

PEDIATRICS

# Safety of a modification of the triage level for febrile children 6 to 36 months old using the Paediatric Canadian Triage and Acuity Scale

Jocelyn Gravel, MD, MSc(epid); Sergio Manzano, MD; Michael Arsenault, MD

**ABSTRACT**

**Objective:** The Paediatric Canadian Triage and Acuity Scale (PaedCTAS) stipulates that febrile patients who are 3 to 36 months old should be triaged to the PaedCTAS 3 "urgent" category. To optimize resource use, we implemented a protocol enabling these children to be down-triaged to the PaedCTAS 4 "less urgent" category if there was no sign of toxicity. Our objective was to evaluate the safety of this triage protocol modification.

**Methods:** This retrospective cohort study evaluated all patients triaged in an urban tertiary pediatric hospital during a 6-month period between November 22, 2005, and May 22, 2006. Data were retrieved from the emergency department (ED) database and rates of hospitalization and intensive care unit (ICU) admission were compared for 4 groups: all patients triaged as urgent (level 3), all febrile patients from 3 to 36 months old triaged as urgent (level 3), all patients triaged as less urgent (level 4) and all febrile patients aged 3 to 36 months old who were down-triaged to less urgent (level 4).

**Results:** There were 36 285 total ED visits during the study period, including 3477 febrile children who were 3 to 36 months old. Nurses down-triaged 1869 febrile children (54%) to the level-4 (less urgent) category and left 1322 (38%) in the level-3 (urgent) category. Hospitalization rate for down-triaged febrile patients was similar to that seen for all PaedCTAS 4 patients (2.4% v. 2.8%, 95% confidence interval for difference -0.3% to 1.1%). Down-triaged patients had significantly lower admission rates than those remaining in the level-3 (urgent) category (absolute risk reduction 10.7% standard deviation 1.9%,  $p < 0.001$ ). No down-triaged patient died or required ICU admission.

**Conclusion:** Febrile children aged 6 to 36 months who have no signs of toxicity can safely be down-triaged, based on triage nurse clinical judgement, to the less urgent PaedCTAS 4 category. This modification would affect the triage level of approximately 5% of all pediatric ED visits.

**Key words:** triage, pediatric, fever

**RÉSUMÉ**

**Objectif :** Selon l'échelle canadienne de triage et de gravité pour l'urgence pédiatrique (ÉTG pédiatrique), les patients fébriles âgés de 3 à 36 mois devraient être classés au niveau de triage III (urgent) de l'ÉTG pédiatrique. Pour optimiser l'utilisation des ressources, nous avons mis au point un

From the Division of Emergency Medicine, Department of Pediatrics, CHU Sainte-Justine, Université de Montréal, Montréal, Que.

Received: May 11, 2007; revisions received: Aug. 16, 2007; accepted Aug. 17, 2007

*This article has been peer reviewed.*

CJEM 2008;10(1):32-7

protocole selon lequel les enfants de ce groupe peuvent être triés au niveau IV, un niveau de triage inférieur « moins urgent » de l'ÉTG pédiatrique, si aucun signe de toxicité n'est présent. Notre objectif était d'évaluer la sécurité de ce protocole de triage modifié.

**Méthodes :** Notre étude de cohorte rétrospective portait sur tous les patients ayant fait l'objet d'un triage dans un hôpital pédiatrique de soins tertiaires en milieu urbain pendant une période de 6 mois, du 22 novembre 2005 au 22 mai 2006. Nous avons extrait de l'information de la base de données du service d'urgence et avons comparé les taux d'hospitalisation ainsi que les taux d'admission à l'unité de soins intensifs (USI) de quatre groupes, à savoir tous les patients ayant été triés au niveau « urgent » (niveau III), tous les patients fébriles de 3 à 36 mois ayant été triés au niveau « urgent » (niveau III), tous les patients classés au niveau « moins urgent » (niveau IV) et tous les patients fébriles de 3 à 36 mois classés au triage à un niveau inférieur « moins urgent » (niveau IV).

**Résultats :** Au cours de la période couverte par l'étude, 36 285 visites à l'urgence ont été effectuées, parmi lesquelles figuraient 3477 enfants fébriles âgés de 3 à 36 mois. Le personnel infirmier a trié à un niveau « moins urgent » (niveau IV) 1 869 enfants fébriles (54 %) et a trié 1322 (38 %) à un niveau III (urgent). Le taux d'hospitalisation des patients fébriles ayant été triés à un niveau de gravité inférieur était semblable à celui de tous les patients classés au niveau de triage IV selon l'ÉTG pédiatrique (2,4 % contre 2,8 %, intervalle de confiance à 95 %, 0,3 % à 1,1 %). Le taux d'admission des patients ayant été triés à un niveau de gravité inférieur était nettement plus bas que le taux des patients dont la classification est demeurée au niveau III (urgent) (réduction absolue du risque : 10,7 %; écart-type de 1,9 %;  $p < 0,001$ ). Aucun patient ayant été classé à un niveau inférieur n'est décédé ni n'a dû être admis à l'USI.

**Conclusion :** Le degré de priorité assigné aux enfants fébriles âgés de 6 à 36 mois ne présentant aucun signe de toxicité peut être réduit au niveau IV (moins urgent) de l'ÉTG pédiatrique, et ce, en toute sécurité, selon le jugement clinique de l'infirmière au triage. Cette modification s'appliquerait à environ 5 % de tous les enfants se présentant à l'urgence.

## Introduction

With the constant imbalance between patient demand and health care resources, triage systems have become an important aspect of emergency department (ED) functioning. The main goal of triage is to rapidly prioritize the sickest patients while categorizing less urgent patients who are at lower risk of deterioration and morbidity.<sup>1,2</sup> In 1997, the Canadian Association of Emergency Physicians (CAEP) and the National Emergency Nurses' Affiliation (NENA) adopted the 5-level Canadian ED Triage and Acuity Scale (CTAS), which has since become mandatory in most Canadian provinces.<sup>3</sup> In 2001, CAEP, NENA

and the Canadian Paediatric Society developed, by expert consensus, a 5-level pediatric triage scale derived from the adult CTAS.<sup>4</sup> The Paediatric Canadian Triage and Acuity Scale (PaedCTAS) uses signs and symptoms to assign triage levels, grouping more than 150 presenting conditions into 16 systems with 5 levels of urgency (Table 1). The PaedCTAS system has not yet been validated, and only 1 relevant study has been published correlating triage levels with admission rates and interventions.<sup>5</sup> None of its 150 presenting complaint categories have been specifically studied.

The PaedCTAS guidelines specify that febrile patients between 3 and 36 months of age should be triaged as

**Table 1. Triage levels according to PaedCTAS**

Triage level	Definition	Expected time to medical care, min	Expected admission rate, %	Example
1	Resuscitation	Immediate	70–90	Active seizure
2	Emergent	15	40–70	Fever and petechiae
3	Urgent	30	20–40	Suspicion of appendicitis
4	Less urgent	60	10–20	Vomiting and diarrhoea
5	Non urgent	120	0–10	Chronic skin problem

PaedCTAS = Paediatric Canadian Triage and Acuity Scale.

urgent (level 3).<sup>4</sup> Similarly, the 5-level Emergency Severity Index (version 4) recommends that children in this age group with a fever higher than 39°C and those with no obvious source of fever or incomplete immunizations should be classified as level 3.<sup>6,7</sup> However, Zimmer and colleagues reported that such patients may represent up to 25% of all pediatric ED visits.<sup>8</sup> This is a large proportion of ED patients, and artificially increasing their triage category could increase waiting times and morbidity for other patients deemed less urgent. As a result, many pediatric EDs have modified the PaedCTAS to optimize care delivery. In 2001, our institution implemented a triage modification stipulating that febrile children aged 6 to 36 months with no sign of toxicity could be down-triaged to the less urgent (PaedCTAS 4) category. This down-triage option does not apply to febrile patients under 6 months old.

In 2005, authorities from our institution suggested that the new triage protocol should be evaluated. The objective of the current study was therefore to assess the safety of our PaedCTAS modification. Our hypothesis was that febrile children who are down-triaged to PaedCTAS level 4 will have admission rates similar to those of other level 4 patients. This would suggest that it is appropriate and safe to consider a subset of febrile children, those between 6 and 36 months old without apparent toxicity, as a less urgent triage priority.

## Methods

### *Design and setting*

This retrospective cohort study took place in the ED of a tertiary, pediatric, university-affiliated hospital with an annual census of approximately 60 000 patient visits. All patients visiting the ED between November 22, 2005, and May 22, 2006, a 6-month period following the implementation of a new electronic triage system, were eligible for the study. Those in PaedCTAS levels 1, 2 or 5 were excluded from the analysis.

### *Triage modification*

In 2001, an expert group at our centre, including 3 pediatric emergency physicians and 2 chief nurses with experience in pediatric emergency medicine, developed a PaedCTAS modification stipulating that children between the ages of 6 and 36 months who had no signs of toxicity could be triaged as less urgent. Conversely, those between ages 3 and 6 months and older children with signs of toxicity could not be down-triaged. Signs of toxicity are based on subjective evaluation by the nurse and include unexplained crying before examination,

difficulty awakening or poor response to the physical evaluation.

### *Triage evaluation*

All participating triage nurses had more than 1 year of pediatric ED experience, underwent triage training and received satisfactory evaluations by the triage training nurse. During the study period, all patients were triaged using the Staturg triage tool (Statdev, Montréal, Quebec), a computerized version of PaedCTAS that suggests a triage level based on patient complaints. For febrile patients aged 3 to 36 months, Staturg suggested a triage level of 3 (urgent), but informed the nurse that, based on institutional protocol, well-looking patients older than 6 months could be triaged as level 4 (less urgent). The recently implemented Staturg system electronically links patients to specific triage categories and permits easy retrieval of important information, including chief complaint, diagnosis, ED length of stay (LOS) and other specific components of the PaedCTAS.

### *Data analysis*

Patients were stratified into 4 groups:

1. All patients triaged as urgent (level 3);
2. All febrile patients aged 3 to 36 months triaged as urgent (level 3);
3. All patients triaged as less-urgent (level 4);
4. All febrile patients aged 3 to 36 months down-triaged to less urgent (level 4) according to our protocol. For each group, the rates of admission, pediatric intensive care unit (PICU) admission and the number of patients who left without being seen by a physician were calculated.

### *Primary and secondary outcomes*

The primary outcomes were admission rates for group 3 versus group 4 patients. Secondary outcomes included admission rates for group 1 versus group 2 patients, the proportion of patients who left without being seen by a physician and the proportion of patients admitted to the PICU. The statistical significance of observed outcome differences was determined using Student's *t* test. Intervals of 95% confidence (95% confidence interval [CI]) were calculated as appropriate.

### *Sample size calculation*

This was an equivalency study aiming to demonstrate that patients down-triaged from level 3 to level 4 would have an admission rate similar to all other patients triaged level 4. The proportion of admission for all patients triaged level

4 was expected to be 2.5% and we assumed that an increase to 5% would be clinically significant. Setting  $\alpha$  at 0.05 and  $\beta$  at 0.10, we estimated that at least 1392 patients were necessary in groups 3 and 4 (patients triaged level 4), respectively. With an annual census of 60 000 patients, and assuming 5% to 10% of patients eligible for down-triage, we expected to accrue the necessary patients in a 6-month consecutive sample.

The study was approved by our institution's Investigational Review Board. Because of the retrospective design, patient informed consent was deemed unnecessary.

## Results

### Patients and acuity (study flow sheet)

Figure 1 shows that there were 36 285 ED visits during the study period, including 3477 (9.6%) febrile children aged

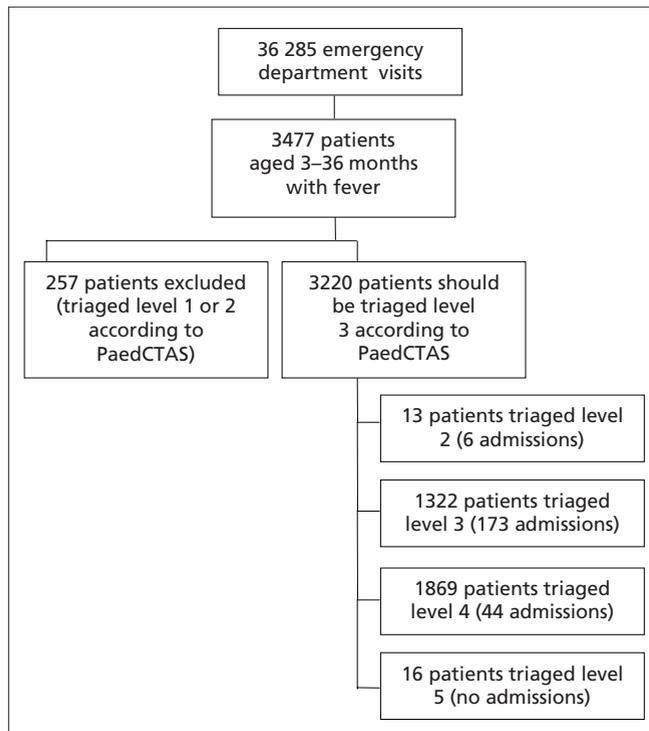


Fig. 1. Study flow chart. PaedCTAS = Paediatric Canadian Triage and Acuity Scale.

3 to 36 months. Of these, 257 children were triaged to level 1 or 2 and excluded from further analysis, leaving 3220 patients (8.8% of total ED volume) eligible for the institutional down-triage protocol. In this group, 1322 (38%) were left in the PaedCTAS 3 (urgent) category and 1869 (54%) were down-triaged to PaedCTAS 4 (less urgent). Thirteen patients who were up-triaged to emergent (level 2) based on their clinical appearance and 16 patients who were incorrectly downgraded to non urgent (level 5) were also excluded from the analysis. None of these patients required hospital admission. We found that, by using our triage modification protocol, approximately 10 patients per day were reclassified as less urgent.

### Key outcomes

Table 2 shows that the hospitalization rate in the subgroup of febrile level-3 (urgent) patients was similar to the rate for all PaedCTAS 3 patients (13.1% v. 15.6%, 95% CI 0.5%–4.5%), while the hospitalization rate in the subgroup of febrile (down-triaged) level-4 patients was similar to that seen for all PaedCTAS 4 patients (2.4% v. 2.8%, 95% CI for difference –0.3% to 1.1%). Febrile patients who were down-triaged to the less urgent PaedCTAS 4 category had significantly lower admission rates than those remaining in the level-3 (urgent) category (absolute risk reduction 10.7% standard deviation 1.9%,  $p < 0.001$ ). No down-triaged patient died or required ICU admission during the study. Table 2 also shows that left-without-being-seen rates were similar within level 3 (2.5% v. 2.3%, 95% CI for difference –0.7% to 1.1%) and within level 4 (20.1% in both groups, 95% CI for difference –1.8% to 2.0%), but that febrile patients who were down-triaged had significantly higher left-without-being-seen rates than febrile patients who remained in PaedCTAS level 3 (20.1% v. 2.5%, 95% CI for difference 15.6%–19.6%,  $p < 0.001$ ).

## Discussion

### Main findings

This study shows that febrile children aged 6 to 36 months with no signs of toxicity have admission rates similar to

Table 2. Admission rates and left-without-being-seen rates stratified by triage level

Triage level	Patient category	No. of patients	Admission rate, % (95% CI)	LWBS rate, % (95% CI)
3	All patients	12 267	15.6 (15.0–16.2)	2.3 (2.0–2.6)
	Patients aged 3–36 mo with fever	1322	13.1 (11.3–14.9)	2.5 (1.7–3.3)
4	All patients	16 082	2.8 (2.5–3.1)	20.1 (19.5–20.7)
	Patients aged 3–36 mo with fever	1869	2.4 (1.7–3.1)	20.1 (18.3–21.9)

LWBS = left without being seen; CI = confidence interval.

PaedCTAS level-4 patients and can safely be down-triaged, based on triage nurse clinical judgement, to this less urgent category. Conversely, febrile patients triaged to PaedCTAS level 3 had outcomes similar to other level-3 (urgent) patients. This down-triage modification would be applicable to approximately 5% all patients visiting a tertiary care, university-affiliated, pediatric ED.

### **Triage validity**

Triage systems should be reliable and valid. Dong and colleagues recently assessed the validity of the adult version of CTAS,<sup>9</sup> showing that its levels correlated with resource use, costs and admission rates. These authors suggested that future research should focus on specific CTAS presenting complaints. PaedCTAS was derived from CTAS by expert consensus and has not yet been validated. This study is the first to focus on a specific PaedCTAS presenting complaint, and its findings agree with those from a 2001 study performed at our institution.<sup>5</sup> In this previous study, admission rates were 12% for urgent patients and 4% for less urgent patients, lower than the 20%–40% and 10%–20% predicted by the PaedCTAS guidelines for urgent and less urgent patients, respectively.<sup>10</sup>

### **Hazards of overtriage**

Our study showed that more than 33% of ED patients were triaged as urgent; this is a higher than expected proportion. If too many patients are triaged unnecessarily to the urgent category, they may distract care providers from patients with more emergent conditions, potentially increasing morbidity. To mitigate this concern, many pediatric EDs have adopted institution-specific triage policies and practices for children with fever. Unfortunately, the emergence of diverse local triage protocols compromises interhospital triage reliability and comparability — 2 of the main potential benefits of a standardized national triage system.<sup>4</sup> A triage modification like the one described here, which would safely reduce the number of patients triaged to the urgent category, could be added as a component of PaedCTAS and would facilitate faster access to care for truly ill patients. Implemented nationwide, it would also improve triage standardization among EDs using the PaedCTAS system.

### **Electronic triage**

Historically, it has been difficult to evaluate what factors drive triage decisions, although one previous report suggested that environmental conditions influence triage level.<sup>5</sup> Nurses using a traditional paper version of PaedCTAS

rely on memory or a triage chart to assign acuity levels, but have wide latitude and do not have to justify the triage level chosen. The Staturg software used in this study suggests a specific triage level based on patient information elicited by the nurse, who must justify any modification of that triage level. By allowing triage nurse overrides and recording the justification for these, computerized triage systems will help investigators gain a better understanding of the triage process.

### **Limitations**

This study was performed in a single centre and external validity is uncertain. To apply the down-triage protocol, nurses were asked to identify “signs of toxicity.” The ability to make this judgment is dependent on triage nurse expertise, and patient findings may vary over time. We studied children aged 6 to 36 months, and our findings cannot be generalized beyond this age range.

Our objective was to assess the safety of down-triaging a subset of febrile patients. Unfortunately, there is no gold standard for triage safety. We used admission rate as a surrogate marker to identify low-risk patients who are able to wait longer for care. This may not be ideal, since the need for rapid care does not correlate perfectly with the need for admission. We are, however, reassured by the fact that none of the almost 2000 down-triaged patients died or required ICU admission. While the innovation studied represents a potentially beneficial modification to PaedCTAS, we did not demonstrate that it is superior to other institution-specific protocols or, in fact, other triage systems like the Emergency Severity Index.

### **Conclusion**

Febrile children aged 6 to 36 months who have no signs of toxicity can safely be down-triaged, based on triage nurse clinical judgement, to the less urgent PaedCTAS 4 category. These findings could lead to the first evidence-based modification of the PaedCTAS guidelines. The triage modification recommended would apply to approximately 5% of all pediatric ED visits and could decrease waiting time for other patients with more urgent problems.

**Competing interests:** None declared.

### **References**

1. Kennedy K, Aghababian RV, Gans L, et al. Triage: techniques and applications in decision making. *Ann Emerg Med* 1996; 28:136-44.

2. McDonald L, Butterworth T, Yates DW. Triage: a literature review 1985-1993. *Accid Emerg Nurs* 1995;3:201-7.
3. Beveridge R. CAEP issues. The Canadian Triage and Acuity Scale: a new and critical element in health care reform. Canadian Association of Emergency Physicians. *J Emerg Med* 1998;16:507-11.
4. Canadian Association of Emergency Physicians. Implementation of Canadian Paediatric Emergency Triage and Acuity Scale. *CJEM* 2001;3:1-32.
5. Gouin S, Gravel J, Amre DK, et al. Evaluation of the Paediatric Canadian Triage and Acuity Scale in a pediatric ED. *Am J Emerg Med* 2005;23:243-7.
6. American College of Emergency Physicians Clinical Policies Committee; American College of Emergency Physicians Clinical Policies Subcommittee on Pediatric Fever. Clinical policy for children younger than three years presenting to the emergency department with fever. *Ann Emerg Med* 2003;42:530-45.
7. Gilboy N, Tanabe P, Travers DA, et al. Emergency Severity Index version 4: implementation handbook. Rockville (MD): AHRQ Publication No. 05-0046-2; 2005.
8. Zimmer KP, Walker A, Minkovitz CS. Epidemiology of pediatric emergency department use at an urban medical center. *Pediatr Emerg Care* 2005;21:84-9.
9. Dong SL, Bullard MJ, Meurer DP, et al. Predictive validity of a computerized emergency triage tool. *Acad Emerg Med* 2007;14:16-21.
10. Paediatric CTAS. 2007. Available: <http://caep.ca/template.asp?id=B795164082374289BBD9C1C2BF4B8D32> (accessed 2007 Aug 10).

---

**Correspondence to:** Dr. Jocelyn Gravel, Pediatric Emergency Department, CHU Sainte-Justine, 3175 Chemin Côte-Sainte-Catherine, Montréal QC H3T 1C5; Graveljocelyn@hotmail.com