Editor's key points

- The number of patients registering is influenced by the apparent high or low occupancy of the waiting area at the time of registration. There was an immediate significant increase in the number of patients registering during the study period compared with the same period the previous year; this persisted for the duration of the study (10.47%, $P < .01$).
- Although not significant, there was a smaller percentage of patients in the less-acute Canadian Triage and Acuity Scale categories during the study period. This suggests that not only were there a substantial number of patients forgoing care in 2016 (presumably due to perceived long wait times), but some of their injuries or illnesses were in high-acuity categories.
- Despite an increased number of patients registering, there was not a concomitant increase in those who left without being seen. The total number of those who left without being seen was lower for every month during the study period ($P < .01$). For those hospitals that might be in competition for patient attendance or are being underused, a less busy-appearing waiting area might be less of a deterrent for patients arriving to register.

Estimation of unregistered patients who left without being seen

At an urban mid-sized Canadian community emergency department

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Abstract

Objective To determine whether changes to the appearance of an emergency department (ED) waiting room influenced the number of patients who left without being seen (LWBS).

Design Retrospective analysis using National Ambulatory Care Reporting System data collected at the time of patient registration.

Setting The ED of Belleville General Hospital, a mid-sized secondary care community hospital in Ontario with a catchment population of 125 000.

Participants All unscheduled patients registering at the hospital to be seen in the ED from July 1 to December 31, 2016 (control period), and from July 1 to December 31, 2017 (study period).

Main outcome measures The volume of patients registering by Canadian Triage and Acuity Scale (CTAS) level to be seen in the ED during the study period compared with the volume of patients registering during the control period, and the number of LWBS during the 2 time periods.

Results The average number of patients registered per month was significantly greater in the study period than in the control period ($t_{10} = -5.53$, $P < .01$). A total increase of 1881 registrations was recorded in the study period, or 10.47% (increase per month ranged from 9.59% to 11.66%). The proportion of patients with less acute triage scores decreased in the study period; however, the differences in CTAS levels between the 2 years was not statistically significant ($\chi^2 = 1.05$, $P = .90$). The number of LWBS according to CTAS level was lower in all categories in the study period, including those in the less acute levels, decreasing from 60 in CTAS 5 in 2016 to 45 in 2017, and 585 in CTAS 4 in 2016 to 330 in 2017. Overall, the distribution of LWBS by CTAS level was significantly different between the control and study periods ($P < .01$).

Conclusion The number of patients registering is influenced by the apparent high or low occupancy of the waiting area at the time of registration.

Nombre estimé de patients non inscrits qui sont partis avant d'être vus

À un service d'urgence communautaire de taille moyenne en milieu urbain au Canada

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Résumé

Objectif Déterminer si des changements à l'apparence de la salle d'attente d'un service d'urgence ont influé sur le nombre de patients qui sont partis sans être vus (PSEV).

Type d'étude Analyse rétrospective à l'aide des données du Système national d'information sur les soins ambulatoires recueillies au moment de l'inscription des patients.

Contexte L'urgence de l'Hôpital général de Belleville, un hôpital communautaire de soins secondaires et de taille moyenne en Ontario, dont la zone desservie compte une population de 125 000.

Participants Tous les patients sans rendez-vous qui se sont inscrits à l'hôpital pour être traités à l'urgence entre le 1er juillet et le 31 décembre 2016 (période de contrôle) et entre le 1er juillet et le 31 décembre 2017 (période à l'étude).

Principaux paramètres à l'étude Le volume de patients qui se sont inscrits d'après le niveau de gravité selon l'Échelle canadienne de triage et de gravité (ETG) devant être vus à l'urgence durant la période à l'étude, comparativement au volume de patients qui se sont inscrits durant la période de contrôle, et le nombre de patients PSEV durant ces 2 périodes.

Résultats Le nombre moyen de patients inscrits par mois était significativement plus élevé durant la période à l'étude que pendant la période de contrôle (t_{10} = -5,53, p < ,01). Une augmentation totale de 1881 inscriptions a été relevée durant la période à l'étude, c'est-à-dire de 10,47 % (l'augmentation par mois variait entre 9,59 et 11,66 %). La proportion de patients ayant des scores de triage moins graves a baissé durant la période à l'étude; toutefois, les différences entre les niveaux selon l'ETG d'une année à l'autre n'étaient pas statistiquement significatives (χ^2 = 1,05, p = ,90). Le nombre de patients PSEV selon le niveau sur l'ETG était plus faible dans toutes les catégories durant la période à l'étude, y compris celui des patients dont les degrés de gravité étaient moindres, accusant une baisse pour passer de 60 chez les niveaux 5 sur l'ETG en 2016 à 45 en 2017, et de 585 chez les niveaux 4 sur l'ETG en 2016 à 330 en 2017. Dans l'ensemble, la répartition des patients PSEV selon le niveau sur l'ETG était significativement différente entre la période de contrôle et la période à l'étude (p < ,01).

Conclusion Le nombre de patients qui s'inscrivent est influencé par l'affluence apparemment élevée ou faible dans la salle d'attente au moment de l'inscription.

Points de repère du rédacteur

- Le nombre de patients qui s'inscrivent est influencé par l'affluence apparemment élevée ou faible dans la salle d'attente au moment de l'inscription. Il s'est produit une hausse immédiate significative dans le nombre de patients qui se sont inscrits durant la période à l'étude par rapport à la même période l'année précédente; cette situation s'est maintenue tout au long de la période à l'étude (10,47 %, p < ,01).
- Même si la différence n'était pas significative, il y a eu un plus faible pourcentage de patients dans les catégories moins graves selon l'Échelle canadienne de triage et de gravité, durant la période à l'étude. Cela porte à croire que non seulement un nombre substantiel de patients ont renoncé aux soins en 2016 (probablement en raison des longues durées d'attente), mais aussi que certaines de leurs blessures ou de leurs maladies étaient dans des catégories de gravité plus élevées.
- En dépit d'un nombre accru de patients qui se sont inscrits, il s'est produit une augmentation concomitante des patients qui sont partis sans être vus. Le nombre total de ceux qui sont partis avant d'être vus était plus faible chaque mois durant la période à l'étude (p <,01). Dans les hôpitaux susceptibles d'être concurrents quant à la fréquentation par les patients ou dans ceux qui sont sous-utilisés, une aire d'attente apparemment moins occupée pourrait être moins dissuasive pour les patients qui arrivent pour s'inscrire.

The number or proportion of patients leaving the emergency department (ED) before being seen by a physician is commonly referred to as the *patients who left without being seen* (LWBS) rate. This rate has been identified as a surrogate indicator of quality of care as a result of overcrowding and increased lengths of stay[1,2]; estimates of the LWBS rate range from less than 1%[2,3] to more than 10%[4] of those who register at an emergency department (ED). It is generally agreed that some level of risk is incurred by both the patient and the hospital should a patient leave after registration but before being assessed by a physician or designate (nurse practitioner or physician assistant).[5,6] While there has been conflicting evidence concerning increased morbidity and mortality, it has been generally agreed that the LWBS are likely to present again at either an ED or another health care provider.[3-5,7] Intuitively, the same risk should be incurred by those patients who arrive at the hospital but leave before even undergoing the registration process, otherwise known as *those who leave without being registered*. Historically, however, it has been impossible to gauge the magnitude of this group, as there is no easy way to identify "potential" patients who do not register. Although it has been mentioned in the literature,[3] this group has never been previously identified, quantified, or analyzed.

Objective

The purpose of this retrospective analysis was to determine if the visible presence of patients waiting to be seen in an ED waiting area had an effect on the likelihood of an individual newly arriving to the ED to complete registration. A secondary question was to quantify the magnitude of such an effect. To the best of our knowledge, following an extensive literature search (which included such headings as *LWBS, registered, non-registered, unregistered,* and *waiting area,* among others), our study will be the first to address this question.

Methods

The study facility is Belleville General Hospital, a mid-sized urban secondary care community hospital in Ontario with a catchment population of 125000. There are approximately 38000 patient visits to the ED annually. The ED is staffed by 22 full-time and part-time physicians (those who have Certification in Family Medicine with a Certificate of Added Competence in Emergency Medicine and those who are Fellows of the Royal College of Physicians of Canada) who provide 45 hours of coverage per day. The patient population is mixed, with 20% aged 16 years and younger, 40% aged 17 to 65 years, and 40% older than 65 years of age. On average, 1.3% of these are assessed as Canadian Triage and Acuity Scale (CTAS) level 1, 22.2% are level 2, 47.5% are level 3, 27.3% are level 4, and 1.7% are level 5. There are 3 primary care hospitals within 30 minutes of the city of Belleville and a tertiary teaching centre 1 hour away that accepts referrals and acts as the regional trauma centre.

The waiting area for patients to register to be seen in the ED has a capacity of 47 chairs, with 2 triage desks located centrally on one side such that the nurses are able to see all patients in the waiting area. The entrance is off the emergency parking lot, which enters directly into the waiting room. In 2016, anyone entering could see everyone seated in the waiting area. Typically, all or most of the chairs would be occupied.

The data used in this study were derived from the National Ambulatory Care Reporting System data sets that are managed by the Canadian Institute for Health Information. Belleville General Hospital submits data to the Ontario Ministry of Health quarterly as part of an alternate funding agreement.

In June 2017, the ED underwent a comprehensive "grassroots transformation review," which included a kaizen event attended by front-line staff including nurses, physicians, patient support workers, and representatives from registration, radiology, and administration. This transformation was undertaken to provide a safer and more efficient process for nursing staff to monitor patients waiting to be seen. As a result of this review, effective July 1, 2017, the hospital ED waiting room was effectively "moved" to chairs within the confines of the ED itself, with the result that patients waiting to be seen were no longer visible to individuals entering the ED to register. It was postulated that people arriving to register might be more inclined to do so with an apparently empty waiting room. One of the important assumptions of this study was that a prime motivator for someone to leave without registering was the perception of a prolonged wait time because of a busy waiting room.

All ambulatory "unscheduled" patients who registered at the ED from July 1, 2016, up to and including December 31, 2016, were compared with those patients who registered during the same period in 2017. Any patients who were attending the ED to see a specific physician or service were excluded (1222 in 2016 and 1331 in 2017), as these are classified as scheduled visits in the National Ambulatory Care Reporting System database. Patients registering in 2016 were considered the control group and those registering in 2017 were considered the study group. Volumes of patients registering in each time period were then analyzed to determine if changes to the waiting area had any effect.

During the study period, no other identified factors changed within the community that were likely to have influenced demand for care. Specifically, there was a stable general practitioner population and consistent urgent care clinics that did not alter their access times (**Table 1**).[8,9] Furthermore, there was no documented increase in community morbidity from any particular medical condition or community outbreak (eg, influenza).

The volumes of patients in the 6 months before the control and study periods were also evaluated to

Table 1. Physicians in Hastings County and Prince Edward County in 2016 and 2017: *Each county also had 2 walk-in clinics.*

	2016			2017		
LOCATION	SPECIALISTS	FAMILY PHYSICIANS	TOTAL	SPECIALISTS	FAMILY PHYSICIANS	TOTAL
Hastings County	108	119	227	109	124	233
Prince Edward County	2	26	28	4	30	34
Total	110	145	255	113	154	267

Data from Physicians in Ontario.[8,9]

determine if there was a significant change in registration year over year. The question of whether any volume change was owing to those who were "less sick" (ie, CTAS levels 4 and 5) choosing to forgo assessment and subsequent treatment is an important consideration; therefore, the volumes for each period were examined by CTAS level. Finally, a review of the LWBS was done for both time frames to determine if there was a change in number or CTAS distribution.

All analyses were conducted with SAS, version 9.4. An independent samples *t* test was used to examine if the average number of patients registering by month differed per year (control vs study periods). A χ^2 test was used to examine if the CTAS level of patients seen was significantly different between the control and study periods. A χ^2 test was also used to examine whether the distribution of LWBS by CTAS level was significantly different between the study and control periods.

This research was reviewed and approved by the Quinte Health Care Research Ethics Board.

Results

The transition of the original formal waiting room from the site of registration to within the confines of the ED was fully implemented on July 1, 2017. The result was an immediate and sustained increase in volume of unscheduled patients who registered of approximately 10% (**Table 2**).

Table 2. Volume of unscheduled registrations in the control and study periods (July to December) and the 6 mo before the control and study periods (January to June): *Scheduled visits have already been removed.*

PERIOD	2016	2017	DIFFERENCE, N	% CHANGE
Control and study				
July	3102	3446	+344	+11.09
August	3067	3395	+328	+10.69
September	2879	3155	+276	+9.59
October	2950	3294	+344	+11.66
November	2928	3220	+292	+9.97
December	3033	3330	+297	+9.79
Total	17 959	19 840	+1881	+10.47
Monthly average	2993	3307	+314	+10.47*
6 mo before control and study				
January	3093	2893	-200	-6.47
February	2888	2717	-171	-5.92
March	3072	2896	-176	-5.73
April	2913	2947	+34	+1.17
May	3155	3234	+79	+2.50
June	3000	3086	+86	+2.87
Total	18 121	17 773	-348	-1.92
Monthly average	3020	2962	-58	-1.92†

*Independent means *t* test comparing 2016 and 2017 July to December monthly averages was statistically significant ($P < .01$).
†The difference between the 2016 and 2017 January to June monthly averages was not statistically significant.

This overall volume is in marked contrast to that seen in the first 6 months of the year. The average number of patients registered per month was significantly greater in 2017 (the study period) than in 2016 (the control period) (t_{10}=-5.53, P<.01). From July 1 to December 31, 2016, 17959 unscheduled visits were recorded. From July 1 to December 31, 2017, 19840 unscheduled visits were documented. This is an increase of 1881 registrations, or 10.47% (range 9.59% to 11.66%). In comparison, for the first 6 months of 2016 the total number of unscheduled patients registering to be seen was 18121, whereas the total for the first 6 months of 2017 was 17773, which is a slight decrease of 1.92% (**Table 2**). The monthly average number of patients was not significantly different in the first halves of 2016 and 2017 (t_{10}=0.69, P=.51).

The proportion of patients at each CTAS level was reviewed for the control and study periods (**Table 3**). Although the proportion of patients with less acute triage scores decreased in the study period, the differences between the 2 years was not statistically significant (χ^2=1.05, P=.90).

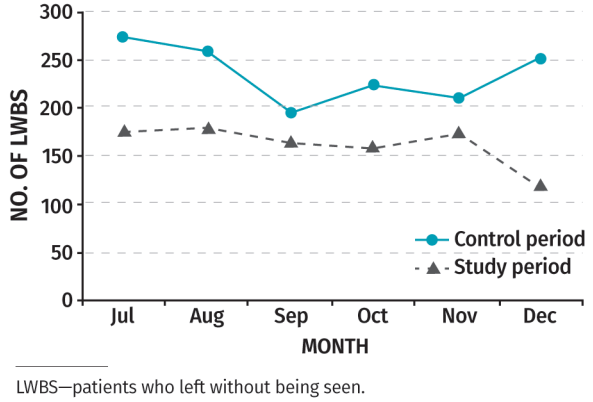
The number of LWBS was reviewed to determine if there was any change between the control and study periods (**Figure 1** and **Table 4**). The number of LWBS by CTAS level was lower in all categories in 2017 compared with 2016, including those in the less acute levels: there were 60 in level 5 in 2016 and 45 in 2017, and 585 in level 4 in 2016 and 330 in 2017. Overall, the distribution of LWBS by CTAS level was significantly different in the control and study periods (P<.01).

Table 3. Patients registered and seen by CTAS level

CTAS LEVEL	JUL-DEC 2016, %	JUL-DEC 2017, %*
1	1.4	1.4
2	22.0	23.6
3	48.1	48.0
4	26.2	25.0
5	2.3	2.0
Total	100.0	100.0

CTAS—Canadian Triage and Acuity Scale.
*Difference between groups is not statistically significant; χ^2 = 1.05, P = .90.

Figure 1. Number of LWBS for the control period (2016) and study period (2017), by month



LWBS—patients who left without being seen.

Discussion

Being able to accurately and reliably quantify the number of patients who leave an ED without being assessed by a physician or designate (nurse practitioner or physician assistant) is a quality of care metric becoming increasingly important to hospitals, health boards, and governments. A number of strategies have been put in place to address the problem of high rates of LWBS; however, there has not been the same rigour directed toward determining and quantifying those who leave before registering. Our study indirectly addressed this question and also examined the acuity of those patients who were assumed to have left without registering by examining change in patient volume after modifying the waiting room appearance. Wait times to be seen by a physician have a direct correlation to LWBS.[5,6] Similarly, the perception of a potentially prolonged wait time to be assessed was postulated to have a comparable effect on patient behaviour. It was hypothesized that an empty waiting room would be more inviting to the individual seeking care, leading to an increased likelihood of registration compared with a busy-appearing or full waiting room. In 2017, substantial changes were made to the location where patients would wait to be seen such that for most of the day the main waiting room for the ED would appear empty or almost empty, as the patients were moved to an area away from the visual range of the triage and registration areas. These patients were relocated to within the ED where they could be more closely monitored and moved between chairs and stretchers as required. There was an immediate significant increase in the number of patients registering during the study period over the same period the previous year and this persisted for the duration of the study. The magnitude of the increase was 10.47% of the total unscheduled emergency visits (P<.01). Of note, before the changes to the waiting room were made, the volume had actually diminished year over year by 1.92%. The slight decrease in unscheduled registrations in the 6 months before the control and study periods provides evidence that the increase in registrations in the study group was the direct result of the intervention and not a temporal trend. Confounding variables were limited during the study period insofar as there was minimal change in number and practice of the primary care physicians in the community. In fact, there was a slight increase in both family physicians and other specialists during the study period (4.71%). Nor was there any known change in the overall health of the general population, as

Table 4. Number of LWBS for the control (2016) and study (2017) periods, overall and by CTAS level: *There were 0 LWBS at CTAS level 1 for both years across all months.*

	2016					2017					
		LWBS BY CTAS LEVEL, N (%)					LWBS BY CTAS LEVEL, N (%)				
MONTH	LWBS, N	2	3	4	5	LWBS, N	2	3	4	5	*P* VALUE*
July	273	18 (6.6)	129 (47.3)	109 (40.0)	17 (6.2)	178	13 (7.3)	124 (69.7)	36 (20.2)	5 (2.8)	<.01
August	260	12 (4.6)	120 (46.2)	118 (45.4)	10 (3.8)	182	13 (7.1)	88 (48.4)	74 (40.7)	7 (3.8)	.60
September	195	8 (4.1)	100 (51.3)	80 (41.0)	7 (3.6)	165	13 (7.9)	85 (51.5)	62 (37.6)	5 (3.0)	.47
October	224	17 (7.6)	104 (46.4)	97 (43.3)	6 (2.7)	158	14 (8.9)	70 (44.3)	68 (43.0)	6 (3.8)	.65
November	210	14 (6.7)	98 (46.7)	88 (41.9)	10 (4.8)	173	24 (13.9)	86 (49.7)	54 (31.2)	9 (5.2)	.04
December	251	10 (4.0)	138 (55.0)	93 (37.1)	10 (4.0)	118	10 (8.5)	59 (50.0)	36 (30.5)	13 (11.0)	.01
Total	1413	79 (5.6)	689 (48.8)	585 (41.4)	60 (4.2)	974	87 (8.9)	512 (52.6)	330 (33.9)	45 (4.6)	<.01

CTAS—Canadian Triage and Acuity Scale, LWBS—patients who left without being seen.
**P* values from χ^2 tests comparing the distribution of LWBS by CTAS level in 2016 and 2017.

might occur in the event of a local outbreak or epidemic. Finally, there was no change in the investigative resources available either at the hospital or within the community that might have resulted in patients preferentially seeking care at the ED rather than from their primary care providers.

While it might be assumed that the measures taken would encourage patients with less serious illnesses or injuries to be seen, this phenomenon was not reflected in the acuity as measured by CTAS level. The percentage of patients in each CTAS level was virtually unchanged between the control period and the study period. Although not significant, there was a smaller percentage of patients in the less-acute categories (ie, CTAS 4 and 5) during the study period. This suggests that not only were there a substantial number of patients forgoing care in 2016 (presumably due to perceived long wait times), but their injuries or illnesses included some patients in high-acuity categories.

Despite an increased number of patients registering, there was not a concomitant increase in the LWBS. **Figure 1** summarizes the LWBS from **Table 4** during the 2 time frames. The total number of LWBS was lower for every month during the study period ($P<.01$). These findings might be useful for those EDs that, despite low LWBS numbers, currently have waiting areas with high occupancy rates that might be visible to those entering to register. Capturing potential patients can be viewed as a risk mitigator while at the same time providing service to a population that might not be using the ED when they appropriately should. For those hospitals that might be in competition for patient attendance or are being underused, a less busy-appearing waiting area would be less of a deterrent for patients arriving to register.

Limitations

This study cannot unequivocally state that all the patients who left without being registered were captured. One of the important assumptions of this study was that the prime motivator for someone to leave without registering was the perception of a potential prolonged wait time. Other factors that might contribute to not registering, such as resolution of symptoms, lack of appropriate documentation, and psychosocial factors, have not been addressed; however, there is no reason to believe that any of these factors would have been different between the 2 study periods. The assumption that a substantial number of patients leave without being registered is predicated by a busy-appearing waiting room that is visible to those registering. At the time of writing there was very little information in the literature that addressed this issue.

Conclusion

In the setting of an ED in which the waiting room is full or appears full, reflecting potential longer wait times to be seen, there might be a substantial number of patients who present to the ED but leave before registration. This group of patients is not being captured by the traditional methods of tracking. In our study, we found that the number of those who left without registering was significant and represented more than 10% of the total unscheduled patients. Furthermore, these patients have an acuity profile that reflects the overall acuity of most of the patient population who go on to register, be triaged, and ultimately be seen by a health care professional in the ED.

Drs de la Roche, Froats, Bell, McDonald, Bolton, Devins, Hall, Leclerc, Istead, Miron, Badowski, and **Steinitz** are all active staff members at Quinte Health Care in Belleville, Ont. **Mr King** and **Ms Gogna** are both doctoral candidates at Queen's University in Kingston, Ont.

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Contributors
All authors contributed to the concept and design of the study; data gathering, analysis, and interpretation; and preparing the manuscript for submission.

Competing interests
None declared

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