

Pediatric Triage Variations Among Nurses, Pediatric and Emergency Residents Using the Canadian Triage and Acuity Scale

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Original Research

Keywords: CTAS, Triaging system, Pediatrics

Posted Date: June 26th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-37889/v1>

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Abstract

Background Emergency care continues to be a challenge, since patients' arrival is unscheduled and simultaneous which may fill the Emergency Department with non-urgent patients. Triage is an integral part of every busy ED. The Canadian Triage and Acuity Scale (CTAS) is considered to be the most accurate and reliable tool for patient assessment worldwide. This study aims to identify the chosen triage level and compare the variation between registered nurses, pediatric and adult emergency residents by using CTAS cases. Methodology This study was conducted at King Abdulaziz Medical City, Saudi Arabia. A prospective self-administered questionnaire was used, and which contains 15 case scenarios with different triage levels. All cases were adopted from a Canadian triage course after receiving permission. Each case provides the patient's symptoms, clinical signs and mode of arrival to the ED. The participants were instructed to assign a triage level using the following scale: 1=resuscitation, 2=emergent, 3=urgent, 4=less urgent, and 5=non-urgent. A non-random sampling technique was used for this study. Result A total of 151 participants completed the study questionnaire. 73 (48.34%) were nurses and 78 (51.66%) were residents (42 pediatric residents and 36 emergency residents). Each participant was given a score based on the correct answer for the case scenario. A mean score was compared among the nurses, pediatric residents and emergency residents. Since our data were not normally distributed, we used the Kruskal-Wallis test to observe statistical differences between the groups. The Kruskal Wallis Post-Hoc test was performed to see which groups were statistically significant, and it was found that there was a significant difference between nurses and pediatrics residents (P value < 0.001). Moreover, there were no significant differences found between nurses and ER residents (P value > 0.05). Conclusion The triaging system was found to be a very important tool to prioritize patients based on their complaints. The results showed that nurses had the greatest experience in implementing patients on the right triage level. On the other hand, ER and pediatric residents demonstrated a need to develop more knowledge about CTAS and become exposed more to the triaging system during their training.

Introduction:

The emergency department (ED) is one of the most crucial sectors of the healthcare system. Emergency care continues to be a challenge, since patients' arrival is unscheduled and sometimes simultaneous. There has been a steady increase in the number of patients visiting EDs annually, which leads to a rise in resource utilization. Studies have shown that about 25–60% of the patients seeking care in emergency departments are real emergency cases (1, 2). However, EDs may become filled with non-urgent patients, leading to overcrowding. This can lead to patients without complete care, dissatisfaction among both patients and care providers, poor treatment, and poor health-related outcomes. (3) Furthermore, prioritizing and making a decisive decision about the severity of a condition will significantly reduce ED overcrowding and provide sufficient care for patients who need it the most (4).

Triage is a French word originating in the late 1700s, which means "to sort" or "to select " (5). In the past, it was used to sort injured soldiers by prioritizing them according to the type and urgency of their conditions (6). Since the 1960s, triage has been used for medical purposes to determine the priority of an

emergency patient's treatments based on the severity of their condition. However, it was a concept lacking a formal structure as well as agreement with regard to the categories used. Triage was performed either by staff or by the patients themselves (7). Today, triaging is an integral part of every busy emergency department. It ensures that patients receive appropriate attention in response to their clinical needs rather than to the time of their arrival.

Over several years, many formalized systems appeared, which are used differently worldwide. These include the Australian Triage Scale (ATS), the Canadian Triage and Acuity Scale (CTAS), the Manchester Triage System (MTS), and the Emergency Severity Index (ESI) (8). In Saudi Arabia, there is still no unified triage system. However, CTAS has been applied for more than 10 years in different hospitals in Saudi Arabia, including King Abdullah Specialist Children's Hospital (KASCH) (9). Although the Canadian Triage and Acuity Scale (CTAS) was first utilized in Canada, several studies showed that CTAS is considered an accurate and reliable tool for patient assessment outside of Canada. It demonstrates reliability and validity in both children and adults (10, 11). According to CTAS, triage is classified into five levels: 1 = resuscitation, 2 = emergent, 3 = urgent, 4 = less urgent, 5 = non-urgent (12). Determining the CTAS level is a combination of selecting the Canadian Emergency Department Information System (CEDIS) presenting complaint and looking critically at the patient, with the information given from the patient, to assess whether he is stable. It will allow the nurse to choose appropriate modifiers to assign the most suitable CTAS level (13).

During a short assessment, nurses will identify signs and symptoms that determine the patient's urgency. The role of triaging nurses is vital for assessing the patient, such as communicating with the public, communicating with health professionals, assigning resources, initiating treatment protocols/first aid measures, monitoring and reassessing, participating in patient flow, and documenting (14). A study conducted among nurses with at least six months of triage experience showed that there is moderate to low agreement among nurses in determining the level of triage for pediatric patients (5). After a short assessment, physicians see patients in order of their urgency level and manage them accordingly. Also, there are some differences between physicians in triaging experience based on their specialties. This has been shown in several areas, including the management of febrile seizure and sedation use (15). However, many studies have focused only on the management of cases, and not on physicians' or nurses' perceptions of triaging patients (16).

Limited studies have been conducted in measuring pediatrics triaging systems, specifically CTAS. Most previous studies have focused on adult populations or on different triaging systems that are not used in Saudi Arabia (17). The objective of this study is to determine whether differences exist between pediatric and adult nurses and triaging in pediatric patients.

Methodology:

A cross-sectional design was used to assess health care opinions about the triage level. A non-probability sample was used, as we were conducting the study data collection during a clinical shift, and the

responders were therefore selected based on their accessibility and time. Based on an estimate, we have around 80 residents in both emergency and pediatric residency programs. We targeted all, since we expected a response rate of around 80%. Nurses were selected based on the known population size of 200 and 5% as a margin of error with a 95% confidence interval, and 50% as the response distribution, and the calculated sample size of 132. A rough estimate of 200 participants was considered for the study. All residents were included from general pediatrics and the adult emergency training program. Pediatrics and adult emergency nurses were also included. We excluded emergency fellows and emergency consultants from the study due to expected high knowledge, which would have affected the study results.

A questionnaire of 15 case scenarios was distributed among nurses and residents. All cases were adopted from the CTAS course. Permission was obtained from the post-graduate training center and CATS course developer in order to use the material. The cases were reviewed and culturally readjusted, and cases that could be triaged into two different levels were eliminated to avoid confusion. We included two to three from each level to reflect reality. The case scenarios described patients coming to the ED. Each case provided background information on the patients, symptoms, important clinical signs, and mode of arrival to the ED. The participants were instructed to assign a triage level using the following scale: 1 = resuscitation, 2 = emergent, 3 = urgent, 4 = less urgent, and 5 = non-urgent (Table 1). All the data collected were entered using Microsoft Excel. The data were analyzed using SPSS version 22 software. Since the data were not normally distributed, Kruskal Wallis test was used to determine the statistically significant differences between the three groups. A p-value of less than 0.05 was considered statistically significant. Results were expressed in tables and figures. Mean and Standard Deviation (SD) were used for continuous variables. The rates of agreement between pediatrics, adult residents and nurses were calculated using kappa statistics (weighted kappa) (95% CI). The following guidelines for the interpretation of kappa statistics were used: less than 0.40, poor to fair; 0.41 to 0.60, moderate; 0.61 to 0.80, substantial; and greater than 0.80, almost perfect.

Table 1
CTAS time objectives

Triage level	Time for triage	Time to nursing assignment	Time to nursing reassessment	Time to physician assessment
I		≤ 10 min	Continuous care	Immediate
II			Every 15 min	≤ 15 min
III			Every 30 min	≤ 30 min
IV			Every 60 min	≤ 60 min
V			Every 120 min	≤ 120 min

Results:

Of the 151 participants (73 Nurses, 36 ER residents and 42 pediatric residents) a 100% response rate was achieved for all case scenarios. The mean (\pm SD) age was 31.14 (\pm 6.76) years with the majority, 66%, being females. Among the 73 nurses, 29 (40%) were working in pediatrics and 44 (60%) were working with adults. For the ED residents, 36.2% were in level R2, 22.2% were in levels R1 and R4 and 19.4% were in level R3. Similarly for pediatric residents, a greater part of them, 50%, were in level R4, while 23.8% were in R2, 21.4% were in R3 and 4.8% were in R1.

Among pediatric residents 38.1% had used the CTAS to triage pediatric patients. Fifty-five percent of the pediatric residents knew about CTAS scales. Of the pediatric residents, all had performed an emergency rotation (42, 100%).

Triage scores were compared using the Kruskal Wallis test and were statistically significant with a p value of 0.006. The mean ranks for nurses, emergency residents and pediatric residents were 86.41, 73.6 and 59.96, respectively (Table 2). Figure 1 describes the Kruskal Wallis Post Hoc test and shows that the scores were statistically significant among pediatric residents (mean rank = 59.96) and nurses (mean rank = 86.41) with a p value of 0.005. The scores were statistically insignificant for pediatric residents-emergency residents (p value = 0.493) and for emergency resident-nurses (p value = 0.435) (Fig. 1).

Weighted Kappa along with a 95% confidence interval was used to find the level of agreement among nurses and residents based on the level of training. The overall agreement levels for residents were moderate, with the weighted Kappa as 0.438. The level of agreement was observed to be good among the nurses, with weighted Kappa as 0.688. Among the pediatric residents (Weighted Kappa= -1.455) and emergency residents (Weighted Kappa= -0.470), the agreement level was observed to be poor (Table 3).

Table 2
Comparing the Triage score among Nurses, Pediatric residents and emergency Residents

Participants	No. of subjects	Mean Rank	Test used & Test Statistic	P value
Nurse	73	86.41	Kruskal Wallis Test Chi square = 10.158	0.006*
Emergency Resident	36	73.60		
Pediatric Resident	42	59.96		
Total	151			
*Statistically significant at 5%				

Table 3
Level of agreement among Nurses and Residents (Pediatric and Emergency) with Weighted Kappa and 95% CI

	No. of subjects	Weighted Kappa	95% CI
Residents	78	0.438	(-0.282-0.832)
Pediatric Residents	42	-1.455	(-2.375-0.932)
Emergency Residents	36	-0.470	(-1.556-0.577)
Nurses	73	0.688	(-0.077-1.00)
Nurses and Residents	151	0.193	(-0.213-0.473)

Discussion:

Triage is a very important tool in emergency departments, which requires the whole team to be aware. Non-urgent cases are estimated to be 9% – 54% in the United States of America, and 25.5% – 60% in Canada (1, 18). Mis-triaging leads to an avoidable crowding in emergency departments. A well-structured triaging system and multidisciplinary team must be implemented in each emergency department for optimum patient care. The level of agreement among nurses was satisfactory, which indicates the strength of training and experience in the field of patient triaging. In contrast, patient triaging was not an integral part of the resident training program, which was reflected in the study findings.

The results showed 51.3%, 56.6%, and 59.9% mis-triaged the cases for nurses, Emergency residents, and pediatric residents, respectively, which may negatively impact patient care. ED overcrowding affects the hospital financially (4, 16). Over-triaging can have a huge impact on hospital resources by over-investigation and management for non-urgent cases. A study conducted among pediatrics injured patients found that 61% of the patients who were considered to have a severe trauma were discharged from the pediatrics center in less than 24 hours (19). On the other hand, under-triage can harm the patient by delaying management and putting the patient at risk of deterioration, especially for the pediatric age group, which might be accompanied by unclear signs of serious illness (18).

Inter-rater agreement using the CTAS scale has been studied for many years, mostly among nurses. Dallaire et al. compared nurses based on their experience and found a moderate agreement among them (weighted kappa of 0.44) (20). This finding contradicts our result, in which we compared a number of senior and junior nurses with different years of experience and in which practice found a good agreement between nurses, with a weighted kappa of 0.688. However, our study's results were similar to those of Alquraini et al., which also found good agreement (weighted kappa of 0.770) (9). In addition, upon comparison between pediatrics residents, poor agreement was found (weighted kappa of -1.455) in this study. In contrast, a moderate agreement was concluded by Bergeron et al. (weighted kappa of 0.419) (5). In terms of physicians compared to nurses, this study resulted in a poor level of agreement (weighted kappa 0.193). Unlike our finding, a meta-analysis of 12 studies showed a pooled estimator of a good

level of agreement with a value of 0.797 (21). Unsurprisingly, nurses performed better than residents in our study, due to their daily experience and regular practice of using a triaging scale.

This study had some limitations. First of all, we used paper-based case scenarios instead of real ED patients. Even though the cases in this study were adopted from the CTAS courses with some cultural modifications, few studies support that triage reliability testing can be tested using case scenarios as an alternative to real patients (22). The data presented in this study comes from only one institution. This could affect the ability to generalize our findings to other facilities. Since our center is considered one the largest emergency trauma centers in the region, we believe that our setting is ideal for testing CTAS reliability. We also used a limited number of scenarios, and all of them were pediatrics populations. We specifically chose the more common scenarios seen in our region. Since adult Emergency residents mandatorily rotate under pediatric ED, we included only pediatric cases.

Conclusion:

In conclusion, patients can present with a broad spectrum of emergencies that range from minor to severe presentations. In order to avoid overcrowding, having a well-structured triaging system is crucial to every ED. Also, nurses and physicians need to be more aware of how to use and apply this system. Our results showed that nurses had the highest level of experience in implementing patients on the right triage level, due to their knowledge and practice with CTAS scale. Additionally, these results signify the importance of emergency and pediatric residents to become familiar and have enough exposure to and training with the triaging system.

Abbreviations

ED = Emergency Department

ATS= Australian Triage Scale

CTAS= Canadian Triage and Acuity Scale

MTS= Manchester Triage System

ESI= Emergency Severity Index

KASCH= King Abdullah Specialist Children's Hospital

CEDIS= Canadian Emergency Department Information System

SD= Standard Deviation

Declarations

Ethics approval and consent to participate:

This study was approved by the ethical committee of King Abdullah International Medical Research Center. All participants were informed about this study.

Consent for publication:

Not applicable

Availability of data and materials:

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

Competing interests:

The authors declare that they have no competing interests

Funding:

The authors did not receive any grant or funding support from any funding agencies in the public, commercial, or not-for-profit sectors in conducting this study.

Authors' contributions:

SS and TB conducted the study design, collected the data ,rafting the article and revising it critically for important intellectual content. WP performed the statistical analysis. NH and SQ final approval of the version to be submitted. The author(s) read and approved the final manuscript.

Acknowledgements:

Not applicable

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Figures

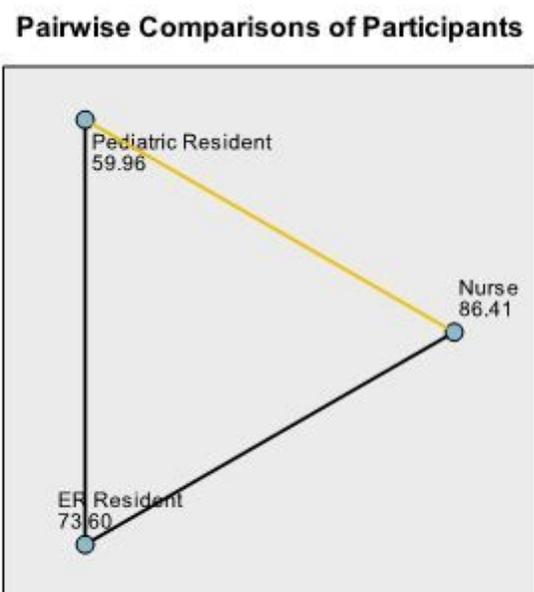


Figure 1

Post Hoc Tests for the triage score and the participants