

VESAS: A Solution to Seasonal Fluctuations in Emergency Department Census

From the Division of Emergency Medicine, Children's Hospital of Philadelphia and University of Pennsylvania School of Medicine, Philadelphia, PA.

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Address for reprints: Kathy N Shaw, MD, Division of Emergency Medicine, Children's Hospital of Philadelphia, 34th Street and Civic Center Boulevard, Philadelphia, PA 19104; fax 215-590-4454, E-mail shaw@email.chop.edu.

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Kathy N Shaw, MD, MSCE
Jane M Lavelle, MD

Study objective: To design and implement a plan for emergency department staffing and additional space to reduce waiting time and the rate of patients leaving without being seen during the viral epidemic season.

Methods: The study was conducted in the ED of a tertiary care children's hospital. We compared 24,657 children who presented for care between November 1996 and March 1997 (VESAS plan enacted) with 24,012 children who presented for care during the same period in the preceding year. VESAS (Viral Epidemic Supplemental Attending and Staff), an additional team of personnel, was on call for the viral epidemic season and was called to work if the hourly ED census that day was 25% or more of the past year's average hourly patient volume. Extra examination rooms were made available in space contiguous to the ED. Interval data, "left without being seen" rates, and ED census were monitored and compared with the previous year's data.

Results: The VESAS team was used for 32% of the days during the 4-month intervention period. The left-without-being-seen rate was reduced by 37% (95% confidence interval, 33% to 41%). The average time from arrival to consultation with a physician was decreased by 15 minutes (95% confidence interval, -10 to -20) for all patients. Waiting times were most markedly reduced for less acutely ill or injured patients, although a modest decrease was also observed in patients with more severe illnesses or injuries (-10 minutes). The percentage of lesser-severity patients seen in an urgent care area was increased from 35% to 51%.

Conclusion: VESAS, a plan for providing space and personnel to handle an increased volume of patients that can be activated on the basis of hourly census data, was successful as judged by waiting times and percentage of patients who left without being seen.

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INTRODUCTION

A unique problem that hinders efficient care in many emergency departments is the increased patient volume during viral epidemic seasons. In preceding years at our institution, it was noted that waiting time and the number of patients who left without being seen (LWBS) dramatically increased during these peak winter months. It has been shown that the percentage of LWBS patients correlates with prolonged waiting times and patient dissatisfaction.¹⁻³ It was our goal to design and implement a plan for ED staffing and additional space aimed at reducing both the time waited to see a physician and the number of LWBS patients during the viral epidemic season.

MATERIALS AND METHODS

Our ED is located in a tertiary care pediatric hospital in an urban setting. The ED sees approximately 54,000 patient visits annually, of which 50% are triaged in the acute category. Fifteen percent of patients seen in the ED are admitted to the inpatient unit, and 50% of admitted patients are evaluated in the ED.

The physical ED space is limited to 16 patient rooms, 4 observation beds, 1 cast room, and 2 resuscitation beds. The urgent care space is located across the hall from the main ED in a primary care clinic and has 22 examining rooms, available for use after 5 PM.

Board-certified/eligible pediatric emergency physicians provide 24-hour coverage in our ED. Fifteen pediatric house staff (5 from each postgraduate year) rotate through each month. Emergency medicine and family practice residents also spend time in our ED. The urgent care area is staffed by a board-certified/eligible pediatrician and a nurse practitioner, has no residents, and is open evenings from 6 to 11 PM and weekends from 1 to 11 PM.

Although in previous years we attempted to add attending physician staffing and find extra rooms during this viral epidemic period, it occurred episodically and without additional support staff or prearranged contiguous space. We hypothesized that to make an impact on patient waiting times, the implemented plan must consider all staff pertinent to patient flow, as well as increased space.

The Viral Epidemic Supplementary Attending and Staff (VESAS) plan included an additional team of personnel. An attending physician, nurse practitioner, registered nurse, senior nursing assistant, ED clerk, and registrar were mobilized to provide care/service between 1 PM and midnight as needed. All personnel were required to sign up in advance for additional hours during the VESAS time period. Staff were paid an on-call fee and an additional hourly rate when

called in to the ED. The physicians used for the VESAS plan were either from the pediatric emergency medicine attending staff or board-certified/eligible pediatricians who had been credentialed to moonlight in our urgent care area. All had attending staff privileges, with no teaching or precepting responsibilities.

The average number of patients registering on an hourly basis from July 1996 to July 1997 was obtained from the hospital's information systems (IS) department. Cumulative daily averages were then calculated at 4-hour intervals. VESAS was activated when these numbers were approximately 25% greater than normal patient volume. Review of patient registration numbers in conjunction with the attending physician's and charge nurse's perceptions of the severity of illness/injury and waiting times determined whether VESAS would be activated each day.

In an attempt to overcome our space limitation, the primary care center provided 2 to 6 rooms between the hours of 1 and 5 PM on weekdays. Urgent care hours were increased in the evenings by 2 hours daily and 1 hour daily on the weekends. Double triage was instituted when there was a 5-minute wait or 5 patients waiting. Other hospital departments were notified of our high-volume period and asked to provide extra services.

Implementation and compliance were variable and determined by each department. No changes in resident or attending staffing or scheduling occurred other than implementation of the VESAS plan for the 2-year period.

Patient times, census, and triage categories were obtained through the hospital IS department from their billing data system. ED patient times are recorded on the patient's chart during the ED visit by the triage nurse, registrar, and evaluating physician. When the ED visit and chart are completed, the registrar enters these times into the data system. Children are classified in this system as acute or nonacute. For each patient, intervals are calculated if both start and end times are recorded; they are left blank otherwise. In addition, patient times were stored and retrievable only

Table.
Viral epidemic ED statistics.

Epidemic Season (November–March)	ED Visits	No. of LWBS	(%) Patients LWBS
1995-96	24,021	538	(2.2)
1996-97*	24,657	338	(1.4)

*VESAS intervention year.

for patients discharged from the ED, not those who were admitted to the hospital. LWBS patients were manually recorded by the registrar on a daily basis. Days on which the VESAS plan was activated were also recorded.

We used descriptive statistics to report ED visits, number, and times. Monthly and seasonal averages, with SDs and ranges, were calculated from the average daily ED times. The 95% confidence intervals (CIs) for differences of 2 means were determined with the use of CIA software.⁴ Costs were determined from the average hourly rates of personnel for hours worked during the VESAS plan and on-call fees per hour or shift when the plan was not instituted. Average collection rates for hospital and physician ED charges were

obtained from the hospital and physician billing departments.

RESULTS

The patient volume for the viral epidemic season (November-March) of the winter of 1996-97 was 24,657 visits, approximately 2.6% greater than that for the 1995-1996 season (Table 1). The VESAS intervention plan was begun on November 18, 1996, and was in full implementation from December 14, 1996 through March 21, 1997. During this intervention period, the VESAS team was called into the ED to work on 32% (n=27) of the evenings and 32% (n=12)

Figure 1.

Patients who left without being seen. The line punctuated with squares represents the 1995-96 epidemic season; the line marked with circles represents the 1996-97 (VESAS) season.

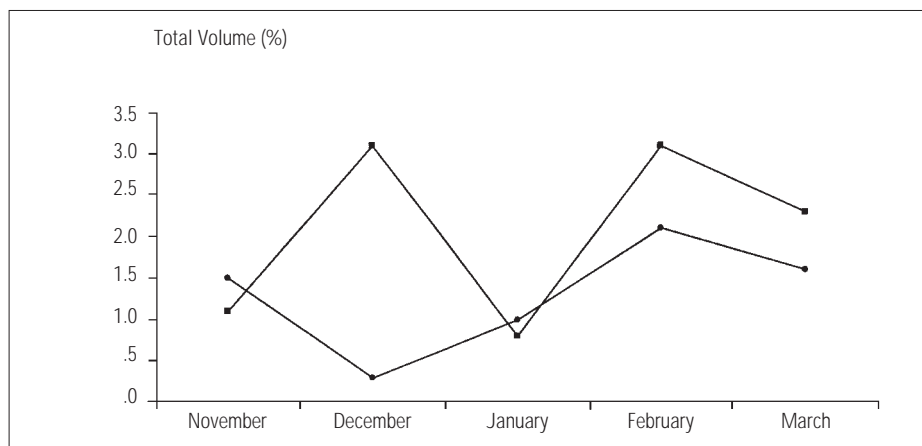


Table 2.

Comparison of average ED times by level of illness/injury for VESAS and non-VESAS years.

Triage Category	No. of Patients	Intervals of Waiting (Minutes)*			
		Arrival to Triage	Triage to Registration	Registration to Physician Arrival	ED Arrival to Arrival of Physician
Acute					
1995-96	12,908	5±3.4 (0-18)	16±1.7 (13-21)	53±14.4 (31-79)	74±17.5 (23-94)
1996-97	12,943	5±3.4 (0-11)	18±1.7 (15-30)	42±11.8 (21-82)	64±14.0 (37-103)
Change†	35	0 (-1 to 1)	2 (1-2)	-11 (-8 to -14)	-10 (-6 to -14)
Nonacute					
1995-96	11,113	6±3.8 (0-24)	22±3.8 (16-42)	80±30.3 (27-175)	103±29.5 (43-199)
1996-97	11,714	5±3.2 (1-19)	22±3.6 (16-34)	58±20.9 (23-111)	83±22.4 (44-169)
Change†	601	-1 (0 to -2)	0 (-1 to 1)	-22 (-16 to -28)	-20 (-14 to -26)
Total					
1995-96	24,021	6±3.6 (0-22)	19±2.9 (15-33)	68±22.4 (27-148)	90±22.8 (50-148)
1996-97	24,657	5±3.0 (1-18)	20±2.4 (16-29)	51±15.9 (22-98)	75±18.5 (41-138)
Change†	636	-1 (0 to -2)	1 (0 to 2)	-17 (-13 to -21)	-15 (-10 to -20)

*Data expressed as mean±SD (range).
†95% CI.

of the weekend days. On no day of the week was VESAS used more than on the others. Most of the days requiring VESA activation were in February (n=20) and November (n=11), corresponding to the months with the highest number of patient visits (5,695 and 5,259, respectively). Fifty-one percent of patients triaged as nonacute were seen in the urgent care area during this intervention, compared with 35% during the previous epidemic season, reflecting the increased use of this area.

The number of LWBS patients was significantly reduced 37% (95% CI, 33% to 41%) during the 1996-97 intervention year compared with the preceding year (Table 1). For both years, 15% of the LWBS patients were triaged as having an acute illness or injury. The highest percent of LWBS patients (2.1%) during the VESAS implementation occurred in the peak patient volume month of February 1997 (Figure 1). This month illustrates the success of the intervention. Its 2.1% LWBS rate is lower than the 3.1% LWBS rate of February 1996, which had a comparable number of patient visits. The major reduction in wait time occurred in getting the patient into a room and seen by a physician after registration.

Interval data was available for 72% of patients' visits, 64% for 1995-96 and 80% for the intervention year. The effect of the VESAS intervention on the wait time from arrival in the ED to being seen by a physician is depicted in Figure 2. Overall, waiting times tended to parallel the total number of visits per month. During the VESAS intervention season (1996-97), the waiting time to see a physician was less than that for the previous year in all months except November. Most striking are the shorter wait times in the months of January and February despite a higher number of patient

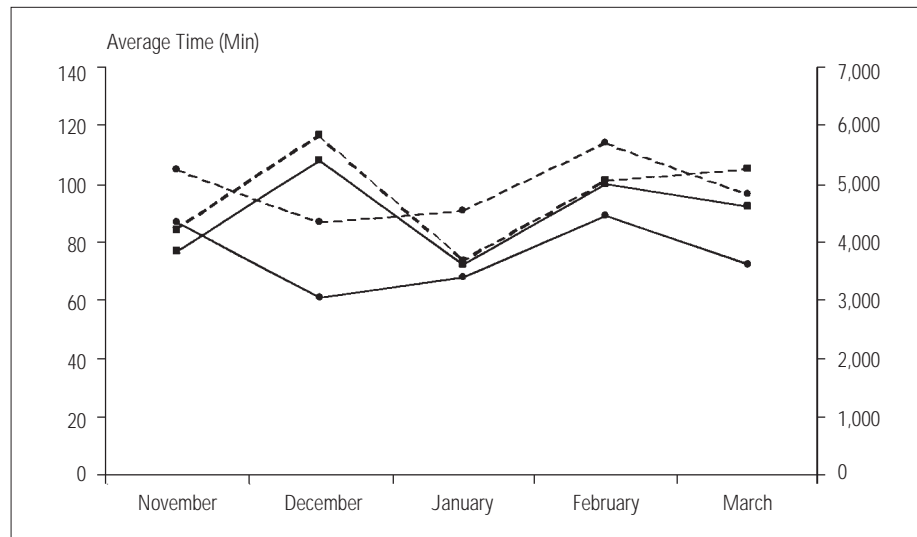
visits compared with the previous year. Overall, the waiting time for all patients for the entire viral epidemic season was decreased by an average of 15 minutes (95% CI, -10 to -20) (Table 2). As expected, waiting times were most markedly reduced for patients triaged as nonacute, although a modest decrease in waiting time also occurred for the patients with worse illness/injury.

The cost of the 4-month VESAS plan was approximately \$60,000. This sum included paying a minimal on-call fee for days that required no VESAS and the usual hourly rate for each of the individual employees or moonlighters when the plan was activated. The cost for physicians and pediatric nurse practitioners was approximately \$44,000; nursing fees were \$10,500 and registration costs were \$5,500. The overall cost was reduced by 50% when the average hospital and physician fees collected for the approximately 200 non-LWBS patients are deducted. Therefore the VESAS plan cost approximately \$250 per day during its implementation, or 8 cents per average minute of waiting time eliminated for the patients and their families.

DISCUSSION

Patients who are the least sick or have the least severe injuries have the greatest delays through ED systems, although their actual evaluation and treatment times are brief.⁵ EDs' poor efficiency for these lesser-severity patients results in dissatisfaction, and some leave without being seen by a physician.¹⁻³ Most EDs strive for a 1% to 2% LWBS rate, although rates range from 1% to 15%.^{1-3,6} Our reduction of our LWBS

Figure 2. Average wait time. Solid lines, ED arrival to physician arrival; dotted lines, total visits per month. Lines punctuated with squares represent the 1995-96 epidemic season; those with circles represent the 1996-97 (VESAS) season.



rate by 37% represents both a statistical and clinically significant improvement in ED efficiency and quality of care.

General use of a fast track or urgent care area for less severely injured or ill patients has been shown to reduce LWBS rates for all ED patients⁶ and to be more cost-effective.⁷ Our prearranged system to supply additional staffing and space for our urgent care area on a daily, as-needed basis to handle the increased volume of predominantly less critical patients during the winter viral epidemic season was a success as judged both by decreased waiting time to see a physician and a lower LWBS rate.

The VESAS plan demonstrates how flexible and adequate space and staffing can reduce waiting times. Liptak et al⁸ found that the delay in getting an ED patient into a room was affected both by room availability and by nurse staffing, whereas the wait in a room was related to the adequacy of physician staffing and the number of patients concurrently registered in the ED. Our findings after the deployment of a VESAS team comprising an extra attending physician, nurse, and PNP and more examination rooms in the urgent care area support these findings. The major reduction in wait time occurred in getting the patient into a room and seen by a physician after registration. Although no known additional interventions or changes occurred during use of the VESAS plan, it is possible that improved efficiency was due in part to some unmeasured factors.

The (mean±SD) 83±22-minute wait from the patient's arrival to being seen by a physician during this epidemic period is consistent with annual averages at other children's hospitals for low-severity patients (1.25±.58 hours)⁹ but is far from an ideal goal of 30 to 60 minutes. Waiting times for our acute category of patients appear artificially long as patients in the acute and urgent triage categories are combined. Further, admitted patients representing 25% of our acute category were not included in the data analysis. Finally, all interval data were not available for every patient. These limitations are the result of availability of data entered or provided by our hospital's IS department. Requests have been made for more detailed data entry and retrieval.

Although the VESAS plan was implemented primarily for the nonacute patients with use of urgent care space and general pediatrician staffing, a significant reduction in waiting time was also found for the more severely ill or injured patients. This reduction may reflect the increased staff and space in the main ED area when less acutely ill or injured patients are siphoned off to a separate area. Use of urgent care for these patients has been successful in other academic EDs.¹⁰ We, however, purposely staffed this area with attending physicians so that efficiency would not be compromised by supervision of house staff.

The VESAS intervention plan required significant allocation of resources and considerable financial cost and administrative support. Some costs were recovered through the reduction in dissatisfied patients who LWBS. We believe that the reduction in waiting times for patients and families was worth the cost. Surveys of the staff are needed to confirm our impression that the work environment was less stressful.

Our VESAS plan was designed for one pediatric tertiary care hospital's ED and may not be directly applicable to other ED settings. The principle of planning space and personnel to handle an increased volume of patients that can be activated on the basis of hourly census could be used in many settings. ED crowding is a problem nationwide.¹¹ We offer our plan as a potential solution to providing efficient ED care for all patients during known high-volume periods.

We thank the attending physicians, nurses, and staff of the Children's Hospital of Philadelphia ED for their dedication to improving patient care and willingness to accept change, as well as the hospital administration for providing the support and finances to institute and maintain the VESAS plan. Special acknowledgment is made to Jeff Rivest, Carole Burdge, Jeanne Venella, Gretchen Pierce, Sally Poliwoda, Noreen McDanielis-Yakscoe, and Mary Ellen Morton. We also thank Doug Baker, MD, for his clever naming of the VESAS plan. Finally, we thank Sharon Mapp for becoming a data-management and graphics expert and Pat Parkinson for her dedication and expertise in manuscript preparation.

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