VARIABILITY IN PRICING OF GENERIC ANTIPSYCHOTIC MEDICATIONS USED IN THE

TREATMENT OF SCHIZOPHRENIA AT COMMUNITY PHARMACIES

IN THE KANSAS CITY METROPOLITAN AREA

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VARIABILITY OF GENERIC ANTIPSYCHOTIC MEDICATION PRICES AT COMMUNITY

PHARMACIES IN THE KANSAS CITY METROPOLITAN AREA

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ABSTRACT

Studies examining variability in generic medication pricing at community pharmacies have revealed conflicting results. No studies have examined variability in costs of antipsychotic medications or if these costs vary across types of pharmacies. Specifically, comparative drug pricing for generic formulations of five commonly used second-generation antipsychotic medications (risperidone, olanzapine, quetiapine, ziprasidone, and aripiprazole) recommended for first line therapy in the treatment for schizophrenia is lacking.

Pharmacy-level variability in retail cash pricing for five generically available second-generation and one first-generation antipsychotic medications at therapeutic doses for the treatment of schizophrenia in the Kansas City metropolitan area was examined. Two hundred and sixty-five pharmacies were queried by telephone between April 25 and May 25, 2017 for the cash price of a 30-day supply of haloperidol 10 milligrams (30 tablets), risperidone 4mg (30 tablets), olanzapine 20mg (30 tablets), quetiapine 300mg (60 tablets), ziprasidone 80mg (60 tablets), and aripiprazole 20mg (30

tablets). Each pharmacy was then classified as being either a chain (n=182), grocery

store (n= 53), or independent pharmacy (n= 30).

Retail cash prices varied for all antipsychotic medications, with significant

differences in price by pharmacy type. Price variation across all pharmacy types for a 30-

day supply was the least for haloperidol (range $20.00 - $102.99) and the greatest for

aripiprazole (range $29.99 - $1,345.00). Pairwise comparisons showed chain pharmacies

had higher prices compared with independent pharmacies (p <.001) for all drugs except

haloperidol (p =.49). Overall, chain pharmacies had the highest prices, with prices at

grocery store pharmacies averaging $180.00 lower than chain and independent

pharmacies $414.00 lower than chain pharmacies.

This is the first report on the pharmacy-level variability in the costs of generic

antipsychotic treatment options for schizophrenia. There are appreciable differences in

the costs of antipsychotic medications and understanding variability in pricing for these

medications may be valuable for providers serving uninsured patients. Further analyses

will examine the contribution of geographic-level socio-demographic factors to these

differences.

APPROVAL PAGE

The faculty listed below, appointed by the Dean of the School of Medicine have

examined a thesis titled "Variability in Pricing of Generic Antipsychotic Medications

Used in the Treatment of Schizophrenia at Community Pharmacies in the Kansas City

Metropolitan Area," presented by Carrie Kriz, candidate for the Master of Science

degree and certify that in their opinion it is worth of acceptance.

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CONTENTS

Chapter

TABLES

ILLUSTRATIONS

CHAPTER 1

INTRODUCTION

Schizophrenia is a disorder characterized by the presence of hallucinations, delusions, disorganized speech or behavior, and negative symptoms such as poverty of speech and anhedonia. Despite affecting only 1% of the total population, the economic burden of schizophrenia in the United States was estimated at $155.7 billion in 2013, with $9.2 billion of the total costs attributed to medications (Cloutier et al., 2016). Access to these medications is imperative in preventing disease relapse and the emergence of psychotic symptoms. While most individuals diagnosed with schizophrenia qualify for government provided health insurance (Medicaid and Medicare), studies have estimated up to 20% of these individuals lack health insurance (Yanos, Lu, Minsky, & Kiely, 2004). Pricing of medications, therefore, is of critical significance to this population.

When a medication enters the pharmaceutical market, it is available exclusively as brand name for a period of time under the protection of a patent. Generic versions of a medication may be introduced to the market once the patent of the brand-name medication expires. As defined by the United States Food and Drug Administration, *'a generic drug is a medication created to be the same as an already marketed brand-name drug in dosage form, safety, strength, route of administration, quality, performance characteristics, and intended use'* (Food and Drug Administration, n.d.). However, given the required criteria of bioequivalence for approval, generic medications are not required to undergo extensive testing and as such, typically cost less when compared to

their brand-name counterparts. Among other factors that have been shown to influence generic-brand-name drug pricing, the number of manufacturers for a generic medication is inversely associated with the cost of the medication relative to the brand-name version (Dave, Hartzema, & Kesselheim, 2017).

First line treatment for schizophrenia is antipsychotic medication and current treatment guidelines support the use of second-generation antipsychotics (SGA) with the exception of clozapine as first line therapy (Lehman et al., 2004). Presently, five SGAs recommended for first line treatment are currently available in a generic formulation: risperidone, olanzapine, quetiapine, ziprasidone, and aripiprazole. Of these medications, generic risperidone has been available the longest, receiving generic approval in 2009 and aripiprazole is the most recent with generic approval in 2015. SGA are recommended over first-generation antipsychotics (FGA) such as haloperidol due to better tolerability. With respect to routine clinical use, however, haloperidol is commonly prescribed and is the only FGA that remains in the top 300 prescribed medications in the United States (Kane SP, 2018).

Recent studies have shown variability in the retail cash pricing of generic medications (Hauptman, Goff, Vidic, Chibnall, & Bleske, 2017; Moshtaghi et al., 2017). Additional studies suggest that generic drug prices may differ by pharmacy type (Arora, Sood, Terp, & Joyce, 2017; Gellad et al., 2009). To our knowledge, there has been no examination of pharmacy-level variability in drug pricing for the generic formulations of antipsychotic medications. In this study, we sought to examine the variability in the

pricing of antipsychotic medications at pharmacies in the Greater Kansas City Area, and

its relationship with pharmacy type (chain, grocery, and independent).

CHAPTER 2

LITERATURE REVIEW

Generic Medications

Patent expiration for newly developed ('brand') medications allows additional

manufacturers to develop generic equivalents of medication. As the number of generic

medication manufacturers increases, the cost for the medication decreases (Dave et al.,

2017). A Department of Health and Human Services (DHHS) report in 2016 confirmed

that competition in the generic drug market continues to reduce costs overall despite

notable increases in costs of certain generic medications (Department of Health and

Human Services, 2016).

Despite the DHHS findings, portions of the generic drug market show increasing

prices of some generic medications (Alpern, Stauffer, & Kesselheim, 2014). For

example, a recent study documented price increases in a subset of commonly

prescribed generic antibiotics between 2013 and 2016 (Alpern, Zhang, Stauffer, &

Kesselheim, 2017).

Antipsychotic Medications

Antipsychotic medications are divided into two classes, older first-generation

antipsychotic (FGA) medications (developed in the 1950s) and newer, second-

generation antipsychotic (SGA) medications (developed in the 1980s). Following the

development of several new SGA, the Clinical Antipsychotic Trials of Intervention

Effectiveness (CATIE) trial was a landmark, public health-focused clinical trial funded by

the National Institute of Mental Health to examine efficacy of antipsychotic

medications. At the time, it was unclear if SGA demonstrated superior efficacy to older FGA and so the CATIE trial compared the efficacy of a FGA to new SGA medications. The study showed similar efficacy between four SGA medications: risperidone, ziprasidone, olanzapine, and quetiapine and an older FGA, perphenazine (Lieberman et al., 2005). The CATIE trial results demonstrated differences in side effects and tolerability for specific medications but established that SGA did not have superior efficacy to FGA.

While equally efficacious, SGA medications have a lower risk of movement disorders such as tardive dyskinesia than FGA (Correll, Leucht, & Kane, 2004). Tardive dyskinesia is a disorder characterized by repetitive, involuntary body movements, which can be permanent, and results from long-term use of medications that block the dopamine receptor, including antipsychotics. Current treatment guidelines acknowledge the utility of both FGA and SGA medications in the treatment of schizophrenia, but recommend the use of SGA due to a reduced risk of movement disorders such as tardive dyskinesia (Lehman et al., 2004).

Since the publication of the CATIE trial additional SGA medications have come to market, however there remains no single recommended first line medication for all patients with schizophrenia. Ultimately, providers select an antipsychotic medication based on the patient's history, medication side effect profile, cost, and patient preference.

Price Variability

Several studies have assessed variability in generic drug prices at the pharmacy level. A recent study in St. Louis found the combined price for a 30-day supply of three

5

generic medications commonly used for heart failure (digoxin, lisinopril, and carvedilol)

varied from $12 to $397 (Hauptman et al., 2017). Of the three heart failure medications

examined, digoxin was consistently the most expensive despite being available as a

generic longer than lisinopril and carvedilol. Increased cost of digoxin may be the result

of drug recalls and a subsequent reduction in the number of manufacturers from eight

to three (Alpern et al., 2014). The authors found only one chain pharmacy with

consistent prices offered across area stores. This contrasts with an earlier finding from

2006 in Florida, in which researchers using a state database found chain pharmacies to

have the most consistent pricing (Gellad et al., 2009).

A study in Southern California evaluating commonly prescribed eardrops showed

significant variability in pricing. The authors found significant price differences between

big chain and small chain pharmacies for four of the eleven medications with three

being significantly less expensive at independent pharmacies (Moshtaghi et al., 2017). A

study examining "price shopping" in Los Angeles County, for two commonly prescribed

generic oral antibiotics used in the treatment of community acquired pneumonia found

the average price of levofloxacin at independent pharmacies to be half the price of a

grocery or big-box store pharmacy and one-quarter the price of a retail chain pharmacy

(Arora et al., 2017). Both levofloxacin and azithromycin were cheapest at independent

pharmacies and most expensive at chain pharmacies with prices most consistent among

chain pharmacies. A study of commonly used medications in dermatology examined

prices at chain pharmacies across states and found most chains to have consistent

pricing across states, however prices varied across chain retailers (Alghanem, Abokwidir,

Jr, Feldman, & Alghanem, 2017).

Summary

Generic antipsychotic medications may provide a cheaper alternative to brand

name medications for patients. Several studies have examined variability in pricing for a

variety of medication types; however, no studies have examined price variability in

antipsychotic medications. Additionally, results are conflicting regarding price variability

across pharmacy types, with study results supporting claims of chain pharmacies having

the cheapest and the most expensive retail cash prices.

Research Objectives

Therefore, the objectives of this research were to examine the variability in

pricing of antipsychotic medications used in the treatment of schizophrenia in the

Kansas City metropolitan area, and determine if prices varied by pharmacy type

(independent, grocery store, or chain).

CHAPTER 3

METHODOLOGY

Pharmacies

The Missouri Division of Professional Registry and Kansas Board of Pharmacy

provided information for retail pharmacies in Jackson, Clay, and Platte Counties in

Missouri and Johnson and Wyandotte Counties in Kansas. At the time of data collection,

281 pharmacies operated in the selected counties. Pharmacies excluded from data

collection include nine specialty pharmacies, three non-operational, two duplicates, one

located outside of the selected counties, and one call service. The five counties selected

encompass the majority of the Kansas City metropolitan region and a population of 1.76

million people.

Of the 265 pharmacies included in data collection, 147 were in Missouri and 118

in Kansas. Each pharmacy was categorized as being a nationwide chain pharmacy

(n=182), a grocery store pharmacy (n=53), or an independent pharmacy (n=30). Chain

pharmacies included stores that also sell groceries such as Wal-Mart and Costco, as they

have locations across the nation and purchasing power comparable to other chain
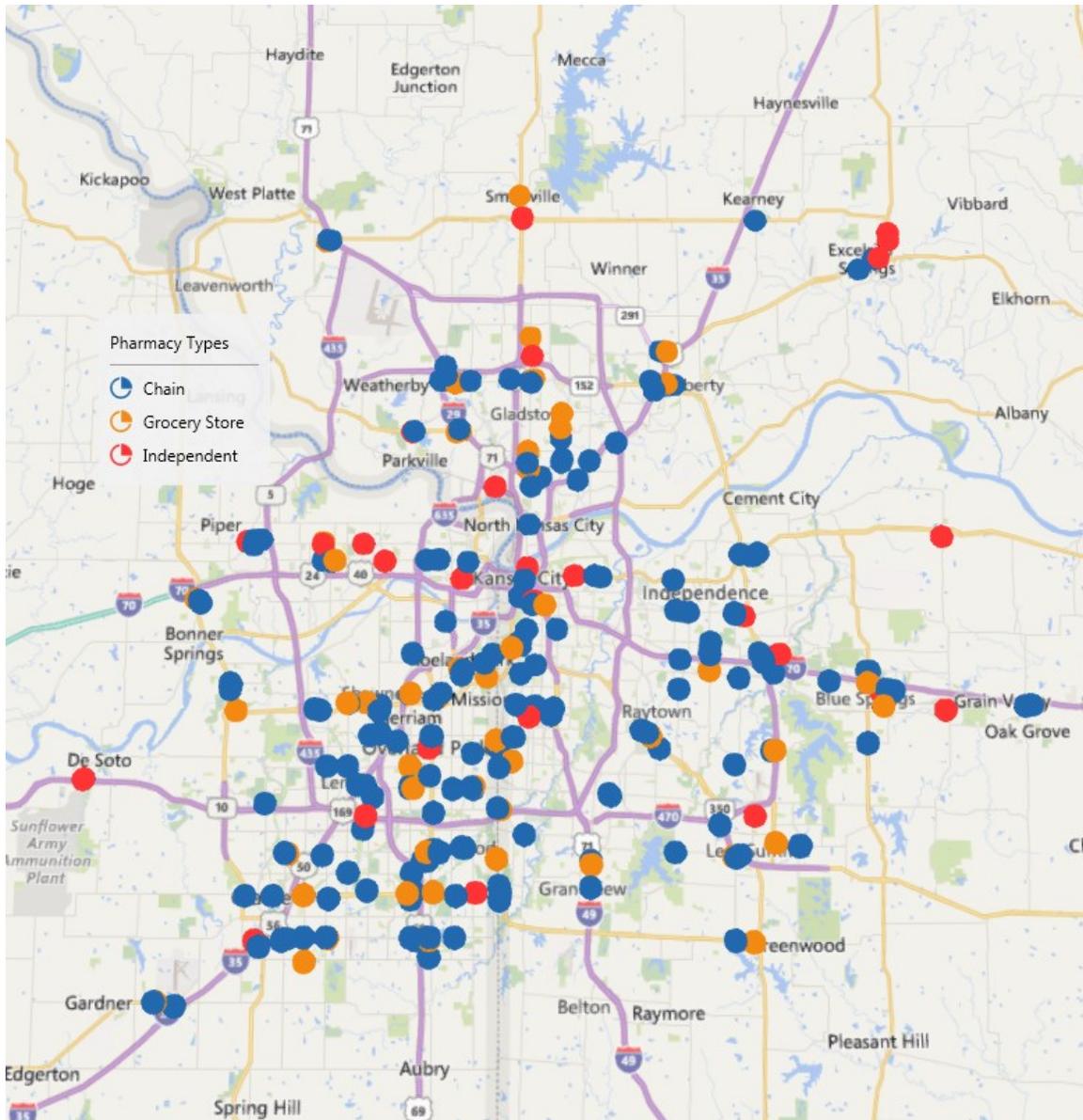
pharmacies.

Figure 1: Map of included pharmacies Kansas City Metro by type

Medications of Interest

All of the antipsychotic medications studied are listed among the top 300

prescribed medications in the United States for 2018 (Kane, SP, 2018). The

recommended therapeutic dose for schizophrenia determined the strengths for each

medication. Medication strengths included: 1) risperidone 4mg, 2) olanzapine 20mg, 3)

quetiapine 600mg, 4) ziprasidone 160mg, 5) aripiprazole 20mg, and 6) haloperidol 10mg. All included medications and strengths describe total daily dose. Haloperidol, an older but commonly used FGA, served as a price comparison between newer SGAs and an older FGA.

Study Design

Over the course of a 30-day period (April-May 2017), each pharmacy responded to three phone queries requesting the cash price for a 30-day supply of two of the six antipsychotic drugs. The requested price was for thirty doses or a 30-day supply of risperidone, haloperidol, olanzapine, and aripiprazole at the selected strength as these medications are dosed once daily. Quetiapine and ziprasidone are dosed twice daily so prices requested are for sixty doses of quetiapine 300mg and ziprasidone 80mg. Pharmacy students assisted with phone queries, each time requesting the cash price for medications at the specific strength and number of doses. Reponses where the requested strength was not available are not included in the analysis. Discounted prices offered with the use of a membership card or coupon were not recorded.

Pricing data collected was managed using the REDCap electronic data capture tool hosted at the Center for Health Insights of the University of Missouri–Kansas City (UMKC; (Harris et al., 2009). The UMKC Adult Health Sciences Institutional Review Board designated this study non-human subject's research.

Statistical Analysis

Statistical analyses were completed using IBM SPSS Statistics version 24 and SAS version 9.4. Descriptive statistics were used to generate median drug prices, both overall and for each medication by pharmacy type. Kruskal-Wallis H test for non-

normally distributed data was used to test the statistical significance of potential

differences in pricing for each of the six antipsychotic medications across the three

pharmacy types. Statistical significance of pairwise comparisons between pharmacy

types was assessed using Dunn's procedure. Levene's test was used to assess variability

in price across medications. Generalized linear models (PROC GLM in SAS) were used to

examine the association of price with pharmacy type and interaction with medication

type. Overall statistical significance was assessed using with the alpha level set to 0.05.

Alpha levels were adjusted using a Bonferroni correction to address the issue of multiple

comparisons.

CHAPTER 4

RESULTS

Overall Pricing by Medication

Of the 265 pharmacies included, 238 had all six medications in stock at the specified strengths. The median price of the six medications varied greatly (Table 1, Figure 2). Medication prices did not follow a normal distribution. Examination of pricing across medications revealed that the SGA aripiprazole had the largest variability (max. - min. difference: $1315.01) while the FGA haloperidol had the least (max. - min. difference: $82.99). Levene's test confirmed statistically significant differences in price variability across medications (p <.01).

Table 1.

Variability in Cash Pricing of Generic Antipsychotic Medications at Retail Pharmacies (n=265) in the Kansas City Metropolitan Area in May 2017.

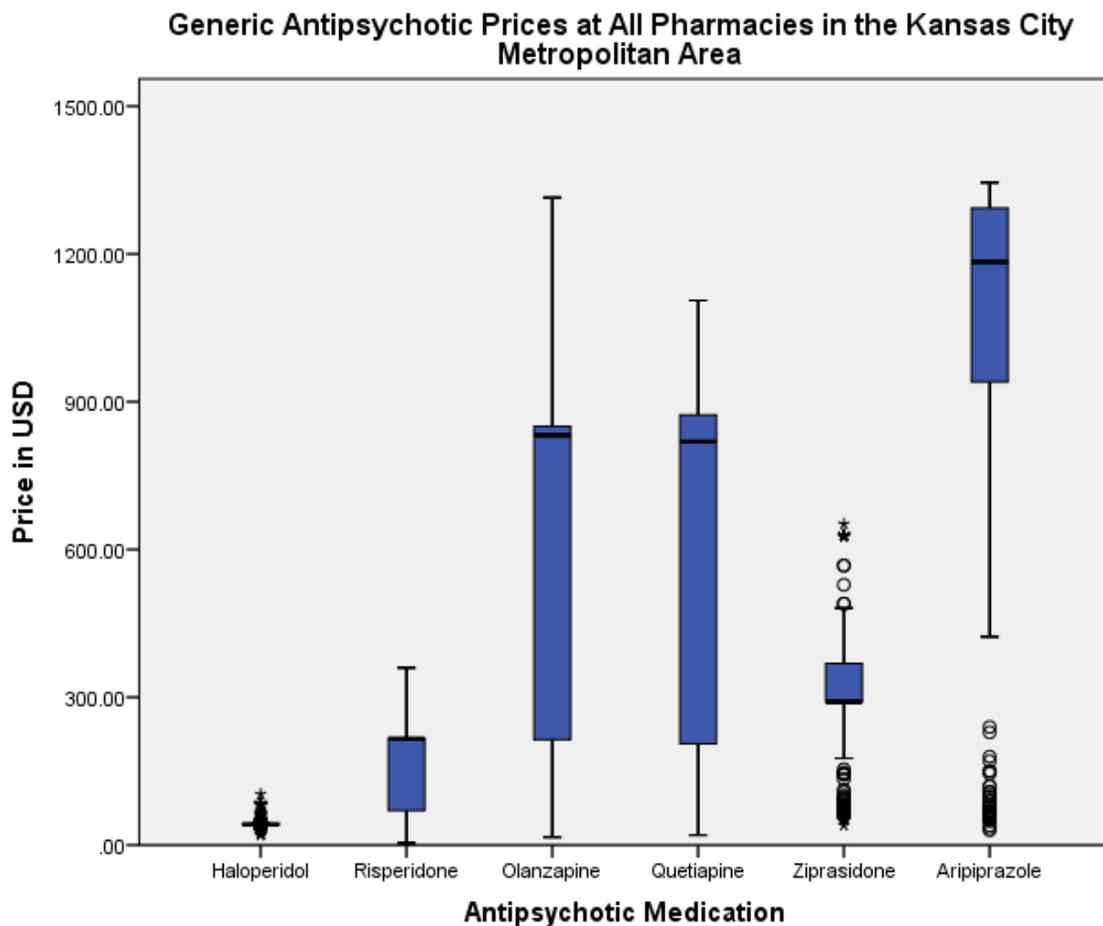| Medication	Haloperidol 10mg (n=250)	Risperidone 4mg (n=253)	Olanzapine 20mg (n=259)	Quetiapine 600mg (n=263)	Ziprasidone 160mg (n=261)	Aripiprazole 20mg (n=254)
Mean	$45.61	$172.86	$560.05	$579.23	$302.83	$981.49
Median	$41.79	$215.99	$832.09	$818.99	$290.99	$1183.99
Min. price	$20.00	$4.00	$16.00	$20.00	$40.00	$29.99
Max. price	$102.99	$360.00	$1314.40	$1105.75	$651.83	$1345.00
Max. / Min. Ratio	5x	90x	82x	55x	16x	44x

Figure 2: Range in cash pricing (USD) for 30-day supply of antipsychotic medications across all pharmacies (N=265).

Pricing by Pharmacy Type

There were significant differences in pricing according to pharmacy type for all six antipsychotic medications ($p < .001$ for all). Pairwise comparisons showed a significant difference in pricing between at least two of the three pharmacy types for each medication (Table 2). Four SGA medications - olanzapine, ziprasidone, quetiapine, and aripiprazole – showed significant differences in pricing between the three pharmacy types.

Table 2.

Differences in Median Cash Pricing for 30-day Supply of Generic Antipsychotic Medications by Pharmacy Type and Kruskal-Wallis Mean Rank Test Significance with Pairwise Comparisons

	Haloperidol 10mg	Risperidone 4mg	Olanzapine 20mg	Quetiapine 600mg	Ziprasidone 160mg	Aripiprazole 20mg
Chain	$41.79	$215.99	$849.00	$819.99	$291.00	$1183.99
Independent	$45.97	$19.50	$31.41	$41.82	$72.81	$84.35
Grocery	$60.29	$63.99	$213.99	$508.99	$480.00	$1111.99
P-value	< .001	< .001	< .001	< .001	< .001	< .001

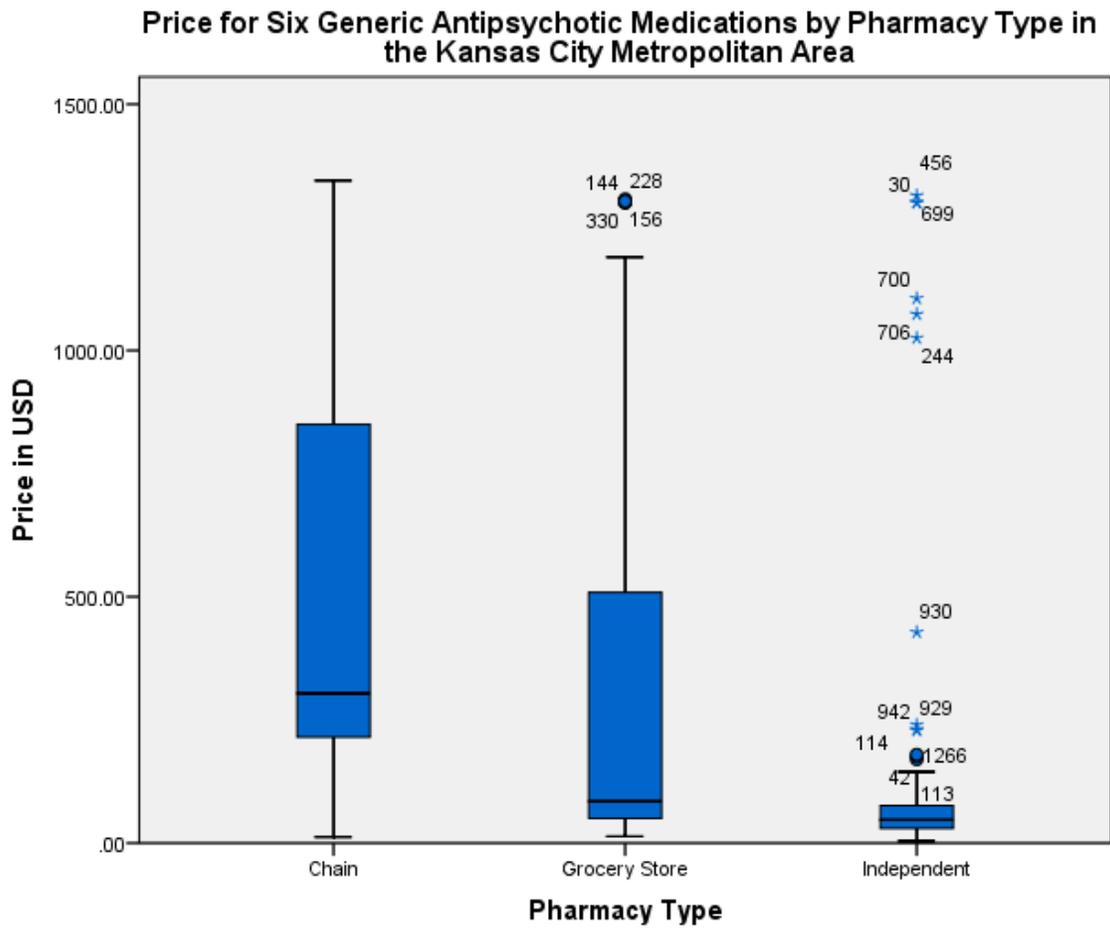| Kruskal-Wallis Pairwise Comparisons Bonferroni-adjusted P-value						
Chain - Independent	.481	< .001	< .001	< .001	< .001	< .001
Independent - Grocery	.074	.143	.034	.020	< .001	< .007
Chain - Grocery	< .001	< .001	< .001	< .001	.026	< .001

Figure 3. Range in price for all antipsychotic medications by pharmacy type

Table 3.

Regression Results for Pharmacy Type Predicting Price

Variable	Coefficient	Standard Error	Significance
Constant (Chain)	516.49	11.908	< .001
Grocery	-180.28	25.614	<. 001
Independent	-414.89	33.441	< .001
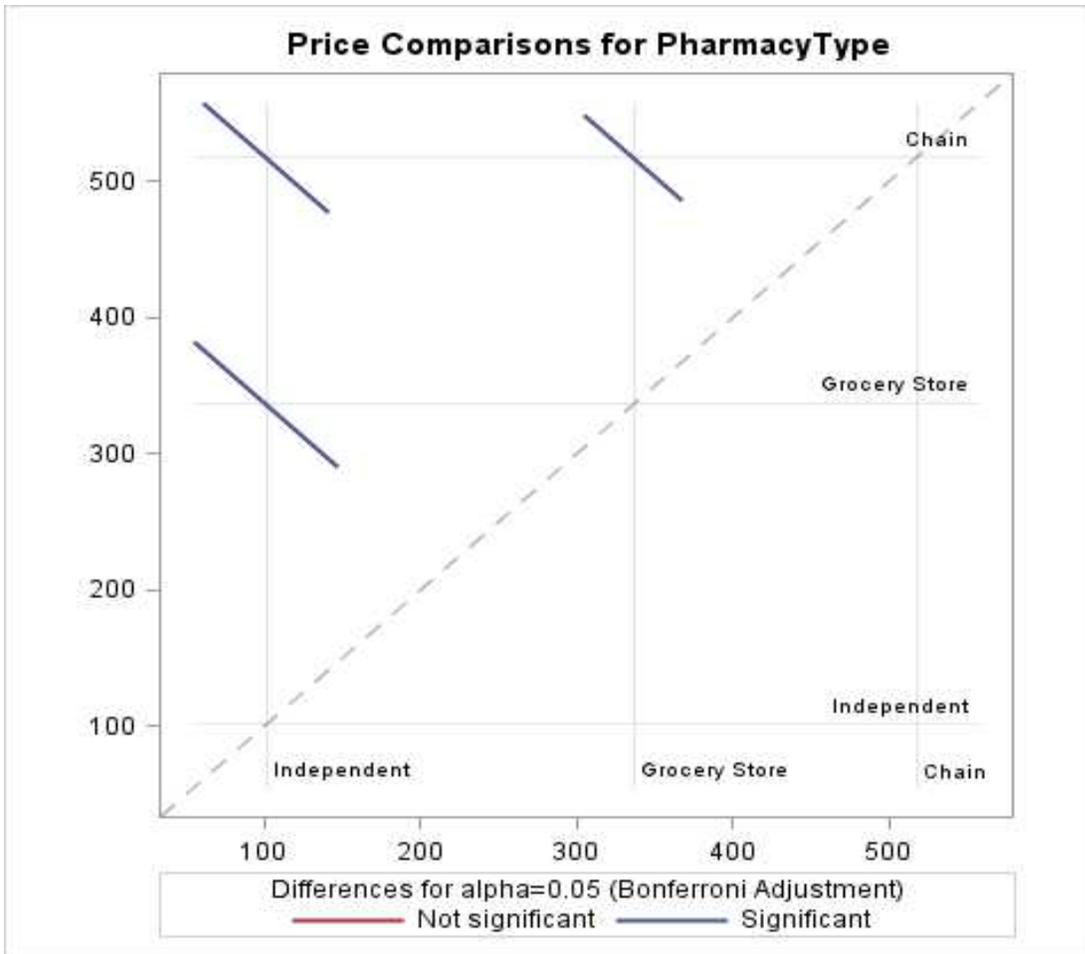
Figure 4: Pairwise comparisons plot for differences in overall prices by pharmacy type

There were statistically significant differences in overall price by pharmacy types (Table 3). Overall, chain pharmacies had the highest prices, followed by grocery store pharmacies, with independent pharmacies having the lowest overall prices (Figure 3 and Table 3). Pairwise comparisons for price by pharmacy type also showed significant differences in pricing by pharmacy type (Figure 4). A statistically significant interaction was detected between medication price and pharmacy type, i.e. the difference in pricing between medications varied by pharmacy type (Figure 5 and Figure 6).

Figure 5: Median prices for 30-day supply of antipsychotic medications by pharmacy type.

Figure 6: Interaction of price and pharmacy type by medication

CHAPTER 5

DISCUSSION

In our study sample of pharmacies in the Greater Kansas City Area, retail cash prices for generic antipsychotics varied by as much as $1,000.00 between pharmacies. Despite the wide price range, 30-day supplies for all medications could be obtained at one or mor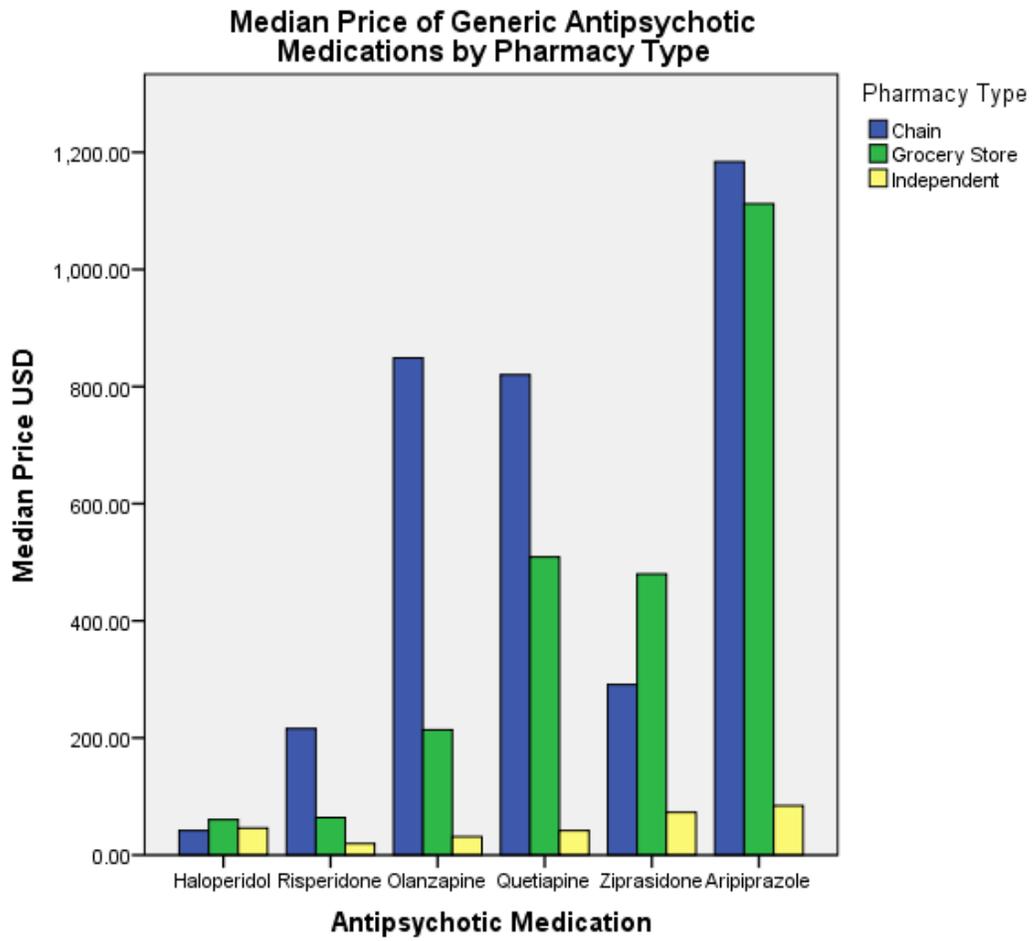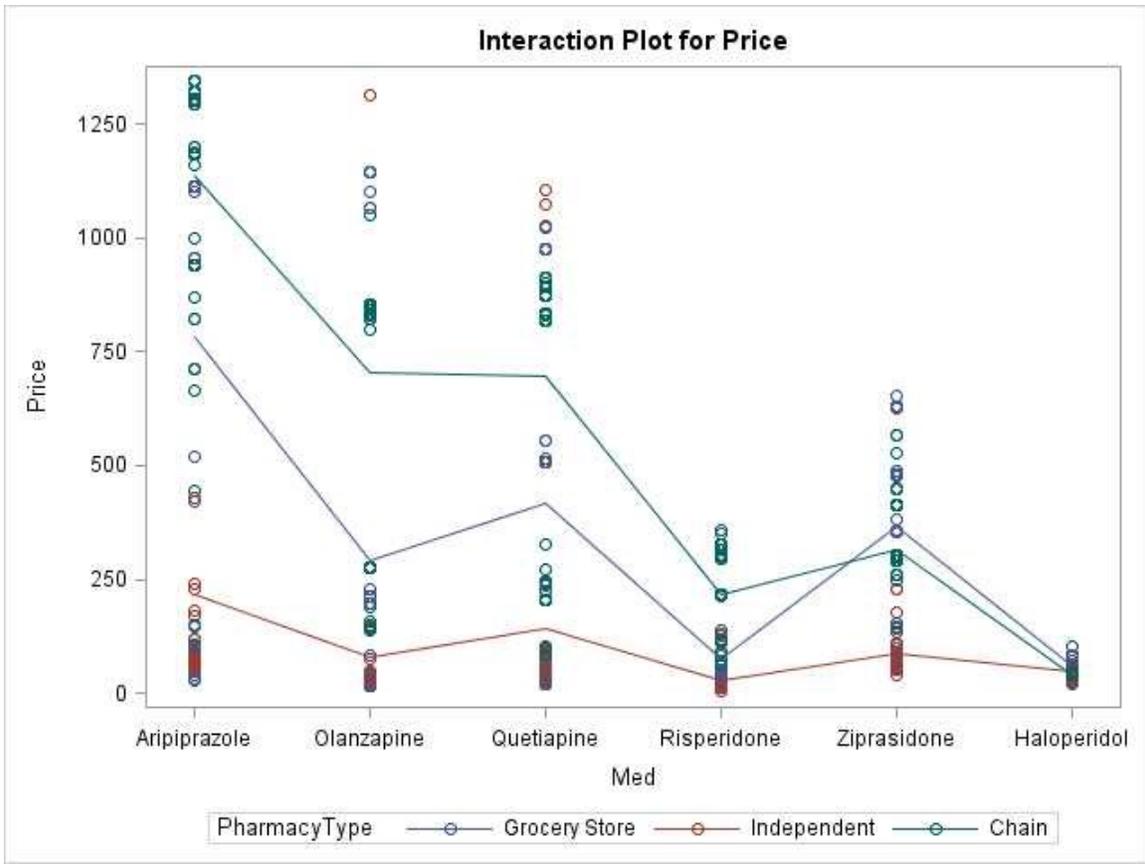e pharmacies for less than $40.00. Haloperidol, the older FGA had the smallest variability in pricing, but did not have the lowest quoted price. Individuals without insurance may be able to access a newer SGA at the same price or lower than a FGA as both risperidone and olanzapine had lower minimum prices quoted, and quetiapine had the same ($20.00) lowest quoted price. At independent pharmacies, risperidone, olanzapine, and quetiapine had lower median prices than haloperidol. The availability of three newer SGA medications at a lower or similar price to haloperidol may benefit patients with schizophrenia, considering the reduced risk for movement disorders associated with SGA.

All six medications had significant differences in pricing between at least two pharmacy types. Overall, chain pharmacies were the most expensive, followed by grocery store, and independent pharmacies. However, for haloperidol and ziprasidone, grocery stores were costlier than chain pharmacies. This variability in pricing suggests patients, particularly those without insurance, may benefit from access to a variety of pharmacy types in order to obtain the lowest price.

To better understand the source of price differences across pharmacy types, informal interviews were conducted with community pharmacists. Based on these

interviews, it appears prices at chain pharmacies may be set to maximize profits in contracts with pharmacy benefit managers, which manage prescription coverage for commercial insurance plans. Because prices are set at the corporate level for these contracts, individual pharmacists at chain pharmacies likely have less freedom than pharmacists at grocery store and independent pharmacies to adjust costs for individuals without insurance. Ultimately, contracts with pharmacy benefit managers are proprietary, and further investigation of the driving forces between differences in pricing at different pharmacy types will be necessary.

In an effort to assist patients to pay the lowest price for their medications, some states have established website databases of publicly reported medication prices at pharmacies. The reliability of these databases, including a no-longer operational database for Missouri , to have information for all pharmacies has not been demonstrated (Kullgren, Segel, Peterson, Fendrick, & Singh, 2017). Given promising findings for differences in price by pharmacy type and the potential benefit identifying the lowest cost for medication, such state websites may provide benefit to both providers and patients if well managed (Arora et al., 2017).

Individuals with schizophrenia often suffer with co-occurring cognitive deficits; as such, the utility of websites for price comparison for these individuals remains questionable. A recent study of patients with severe mental illness in the Veterans Affairs health system found these patients were less likely to use the internet than patients without severe mental illness (51% vs. 71%) (Tsai, Klee, Rosenheck, & Harkness, 2014). Without access to the internet, uninsured individuals may not benefit from

prescription coupon websites, such as GoodRx or Blink Health. These individuals may also struggle to identify and contact multiple pharmacies to find a lower price. Therefore, health care professionals may need to provide counseling to uninsured patients regarding how to obtain low priced prescriptions.

Strengths and Limitations

Where prior studies have examined a random sample of pharmacies or pharmacies in a single county, this study contains data from every retail pharmacy in a five-county metropolitan region. The selection of antipsychotics for evaluation was based on treatment guidelines for schizophrenia and the addition of haloperidol as a comparator were both strengths of this study as it reflects current prescribing patterns of antipsychotics for this disease state. Study data was collected over a short period of time, one month, to reduce any impact from market fluctuation in prices.

A limitation of this study was that data was not collected regarding availability of pharmacy discount plans or pricing with a coupon or discount membership. The price reported from the pharmacy may not be reflective of the price paid if a coupon or discount program was utilized. On several occasions, the pharmacy employee did offer suggestions on how to obtain the prescriptions at a lower price; however, data on how often this occurred was not recorded. Data was collected by study staff and volunteer pharmacy students, and, as such, the data reflects information provided to an educated consumer. Individuals, specifically individuals with major mental illnesses such as schizophrenia, may have greater difficulty providing the necessary information about their prescription to obtain pricing information.

Lastly, the cost associated with antipsychotics in this study is specific to the treatment of schizophrenia. Antipsychotics are used in the treatment of other psychiatric disease states such as bipolar disorder and depression. The results of this study may not reflect the costs associated with treating these disease states as antipsychotic dosing recommendations are different.

Future Directions

Further analyses are necessary to determine if there are socio-economic or neighborhood characteristics that contribute to price variability. A recent study in Chicago found significant differences in the pharmacy availability in segregated white and minority communities (Qato et al., 2014). The types of pharmacies available also significantly differed in segregated white and black communities. The visual representation of pharmacies by type seen in Figure 1 suggests similar discrepancies may exist in the Kansas City metropolitan area.

Studies examining medication pricing and neighborhood characteristics using ZIP code level information have revealed price discrepancies corresponding to race and income. A study in Wayne County, Michigan found prices of generic levothyroxine to be higher in ZIP codes with lower income (Erickson & Workman, 2014). A study of publicly reported prices from a Florida prescription database discovered mean prices were 9% higher in poorer areas (Gellad et al., 2009); however, not all studies have replicated these findings (Arora et al., 2017). Next steps from this study will examine antipsychotic pricing and area-level characteristics as well as access to pharmacy types. As prescription discount websites become increasingly popular, future studies should

examine the variability in retail cash pricing in the context of these discount programs as well.

Study findings suggested range in antipsychotic price trended with the length of time available generically, with haloperidol having the lowest variability in price and aripiprazole the highest. Recent findings have found prices are reduced as the number of generic manufacturers is increased (Dave et al., 2017). Additional analyses may examine the relationship between lengths of time available generically, number of manufacturers, and price to determine if this trend persists with antipsychotic medications.

Conclusion

Similar to findings for medications with other indications, prices for antipsychotic medications varied greatly. Prices also varied significantly by pharmacy type - prices varied by chain, grocery store, and independent pharmacies. Overall, chain pharmacies were the most expensive and independent pharmacies the least expensive. Differences in prices by pharmacy type also varied for each medication. This information is potentially useful to healthcare professionals and other stakeholders who are engaged in the delivery of care to uninsured patients with schizophrenia. By understanding where and how patients can access low cost antipsychotic medications, providers may be able to provide patients with the best possible treatment option for the patient regardless of cost.

REFERENCES

Alghanem, N., Abokwidir, M., Jr, A. B. F., Feldman, S. R., & Alghanem, W. (2017).

Variation in cash price of the generic medications most prescribed by

dermatologists in pharmacies across the United States. *Journal of Dermatological

Treatment*, *28*(2), 119–128. https://doi.org/10.1080/09546634.2016.1182614

Alpern, J. D., Stauffer, W. M., & Kesselheim, A. S. (2014). High-Cost Generic Drugs —

Implications for Patients and Policymakers. *New England Journal of Medicine*,

371, 1859–1862. https://doi.org/10.1056/NEJMp1408376

Alpern, J. D., Zhang, L., Stauffer, W. M., & Kesselheim, A. S. (2017). Trends in Pricing and

Generic Competition Within the Oral Antibiotic Drug Market in the United States.

Clinical Infectious Diseases, *65*(11), 1848–1852.

https://doi.org/10.1093/cid/cix634

Arora, S., Sood, N., Terp, S., & Joyce, G. (2017). The price may not be right: the value of

comparison shopping for prescription drugs. *The American Journal of Managed

Care*, *23*(7), 410–415.

Cloutier, M., Aigbogun, M. S., Guerin, A., Nitulescu, R., Ramanakumar, A. V., Kamat, S.

A., … Henderson, C. (2016). The Economic Burden of Schizophrenia in the United

States in 2013. *The Journal of Clinical Psychiatry*, *77*(6), 764–771.

https://doi.org/10.4088/JCP.15m10278

Correll, C. U., Leucht, S., & Kane, J. M. (2004). Lower Risk for Tardive Dyskinesia

Associated With Second-Generation Antipsychotics: A Systematic Review of 1-

Year Studies. *American Journal of Psychiatry*, *161*(3), 414–425.

https://doi.org/10.1176/appi.ajp.161.3.414

Dave, C. V., Hartzema, A., & Kesselheim, A. S. (2017). Prices of Generic Drugs Associated

with Numbers of Manufacturers. *New England Journal of Medicine*, *377*(26),

2597–2598. https://doi.org/10.1056/NEJMc1711899

Department of Health and Human Services. (2016, January 27). Understanding Recent

Trends in Generic Drug Prices. Retrieved February 3, 2018, from

https://aspe.hhs.gov/pdf-report/understanding-recent-trends-generic-drug-

prices

Erickson, S. R., & Workman, P. (2014). Services provided by community pharmacies in

Wayne County, Michigan: A comparison by ZIP code characteristics. *Journal of

the American Pharmacists Association*, *54*(6), 618–624.

https://doi.org/10.1331/JAPhA.2014.14105

Food and Drug Administration. Questions & Answers - Generic Drugs: Questions &

Answers [WebContent]. Retrieved February 24, 2018, from

https://www.fda.gov/Drugs/ResourcesForYou/Consumers/QuestionsAnswers/uc

m100100.htm#q1

Gellad, W. F., Choudhry, N. K., Friedberg, M. W., Brookhart, M. A., Haas, J. S., & Shrank,

W. H. (2009). Variation in Drug Prices at Pharmacies: Are Prices Higher in Poorer

Areas? *Health Services Research*, *44*(2 Pt 1), 606–617.

https://doi.org/10.1111/j.1475-6773.2008.00917.x

Harris, P. A., Taylor, R., Thielke, R., Payne, J., Gonzalez, N., & Conde, J. G. (2009).

Research electronic data capture (REDCap)—A metadata-driven methodology

and workflow process for providing translational research informatics support.

Journal of Biomedical Informatics, *42*(2), 377–381.

https://doi.org/10.1016/j.jbi.2008.08.010

Hauptman, P. J., Goff, Z. D., Vidic, A., Chibnall, J. T., & Bleske, B. E. (2017). Variability in

Retail Pricing of Generic Drugs for Heart Failure. *JAMA Internal Medicine*, *177*(1),

126–128. https://doi.org/10.1001/jamainternmed.2016.6955

Kane, SP. (2018, February 3). The Top 300 of 2018 Clin Calc DrugStats Database, Version

18.0. Retrieved February 26, 2018, from

http://clincalc.com/DrugStats/Top300Drugs.aspx

Kullgren, J. T., Segel, J. E., Peterson, T. A., Fendrick, A. M., & Singh, S. (2017). Availability

and variation of publicly reported prescription drug prices. *The American Journal

of Managed Care*, *23*(7), 444–448.

Lehman, A. F., Lieberman, J. A., Dixon, L. B., McGlashan, T. H., Miller, A. L., Perkins, D. O.,

… Steering Committee on Practice Guidelines. (2004). Practice guideline for the

treatment of patients with schizophrenia, second edition. *The American Journal

of Psychiatry*, *161*(2 Suppl), 1–56.

Lieberman, J. A., Stroup, T. S., McEvoy, J. P., Swartz, M. S., Rosenheck, R. A., Perkins, D.

O., … Hsiao, J. K. (2005). Effectiveness of Antipsychotic Drugs in Patients with

Chronic Schizophrenia. *New England Journal of Medicine*, *353*(12), 1209–1223.

https://doi.org/10.1056/NEJMoa051688

Moshtaghi, O., Haidar, Y. M., Ghavami, Y., Gu, J., Moshtaghi, A., Sahyouni, R., … Djalilian,

    H. R. (2017). Price variation in the most commonly prescribed ear drops in

    Southern California. *The Laryngoscope*, *127*(8), 1780–1784.

    https://doi.org/10.1002/lary.26479

Qato, D. M., Daviglus, M. L., Wilder, J., Lee, T., Qato, D., & Lambert, B. (2014). 'Pharmacy

    Deserts' Are Prevalent In Chicago's Predominantly Minority Communities,

    Raising Medication Access Concerns. *Health Affairs*, *33*(11), 1958–1965.

    https://doi.org/10.1377/hlthaff.2013.1397

Tsai, J., Klee, A., Rosenheck, R. A., & Harkness, L. (2014). Internet Use Among Veterans

    With Severe Mental Illness. *Psychiatric Services*, *65*(4), 564–565.

    https://doi.org/10.1176/appi.ps.201300432

Yanos, P. T., Lu, W., Minsky, S., & Kiely, G. L. (2004). Correlates of Health Insurance

    Among Persons With Schizophrenia in a Statewide Behavioral Health Care

    System. *Psychiatric Services*, *55*(1), 79–82.

    https://doi.org/10.1176/appi.ps.55.1.79

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