Association of Emergency Department Waiting Times With Patient Experience in Admitted and Discharged Patients

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Abstract

Prolonged waiting times are associated with worse patient experience in patients discharged from the emergency department (ED). However, it is unclear which component of the waiting times is most impactful to the patient experience and the impact on hospitalized patients. We performed a retrospective analysis of ED patients between July 2018 and March 30, 2020. In all, 3278 patients were included: 1477 patients were discharged from the ED, and 1680 were admitted. Discharged patients had a longer door-to-first provider and door-to-doctor time, but a shorter doctor-to-disposition, disposition-to-departure, and total ED time when compared to admitted patients. Some, but not all, components of waiting times were significantly higher in patients with suboptimal experience (<100th percentile). Prolonged door-to-doctor time was significantly associated with worse patient experience in discharged patients and in patients with hospital length of stay ≤ 4 days. Prolonged ED waiting times were significantly associated with worse patient experience in patients who were discharged from the ED and in inpatients with short length of stay. Door-to-doctor time seems to have the highest impact on the patient's experience of these 2 groups.

Keywords

waiting time, emergency department, hospitalized patients, patient satisfaction

Introduction

Patient experience in the health care setting has been a topic of great interest over the past 2 decades. Studies demonstrate that higher patient satisfaction is associated with decreased mortality (1), lower readmission rate (2), better adherence to treatment (3), fewer lawsuits (4), and lower health care costs.(5) In addition, the Hospital Value-Based Purchasing program part of the Affordable Care Act ties better patient experience measures to higher reimbursement (6), thereby providing further incentive to optimize the patient experience.

The emergency department (ED) is frequently the port of entry to the health care system. The first impression of the health system for many hospitalized patients is the ED. The overall ED experience of a patient may also impact the patient's impression of their inpatient stay. The relation between early impressions impacting later perceptions and experiences is termed "halo effect" and has been studied (among others) in the setting of evaluation of medical education and performance (7,8). A better understanding of the factors that impact not only the ED experience but subsequently carry through to the inpatient stay is essential.

Among the factors that impact ED experience is waiting time (9). This factor likely worsened over the past few years due to the increase in ED patient volume and acuity (10). Prolonged waiting times are associated with worse ED

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patient experience (11–13), but it is unclear which part of the patient's ED waiting time has the biggest impact on their experience.

Furthermore, how ED waiting time affects later inpatient experience is also unclear. In one study by Davenport, there was no association between lower ED waiting time and better experience in inpatients (14). It is conceivable that while the halo effect of the ED experience can carry over into the hospital stay, the longer the hospital stay, the higher the likelihood that the initial effect dissipates. Therefore, the halo effect can be seen in some, but not all, patients.

A study was conducted to help answer the following questions: which part of the ED waiting times impacts patient's experience the most and whether prolonged ED waiting times affects the patient experience of some or all of the subsequently hospitalized patients.

Methods

We conducted a retrospective analysis of patients who presented to the ED of Cooper University Hospital from July 2018 through March 30, 2020. Our institution is an urban academic tertiary care center with 635 licensed beds that serves Southern New Jersey. It is a level 1 trauma center with an annual ED census of 82 000 visits. This study was approved by the institution review board (IRB) of the Cooper University Healthcare (IRB # 19-101).

Demographic Variables

We collected the following variables: age, gender, race, admission status to the hospital, hospital length of stay (LOS, if applicable), and insurance status.

Emergency Department Throughput, Definitions, and ED Times

Our ED throughput and waiting times are measured using our Electronic health Record, Epic. Patients entering the ED through the walk-in entrance are preregistered, then undergo a "quick look" triage where the patient is assigned an Emergency Severity Index with levels 1 to 5 by the triage nurse. Patients entering the ED via emergency medical service are processed in a similar manner by a separate triage nurse. At times, patients may be registered and triaged at the bedside. Upon completion of this process, the patient is placed on the "needs attending" list of the ED track board once the patient is in an ED care space.

The time from ED registration until the patient is seen by a provider is termed "time to first provider." This can be a resident, attending physician, or advanced practice provider. The time from ED registration until the patient is seen by a licensed independent provider (attending physician or advanced practice provider) is termed "door to doctor" (if a resident in not involved in the care of the patient, the door-to-provider and door-to-doctor time are identical). The time

from an independent provider seeing the patient until a disposition decision is made is termed "doctor to disposition." The time between the disposition decision and the patient leaving the ED is termed "disposition to departure." For patients admitted to the hospital, this interval time of disposition decision to leaving the ED represents "boarding time" in the ED. The "total ED time" is the total time that a patient spent in the ED from registration to departure. All these times were measured in minutes.

We defined prolonged waiting times as greater than the median.

Patient Experience Questionnaires

Our institution uses Press Ganey to assist in collecting data for patient experience. For patients who were in the ED and subsequently admitted to the hospital, we collected the Hospital Consumer Patient Assessment of Healthcare provider and systems (HCAPS) questionnaire (15) and for those who were discharged from the ED: the Press Ganey ED survey (see Supplementary material).

From the HCAPS questionnaire, we extracted the answers to the following questions as outcomes of interest: "Rate the Hospital," "Recommend the Hospital," "Communication with Nurses," and "Communication with Doctors." For the HCAHPS survey, the questions used are answered on either a 4-point or 11-point Likert scale: Rate the Hospital is answered on an 11-point Likert scale (0-10), Recommend the Hospital is answered on a 4-point Likert scale (definitely no, probably no, probably yes, definitely yes), and Physician and Nurse Communication are answered on a 4-point scale (never, sometimes, usually, always).

All responses that give the highest rating on any Likert scale: 9 and 10 (definitely yes, always) are considered to be "TopBox" responses. This is a binary scoring methodology where all TopBox responses are equated to a numerical value of 100 whereas all the other responses are equated to a numerical value of 0. The TopBox methodology is recommended by CMS (16).

For the ED satisfaction survey, we recorded the answers to the following domains as the outcomes of interest: "the nursing domain," "the care provider domain," and "overall assessment." All questions are answered on a 5-point Likert scale (very poor, poor, fair, good, very good). Individual responses are then converted into "mean scores "using the formula $(x \times 25) - 25$," where x is the numerical Likert response (ie, 1 for very poor and 5 for very good). Using the mean score methodology is recommended by Press Ganey.

We then dichotomized the scores into optimal (100% score) or suboptimal (any other value). The TopBox score determines the percentile ranking of institutions when they are compared among each other. Therefore we used a similar methodology to replicate what happens in real life.

Table 1. Demographics and ED Waiting Times.

Variable	All patients	Discharged	Admitted	P value
Number of patients	3157	1477	1680	
Age	62 [46-73]	52 [30.5-65]	67 [59-78]	<.001
Gender, n (%)				
Females	1855 (58.8)	913 (61.8)	942 (56.1)	<.001
Males	1302 (41.2)	564 (38.2)	738 (43.9)	
Ethnicity, n (%)				
White	2045 (64.8)	836 (56.6)	1209 (72)	
AA	543 (17.2)	300 (20.3)	243 (14.5)	
Hispanic	439 (13.9)	282 (19.1)	157 (9.3)	<.001
Other	130 (4.1)	59 (4)	71 (4.2)	
Insurance, n (%)				
Medicare	920 (29.1)	273 (18.5)	647 (38.5)	
Managed Care	1607 (50.9)	873 (59.1)	734 (43.7)	
BCBS	310 (9.8)	149 (10.1)	161 (9.6)	
Commercial	184 (5.8)	98 (6.5)	86 (5.1)	<.001
Medicaid	50 (1.6)	30 (2)	20 (1.2)	
Other	86 (2.7)	54 (3.6)	32 (1.9)	
ED door to first provider (minutes)	31 [15-65]	37 [18-67]	27 [12-61]	<.001
ED door to doctor (minutes)	55 [29-93]	55 [30-90]	54 [28-96]	.543
ED doctor to disposition (minutes)	160 [89-251]	138 [66-231]	180 [107-265]	<.001
Disposition to departure (minutes)	60 [20-215]	20 [12-34]	194 [94-427]	<.001
ED total time (minutes)	350 [219-542]	234 [145-341]	490 [340-731]	<.001
LOS			4 [2-6]	

Abbreviations: AA, African American; BCBS, Blue Cross Blue Shield; ED, emergency department; LOS, length of stay.

Statistical Analysis

The patient population was divided in 2 based on subsequent hospitalization status: discharged from ED versus admitted to the hospital. Categorical variables are presented as percentages, continuous variables are presented as median and interquartile range.

We performed χ^2 analysis, Mann-Whitney analysis, Fleiss κ calculation, and multivariate regression analysis. For the latter, we entered the variables, such as age, gender, race, insurance status, door to first provider, door to doctor, doctor to disposition, disposition to departure, and total ED time. We used a forward conditional methodology and considered variables to have significant association with the outcomes of interest if $P < .05$. For patients who were admitted to the hospital, we also entered the variable hospital LOS. We performed 2 sets of multivariate regression analyses. In the first set, all the ED times were entered as continuous variables. In the second set, the ED waiting times were dichotomized to their medians and prolonged waiting times were considered as > median. In both sets of analyses, gender, race, and insurance status were entered as categorical variables. All analyses were done using SPSS, IBM 25.0 software.

Results

Demographics and ED Waiting Times by Discharge Status

Over the study period, we surveyed 31 759 inpatients and 3940 completed surveys were returned (response rate of 12.4%), of which 1680 were from patients admitted from the ED. In the same period, we also sent surveyed 44 988 of the patients discharged from the ED and 1477 completed surveys (response rate of 3.3%) were returned.

There were 3278 patients included in the study: 1477 patients were discharged from the ED and 1680 were admitted to the hospital. Demographic data are presented in Table 1. Patients who were admitted to the hospital were significantly older and were proportional more male. In the hospitalized group, more patients defined their race as white and had Medicare insurance. The ED waiting times are shown and compared for both groups in Table 1. Patients who were discharged had a higher door-to-first provider and door-to-doctor time, but a lower doctor to disposition, disposition to departure, and total ED time when compared to admitted patients (Table 1). The median LOS for the inpatient group was 4 days.

Responses to Patient Experience Questionnaires

The inpatient cohort and the ED-discharged cohort responses are presented in Table 2. The Fleiss κ was .371 for the inpatient cohort and .338 for the ED-discharged cohort, indicating a fair agreement between the responses.

Abbreviation: ED, emergency department. Emergency Department Waiting Times by Experience Outcome

We compared the waiting times for patients and stratified the 2 cohorts (hospitalized and ED discharged) between the

patients whose experience was an optimal (score 100) and suboptimal (<100).

For the inpatient cohort overall, there were significant differences, as summarized in Table 3. In particular, door-to-doctor time was significantly different for all the outcome groups, whereas disposition to departure was not significantly different in any group (Table 3).

We then analyzed a subset of the inpatient cohort: patients with LOS ≤ 4 days (median of the sample) due to the immediacy factor. Door-to-first provider and door-to-doctor time were significantly different for all outcomes, and

disposition to departure was also not different in any subgroup (Table 3).

Finally, for the patients discharged from the ED, the waiting times: door to first provider, door-to-doctor, and total ED times were significantly different between all subgroups ($P < .001$). There was no significant difference for the doctor-to-disposition time between groups (Table 3).

Multivariate Analysis

We performed a multivariate regression analysis as described in section "Methods" for 3 groups: inpatient cohort with an LOS ≤ 4 days, inpatient cohort with LOS > 4 days, and ED-discharged patients.

In this first set of analyses, the waiting times were ran as continuous variables.

For patients with LOS less than or equal to 4 days, door to doctor was associated with all 4 outcome variables, doctor to disposition was associated with recommend the hospital outcome only. Door-to-first provider time, disposition to departure, and total ED time were not associated with any outcome. For the patients with LOS of more than 4 days, no waiting times were associated with patient experience scores.

For the group that was discharged from the ED, the door-to-doctor variable was significantly associated with lower

Table 2. Responses to Questionnaires.

	Median	TopBox
Inpatient cohort		
Physician Communication	75.3 (37.7)	1084 (64.9%)
Nursing Communication	78.3 (34.6)	1113 (66.4%)
Rate Hospital	66.3 (47.3)	1098 (66.3%)
Recommend Hospital	68 (46.7)	1114 (68%)
ED discharged cohort		
Overall assessment domain	78.8 (30.3)	795 (54.4%)
Nursing domain	84.8 (23.4)	814 (55.3%)
Provider domain	83.9 (25.4)	843 (57.7%)

Table 3. ED Waiting Times.

		Door to first provider	Door to doctor	Doctor to disposition	Disposition to depart	Total time
Inpatient cohort						
Physician Communication	0	27 [13-65]	58 [29-103][a]	186 [109-272]	210 [100-464]	519 [358-769][a]
	100%	27 [12-60]	52 [28-91]	173 [105-261]	185 [91-414]	473 [333-718]
Nursing Communication	0	30 [13-67][a]	59 [32-102][a]	184 [107-276]	197 [98-448]	508 [344-767]
	100%	26 [12-53]	52 [27-93]	176 [107-260]	192 [91-414]	477 [337-719]
Rate the Hospital	0	30 [13-67] [a]	60 [33-103][a]	183 [109-271]	212 [99-506]	509 [354-805][a]
	100%	26 [12-60]	51 [26-93]	176 [106-263]	188 [91-399]	4474 [335-699]
Recommend Hospital	0	30 [14-69][a]	61 [33-101][a]	192 [117-281][a]	198 [98-470]	527 [354-784][a]
	100%	26 [12-60]	51 [27-93]	173 [105-260]	191 [90-408]	473 [336-706]
Inpatient cohort ≤ 4 days						
Physician Communication	0	32 [17-74][a]	64 [35-109][a]	192 [117-271]	193 [98-436]	508 [361-772][a]
	100%	27 [13-60]	53 [29-89]	172 [108-261]	176 [84-397]	4471 [331-696]
Nursing Communication	0	35 [16-74][a]	66 [36-113][a]	183 [109-272]	170 [88-423]	490 [338-769]
	100%	26 [13-59]	53 [29-89]	179 [112-262]	187 [87-398]	478 [340-701]
Rate Hospital	0	35 [17-72][a]	70 [42-110][a]	183 [112-267]	203 [92-536]	515 [358-819][a]
	100%	26 [13-59]	51 [27-91]	178 [112-267]	175 [85-368]	470 [335-681]
Recommend Hospital	0	35 [16-72][a]	67 [37-104][a]	197 [121-291][a]	184 [92-435]	522 [361-784][a]
	100%	26 [13-60]	53 [29-92]	170 [110-253]	182 [85-400]	467 [334-697]
ED-discharged cohort						
Overall Assessment Domain	0	48 [23-81][a]	68 [37-109][a]	144 [62-241]	21 [13-37][a]	257 [160-378][a]
	100%	30 [16-54]	47 [26-76]	135 [62-224]	20 [12-32]	219 [135-319]
Nursing Domain	0	47 [24-82][a]	68 [40-111][a]	142 [69-253]	21 [13-36][a]	261 [163-381][a]
	100%	30 [15-54]	47 [25-74]	134 [64-219]	20 [12-32]	214 [132-309]
Provider Domain	0	47 [22-79][a]	67 [38-107][a]	142 [66-238]	21 [13-36]	255 [159-374][a]
	100%	32 [16-57]	49 [27-79]	131 [66-224]	20 [12-30]	222 [137-321]

Abbreviation: ED, emergency department.
[a] Significant differences.

Table 4. Multivariate Analysis for Prolonged Waiting Times and the Outcomes of Interest.[a]

	Prolonged door to first provider	Prolonged door to doctor	Prolonged doctor to disposition	Prolonged disposition to depart	Prolonged total ED time
Inpatient cohort ≤4 days					
Rate doctors	NS	1.5 [1.2-2]	1.3 [1-1.7]	NS	NS
Rate nurses	NS	1.5 [1.2-2]	NS	NS	NS
Rate the hospital	NS	1.7 [1.3-2.3]	NS	NS	NS
Recommend hospital	NS	1.6 [1.2-2]	1.4 [1.1-1.9]	NS	NS
ED-discharged cohort					
Overall standard	NS	2.0 [1.6-2.5]	NS	NS	1.4 [1.1-1.9]
Nursing domain	NS	2.2 [1.8-2.8]	NS	1.6 [1.1-2.6]	1.8 [1.3-2.3]
Provider domain	NS	2 [1.6-2.5]	NS	NS	1.4 [1.1-1.9]

Abbreviations: ED, emergency department; NS, not significant.
[a]OR [95% CI].

likelihood of getting an optimal experience score for the physician and nursing domain outcomes. Door to first provider was associated with the overall assessment domain. Disposition to depart was associated with recommend the hospital. Physician domain and total ED time were associated with overall rating. Nursing domain and doctor to disposition were not associated with any outcome (Supplemental table).

For the second set of analyses, we dichotomized the waiting times to their medians and entered them into the model as categorical variables.

For the patients with LOS less than or equal to 4 days, the variable prolonged door-to-doctor time was found to be associated with a higher likelihood of suboptimal experience for all the outcomes. Prolonged doctor to disposition had a higher likelihood of suboptimal experience for the outcomes of rate the doctors and recommend the hospital.

For the patients with LOS of more than 4 days, no waiting times were associated with patient experience scores.

For the patients who were discharged from the ED, both a prolonged door-to-doctor and prolonged total ED time were associated with suboptimal experience for all outcomes (Table 4).

Discussion

In this study, we analyzed the association of the different components of ED waiting times and patient experience in both admitted and discharged patients. We found the metric: Door to doctor impacted the patient experience scores the most for inpatients with LOS ≤ 4 days and for patients who were discharged from the ED. We also found that none of the ED waiting time's metrics were associated with differences in patient experience in patients whose LOS > 4 days.

Many studies have looked at the impact of ED waiting times on patient experience and found that high ED waiting times and longer ED throughput times were associated with worse experience (9). Most of those studies, however, were published more than a decade ago. Since then, ED visits and patient acuity have increased (10). In many studies, it was

the perceived but not the actual waiting times that were associated with worse experience (11–13). In a recent telephone survey of more than 7000 patients, Aronson et al found that total waiting time was one of the factors associated with ED satisfaction. In that study, the authors did not link the responses to the patient experience surveys and factor collected (17).

In our study, there is some significant difference between groups: Patients who were discharged from the ED are younger, more females, and more African American. All the ED waiting times were significantly longer in inpatients, with the exception of the door to doctor. The fact that doctor to disposition, disposition to departure, and total time is lower in discharged patients is expected as these patients generally require less workup, testing, and imaging prior to final disposition. Door-to-doctor time for discharged patients was higher than inpatients. This can be explained by the effective prioritization of patients at triage: The doctor will preferably see sicker patients first.

We chose to look at how waiting times affected patient's experience in regard to nursing, provider, and overall experience. We did not want to analyze the impact on facility or testing as we did not think there would be a plausible relation between them.

We compared the time metrics for the different outcome responses. For the ED discharged cohort, door-to-doctor and total ED times were significantly lower in patients who reported an optimal experience compared to those who did not. For the inpatient cohort, these findings were more nuanced as we did not see the same robust difference in the group as a whole. The cohort of patients with a shorter LOS reported a better experience with a shorter door-to-doctor time. The reasons why these findings were not consistently found in the larger inpatient cohort may be due to the immediacy factor. As a patient's hospital course prolongs, new factors may affect the patient's experience, subsequently diluting the impact of the ED experience on the patient's overall impression of their care.

After performing a multivariable regression analysis, we found that door-to-doctor time was significantly associated

with all outcomes in patients discharged from the ED and those with LOS ≤ 4 days. The other ED waiting times have some associations, but these measures were not consistent as compared to door-to-doctor times.

An institution-wide education program focusing on bedside communication and optimizing the patient experience was initiated 5 years ago. After meeting the provider, the other times may have less of an impact due to the learned bedside communications by the physicians and nurses. Longer wait times to see a doctor may likely lead to increased stress, anxiety, and an overall worse experience, while patients wait for a physician to address their concerns. Our study findings differ from a previous report by Davenport et al (14). Among the findings of their study was that a shorter actual ED time was not associated with higher patient satisfaction for inpatients. There are multiple differences between both studies that help explain this discrepancy: (1) Their study was conducted in a community hospital with a small sample size of 168 patients, (2) they defined good outcome as a satisfaction score of ≥ 75 (we defined an optimal satisfaction as 100%), (3) they analyzed time in the ED as a whole and did not look at the individual components, and (4) they only looked at the outcome "overall rating of inpatient stay" for the inpatient stay. Also they did not analyze separately the association of higher actual ED waiting times in patients with short or long LOS.

In our institution, patients are seen in 65% of cases by residents, but our results seem to indicate that patients do not perceive that they are seen by a doctor until an attending physician or advanced practice nurse sees them.

The findings of our study may help improve inpatient experience by focusing on shortening the time to see an independent provider so they can begin the evaluation and treatment plan. This could be achieved by staffing a provider in triage during peak patient arrival times and align departmental staffing based on arrival curves for patients. Additional strategies include prioritizing "back-end" throughput to help decompress ED boarders and working with key stakeholders (such as the laboratory, radiology, transport, environmental services . . .) to improve the overall operational efficiency and execution of the patient's treatment plan.

Limitations

This is a retrospective study with all the limitations that come with it. There could be other factors that impacted patient experience that we did not record. We were not able to control for patient-specific outcomes such as complications or need for surgery or testing. Also, in our ED, patients can be assigned to different "regions" of the ED depending on their acuity of illness. We were not able to control for this. We were not able to adjust for discharging service.

The average LOS in our institution is 5.6 days; thus, patients who responded may not be completely representative of the admitted patient population. Additionally, we had a relatively low number of surveys received compared to the number of patient who were seen in the ED and those subsequently admitted to the hospital (18,19). This could have introduced bias in our findings. This could be partly due to the fact that not all patients are eligible for the ED survey, in particular those with a recent ED visit (within 3 months). Furthermore, patients who fill out the surveys could have been those with prolonged waiting times that may be more upset, therefore giving us a skewed sample. Finally, waiting time can be subjective and can be highly dependent on the presenting symptom. Unfortunately, we did not have access to chart-level data to make more analyses; thus, we used the "greater than median" variable for all patients.

Conclusion

Prolonged ED waiting times were significantly associated with worse patient experience in patients who were discharged from the ED and in inpatients with short LOS. Among the different component of waiting times, door-to-doctor time seems to have the highest impact. Further studies are needed to confirm these findings.

Authors' Note

Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online.

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