

The Association Between Family Medicine Appointment Cancellations and Hospital Utilization in 2019 and 2020

Del G. Carter, BA, Maribeth P. Williams, MD, MS, Benjamin J. Rooks, MS, and Peter J. Carek, MD, MS

Introduction: The COVID-19 pandemic caused a disruption in the usual primary care services offered and received by patients. The objective of this study was to compare the impact of family medicine appointment cancellations on hospital utilization metrics both before and during the COVID-19 pandemic within a family medicine residency clinic.

Methods: This study is a retrospective chart review of cohorts of patients with a family medicine clinic cancellation who presented to the emergency department during a similar time period before and during the pandemic (March-May of 2019 vs March-May 2020). The patient population studied has multiple chronic diagnoses and prescriptions. Hospital admission, hospital readmission, and length of stay for hospitalizations during these periods were compared. The impacts of appointment cancellations on the emergency department presentation with subsequent inpatient admission, readmission, and length of stay were examined using generalized estimating equation (GEE) logistic or Poisson regression models to account for the lack of independence between patient outcomes.

Results: A total of 1878 patients were included in the final cohorts. Of these patients, 101 (5.7%) presented to the emergency department and/or hospital in both 2019 and 2020. An increased odds of readmission was associated with family medicine appointment cancellation regardless of year. The effects of appointment cancellations were not associated with admissions or length of stay between 2019 and 2020.

Conclusion: Between the 2019 and 2020 cohorts, appointment cancellations were not associated with significant differences in likelihood of admission, readmission, or length of stay. A higher risk of readmission was associated with patients with a recent family medicine appointment cancellation. (J Am Board Fam Med 2022;00:000–000.)

Keywords: Community Medicine, Continuity of Patient Care, COVID-19, Family Medicine, Patient Readmission, Primary Health Care, Retrospective Studies

The importance of primary care to both individual patient health and the overall health care system

has been well-documented in recent decades. Both increased primary care physician supply¹ and continuity² are associated with decreased overall mortality. Studies have noted the association of lower hospitalizations and decreased health care costs with increased primary care continuity,³ increased primary care access,⁴ and stronger primary care systems.⁵ Overall, robust primary care has been associated with improved patient health outcomes as measured by numerous indicators.^{6,7}

Catastrophes such as natural disasters cause disruption of life and community resources, including access to primary care, including appointments with family physicians. Multiple studies have demonstrated negative health effects are indirectly associated with natural disasters that cause disruption in

This article was externally peer reviewed.
Submitted 24 June 2022; revised 9 September 2022; 14 October 2022; accepted 18 October 2022.

This is the Ahead of Print version of the article..

From the College of Medicine, University of Florida (DGC); Department of Community Health and Family Medicine, University of Florida (MPW, BJR, PJC).

Funding: Research reported in this publication was supported by a training grant from the National Institutes of Health (NIH) under award number T35HL007489-37. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Conflict of interest: none.

Corresponding author: Maribeth P. Williams, MD, 1707 N Main Street Gainesville, FL 32609 (E-mail: maribethporter@ufl.edu).

the access or continuity of primary care.^{8–10} While a pandemic similar to the SARS-CoV-2 virus has not occurred in nearly a century, the virus' drastic impact on daily life raised concerns that disruptions in primary care services may yield negative impacts on patient health. Observational trend analysis demonstrated fewer than usual outpatient visits during the early pandemic.^{11,12} A decrease in hospital admissions through the emergency department was noted during the pandemic and raised the hypothesis that patients may have deferred necessary care potentially leading to worse health outcomes in the future.¹³

With the importance of primary care, in particular family medicine, on patient health, changes in primary care delivery and utilization in the COVID-19 era warrant further consideration to understand the associated impacts and consequences more fully. To that end, we examined the association of family medicine appointment cancellations on hospital utilization metrics both before and during the COVID-19 pandemic.

Methods

Data for this study were obtained from the electronic health records of adult patients from a family medicine teaching clinic within a large academic medical center. The cohort for this study included adult patients at least 18 years old with at least 1 clinic visit over the preceeding 2 years who presented to the emergency department (ED) during 1 of the following 2 time periods: 03/15/2019 to 05/31/2019 (prepandemic) or 03/15/2020 to 05/31/2020 (during pandemic).

Based on an individual chart review, patients were classified as having had a recent family medicine appointment cancellation if the cancellation occurred during the time period studied and before their ED presentation. "No-shows" were counted as an appointment cancellation since they still represented a lack of receipt of expected or scheduled primary care. Differences between the 2019 and 2020 cohorts were assessed using chi-squared tests for categorical variables and *t* test for continuous variables. Since several patients appeared in both the 2019 and 2020 cohorts, the association between appointment cancellations on the inpatient admissions, readmission, and length of stay were determined using generalized estimating equation (GEE) logistic or Poisson regression models to account for the potential lack of independence between patient outcomes. Interaction terms between

appointment cancellations and cohort year were included to determine whether the effect of appointment cancellations at admission changed between 2019 and 2020.

All models were fit using an independence correlation structure and robust errors were used to estimate confidence intervals. Models were adjusted for age, race/ethnicity, marital status, insurance status, the presence of psychiatric, substance abuse, or chronic pain diagnoses, and the number of prescribed medications.

This project was determined to be exempt by the University of Florida's IRB.

Results

A total of 1878 patients were included in the final cohorts. Of these patients, 101 (5.7%) presented to the ED in both 2019 and 2020. [Table 1] A significant decrease in ED presentations between the 2 groups occurred. Demographic information such as age, race, insurance status, and marriage status were similar. The rate of hospital admissions, rate of readmissions, recent telemedicine appointments, number of medications, and number of diagnoses were higher in the pandemic group compared with the patients in the prepandemic group.

The results of the regression analysis measuring the association of appointment cancellations on inpatient outcomes are presented in Table 2. In the unadjusted analyses, an association between appointment cancellations and inpatient admission was observed. However, this association was not present in adjusted analyses. An association between family medicine appointment cancellations and an increased odds of readmission was observed in both unadjusted and adjusted analyses. No association between appointment cancellations and length of stay was observed.

The association between appointment cancellations on readmissions was not statistically different between 2019 and 2020, suggesting that the COVID-19 pandemic did not influence this relationship. [Table 3] However, a statistically significant reduction in the association between appointment cancellations and hospital admissions was observed between groups. Stratified analyses of the relationship between appointment cancellations and admissions did not show an association in 2019 (OR = 1.36, 95% CI: 0.96 – 1.94) or 2020 (OR = 0.63, 95% CI: 0.40 – 1.01) individually, suggesting that this observed change may be a statistical artifact.

Table 1. Descriptive Statistics for the ED Patient Population in Spring 2019 and Spring 2020

n	2019	2020	p-Value
	1220	658	
Recent Appointment Cancellations	289 (23.7%)	160 (24.3%)	0.805
Inpatient Admissions	267 (21.9%)	184 (28.0%)	0.004
Inpatient Readmissions	42 (15.8%)	30 (16.7%)	<0.001
Average Length of Stay in Days (Median; IQR)	3 (5)	3 (4)	0.157
Mortality	11 (0.9%)	10 (1.5%)	0.325
Recent Telemedicine Appointments	0 (0%)	54 (8.2%)	<0.001
Age (Mean; S.D.)	47.2 (52.5)	47.2 (16.7)	0.989
Race			
Non-Hispanic White	448 (36.8%)	256 (39.4%)	0.377
Non-Hispanic Black	693 (57.0%)	357 (54.9%)	0.311
Hispanic	47 (3.9%)	22 (3.4%)	0.667
Other	32 (2.3%)	23 (2.3%)	0.354
Marriage/Life Partner	329 (27.1%)	174 (26.9%)	0.850
Insured	1112 (91.4%)	586 (90.0%)	0.166
Psychiatric Diagnosis	788 (64.8%)	444 (68.2%)	0.228
Substance Abuse Diagnosis	545 (44.8%)	312 (47.9%)	0.276
Chronic Pain Diagnosis	262 (21.5%)	128 (19.7%)	0.331
Number of Medications (Median; IQR)	16 (20)	18 (21)	0.016
Number of Diagnoses (Median; IQR)	58 (61)	68 (64)	<0.001

Abbreviations: SD, standard deviation; IQR, Interquartile range; ED, emergency department.

Table 2. Odds/Rate Ratios and 95% Confidence Intervals for the Relationship Between Appointment Cancellations and Hospital Utilization Metrics

	Unadjusted	Adjusted*
Inpatient Admissions	1.56 (1.23, 1.98)	1.03 (0.78, 1.36)
Inpatient Readmissions	2.09 (1.22, 3.60)	2.01 (1.12, 3.61)
Length of Stay†	0.99 (0.80, 1.23)	0.90 (0.71, 1.13)

*Models adjusted for age, race/ethnicity, marital status, insurance status, the presence of psychiatric, substance abuse, or chronic pain diagnoses, and the number of prescribed medications.

†Rate ratios from Poisson regression model.

Table 3. Interaction Coefficients and 95% Confidence Intervals for the Effect of Primary Care Appointment Cancellations on Hospital Utilization Metrics Between 2019 and 2020

	Unadjusted	Adjusted*
Inpatient Admissions	0.61 (0.37, 0.99)	0.43 (0.24, 0.77)
Inpatient Readmissions	0.58 (0.21, 1.63)	0.58 (0.19, 1.74)
Length of Stay†	0.82 (0.53, 1.28)	0.75 (0.44, 1.28)

*Models adjusted for age, race/ethnicity, marital status, insurance status, the presence of psychiatric, substance abuse, or chronic pain diagnoses, and the number of prescribed medications.

†Results from Poisson regression model.

Discussion

No differences in the association between family medicine appointment cancellations and admission, readmission, or length of stay were found between the 2019 and 2020 patient cohorts. As such, these results suggest that appointment cancellations were not associated with a greater or lesser likelihood of admission, readmission, or length of stay during the COVID-19 pandemic versus earlier time periods.

Despite the lack of difference between cohorts, a statistically significant difference observed between appointment cancellations and hospital readmissions was noted. In an overall analysis, patients with

a recent family medicine appointment cancellation had 2.01 times the odds of experiencing a hospital readmission. Previous research into the association between appointment cancellations or no-shows has focused on inpatient admissions, readmissions, and/or ED visits among diabetic,^{14,15} asthmatic,¹⁶ and HIV¹⁷ patients specifically. Among a more general population, patients who no-show have been shown to be more likely to use the ED and/or require hospitalization.^{18,19} To our knowledge, no one has evaluated whether recent primary care appointment cancellations are associated with

higher odds of readmission among a family medicine patient population. If the statistically significant association between recent family medicine appointment cancellations and odds of readmission found in this study involving one family medicine clinic within a larger academic medical center holds true in broader, more generalizable populations, health systems could potentially identify patients at higher risk for readmission earlier than other associated variables allow.

Of note, inpatient admissions, readmissions, number of medications, and number of diagnoses were all greater in the 2020 cohort than in 2019. These differences were statistically significant but not controlled for any potential confounding factors. While these differences were not more fully evaluated in this study, they do raise questions of whether there may have been a difference in acuity of the patients in the 2020 versus 2019 cohorts irrespective of any recent family medicine appointment cancellation.

Several limitations to this study are present. We did not consider the reason behind an appointment cancellation. Thus, we were unable to evaluate if specific types of cancellations (facility-canceled, patient-canceled, or no-show) had differing associations. This represents a potential area for future study. In relation to not considering the reason for cancellation, it is possible that some patients missed or canceled appointments due to being admitted or readmitted at that time. In addition, the time period evaluated was relatively short at two and a half months for each year. As mentioned, several variables (Table 1) were significantly different between the two cohorts and could have impacted the results noted. Finally, the patient population consisted of patients from one family medicine residency clinic and one emergency department.

In conclusion, when family medicine patient cohorts with an appointment cancellation were compared before and during the COVID-19 pandemic, there was no significant difference in hospital admission, readmission, or length of stay between groups. However, a higher risk of readmissions was associated with patients with a recent family medicine appointment cancellation both before and during the pandemic.

To see this article online, please go to: <http://jabfm.org/content/00/00/000.full>.

References

1. Basu S, Berkowitz SA, Phillips RL, Bitton A, Landon BE, Phillips RS. Association of primary care physician supply with population mortality in the United States, 2005–2015. *JAMA Intern Med* 2019;179:506–14.
2. Gray DJP, Sidaway-Lee K, White E, Thorne A, Evans PH. Continuity of care with doctors - A matter of life and death? A systematic review of continuity of care and mortality. *BMJ Open* 2018;8:e021161.
3. Bazemore A, Petterson S, Peterson LE, Bruno R, Chung Y, Phillips RL. Higher primary care physician continuity is associated with lower costs and hospitalizations. *Ann Fam Med* 2018;16:492–7.
4. Rosano A, Loha CA, Falvo R, et al. The relationship between avoidable hospitalization and accessibility to primary care: A systematic review. *Eur J Public Health* 2013;23:356–60.
5. Kringos DS, Boerma W, van der Zee J, Groenewegen P. Europe's strong primary care systems are linked to better population health but also to higher health spending. *Health Aff (Millwood)* 2013;32:686–94.
6. Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q* 2005;83:457–502.
7. Macinko J, Starfield B, Shi L. The contribution of primary care systems to health outcomes within organization for economic cooperation and development (OECD) countries, 1970–1998. *Health Serv Res* 2003;38:831–65.
8. Baum A, Barnett ML, Wisnivesky J, Schwartz MD. Association between a Temporary reduction in access to health care and long-term changes in hypertension control among veterans after a natural disaster. *JAMA Netw Open* 2019;2:e1915111.
9. Kishore N, Marqués D, Mahmud A, et al. Mortality in Puerto Rico after Hurricane Maria. *N Engl J Med* 2018;379:162–70.
10. de Rubeis V, Lee J, Anwer MS, et al. Impact of disasters, including pandemics, on cardiometabolic outcomes across the life-course: A systematic review. *BMJ Open* 2021;11:e047152.
11. Patel SY, Mehrotra A, Huskamp HA, Uscher-Pines L, Ganguli I, Barnett ML. Trends in outpatient care delivery and telemedicine during the COVID-19 pandemic in the US. *JAMA Intern Med* 2021;181:388–91.
12. Baum A, Kaboli PJ, Schwartz MD. Reduced in-person and increased telehealth outpatient visits during the COVID-19 pandemic. *Ann Intern Med* 2021;174:129–31.
13. Nourazari S, Davis SR, Granovsky R, et al. Decreased hospital admissions through emergency departments during the COVID-19 pandemic. *Am J Emerg Med* 2021;42:203–10.
14. Nuti LA, Lawley M, Turkcan A, et al. No-shows to primary care appointments: Subsequent acute care utilization among diabetic patients. *BMC Health Serv Res* 2012;12:304.

15. McComb S, Tian Z, Sands L, et al. Cancelled primary care appointments: a prospective cohort study of diabetic patients. *J Med Syst* 2017;41.
16. McGovern CM, Redmond M, Arcoleo K, Stukus DR. A missed primary care appointment correlates with a subsequent emergency department visit among children with asthma. *J Asthma* 2017;54: 977–82.
17. Colubi MM, Pérez-Elías MJ, Elías L, SEAD Study Group, et al. Missing scheduled visits in the outpatient clinic as a marker of short-term admissions and death. *HIV Clin Trials* 2012;13:289–95.
18. Hwang AS, Atlas SJ, Cronin P, et al. Appointment “no-shows” are an independent predictor of subsequent quality of care and resource utilization outcomes. *J Gen Intern Med* 2015;30:1426–33.
19. Nguyen DL, Dejesus RS. Increased frequency of no-shows in residents’ primary care clinic is associated with more visits to the emergency department. *J Prim Care Community Health* 2010;1:8–11.