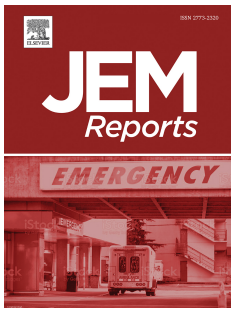

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Physician-Driven Early Evaluation: Encounters Seen in a Vertical Model

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Physician-Driven Early Evaluation: Encounters Seen in a Vertical Model

ABSTRACT

Background: Although many emergency departments (EDs) employ some form of vertical patient flow, there is limited published literature describing variations of vertical pathways.

Objectives: We sought to describe our ED's emergency physician (EP)-driven vertical model and to characterize patients selected by EPs to be seen in our vertical space.

Methods: We retrospectively reviewed all vertical ED encounters in the study period, separately analyzing those who eventually received an ED bed ("ED Bed") and those who were discharged without being roomed ("Vertical only"). We report patient demographics, ESI, vital signs, oxygen use, chief complaints, resource utilization, ED LOS, disposition, and 72 hour return rates.

Results: Physicians elected to perform initial evaluations of a variety of patients in the vertical space. The two most common classes of complaints evaluated in the vertical space were extremity issues (21.4%) and skin complaints (13.5%). Patients presenting with abdominal pain and chest pain initially assessed in vertical were significantly more likely to later receive an ED bed (Standardized Difference of 38% and 21.4% respectively), and patients with skin complaints were more frequently discharged from the vertical space and were less likely to receive an ED bed (Standardized Difference of 32.2%). Most (56.2%) Vertical only patients were ESI 3, although EPs also discharged ESI 2, 4, and 5 patients from Vertical.

Conclusions: EP-driven patient selection for a vertical pathway allowed EPs to discharge some patients without bed placement while simultaneously functioning as their own triage physicians for higher-acuity patients who would go on to receive an ED bed.

Keywords: emergency medicine, emergency department operations, vertical patient flow, hospital administration, length of stay

INTRODUCTION

Many Emergency Departments (EDs) with limited physical capacity employ vertical patient processing to expedite care. Vertical patients undergo testing and interventions while occupying less acute space (such as chairs) rather than ED beds. Vertical patient flow may improve length of stay (LOS) [1] and patient satisfaction [2].

Although 29% of academic EDs had implemented some form of vertical flow prior to the COVID-19 pandemic, there is limited published literature describing specific vertical interventions [3]. As our ED's vertical model relies on EP selection of patients and therefore has unique operational implications, we sought to characterize emergency patients selected to be seen in our vertical space.

MATERIALS AND METHODS

The XXX ED is a tertiary care facility in City, State, seeing approximately 41,000 visits per year during the study period. There are 26 single treatment rooms and up to 9 hallway spaces. The hospital does not have obstetrical services, an inpatient pediatrics unit or a trauma designation. The ED employs board-eligible or board-certified EPs, but no nurse practitioners or

physician assistants. EPs are salaried with no RVU-based incentives. Rotating residents see approximately 10% of patients. There is no fast track or ED observation unit. EPs work staggered overlapping 8.5 hour shifts, with one physician starting at each of the following times: 6A, 8A, 10A, 11A, 12:30P, 3P, 5P, 6P, and 12A. We add an additional 11:30A shift during wintertime due to increased volumes.

A computerized rotational patient assignment system allocates patients upon arrival to individual queues for emergency physicians (EPs) [4]. We do not station an EP in triage. We rarely utilize nurse-initiated orders outside of acute processes such as suspected cerebrovascular accident or ST-elevation myocardial infarction, as our assignment model rapidly establishes the EP responsible for care. Our group expectation is that EPs disposition all assigned patients prior to end of shift.

Our workflow results in a hybrid vertical model, whereby EPs may choose to serve as their own triage physician to expedite care and stream their own patients into a vertical pathway. EPs typically review patient charts to place necessary orders early during the ED stay. During times of ED saturation, when patients will experience a wait for an ED bed, EPs can request to see patients in a dedicated reserved ED room (hereafter, “Vertical”) with an assigned nurse and reclining chair to perform an initial evaluation. EPs have discretion as to which patients to see in Vertical, although they may compete with other EPs utilizing the space. Once an EP completes their examination in Vertical, the patient returns to the waiting room until an ED room becomes available, at which point they may be moved to an ED bed at the discretion of the Charge Nurse in consultation with the EP, or until all diagnostics are complete and the patient can be discharged from the ED without receiving a dedicated ED bed.

Vertical opens during daytime hours dependent on nurse staffing and ED capacity constraints. Vertical typically opens around 10A to 11A when Main ED beds become full and closes around 10P when ED volume decreases and Main ED beds are available again. If an ED room is available, patients are routed to the Main ED and not placed in Vertical. EPs contact the Vertical nurse by phone to request to see a selected patient from their assigned list; although typically this contact is initiated by the EP, the Vertical nurse will occasionally suggest a waiting room patient to the assigned EP as potentially appropriate for initial assessment in Vertical. As patients are typically placed back in the waiting room after their assessment, interventions in this space are limited; narcotics and IV medications are discouraged, as are time-consuming procedures such as lacerations, bladder irrigation, lumbar punctures, and reductions. EPs otherwise have discretion as to the patients they select from their lists to assess in Vertical.

We performed a retrospective review of ED operational data from 10/6/2018 through 12/31/2019. We chose these dates to coincide with the initiation of a new electronic medical record and to exclude visits seen during the coronavirus pandemic respectively. We reviewed all patient encounters initiated in Vertical, and separately analyzed those who eventually received an ED bed ("ED Bed") and those who did not; those who did not were discharged without being roomed in the main ED ("Vertical only"). We report age, gender, race, chief complaint, ESI, vital signs, oxygen use, ED LOS, resource utilization (plain x-ray, non-contrast CT, contrast-enhanced CT, ultrasound, laboratory studies, IV fluids, IV medications), and disposition. We determined rates of return to our own hospital within 72 hours with and without admission. We calculated standardized mean differences comparing ED Bed and Vertical only patients and report the absolute values of these standardized mean differences. We considered standardized

mean differences larger than 20% in absolute value to be clinically significant based on Cohen's interpretation of a small effect.

We categorized vital signs as follows: pulse, tachycardic (greater than 100) or not; respiratory rate, tachypneic (greater than 20) or not; temperature, febrile (greater than 38°C) or not; systolic blood pressure, hypotensive (less than 90) or not. We also report whether patients required oxygen during triage. Due to constraints of our medical record, we were unable to determine whether patients presented on home oxygen or were found to require oxygen upon arrival.

For vertical patients, we excluded vital sign data from calculations when we suspected these were in error. We made that assumption for the following, as these patients would never be managed in Vertical: heart rate less than 30 or greater than 200; respiratory rate less than 5 or greater than 60; temperature less than 30 degrees Celsius; and systolic blood pressure less than 50 or greater than 300. We used these vital sign ranges in prior publications to identify likely inaccurate data [5].

We created chief complaint categories prior to analysis by grouping similar presenting issues. We include counts of individual chief complaints within these categories in Appendix 1.

Our institutional review board provided an exemption from full review.

RESULTS

During the study period, physicians evaluated 3,211 patients in Vertical: 2,219 patients (69.1%) received an ED bed ("ED bed") and 992 (30.9%) were discharged without receiving a

bed ("Vertical only"). We present patient demographics in Table 1. Most (56.2%) Vertical only patients were ESI 3, although physicians also discharged ESI 2, 4, and 5 patients from Vertical. Mean ESI was lower in ED bed (3.0) versus Vertical only (3.4) patients. Mean ESI for all ED encounters during the study period was 2.8.

We present chief complaint categories in Table 2 and the distribution of chief complaints within each category in Appendix 1. The two most common classes of complaints in Vertical were extremity issues (21.4%) such as injuries or swelling and skin complaints (13.5%) such as lacerations or cellulitis. Patients seen in Vertical presenting with abdominal pain and chest pain were significantly more likely to receive an ED bed, and patients with skin complaints were more frequently discharged from Vertical and were less likely to receive an ED bed.

We present triage vital signs in Table 3. EPs chose to evaluate some patients who presented tachycardic, tachypneic, febrile, or hypotensive in Vertical, and some patients were discharged from Vertical with abnormal initial vital signs. Rates of tachycardia and oxygen use differed between Vertical only and ED bed groups. We excluded two encounters from this analysis due to likely erroneous vital signs: one patient with a heart rate of 18 and one with a heart rate of 20.

Mean ED bed LOS was 280.5 ± 188.7 minutes vs. Vertical only LOS of 115.5 ± 63.5 minutes (Standardized Difference 117.2%). We note testing and therapeutic interventions in Table 4. EPs frequently ordered x-rays and laboratory studies on Vertical only patients. Despite instructions to avoid IV access in Vertical, 4 Vertical only patients received IV fluids or IV medications, and 5 Vertical only patients underwent contrast-enhanced CT imaging, suggesting

that our nursing staff and EPs occasionally worked together to implement novel operational flows using this space when necessary.

Vertical only patients were, by definition, discharged from the ED (98.1% discharge, 0.1% eloped, 0.9% against medical advice, 0.9% left without being seen). ED bed patients were discharged from the ED (73.1%), admitted as inpatient or observation (25.9%), left against medical advice (0.4%), or transferred (0.5%). Additional dispositions in the ED bed group included one encounter each for: eloped, left without being seen, sent to cath lab, sent to operating room, and sent to specialty department.

Returns to the ED within 72 hours were uncommon, occurring in 3.4% in both the ED bed and Vertical only groups (Standardized Difference 0.3%). Only 1.2% of ED bed and 0.5% of Vertical only patients returned and were admitted (Standardized Difference 7.7%).

DISCUSSION

In a single-site study of a novel vertical pathway, EPs evaluated and discharged patients from Vertical who would usually not have qualified for acuity-based vertical or fast track pathways. Most published vertical pathways exclude ESI 2 encounters [1,2] or focus on ESI 4 or 5 patients using fast-track protocols [3]. Our EPs freely selected the patients they wished to see in Vertical. Our flow may have led to broader patient selection, as EPs could review medical records and initial diagnostic results of potentially higher-acuity patients prior to requesting that a patient be seen in Vertical. The high percentage of Vertical only encounters categorized as ESI 3 likely reflects both the high percentage of ESI 3 visits to our ED (56.2% of all ED encounters during the study period) and the heterogeneity of ESI 3 encounters. Physician-based Vertical

patient selection allowed EPs to utilize their expertise to identify patients who may not need extensive workups. Geriatric patients dispositioned from Vertical may have especially benefited from this flow; previous work has demonstrated that ED LOS greater than 6 hours places geriatric patients at increased risk of adverse outcomes, and geriatric patients may not be selected for fast track or vertical pathways at some hospitals despite there being evidence that this may be done safely with appropriately screened patients [6].

Patients presenting with extremity and skin complaints accounted for a large percentage of the Vertical only group. A previous study examining implementation of a fast track at a French hospital found injuries and skin problems to have the lowest LOS [7]; this likely impacted our proportion of Vertical only patients, as patients with longer LOS would be more likely to be bedded simply based on LOS despite the ability to complete their care entirely in Vertical. Future optimization of our Vertical flow will involve flagging patients when they are identified by EPs as not requiring an ED bed during high-occupancy times. Considering measures of patient complexity and augmenting the triage system accordingly might also help better identify Vertical only patients early in their ED course [8].

Our patient assignment system and expectation of disposition prior to shift end encourages EPs to pull patients into Vertical rapidly, even though our EPs are salaried without RVU-based incentives. This likely contributes to our low LWBS rates; during busy hours, our waiting room time can exceed 2-3 hours, so early EP contact in Vertical may encourage patients to stay and receive care. We anticipate that an RVU-based payment structure would encourage Vertical use as well. Our Vertical model may not be as beneficial in operational situations where rapid assessment of patients is not incentivized in some manner.

Although a dedicated Vertical EP might perform a similar function, our flow model does not require patient reassignment to another EP in cases where an ED bed is necessary, as the same EP who evaluated the patient in Vertical continues to care for the patient in a Main ED bed. This limits re-work and additional testing, which may be an issue in traditional physician-in-triage models [9]. We believe that this is the first report of a vertical model staffed by multiple physicians simultaneously.

This work contributes to the literature on optimizing ED patient flow through vertical streaming [10,11] and early patient evaluation [9,12,13]. It also relates to the literature on utilizing predictive measures of patient complexity upfront so that patients with less complex needs can be routed differently [8].

LIMITATIONS

ED bed placement depended upon bed availability and not simply patient need, which limits comparison between ED bed and Vertical only subgroups. In times of low ED saturation, patients receive ED beds after evaluation despite being otherwise suitable for complete vertical processing. LOS data is likely skewed due to longer turn-around times for advanced imaging such as contrast-enhanced CT for ED Bed patients as well as wait times for admitted patients remaining in the ED pending inpatient bed assignment. Some vertical-type patients may have been inadvertently excluded from our analysis as an EP will occasionally evaluate and discharge a patient in triage, although this is rare in our environment.

Our ED, at 26 beds, is relatively small, and we do not segregate into zones or pods. Our physicians are accustomed to going anywhere in the Department to see patients, so adding a

'Vertical expectation' was not onerous, particularly as the vertical room was co-located within the ED. In 'zoned' or physically larger EDs, this approach might not be as feasible.

Our data may not be broadly generalizable to some EDs. We focused on pre-pandemic data as large numbers of COVID-19 respiratory patients would have diluted findings regarding other disease processes suitable for Vertical assessment; however, this may limit pandemic-era application of this data. New PPE and isolation requirements may complicate physical arrangements. Additionally, our ED sees a majority Caucasian population, which may limit generalizability when other EDs may serve a more diverse patient population. Our Vertical space requires a dedicated nurse, which may not be feasible in EDs suffering severe nursing staff shortages.

Despite these limitations, we believe our characterization of the Vertical only group may be beneficial to ED directors looking to optimize flow in space-limited settings.

CONCLUSIONS

EP-driven selection of patients for a vertical flow pathway resulted in successful discharge without bed placement of ED patients while simultaneously allowing EPs to function as their own triage physicians for higher-acuity patients who would go on to receive an ED bed. Further analysis of data may allow for proactive identification of patients at the time of triage who may be appropriate for vertical processing.

ARTICLE SUMMARY

Why is this topic important? Vertical patient flow has been shown to improve emergency department length of stay and patient satisfaction, thereby improving patient flow and crowding. However, descriptions of specific vertical models remain under-reported in the literature.

What does this study attempt to show? As our vertical model's reliance on physician selection of patients has unique operational implications, we sought to describe our vertical system and characterize emergency patients selected to be seen in this pathway.

What are the key findings? Physician-driven selection of patients for a vertical flow pathway resulted in successful discharge without bed placement of ED patients including some with abnormal vitals and higher ESI, who typically would not have qualified for acuity-based "fast-track" style care plans, while simultaneously allowing EPs to function as their own triage physicians for higher-acuity patients who would go on to receive an ED bed.

How is patient care impacted? Emergency department directors aiming to expedite patient care while avoiding potential rework associated with a dedicated provider-in-triage may consider a rotational patient assignment combined with vertical flow capabilities.

REFERENCES

[1] Wallingford G, Joshi N, Callagy P, Stone J, Brown I, Shen S. Introduction of a horizontal and vertical split flow model of emergency department patients as a response to overcrowding. Journal of Emergency Nursing 2018;44(4):345–352.

[2] Garrett JS, Berry C, Wong H, Qin H, Kline JA. The effect of vertical split-flow patient management on emergency department throughput and efficiency. American Journal of Emergency Medicine 2018;36(9):1581–1584.

[3] Liu SW, Hamedani AG, Brown DFM, Asplin B, Camargo CA. Established and novel initiatives to reduce crowding in emergency departments. Western Journal of Emergency Medicine 2013;14(2):85–89.

[4] Traub SJ, Stewart CF, Didehban R, et al. Emergency department rotational patient assignment. Annals of Emergency Medicine 2016;67(2):206–215.

[5] Hodgson NR, Poterack KA, Mi L, Traub SJ. Association of vital signs and process outcomes in emergency department patients. Western Journal of Emergency Medicine 2019;20(3):433–437.

[6] Gasperini B, Pierri F, Espinosa E, Fazi A, Maracchini G, Cherubini A. Is the fast-track process efficient and safe for older adults admitted to the emergency department? BMC Geriatrics 2020;20(154):1-6.

[7] Chrusciel J, Fontaine X, Devillard A, et al. Impact of the implementation of a fast-track on emergency department length of stay and quality of care indicators in the Champagne-Ardenne region: a before-after study. BMJ Open 2019;9(6):1-8.

[8] Saghafian S, Hopp WJ, van Oyen MP, Desmond JS, Kronick SL. Complexity-augmented triage: a tool for improving patient safety and operational efficiency. Manufacturing and Service Operations Management 2014;16(3):329–345.

[9] Traub SJ, Wood JP, Kelley J, et al. Emergency department rapid medical assessment: overall effect and mechanistic considerations. Journal of Emergency Medicine 2015;48(5):620–627.

[10] Saghafian S, Austin G, Traub SJ. Operations research/management contributions to emergency department patient flow optimization: review and research prospects. IIE Transactions on Healthcare Systems Engineering 2015;5(2):101–123.

[11] Saghafian S, Hopp WJ, van Oyen MP, Desmond JS, Kronick SL. Patient streaming as a mechanism for improving responsiveness in emergency departments. Operations Research 2012;60(5):1080–1097.

[12] Traub SJ, Bartley AC, Smith VD, Didehban R, Lipinski CA, Saghafian, S. Physician in Triage Versus Rotational Patient Assignment. Journal of Emergency Medicine 2016;50(5):784–790.

[13] Han, JH, France DJ, Levin SR, Jones ID, Storrow AB, Aronsky D. (2010). The effect of physician triage on emergency department length of stay. Journal of Emergency Medicine 2010;39(2):227–233.

Table 1: Vertical patient demographics

	ED bed (N=2219)	Vertical only (N=992)	Total (N=3211)	Standardized Difference (95% CI)
Age				18.4% (10.9%-25.9%)
Mean (SD)	58.8 (20.1)	54.9 (22.0)	57.5 (20.8)	
Median (Q1, Q3)	62 (44, 75)	59 (36, 73)	61 (41, 74)	
Range	0 - 101	1 - 98	0 - 101	
Gender (Male)	937 (42.2%)	477 (48.1%)	1414 (44.0%)	11.8% (4.3%-19.3%)
Race (Caucasian)	2023 (91.2%)	873 (88.0%)	2896 (90.2%)	10.4% (2.9%-17.9%)
ESI				**77.2% (69.2%-84.7%)**
2	391 (17.6%)	34 (3.4%)	425 (13.2%)	
3	1542 (69.5%)	558 (56.2%)	2100 (65.4%)	
4	279 (12.6%)	350 (35.3%)	629 (19.6%)	
5	7 (0.3%)	50 (5.0%)	57 (1.8%)	

Bold font represent standardized differences greater than 20%

Table 2: Chief complaint category for Vertical patients

	ED bed (N=2219)	Vertical only (N=992)	Standardized Difference (95% CI)
Chief complaint category			
Abdominal Complaints	321 (14.5%)	37 (3.7%)	**38% (30.5%-45.5%)**
Abnormal Test Results	79 (3.6%)	25 (2.5%)	6.1% (-1.4%-13.5%)
Allergic Reaction	7 (0.3%)	6 (0.6%)	4.3% (-3.2%-11.8%)
Back or Flank Pain	123 (5.5%)	40 (4.0%)	7.1% (-0.4%-14.6%)
Breast Complaints	6 (0.3%)	5 (0.5%)	3.8% (-3.7%-11.2%)
Cardiac Arrhythmias	41 (1.8%)	14 (1.4%)	3.4% (-4.0%-10.9%)
Chest Pain	167 (7.5%)	28 (2.8%)	**21.4% (13.8%-28.9%)**
Dizziness/Lightheadedness/Syncope	73 (3.3%)	13 (1.3%)	13.2% (5.7%-20.7%)
Ear Complaints	14 (0.6%)	28 (2.8%)	16.9% (9.4%-24.4%)
Epistaxis	5 (0.2%)	7 (0.7%)	7.1% (-0.4%-14.5%)
Exposures, Bites, and Envenomations	14 (0.6%)	10 (1.0%)	4.2% (-3.3%-11.7%)
Extremity Complaints	309 (13.9%)	212 (21.4%)	19.6% (12.1%-27.1%)
Eye Complaints	28 (1.3%)	45 (4.5%)	19.6% (12.1%-27.1%)
Falls, Motor Vehicle Crashes, Assaults, and Trauma	101 (4.6%)	61 (6.1%)	7.1% (-0.4%-14.6%)
Fatigue and Weakness	49 (2.2%)	12 (1.2%)	7.7% (0.2%-15.2%)
Fevers, Sweats or Chills	48 (2.2%)	9 (0.9%)	10.2% (2.7%-17.7%)
Foreign Body	2 (0.1%)	7 (0.7%)	9.8% (2.3%-17.3%)
Gastrointestinal Issues	139 (6.3%)	37 (3.7%)	11.7% (4.2%-19.1%)
Genital Complaints	27 (1.2%)	14 1.4%)	1.7% (-5.8%-9.2%)
Medical Device or Treatment Issue	24 (1.1%)	11 (1.1%)	0.3% (-7.2%-7.7%)
Medication Request	5 (0.2%)	12 (1.2%)	11.7% (4.2%-19.2%)
Neurological Issue	142 (6.4%)	40 (4.0%)	10.7% (3.2%-18.2%)
Other	32 (1.4%)	16 (1.6%)	1.4% (-6.1%-8.9%)
Other Pain	33 (1.5%)	28 (2.8%)	9.2% (1.7%-16.7%)
Post-Op Issue	4 (0.2%)	2 (0.2%)	0.5% (-7.0%-8.0%)
Psychiatric Complaints	5 (0.2%)	6 (0.6%)	5.9% (-1.6%-13.4%)
Shortness of Breath	144 (6.5%)	25 (2.5%)	19.2% (11.7%-26.7%)
Skin Complaints	98 (4.4%)	134 (13.5%)	**32.2% (24.7%-39.8%)**
Substance Abuse Issues	4 (0.2%)	0 (0.0%)	6% (-1.5%-13.5%)
Upper Respiratory Symptoms	112 (5.0%)	81 (8.2%)	12.6% (5.1%-20.1%)
Urinary Complaints	63 (2.8%)	27 (2.7%)	0.7% (-6.8%-8.2%)

Bold font represent standardized differences greater than 20%

Table 3: Vital signs and oxygen use for Vertical patients

	ED bed (N=2219)	Vertical only (N=992)	Standardized Difference (95% CI)
Pulse rate: Tachycardic	372 (16.8%)	96 (9.8%)	**20.7% (13.2%-28.3%)**
Respiratory rate: Tachypneic	83 (3.7%)	32 (3.2%)	2.8% (-4.7%-10.3%)
Temperature: Febrile	24 (1.1%)	1 (0.1%)	12.9% (5.4%-20.5%)
Systolic blood pressure: Hypotensive	8 (0.4%)	1 (0.1%)	5.4% (-2.1%-12.9%)
Oxygen Used in Vertical	106 (4.8%)	6 (0.6%)	**26% (18.5%-33.5%)**

Bold font represent standardized differences greater than 20%

Table 4: Diagnostic tests conducted for Vertical patients

	ED bed (N=2219)	Vertical only (N=992)	Standardized Difference (95% CI)
Plain x-ray	973 (43.8%)	256 (25.8%)	**38.6% (31.0%-46.1%)**
Non-contrasted CT	423 (19.1%)	53 (5.3%)	**42.9% (35.3%-50.4%)**
Contrasted CT	470 (21.2%)	5 (0.5%)	**70.5% (62.8%-78.2%)**
Ultrasound	299 (13.5%)	52 (5.2%)	**28.6% (21.0%-36.1%)**
Labs	1704 (76.8%)	248 (25.0%)	**121.1% (113.1%-129.2%)**
IV fluids	721 (32.5%)	4 (0.4%)	**96% (88.2%-103.9%)**
IV medications	346 (15.6%)	4 (0.4%)	**58.3% (50.7%-65.9%)**

Bold font represent standardized differences greater than 20%