5-2021

An Analysis of Factors that Impact Utilization of Indianapolis Emergency Departments

Josey Ann Noel

An Analysis of Factors that Impact Utilization of Indianapolis Emergency Departments

A Thesis

Presented to the

College of Liberal Arts and Sciences

and

The Honors Program

of

Butler University

In Partial Fulfillment

of the Requirements for Graduation Honors

Josey Ann Noel

May 2021

Abstract

Background: Over 145 million Emergency Department (ED) visits occur annually in the United States. Policy makers continue to push for less ED visits for ambulatory sensitive conditions. The aim of this study was to explore the risk factors associated with being a frequent ED utilizer for low-acuity needs.

Methods: This prospective survey study was conducted in two urban, level 1 trauma centers in Indianapolis, Indiana. The primary outcome was frequent ED utilization, defined as 4 or more visits in the past 12 months. Patient demographics, past ED visits, and primary care physician (PCP) utilization information were collected for 445 patients. A multivariate logistic regression model and Chi-square test were utilized to analyze associations between ED utilization and other factors.

Results: Of the 638 eligible ED patients, 445 were enrolled into the study. Patients were primarily female (274 females, 61.6%). Over half (55.1%) were African American and 36.4% were Caucasian. 291 (65.4%) patients stated they had a PCP, and 114 (25.6%) patients were frequent ED visitors. Patients with higher Charlson Comorbidity Index scores (p=0.0145), unemployed status (p=0.0087), and with additional physicians besides a PCP (p=0.0007) were found to have higher odds of being a frequent ED visitor.

Conclusion: Having a PCP was not found to be associated with being a frequent ED visitor (p= 0.2978); however, patients with a higher Charlson Comorbidity Index score, experiencing unemployment, and with additional physicians besides a PCP were found to have higher odds of utilizing the ED more frequently. Future research identifying additional factors that result in patients utilizing the ED for low-acuity needs is necessary.

Background

According to the Centers for Disease Control and Prevention, over 145 million Emergency Department (ED) patient visits occur annually in the United States. Only 8.7% of these patients are hospitalized, suggesting many patient encounters could be managed by less-emergent providers.[1] Furthermore, a subset of the patient population can be defined as frequent users of the ED, with frequent users defined as patients that visit the ED four or more times in a year.[2-4] This perceived overutilization contributes to overcrowding, which puts additional strain on ED resources.[5] While many retrospective studies have been performed to characterize this subset of patients, few prospective studies have been completed that gather data from these frequent users. This suggests that a more comprehensive understanding could be gained if patient perspectives were understood.

In an attempt to reduce ED visits, many factors have been studied to determine if they have a strong association with frequent usage. Studies have concluded that socioeconomic distress is associated with frequent ED visits.[3,6-8] Socioeconomic factors that predict frequent ED use include a single or divorced marital status, low income, and a high school education or lower.[3] Furthermore, frequent ED visits are often associated with chronic illnesses. [2,6,7,9] Patients who are high frequency users, characterized as visiting the ED 20 or more times per year, were more likely to be affected by at least one substantial psychosocial factor.[6] In addition to identifying socioeconomic factors associated with frequent ED use, it is important to consider if a patient's access to other health services, such as to a primary care physician (PCP), could explain why the ED is used for non-emergent concerns.

This prospective study evaluated low-acuity patients in two EDs in Indianapolis. The primary goal was to determine the risk factors associated with frequent ED use, defined as four or more visits in the past year.

Methods

This was a prospective cross-sectional survey study of low-acuity patients' utilization of the ED.

Study Sample

This study was approved by Indiana University's IRB and was conducted in two level 1 trauma centers in Indianapolis, Indiana: IU Health Methodist Hospital and Sidney and Lois Eskenazi Hospital. Trained research assistants screened emergency medical records (Cerner™ or Epic™) of low-acuity patients in the respective EDs. Patients were triaged and assigned acuity levels by hospital staff. Research assistants completed a pre-survey of patient demographics for those that met the study's inclusion and exclusion criteria. Eligible patients were English speaking, over the age of 17 years old, and gave verbal consent. The following were defined as exclusion criteria: vital signs outside of normal limits, patients presenting with high-acuity needs, homelessness, ingestion of any illicit substances, a primary mental health complaint, pregnancy, and any patient unable to provide verbal informed consent.

Survey Administration and Description

Two surveys were utilized (Survey 1 and Survey 2). For the first survey (Survey 1), consenting patients were administered a verbal survey including information about patient demographics, ED visits, and PCP utilization. Data was entered into a secure, Health Insurance and Accountability Act (HIPPA) compliant database (REDCap™).

Survey data was collected between February 2018 and April 2019. At this point, a more extensive version of the survey was created which included additional questions about PCP utilization and patient demographics (Survey 2). Responses for Survey 2 were collected until December 2019. See abridged versions of both surveys in Appendix A.

Statistical Analysis

Both Survey 1 and Survey 2 were used in the subsequent analysis. Descriptive analyses were generated through the application of filters on REDCap™. Collected data was analyzed using Statistical Package for Social Sciences version 26 (SPSS™). With the primary outcome of frequent ED utilization, a multivariate logistic regression model was utilized to compare associations between ED utilization and other factors. P-values, odds ratios, and confidence intervals are reported, with p-values less than 0.05 considered statistically significant. Subjective questions answered by the patients and objective answers found in the electronic health records were analyzed separately.

Results

Of 638 eligible ED patients approached, 445 participated in one of the two similar surveys. Patients were primarily female (274 females, 61.6%). Over half (55.1%) were African American and 36.4% were Caucasian. 205 (46.1%) patients had Medicare or Medicaid as their primary form of insurance, 108 (24.3%) had either private or group insurance, and 89 (20.0%) had no form of insurance. Self-reported outcomes included 291 (65.4%) patients had a PCP and 114 (25.6%) were frequent ED visitors (Table 1).

Using backwards selection to build a multivariate logistic regression model, this study determined the risk factors associated with being a frequent ED user for low-acuity needs, with a frequent visitor being defined by four or more self-reported prior ED visits

in the past year. Based on this study, having a PCP was not associated with being a frequent ED visitor (p= 0.2978, Table 2). Medications were significantly correlated with both Charlson Comorbidity Index (CCI) scores and other physicians, thus, CCI, insurance, employment, and other physicians were included in the final multivariate logistic regression model. Patients with a higher CCI, experiencing unemployment, and with additional physicians besides a PCP were found to have higher odds of being a frequent ED visitor (Table 3).

A subset of participants was asked if they contacted their PCP before visiting the ED. They were also asked if they visited their PCP annually for wellness checks. There was not sufficient evidence to suggest whether or not a patient with a PCP employing annual visits was associated with their frequency of ED visits (p=0.726, Table 4). Of the subset sample, 63.9% of non-frequent ED visitors contacted their PCP, while 82.1% of frequent visitors contacted their PCP; however, no significant differences were noted (p= 0.0717, Table 5).

Discussion

Overcrowding of EDs is a pressing issue affecting patients and healthcare providers. This prospective study characterized low-acuity patients in two EDs in Indianapolis to determine the risk factors associated with frequent ED use, defined as four or more visits in the past year. Patients with a higher CCI score, experiencing unemployment, and with additional physicians were found to have higher odds of being a frequent ED user.

The CCI index is pertinent for healthcare research and allows researchers to holistically summarize patients' comorbidities.[10] This research showed that patients with

more comorbidities are more likely to frequently utilize the ED than patients with lower scores. This is in accordance with previous studies, which conclude that patients who utilize the ED frequently suffer from chronic conditions. [2,6,7,9] Further, frequent users often seek medical care outside of the ED, which explains why frequent ED users in this study were more likely to have additional physicians aside from their primary care physician.

Numerous studies have highlighted the important role that a patient's socioeconomic status (SES) has on their ability to seek out proper medical care. [3,6-8] As unemployment status is a SES indicator, information regarding patients' employment statuses was gathered in the survey. This study showed that the true odds of an unemployed patient being a frequent ED visitor are between 1.036 and 3.369 times the odds of an employed patient (Table 3).

Secondary to determining risk factors associated with frequent ED usage, this study sought to determine the effect of the strength of the relationship between patients' and their PCP and frequent ED usage. Previous research has demonstrated that convenience and access to other health services, such as to a PCP, affects the frequency of non-emergent visits. [11-13] While there was not enough evidence in our research to support an association between patients annually visiting their PCP and frequent ED use, nor between patients contacting their PCP prior to coming to the ED and frequently visiting, a large majority (82.14%) of frequent ED users with a PCP contacted them beforehand. This suggests that even having a PCP by itself, in this patient population, may not reduce ED utilization. This calls for future analysis of additional factors that drive patients to utilize the ED.

While this study was able to characterize a key group of frequent ED users in Indianapolis, there are multiple notable limitations. Data was only collected when research assistants were available, typically Monday-Friday from 12-6 PM. Although these are peak volume hours, this data is less generalizable because information was not collected on weekends or holidays. Additionally, the sample was from two urban hospitals in downtown Indianapolis, which is not generalizable to other types of hospitals in rural locations. Further, patients experiencing homelessness and who did not speak English were not included in the study, which may be excluding a pertinent population that utilizes the ED frequently. Lastly, even though patients were assured their anonymity would be maintained, reporting bias may have occurred. To combat this, patients were told they could choose not to answer specific questions.

Determining what factors are associated with high ED use is significant so that the appropriate interventions can be implemented. A systematic review of recent strategies has shown that financial incentives and patient education are among the most effective interventions to reduce ED use.[14] Additional research has been conducted testing the efficacy of targeted messaging to frequent ED users, encouraging them to contact their PCP before visiting the ED. [15] However, there remains ambiguity within these results. To fully understand the most effective interventions, it is imperative that this patient population of frequent users is characterized. This study adds to current research on ED utilization by further characterizing the demographics and PCP utilization of low-acuity patients in an urban environment.

Conclusion

This study demonstrated that patients with a higher CCI score, experiencing unemployment, and with additional physicians involved in their healthcare have increased odds of being a frequent ED visitor; however, having a PCP was not found to be statistically significant. Further research is warranted to determine additional variables that contribute to frequent ED usage to provide a holistic understanding of ED utilization.

Acknowledgments

This research was supported by the Undergraduate Academic Associates Program and the IMPRS Summer Research Program through Indiana University School of Medicine. I would like to thank Dr. Peter Pang, the Principal Investigator on this study, for his support and guidance throughout this project. I would also like to show my gratitude to the numerous students involved in the Undergraduate Academic Associates Program who assisted in the data collection process.

This study would not have been possible without Layla Wisser, a fellow Butler University student. Thank you for your significant contributions collecting data and assistance creating the second survey. I would also like to thank Kaleb Ware, a medical student, for his work collecting data and help furthering this project. I am immensely grateful for Katelyn Ware, a statistician, for her assistance analyzing the results and interpreting the statistics.

I would like to thank Dr. Jane Gervasio for advising me throughout this process of writing my thesis. Lastly, I would like to thank the Butler University Honors Program. Specifically, I wish to express my gratitude to Dr. Jason Lantzer for all of the support he offered throughout my undergraduate career.

References

1. National Hospital Ambulatory Medical Care Survey: 2016 Emergency Department Summary Tables. Centers for Disease Control and Prevention website. https://www.cdc.gov/nchs/fastats/emergency-department.htm. January 19, 2017. Accessed January 20, 2020.
2. LaCalle EJ, Rabin EJ. Frequent users of emergency departments: the myths, the data, and policy implications. *Ann Emerg Med.* 2010; 56(1): 42-48.
3. Sun BC, Burstin HR, Brennan TA. Predictors and outcomes of frequent emergency department users. *Acad Emerg Med.* 2003; 10(4): 320-328.
4. Hunt KA, Weber EJ, Showstack JA, Colby DC, Callaham ML. Characteristics of Frequent Users of Emergency Departments. *Ann Emerg Med*. 2006;48(1):1-8. doi:10.1016/j.annemergmed.2005.12.030
5. Rocovich C, Patel T. Emergency department visits: Why adults choose the emergency room over a primary care physician visit during regular office hours? *World J Emerg Med*. 2012; 3(2): 91-96.
6. LaCalle EJ, Rabin EJ, Genes NG. High-frequency users of emergency department care. *J Emerg Med.* 2013; 44(6): 1167-1173.
7. Krieg C, Hudon C, Chouinard M-C, Dufour I. Individual predictors of frequent emergency department use: a scoping review. *BMC Health Serv Res*. 2016;16(1). doi:10.1186/s12913-016-1852-1
8. Hong R, Baumann BM, Boudreaux ED. The emergency department for routine healthcare: Race/ethnicity, socioeconomic status, and perceptual factors. *J Emerg Med*. 2007;32(2):149-158. doi:10.1016/j.jemermed.2006.05.042
9. Cunningham A, Mautner D, Ku B, Scott K, LaNoue M. Frequent emergency department visitors are frequent primary care visitors and report unmet primary care needs. *JEval Clin Pract*. 2016;23(3):567-573. doi:10.1111/jep.12672
10. Austin SR, Wong Y-N, Uzzo RG, Beck JR, Egleston BL. Why Summary Comorbidity Measures Such As the Charlson Comorbidity Index and Elixhauser Score Work. *Med Care*. 2015;53(9). doi:10.1097/mlr.0b013e318297429c
11. Tsai JCH, Liang YW, Pearson WS. Utilization of emergency departments in patients with non-urgent medical problems: patient preference and emergency department convenience. *J Formos Med Assoc.* 2010; 109(7): 533-542.
12. Gindi RM, Black LI, Cohen RA. Reasons for emergency room use among U.S. adults aged 18-64: national health interview survey. *Natl Health Stat Report.* 2016; (90): 1-16.
13. Doupe MB, Palatnick W, Day S, et al. Frequent Users of Emergency Departments: Developing Standard Definitions and Defining Prominent Risk Factors. *Ann Emerg Med*. 2012;60(1):24-32. doi:10.1016/j.annemergmed.2011.11.036
14. Morgan SR, Chang AM, Algatari M, Pines JM. Non-emergency department interventions to reduce ED utilization: a systematic review. *Acad Emerg Med.* 2013; 20(10): 969-985.
15. Raven MC, Kotchko SM, Gould DA. Can targeted messaging encourage PCP contact before ED visits? *Am J Manag Care*. 2013 Jan;19(1):41-45.

Table 1. Patient Demographics and Baseline Characteristics

	Non-Frequent ED Visitor (N=331)	Frequent ED Visitor (N=114)	Overall (N=445)
Gender			
Male	128 (38.67)	42 (36.8)	170 (38.2)
Female	202 (61.0)	72 (63.2)	274 (61.6)
Missing	1 (0.3)	0	1 (0.2)
Race			
White	119 (36.0)	43 (37.7)	162 (36.4)
African	183 (55.3)	62 (54.4)	245 (55.1)
American/Black	26 (7.9)	6 (5.3)	32 (7.2)
Other	3 (0.9)	3 (2.6)	6 (1.35)
Health Insurance			
Private/Group	88 (26.6)	20 (17.5)	108 (24.3)
Government Aid	136 (41.1)	69 (60.5)	205 (46.1)
Other	88 (26.6)	21 (18.4)	109 (24.5)
Missing	19 (5.7)	4 (3.5)	23 (5.2)
Medications			
0	98 (29.6)	19 (16.7)	117 (26.3)
1-3	104 (31.4)	25 (21.9)	129 (29.0)
4-6	44 (13.3)	21 (18.4)	65 (14.6)
>6	80 (24.2)	47 (41.2)	127 (28.5)
Missing	5 (1.5)	2 (1.8)	7 (1.6)
Habitation			
Alone	81 (24.5)	24 (21.1)	105 (23.6)
Not Alone	249 (75.2)	88 (77.2)	337 (75.7)
Missing	1 (0.3)	2 (1.8)	3 (0.7)
Employment			
Employed	196 (59.2)	51 (44.7)	247 (55.5)
Unemployed	56 (16.9)	30 (26.3)	86 (19.3)
Retired or Disabled	74 (22.4)	31 (27.2)	105 (23.6)
Missing	5 (1.5)	2 (1.8)	7 (1.6)
Self-reported PCP*			
Yes	213 (64.4)	78 (68.4)	291 (65.4)
No	109 (32.9)	31 (27.2)	140 (31.5)
Missing	9 (2.7)	5 (4.4)	14 (3.2)
Other physician besides PCP*			
Yes	121 (36.6)	61 (53.5)	182 (40.9)
No	208 (62.8)	49 (43.0)	257 (57.8)
Missing	2 (0.6)	4 (3.5)	6 (1.4)
All numbers are expressed as N(%).			

*Primary Care Physician (PCP)

Table 2. Univariate Logistic Regression Models Output

Variable	Parameter Estimate	p-value
Age	-0.00124	NS
Charlson Comorbidity Index	0.1380	0.0145
Eskenazi	0.1040	NS
Male	-0.0828	NS
Race		
Black vs. White	-0.0644	NS
Other vs. White	-0.4480	NS
Insurance		
Government vs. Private	0.8031	0.0054
Other vs. Private	0.0488	NS
Number of Medications		
1-3 vs. 0	0.2150	NS
4-6 vs. 0	0.9009	0.0136
>6 vs. 0	1.1086	0.0004
Living Alone	0.1763	NS
Employment		
Retired or Disabled vs. Employed	0.4761	0.0729
Unemployed vs. employed	0.7223	0.0087
PCP*	0.2528	NS
Other Physicians	0.7608	0.0007
All p-values are from a Wald Chi-square test		

*Primary Care Physician; NS= not statistically significant

Table 3. Odds Ratio Estimates and Confidence Intervals

Effect	Point Estimate	95% Wald Confidence Limits	
Charlson Comorbidity Index Score	1.168	1.012	1.348
Insurance: Government vs Private	1.851	0.981	3.494
Insurance: Other vs Private	0.978	0.469	2.039
Retired or Disabled vs Employed	0.711	0.349	1.450
Unemployed vs Employed	1.868	1.036	3.369
Additional Physicians: Yes vs No	1.842	1.134	2.994

Table 4. Relationship between Emergency Department Usage Frequency and Annual Wellness Checks with Primary Care Physician

ED Visits	Annual Wellness Checks		
Frequency **Row Pct** **Col Pct**	**Yes**	**No**	**Total**
Non-Frequent ED* Visitor	74 65.49 89.16 72.55	9 7.96 10.84 81.82	83 73.45
Frequent ED* Visitor	28 24.78 93.33 27.45	2 1.77 6.67 18.18	30 26.55
Total	102 90.27	11 9.73	113 100.00
Frequency Missing = 1			

*Emergency Department

Table 5. Relationship Between Emergency Department Usage Frequency and Contacting Primary Care Physician

ED Visits	Contacting PCP		
Frequency Percent Row Pct Column Pct	Yes	No	Total
Non-Frequent ED* Visitor	53 47.75 63.86 69.74	30 27.03 36.14 85.71	83 74.77
Frequent ED* Visitor	23 20.72 82.14 30.26	5 4.50 17.86 14.29	28 25.23
Total	76 68.47	35 31.53	111 100.00
Frequency Missing = 3			

*Emergency Department

Appendices

Appendix A

Representation of Electronic Pre-Survey

Record ID:

Study Site:
- Eskenazi
- Methodist

Patient Age (years):

Sex:
- Female
- Male

Ethnicity:
- Not Hispanic or Latino
- Hispanic or Latino

Race:
- White
- Black
- Hispanic or Latino
- Asian
- American Indian/Alaska Native
- Native Hawaiian or Other Pacific Islander
- Other

ESI Triage Category:
- 2
- 3
- 4
- 5

(Only for Methodist patients)

Health Insurance:
- Private/group
- Medicare
- Medicaid
- Military/VA
- Self-Pay (No Insurance)
- Other

Vital Signs

Temperature (F):

Heart Rate (bpm):

Systolic Blood Pressure (mmHg):

Diastolic Blood Pressure (mmHg):

Respiration Rate (breaths per minute):

Oxygen Saturation (%):

Charlson Comorbidity Score

Comorbidity (Choose all that are present)
Assigned weights for each condition the patient has ( )

- Myocardial infarct (+1)
- Congestive heart failure (+1)
- Peripheral vascular disease (+1)
- Cerebrovascular disease (except hemiplegia) (+1)
- Dementia (+1)
- Chronic pulmonary disease (+1)
- Connective tissue disease (+1)
- Ulcer disease (+1)
- Mild liver disease (+1)
- Diabetes (without complications) (+1)
- Diabetes with end organ damage (+2)
- Hemiplegia (+2)
- Moderate or severe renal disease (+2)
- Solid tumor (non metastatic) (+2)
- Leukemia (+2)
- Lymphoma, Multiple myeloma (+2)
- Moderate or severe liver disease (+3)
- Metastatic solid tumor (+6)
- AIDS (+6)

Age

- 18-49 (+0)
- 50-59 (+1)
- 60-69 (+2)
- 70-79 (+3)
- 80-89 (+4)
- 90-99 (+5)

Total points:

Number of daily medications (no prn):

- 0
- 1-3
- 4-6
- >6

ER Disposition

- Status unknown at this time
- Discharged
- Sent to observation
- Hospitalized
- Transferred

Representation of Electronic Survey 1

Day of the week:

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

Time of interaction:

Habitation Status (what is the patient's current living arrangement):

- Alone
- Living with others
- Skilled nursing facility or assisted living
- Nursing home

Employment Status:

- Full time
- Part time
- Retired
- Unemployed
- Disabled

(If Freelance, please clarify average hours worked in a week. ~20 hours = Part-time; ~40 hours = Full-time.)

Number of Emergency Department visits in the past 12 months:

- 1
- 2
- 3
- 4 or more

Do you have a primary care physician?

- Yes
- No
- Unsure

If yes, did you call your primary physician prior to coming to the ED?

- Yes
- No
- Prefer not to answer

If yes, did you call or meet with your PCP?

- Call
- Meet

Did they call you back?

- Yes
- No
- Came to the ED and didn't wait
- Waited at least 4 hours and then came to the ED

If yes, they called you back, did they:

- Tell you to go to the ER?
- Ask you to schedule an appointment?

If yes, were you able to speak directly with your primary care physician?

- Yes
- No, but someone in the office
- No

Do you have any other doctors who care for you besides your primary care physician? This may include specialists, chiropractors, physician extenders (PA or NP), etc.

- Yes
- No
- Unsure

Representation of Electronic Survey 2

Day of the week:

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

Time of interaction:

Including today, how many times have you visited an Emergency Department in the last 12 months?

- 1
- 2
- 3
- 4 or more
- Prefer not to answer

Do you have a primary care physician?

- Yes
- No
- Unsure
- Prefer not to answer

Do you visit your primary care physician annually for wellness checks (physicals)?

- Yes
- No, but visit when needed
- Prefer not to answer

Did you call or meet with your primary care physician before coming to the ED?

- Yes, met with them
- Yes, called
- No, no attempt made
- No, called but no answer
- No, but spoke with someone in their office
- Prefer not to answer

Did your primary care physician call you back?

- Yes
- No
- Prefer not to answer

What did your doctor or his staff suggest you do?

- Tell you to go to the ER
- Ask you to schedule an appointment
- Prefer not to answer

Do you have any other doctors or specialists who care for you besides your primary care physician?

Such as a cardiologist, gynecologist, or neurologist.

- Yes
- No
- Unsure
- Prefer not to answer

How did you arrive to the ED today?

- Ambulance
- Bus
- Car (drove self)
- Friend or family drove me Uber, Lyft, or Taxi
- Bike
- Walk
- Prefer not to answer

What is your highest education degree?

- Some high school
- High school graduate or GED
- Associate's Degree
- Bachelor's Degree
- Post-graduate Degree
- Prefer not to answer

Employment Status:

- Full time
- Part time
- Retired
- Unemployed
- Disabled
- Prefer not to answer

(If Freelance, please clarify average hours worked in a week. ~20 hours = Part-time; ~40 hours = Full-time.)

If you're comfortable answering, what is your current household income?

- Unemployed
- < 25,000
- 25,000 to 50,000
- 50,000 to 75,000
- 75,000 to 100,000
- > 100,000
- Prefer not to answer

What is your current living arrangement? Do you live...

- Alone?
- With others?
- In a nursing home or assisted living facility?
- Prefer not to answer