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Missed Appointment Rates And The Implication On Primary Care Practice

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Abstract

Problem: Missed appointments cost primary care facilities money and resources through lack of utilization. When patients fail to attend their scheduled appointment the providers are non-productive when they could be seeing other patients that are potentially moved to other days, sending patients to other providers, or worse sending patients to the prompt care or the Emergency Department for care. The missed appointment rate at Office A Primary Care is approximately ten percent, while Office B has a nearly 11% missed appointment rate. Both facilities make reminder calls to patients the day before their appointments to remind them of their appointment and still there is a significant missed appointment rate.

Methods: This project includes an observational, descriptive design utilizing retrospective data collection from the medical record of patients from the calendar year 2019 with a comparison between the two primary care offices (Office A and B) and evaluation if the prompt care at Office A impacts the missed appointment rates.

Results: Results showed a significantly less likely rate of missed appointments at Office A than at Office B. Additionally, those that did miss their appointment at Office A were more likely to have an urgent care visit than those that missed visits at Office B. This is greatest for regular office visits and preventative exams, as well as, for those with a payor source of Medicare. Younger individuals were more likely to miss their appointments than older individuals.

Implications for Practice: Further studies and investigation is needed to find ways to reduce missed appointment rates. While both offices have relatively low rates, it would improve productivity and profitability to reduce the missed appointments, as well as improve patient outcomes. Additionally, it is assumed that there are times when the patient misses their appointment and ultimately ends up in the emergency department.

Keywords: no show, no-show, primary care

Missed Appointment Rates And The Implication On Primary Care Practice

Expanding access to health care has been discussed for years. This was extensively addressed with the Affordable Care Act (ACA); however, the main premise of the ACA was to increase insurance coverage for Americans so they could afford to have primary care coverage and access to appropriate health care (McGough, Norris, Scott, & Burner, 2017). With the onset of the ACA, the expectation was to create more convenient access to primary and specialty care and to reduce the use of the emergency department (ED) for non-emergent care (McGough et al.). While having adequate insurance coverage is important, it is not the only factor that affects accessibility to health care. The goal has become having the correct care, for the correct patient, in the correct place, and at the correct time. This often pertains to the working individuals who cannot make it to traditional provider's office hours due to conflicting work schedules (McGough, et al.). Timely access to health care with the primary care provider is associated with improved outcomes for the patient which ultimately reduces cost of health care. This is an underlying goal since health care expenditures are a major issue in the United States (Ansell, Crispo, Simard, & Bjerre, 2017).

Another barrier to access is missed appointments within the primary care setting. Missed appointments are defined as a patient either not showing for their scheduled appointment time or cancelling on the same day of the appointment. Missed appointments impose an inefficient use of human resources, which are resources in a system where the demand for healthcare is higher than the supply (Lenzi, Ben, & Tetelbom Stein, 2015). Patient missed appointment rates are a consistent problem in the primary care setting leading to inefficient use of resources, non-productive time for providers, and decreased access to primary care for other patients (Lenzi et al., 2015). Decreased revenues are also a consequence of patient missed appointments (Chand, Kamble, Diwan, Mahobia, & Chand, 2017). In 2013, healthcare systems accounted for approximately \$2.9 trillion in health care

dollars (Centers for Medicare and Medicaid Services [CMS], 2018), however, in 2017, it is estimated to account for approximately \$3.5 trillion, which is a growth of 3.9% (CMS, 2018). Missed appointments are estimated to cost about \$3 million dollars per year in health care resources that could have been used elsewhere (Kheirkhah, Feng, Travis, Tavakoli-Tabasi, & Sharafkhaneh, 2016).

Approximately 20% of adults seek care through the ED, which could be managed in a primary care setting (Gindi, Black, & Cohen, 2016). Hospital ED visits decreased from 2014 to 2015 by 3%, from 141.4 million to 136.9 million ED visits according to recent data collected by the Centers for Disease Control (CDC, 2015); however, there was an increase in non-urgent use in the same year from 24.6 percent to 26.1 percent visits (Daly, 2018).

In the Midwest there is a large faith-based health care organization consisting of 13 hospitals within two states with 1,874 licensed acute care beds, 18 prompt care centers, 11 centers for health and two colleges of nursing. Within the organization, there are 1,300 primary care, specialty and advanced care providers. Within this large healthcare organization are two rural, healthcare primary care provider facilities. One is near a small rural hospital and the other has a prompt care within the same building. These two offices are within a close geographic area, the remaining offices within the region are approximately 170 miles away. In the office with the prompt care (Office A), there are two physicians, two nurse practitioners, and three physician assistants. In the office across from the hospital (Office B), there are four physicians, two physician assistants, and two nurse practitioners. An average new patient appointment costs \$280, whereas an established level three visit costs about \$147 per visit. The average missed appointment rate for Office A is 9.51%, whereas the average missed appointment rate for the Office B is 10.59% for the year 2018. While this missed appointment rate is below the national average, it still accounts for a considerable cost in lost revenue and missed opportunities for other patients to be scheduled.

The purpose of this needs assessment initiative is to obtain baseline information and compare results about missed appointments between two primary care office sites. The aim of this project is to assess the impact of a prompt care on site on missed appointment rates and develop recommendations for improvement. Outcome measures of interest include number of primary care and prompt care visits; reasons for scheduled appointment; number of missed appointments; and demographics such as age, gender, race/ethnicity, zip code, and payor status. The question for study is in comparing Office A and Office B, age 18 and older, during the year of 2019 was there a difference in missed appointment rates between Office A with the prompt care onsite and Office B without the prompt care onsite.

The Health Needs Assessment (HNA) framework that was used for this project had five steps (Cavanaugh & Chadwick, 2005). Step one involved getting started which included define the population of the project; determining what was to be achieved; who needed to be involved with the project; what resources were going to be needed; and what the risk would be. In step two, the priorities were defined which included population profiling; gathering the data; defining the needs; and identifying and assessing health conditions and determinant factors that could be at play. Assessing the health priority for action is step three and this includes choosing the health conditions and determinant factors with the most priority for action and impact to the population and determining effective interventions that are affordable and appropriate. With step four, plan for change. During this step, clarification of goals for intervention, plan for action, monitor and evaluate and plan for risk. Step five involves plans for the next step and learning from the project, measuring the impact and choosing the next project.

Literature Review

A comprehensive review of the literature was completed using the databases of CINAHL and Medline with advanced parameters of 2014-2019 dates of publication and peer

review. A Google search was also conducted to ascertain peer reviewed research articles. Key terms used to search were primary care, no-show and missed appointment. This search resulted in 53 articles of which 24 of articles were useful in obtaining information pertaining to primary care missed appointment rates and the implications that result (Appendix A). Exclusion criteria was anything published beyond five years ago. Four of the articles were not research articles but were used for background information.

Reasons for Missed appointments

Common reasons given for no-show of appointments was forgetting or misunderstanding the importance of the appointment. Another reason given for not attending appointments was transportation issues where public transportation was not prevalent. Other patients mention disrespect by the professionals and other emotional barriers (Giunta, 2019; Tine Health, 2018).

Demographics Related to Missed Appointments

Research shows that individuals that are more likely to not attend their primary care appointment tend to be younger and female (Lenzi et al., 2015). Additionally, they are more likely to be African American and of low socioeconomic class (Hwang et al., 2015). Medicaid recipients are the most likely insurance classifications with private insurance being next (Dobbs et al., 2018). January appointment have the highest no-show rates with June being the lowest. Monday is the weekday with the highest rate of missed appointments (Dobbs et al., 2018; Lenzi et al., 2015; Hwang et al., 2015).

Impacts of Missed Appointments

Many studies have been conducted all over the world that have investigated the impacts of missed appointment rates on health care systems. Missed appointments have been shown to reduce productivity in the primary care setting, decrease utilization of resources, costing billions of health dollars each year (Kheirkhah et al., 2016). Missed appointments

make it difficult for other patients to get appointments in a timely manner causing a backlog and waitlist of primary care patient needing appointments (Kheirkhah et al., 2016).

Additionally, health outcomes have been shown to decrease because of missed appointments.

This occurs because of decreased preventative care,

higher A1C factors, higher lipid levels, increased emergency department visits and

hospitalizations (Chand et al., 2017; Gier, 2017; Hwang et al. 2015; Kheirkhah et al. 2016;

Mieloszyk, Rosenbaum, Hall, Raghavan, & Bhargava, 2018).

Transportation

While transportation is mentioned as an obstacle to keeping primary care appointments, the studies that were reviewed indicate that there is no significant difference in distance on missed appointment rates (Chaiyachati et al., 2018). Additionally, providing Uber type rideshares was unsuccessful in reducing the missed appointment rates within the primary care setting (Chaiyachati et al., 2018). This, however, could be at least in part due to the studies being conducted in large metropolitan areas with readily available public transportation (Chaiyachati et al., 2018). The studies read where all conducted in large metropolitan areas with good public transportation systems which could impact the results of the studies.

Patient Reminders

Increasing patient engagement has been shown in several studies to decrease missed appointment rates (Teo, Forsberg, Marsh, Saha, & Dobscha, 2017; Goffman et al., 2017).

The use of patient portals has been shown to increase patient engagement in their health through increased communication with the providers (Zhong et al., 2018). This increased communication allows the patients to make more informed and educated decisions about their health. While this increase patient engagement, it also increases the amount of

interaction that the provider has with the patient, increasing their workload (Zhong et al., 2018).

Likewise, the interaction with patient reminders also reduces missed appointment rates but only when the patient has had direct contact with a person. Indirect contact such as an answering machine or caller id has no effect on rates (Teo et al., 2017). This was also the case with patient navigators' that called the patients prior to their appointments. The patients had lowered missed appointments and better outcomes with the navigator calls. (Goffman et al., 2017; Teo et al., 2017; Weaver, Talley, Mullins, & Selleck, 2019; Zhong et al., 2018).

Open access scheduling is another way that has been found to decrease missed appointment rates. Allowing patient to schedule themselves within a short timeframe has been shown to increase patients' meeting their appointment obligation. The farther out the appointment, the more likely the patient is to miss that appointment. Longer wait time to see a patient's primary care provider is also linked to poor patient outcomes. In providing open access, it was also necessary to provide greater access, which included longer hours and more availability within the schedule for patients to be able to see their primary care provider (Ansell et al., 2017; Mohamed, Mustafa, Tahtamouni, Taha, & Hassan, 2016).

In contrast, Banjaree et al., (2017) found higher incidence of missed appointments among those that were schedule within a day or two of their appointment.

Additionally, increased hours for primary care providers has been linked with better continuity of care and improved patient outcomes. With the implementation of the Affordable Care Act (ACA) there have been more patients seeking care with more complex health issues than ever before which has placed an undue burden on the health care system, resulting in the need for changing patterns to adjust for the influx. Those changes have been increased primary care hours, urgent care access and hiring more mid-level providers

(McGough et al., 2017; Shrank, 2017; Robert Wood Johnson Foundation, 2017; Canadian Agency for Drugs and Technologies in Health, 2016).

Strategies Used

Since one of the reasons mentioned by patients for missing their appointments was misunderstanding, one study emphasized education and increased their patient attendance rate by 34 percent. They educated their patients on the importance of complying with their appointments as well as how to properly cancel the appointment if they could not attend. Another study took a look at patient history and those that were habitually missing appointments and double booked their appointments so that they would not lose revenue and found that they rarely had problems with the schedule that they could not handle (Creps & Lotfi, 2017; American Osteopathic Association, 2018).

Needs Assessment

Problem

Office A opened in December 2017 and has seen 14,180 patients in the first year it was open excluding lab visits. Missed appointment rates for the next year of operation (2018) were 9.51 percent. Highest missed appointments were on Fridays with 10.29%, followed closely by Monday with 9.58% and the remainder of the days having 8.81-9.52% (Table 1).

Table 1
Office A Visits/Missed appointments By Day (January – December 2018)(rates in bold)

	Monday	Tuesday	Wednesday	Thursday	Friday	Totals
Raw No.	3350	2532	2610	2628	3060	14180
Missed appointments	321	241	230	242	315	1349
Rate	9.58%	9.52%	8.81%	9.21%	10.29%	9.51%

The Office A building consists of seven providers, including two physicians, three physician assistants and two-family nurse practitioners, some of which are part-time. The

current hours of operation are 8 AM– 4:30 PM Monday through Friday. The primary care practice only sees patients 14 years and up. The last patient is scheduled at 4:30 PM. One nurse practitioner started staying until 6 PM in October, 2019.

There is a prompt care in the building that operates from 8 AM until 7 PM Monday through Saturday and 8 AM through 6 PM Sunday. The prompt care sees patients of all ages. There are three providers in the prompt care, one doctor and two nurse practitioners, with the doctor being part-time.

The community for Office A has a population of about 18,000 people. It consists of small businesses, agriculture and upper middle-class subdivisions. Median income for Office A is \$64,529, compared to \$60,960 for Illinois. Demographic racial profile of Office A is 91.6% white, 4.6% black, 1.5% Hispanic, 1.3% biracial, 0.7% Asian and 0.2% American Indian (City-Data.com, 2019a). Office A also serves the surrounding areas.

Office B opened in 1977. Prior to that, they had physician offices at the hospital. Currently, there are eight providers at office B, four physicians, two nurse practitioners and two physician assistants. The office hours are basically 8AM to 5 PM with two providers having hours until 6:30 PM. During 2018, office B saw 25,314 visits. At the Office B office, Friday has the highest missed appointment rate at 11.27%, followed closely by Tuesday at 11.05% (Table 2).

Table 2
Office B Visits/Missed appointments By Day (January–December 2018) (rates in bold)

	Monday	Tuesday	Wednesday	Thursday	Friday	Totals
Raw No.	4849	5884	5079	5395	4107	25314
Missed appointments	473	650	533	562	463	2681
Rate	9.75%	11.05%	10.49%	10.42%	11.27%	10.59%

The community for Office B has a population of approximately 26,725 people. Median household income for Office B is about \$38,393 per year. Demographic racial profile of Office B consists of 66.9% white, 25.7% black, 5.0 % bi-racial, 2.1% Hispanic, 0.5% Asian, and 0.08% American Indian (City-Data.com, 2019b).

While the nine and ten percent may seem reasonable, it can prevent some patients from seeing their primary care provider when needed and cause them to have to utilize the prompt care for access or worse yet the emergency room for a non-urgent issue. Identifying barriers that prevent individuals within the practice from coming to their scheduled appointments could prevent a backlog of access and unnecessary utilization of the emergency room. In analyzing which types of appointments have the highest missed appointment rates from reviewing the provider schedules from 2018, the following types of appointments were analyzed including follow up mental health, new patient, routine well visits, emergency room/hospital follow up, acute visits, chronic disease management visits, transfer of care visits, and preoperative clearance visits. Data for Office B was unavailable to analyze. The findings were that the highest missed appointment types were chronic disease management with 25.35%, closely followed by routine well visits with 20.09%. Lowest visit types to missed appointments were preoperative clearance visits, 0.37%, followed by transfer of care, 3.85% (Table 3).

Table 3
Types of Visits Missed Office A (January – December 2018) (Rates in bold)

	TOTALS	Rates
<i>Follow up on mental health</i>	152	11.27%
<i>New Patient</i>	111	8.23%
<i>Routine Well Visits</i>	271	20.09%
<i>Emergency Room/Hospital follow up</i>	178	13.19%
<i>Acute Visits</i>	238	17.64%
<i>-Chronic Condition Follow up</i>	342	25.35%
<i>Transfer of Care</i>	52	3.85%
<i>Preop Appointments</i>	5	0.37%
<i>Total Visits</i>	1349	

Health Needs Assessment Framework Description

The HNA is a systematic method for reviewing the health issues of a community or entity to acquire the priority issues facing the population. Then it is agreed upon regarding the allocation of resources to reduce the inequalities that lead to the issue facing the population causing the disparity (Cavanaugh & Chadwick, 2005). During this aspect of the project, it is not clear how systematic the process was. During the day, as this nurse practitioner was completing the schedule it became clear that many times there was much wasted time and resources during the day with missed appointment that left non-productive areas within the schedule.

Steps to Process

Step One-Getting Started. Within step one the population is identified, along with what objectives are to be achieved. Within this step, identification of the individuals involved in the process must be acquired, along with the resources that are needed. Risks involved with the process/project also need to be identified within the first step (Cavanaugh &

Chadwick, 2005). In simple terms this is where one starts to think about a problem and determines the population where the problem is occurring.

Within this step, the population was identified to be Office A and B. Even though the missed appointment rate is ten percent which is below the national average of just under 20% (Tine Health, 2018), it is still problematic because of loss of productive, resources and access to primary care for other patients. Risks associated with the project are very minimal and only include the collection of data which is being supplied by analytics and de-identified prior to the investigator having access for review and compilation of certain data analysis including number of missed appointments during the time frame, number of prompt care/urgent care visits for the year of 2019, age, gender, race/ethnicity, zip code, payor source, and reason for visit.

Step Two-Identifying Health Priorities. Step two involves profiling the population for priority health issues and gathering data. This step will allow for determining the perceptions of needs and identifying and assessing priority health conditions, along with determinant factors (Cavanaugh & Chadwick, 2005). This is where there are gaps between what is happening and what should be happening.

In watching schedules, two trends become very apparent. One was the pattern on frequent missed appointment in many of the provider's schedules and the other was many of the patient's going to the emergency department for non-urgent reasons. While both are very high priority issues, they seemed to be possibly intertwined. Data was gathered through data analytics and analyzed using statistical methods listed. Analysis on whether the prompt care on site made a difference in missed appointment rates was investigated.

Step Three-Assessing a Health Priority for Action. This is the step that involves picking the health condition and determinant factor with the most significant size and impact. This is also the step to determine the acceptable interventions and actions to mitigate the

problem (Cavanaugh & Chadwick, 2005). Within this step options are determined to fill the gaps and it is determined why the disparity is happening so that it can be addressed and rectified.

The missed appointment rates seemed to be the project that would be quickest to get answers on trends of why patients were not coming to their appointments and what they were doing instead which could possibly tie into the emergency department misuse issue. Depending on which trends are the most prevalent, we can possibly make suggestions on how to modify those disparities to reduce the missed appointment rates. It was found that the site with the prompt care had a lower missed appointment rate but did have a higher utilization of prompt care visits from those that did miss their appointments within the 30 days following their appointment.

Step Four-Planning for Change. Within this step monitoring the outcome of the intervention occurs and adjusting and making changes to improve the process. Additionally, risk-management strategies are addressed (Cavanaugh & Chadwick, 2005).

More accessibility to the primary care providers seems to be key to individuals keeping their appointments. The shorter the wait time to get in to see the provider the more likely they are to keep the appointment. This can be accomplished with walk in times and added self-scheduling.

Step Five-Moving On/Review. Within this step learning from the process occurs and measuring the impact that has occurred throughout the process for the next step. Additionally, the next priority can be addressed to keep the flow going (Cavanaugh & Chadwick, 2005).

Further investigation is needed to assess why individuals are missing their appointments. Some suggestions could be to have some walk-in hours with the primary care

providers and longer hours to provide non-traditional office hours to accommodate work schedules.

Methods

Design

The overall design of this project is an observational, descriptive needs assessment project using the HNA Framework (Cavanaugh & Chadwick, 2005). This is the framework being utilized to determine the causes of the ten percent missed appointment rate in the primary care offices of Office A and B. It utilized a retrospective data collection from the medical record for the calendar year of 2019 comparing Office A and Office B and how having the prompt care onsite and other factors impacted the missed appointment rates.

Brief Review of Setting

Office A is a primary care setting in an urban Midwest community with two physician, two nurse practitioners, and three physician assistants. Primary care sees patients from 14 years old with no upper limit of age. Hours of service in the primary care is from 7:45 AM until 4:45 PM, with one nurse practitioner staying until 6 PM four days a week. There is a prompt care in the same building as this primary care.

Office B is also a primary care setting in an urban Midwest community with four physicians, two physician assistants and two nurse practitioners. The office sees patients above the age of 14 years of age with no upper limits to age. The hours are from 8 AM to 6:30 PM. This primary care office has an adjacent hospital across the street.

Sample

An aggregate query of the electronic health record found 72,048 appointment encounters. The data query was completed by the organizations data analytics staff and all data was de-identified prior to the investigator having access.

Description of Data Collection Tool

Data was dispersed from data analytics to the investigator with a spreadsheet including the following data including age, gender, race/ethnicity, zip code, payor source, reason for visit, number of missed appointments, and number of prompt care visits during 2019. The data was obtained from the electronic health record and de-identified prior to being included on the spreadsheet. The number of patient encounters/appointments included in this analysis is 72,048.

Procedures

With a ten percent overall missed appointment rate, it is important to find ways to decrease missed appointments and to increase compliance with patients completing their appointments on time. An aggregate data analysis was completed including age, gender, race/ethnicity, zip code, payor source, reason for visit, number of missed visits and the number of prompt care visits within 30 days of the missed visit during the year 2019 to conclude if there was a significant difference in missed appointments related to the facility with the prompt care compared with the facility without the prompt care. The spreadsheet was kept on a secured computer with a password when not in use. The spreadsheet is saved on a jump drive with a secure password that is only known to the investigator. This data will be deleted when the project is completed.

Human Subject Review

Risks associated with the project are few, patient identifiers were not included with the data. Information was collected and entered into a spreadsheet without any identifiers. The spreadsheet was kept on a jump drive that was password protected with only this author having the password and was on a computer terminal that is password protected. Again, the data was pulled by analytics and analyzed by the statistician thus no patient information was identifiable.

Review for support was first obtained through the healthcare organization IRB approval processes. Secondly, IRB approval was obtained through the University of Illinois Medical School and lastly through the University of Missouri – St. Louis. Both were exempt reviews since this is a retrospective medical record review with no personal health information collected and no patient contact that occurred throughout the process. There are few risks associated with this study since patient identifiers were omitted prior to the investigator seeing the data. Since the project is being conducted by an investigator that also happens to be an employee of the facility, benefits are driven by both educational endeavors and potential clinical benefits as noticed in the clinical area. Confidentiality was protected through the elimination of patient identifiers on the data spreadsheet that was created by data analytics staff and shared with the investigator. The benefits of the project are the development of strategies that may increase access to the patient's primary care provider. Another benefit will be identification of reasons for missed appointments to primary care appointments.

Data Collection/Analysis

Data was extracted by the entities data analytics department and de-identified prior to being shared with the primary investigator. The data consists of the data elements listed below and was extracted for all appointments for patient aged 18 or older scheduled between January 1, 2019 to December 31, 2019 at office A and office B. Additionally, the number of missed appointments in a 12 month period prior to an appointment were calculated in order to determine a patient's history of missed appointments. The number of urgent care encounters within the healthcare system 30 days following an appointment was also collected.

Data Elements

Below is the list of data elements that was collected and analyzed.

- Patient ID (not patient medical record number, but study identifier)
- Appointment Location/Office
- Appointment/Urgent Care/ED Encounter ID
- Appointment/Urgent Care/ED Encounter Date
- Appointment Status
- Appointment Cancel Date
- Patient Birth Date (converted to age prior to being given to this student)
- Payor
- Race/Ethnicity
- Gender
- Patient Zip Code
- Appointment Location/Facility
- Reason for appointment

Statistical Analysis

All statistical analysis was performed using the open source statistical program R (version 4.0.0) against a 2-sided alternative hypothesis with a significance level of 5% ($p = 0.05$). Data was extracted for all appointments scheduled at Office A and Office B during calendar year 2019 for patients 18 years old and older. Appointment types were limited to those listed in Table 4. Additional independent or control variables included age, sex, ethnic group, zip code, payor type and the number of missed appointments in the previous 12 months. Zip codes with less than 5 missed/same day cancels were excluded and the missed rate for each zip code was calculated and included as a predictor also. Patients with a payor type of “Other” or “Worker’s Comp” were also excluded due to the rarity of a missed appointment in these groups resulting in a total sample size 72,048 appointments. Over 99% of patients had either 0 or 1 missed or same day cancel appointment in the previous 12 months leading to these variables being treated as a binary flag indicating if the patient had a previous missed/same day cancel or not. Approximately 95% of patients had either 0 or 1 urgent care visits in the 30 days following the scheduled appointment so this was also made into a binary variable. LASSO regression was used to identify variables related to the

outcomes of a missed appointment or an urgent care visit within 30 days of a scheduled appointment that would need to be controlled for. Multiple logistic regressions were then used to examine the relationship between location and the outcome variables while controlling for the potentially confounding variables identified in the variable selection process (J. McGarvey, personal communication, August 7, 2020).

Patient and Appointment Characteristics

Patient demographic information as well as the distribution of patients across payor and visit types for each facility are presented in Table 4. An unadjusted chi-square test found the proportion of patients with a missed/same day cancel appointment was significantly higher at Office B (15.2%) compared to Office A (14.5%), ($X^2=6.27$, $p < 0.001$). In addition, a significantly higher proportion patients at Office B had a missed appoint in the previous 12 months (0.88%) compared to Office A (0.74%)($X^2= 3.96$, $p = 0.047$) and significantly less patients at Office B had an urgent care visit within 30 days of their scheduled appointment (11.5%) compared to Office A (19.3%), ($X^2= 844.56$, $p = 0.012$) (J. McGarvey, personal communication, August 7, 2020).

Table 4.

Patient and Appointment Characteristics

Tests performed included independent sample t-test and for binary or categorical variables a chi-square test was used to compare between groups

	t-test or Chi ²	Office A	Office B
		N = 27159 appointments	N = 44889 appointments
Age	< 0.001	54.9 (18.0)	56.3 (17.3)
Sex:	< 0.001		
Female		16755 (61.7%)	26595 (59.2%)
Male		10404 (38.3%)	18294 (40.8%)
Ethnic Group	< 0.001		
Not Hispanic or Latino		26744 (98.5%)	44022 (98.1%)
Black or African American		17 (0.06%)	14 (0.03%)
Hispanic or Latino		244 (0.90%)	614 (1.37%)
Unknown/Missing/Refused		106 (0.39%)	186 (0.41%)
White		48 (0.18%)	53 (0.12%)
Visit type:	< 0.001		
Extended office visit		7992 (29.4%)	9399 (20.9%)
Hospital follow up		989 (3.64%)	1799 (4.01%)
New patient		2212 (8.14%)	3932 (8.76%)
Office visit		14265 (52.5%)	27875 (62.1%)
Patient transfer		480 (1.77%)	1298 (2.89%)
Preventative exam		1221 (4.50%)	586 (1.31%)
Payor type:	< 0.001		
BC/BS		3221 (11.9%)	4631 (10.3%)
Commercial		5683 (20.9%)	9132 (20.3%)
Medicaid		3189 (11.7%)	6491 (14.5%)
Medicare		4437 (16.3%)	8589 (19.1%)
Medicare C		2782 (10.2%)	5582 (12.4%)
Unknown/None		7847 (28.9%)	10464 (23.3%)
Missed Appt in Previous 12 Months	0.047*	200 (0.74%)	394 (0.88%)
Urgent Care Visit in 30 Days Following Appt.	< 0.001	5249 (19.3%)	5150 (11.5%)
Missed or Same Day Cancel Appt.	0.012*	3948 (14.5%)	6835 (15.2%)

Missed/Same Day Cancel Appointments

The results of a multiple logistic regression examining the relationship between location and missed/same day cancel appointments while controlling for potentially

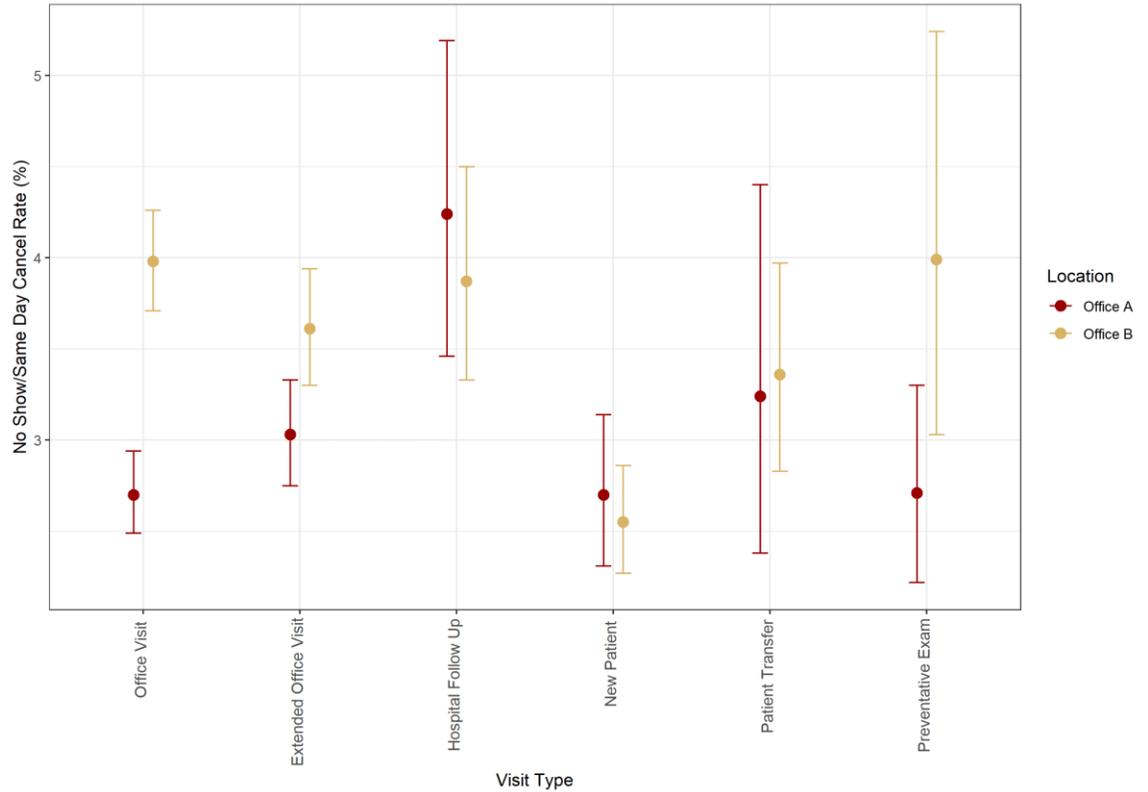
confounding variables are presented in Table 5. Odds ratios (OR.), the 95% confidence around the odds ratio and the p-values are presented in Table 5. Odds ratios less than 1 indicate the variable is associated with a decreased likelihood of a missed appointment, odds ratios greater than 1 are associated with an increased likelihood of a missed appointment and odds ratios close to one essentially have no impact. Predictor variables were selected using a LASSO regression. Gender, ethnic group and the patient's zip code were not found to contribute to the performance of the model and were excluded. Office A was significantly associated with a decreased likelihood of a missed. The overall adjusted missed rate for Office B was approximately 4% (95% CI = 3.7%, 4.3%) whereas Office A had an overall adjusted missed rate of 2.7% (95% CI = 2.5%, 3.0%). Age was also negatively associated with a missed appointment, indicating that older patients were less likely to have a missed or same day cancel. The patient's actual zip code, as a categorical variable, was excluded by variable selection, however the missed rate for the patient's zip code was included and significantly associated with an increased likelihood of readmission. In addition, a missed appointment in the previous 12 months was associated with an increased likelihood of a missed appointment. Payor types of Medicare, Medicaid, Medicare C and an unknown or missing payor were all significantly associated with an increased likelihood of missed appointment. The adjusted missed rate for patients with an unknown or missing payor type was approximately 46.8%, compared to approximately 4.0% for other payor types. However, these are patients that had no payor listed in the data so it somewhat unclear if they did not have a payor or if it was just missing from the documentation for that encounter. Significant, positive interactions were found between location and visit type, which are displayed in figure 1 (J. McGarvey, personal communication, August 7, 2020).

Table 5.
Missed/Same Day Cancel Multiple Logistic Regression Results

Variable	OR	95% CI		p-value
(Intercept)	0.07	0.06	0.08	< 0.001
Office A	0.67	0.63	0.72	< 0.001
Age	0.98	0.98	0.98	< 0.001
Zip Code Missed Rate	1.05	1.04	1.06	< 0.001
Missed in Previous 12 Months	2.13	1.68	2.67	< 0.001
Payor type: Medicaid	1.82	1.65	2.01	< 0.001
Payor type: Medicare C	1.28	1.11	1.47	0.001
Payor type: Unknown/None	21.22	19.74	22.84	< 0.001
Payor type: Medicare	1.59	1.40	1.80	< 0.001
Visit type: Extended office visit	0.90	0.84	0.98	0.010
Visit type: Hospital follow up	0.97	0.84	1.13	0.723
Visit type: New patient	0.63	0.57	0.70	< 0.001
Visit type: Patient transfers	0.84	0.71	0.99	0.038
Visit type: Preventative exam	1.00	0.75	1.33	0.979
Office A * Payor type: Medicare	0.57	0.44	0.71	< 0.001
Office A * Visit type: Extended office visit	1.25	1.11	1.40	< 0.001
Office A * Visit Type: Hospital follow up	1.64	1.27	2.11	< 0.001
Office A * Visit type: New patient	1.58	1.31	1.90	< 0.001
Office A * Visit type: Patient transfer	1.44	1.00	2.05	0.048
Office A * Visit type: Preventative exam	1.00	0.71	1.42	0.998

Figure 1.

Impact of the Interaction between Location and Visit Type on No Show Rates



These findings indicate that the missed rate for office visits was significantly lower at Office A in comparison to Office B, however this effect was significantly reduced for extended office visits, hospital follow up appointments, new patient appointments and patient transfer appointments. The adjusted missed/same day cancel rates for each location by visit type are presented in Table 6 (J. McGarvey, personal communication, August 7, 2020).

Table 6.

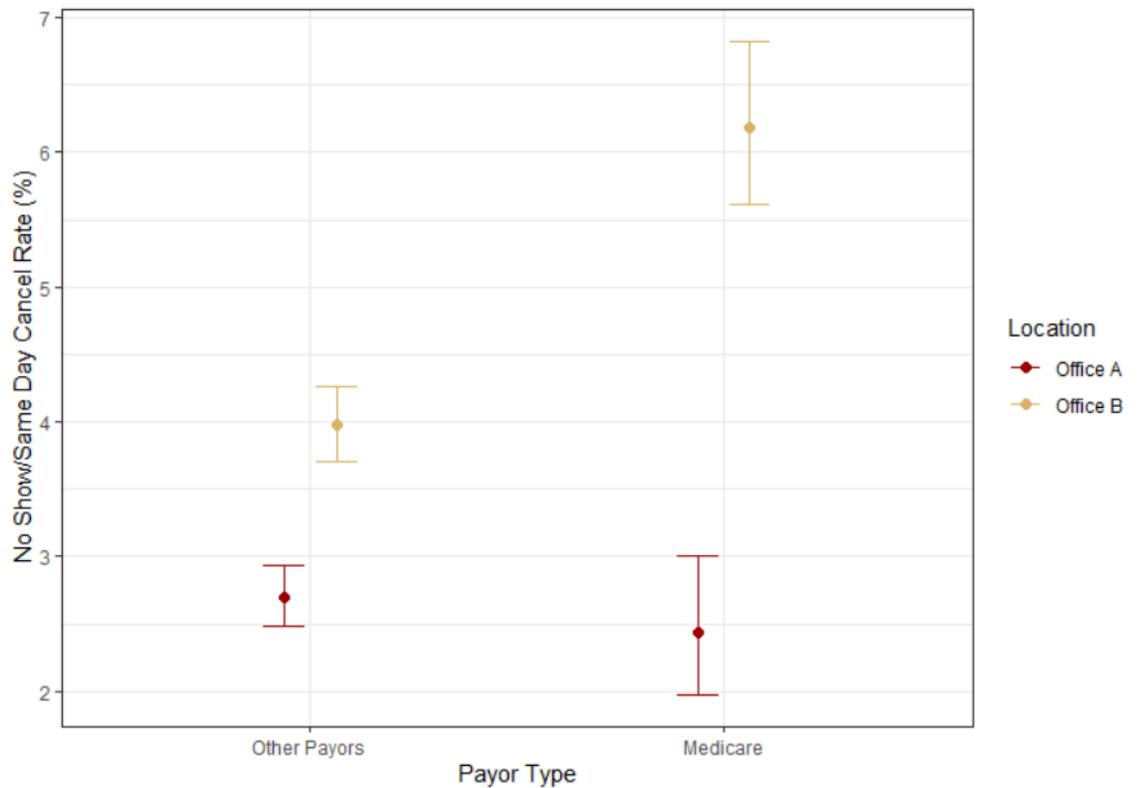
Missed/Same Day Cancel Rates by Location and Visit Type

Visit Type	Office A			Office B		
	Missed %	95% CI		Missed %	95% CI	
Office visit	2.7	2.5	2.9	4	3.7	4.3
Extended office visit	3	2.8	3.3	3.6	3.3	3.9
Hospital follow up	4.2	3.5	5.2	3.9	3.3	4.5
New patient	2.7	2.3	3.1	2.6	2.3	2.9
Patient transfer	3.2	2.4	4.4	3.4	2.8	4
Preventative exam	2.7	2.2	3.3	4	3	5.2

The adjusted missed/same day cancel rate at Office A was approximately 1.3% lower than Office B for both office visits and preventative exams compared. However, the absolute difference between locations is only approximately 0.6% for extended office visits, 0.4% for hospital follow up appointments, 0.2% for new patient appointments and 0.1% for patient transfer appointments (J. McGarvey, personal communication, August 7, 2020).

A significant, negative interaction was also found between location and a payor type of Medicare, indicating the difference in missed rates between Office B and Office A is greater for Medicare patients (Figure 2). The Office B missed rate was 3.7% higher than Office A for Medicare patients and only 1.3% higher for patients with other payor types (J. McGarvey, personal communication, August 7, 2020).

Figure 2.
Impact of the Interaction between Location and Medicare on No Show Rates



Urgent Care Visit within 30 Days of a Scheduled Appointment

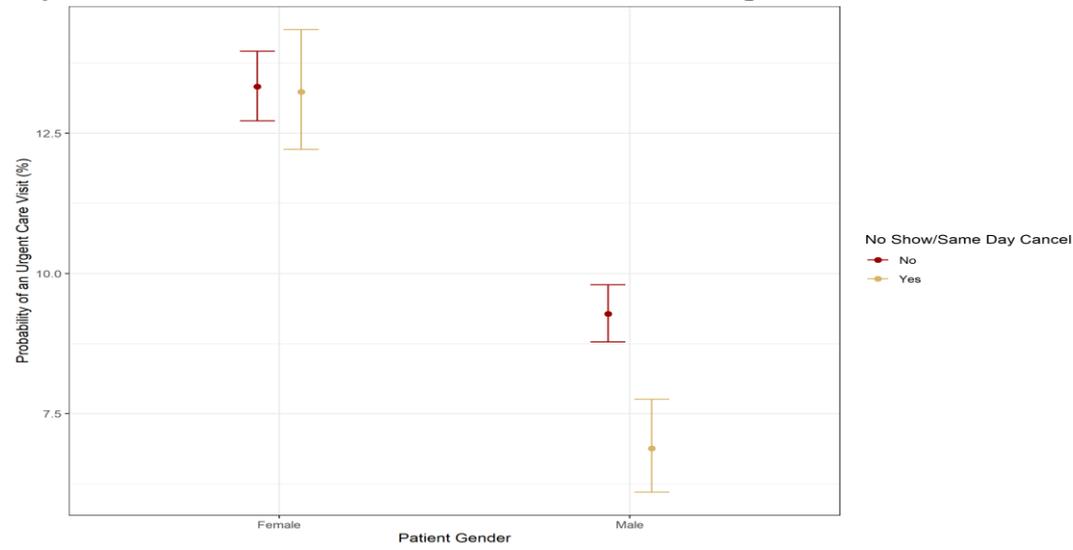
Approximately 95% of patients had either 0 or 1 urgent care visit within 30 days of the scheduled visit at either Office B or Office A leading to the variable being treated as a binary flag indicating if the patient had a urgent care visit within 30 days of the appointment or not. LASSO regression was used for variable selection and the variables found to be related to an urgent care visit were included in a multiple logistic regression. The results found that patients with a scheduled appointment at Office A were significantly more likely to have an urgent care visit within 30 days of the appointment compared to Office B.

Approximately 21.6% (95% CI = 20.7%, 22.5%) of patients had an urgent care visit within 30 days of a scheduled appointment at Office A compared to 13.33% (95% CI = 12.7%, 14.0%) at Office B (Table 7). Older patients, males, patients from zip codes with a higher missed rate and patients without insurance or an unknown payor type were also significantly less likely to have an urgent care visit within 30 days of a scheduled appointment. Whether or not the scheduled appointment was a missed or same day cancel was not significantly related to the likelihood of an urgent care encounter within 30 days of that appointment. However, there was a significant negative interaction between patient gender and whether the scheduled appointment was a missed or same day cancel. This indicates that male patients that missed the scheduled appointment were less likely to have an urgent care encounter within 30 days. This interaction is presented in Figure 3 (J. McGarvey, personal communication, August 7, 2020).

Table 7.
Urgent Care Multiple Logistic Regression Results

Variable	OR	95% CI		p-value
(Intercept)	0.56	0.49	0.64	< 0.001
Office A	1.79	1.72	1.87	< 0.001
Age	0.99	0.99	1.00	< 0.001
Gender: male	0.67	0.63	0.70	< 0.001
Zip missed rate	0.94	0.93	0.95	< 0.001
Payor type: BC/BS	0.95	0.88	1.02	0.177
Payor type: Medicaid	1.04	0.96	1.11	0.333
Payor type: Medicare	1.03	0.95	1.11	0.467
Payor type: Medicare C	1.02	0.93	1.11	0.735
Payor type: Unknown/None	0.87	0.82	0.94	< 0.001
Missed/Same day cancel	0.99	0.92	1.08	0.857
Gender: male * missed/Same day cancel	0.73	0.63	0.84	< 0.001

Figure 3.
Impact of the Interaction between Gender and Missed on Urgent Care Encounters



In female patients the adjusted likelihood of an urgent care visit within 30 days of a completed appointment (13.3%) was essentially the same as it was after a missed appointment (13.2%). However, in male patient the likelihood of an urgent care visit following a missed appointment was 6.9%, 2.4% lower than the likelihood of an urgent care

visit within 30 days of a completed appointment (9.3%) (J. McGarvey, personal communication, August 7, 2020).

Discussion

The results of this analysis found that a missed or same day cancel appointment is significantly less likely at Office A than Office B. This difference is greatest for office visits and preventative exams, as well as patients with a payor type of Medicare. Patients from zip codes with a higher missed rate were also more likely to have a missed or same day cancel appointment. LASSO regression found this variable to be a better predictor than the actual zip code indicating it is a better approximation of the latent variables that either zip code missed rate or actual zip code represents such as distance between the patient's home and the appointment location or possibly socioeconomic factors associated with the area. Inclusion of data such as distance to the appointment or census socioeconomic data regarding the area where patient lives would likely be more informative than zip code or zip code missed rate. It seemed that certain zip codes from Office B had higher missed appointment rates, this would merit more investigation to determine if this were related to a social determinant of health. Patients without a listed payor type were also significantly more likely to have a missed appointment compared to patients that did have a payor listed, however further investigation would likely be helpful to determine if these patients actually did not have a payor or if it was missing from data. Patients with a scheduled appointment at Office A were significantly more likely to have an urgent care visit within 30 days of a scheduled appointment and patients from zip codes with higher missed rates or no payor in the data were less likely to have an urgent care encounter within 30 days of a scheduled appointment. Whether or not the appointment was missed was not significantly related to the likelihood of an urgent care visit, however for male patients a missed appointment was associated with a

decreased likelihood of an urgent care visit within 30 days (J. McGarvey, personal communication, August 7, 2020).

Office A was less likely to have a missed appointment but more likely to have an urgent care visit within the 30 days following the missed visit when there was a missed appointment. This lends the question on whether Office B had more ED visits associated with their missed appointments, which was not captured in the data. Older individuals were less likely to miss their appointments, which was consistent with the literature findings.

Limitations

Several limitations to the project existed included lack of data regarding emergency visits to facility and surrounding facilities, and data related to urgent cares outside of the attached urgent care. Additionally, information on the reasons for the missed visits would have been useful to determine what could be done to assist in alleviating barriers. One factor that was not explored was the lead time of schedule to actual appointment time to ascertain if that factored into missed appointment rates. This was mentioned in the literature as a factor related to missed appointments and could easily be investigated to determine if it is also a factor in this setting.

Recommendations

Further studies are needed to determine if there are emergency room visits associated with the missed appointments. Additionally, interviews or surveys with the patients to determine the reasons for the missed appointments would give information to assist with possible barriers to making their scheduled appointments. Another area of interest would be if self-scheduled appointments had significant missed appointment rates. This would glean information on the success of self-scheduling to relieve some of the missed appointments from the schedules.

Since Office A has less missed appointments, one would ponder if that is related to the urgent care on site and individuals seeking care at the urgent care rather than making an appointment to be seen by their primary provider, whereas at Office B patients' possibly seeking care with the primary provider and instead of going to the emergency department. Another consideration is Office A having more availability for patients to be seen sooner with a provider within the care team, thus eliminating the missed appointment. Information related to income or socioeconomic factors would likely be more helpful than zip codes.

Recommendations for Practice

More access to the provider teams needs to be made because this increases patient satisfaction and patient outcomes. This can be done by increasing hours, rather longer, less traditional office hours or through adding providers within the team. Society seems to want health care like everything else, when and where they want it, so availability and flexibility are key. Additionally, ease of access to be able to schedule, through possible walk-in hours or through added availability to the self-scheduling module. Individuals in today's society seem to like things done on their schedule, thus same day scheduling is a must or they will go to a prompt care/urgent care or worse yet the emergency room for their health care needs; to avoid this more access is vital.

Summary

In summary, there was a 14% difference between the Office A and Office B in missed appointment rates, with Office B having the higher rate, which is the office without the adjacent prompt care. According to the data, of those that missed appointments, 74% of Office A patients had previously missed appointments within the last 12 months, while 88% of patients from Office B had previously missed appointments. This holds true with what was found in the literature regarding habitually missing appointments, which begs the question of why they are missing their appointment. Another finding in the data, was that Office A had a

greater incidence of prompt care visits within the 30 days following their missed visit, which is somewhat counter intuitive to what you would think since Office A has more availability for same day appointments.

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Appendix A

Evidence Table

Author(s), Date, Title, & Journal Information	Purpose, Study Design, Sample, Setting, & Intervention	Intervention Period & Outcome Measures	Results & Conclusions	Study Strengths, Limitations, & Recommendations
<p>American Osteopathic Association. (2018). Outpatient Clinic Reduces No Shows by 34 Percent Amid 13 Percent Patient Visit Increase. <i>Medical Express</i>.</p>	<p>Purpose: To address obstacles that prevent patients from making their appointments.</p> <p>Study Design: Retrospective comparison of 3rd quarters.</p> <p>Sample: Convenience sample of patients seen during 3rd quarter surveyed. Interventions applied to patients of 4th quarter.</p> <p>Setting: Community-based health center in New York.</p> <p>Intervention: 4 point intervention to reduce obstacles to keeping appointments or cancelling in a timely manner.</p>	<p>Intervention Period: 4th quarter of 2015. (October to December 2015)</p> <p>Outcome Measures: No show rates and patient volume</p>	<p>Results & Conclusion: Reduced no show rate by 34 percent with a 13 percent increase in patient visits.</p>	<p>Strengths:</p> <p>Limitations: Limited scope of study</p> <p>Recommendations: Minimize obstacles and keep everyone aware of no shows</p>

Author(s), Date, Title, & Journal Information	Purpose, Study Design, Sample, Setting, & Intervention	Intervention Period & Outcome Measures	Results & Conclusions	Study Strengths, Limitations, & Recommendations
<p>Ansell, D., Crispo, J. A., Simard, B., & Bjerre, L. M. (2017). Interventions to Reduce Wait Times for Primary Care Appointments: A Systematic Review. <i>BMC Health Services Res.</i>, 295.</p>	<p>Purpose: systematically review the literature to identify interventions designed to reduce wait times for primary care appointments, increase patient satisfaction and decrease no show rates</p> <p>Study Design: literature review</p> <p>Sample: 3960 articles that were eligible for inclusion, eleven that included all of the inclusion/exclusion criteria</p> <p>Setting: n/a Intervention: n/a</p>	<p>Intervention period:</p> <p>Outcome measures:</p>	<p>Open access scheduling is most common intervention to reduce wait times for primary care appointments. Dedicated telephone calls for follow up consultations, presence of nurse practitioners on staff, nurse and general practitioner triage and email consultation were effective at reducing wait times.</p>	<p>Strengths: All retrieved articles were systematically appraised using a double-blinded reviewer process. Web-based tools were used to assure quality and a systematic approach to data collection</p> <p>Limitations: Did not search grey literature, including conference proceedings, meeting abstracts, or government, and professional organization websites. Did not contact authors about non-published works. Only included studies published in English and French</p> <p>Recommendations: Open access appointments increase access and decrease no show rates.</p>
<p>Banerjee, R., Suarez, A., Kier, M., Honeywell, S., Feng, W., Mitra, N., . . . Myers, J. (2017). If You Book It, Will They Come? Attendance at PostDischarge Follow Up Visits Scheduled by</p>	<p>Purpose: To measure post discharge follow up visit attendance rates.</p> <p>Study Design: Observational cohort study</p> <p>Sample: adult patients hospitalized between</p>	<p>Intervention period: April 2014 – March 2015</p> <p>Outcome measures: No shows or same day cancellations</p>	<p>25% were no shows or same day cancellations, 23% were cancelled prior to the visit and 52% were attended as scheduled.</p> <p>Even when appointments are scheduled before patients leave the hospital, 25% still result</p>	<p>Strengths: Results correlated with other studies</p> <p>Limitations: the study was unable to measure no shows and same day cancellations that were not associated with their affiliates. They also did not measure health literacy as a predictor of no showing. Study was done at a single</p>

Author(s), Date, Title, & Journal Information	Purpose, Study Design, Sample, Setting, & Intervention	Intervention Period & Outcome Measures	Results & Conclusions	Study Strengths, Limitations, & Recommendations
<p>Inpatient Providers. <i>Journal of Hospital Medicine</i>, 618-625.</p>	<p>April 2014 and March 2015 for whom at least one follow up visit was scheduled</p> <p>Setting: Medical units at an academic quaternary-care hospital and its affiliated outpatient clinics.</p> <p>Intervention: measurement is the incidence of no shows or same day cancellations of appointments</p>		<p>in no shows, thus more strategies are needed to improve attendance.</p>	<p>large urban teaching facility and results may not be generalizable.</p> <p>Recommendations: More research to find solutions to no shows in primary care</p>
<p>Canadian Agency for Drugs and Technologies in Health. (2016). Timely Access to Primary Care for Patients With Chronic Diseases: A Review of Clinical Benefit, Cost Effectiveness, and Guidelines. <i>Rapid Response Report</i>, 1-17.</p>	<p>Purpose/Research Questions:</p> <ol style="list-style-type: none"> 1. What are the clinical benefits associated with timely access to primary care or primary care teams for patients with chronic diseases? 2. What is the cost-effectiveness of timely access to 	<p>Intervention period: after 2011</p> <p>Outcome Measures: clinical benefits, cost effectiveness, guidelines</p>	<p>Results & Conclusions: one study showed that better actual access was not associated with decreased use of ED. No studies on cost effectiveness were found. No studies on guidelines were found.</p>	<p>Strengths:</p> <p>Limitations: Limited evidence regarding association between ER use and timely access to primary care for chronic disease management.</p> <p>Recommendations: More studies needed.</p>

Author(s), Date, Title, & Journal Information	Purpose, Study Design, Sample, Setting, & Intervention	Intervention Period & Outcome Measures	Results & Conclusions	Study Strengths, Limitations, & Recommendations
	<p>primary care or primary care teams for patients with chronic diseases?</p> <p>3. What are the evidence-based guidelines associated with timely access to primary care or primary care teams for patients with chronic diseases?</p> <p><i>Sample:</i> literature search using PubMed, The Cochran Library, University of York, Centre of Reviews and Disseminations (CRD) databases, Canadian and major international health technology agencies, as well as, focused internet searches.</p> <p><i>Setting:</i></p>			

Author(s), Date, Title, & Journal Information	Purpose, Study Design, Sample, Setting, & Intervention	Intervention Period & Outcome Measures	Results & Conclusions	Study Strengths, Limitations, & Recommendations
	<p>Intervention: assignment and timely access (<5 day wait for next available appointment) to primary care providers/team of providers for chronic disease management</p>			
<p>Chaiyachati, K. H., Hubbard, R. A., Yeager, A., Mugo, B., Lopez, S., Asch, E., . . . Grande, D. (2018). Association of Rideshare-Based Transportation Services and Missed Primary Care Appointments: A Clinical Trial. <i>Journal of the American Medical Association</i>, 383-289.</p>	<p>Purpose: to determine the association between offering rideshare-based transportation services and missed appointment rates for primary care patients.</p> <p>Study Design: prospective clinical trial</p> <p>Sample: 786 Medicaid patients</p> <p>Setting: primary care patients at 1 of 2 academic internal medicine practices located within the same building</p> <p>Intervention: both arms received automated appointment phone call reminders. As part of the study protocol,</p>	<p>Intervention period: October 24, 2016-April 20, 2017</p> <p>Outcome measures: missed appointment rates</p>	<p>Results & Conclusion: 786 patients in study, 566 (72%) were women, mean age 46. Intervention arm 57 among 288 participants who answered the phone call used ridesharing. The missed appointment rate was 36.5% (144 of 304) for the intervention arm and 36.7% (144 of 392) for the control arm p=.96.</p>	<p>Strengths: randomized within two clinics</p> <p>Limitations: large urban area with good public transportation, did not account for other social risk factors, recruitment strategy may have affected the number of patients who used the service, no measurement for comfort using text message communication, there was a secular change within the health system, study population may not have been interested in ridesharing</p> <p>Recommendations: Similar studies of interventions for improving transportation as a means to better health care access are warranted and worth testing in other settings.</p>

Author(s), Date, Title, & Journal Information	Purpose, Study Design, Sample, Setting, & Intervention	Intervention Period & Outcome Measures	Results & Conclusions	Study Strengths, Limitations, & Recommendations
	<p>patients assigned to both arms received up to 3 additional appointment reminder phone calls from the research staff 2 days before their scheduled appointment. During these calls, patient in the intervention arm were offered a complimentary ridesharing service. Research staff prescheduled rides for those interested in the service. After the appointment, patients phoned research staff to initiate a return ride home.</p>			
<p>Chand, A. A., Kamble, K. M., Diwan, A. K., Mahobia, V. K., & Chand, D. A. (2017). A Study to Evaluate Resource Draining "No Shows". <i>Journal of Cancer Research Therapy</i>, 498-500.</p>	<p>Purpose: to analyze no show rates and reasons Study Design: retrospective analysis Sample: 180 patients Setting: radiation therapy Intervention: called with a survey to determine reason for no show</p>	<p>Intervention period: May 1, 2013 – July 31, 2013 Outcome measures: Patients were divided into group A, who complied with their appointment time and group B, who did not comply. Group B was called and asked questions from a preformed questionnaire.</p>	<p>Results & conclusions: Group A patients were not contacts. Group B patients had a mean wait time of 74+/-12.6 days. Of these patients, 22 (31.4%) died. 28 patients had went elsewhere for treatment, with 92.8% being because of the long wait. Of the ones that did not go elsewhere, 42, cost was</p>	<p>Strengths: direct communication with patients Limitations: one clinic, no generalizability Recommendations: further investigation to improve no show rates</p>

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			<i>a major factor, 69%, with 26.1% not understanding the importance of the treatment.</i>	
<p>Creps, J., & Lotfi, V. (2017). A Dynamic Approach for Outpatient Scheduling. <i>Journal of Medical Economics</i>, 1-13.</p>	<p>Purpose: to develop a dynamic scheduling process for scheduling patients that are expected to have multiple appointments.</p> <p>Study Design: retrospective study</p> <p>Sample:</p> <p>Setting: Large university hospital</p> <p>Intervention: decision tree analysis was applied to the predictors that significantly correlated with patient attendance behavior to assess likelihood of patient no show</p>	<p>Intervention period: year 2014</p> <p>Outcome Measures: patient characteristics, appointment data and historical attendance data</p>	<p>Results & conclusions: the dynamic scheduling resulted in increased scheduling efficiency through overbooking but with less than 5% risk of appointment conflicts (two patients showing at the same time). Increasing clinic utilization by 6.7%.</p>	<p>Strengths: Decreases no show revenue losses</p> <p>Limitations: potential clinician cost increase related to possible appointment conflicts. The second limitation is that patients with appointment conflicts might not wait for treatment. A third limitation is that the model does not take into account patient satisfaction, nor the ethics of overbooking.</p> <p>Recommendations: More work needs to be done to reduce the limitations involved.</p>
<p>Dobbs, R. W., Malhotra, N. R., Caldwell, B. M., Rojas, R., Moreira, D. M., & Abern, M. R. (2018).</p>	<p>Purpose: to determine if distance from clinic impacts missed appointment rates</p>	<p>Intervention period: July 1, 2014 to June 30, 2015</p> <p>Outcome measures: No shows were measured. The data also included</p>	<p>Results & Conclusions: No patients missed more than 2 appointments. Overall cohort consisted of 59.1% black, 20.7% unknown/other, 11.9%</p>	<p>Strengths: similar findings to other studies</p> <p>Limitations: Misclassification of patients as missed appointments when they may</p>

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<p>Determinants of Clinic Absenteeism: A Novel Method of Examining Distance from Clinic and Transportation. <i>Journal of Community Health</i>, 19-26.</p>	<p>Study Design: retrospective cohort study, case control design</p> <p>Sample: 1341 scheduled clinic encounters (576 unique patients)</p> <p>Setting: Academic urology clinic</p> <p>Intervention: Driving distance and public transit times were calculated using Google Distance Matrix API algorithm.</p>	<p>demographics including race, insurance provider, new or established patient, month of appointment, diagnosis, driving time and transit time</p>	<p>white, 5.4% Hispanic, 2.8% Asian, and <1% Native American. No difference in median age, race, or ethnicity of patients that missed appointments. There were 186 patients or 14% no shows, with 79.6% being established and 20.4% being new. Private insurance made up 10% of no shows, 19% was Medicare and 12% Medicaid. December had the highest no show rate and June was the lowest. Longer drive distances were associated with improved compliance of keeping appointments.</p> <p>Drive times and transit had no significant bearing on no show rates.</p>	<p>have died or were lost to follow up. Study was limited to a single center. Limited data on why patients missed appointments and what kind of transportation they use. Short study period.</p> <p>Recommendations: Expand findings to other areas to see if transportation times affect no show rates.</p>
<p>Gier, J. (2017). Missed Appointments Cost the U.S. Healthcare System \$150B Each Year. <i>healthmgmttech.com</i>, 4-26.</p>	<p>Purpose: n/a Study Design: n/a Sample: n/a Setting: n/a Intervention: n/a</p> <p>Commentary</p>	<p>Intervention period: n/a Outcome measures: n/a</p>	<p>Results & conclusions: No shows cost \$150 billion every year. Landlines are the primary way patients communicate with their providers. 88% of appointments are made</p>	<p>Strengths: n/a</p> <p>Limitations: Not a study</p> <p>Recommendations: Utilize more smart technology to interact with patients.</p>

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			through landline phones. Majority of patients say they face challenges when trying to communicate with their healthcare providers, 65%. Only 2.4% of appointments are self-schedules.	
<p>Giunta, D. H. (2019). Nonattendance Rates of Scheduled Outpatient Appointments in a University General Hospital . <i>PLoS ONE</i>.</p>	<p>Purpose: Aim to estimate non-attendance to scheduled medical ambulatory appointment rates globally and by subgroups</p> <p>Study Design: retrospective cohort</p> <p>Sample: 348,420 patients</p> <p>Setting: integrated health care network that is formed by two high complexity hospitals and 22 primary care centers in Buenos Aires, Argentina</p> <p>Intervention: patient was scheduled for an</p>	<p>Intervention period: January 1, 2015 – December 31, 2016</p> <p>Outcome measures: analysis of no shows for appointments for general practitioners, clinical specialties, and surgical specialties. The exclusions were dermatology and psychiatry.</p>	<p>Results & conclusions: 4,839,335 appointments were made to outpatient clinics, scheduled by 418,981 patients. Out of those, 2,526,549 met inclusion criteria with 348,420 individual patients. General practitioners accounted for 25.79%, 32.26% for different clinical specialties, and 41.95% for surgical specialties. Mean age was 60.4 years and 31.33% were men. No show rate was 27.84%, with 25.53% general practice, 27.78% clinical specialties and 29.31% to surgical specialties. Female no show rate was 28.06%, with 24.95% being male. 31.9% was younger than</p>	<p>Strengths: Similar results to other studies. There was a large depository of information.</p> <p>Limitations: variations in definitions of absenteeism and no show</p> <p>Recommendations: Further studies in like countries.</p>

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	<p>appointment and then was determined to either be present or absent</p>		<p>65, with 22.27% older than 65.</p>	
<p>Goffman, R. M., Harris, S. L., May, J. H., Milicevic, A. S., Monte, R. J., Myaskovsky, L., . . . Vargas, D. L. (2017). Modeling Patient No-Show History and Predicting Future Outpatient Appointment Behavior in the Veterans Health Administration. <i>Military Medicine</i>, 1708-1714.</p>	<p>Purpose: To determine which patients are likely to no show their appointments and provide interventions to prevent the no show.</p> <p>Study Design: Pilot study design</p> <p>Sample: 1754 patients</p> <p>Setting: VA Pittsburgh Healthcare System</p> <p>Intervention: all patients received regular automated reminder calls. Probabilities of no shows were calculated and live reminder calls were made to those with a predicted no show rate of at least 0.20. Reminder calls were made at 24, 48 or 72 hours in advance.</p>	<p>Intervention period: July 30, 2012 – August 17, 2012</p> <p>Outcome measures: Age, history of no shows, multiple appointments on same day, reminders given</p>	<p>Results & Conclusions: It was found that the most important indicators in predicting no show behavior is age, appointment history, appointment lead time, and multiple appointments on the same day.</p> <p>Shorter lead times and multiple appointments on the same day decrease no show rates.</p>	<p>Strengths: consistent with other studies.</p> <p>Limitations: Population of the VA is predominantly older and male thus generalizability may be limited.</p> <p>Recommendations: Additional studies to further investigate the reminder calls at various intervals.</p>
<p>Heath, S. (2018). Patient Education, Scheduling Fixes</p>	<p>Purpose: decrease no show rates through improving scheduling</p>	<p>Intervention period:</p> <p>Outcome measures:</p>		<p>Strengths:</p> <p>Limitations:</p>

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<p>Shrink Patient No-Show Rates. <i>Thinkstock.</i></p>	<p>process and patient education</p> <p>Study Design: n/a</p> <p>Sample: n/a</p> <p>Setting: Family medicine at Nassau University Medical Center</p> <p>Intervention: n/a</p>			<p>Recommendations:</p>
<p>Hwang, A. S., Atlas, S. J., Cronin, P., Ashburner, J. M., Shah, S. J., He, W., & Hong, C. S. (2015). Appointment "no-shows" are an Independent Predictor of Subsequent Quality of Care and Resource Utilization Outcomes. <i>Journal of General Internal Medicine</i>, 1426-1433.</p>	<p>Purpose: to test the hypothesis that patients with the tendency to no show their appointments will have worse clinical outcomes compared to patients that attend their appointments on a regular basis.</p> <p>Study Design: retrospective clinical cohort</p> <p>Sample: 140,947 patients</p> <p>Setting: Massachusetts General Hospital practice-based network</p>	<p>Intervention period: January 1, 2007 – December 31, 2009</p> <p>Outcome measures: colorectal, cervical, and breast cancer screenings, and above goal on Hgb A1c and low-density lipoprotein levels at 1-year follow up and hospitalizations and emergency room visits in the subsequent 3 years.</p>	<p>Results & conclusions: Those in the high no show propensity group were low on screenings and above goal on A1c and LDL. Additionally, they had higher rates of hospitalizations and ER visits.</p> <p>No show rates have an impact on health outcomes.</p>	<p>Strengths: Using more data points and increase number of years provided a stronger correlation</p> <p>Limitations: Unable to investigate visit history and outcomes outside of their facility.</p> <p>Recommendations: More research to provide generalizability</p>

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	<p>Intervention: Visits of those patients from January 1, 2007 to December 31, 2009 were looked at to see if they were incomplete on their preventative screenings and if their levels of LDL and A1C went down.</p>			
<p>Kheirkhah, P., Feng, Q., Travis, L. M., Tavakoli-Tabasi, S., & Sharafkhaneh, A. (2016). Prevalence, Predictors, and Economic Consequences of No-Shows. <i>BMC Health Services Research</i>, 16-29.</p>	<p>Purpose: To investigate the extent of no shows and factors such as hospital size, gender, and age that may affect it.</p> <p>Study Design: Retrospective review of information compiled in administrative databases for a 12-year period.</p> <p>Sample: no show data for the last 12 years in 10 main clinics.</p> <p>Setting: 10 main clinics including audiology, dermatology, cardiology, eye care. GI, mental health, primary</p>	<p>Intervention period: Analyzed the last 12 years of no-show data in the 10 main clinics for each fiscal year October to September in the first phase. In the second phase all the no show data between fiscal year 2006-2008 was extracted and analyzed.</p> <p>Outcome measures: Missed appointments were categorized as clinic cancelled, patient cancelled or no showed.</p>	<p>Results & conclusions: Mean no show rate was 18.8% in the 10 clinics, GI having 25.7%, audiology 12.6%. Primary care had the highest number of visits and the highest no show rate. Meana cost per visit is \$167. Mental health had the most no shows. Size of a hospital seemed to effect no show rates</p>	<p>Strengths: Looked at many factors. Very large number of patients.</p> <p>Limitations: Unique population. Mainly males and elderly. May have issues with generalizability. Some conflicts with other study findings that would need further investigations.</p> <p>Recommendations: Further studies to verify findings on some statistics such as women no showing more than men.</p>

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	<p><i>care, orthopedics, urology, and podiatry in the Michael E DeBakey VA Medical Center in Houston, Texas.</i></p> <p>Intervention: Analyzed the last 12 years of no-show data in the 10 main clinics for each fiscal year October to September in the first phase. In the second phase all the no show data between fiscal year 2006-2008 was extracted and analyzed.</p>			
<p>Lenzi, H., Ben, A., & Tetelbom Stein, A. (2015). Development and Validation of a Patient No-Show Predictive Model at a Primary Care Setting in Southern Brazil. <i>PLoS ONE</i>.</p>	<p>Purpose: to develop and validate a patient no show predictive model based on empirical data.</p> <p>Study Design: retrospective study</p> <p>Sample: 57,586 scheduled appointments/5,637 patients</p> <p>Setting: Brazilian public primary care</p>	<p>Intervention period: November 1, 2011 to March 31, 2014</p> <p>Outcome measures: demographics, time measures, health professionals, types of appointments, days of week, month,</p>	<p>Results & conclusions: 70.7% fulfilled inclusions criteria. No show rate was 13%. Mean age was 41 years. Males accounted for 31%. 82.1% are reported to be white. 36% was same day.</p> <p>The study found that previous patient attendance and same day appointments were the most important predictors of no shows.</p>	<p>Strengths: They used a mixed-effect modelling approach to account for the variance across patient and health professional and developed relatively simple models and compared them using a multi-model inference method. This allowed some flexibility with the models to allow for the variability.</p> <p>Limitations: despite the advantage of the stepwise algorithm of comparing predictors automatically, it may lead to spurious associations.</p>

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	<p>Intervention: Various metrics were calculated such as lead time, waiting time, previous attendance, previous same day appointments</p>			<p>The was also an issue with some missing data.</p> <p>Recommendations: further investigation is needed to explore the effectiveness of using this model in terms of improving service performance and its impact on quality of care compared to customary practice.</p>
<p>McGough, P. M., Norris, T. E., Scott, J. D., & Burner, T. G. (2017). Meeting the Demands of the Affordable Care Act: Improving Access to Primary Care. <i>Population Health Management</i>, 87-89.</p>	<p>Purpose: How to address the challenges of sparse resources in primary care.</p> <p>Study Design: n/a Sample: n/a Setting: n/a Intervention: n/a</p>	<p>Intervention period:</p> <p>Outcome measures:</p>	<p>Results & conclusions:</p>	<p>Strengths:</p> <p>Limitations:</p> <p>Recommendations:</p>
<p>Mieloszyk, R. J., Rosenbaum, J. I., Hall, C. S., Raghavan, U. N., & Bhargava, P. (2018). The Financial Burden of Missed Appointments: Uncaptured Revenue Due to</p>	<p>Purpose: to investigate the economic burden of no show appointments Study Design: n/a Sample: n/a Setting: Intervention:</p>	<p>Intervention period: n/a Outcome measures: n/a</p>	<p>Results & conclusions: per exam uncaptured revenue ranges up to \$15,000 per year for breast ultrasound and up to \$350,000 per year for mammogram screening. With other tests amounting to more in uncaptured revenues.</p>	<p>Strengths: n/a Limitations: n/a Recommendations:</p>

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<p>Outpatient No-Shows in Radiology. <i>Current Problems in Diagnostic Radiology</i>, 285-286.</p>				
<p>Mohamed, K., Mustafa, A., Tahtamouni, S., Taha, E., & Hassan, R. (2016). A Quality Improvement Project to Reduce the 'No Show' Rate in a Paediatric Neurology Clinic. <i>BMJ Quality Improvement Reports</i>, 1-4.</p>	<p>Purpose: to assessment the effectiveness of a quality improvement process to reduce no shows</p> <p>Study Design: QI project</p> <p>Sample: 53</p> <p>Setting: Pediatric Neurology clinic in Qatar</p> <p>Intervention: Improving the way they contacted patients and allowing for immediate rescheduling when they knew they were not able to make appointment, reviewing available appointment the morning before clinic date and replacing cancelled slots by</p>	<p>Intervention period: September 2013 – December 2013</p> <p>Outcome measures: No show rates</p>	<p>Results & conclusions: No show rates dropped from 49% to 25% in 4 months.</p> <p>Better communication and a more flexible scheduling system provided a reduction in no shows in 4 months' time. Allowed access for urgent patients.</p>	<p>Strengths: One aspect revealed problems in another area.</p> <p>Limitations: Cultural issues which made it difficult to make a international benchmark. Small sample size, limited time.</p> <p>Recommendations: Further work with the model.</p>

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	<p>patients on waiting list, physician review for habitual no show patients to decide if they need further appointment or follow up by specialty nurse</p>			
<p>O'Malley, A. S., Samuel, D., Bond, A. M., & Carrier, E. (2012). After-Hours Care and Its Coordinations with Primary Care in the U.S. <i>Journal of General Internal Medicine</i>, 1406-1415.</p>	<p>Purpose: to identify and describe models of after-hours care in the U.S. that are delivered in the primary care</p> <p>Study Design: qualitative analysis of data from in-depth interviews (phone)</p> <p>Sample: 44 primary care physicians, practice managers, nurses and health plan representatives from 28 organizations</p> <p>Setting: telephone interviews from 28 different organizations</p> <p>Intervention: identified respondents through internet searches, references from health plans and PCMH</p>	<p>Intervention period: January 2011 – July 2011</p> <p>Outcome measures: after hours model, motivation for their arrangement, process for exchanging information between the after-hours and usual provider, after-hours staffing and resource needs, model sustainability, barriers and facilitators of after-hours care and its coordination with primary care and lessons learned</p>	<p>Results & conclusions: 44 interviews completed in 28 different locations across 16 states. Five different models, same PCP all the time, PCP plus practice partners, PCP plus small, local cross coverage, PCP plus large cross-coverage, PCP plus contractual coverage.</p> <p>Challenges were billing and reimbursement, reluctance of providers to work irregular hours, finding collaborations, getting patients to use after hours services rather than the ER and overcoming trust issues.</p> <p>Major themes included feasibility, communication, and access and continuity.</p>	<p>Strengths: some themes were identified. Provides some good information.</p> <p>Limitations: small sample size, not generalizable</p> <p>Recommendations: Further research is needed to obtain more information.</p>

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	<p>managers and recommendations from U.S. experts on after-hours care. Participants completed an emailed questionnaire describing their size, staffing, and payer mix and operating hours. Then an interview was done with the lead person knowledgeable about care delivery.</p>			
<p>Robert Wood Johnson Foundation. (2017). How Have Providers Responded to the Increased Demand for Health Care Under the Affordable Care Act? <i>U. S. Health Reform.</i></p>	<p>Purpose: 20 million previously uninsured people have gained insurance since the ACA was passed. To better understand how providers are handling the increased demand for health care services under the ACA</p> <p>Study Design: Interviews in five communities</p> <p>Sample: n/a Setting: n/a Intervention: n/a</p>		<p>Results & conclusions: providers are adapting well to the influx of insured patients.</p>	

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<p>Teo, A. R., Forsberg, C. W., Marsh, H. E., Saha, S., & Dobscha, S. K. (2017). No-Show Rates When Phone Appointment Reminders are Not Directly Delivered. <i>Psychiatric Services</i>, 1098-1100.</p>	<p>Purpose: to improve patient engagement and attendance</p> <p>Study Design: observational cohort</p> <p>Sample: 250</p> <p>Setting: primary care patients with depression, Veterans Health Administration health care system in the Pacific Northwest</p> <p>Intervention: after completing the PHQ-9 , they were scheduled if the scored >9 and given two reminder calls</p>	<p>Intervention period: December 2015 – February 2017</p> <p>Outcome measures: race, education, type of reminder</p>	<p>Results & conclusions: Live reminders were associated with a lower no show rate 3%, message reminders 24% and no answer 39%.</p> <p>Missed appointments significantly increase with no answers on the reminder calls.</p>	<p>Strengths: Some similarities to other studies</p> <p>Limitations: confidentiality and small sample size</p> <p>Recommendations: Need further research on text and no show rates because many people do not answer phone calls they do not know.</p>
<p>Tine Health. (2018). Why Patients Miss Doctor Appointments & How to Decrease No-Shows. <i>Health</i>.</p>	<p>Purpose: to determine reasons why individuals no show appointments</p> <p>Study Design: n/a</p> <p>Sample: n/a</p> <p>Setting: n/a</p> <p>Intervention: n/a</p>	<p>Intervention period:</p> <p>Outcome measures:</p>	<p>Results & conclusions: reminder calls reduce no show rates</p>	<p>Strengths:</p> <p>Limitations:</p> <p>Recommendations:</p>
<p>Weaver, K. R., Talley, M., Mullins, M., & Selleck, C. (2019). Evaluating Patient Navigation</p>	<p>Purpose: to decrease no show rates to the PATH clinic and to determine barrier to</p>	<p>Intervention period: July 1, 2016 – December 21, 2016</p>	<p>Results & conclusions: First appointment no shows decreased by 17.7% after implementation. Large</p>	<p>Strengths: Navigation had positive results. Further studies needed to improve rates further</p>

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<p>to Improve First Appointment No-Show Rates in Uninsured Patients with Diabetes. <i>Journal of Community Health Nursing</i>, 11-18.</p>	<p>coming to appointments</p> <p>Study Design: retrospective review</p> <p>Sample: 96</p> <p>Setting: University of Alabama Providing Access to Healthcare Clinic (PATH) – free clinic for uninsured individuals with diabetes</p> <p>Intervention: data was collected before and after implementation of the patient navigation protocol</p>	<p>Outcome measures: demographics. No show rates, HgbA1c values, navigation calls, accuracy of phone numbers on referral forms, identified barriers to attending appointments, time spent making calls</p>	<p>number of referrals were for patients in homeless shelters. Shelter residents had a high no show rate. HgbA1c numbers improved with attendance. Barriers identified were living in a shelter and non-English speaking, followed by transportation.</p>	<p>Limitations: convenience sample to one free clinic in Birmingham, Alabama thus findings may not be generalizable. Small sample size.</p> <p>Recommendations: Larger studies would be beneficial.</p>
<p>Zhong, X., Liang, M., Sanchez, R., Yu, M., Budd, P. R., Sprague, J. L., & Dewar, M. A. (2018). On the Effect of Electronic Patient Portal on Primary Care Utilization and Appointment Adherence. <i>BMC Medical Informatics</i></p>	<p>Purpose: to investigate the impact of patient portal adoption on patient primary care utilization and appointment no shows</p> <p>Study Design: retrospective observational study</p> <p>Sample: 46,544 patients</p>	<p>Intervention period: July 2013 – June 2016</p> <p>Outcome measures: disease burden adjustment rates of office visits arrived, no-shows, and cancellations to primary care per quarter to portal adopters</p>	<p>Results & conclusions: At the time of adoption, the quarterly PCP office visit rate ratio (RR) of portal user to non-users was 1.33. The no show rates of users were significantly smaller except for the 7th, 8th and 10th quarters post adoption. In those quarters there was not a significant change.</p>	<p>Strengths: Large sample size</p> <p>Limitations: Results differ from other studies. Need further studies to evaluate health outcomes. Follow up is limited.</p> <p>Recommendations: Further research to determine why results differed.</p>

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<i>and Decision Making</i> , 84-96.	<p>Setting: University of Florida primary care</p> <p>Intervention: patients enrolled with mychart, a patient portal.</p>		<p>Cancellation rates were not significantly changed.</p> <p>Portal use decrease disease burden and no show rates.</p>	