**Can Adopting Data Science Help Local Pharmacies?**

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**Abstract**

This white paper is written with the intentions of proposing my idea of artificial intelligence into a local pharmacy business. I will be going through how a local pharmacy functions, how the pharmaceutical industry has been using data science, what my idea is, and how my idea can be an efficient way for a local pharmacy to be more profitable.

**Introduction**

The pharmaceutical industry is one industry that will be around for as long as people need medicine. Like most industries, it is changing constantly. New drugs and new ways to help people’s medical needs are being discovered all the time. The healthcare industry is constantly changing as well. In 2017, health care has become the USA’s largest job employer.1 These two industries are highly correlated. More people with access to healthcare requires more prescriptions and OTC items to be bought.

Like these industries, the way pharmacies function constantly changes. Local pharmacies are in competition with chain pharmacies in servicing the local population. More customers are being drawn into chain pharmacies like CVS and Walgreens for their services rather then going to a local pharmacy. There are many reasons for this: they can offer the customer lower copays, they have a larger selection of OTC products available, and they offer other services local pharmacies don’t have. CVS bought out the health insurance company Aetna that covers over 20 million Americans with insurance.2 That is 20 million less customers local pharmacies would have had the opportunity to service. Along with this competition, local pharmacies must deal with the rise of employee salaries. Minimum wage has risen over 50% in New York in the last three years and it seems as if more states are following their lead.

So why would anyone want to own a local pharmacy with all these obstacles making it seem like it is a definite failure? Although it might not seem that way right now, the purpose of this white paper will be to show how a small business such as a pharmacy can implement data science methods and techniques to help find solutions to their problems and make their business successful. I will be showing you this through my research, data I have from a local pharmacy, and proposal for a way in which local pharmacies can become more profitable. Not every local pharmacy will have the same data and problems to solve as the one I am using for this paper. However, they generally are run the same and my paper will be written as a way for all business owners to see how data science can be used to help increase their small business’s profit.

**How a Pharmacy Functions**

The local pharmacy I am using has many separate parts for it to function as a store. Through these parts, the pharmacy produces a lot of data. This data consists of over the counter (OTC) inventory and sales, prescription drug inventory and sales, distribution of medicine through pickup or delivery, supply purchases, and employee salaries. Pharmaceutical software and Linux servers are used to handle this data. Like most of the data in the world today, it is not used for anything. All this data is saved for is for if the pharmacy gets audited, they have their records on file. The data I will be using from these parts will be the OTC and prescription drug inventory and sales data because of what I believe the data can help find in helping the pharmacy become more profitable. All patient related data will be kept private as I will be only using the pharmacy’s sales data.

***OTC***

The local pharmacy has two long rows, about 20 feet long and 8 feet high, of OTC items for people to buy. There are also some items we can sell without a prescription, but you need to show ID for behind the counter. Each section is dedicated to some part of the body such as stomach, eye, etc. These items are sold at a standard markup price for each item given to the pharmacy by the distributor they use. Some OTC items are given a small profit percentage while others are given a larger one. The pharmacy is legally not allowed to charge more than the price they are given. Because it is a small pharmacy and OTC items do not sell that quickly, there is usually a small amount of each item, ranging from 1-3 in stock.

***Prescription***

The local pharmacy has walls in the back with shelves filled up with all prescription drugs used to fill people’s prescriptions. They are organized by brand name and each spot on the shelves has the generic and brand name drug. Most generic medications that are distributed often are ordered daily to keep enough stock in the store. Brand name drugs are way more expensive then generic drugs, so they are ordered more to supply a demand rather then keep in stock. Profit is made mostly from selling the generic drugs at this local pharmacy. They can buy the generic drugs at prices from distributors where they can make a profit from the customer’s insurance plan and/or legal copay they charge them. Brand name drugs are too expensive from distributors and pharmacies usually can’t make a profit from them or even sometimes lose money.

**Data Science in the Pharmaceutical Industry**

There are a few reasons in which customer’s still go to local pharmacies over the massively growing chain ones. One of these reasons is that the service you receive is more genuine then at the other pharmacies. At local pharmacies you can have a friendly conversation with the pharmacist and get to know the people that work there while they work their best to try to answer all your questions. Another reason is that you can work with the pharmacist to help figure out the best medication for your symptoms and work on getting the lowest copays they can give you for your medication. All these loyal customers will come to your local pharmacy for these reasons, but you never know when they will leave and go to a cheaper alternative pharmacy that the local one can’t compete with price wise. With using data science, you want to give these customers a reason to stay and continue to grow this base by optimizing their experience and comfortableness of your pharmacy.

There is so much pharmaceutical data available that data science has been introduced to this field in the past. A decade worth of patient information and drug sales history are available for any pharmacy ranging from a very small to a large one.3 This is legally required for pharmacies to keep stored as this information needs to be available. However, most of the data has only been analyzed in the past through business intelligence tools. Predictive modeling and artificial intelligence methods on the data have been introduced more over the last 5 years. Here I will give some examples on how data science has already been implemented into the pharmacy industry.

***Cognitive Services***

Most pharmacies use a specific pharmaceutical software that I mentioned earlier to fill all their prescriptions through. This software also accesses the servers with all the patient and prescription data so that the pharmacists can know the history of a patient. Another thing this software is used for is to bill insurance companies through a person’s health insurance information. In the past, pharmacies have used this software only for back end needs. However, recently these software companies have developed phone applications that allow the customer to interact with the pharmacy. Customers are given a way to make their own login name and password through their social security number. These applications give the customer access to their past prescription history and allow them to send the pharmacy refill notifications through them when they are ready for a refill.

Another main reason people come into the local pharmacy which I also mentioned earlier is to have the assistance they need to buy an OTC item to make them feel better. Pharmacies have been developing chatbots through their own web services that would help give their customers the support they need through them.4 Customers could now get the same care they receive at the store with answers the pharmacists would have given them through a trained bot that people can access at home at any time. This has shown to be important for a local pharmacy to have because even with urgent cares becoming popular these days, people will look to a free alternative to getting the medical help they need. There would be no reason for them to spend the money to see a doctor when the doctor could just be telling them to buy an OTC item. These bots are working on eliminating the need for many employees and the pharmacist from answering questions so they can work more efficient hours.

***Artificial Intelligence***

Artificial intelligence is where the many aspects of data science that are being used to benefit pharmacies come together. Pharmacies can now collaborate with doctor’s offices to have access to the patient’s health records through artificial intelligence; something they have been left out of for decades.5 This can completely change the way pharmacists can treat patients. The pharmacist will now have determined treatment options based on predictive analytics to give the patient the care they need.5 Analytics based off patient information has the highest of accuracy because of all the tests and deep learning algorithms this data is run through and all the years of data collection both pharmacies and doctor’s offices have. It makes logical sense for these two industries to merge their data for the better of the people because of how closely related they are.

**Proposal**

Based off all this information I have given you about pharmacies and data science, I have come up with an idea for a way in which I can use data science in order to help a local pharmacy become more profitable.

As I mentioned earlier, local pharmacies make most of their money through the volume of sales they make. There is a certain set profit they can make on all OTC, generic, and brand name prescriptions. However, there is no set price in which the pharmacies can buy these items for from the distributors. The prices of brand name prescription items and OTC items in which the pharmacies buy them from their distributors are pretty much set. Generic prescription prices however vary by distributor based on quantity, demand, and how much you are buying.

My idea is to create a bot that uses artificial intelligence to log into these distributor websites that the local pharmacy has access to and constantly be scanning the prices of these generic drugs to look for patterns. These patterns can determine which company sells which drug for the cheapest amount, what time is the best time to buy what drug, and what drugs fluctuate the most in price. In addition to this, I would like to program the bot to use machine learning to predict the amount of prescriptions each generic drug will be used to fill for month by month. This will help the pharmacy know how many of each drug they need to order for the month and when the price of the drug reaches a low point, they can order it in bulk to save the most money they can. Cutting down the price of generic drugs the pharmacy buys can make a huge impact in the pharmacy’s profit. This is because most prescriptions today are filled to be generic; about 85%.

**Discussion**

Some controversy that could come from my idea is that each local pharmacy might have different payment schedules to distributors rather then bi weekly like the pharmacy that I used to come up with this idea does. Pharmacies could not afford to buy these generic drugs in bulk to keep in stock as they are not getting paid for them that far ahead of time.

Another argument that could be made is there are similar websites right now such as PharmSaver6 that scan through all distributors to find the lowest prices for these drugs today. This website’s idea has the intentions of saving local pharmacies money on their generic drugs like mine. However, my idea will be specific to each pharmacy drug needs and will be using their own data to predict how much of each drug the pharmacy will fill per month. PharmSaver only uses prices for when you need something the next day. My idea has the potential to save pharmacies even more money by getting the drugs at the month low price rather the that exact time you log onto their website low price.

**Conclusion**

I think that my idea is very doable considering how much data pharmacies gather and do not use. The goal of my paper was to show you how a local pharmacy can use their data to make a larger profit. My idea is not limited to only pharmacies. Any small business that buys their products from distributors that fluctuate in prices can use this bot to save money. The hardest part of my idea will be convincing a small business to let data science control your decisions but once they see an increase in profit, I’m sure you’ll have the owners hooked.

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