

Revisions to the *Canadian Emergency Department Triage and Acuity Scale Implementation Guidelines*

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Introduction

There has been widespread implementation of the *Canadian Emergency Department Triage and Acuity Scale* (CTAS) across Canada since it was introduced in 1999.^{1,2} This consensus document, developed by the CTAS National Working Group (NWG) of nurse and physician leaders in emergency department (ED) triage, continues to be viewed as a dynamic document that requires modification over time as experience is gained in its application. This article presents the first major modification to the CTAS.

Rationale for change

Although a number of publications have validated the reliability of the CTAS,³⁻⁵ the inter-rater and inter-site reliability of the scale could be improved through a more objective approach to the triage acuity assignment. These revisions to the CTAS are an attempt to improve on its reliability and help with standardization.

Several publications have also examined the predictive validity of CTAS and its correlation with resource utilization in EDs.⁶⁻⁸ Jiménez and colleagues⁸ found the scale to be a valid instrument for predicting admission rates, hospital length of stay and diagnostic utilization.

The CTAS, a 5-level triage scale for classifying the acuity of a patient's condition, is based primarily on the patient's presenting complaint. The original guidelines included a limited number of presenting complaints.

Complaints not listed in the original guidelines were often compared with others in the list to extrapolate a triage level. The development and publication of the Canadian Emergency Department Information System (CEDIS) Presenting Complaint List (Version 1.0)⁹ offers a strong platform from which to revise the CTAS. The CEDIS list is recommended for use in all Canadian EDs, but to support this recommendation, there is a need to clearly define all complaint-specific modifiers for each of the CTAS levels. Some initial work has been published on the reliability of the CEDIS Presenting Complaint List, and a modified presenting complaint list, matched to CTAS levels in a computer-assisted triage system, has been evaluated.^{10,11}

The original CTAS guidelines recommend a time-to-physician assessment on the basis of triage acuity level. However, when the presenting complaint is not specifically identified in the guidelines, assigning an acuity level becomes more subjective. The CTAS NWG believed that a more objective approach was required.

The emphasis on the time-to-nurse and time-to-physician assessment and the lack of understanding of fractile response rates for system performance have led to both over- and underestimates of triage level. In some instances, the triage level assigned was based on times that were achievable, rather than time responses recommended in the guidelines. There is therefore a strong urge to move away from the concept of prescribed times to initial assessment because these times are rarely achievable and impediments

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Endorsed by the Canadian Association of Emergency Physicians (CAEP), the National Emergency Nurses Affiliation (NENA), l'Association des médecins d'urgence du Québec (AMUQ), the Canadian Paediatric Society (CPS) and the Society of Rural Physicians of Canada (SRPC).

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to patient throughput are often beyond ED control. The CTAS NWG believes that the focus should shift to the timely *reassessment* of patients waiting to be seen, to ensure that unavoidable delays are safe.

Lastly, there is a need to develop a national strategy to educate those using the CTAS to improve standardization and reliability and validity. The timing of this educational development dovetails nicely with the revisions to the guidelines.

Methods

The experience gained from the development of the pediatric CTAS (PaedCTAS)¹² conceptual framework and education program was used to develop an education program for CTAS use with adult patients. A pilot of this program was delivered to a group of nurse educators and nurse triage experts in Toronto in December 2003. Their evaluations and feedback were used by the CTAS National Education Subcommittee, which met in January 2004, to improve the education program and enhance and increase the objectivity of the triage process.

To improve the reliability of the CTAS, the group focused on the relative importance and use of the presenting complaint, vital signs, pain scales and mechanism of injury in the triage decision. Definitions were agreed upon, the comprehensiveness of the CEDIS Presenting Complaint List was reviewed and recommendations were developed for the CTAS NWG. Members of the CTAS and CEDIS NWGs were asked to review this before the June 2004 meeting. The members of these groups represent nurses and physicians experienced in both pediatric and adult ED triage and ED information systems, and who are familiar with the CEDIS Presenting Complaint List.

At the June meeting, 3 subgroups reviewed the CEDIS Presenting Complaint List and matched each complaint to CTAS acuity levels using the criteria of presenting complaint, vital signs, pain scales, mechanism of injury and other modifiers. The group discussed the recommendations of the subgroups and developed a consensus agreement on the changes to the CTAS National Guidelines and modifications to the CEDIS Presenting Complaint List.

Results and discussion

The complete revised CTAS document with each CEDIS presenting complaint and corresponding CTAS level based on first- and second-order modifiers can be found at the Canadian Association of Emergency Physicians Web site (www.caep.ca).

Initial versus reassessment triage acuity level

The triage assessment and triage acuity level assigned by the triage nurse at the first patient encounter is defined as the CTAS triage level. This initial triage level is based on the nurse's assessment of acuity and helps determine the urgency with which this patient requires care relative to the other patients waiting to be seen. It also determines the recommended frequency of reassessment while the patient is waiting. This initial score cannot be changed. The triage assessment is based on time-limited information. It is not a final diagnosis; the patient's condition may improve or deteriorate over time.

The goal of triage is to identify the patients who need to be seen first and those who can safely wait. ED waiting times have been increasing, and even those patients triaged as CTAS Level II are sometimes required to wait for long periods before being seen because ED beds are not available. This reality is a major reason for the emphasis on patient *reassessments* in these revised guidelines. It is important that the patient or their caregiver be instructed to contact the triage nurse if the presenting condition worsens while the patient is in the waiting area. The safety of waiting is a shared responsibility between the patient and the triage nurse. The recommended reassessment time intervals are the same as those in the original guidelines:

- Level I patients should have continuous nursing care
- Level II every 15 minutes
- Level III every 30 minutes
- Level IV every 60 minutes
- Level V every 120 minutes.

The extent of the reassessment depends on the presenting complaint, the initial triage level and any changes identified by the patient.

Prolonged wait times and the need to warehouse admitted patients in the ED often lead to significant changes in patient acuity. The same acuity scale may be applied at the time of reassessment to establish a "reassessment acuity level," which should be recorded on the triage record (not altering the initial triage score) as well as any action taken. The patient's status may change because of changing modifiers associated with the presenting complaint or because the presenting complaint has actually changed. Should acuity increase upon reassessment, the order of priority of the patients waiting in the ED may change. This demonstrates that the process of triage and acuity assignment is dynamic and should involve multiple reassessments and possible reassignments of a CTAS acuity level.

Presenting complaint and first- and second-order modifiers

The patient's presenting complaint remains the primary determinant of the CTAS acuity level. This level, however, can be altered by the application of specific objective first- and second-order modifiers. The CEDIS Presenting Complaint List is the foundation upon which the revised CTAS guidelines have been developed.

Most presenting complaints can be modified by first-order modifiers — vital signs, pain scales and mechanism of injury — and by chronicity of the complaint. Chronic recurring complaints of well recognized problems or acute complaints where the symptoms have completely resolved may be assigned one level of acuity lower. For example, patients with abdominal pain or headache with normal vital signs may be assigned a CTAS Level of II, III or IV on the basis of pain severity, and patients with a chronic or recurring problem of similar severity may be given CTAS acuity Level III, IV or V.

Second-order modifiers tend to be specific to the presenting complaint. For example, chemical injury to the eye is classified CTAS Level II.

The process that has been developed for the assignment of triage level is as follows:

1. **The presenting complaint** is determined by the triage nurse early in the triage process. This automatically generates a complaint-specific minimum CTAS level.
2. **First-order modifiers** are then applied, where appropriate, starting with vital signs, which, based on defined alterations in hemodynamic stability, blood pressure, temperature, level of consciousness and degree of respiratory distress, may change the triage level.
3. **Pain severity** is then determined, differentiating central versus peripheral and acute versus chronic recurring pain. The CTAS level assigned is based upon the highest level identified by any of the modifiers. For example, a patient with normal vital signs may be assigned a CTAS Level of III, IV or V based on the presenting complaint. However, if they have central pain that is severe, then they would be assigned a CTAS Level II on the basis of their pain scale.
4. **Mechanism of injury** (i.e., high- or low-risk mechanism) is considered for all trauma patients. High-risk mechanisms translate to an immediate CTAS Level II.
5. **Second-order modifiers** are also important for specific complaints to help risk stratify patients, especially when first-order modifiers are not definitive.

Vital signs

Vital signs have always been important to the determina-

tion of the acuity level. In fact, the original guidelines on how soon a patient should be seen were, in part, based on the presence of abnormal vital signs. The CTAS NWG has grouped abnormal vital signs under the following categories to help in the assignment of CTAS acuity levels: hemodynamic stability, hypertension, temperature, level of consciousness and degree of respiratory distress.

Hemodynamic stability: Patients with abnormal circulatory vital signs may be assigned CTAS Level I (unstable) or CTAS Level II (potentially unstable). Level I patients show signs of shock with evidence of hypoperfusion or of progressive deterioration. Level II patients have abnormal vital signs without signs of hypoperfusion or hemodynamic compromise and without evidence of progressive worsening (Table 1).

Table 1. CTAS level and hemodynamic stability

CTAS level	Description
I (shock)	Evidence of severe end-organ hypoperfusion: marked pallor, cool skin, diaphoresis, weak or thready pulse, hypotension, postural syncope, significant tachycardia or bradycardia, ineffective ventilation or oxygenation, decreased level of consciousness. Could also appear as flushed, febrile, toxic, as in septic shock.
II (hemodynamic compromise)	Evidence of borderline perfusion: pale, history of diaphoresis, unexplained tachycardia, postural hypotension, by history (feeling faint on sitting or standing) or suspected hypotension (lower than normal blood pressure or expected blood pressure for a given patient).
III	Vital signs at the upper and lower ends of normal as they relate to the presenting complaint, especially if they differ from the usual values for the specific patient.
IV	Normal vital signs.

Hypertension: Patients with hypertension may be assigned a CTAS acuity level on the basis of the degree of elevation and the presence or absence of other symptoms (e.g., headache, nausea, shortness of breath) (Table 2).

Table 2. CTAS level and hypertension

CTAS level	Blood pressure, mm Hg	Other symptoms
II	SBP > 220 or DBP > 130	Any symptoms
III	SBP > 220 or DBP > 130	No symptoms
III	SBP 220–200 or DBP 130–110	Any symptoms
IV	SBP 220–200 or DBP 130–110	No symptoms

SBP = systolic blood pressure; DBP = diastolic blood pressure.

Temperature: An abnormal temperature, as it relates to infectious illness or environmental exposure, may indicate a reassessment of CTAS level, but age, outward appearance (e.g., hyperdynamic state) and immunocompromised state must be taken into account (Table 3).

Table 3. Temperature and CTAS level

Temperature, age, condition	CTAS level
Low temperature	
0–3 mo (<36°C)	II
>3 mo ($\leq 31^{\circ}\text{C}$)	II
>3 mo (32°–35°C)	III
Elevated temperature	
0–3 mo ($>38^{\circ}\text{C}$)	II
3 mo to 3 yr ($>38.5^{\circ}\text{C}$)	
Immunocompromised*	II
Looks unwell	II
Looks well	III
>3 yr ($>38.5^{\circ}\text{C}$)	
Immunocompromised*	II
Looks unwell† (use other modifiers)	II or III
Looks well‡ (use other modifiers)	III or IV
Adults ≥ 16 yr ($>38.5^{\circ}\text{C}$)	
Immunocompromised*	II
Looks septic (hemodynamic compromise)	II
Looks unwell†	III
Looks well‡	IV

*Neutropenia, transplant, steroids.

†Fever and looks unwell (CTAS level III) means looks flushed, is in a hyperdynamic state (rapid, bounding pulse with a widened pulse pressure) and is anxious, agitated or confused.

‡ Fever and looks well (CTAS level IV) means looks comfortable, in no distress, with normal pulse quality, and is alert and oriented.

Level of consciousness: The patient's Glasgow Coma Scale (GCS) score may be used to determine the CTAS level, both in patients who have experienced trauma and those who have not. It can be used to define CTAS Levels I and II, but other factors should be used to differentiate the CTAS level for patients with GCS scores of 14 or 15 (Table 4). The use of the GCS implies that there was a pre-existing GCS score. In patients with dementia and other chronic central nervous system conditions, the GCS is less useful than identifying a change from their normal status.

Respiratory distress: Respiratory rate and oxygen saturation are useful measures to assess acuity; however, one should note that both can be chronically abnormal. The CTAS guidelines provide the following advice when degree of respiratory distress is being assessed:

- No single factor can be used in isolation; all factors, combined with an evaluation of the work of breathing, should be considered when assigning a CTAS level (Table 5).

- Oxygen saturation rate should not be used in isolation.
- Two or 3 satisfactory efforts are needed to measure an accurate peak expiratory flow rate (PEFR), and neither PEFR nor FEV₁ (forced expiratory volume in 1 s) measurements are helpful in estimating acuity in patients with chronic obstructive pulmonary disease (COPD).
- Race- and gender-specific tables should be used.
- Whenever possible, individual patient baseline PEFR values should be used to calculate their percentage predicted at triage.

Table 4. Glasgow Coma Scale (GCS) score and CTAS level

GCS score	Description	CTAS level
3–9	Unconscious: unable to protect airway, response to pain or loud noise only and without purpose (i.e., abnormal posturing or withdrawal activity), continuous seizure or progressive deterioration in level of consciousness	I
10–13	Altered level of consciousness: response inappropriate to verbal stimuli (localizes to pain only or confused/garbled speech); loss of orientation to person, place, or time (confusion); new impairment of recent memory (amnesia); altered behaviour (agitation, restlessness)	II
14–15	Other modifiers should be used to define level	III–V

Table 5. Respiratory distress and CTAS level

Level of distress	Description of patient	O ₂ saturation	PEFR predicted	CTAS level
Severe	Fatiguing from excessive work of breathing, cyanosis, single-word speech, unable to speak, upper airway obstruction, lethargic or confused	<90%	—	I
Moderate	Increased work of breathing, speaking phrases or clipped sentences, significant or worsening stridor but airway protected	<92% predicted	<40% predicted	II
Mild / moderate	Dyspnea, tachypnea, shortness of breath on exertion, no obvious increased work of breathing, able to speak in sentences, stridor without any obvious airway obstruction	92% to 94% predicted	40% to 60% predicted	III

PEFR = peak expiratory flow rate.

Pain severity determination

The following assumptions should be made when assessing pain severity in association with CTAS level:

- certain pain locations are more likely to predict life-threatening conditions;
- severe pain may predict a more dangerous problem and require more timely pain control and definitive interventions;
- acute pain is more likely to be dangerous than chronic or recurrent pain.

Central pain is defined as pain suspected to be originating within a body cavity (head, chest, abdomen) or organ (eye, testicle, deep soft tissues), possibly associated with life- or limb-threatening conditions. Examples include ischemic events (acute coronary syndrome, dissecting aneurysm, testicular torsion), expanding/obstructing events (glaucoma, bowel obstruction), irritant events (subarachnoid hemorrhage, bowel perforation) and infectious events (necrotizing fasciitis, deep neck infections).

Peripheral pain is defined as pain suspected of originating within the skin, soft tissues, axial skeleton or surface of superficial organs (eye, ear, nose). Examples include skin lacerations and abrasions, contusions, fractures (wrist, ribs) and foreign bodies (eye, ear, nose).

Acute pain is of new onset (first time), whereas chronic pain is suggestive of a well recognized long-term or frequently recurring pain syndrome that has not changed in pattern or nature to create concerns. For example, there is a clear difference in “risk” and “need for intervention” between a patient who falls off a roof and presents with acute back pain (8 out of 10) and the patient with chronic back pain who presents with the same pain score. The original guidelines included these concepts but did not objectify them (Table 6).

Table 6. Assessment of pain and CTAS level

Pain severity	Pain score*	Location of pain	Acute v. chronic pain	CTAS level
Severe	8–10	Central	Acute	II
		Peripheral	Chronic	III
	4–7	Central	Acute	III
		Peripheral	Chronic	IV
Moderate	4–7	Central	Acute	III
		Peripheral	Chronic	IV
	0–3	Central	Acute	IV
		Peripheral	Chronic	V

*On a 10-point Likert scale.

Pain scales rely on patient self-reporting, which is very subjective. The CTAS NWG recommends that a consistently applied and accepted pain scale (such as a 10-point Likert scale or 10-cm visual analog scale) be used at triage and that the same scale be used for reassessment. Patients may overestimate or underestimate their pain depending on various factors; cultural differences, fear and anxiety or expectations will influence the patient’s perception and self-reporting of pain.

The triage nurse should apply a pain scale and record the patient’s self-reported level of pain. When applying the pain modifier to determine the final triage score, the triage nurse should also consider objective observations. In general, patients should display some physiologic changes associated with their pain and appear to be in some degree of distress. Patients may have significant pain and deny it, yet show overt signs of pain such as tachycardia, facial grimacing, distraction and remoteness. Conversely, a patient may report a high level of pain, yet exhibit no distress or physiologic changes. It is important that the triage nurse record both personal observations and the patient’s pain score when arriving at a CTAS level.

Mechanism of injury

The mechanism of injury can be used as a modifier, and it alone can determine the CTAS level as Level II when there is a high-risk mechanism. Abnormal vital signs associated with injury are used to define Level I and Level II, and in those cases the mechanism of injury would add nothing. The mechanism of injury is important for stable patients at risk for a serious injury. High-risk mechanism of injury victims are given a CTAS Level II (see Table 7, p. 426).

Other modifiers

Blood glucose level

Although, historically, a blood glucose determination has not been part of the triage process, it has become necessary as wait-times continue to increase, even for those more urgent patients. Thus, for patients with diabetes, whose presenting complaint may be associated with an abnormal glucose level, a blood sugar reading can be taken to assist in determining the final triage level (see Table 8, p. 426).

Obstetrical presentations

The original CTAS implementation guidelines included a limited list of obstetrical presentations. The revised guidelines have expanded the list, and this has resulted in additions to the CEDIS Presenting Complaint List. There are different problems, presentations and management issues associated with pregnant patients, depending on how far

Table 7. Mechanism of injury and CTAS level

Risk level	Mechanism of injury and examples	CTAS level
High	General trauma Auto accident: ejection from vehicle, rollover, extrication time >20 min, significant intrusion into passenger's space, death in the same passenger compartment, impact >40 km/h (unrestrained) or impact >60 km/h (restrained) Motorcycle accident where impact with a car >30 km/h, especially if rider is separated from bike Pedestrian or bicyclist run over or struck by vehicle at >10 km/h Fall of >6 m Penetrating injury to head, neck, torso or extremities proximal to elbow and knee	II
High	Head trauma Auto accident: ejection from vehicle, unrestrained passenger striking head on windshield Pedestrian struck by vehicle Fall from >3 feet or 5 stairs Assault with a blunt object other than fist or feet	II
High	Neck trauma Auto accident: ejection from vehicle, roll-over, high-speed (esp. if driver unrestrained) Motorcycle accident Fall from >3 feet or 5 stairs Axial load to the head	II
Low	General trauma Auto accident: car-on-car rear-end collision, while coming to a stop, or impact <30 km/h and driver restrained	Use other modifiers
Low	Head trauma Auto accident: low-impact (<30 km/h) and driver restrained Fall or trip while standing on the ground Fist fight or blow to head (excluding with pointed or heavy object) with no loss of consciousness	Use other modifiers
Low	Neck trauma Simple rear-end collision (car-on-car), driver ambulatory after injury (driver not intoxicated or confused due to head injury) or delayed onset of neck pain	Use other modifiers

Table 8. Blood glucose and CTAS levels

Blood glucose level	Symptoms	CTAS level
<3 mmol/L	Confusion, diaphoresis, behavioural change, seizure	II
	None	III
>18 mmol/L	Dyspnea, dehydration, weakness	II
	None	III

along the pregnancy has progressed (e.g., <20 wk v. >20 wk gestation). Specific complaints related to gestational age of >20 weeks are shown in Table 9.

Table 9. Pregnancy-related presenting complaint (>20 wk gestation) and CTAS level

Presenting complaint	CTAS level
Presenting fetal parts or prolapsed cord	I
Vaginal bleeding, 3 rd trimester (other than show)	I
Active labour (contractions <2 min apart)	II
No fetal movement	II
Complex of hypertension +/- headache +/- edema +/- abdominal pain	II
Post-delivery (mother and child)	II
Possible leaking amniotic fluid (>24 h)	III

Conclusions

This is the first major revision to the *CTAS Implementation Guidelines* since their inception in 1999. It is based on 5 years of collective experience of individuals with expertise in ED triage, the evidence that exists to date and the consensus of the working group's members. It remains a living document; the CTAS NWG meets yearly to discuss progress, enhancements and plans for any major revisions. Comments from users of the CTAS are welcome and may be submitted to ctas@caep.ca.

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Key words: Canadian Emergency Department Triage and Acuity Scale; CTAS; pain measurement; presenting complaint; trauma severity indices; triage

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