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Accuracy and Reliability of Paediatric ED Triage

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Abstract

Objective

To determine the accuracy and reliability of triage of children in public hospital emergency departments using the Australasian Triage Scale. This is the first study to examine these issues in paediatric triage following the 2007 development of the Emergency Triage Education Kit to foster accurate and consistent application of the Australasian Triage Scale.

Methods

A convenience sample of 167 triage nurses working at three general hospitals and one specialty paediatric hospital in greater metropolitan Melbourne assigned triage ratings for nine paediatric clinical scenarios using the Australasian Triage Scale. Scenarios were derived from the Emergency Triage Education Kit or from other published sources. Kappa was used to assess interrater reliability within and between hospitals.

Results

Triage nurses correctly assigned triage scores to an average of 5.3 of nine paediatric clinical scenarios. Accuracy in specific hospitals ranged from a low of 15% on one scenario, to 100% accuracy on a different scenario at a different hospital. Interrater reliability within and across the emergency departments studied was found to be

kappa = 0.27. Both accuracy and interrater reliability were marginally higher at the speciality paediatric hospital.

Conclusions

Our findings demonstrate inconsistencies in the accuracy and reliability in which sick children presenting to EDs receive triage scores both within and across hospitals.

These results suggest the need for improvements either in current triage nurse training or training resources. Use of the Emergency Triage Education Kit alone has not resulted in high levels of paediatric triage accuracy or reliability.

Key words

Emergency Department, Nursing, Hospital, Paediatric, Triage

Introduction

The Australasian Triage Scale (ATS) is used in all Australian public hospitals to ensure that patients presenting to the Emergency Department (ED) are seen in a timely manner 'commensurate with their clinical urgency'.¹ The ATS was known as the National Triage Scale prior to being refined and renamed in the late 1990s,² and the tool has remained unchanged since November 2000.³ All patients are assigned a triage score upon ED arrival by specially trained nursing or medical staff.¹ The categories of the triage scale range from 1 (most urgent), with immediate detailed assessment and treatment recommended, to 5 (least urgent), where the maximum recommended wait time to treatment commencing is 120 minutes.¹ The triage process is designed to take no more than two to five minutes to perform and involves observation of general appearance, an account of focused clinical history of the presenting complaint and physiological data.^{2,3} The same triage standards, priorities and principles apply to both adult and paediatric (infant, child and adolescent) presentations.^{2,3} Although clinical urgency does not equate to medical complexity or severity, triage assessment serves as an important measure of the need for time-critical medical intervention.³

Previous studies have shown variation within and between hospitals in the application of the ATS.⁴⁻⁶ The limited number of studies into application of the ATS specifically to paediatric populations have suggested that it has only poor to moderate reliability when tested.^{4,7,8} Further, triage nurses in mixed (general) EDs may be less consistent in triaging children than their counterparts in paediatric speciality EDs.⁹

Since these studies were conducted, the Department of Health and Ageing in 2007 published the Emergency Triage Education Kit (ETEK) to provide consistency in the triage training of emergency clinicians and to promote accurate use of the ATS and diminish variability in its application.^{10,11} This teaching resource was funded by the Commonwealth Government and developed in collaboration with the Australasian College for Emergency Medicine, the Australian College of Emergency Nursing, the College of Emergency Nursing Australasia and the Council of Remote Area Nurses of Australia. Most hospitals (~75%) use the ETEK to support training of staff in the application of the ATS.¹² However, no assessments of the reliability or accuracy of the use of the ATS across hospitals for paediatric patients has been conducted since the ETEK was released.

Inconsistency in the application of the ATS within and between hospitals has potential implications for patient care and outcomes, as children with identical presentations could have substantially different waiting times depending on which category they are assigned. From a policy perspective, any comparison of hospital performance regarding ED care for children or discussion of resourcing for children's emergency health care at different hospitals relies on the assumption that the ATS is applied consistently within and across sites. We undertook this study to test the accuracy and reliability of the use of the ATS in triaging paediatric presentations within general and speciality children's hospitals.

Methods

Scenario development

Six paediatric scenarios designated as triage categories 3, 4 or 5 were selected from the ETEK and two from a previous research study.^{2,4,13} Each scenario related to a child aged under 8 and included several sentences describing the presentation and clinical signs. An additional scenario taken from the ETEK was modified slightly to change the age of the patient (from adult to child) and time of day of presentation. While the scenarios were modified slightly to have a consistent writing style, no changes were made to any of the key presentation or clinical details.

For the 7 scenarios from the ETEK training manual, the designation of the triage category in the manual was considered the correct response. For the 2 scenarios from the research study, the triage classification used by the researchers was considered the correct response.

Participants

We recruited 167 triage nurses from three public general hospital EDs that had paediatric ED services and one public speciality paediatric hospital ED (ranging from 40-44 at each site) in the Melbourne metropolitan region. Invitations to participate in a research study were sent via email by each hospital's ED Nurse Unit Manager or Nurse Educator to all triage nurses in the weeks preceding data collection. The invitations requested triage nurses contact the researchers directly if they wished to pre-book a

time to participate in a study of the reliability of triage classification. Trained research assistants attended the EDs for booked appointment times. They also recruited additional triage personnel at varying times of day, providing participant information sheets and inviting all staff who performed triaging duties at the hospital to participate. Nurses were considered eligible if they were trained in the use of the ATS and had performed paediatric triage at that hospital ED at least once in the past year.

Data collection

Each nurse who agreed to participate completed an informed consent document. They were then provided with a sheet of paper describing each of the 9 clinical scenarios. Below each scenario was printed the numbers 1 to 5. Participants were instructed to circle the triage category assignment they thought most appropriate for each scenario. Participants received a \$10 gift voucher in recognition of their time and effort. Most completed the triage form in less than 10 minutes. A research assistant was available nearby to collect the completed forms. Data collection was conducted during November and December 2014. The study received ethics approval from the University of Melbourne Human Research Ethics Committee and from the ethics committees at each of the four participating hospitals.

Data Analysis

Accuracy was assessed for each scenario in two ways. To assess differences in triage accuracy between scenarios, we calculated the proportion of raters within each hospital who selected the correct triage category for each scenario. To assess overall differences between hospitals in accuracy, for each hospital we calculated the mean number of scenarios that were correctly triaged along with the 95% confidence interval.

Interrater reliability (IRR) was assessed using a linear-weighted kappa statistic, calculated for all of the participating nurses at each hospital and as an overall estimate.

Stata 13.1 was used for all analyses.

Results

The accuracy of participant's triage category assignment for each scenario in each of the three general hospitals ranged from 15% to 88%. There was only one scenario where all surveyed nurses at a specific hospital ED selected the correct triage category. This occurred with scenario 3 at the paediatric speciality hospital (Table 1). On average, nurses at the speciality hospital responded correctly to more scenarios than their counterparts at general hospitals. The average number of scenarios correct for nurses at each hospital is shown in Figure 1. In some scenarios the inaccurate responses were predominately over-triage decisions (e.g. scenario 2), while for other

scenarios the inaccuracies were predominately under-triage decisions (e.g. scenario 9) or a mixture of both (Figure 2).

IRR was low among the triage personnel at each hospital as well as across hospitals, ranging from 0.26 to 0.42 (Table 2). However, reliability was found to be slightly higher in the specialty children's hospital.

Discussion

Among the most important findings of this study was the low overall accuracy of paediatric triage at all participating hospitals. At the best performing hospital, the average of correct triage category assignments was less than two-thirds of all presentations. Importantly, we found errors in both under and over triage category assignment. It appears there may be a trend for triage nurses at general EDs to select triage categories of greater urgency than those selected by nurses at a specialty paediatric ED. The implications of incorrect triage designations in EDs may be significant; patients who are incorrectly assigned a triage score of greater urgency than appropriate may cause an increase in wait times for other patients with more urgent conditions.⁵ Conversely, patients who are assigned a triage category of lesser urgency than appropriate are likely to wait longer than advisable for care.

Hospitals also have performance indicators for the treatment of ED presentations in a timely manner based on their triage classification. For example, the Australasian

College for Emergency Medicine recommends hospitals treat at least 70% of category 4 patients within 1 hour, while the 2009 National Healthcare Agreement set a benchmark target of 80% of all patients to be seen with the recommended waiting time for their triage category.^{1,14} Variation within and between hospitals in triage classification minimises the impact of the application of those quality standards. Additionally, potential proposed strategies to re-direct non-urgent patients to primary care settings or to general EDs (rather than specialty hospitals) will not be feasible if there is not uniformity with regard to the determination of the urgency for treatment either within or across EDs.

Another key finding was that the IRR of the application of the ATS by triage nurses was poor within and across the EDs in our study. This is consistent with previous studies conducted prior to the development and release of ETEK in 2007.^{4,7,8} This finding indicates that the triage category assigned to any given child could differ depending upon which nurse conducts the triage assessment and to which hospital they present. Similar to the findings of Durojaiye et al.⁹ in 2002, we found that nurses at a paediatric speciality hospital were more accurate and consistent in their triage decisions than those working in general EDs. However, we still found significant variation. Whether this relates to differences in training or other factors in applying the ATS to paediatric patients is unknown. Consistency in the application of the ATS (both between and within hospitals) is important to the consistency of the delivery of services to children

in the ED. Paediatric patients and their families should be able to expect consistency in triage whenever they present to a general or specialty hospital.

Triage category data are used to compose patterns of patient presentations, resource allocation and in the measurement of hospital performance – such as reporting the proportion of patients treated within the maximum recommended waiting time for a specific triage category.^{1,15} This information is subsequently used in health systems policy and planning and funding strategies such as rewards for efficiency and the direction of funding towards hospitals treating patients of greater overall urgency.¹⁶⁻¹⁸

Our findings of relatively low accuracy and reliability in application of the ATS to paediatric populations may therefore raise concerns in relation to the use of triage category based measures for comparisons between hospitals. Without accurate and reliable triage, there's no surety that figures relate to patients with equal clinical urgency across sites.

The ETEK contains 12 learning modules including units on the ATS itself, the process of conducting triage, and triage of mental health and paediatric patients. It contains details on key issues around each topic, learning exercises, lesson plans and tests that can be either self-directed or delivered by a hospital clinical educator.^{2,19,20} A previous study at a single hospital has shown that paediatric triage consistency and IRR may be aided by the introduction of the ETEK and may be further improved by intensive education sessions focused on the physiological signs most important in the triage of

children.²¹ However, our study reveals that there is significant room for improvement in the current accuracy and reliability across multiple hospitals and quite possibly a need for improvements in current paediatric triage training for nurses. Further, at the present time there is no standard means by which hospitals can evaluate the application of the ATS by their own triage staff. In 2011, a report commissioned by the New South Wales Department of Health recommended that a nationally consistent quality audit tool be developed to help EDs review the triage process and to be used in conjunction with the ETEK as part of ED triage education programs.¹² However, no action of this type has occurred.

Limitations

Limitations to this study include the use of paper-based scenarios, which may affect accuracy and IRR due to lack of visual cues.^{4,22} Our study was conducted at only four hospitals in metropolitan Melbourne and therefore our results may not be generalisable beyond the sites at which the study was conducted. Additionally, we did not explore depth, breadth and quality of triage training applied at each of the hospitals. This, along with extent of nurse experience in applying the ATS to paediatric patients, may potentially impact on performance and are factors for exploration in future research. The reasons for the triage decision were not reported, so specific areas of disagreement in the decision making process are not able to be identified.

Conclusion

This is the first multi-site study to examine the accuracy and reliability of paediatric triage using the ATS since the release of the ETEK. Accuracy and reliability was found to be low at all hospitals tested, although slightly better at the paediatric speciality hospital compared with the general hospitals. These results indicate that children presenting to hospital emergency departments may not be receiving triage scores in a consistent manner that is appropriate to their actual clinical urgency. The results suggest the potential need for improvements in the manner in which nurses are trained in the application of the ATS to paediatric patients, either through improvements to the ETEK or other training mechanisms (such as hospital-based programs). These may be either provided during initial triage training, or applied as continuing professional development on a regular basis in order to maintain consistency in ATS application. Additionally, without the introduction of a quality audit tool or other measure of consistency, there is no certainty that all hospitals are triaging children in an accurate and reliable manner either currently or over time.

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Figure legends

Figure 1. Average number of scenarios correct for nurses at each hospital (max = 9), 95% CI.

Figure 2. Participant responses at each hospital according to the Australasian Triage Scale categories.

Tables

Table 1. Accuracy rate for each scenario for nurses at each hospital

		Scenario number								
	<i>n</i>	1	2	3	4	5	6	7	8	9
General hospital 1	44	61%	45%	52%	61%	61%	75%	52%	30%	64%
General hospital 2	40	32%	15%	47%	70%	35%	73%	40%	17%	57%
General hospital 3	41	63%	59%	80%	61%	88%	61%	63%	49%	54%
Paediatric specialty hospital	42	60%	88%	100%	64%	71%	81%	71%	36%	67%
Overall	167	54%	52%	70%	64%	64%	72%	57%	33%	60%

Table 2. Interrater reliability within and between hospitals

	Kappa
General hospital 1	0.26
General hospital 2	0.32
General hospital 3	0.32
Paediatric specialty hospital	0.42
Overall	0.27