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Descriptive Report

Assessing Medication Adherence at a Student-Run Free Clinic in the Midwest

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Abstract

Background: One of the primary barriers to medication adherence is traversing a physical distance to a pharmacy to pick-up medications. There are few studies that have examined how socioeconomic factors affect patient medication adherence in the context of student-run free clinics (SRFC). Low medication adherence leads to poorer patient outcomes, especially in patients with chronic diseases.
Methods: This retrospective chart review aims to quantify the rate of medication adherence at this student-run free clinic using prescription pick-up rate and medication possession ratio (MPR). This study involved review of medication documentation in the electronic medical record (EMR) and charge reports of dispensed medications from the clinic's community partner, OneWorld pharmacy. Prescriptions written for and picked up by Student Health Alliance Reaching Indigent Needy Groups (SHARING) patients between January 1, 2018, and May 31, 2020, were included for analysis. Medication adherence was calculated using MPR.
Results: 1,396 prescriptions were written for 37 patients over the study period and 177 prescriptions (12.7%) were dispensed. The MPR for the patient population is 0.1128 (Standard Deviation (SD) = 0.36159). It took patients an average of 29.4 days (SD = 44.3) to pick-up medications after the prescription was sent.
Discussion: At an off-campus pharmacy, SRFC patients had a low prescription pick-up rate and low medication adherence, with delayed time to prescription pick-up. Further investigations are needed to identify barriers to prescription adherence and improve adherence rates.

Background

As advances in drug development continue, it is important to recognize that the effectiveness of new therapies is highly dependent on patient adherence, the extent to which patients take their medications at home.[1,2] This factor is a pressing issue as multiple studies, from clinic-level to multi-institution meta-analyses, have shown that patient adherence rates—often measured by the quantifiable proxy of pick-up rates—are poor.[1–5] Adherence rates vary by disease condition in meta-analysis studies, with Human Immunodeficiency Virus (HIV) having the highest mean adherence rate (88%). Diseases such as arthritis, cancer, and seizure disorders have higher rates of 80%; contrastingly, sleep disorders, diabetes, pulmonary diseases, and end stage renal disease have lower adherence rates near 70%.[5] These statistics are conservative estimates, while other statistics suggest that half of the 3.2 billion prescriptions dispensed annually are not taken as prescribed. Multiple studies found that lower adherence levels are associated with chronic disease.[6–8] Additionally, lack of insurance coverage affects adherence. In a survey of 14,464 Medicare recipients, 20% reported that they did not fill their medication because it was not covered by insurance.9 Moreover, studies have shown that minority patients may face greater issues with cost-related medication non-adherence, suggesting

that socioeconomic status may be a contributing factor.[10,11]

Adherence rates are commonly measured by prescription pick-up rates instead of patient self-reported methods, which can involve overestimation errors.[1] In one study of 1,026 Medicaid patients who visited the emergency department, 90% reported filling their discharge prescriptions, but only 74% of prescriptions were claimed when confirmed by checking pharmacy records.[12] The non-adherence rate in patients has been associated with a $170 billion increase in United States healthcare costs annually and has been identified by the World Health Organization (WHO) as a leading cause of preventable morbidity and mortality.[6,13–15]

Most studies in current literature, including those cited above, have investigated how adherence is affected by different drug therapy qualities such as price, disease target, and effectiveness, but little has been done to examine socioeconomic factors (e.g., limited transportation, lack of general health education, segmented medical care) in the specific context of student-run free clinics (SRFC). To our knowledge, only one study has evaluated medication adherence at a SRFC, finding that the medication pick-up rate of 62 patients increased to 100% (111 prescriptions) when the clinic dispensed the medications compared to the 58.2% pick-up rate (158 prescriptions) from an outside pharmacy.[16]

There are more than 100 SRFCs in the United States where individuals from underserved populations can receive free or heavily subsidized care.[17] A web-based survey was sent to 124 Association of American Medical College allopathic schools. Of those schools, 94 responded (76%). Of those respondents, 49 schools had at least 1 SRFC (52%) for a total of 111 SRFCs. Of 59 SRFCs that provided information about their medications, 79% dispensed medications on-site and 10% had medication donations as part of their finances.[18] Often these clinics provide medications for free or at a heavily discounted price, removing one barrier to medication adherence.[17, 18]

The University of Nebraska Medical Center (UNMC) is home to its own SRFCs which have been in practice since 1997.[19] The Student Health Alliance Reaching Indigent Needy Groups (SHARING) clinics are interprofessional SRFCs for low-income, uninsured adults in Omaha, Nebraska SHARING hosts several interdisciplinary clinics, including the general SHARING clinic for comprehensive medical care and the Greater Omaha Outreach for Diabetes Lifestyles Impacting Fitness and Education (GOODLIFE) clinic for diabetes specific care. The clinics provide acute and chronic medical care, preventative services, physical therapy, dietitian consultation, social work consultation, and psychological services.[19] Medications were provided to patients at a copay of $3.00 per prescription through an off-campus pharmacy, OneWorld , a long-standing community partner of UNMC.[20] OneWorld pharmacy is approximately 4.3 miles from the clinics' locations and is open from 8:00 AM to 6:00 PM on weekdays; these hours make it infeasible to visit the pharmacy after an appointment at the SHARING clinic, open 5:30 PM to 7:00 PM every Tuesday, and/or the diabetes-focused GOODLIFE clinic, open 5:30 PM to 7:00 PM the second Wednesday of each month.[19,20] While there is a direct public transportation line between Nebraska Medicine and OneWorld, the Omaha Route 3 metro bus, even if a patient had the first visit slot at SHARING, they could not transit to OneWorld before the pharmacy closing time.[21] These accessibility factors present an important topic of analysis. By assessing medication adherence at the SHARING clinics with a focus on clinic-to-pharmacy distance, this study aims to provide free clinics with actionable data to promote higher quality of care and better health outcomes for their patients, as well as help to fill the void of research about medication adherence at SRFCs.[15-16]

Methods

Study Design

The objective of this study was to investigate medication adherence at the SHARING and GOODLIFE clinics to assess the impact of clinic-to-pharmacy distance. A retrospective chart review of medication documentation in the electronic medical record (EMR) was completed and cross referenced with pick-up records of the clinics' community partner, OneWorld pharmacy.

Table 1. Patient demographics at the SHARING and GOODLIFE clinics that use OneWorld Pharmacy

Patient Demographics	(n%)
Age in Years, mean (range)	45.6 (20-71)
Sex, n (%)	
Male	11 (29.7)
Female	26 (70.3)
Gender	
Men	11 (29.7)
Women	26 (70.3)
Race	
Caucasian	19 (51.4)
African American	10 (27.0)
Multiracial	2 (5.4)
Other	6 (16.2)
Ethnicity	
Hispanic or Latino	11 (29.7)
Non-Hispanic or Latino	26 (70.3)

SHARING: The Student Health Alliance Reaching Indigent Needy Groups; GOODLIFE: Greater Omaha Outreach for Diabetes Lifestyles Impacting Fitness and Education

The patients received their prescriptions at a reduced cost. This study was determined to be a quality improvement (QI) project and exempt from review by the Institutional Review Board (IRB) at UNMC. Prescriptions written at SHARING or GOODLIFE and picked up from January 1, 2018, to May 31, 2020, as documented in the EMR and OneWorld pharmacy records respectively, were recorded. The coronavirus disease of 2019 (COVID-19) pandemic began March 2020. Based on the location of Omaha, the SRFCs and OneWorld did not have waves of COVID-19 infections until mid-April of 2020. To pick up prescriptions inside the pharmacy, patients were required to wear a mask and were screened for COVID-19. Other methods of prescription pick-up occurred via an outdoor walk-up window and delivery to patient cars and homes.

The total number of prescriptions included new medications prescribed, refills, and refill renewal requests. Refill renewal requests are requests that are sent to the pharmacy to forward to prescribers. Patients included in this study were seen at SHARING, GOODLIFE, or both clinics and used OneWorld, resulting in a total of 37 patients. Prescription medication class was determined by medication indication. When reviewing prescriptions in the EMR, durable medical equipment, emergency department and hospital discharge medications, and medications written as needed were excluded from analysis. Prescriptions written at a clinic other than SHARING or GOODLIFE were excluded since they were not provided at a reduced cost.

Data Collection

Patient name, date of birth, age, sex, gender, race, and ethnicity were recorded. Clinics attended, prescribed medication class, medication class received, prescription written date, written number of refills, written days' supply, days' supply received, pick-up dates, and prescription termination date were also recorded. Recorded dates were used to calculate time elapsed between the date the prescription was written and picked up. After recording patient prescription information, medication pick-up was validated using OneWorld charge data.

To establish the patient prescription pick-up rate at OneWorld, the percentage of written prescriptions and refills that were picked up by patients was calculated using the medication possession ratio (MPR). MPR is a ratio used to determine medication adherence by quantifying the amount of time someone has a medication in their possession. The denominator is the length of days from the first prescription to the last. The numerator is the days supplied during that period. $$\textbf{MPR} = \frac{\textbf{Number of days supplied}}{\textbf{\# of days covered by prescription}}$$

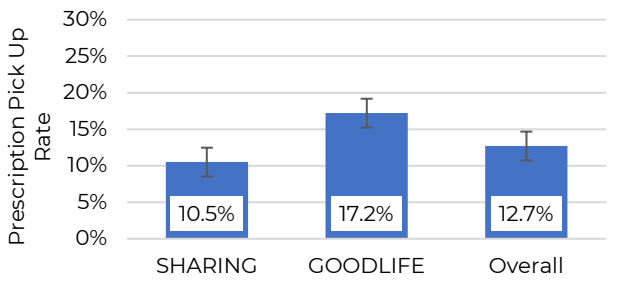
MPR ranges between 0 and 1, with values closer to 0 indicating low adherence and values closer to 1 suggesting higher adherence. Achieving an MPR of 0.8 has served as a target threshold for adherence.[22] This target includes all prescriptions, including prescriptions that were never picked up. MPR methods have been used in several studies exploring medication adherence, as it acknowledges that prescribing a patient medication does not mean that it will be collected by them.[23-26] In this study, MPR was used to evaluate medication adherence for the overall patient population and the individual populations of the SHARING and GOODLIFE clinics.

Table 2. Classes of medications prescribed and picked up at the SHARING and GOODLIFE clinics

Prescribed Medication Class	Prescribed (n)	Prescribed (%)	Picked Up (n)	Picked Up (%)
Blood Pressure	220	15.8	0	0
Insulin*	170	12.2	81	45.8
Diabetes†	134	9.6	8	4.5
Cholesterol	108	7.7	0	0
Antidepressants	77	5.5	0	0
Heartburn, acid reflux, GERD[1]	66	4.7	0	0
Antiseizure	64	4.6	34	19.2
Inhalers*	62	4.4	23	13.0
Allergies	54	3.9	0	0
Vitamins	54	3.9	0	0
Diabetic peripheral neuropathy	52	3.7	0	0
Analgesic	51	3.7	0	0
GLP-1 agonists[2,*]	38	2.7	28	15.8
Antibiotics	33	2.4	0	0
Hormone	22	1.6	0	0
Fungal Infections	20	1.4	0	0
Antiplatelet	17	1.2	0	0
Antianxiety	17	1.2	1	0.6
Migraines, cluster or tension headaches	16	1.1	0	0
Dopamine promoters (PD, RLS)[3]	13	.9	0	0
Sleep, sedatives	11	.8	0	0
Eye drops	11	.8	0	0
Benign prostatic hyperplasia	11	.8	0	0
Mood disorders	10	.7	0	0
Constipation	10	.7	0	0
Asthma meds (not inhalers)	10	.7	0	0
Heart failure	9	.6	0	0
Nicotine products	7	.5	0	0
Arthritis	6	.4	0	0
Rash, cellulitis	5	.4	0	0
Erectile dysfunction	4	.3	2	1.1
Flatulence, bloating	3	.2	0	0
Ear drops	3	.2	0	0
Osteoporosis	2	.1	0	0
Birth control	1	.1	0	0
Anti-diarrheal	1	.1	0	0
IBS[4]	1	.1	0	0
Hot flashes	1	.1	0	0
COPD medications	1	.1	0	0
Hepatitis C	1	.1	0	0
Gout	1	.1	*0*	0

**GLP-1 agonists, asthma inhalers, and insulin were listed as their own medication classes due to Medication Administration Program (MAP) billing protocols. †Diabetes refers to all medications that are used to treat diabetes except for insulin and GLP-1 agonists. SHARING: The Student Health Alliance Reaching Indigent Needy Groups; GOODLIFE: Greater Omaha Outreach for Diabetes Lifestyles Impacting Fitness and Education; GERD: gastroesophageal reflux disease; GLP-1: glucagon-like peptide-1; PD: Parkinson disease; RLS: Restless Leg Syndrome; IBS: Irritable bowel syndrome; COPD: Chronic obstructive pulmonary disease*

Figure 1. Prescription pick-up rates of the SHARING and GOODLIFE clinics and overall patient population of the clinics.



SHARING: The Student Health Alliance Reaching Indigent Needy Groups; GOODLIFE: Greater Omaha Outreach for Diabetes Lifestyles Impacting Fitness and Education.

Data Analysis

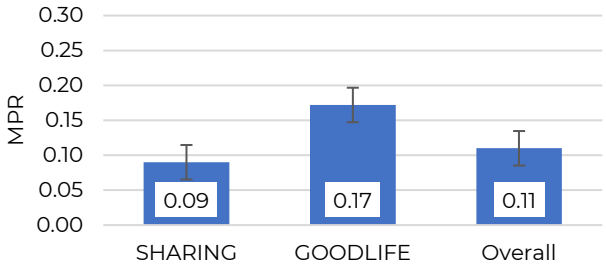
Descriptive statistics (mean, ranges, standard deviations, percentages) were found for all data collected (IBM SPSS Statistics for Windows, Version 29.0, 2022, Armonk, NY). At a 95% confidence interval, a p-value of less than 0.05 was determined to be statistically significant. Due to the non-normality of the data, a nonparametric Mann-Whitney U-test was run to examine whether there was any significant difference between the MPR of SHARING and GOODLIFE.

Results

From January 1, 2018, to May 31, 2020, 37 patients received prescriptions sent to OneWorld pharmacy from SHARING or GOODLIFE. Each patient had an average of 37.9 prescriptions (Standard Deviation [SD] = 38.1) sent to OneWorld and 6.8 different medication classes (SD = 4.3) during the entire 2-year study period. The average number of prescriptions per patient includes both new prescriptions and refills over the two-year period. Refills were included in data collection, even if the patient did not pick up prior refills. After sending prescriptions to OneWorld, it took patients, on average, 29.4 days (SD = 44.3) to pick-up their medications.

The three most prescribed medication classes were blood pressure (15.8%), insulin (12.2%), and diabetes medications not including insulin (9.6%). The prescribed medication classes during the period of interest are summarized in Table 2.

Figure 2. Average MPR of the SHARING and GOODLIFE clinics and overall patient population.



An MPR closer to 0 indicates low adherence while an MPR closer to 1 indicates higher levels of adherence to medication. MPR: Medication Processing Ratio; SHARING: The Student Health Alliance Reaching Indigent Needy Groups; GOODLIFE: Greater Omaha Outreach for Diabetes Lifestyles Impacting Fitness and Education

Patients picked up an average of 5.95 medications from OneWorld (SD = 8.4), with insulin (45.8%), antiseizure (19.2%), and glucagon-like peptide-1 (GLP-1) agonists (15.8%) being the most frequently picked up medication classes (Table 2).

To evaluate medication adherence, the percentage of prescriptions and refills that were picked up and MPR were calculated. The prescription pick-up rate was 12.7% for 37 patients over a two-year period (Figure 1). Figure 2 illustrates the MPR for the overall patient population and the individual populations of the SHARING and GOODLIFE clinics. The overall MPR for the patient population of the clinics was 0.1 (SD = 0.4).

Breaking down adherence by clinic, the SHARING clinic's prescription pick-up rate was 10.5% while the GOODLIFE clinic's prescription pick-up rate was 17.2%, indicating that GOODLIFE patients were picking up their medications more often (Figure 1). Figure 2 shows the MPR for patients at SHARING was 0.09 (SD = 0.3) and at GOODLIFE was 0.2 (SD = 0.5). The GOODLIFE clinic's patients had a significantly higher MPR than the SHARING clinic's patients (0.2 vs 0.09; $p<0.001$), suggesting GOODLIFE patients pick up their medications more often.

Discussion

One of the main goals of this study was to assess SHARING prescription pick-up rates from

OneWorld pharmacy. This study found a low prescription pick-up rate at OneWorld, suggesting low medication adherence. In the GOODLIFE clinic, there were fewer patients that were prescribed less medications and refills compared to SHARING's population. At GOODLIFE, fewer and less complex medication regimens are being prescribed, focusing on diabetes specific care, which likely contributed to GOODLIFE having a slightly higher MPR and prescription pick-up rate. This is consistent with the finding that the most commonly picked up and second most commonly prescribed medication class was insulin.

Medication adherence was further analyzed by calculating MPR. MPR considers all prescriptions, including the medications that were not picked up, which is important because patients were not necessarily taking those medications during that time if they ever started that medication. It is important as a clinician to know if a patient picks up or does not pick up their medicine. The overall, SHARING, and GOODLIFE MPRs were all close to 0, indicating a low level of medication adherence in the overall and individual clinic populations. GOODLIFE patients had a significantly higher pick-up ratio than SHARING patients, suggesting that medication adherence is higher in GOODLIFE patients. However, the GOODLIFE MPR was not close to 1, so while GOODLIFE patients appear to be more adherent to their medications than SHARING patients, there is room for improvement. Prescription pick-up rate and MPR cannot fully substitute for true medication adherence.

Additionally, it takes patients an average of almost a month to pick-up their medications after they are prescribed. There is a huge disparity between the number of prescriptions written and sent to OneWorld. Patients are struggling to pick-up their medications and maintain their normal drug regimen. We propose that one of the major barriers could be the physical distance between the clinics and OneWorld. Patients with limited access to reliable transportation during OneWorld's hours of operation might not be able to pick-up their medications. GOODLIFE and SHARING are both located in the Durham Outpatient Center on UNMC's campus, so distance between the clinics was not a contributing factor. This study highlights the importance of taking steps to improve the SHARING clinics to raise medication adherence. One step that will be taken is to survey the patients at their visits, asking what barriers prevent them from picking up their medications and suggestions they have for overcoming those barriers.

Pharmacy services were moved from OneWorld pharmacy to an on-campus location, which allows patients to pick-up their medications at the same time as their clinic visits. This will eliminate the barrier of physical distance between the clinic and pharmacy, allowing patients with limited access to transportation or limited availability during business hours to pick-up their medications. Based on our findings, a shorter distance between the pharmacy and clinic that patients use may promote higher adherence to their medications, removing a barrier to care. Furthermore, in the context of the COVID pandemic, medication delivery has become more readily available, and this is being explored as another option. Further analysis of patient medication adherence at the new pharmacy needs to be completed to confirm if physical proximity between SRFCs and pharmacy plays a role in medication adherence. Patients picking up their prescriptions from their pharmacy is one of the first steps towards achieving optimal adherence, which is critical in improving patient outcomes.[6,13–15] Furthermore, future studies can further evaluate patient-oriented outcomes tied to medication assistance such as the number of patients with an A1C or blood pressure at goal.

The results of this study illustrate a method for evaluating medication adherence at SRFCs. Using MPR, other SRFCs can determine their patient population's medication adherence at any point in time they wish to assess. SRFCs can use the data collected to refine clinic processes to enhance their patient outcomes and quality of care provided. This method can be used repeatedly to compare past and current adherence levels to evaluate if clinic modifications are functioning, leading to improvements in medication adherence.[23]

Limitations

The authors recognize several limitations. This study has a small patient sample size of only 37 patients, making it difficult to limit confounding factors. This study, as typical of QI projects, also sacrifices some external generalizability due to its narrow study population, but our smaller scope is useful in the specific context of SRFCs. Additionally, the patients in this study could have used other pharmacies besides OneWorld pharmacy to pick-up their medications. This study can show that patients physically picked up their medications but cannot show that they took their medications as instructed. Lastly, this study was limited by the COVID-19 pandemic, which affected how patients picked up their medications from OneWorld, as described above.

Disclosures

The authors have no conflicts of interest to disclose.

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