ETAT+ Ethiopia guideline. The American College of surgeons, committee on trauma also suggests acceptable percentage of over-triage to be in the range of 25 to 35 percent [14].

Triage knowledge is the awareness of the health care workers about the key principles related to pediatric emergency triage and it will be measured in the following way:

Low level of triage knowledge: Score < 60%

Medium level of triage knowledge: Score 60-79

High level of triage knowledge: Score 80% and above

Ethical consideration

Ethical clearance was obtained from SPHMMC IRB (institutional review board). Informed written consent was obtained from the nurses who were included in the study.

Result

Socio-demographic characteristics

A total of 20 pediatric emergency nursing staffs were involved in the study. Majority of the respondent were female 15 (75%) and most of them were in the range of 20-30 years of age. Almost all were BSC holders and 1 was diploma holder (Table 1).

Experience of the nursing staffs

This study showed that majority of the participants had less than 5 year of service, 17 (85%) and 3 (15%) of them had above 5 year of service.

Table 1: Socio-demographic data of the participant nurses

Age	Number	Percent
20-30 years	19	95%
31-40 years	1	5%
Sex		
Male	5	25%
Female	15	75%
Education status		
Diploma	1	5%
Bachelors of science(BSC)	19	95%
Year of service		
0-5 years	17	85%
6-10 years	3	15%

Pediatric emergency triage knowledge

Most of the respondents have medium level of pediatric emergency triage knowledge 12 (60%). Half of the respondents do not know the definition of triage according to the ETAT+Ethiopia guideline, 10 (50%). 5 (25%) of them correctly defined triage. Only 6 (30%) of the respondents know the time required (duration) to triage a sick child (Table 2).

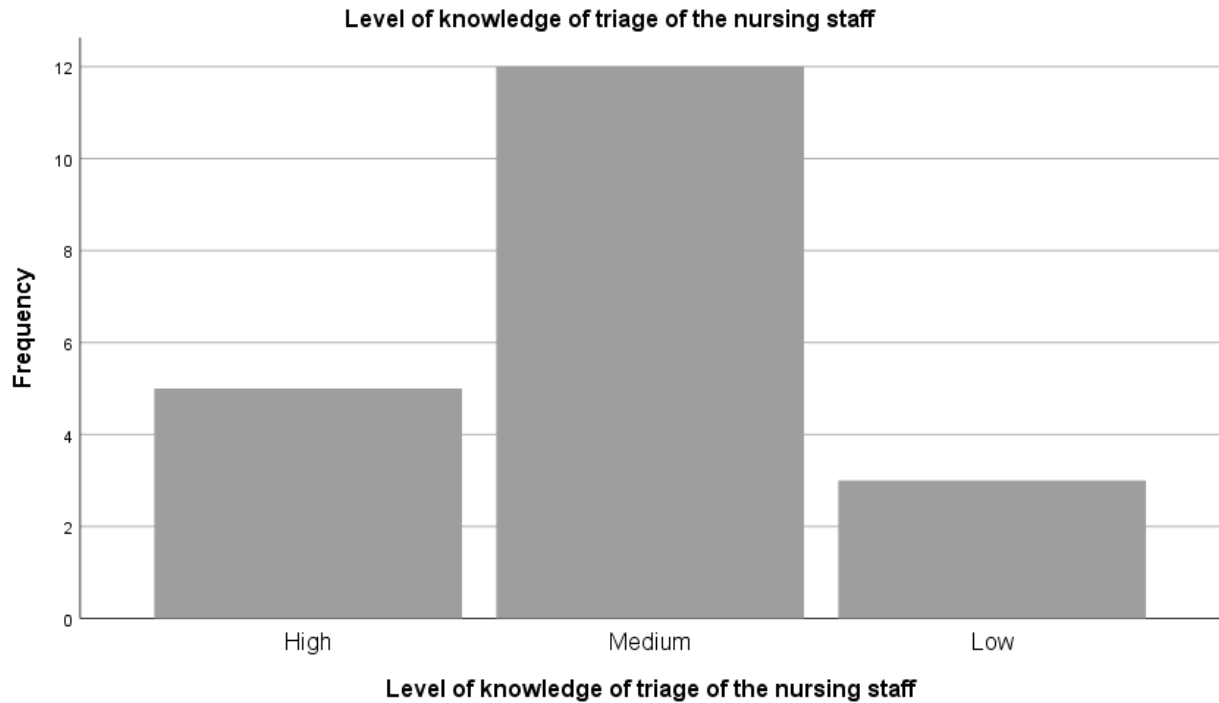


Figure 1: Level of knowledge of the triage nurses

Factors that affect performance of pediatric emergency triage

Majority of them responded work overload affected their performance of pediatric emergency triaging 15(75%). One of the respondents mentioned other factor affected performance of triaging at pediatric emergency but did not specify the factor.

Table 2: Factors affecting performance of pediatric emergency triage

Definition of triage	Number	Percentage
Defined it correctly	5	25
Tried to define	5	25
Did not define	10	50
Duration of triage (15-20sec)	6	30
Factors affecting quality of triage		
Work overload	15	75
Lack of pediatric ETAT training	2	10
Lack of protocols & standards	2	10
Other	1	5

Observational findings

There is a separate triage room and separate emergency treatment room. During the study time frame, there were essential medicines and laboratory test in 26.6% and 21.6% of the cases respectively for their immediate use. Unlike essential medicines and lab tests, essential emergency equipment was available at the time of triaging a sick child in 87.8% of the cases.

Table 3: Availability of Essential medicines and lab tests

Essential medicines, lab tests and equipment	Frequency	percentage
Availability of Essential medicines	102	26%
Availability of essential lab. Tests	83	21.6%
Essential triage equipment	337	87.8%

Triage categories as put by the triage nurse

Nearly 50% of the total 384 cases was urgent category followed by emergent category which constitutes for 29% of the cases.

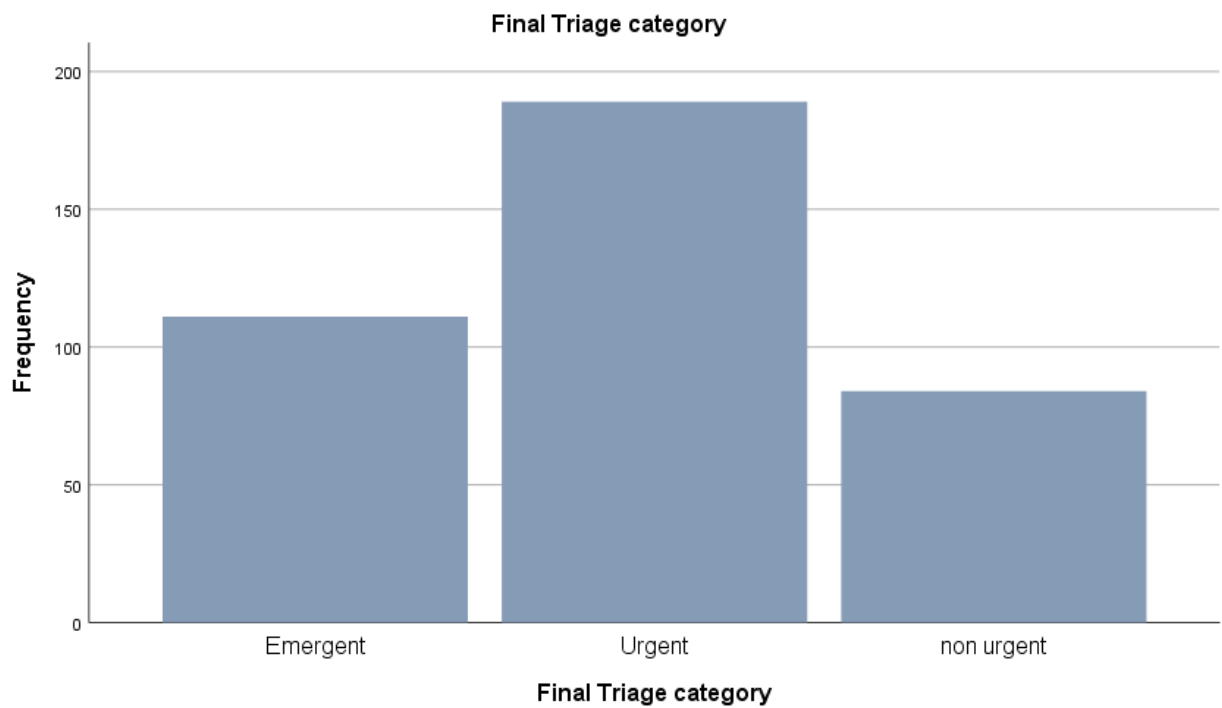


Figure 2: Frequency of the final triage category

Assessment of over triaging, under triaging and correct triaging

From the total of 384 cases, only 166 (43.2%) cases were correctly categorized according to the ETAT+ Ethiopia guideline. 38% of the cases were under triaged. 27.3% were labeled as urgent while the sick child has emergency signs. Over triaging constitute 18.5%.

Table 4: Percentage of correctly triaged and mistriaged cases

Triage categories	Number	Percentage
Correctly triaged according to ETAT guideline	166	43.2%
The patient had emergency signs but inappropriately labeled as having urgent signs	105	27.3%
The patient had signs of emergency but labeled as having non urgent signs	21	5.5%
The child had urgent signs but categorized as non-priority	20	5.2%
The child had urgent signs but labeled as emergent	22	5.7%
The child had non urgent signs but inappropriately labeled as emergent	13	3.4%
The child had signs of non-urgency but labeled as having signs of urgency	36	9.4

Factors affecting pediatric emergency triage

Age of the child

The relationship between the categorical variables, the age of the child triaged at pediatric emergency triage room and final triage category was examined to look for associations. A chi-squared test with 8 degrees of freedom was performed resulting in a test statistic of 33.621. This results in a p value which is less than 0.001 and therefore we have strong evidence to reject the null hypothesis that the age of child triaged and final triage categories are independent variables. Therefore, there is a strong relationship between the two variables.

Vital signs of the child

A chi-squared test with 8 degrees of freedom also was performed resulting in a test statistic of 55.498. This results in a p value which is less than 0.001. Therefore, we can say there is strong relationship between the vital signs of the child who was triaged and the final triage category that ultimately determine patient outcome.

Educational statuses of the triage nurse

The study also showed strong association between educational statuses of the triage nurse and triage quality and also proved the strong association between refresher ETAT training and quality of triage as measured by triage nurse knowledge assessment; $\chi^2(2, N=20) = 14.44, p = 0.001$ and $\chi^2(2, N=20) = 17.319, p = 0.001$ respectively.

Year of service of the staff nurse

There was no a significant relationship between year of service of the staff nurse and triage quality, $\chi^2(2, N=20) = 2.425, p = .297$.

Other factors

Work overload, lack of protocols and standards also were assessed using Chi-square test and showed strong relationship; $\chi^2(6, N=20) = 45.32, p = 0.001$.

Discussion

Assessment of over triaging, under triaging and appropriate triaging

From the total 384 cases, only 166 (43.2%) cases were correctly categorized according to the ETAT+ Ethiopia guideline. This is much low as compared to the study done in South Africa in which nurses triaged non-trauma patients correctly in 67.2% of the cases [15].

The study also revealed 38% of the cases were under triaged (underestimation of the severity). 27.3% of all cases were labeled as urgent while the sick child has emergency signs. On the other side, over triaging (over estimation of severity) constitute 18.5%. Similar study done in South Africa, Gauteng province, showed 13.4% rate of over triage and 19.4% of under triage. This study showed high rate of mis-triaging as compared to the study of the Gauteng province [15]. Another retrospective study of 1267 medical records in South Korea revealed over triage rate of 4.3% and 10.3% of rate of under triaging [16]. Study done in Thailand on "Validation of Songklanagarind Pediatric Triage Model in the Emergency Department" revealed the rates of appropriate triage, over-triage, and under-triage were 68.8%, 28.5%, and 2.7%, respectively [18].

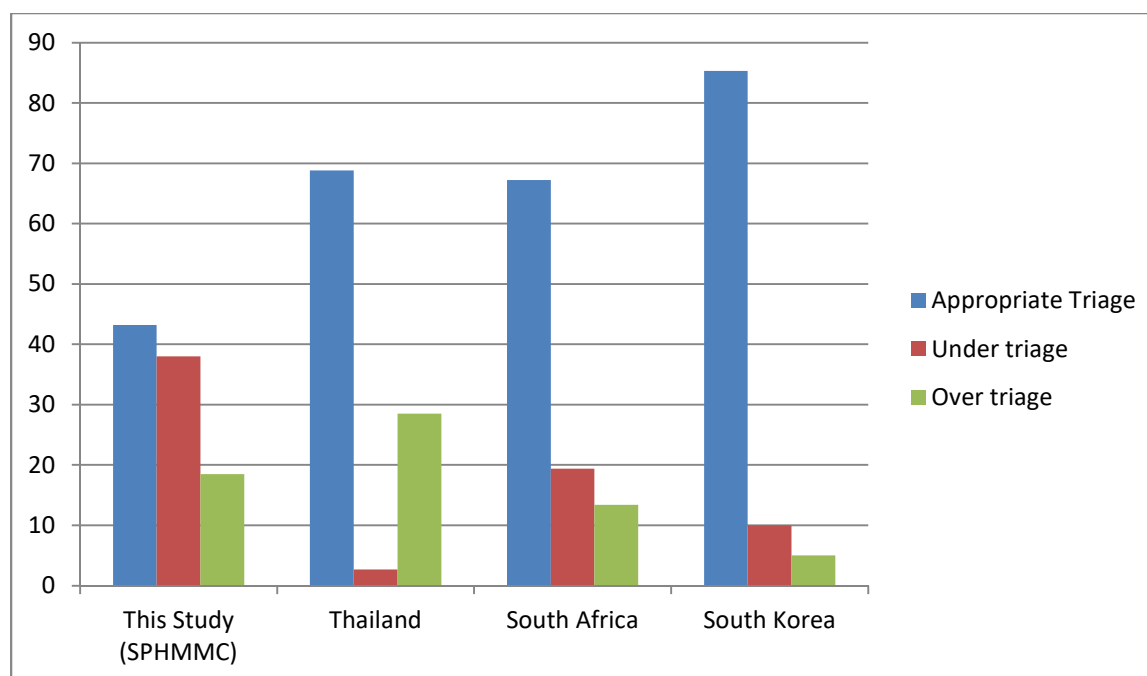


Figure 3: Percentage of appropriate triage, under triage and over triage of this study as compared to that of Thailand, South Africa and South Korea

Table 5: Summary of rate of appropriate triage, under triage and over triage

Triage outcome of 384 cases	Number	Percentage
Correctly triaged	166	42.3
Under triaged	146	38
Emergent demoted to urgent	105	27.3
Emergent demoted to non-urgent	21	5.5
Urgent demoted to non-urgent	20	5.2
Over triaged	71	18.4
Non-urgent promoted to urgent	36	9.4
Non-urgent promoted to emergent	13	3.4
Urgent promoted to emergent	22	5.7

Factors Affecting the Quality of Pediatric Emergency Triage

The study showed that there is a significant relationship between the age of the child and final triage category, $\chi^2(8, N=384) = 33.621, p = .001$.

This study also has revealed a significant association between refresher ETAT training and triage quality, $\chi^2(2, N = 20) = 14.444, p = 0.001$. This is in line with the finding of study in Wolaita Zone that demonstrated significant association between having training and quality of triage with P value < 0.025 [12]. This might be due to exposure of health care workers to up-to-date clinical practice or evidence-based guidelines and standards during reading and training.

This study has shown no significant relationship between experience of the nursing staff and triage quality, $\chi^2(2, N=20) = 2.425, p = .297$. This is in line with the study in Wolaita [12] but contradicts with study done in Iran which showed triage quality and decision making largely depends on the staff's experience [13]. This might be due to the allocation of health care providers in pediatric emergency triage without training on up to date clinical practice guidelines or absence of continuous professional development in the hospital or it may be due to under publication.

Table 6: Summary of factors affecting performance of triage service

Factors	X2	Df	P-value
Age of the child (< 2 month)	33.621	8	0.001
Vital signs of the child (all V/S)	55.498	8	0.001
Educational statuses of the triage nurse	14.44	2	0.001
Refresher training	17.319	2	0.001
Year of service of the staff nurse	2.425	2	0.297
Work overload	45.32	6	0.001

Pediatric Emergency Triage Structural Qualities

The triage setting is better as compared to the study finding of the Multicenter Cross sectional study done in Wolaita in which only one hospital had a separate pediatric emergency triage room and none of the studied hospital had ETAT+ Ethiopia guidelines and sick child flow charts [12]. Similar study on assessment of the quality of care for children in eighteen randomly selected district hospital and subdistrict hospitals in Bangladesh demonstrate that the overall quality of care provided in these hospitals was poor. No hospital had a functioning triage system to prioritize those children most in need of immediate care. Laboratory supports and essential equipment were deficient. Only one hospital had all of the essential drugs for pediatric care [17]

There were essential medicines and laboratory test in 26.6% and 21.6% of the cases respectively for their immediate use. Unlike essential medicines and lab tests, essential emergency equipment was available at the time of triaging a sick child in 87.8% of the cases. Facility based descriptive cross-sectional study of 6 hospitals in Wolaita zone on “Assessment of Quality of Pediatric Emergency Triage and Its Associated Factors” demonstrated that all selected units were equipped with a functioning oxygen cylinder, fluids and drugs desired for emergency triage including salbutamol puffers, adrenaline, and diazepam IV and all kinds of IV fluids critical in the unit were obtainable [12]. In general, the study showed low level of triage facilities in terms of availability of essential medicines and triage equipment as compared to that of the study done in Wolaita Zone. It may be due to the pandemic COVID 19 which forced the hospital to deploy staffs, equipment and emergency medications to the COVID 19 treatment center.

Conclusion

This study indicated that the overall quality of pediatric emergency triage service was poor and indicated by the limited essential emergency medicines and laboratory tests, absence of the ETAT algorithms and sick child flow charts, average level of pediatric emergency triage knowledge, inconsistent refresher ETAT training and lack of triage skills of the pediatric emergency staffs. The quality of pediatric emergency triage can be enhanced by providing annual or biannual refresher ETAT training, providing /posting / the ETAT algorithm and sick child treatment flow charts, providing essential emergency medicines and laboratory tests and making them available, and decreasing work overload by reshuffling or hiring new health care workers.

Recommendation

This study indicated the need to upgrade the quality of pediatric emergency triage. There should be essential emergency medicines and lab test available all the time. The hospital also should provide ongoing training, support and motivate staffs and fill knowledge gap seen.

Health care providers should pay great attention to pediatric emergency triage service quality and update them to contemporary pediatric emergency service or should be trained in principles of pediatric emergency triage assessment and treatment to deliver qualified care.

Limitation

One of the limitations of this study was the difficulty of figuring out the ultimate outcome of the patient after discharge from the hospital; whether their condition improved, not improved or visited other hospital or health care centers. The other limitation was the availability of essential medicines; unavailability of the essential medicines during the triage time might not indicate the total absence of the medicines in the hospital, there may be in the stock.

References

1. <https://en.wikipedia.org/wiki/Triage>. History of triage
2. Nicki Gilboy RN, MS, CEN, FAEN, Paula Tanabe, PhD, MSN, MPH, RN, Debbie Travers, PhD, RN, FAEN, CEN. Et al. Emergency Severity Index (ESI): A Triage Tool for Emergency Department Care. AHRQ Publication No. 12-0014. 2012. Version 4
3. World Health Organization. UPDATED GUIDELINE: Paediatric emergency triage, assessment and treatment Care of critically ill children. 2016
4. Jeremiah S. Hinson^{1*}, Diego A. Martinez^{1,2}, Paulo S. K. Schmitz³, et al, Accuracy of emergency department triage using the Emergency Severity Index and independent predictors of under-triage and over-triage in Brazil: a retrospective cohort analysis. International Journal of Emergency Medicine (2018). Page 3-4.
5. Federal Democratic Republic of Ethiopia, Ministry of Health. Emergency Triage Assessment and Treatment (ETAT +Ethiopia): manual of participant. First edition
6. Hon Lon Tam^{1*}, Siu Fung Chung² and Chi Kin Lou³. A review of triage accuracy and future direction. BMC Emergency Medicine. 2018
7. Aloyce R. Assessment of knowledge and skills of triage amongst nurses working in the emergency centres in Dar es Salaam, Tanzania. African Journal of Emergency Medicine. 2013; 4: 14-8. Epub july, 2013
8. Hasan Rajabi MS, Gholamreza Khademi. Emergency Management of Common Diseases in Children. Int J Pediatr, Vol3, Serial No19, Jun 22, 2015; Vol. 3 (N. 4-1): 789-98). Epub jun 22, 2015
9. Emaduddin Siddiqui et al, Triage for low income countries: is ESI truly the way forward?, International Journal of Community Medicine and Public Health, 07 October 2018
10. Tamburlini T. Improving the quality of paediatric care in peripheral hospitals in developing countries. 563-5.
11. Theresa Maldonado, MD, and Jeffrey R. Avner, MD, Triage of the Pediatric Patient in the Emergency Department: Are We All in Agreement? AAP 2004
12. Daniel Baza Gargamo¹, Addishiwet Fantahun², Temesgen Lera Abiso, Assessment of Quality of Pediatric Emergency Triage and Its Associated Factors in Wolaita Zone, Ethiopia, Science Journal of Public Health, 2019. Page 125.
13. Abbas Dadashzadeh FA, Azad Rahmani, Morteza Ghojzadeh. Factors affecting triage decision-making from the viewpoints of emergency department staff in Tabriz hospitals. Iran J Crit Care Nurs. 2014; vol. 6 (4): 261-6.
14. American College of Surgeons, 633 N. Saint Clair St., Chicago, IL 60611-3211, 2014
15. L N Goldstein et al. The accuracy of nurse performance of the triage process in a tertiary hospital emergency department in Gauteng Province, South Africa, March 2017, Vol. 107, No. 3

16. Sun-Hee Moon et al, Triage accuracy and causes of mistriage using the Korean Triage and Acuity Scale, September 6, 2019
17. Dewan ME Hoque et al. An assessment of the quality of care for children in eighteen randomly selected district and subdistrict hospitals in Bangladesh, BMC Pediatrics 2012
18. Siriwimon Tantarattanapong: Validation of Songklanagarind Pediatric Triage Model in the Emergency Department; a Cross-Sectional Study, Archives of Academic Emergency Medicine. 2021

Annex 1

Questionnaire

St Pauls Hospital Millennium medical College, Department of Pediatrics and Child Health

Hello, my name is Abeshu Chemedda (MD, Pediatric resident) and I am conducting a research on “assessment of the performance of pediatric triage service of St Paul’s Hospital Millennium Medical College as per the national ETAT guideline”. The information collected will be kept confidential and will be used only for research purpose and to improve the quality of care. The study has been approved by the department and has ethical clearance from institutional review board. The questionnaire consists 2 parts; part I contains demographic data and part II contains the main body of the questionnaire. Thank you for your cooperation.

Name of data collector: _____

Signature: _____

Date: _____

Part I: Socio-demographic data

1. What is your age?
 - a. 20-30 yrs.
 - b. 31- 40 yrs.
 - c. 41-50 yrs.
 - d. 51 + yrs.
2. Please state your gender
 - a. Male
 - b. Female
3. Your level of education
 - a. Diploma in nursing
 - b. Bachelors of science in nursing (Bsc)
 - c. Masters of science in nursing (MSN)
 - d. Doctor of nursing practice (DNP)
 - e. Other
4. If your answer to the above question is other, please specify
5. What is your year of service?
 - a. 0-5 years
 - b. 6-10 years
 - c. 10+ years

Part II: assessment of triage

1. Have you ever taken any refresher training?
 - a. Yes
 - b. No
2. If your answer to the above question is yes, what was the training
 - a. Adult emergency triage
 - b. Pediatric emergency triage
 - c. Severe acute malnutrition
 - d. Infection prevention
 - e. Resuscitation
 - f. Other
3. If your answer for the above question is more than one, please mention
 - i. -----
 - ii. -----
 - iii. -----
 - iv. -----
4. Did you take refresher training on pediatric emergency triage within the past year?
 - a. Yes
 - b. No
5. Do you believe taking refresher training will improve quality of care?
 - a. Yes
 - b. No
6. If your answer to the above question is no, please explain
 - i.
7. Triage of a sick child decreases early mortality.
 - a. Yes
 - b. No
8. Triage of a sick child requires an expensive instrument.
 - a. Yes
 - b. No
9. Triage of a sick child decreases hospital stay
 - a. Yes
 - b. No

10. Which of the following factors you think affect your practice of emergency triage? (more than 1 answer is possible)

- a. Work overload
- b. Lack of pediatric ETAT+ guideline
- c. Lack of pediatric ETAT training
- d. Lack of familiarity with ETAT+ guideline
- e. Lack of support from hospital management
- f. Lack of protocols and standards
- g. Overcrowding of the emergency room
- h. Lack of communication among the staffs
- i. Younger age of the child or infant
- j. Other

11. How do you define triage? (in one sentence)

12. What is the total duration of triage?

- a. 5-10 seconds
- b. 10- 15 seconds
- c. 15-20 seconds
- d. 20-25 seconds
- e. 25-30 seconds

13. A three-year old girl is carried in her mother's arms wrapped in a blanket, in the queue. Her airway and breathing are OK. She has cold hands. Her capillary refill is 2 seconds. She is lethargic. Asked if the child has had diarrhea, the mother answered "YES. Four loose stools per day". The skin pinch takes 3 seconds. How would you triage this child?

- a. Red /emergent
- b. Yellow(orange)/ urgent or priority
- c. Green /non urgent or non-priority

14. A four-year old male child was rushed in. He convulsed one hour ago. He is breathing fast but there is no cyanosis and no respiratory distress. He feels very hot, but responds quickly to questions. He has no diarrhea or vomiting. How do you triage this child?

- a. Red/emergent
 - b. Yellow(orange)/urgent or priority
 - c. Green/non urgent or non-priority
15. A one-year old had a seizure at home; then again outside the clinic. He became unconscious. His breathing sounds very wet and noisy and there is drool coming from his mouth. He is looking blue. How do you triage this child?
- a. Red/emergent
 - b. Yellow(orange)/ urgent or priority
 - c. Green /non urgent or non-priority
16. A two-year old male is rushed to your clinic acutely convulsing. How do you triage this child?
- a. Red/emergent
 - b. Yellow(orange)/urgent or priority
 - c. Green/non-urgent or non-priority
17. Below what age is a child always a priority?
- a. < 2 mon
 - b. < 3 month
 - c. < 6 month
 - d. < 12 month
18. A 5-month-old male infant brought to emergency triage held in arms by his mother. The mother says that they observed recently that urine comes from beneath of the baby's penis. He feeds well. His breathing and circulation is normal. How do you triage this infant?
- a. Red/Emergent
 - b. Yellow (orange)/Urgent or priority
 - c. Green / non-urgent or non-priority

Part III Socio-demographic data of the child, triage process and outcome

1. Age
 - a. < 2 month
 - b. 2 month -1 years
 - c. 2-5 yars
 - d. 6 – 10 years
 - e. 11- 18 year
2. Gender
 - a. Male
 - b. Female
3. Mode of arrival
 - a. Walking
 - b. Wheel chair
 - c. Stretcher
 - d. In arm
4. Vital signs
 - a. PR-----
 - b. RR-----
 - c. Temperature-----
 - d. Oxygen saturation-----
 - e. Blood pressure-----
5. Airway problem
 - a. Yes
 - b. No
 - c. Not documented
6. Breathing problem
 - a. Yes
 - b. No
 - c. Not documented
7. Circulation problem
 - a. Yes
 - b. No
 - c. Not documented
8. Is the bay comatose or convulsing?
 - a. Yes
 - b. No
 - c. Not documented

9. Does the child have severe dehydration?
 - a. Yes
 - b. No
 - c. Not documented
10. Does the child has active bleeding, open fracture or poisoned (immediate)?
 - a. Yes
 - b. No
 - c. Not documented
11. Is the child grossly tiny?
 - a. Yes
 - b. No
 - c. Not documented
12. Was pallor detected?
 - a. Yes
 - b. No
 - c. Not documented
13. Is the child in pain?
 - a. Yes
 - b. No
14. Is the child in respiratory distress, irritable or lethargic?
 - a. Yes
 - b. No
 - c. Not documented
15. Was the child referred from another center?
 - a. Yes
 - b. No
 - c. Not documented or referral paper not available
16. Does the child have visible wasting, edema (of both feet) or burn?
 - a. Yes
 - b. No
 - c. Not documented

17. Availability of resource

1. Guidelines	Yes/No
ETAT guideline available	
Availability of ETAT+ chart	
Availability of emergency sick child flow charts	
Availability of treatment algorithm for emergency conditions	
Adherence to guidelines	
2. Equipments and consumables	
Availability of essential equipment's, IO needle, glucometer	
Availability of essential medicines	
3. Structural qualities	
Separate triage area for children	
Room for emergency treatment	
Availability of essential lab tests in unit	
Patients triaged without any delay	
Training on critical illness including trauma	

18. Final triage category

- a. Emergent or red
- b. Priority/urgent or orange/yellow
- c. Queue/non urgent or child sent to OPD

Annex 2

DECLARATION

I hereby declare that; this thesis report is my original work and has not presented for a degree by another person in this or any other university and all source material used for this thesis have been acknowledged.

Name:

Signature_____

Date_____

Name of Advisor

Name:

Signature_____

Date_____