EM Advances

Physician workload and the Canadian Emergency Department Triage and Acuity Scale: the Predictors of Workload in the Emergency Room (POWER) Study

Jonathan F. Dreyer, MD, CM;* Shelley L. McLeod, MSc;* Chris K. Anderson, PhD;†§ Michael W. Carter, PhD;‡ Gregory S. Zaric, PhD§

ABSTRACT

Introduction: The Canadian Emergency Department Triage and Acuity Scale (CTAS) is a 5-level triage tool used to determine the priority by which patients should be treated in Canadian emergency departments (EDs). To determine emergency physician (EP) workload and staffing needs, many hospitals in Ontario use a case-mix formula based solely on patient volume at each triage level. The purpose of our study was to describe the distribution of EP time by activity during a shift in order to estimate the amount of time required by an EP to assess and treat patients in each triage category and to determine the variability in the distribution of CTAS scoring between hospital sites.

Methods: Research assistants directly observed EPs for 592 shifts and electronically recorded their activities on a moment-by-moment basis. The duration of all activities associated with a given patient were summed to derive a directly observed estimate of the amount of EP time required to treat the patient.

Results: We observed treatment times for 11 716 patients in 11 hospital-based EDs. The mean time for physicians to treat patients was 73.6 minutes (95% confidence interval [CI] 63.6–83.7) for CTAS level 1, 38.9 minutes (95% CI 36.0–41.8) for CTAS-2, 26.3 minutes (95% CI 25.4–27.2) for CTAS-3, 15.0 minutes (95% CI 14.6–15.4) for CTAS-4 and 10.9 minutes (95% CI 10.1–11.6) for CTAS-5. Physician time related to patient care activities accounted for 84.2% of physicians' ED shifts.

Conclusion: In our study, EPs had very limited downtime. There was significant variability in the distribution of CTAS scores between sites and also marked variation in EP time related to each triage category. This brings into question the appropriateness of using CTAS alone to determine physician staffing levels in EDs.

Keywords: emergency department, workload, acuity, human resources, remuneration, staffing

RÉSUMÉ

Introduction : L'Échelle canadienne de triage et de gravité (ÉTG) est un outil de priorisation à 5 niveaux utilisé pour déterminer l'ordre de priorité selon lequel il faut traiter les patients qui consultent dans les services d'urgence du Canada. Pour calculer la charge de travail des médecins d'urgence et les besoins en effectifs, de nombreux hôpitaux en Ontario utilisent une formule axée sur la composition de la clientèle, un système qui se fonde uniquement sur le volume de patients inscrits à chaque niveau de l'échelle de triage. Notre étude avait pour but d'analyser la répartition du temps consacré par les médecins d'urgence pour chaque acte médical posé au cours d'un quart de travail, de façon à estimer le temps requis par un médecin d'urgence pour l'examen et le traitement des patients de chaque catégorie de triage et d'évaluer la variabilité de l'assignation aux divers niveaux de l'ÉTG entre les différents hôpitaux.

Méthodes : Des assistants de recherche ont observé directement les médecins d'urgence pendant 592 quarts de travail et ont enregistré leurs activités sur support électronique, à chaque instant. La durée de tous les actes posés chez un patient donné a été résumée pour estimer par l'observation directe le temps requis par un médecin d'urgence pour traiter un patient.

Résultats : Nous avons observé les temps de traitement pour 11 716 patients de 11 services d'urgence attachés à des hôpitaux. Le temps moyen requis par les médecins pour traiter les patients a été de 73,6 minutes [intervalle de confiance (IC) à 95 %, 63,6 à 83,7] pour le niveau 1 de l'ÉTG; de 38,9 minutes (IC à 95 %, 36,0 à 41,8) pour le niveau 2; de 26,3 minutes (IC à 95 %, 25,4 à 27,2) pour le niveau 3; de 15,0 minutes (IC à 95 %, 14,6 à 15,4) pour le niveau 4; et de 10,9 minutes (IC à 95 %, 10,1 à 11,6) pour le niveau 5. Le temps consacré par les médecins à soigner des patients a représenté 84,2 % de leur quart au service d'urgence.

From the *Division of Emergency Medicine, Schulich School of Medicine and Dentistry, University of Western Ontario, London, Ont., the †School of Hotel Administration, Cornell University, New York, NY, the ‡Department of Mechanical and Industrial Engineering, University of Toronto, Toronto, Ont., and §Richard Ivey School of Business, University of Western Ontario, London, Ont.

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Conclusion : Dans notre étude, les médecins d'urgence ont connu très peu de temps morts. On a noté une variabilité significative quant à la distribution des niveaux de l'ÉTG d'un service d'urgence à l'autre, de même qu'une disparité dans le temps accordé par les médecins d'urgence à chaque catégorie de triage. Cela remet en question le bien-fondé de l'utilisation de l'ÉTG seule pour calculer les effectifs médicaux requis dans les services d'urgence.

INTRODUCTION

The emergency department (ED) is an environment in which large numbers of patients with a variety of complaints and acuities are seen on a daily basis. In many Canadian hospitals emergency physician (EP) staffing levels are influenced in part by ED patient census and acuity as determined by the Canadian Emergency Department Triage and Acuity Scale (CTAS),[1] waiting times, and arrivals by time of the day. However, there is no evidence-based or commonly accepted method of predicting physician staffing needs. At a time when ED crowding is common, and patient waiting times are increasing,[2] there is widespread concern about optimizing patient throughput and staff productivity. This includes the provision of appropriate physician staffing.

CTAS was first described in 1995 as a standard tool for triage in Canadian EDs and was introduced for general use in 1999.[3,4] The scale delineates 5 levels of acuity: level 1 (resuscitation), level 2 (emergent), level 3 (urgent), level 4 (less urgent) and level 5 (nonurgent). The scale was published with sentinel diagnoses for each category, as well as guidelines for the maximum time a patient should wait before the first assessment by a nurse and by a physician.

Many hospitals in Ontario use a case-mix formula, based solely on patient volume at each triage level, to determine EP workload and staffing needs (Dr. Michael Murray, Chief of Staff and Emergency Physician, Royal Victoria Hospital, Barrie, Ont.: presentation to the Ontario Physician Services Committee, July 2001). This is linked with a funding mechanism that offers EPs sessional or hourly rates of remuneration as an alternative to fee-for-service billings. The formula assigns a specific number of minutes to patients at each CTAS level. The sum of all patient times during 1 year establishes the number of hours of EP coverage for that ED. In 2003/04, the estimates of physician time used in the funding formula were loosely based on studies from Australia[5,6] and the United States.[7]

Very few studies have attempted to predict EP staffing levels or to determine the amount of time that it actually takes an EP to treat a patient.[7–11] As total patient time in the ED is at least in part related to the activities of EPs, it is important to understand how EPs spend their time on a task-by-task basis while working. Without knowing how EPs spend their time during an ED shift, it is challenging and perhaps impossible to accurately determine adequate physician staffing levels.

Our objectives were to describe the distribution of EP time by activity during a shift, to estimate the amount of time required by an EP to assess and treat patients in each triage category, to describe the variability in the distribution of CTAS scoring between hospital sites and to thus determine if CTAS alone can be used to establish EP staffing levels.

METHODS

Study design

We conducted a prospective observational study to accurately describe the distribution of EP time by activity during a shift and to produce estimates of the amount of time required by an EP to assess and treat patients in each CTAS category. The study was approved by the ethics review board at each institution. Physician participation was voluntary. The study was funded by the Ontario Ministry of Health and Long-Term Care. The funding agreement ensured that the authors maintained control over the study design, methods and interpretation of the results.

Study setting and population

Eleven hospital-based EDs participated. The sites were spread across the 5 geographic regions of the Ontario Hospital Association and were selected to provide a mix of hospital type (2 rural, 6 community and 3 teaching hospitals) and annual ED patient census (low: < 30 000 patients/yr; medium: 30 000–50 000 patients/yr; and high: > 50 000 patients/yr). The participating hospitals included Credit Valley Hospital, Mississauga, Ont.; Kingston General Hospital, Kingston, Ont.; London Health Sciences Centre (Victoria Hospital Site), London, Ont.; Markham–Stouffville Hospital, Markham, Ont.; Quinte Healthcare Corporation (Belleville General Site), Belleville, Ont.; Royal Victoria Hospital, Barrie, Ont.; South Muskoka Memorial Hospital, Bracebridge, Ont.; Stevenson Memorial Hospital, Alliston, Ont.; Sudbury Regional Hospital, Sudbury, Ont.; Sunnybrook and Women's College Health Sciences Centre, Toronto, Ont.; and Windsor Regional Hospital, Windsor, Ont.

Study protocol

The study took place from Sep. 1, 2003, to Aug. 31, 2004. Primary data were collected by research assistants (RAs) who directly observed EPs for entire shifts, recording the activities of the physicians on a moment-by-moment basis. Three RAs travelled to each participating hospital and observed EPs 24 hours per day during 7 consecutive days in nonoverlapping 8-hour shifts (i.e., 0800–1600, 1600–2400 and 2400–0800). Therefore, in hospitals with single EP coverage, we were able to observe all patients who were treated during the data collection period. In hospitals with double or triple physician coverage, we followed only 1 EP per shift who was chosen based on shift start times. All EDs were visited at least twice in different seasons during the study period in order to accurately capture the varied case-mix of patients seen at different times of the year. Postgraduate medical trainees, medical students, nurses, nurse practitioners and physician assistants were not observed.

Two of the 11 hospital EDs had a "fast track" area to deal with low-acuity patients. At one of these sites, the fast track unit was physically separate from the ED and was staffed by separate EPs and nurses. At the other site, the fast track area was located within the ED, and EPs spent time working in both the fast track and non–fast track area. We did not observe EPs working in the physically distinct fast track unit, but the RAs did observe EPs at the other site where they worked in both fast track and non–fast track areas of the ED.

A patient–physician record was defined as "complete" if the RAs observed both the beginning and the end of that patient's care. Otherwise, the observation was incomplete and was right censored.

Before the study launch, a letter was sent to all EPs and ED team leaders outlining the purpose and importance of the study. All EPs were given the option to decline participating; none did so. The RAs did not enter patients' rooms, did not have any contact with patients and did not capture the duration of time spent on specific medical procedures.

Measurements

We developed custom study software to operate on hand-held personal digital assistants (PDAs; Hewlett Packard iPAQ Pocket PC) equipped with Microsoft ActiveSync. The PDA software featured several interlinking screens that the RAs used to record the time that tasks started and ended, the patient to which a specific task was assigned and general information on EPs and patients. Whenever an EP commenced an activity, the RA would select the activity from a 13-option drop-down menu, which included the following:

1. in patient room
2. discussion with patient's family outside the patient's room
3. discussing patient care with nurses and other members of the ED health care team
4. consultation with medical students
5. consultation with postgraduate medical trainees (PGY 1–5)
6. charting
7. on computer
8. other time related to patient care
9. reviewing laboratory, x-ray, ECG and other test results
10. consultation with other physicians and surgeons
11. time on phone to obtain history, arrange transfer or admission, or arrange follow-up
12. performing admission history and physical and/or writing admission orders
13. time not related to patient care

When an EP ended an activity, the RA would indicate that the activity had been completed. The start and end times of all activities were automatically recorded by the software.

The raw data consisted of a series of start and end times (to the second) for all activities performed during a shift, along with the associated patients and physicians. The time for each task was calculated by the difference between its start and end times. All task times for each patient–physician combination were summed to derive the total observed time required for the EP to treat each patient (EP time). Repeat patient visits were recorded as discrete encounters.

The data collection tool also maintained a dynamic list of patients. As a new patient came under an EP's care, the RA added that patient to the list of active patients, along with that patient's demographic and clinical details. Demographic information was gathered from a review of the patient's chart. When an EP started an activity, the patient list was used to associate activities with patients. If the RA could not associate a given task with a specific patient, that is, if the EP was reviewing multiple laboratory reports or discussing a case on the phone and no patient name was mentioned, they indicated "cannot tell."

As patients were discharged from the ED, the RAs removed them from the list of active patients. Patient demographic information gathered by the RAs from the patients' charts (i.e., age, sex, triage score, time of registration and time of discharge) was subsequently validated by comparing the information with data submitted by each hospital to the National Ambulatory Care Reporting System (NACRS) database housed by the Canadian Institute of Health Information. Discrepancies were resolved using the NACRS data.

Before the study commencement, pilot testing was conducted to ensure the validity of the software, to determine the optimal flow of the data collection screens on the PDA and to make certain that reliable and accurate information would be captured. Before travelling to any of the study sites, each RA spent 2 weeks training with the software and learning the data collection procedures.

Data analysis

We could not allocate all EP time for patient-related care to individual patients on the basis of direct observation. Any time that could not be allocated to individual patients was recorded as "cannot tell" time. Time that could be allocated to individual patients was defined as "known time." The "cannot tell" time was allocated to individual patients as follows: for each observation week we calculated the proportion of all "known time" for each activity and CTAS combination. Thus we calculated 65 such proportions (13 activities × 5 CTAS levels). Then, for each shift, we allocated the "cannot tell" time to CTAS levels on the basis of these proportions. We calculated the total allocated time at each CTAS level as the sum of all amounts allocated at each CTAS level. Finally, we calculated the time allocated to each patient using the following formula:

$$\text{Allocated time} = \frac{\text{Known time for patient}}{\text{Total known time for that CTAS}} \times \text{(Total time allocated to that CTAS)}$$

We estimated the distribution of EP time for each CTAS level using Kaplan–Meier product limit survival analysis, which accounts for censored observations.[12] Categorical data are presented as frequencies and percentages. Continuous data are presented as means with 95% confidence intervals (CIs). All analyses were performed using JMP 5.1 (SAS Software) and SPSS 13.0 (SPSS, Inc.).

RESULTS

We gathered data on 11 716 patient encounters from 11 hospital-based EDs. Our RAs observed 169 different physicians over 592 shifts during the study period. Of the 11 716 encounters that were observed, complete data was captured for 9467 (80.8%). The remaining 2249 observations (19.2%) were right censored. Characteristics of the study patients are presented in Table 1.

The distribution of EP time by activity is shown in Table 2. On average, the proportion of ED shift time EPs spent on patient care activities was 87.0% and 87.1% in community and teaching hospitals, respectively. The corollary of this is that the percentage of EP time unrelated to patient care was 13.0% at community hospitals and 12.9% in teaching hospitals. In contrast, in rural hospitals EPs spent 67.5% of their time on patient care activities, meaning 32.5% of EP time was spent on activities unrelated to patient care. Across all sites 84.2% of EP shifts were spent on patient-related activities.

The greatest single proportion of EP time was spent in the patients' rooms for all hospital types (rural 32.9%, community 41.2%, teaching 31.6%). Emergency physicians working in community hospitals spent more time charting (24.1%) than their colleagues in rural (17.4%) and teaching (17.6%) hospitals. Emergency physicians working in teaching hospitals spent more time on the computer (3.4%) than their colleagues in rural (0.3%) and community (1.1%) hospitals. Just over 13% of EP time in teaching hospitals was spent consulting with medical students and postgraduate trainees, a proportion that contrasted sharply with rural (0.5%) and community (3.0%) locations. The category of "other time related to patient care" may encompass tasks such as speaking with police or ambulance crews regarding a patient's care, or arranging investigations. On average, 13.7% of an EP shift (66 min based on an 8-h shift) was categorized as "cannot tell" time.

Of all patients we observed, 2.2% were categorized as CTAS-1, 15.7% as CTAS-2, 39.2% as CTAS-3, 37.2% as CTAS-4 and 5.6% as CTAS-5. We found marked variability in the proportional distribution of CTAS categories between sites (Table 3). For example, community hospital 5 coded 44% of all patients who presented to their ED as CTAS-2. This contrasts with only 28%

Table 1. Characteristics of 11 716 patient encounters from 11 hospital-based emergency departments observed by research assistants during the study period

	CTAS score; % of patient encounters*					
Characteristic	1	2	3	4	5	Total†
Mean age, yr	60.3	50.5	43.3	36.0	34.5	41.5
Demographic characteristics						
Male	65.3	54.2	47.4	53.3	56.8	51.5
No family physician	10.7	10.2	10.2	13.5	36.5	12.9
Resident of nursing home	3.1	2.5	1.9	1.1	0.8	1.6
No fixed address	0.4	0.4	0.4	0.4	0.4	0.4
Mode of arrival						
Walk-in	22.9	58.6	77.6	91.6	93.5	79.4
Ambulance	76.3	39.5	20.8	7.6	5.2	19.1
Police	0.4	1.0	1.0	0.4	0.2	0.7
Other	0.4	0.8	0.7	0.4	1.2	0.7
Investigations and consultations						
Previous visit to ED in last 30 d	12.2	12.0	12.5	13.5	15.7	12.9
Laboratory investigations (≥ 1)	37.0	58.0	47.3	15.7	5.8	34.6
Imaging investigations (≥ 1)	40.8	57.5	40.3	25.3	20.8	36.3
Mental health consultation	0.8	1.4	1.4	0.5	0.2	1.0
Social work consultation	0.4	0.4	0.7	0.3	0.2	0.4
Medical/surgical consultation	22.9	19.9	11.4	3.9	1.7	9.6
Disposition						
Admitted/transferred	35.5	23.8	13.5	6.0	4.0	12.3
Discharged to place of residence	24.4	50.4	68.7	85.5	88.5	72.1
Death	10.7	0.1	0.0	0.0	0.0	0.3
Type of hospital						
Rural	1.0	5.9	28.8	50.8	13.5	100.0
Community	2.0	17.2	40.6	35.4	4.8	100.0
Teaching	3.5	17.7	41.8	33.9	3.1	100.0
All hospitals	2.2	15.7	39.2	37.2	5.6	99.9

CTAS = Canadian Emergency Department Triage and Acuity Scale; ED = emergency department.
*Unless otherwise indicated.
†Not all rows sum to 100% because of rounding.

Table 2. The distribution of emergency physician time by activity and hospital type

	Hospital type; % of shift			
Activity	Rural	Community	Teaching	All hospitals
In patient room	32.9	41.2	31.6	36.8
Discussion with patient's family outside the patient's room	0.6	0.8	0.8	0.8
Discussing patient care with nurses and other members of the ED health care team	3.4	3.3	3.1	3.3
Consultation with medical students	0.5	1.2	3.3	1.8
Consultation with postgraduate medical trainees (PGY 1–5)	0.0	1.8	9.8	4.2
Charting	17.4	24.1	17.6	20.9
On computer	0.3	1.1	3.4	1.8
Other time related to patient care	4.3	4.4	6.5	5.1
Reviewing lab, x-ray, ECG and other test results	3.0	3.6	3.5	3.5
Consultation with other physicians and surgeons	3.2	4.4	5.5	4.6
Time on phone to obtain history, arrange transfer or admission, or arrange follow-up	0.8	0.5	1.6	0.9
Perform admission history and physical and/or write orders	1.3	0.6	0.3	0.6
Time not related to patient care	32.5	13.0	12.9	15.8

ED = emergency department; ECG = electrocardiogram; PGY 1–5 = postgraduate year 1–5.

CTAS-2 at the hospital with the next highest number of patients in this category. Similar differences were seen between a number of other sites.

We estimated the distribution of EP time by CTAS score using Kaplan–Meier product limit survival analysis (Fig. 1). Each line in Figure 1 shows the probability that a patient within the given CTAS category requires at least that much EP time for treatment. For example, the leftmost curve in Figure 1 indicates that 20% of CTAS-5 patients required at least 912 seconds (15 min, 12 s) of EP time and the remaining 80% required at most this much EP time. The mean and median times to treat patients derived from Kaplan–Meier product limit survival estimators varied by CTAS level (Table 4). The mean EP times for CTAS-1, -2, -3, -4 and -5 patients were 73.6, 38.9, 26.3, 15.0 and 10.9 minutes, respectively. As reflected by the interquartile range in Table 4, there was significant variability in EP time within each CTAS category. However, the large sample size of our study resulted in narrow 95% CIs for the point estimates.

Table 3. Percentage of patients in each triage category by study site

	CTAS score; % of patients				
Hospital type	1	2	3	4	5
Rural					
1	1.6	6.1	30.2	51.6	10.5
2	0.6	5.8	28.0	50.4	15.2
Mean	1.0	5.9	28.8	50.8	13.5
Community					
1	1.0	14.5	38.6	44.1	1.8
2	1.5	11.3	34.8	40.7	11.7
3	1.8	21.5	51.7	24.0	1.0
4	1.4	14.1	36.2	40.8	7.6
5	3.8	44.2	34.9	14.0	3.2
6	3.8	9.4	44.8	40.3	1.8
Mean	2.0	17.2	40.6	35.4	4.8
Teaching					
1	3.3	14.9	45.6	34.6	1.6
2	3.4	12.6	33.0	46.4	4.6
3	3.7	28.3	53.9	12.4	1.6
Mean	3.5	17.7	41.8	33.9	3.1

CTAS = Canadian Emergency Department Triage and Acuity Scale.

DISCUSSION

Our study successfully conducted a real-time assessment of 11 716 patient encounters from 11 hospital-based EDs. Across all sites, an average of 84.2% of each EP shift was spent on patient-related activities. However, this average was significantly influenced by the 2 rural sites, both of which had a high percentage of physician downtime (32.5%). This downtime is explained by the combination of the need for 24-hour/day coverage and low patient volumes, especially at night. The 2 rural EDs that participated in this study had annual ED patient censuses of less than 15 000 and 31 000 patients, far less than the average ED patient census in the community

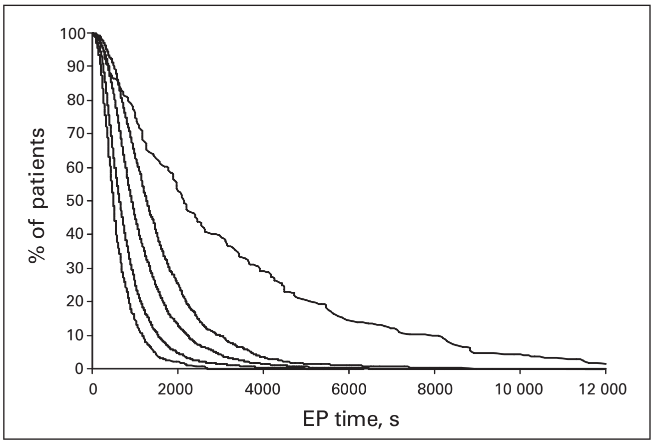

Fig. 1. Kaplan–Meier survival curves grouped by Canadian Emergency Department Triage and Acuity Scale (CTAS) categories. Curves shown from left to right correspond to CTAS-5, CTAS-4, CTAS-3, CTAS-2 and CTAS-1.

Table 4. Summaries of model, mean and median workloads as a function of triage level, derived from Kaplan–Meier survival analysis

CTAS category	No. of patients	Median time, min	IQR, 25th–75th percentile, min	Mean time, min	95% CI for mean
1	262	54.7	(23.6–103.5)	73.6	(63.6–83.7)
2	1844	27.5	(16.3–47.0)	38.9	(36.0–41.8)
3	4597	18.4	(11.2–32.1)	26.3	(25.4–27.2)
4	4355	11.5	(6.9–18.6)	15.0	(14.6–15.4)
5	658	8.5	(5.3–13.8)	10.9	(10.1–11.6)
Combined	11 716	15.7	(9.0–28.4)	24.6	(63.6–83.7)

CI = confidence interval; CTAS = Canadian Emergency Department Triage and Acuity Scale; IQR = interquartile range.

(52 806) and teaching (45 313) hospitals studied.

The percentage of EP time unrelated to patient care was only 13% in both community and teaching hospitals, so it could be said that EP "productivity" was 87% at these hospitals. This 13% works out to be 62 minutes of an 8-hour shift, which may be comparable to the expectation in many full-time working positions. However, this time was not taken in blocks, but, rather, represents a compilation of periods, sometimes just a few minutes at a time, spread over an 8-hour shift. In particular, the normal 30-minute lunch break and two 15-minute coffee breaks that are typically seen in many full-time jobs were rarely observed. Also, it should be noted that time taken for hand washing, for walking from one part of the ED to another to assess the next patient, or for directing patients or families within the ED, was not recorded as time related to patient care in this study. Although such tasks are unavoidable and are arguably indirectly related to patient care, they were included in the 13% of EP time deemed unrelated to patient care. As a result, the 87% productivity we observed may well be underestimated. Some might consider the relatively uninterrupted activity we observed to be unsustainable, and a potential factor in the ability of some EPs to continue to practise emergency medicine over the long term.

As might be anticipated, more time was spent supervising medical students and postgraduate medical trainees in teaching hospitals (12.5%) than community (3.0%) and rural (0.5%) hospitals. We compared our results for teaching hospitals with those from studies of EP activities at a US teaching hospital[8] and a Canadian inner city urban teaching centre.[9] Emergency physicians in our sample spent nearly twice as much time on teaching-related activities as did the EPs reported by Hollingsworth and colleagues,[8] who performed an observational time-and-motion study in a US teaching hospital (annual ED patient census of 84 000) and found that the proportion of teaching time was 6.3%. Similarly, Innes and coworkers[9] reported that teaching time at their institution accounted for 7.3% of EP time. The amount of time devoted to various other activities was similar across the studies. The differences we observed may be because of variations in the definitions of activities or categories.

We estimated the impact of CTAS on EP time with Kaplan–Meier product limit survival analysis. The mean time for physicians to treat patients was 73.6 minutes (95% CI 63.6–83.7) for CTAS-1, 38.9 minutes (95% CI 36.0–41.8) for CTAS-2, 26.3 minutes (95% CI 25.4–27.2) for CTAS-3, 15.0 minutes (95% CI 14.6–15.4) CTAS-4 and 10.9 minutes (95% CI 10.1–11.6) for CTAS-5. Our estimates of EP time are similar to those derived by Murray (Dr. Michael Murray, Chief of Staff and Emergency Physician, Royal Victoria Hospital, Barrie, Ont.: presentation to the Ontario Physician Services Committee, July 2001). Murray's EP times were 75.6, 41.4, 25.2, 12.6 and 7.4 minutes for CTAS levels 1, 2, 3, 4 and 5, respectively. We found more time was needed than previously described to treat CTAS-3, -4 and -5 patients.

We found a marked variability in the distribution of CTAS scores between study sites. Similar variability was observed when we compared our CTAS data gathered during the hospital visits with the annual CTAS data submitted by each hospital to the NACRS database. Despite the fact that triage nurses at all hospitals use the same set of guidelines,[3] we could not readily explain these differences.

Many triage reliability studies have used printed case scenarios involving triage nurses and EPs.[13–16] Beveridge and colleagues[14] reported a very high rate of interobserver agreement within 1 triage category (87% to 98%); however, the probability of agreement between 2 random observers on a random case was only 0.539. Similarly, Manos and coworkers[16] had EPs, nurses and paramedics review 42 case scenarios and assign CTAS scores to assess triage reliability and found that exact agreement was 63.4% and agreement within 1 triage level was 94.9%. Grafstein and coworkers[17] studied actual patient assignments using a computerized menu that linked presenting complaints to preferred triage levels to assess interrater reliability in a real-time clinical setting and reported exact triage agreement of 73.7%. The authors suggested that agreement on exact triage level, rather than agreement within 1 triage level, may be more appropriate if triage categories are to be used to define ED case-mix groups for benchmarking or comparative processes such as ED staffing.

It is evident from the literature that there is considerable variability in triage. Although our study was not designed to assess the accuracy of triage, we believe that the variability we observed is an accurate reflection of the current variability in real-world CTAS assignment. The purpose of this study was to determine the average time required per patient at each CTAS level so that this measure could ultimately be used in workload planning. For this to be a practical goal, the estimated times must reflect potential errors in triage scoring that occur in the real world.

We found very few prospective time studies of EP workload. Innes and coworkers[9] developed a multivariate model based on a workload study involving 20 physicians and 585 patient visits at a single teaching hospital in British Columbia. The strongest workload predictors were procedure required, triage level, arrival by ambulance, Glasgow Coma Scale score, age, comorbidities and number of previous visits. More recently, Millar and colleagues[18] estimated physician workload in a pediatric ED and found that CTAS score, arrival by ambulance, procedures, laboratory tests and the need for admission to hospital were the strongest predictors of EP workload.

Limitations

No pediatric EDs were included in this study. As a result, we collected data on a limited number of pediatric patients and are unable to determine the generalizablity of our results to this population. We classified hospital EDs into rural, community and teaching sites. There are undoubtedly alternative ways of grouping hospitals. Although our study did include 2 smaller more rural hospitals, both were within 1-hour ground travel time of large community and academic hospitals. Physician practice at these hospitals, particularly with regard to transfers and consultations, may be very different from rural hospitals in more remote areas.

We did not include activities, such as walking from one patient care area to another or hand washing, as categories of patient care–related EP activity. Although these are part of an EP's work, they may have been recorded as "time not related to patient care." Charting time and other activities related to the delivery or finalization of care for previously seen patients after the official end of scheduled shifts was not captured in this study. These activities are an important component of EP time and should be included in future studies.

We did not observe nurse practitioners or physician assistants and we are therefore not able to comment on their productivity or impact. An analysis of nurse practitioner workload, as well as a comparison of workload between sites where physicians work under different remuneration schemes, is also worthy of future consideration.

Because of limited resources we did not follow EPs assigned specifically to fast track areas. This may have reduced the number of low-acuity patients in our data set. However, if EPs treat fast track patients in the same manner as similar CTAS patients in the non–fast track areas, then the distribution of EP times should not be affected.

One of our categories included time spent teaching and reviewing patients seen by house staff and medical students. However, some of this time may relate to patients whose demographic data we did not collect, and therefore may not be directly attributable to patients in our data set.

The physicians observed in this study were not blinded to the purpose of this investigation. Therefore, we cannot be certain that the presence of our RAs did not alter the behaviour or practice patterns of the physicians being followed.

In hindsight, we would have liked to gather more detailed information about teaching time. Future studies should attempt to determine the effect of learners at all levels on patient throughput in the ED. In addition, further study in EDs that have a high census of children, serve an inner-city population or are located a significant distance from a tertiary care referral centre should be undertaken.

CONCLUSION

In this study, EPs at community and teaching hospitals were found to have very little downtime. There was significant variability in the distribution of CTAS scores between sites and also marked variability in EP time across locations for each triage category. This brings into question the appropriateness of using CTAS scores alone to determine physician ED staffing levels. The CTAS may be an adequate tool to determine patient acuity, but may only be a rough indicator of patient complexity and physician workload. Future analysis could employ regression modelling to adjust for variables beyond triage level that may affect physician workload.

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Correspondence to: Dr. Jonathan F. Dreyer, Rm. E1-100, Victoria Hospital, 800 Commissioners Rd. E., London ON N6A 5W9; jonathan.dreyer@lhsc.on.ca

Erratum

In the 2009 CAEP Scientific Abstracts, the full list of authors for abstract 36 were inadvertently not included. The correct reference listing should be as follows: Weaver J, Dagnone JD, McGraw RM, Pulling CA, Luctkar-Flude M, Pickett W. Assessment tool for a standardized ventricular fibrillation cardiac arrest [abstract]. *CJEM* 2009;11:262.