Case Study

Inventory Management Excellency by Advanced Analytics in Retail Pharmacy

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Domain

Pharmaceutical

Problems

Pharmacy's underperformed-inventory management is the direct cause that may lead to discontinuity or interruptions during patient's medication.

Pharmacists need more technological facilitators to fully support patient adherence.

Solution

An AI model that provides an estimated drug consumption for the following period, which was analysed based on a dataset of 3-year transactions from nearly 100 pharmacies.

Benefits

Increasing overall performance by reducing overheads from small-frequent-purchases.

Improving stock planning with accurate drug-consumption estimation.

Enhancing prescribing process and patient's medication control.

Content

Abstract

Together with the individual variability in genes and lifestyle, comes the emerging approach for disease treatment and prevention[1]. Consequently, the pharmaceutical industry turns to advanced technology as a lifevest to achieve effective precision medication.

While innovative drugs are the long-term goal of the whole industry, supply chain performance seems to be an urgent issue. It is predicted that in 2020 and on, supply chain function is becoming a revenue-generating, and the distribution channels are diminishing the role of wholesalers[2]. Thus, the retail pharmacy has never been more mainstreamed. The sector is incorporating next-gen technologies to advance their operation and keep a high cart value.

This paper presents how retail pharmacies can leverage AI and Predictive Analytics to transform their inventory and distribution activities, as well as creating the environment for patients to access any medicine at their convenience.

The Two Problems in Retail Pharmacy and Their Effects

Pharmacy's underperformed-inventory management

Pharmacists' neglection to interact with patients

Pharmacy's underperformed-inventory management

Reaching a retail pharmacy, a patient expects to have **correct medication** for their needs, with the **exact requested amount**. In reality, it is common for a patient to make a few trips to different pharmacies before they can get the right drugs or just to get enough pills for a week supply. Not mentioning geographical factor, the most common reason for that inconvenience points at the underperformed inventory management.

Pharmacists' neglection to interact with patients

Besides, pharmacies nowadays weigh-in more to the overall healthcare industry and pharmacists are more aware of their role in managing patients medication. Reports show that **86% of pharmacists believe they should manage patients panels, perform patients assessments (62%) and indicate/adjust/discontinue medication (77%)[3].**

Despite that, pharmacies sometimes neglect to interact with patients, such as reminding patients to the next prescriptions, identifying seasonal diseases to stock up on seasonal medicines, or studying more on patients purchasing habits for inventory readiness of some pharmacies. This interaction can be improved if the inventory system can predict and notify pharmacists of relevant information.

The Two Problems in Retail Pharmacy and Their Effects

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The two problems of inefficient medicine inventory management and reactive demand fulfilment may lead to two results to patients:

(a) **Potential health risks due to the lack of immediate medication or the wrong prescription.** The NewYork Times once pointed out a few cases in which an asthmatic patient and another allergic patient were put at risk after given the wrong medication by pharmacists[4].

(b) **Early discontinuity or unwanted interruption to patients' treatments.** While the continuity of medication is vital to some patients with multiple chronic conditions[5], the performance of pharmacy is indirectly contributing to the patient dedication[6].

Looking for Solutions in Technology

An AI model that provides an estimated drug consumption for the following period, which was analysed based on a dataset of 3-year transactions from nearly 100 pharmacies.

How can retail pharmacies improve their operational performances and get patient commit to their medications?

Pharmacists are using IT system for their daily work, such as medication records, labelling, order and stock control. However, many functionalities have been neglected or undiscovered; for instance, medication records could be utilized for predictive analysis to plan inventory and make order early. Thus, pharmacies are relying more and more on advanced technologies to improve their operation. The partnership between pharmacies and IT software providers has never been more crucial.

Our client, a leading IT software provider, specializes in hospitals/ clinics and medical-related IT services, has realized that harnessing the power of data and automation in pharmacies can spur overall efficiency for the healthcare industry. They implement a smart system for an inventory-distribution-order process that could effectively manage drugs. The system has been widely used by nearly 50% of the national pharmacy chain.

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Nonetheless, expecting a more accurate predictive analysis, the Client collaborates with FPT to leverage AI to advance the system to the next level. The new features provide an estimated drug consumption for the following period. This analysis focuses on solving the industry's problems better:

- **Improve inventory & stock management:** pharmacy inventory readiness is crucial to any patient's medication. The estimation can assist pharmacists in placing more accurate orders;
- **Enhance pharmacist-patient communication:** The estimation for future prescriptions can help pharmacists keep up with current patients and monitor their adherence.

With a database of 3-year of transactions from nearly 100 pharmacies in Tokyo, medications have been divided into four categories based on their characteristics (Illustration 1):

- **Long-term prescriptions of periodically-taken medicines:** medicines for chronic conditions with more than 14-day-supply per one prescription, using more than 2 prescriptions
- **Short-term prescriptions of periodically-taken medicines:** medicines for common diseases with up to 14-day-supply per one prescription, using up to 2 prescriptions
- **Long-term prescriptions of frequently-taken medicines:** medicines for chronic conditions with more than 7-day-supply per one prescription, using more than 2 prescriptions
- **Short-term prescriptions of frequently-taken medicines:** medicines for common diseases with up to 7-day-supply per one prescription, using up to 2 prescriptions

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The database is analysed to identify the estimated amount of medicines that will be purchased in a certain amount of time. The outcome is required to have lowest variables, which means higher accuracy of the analysis.

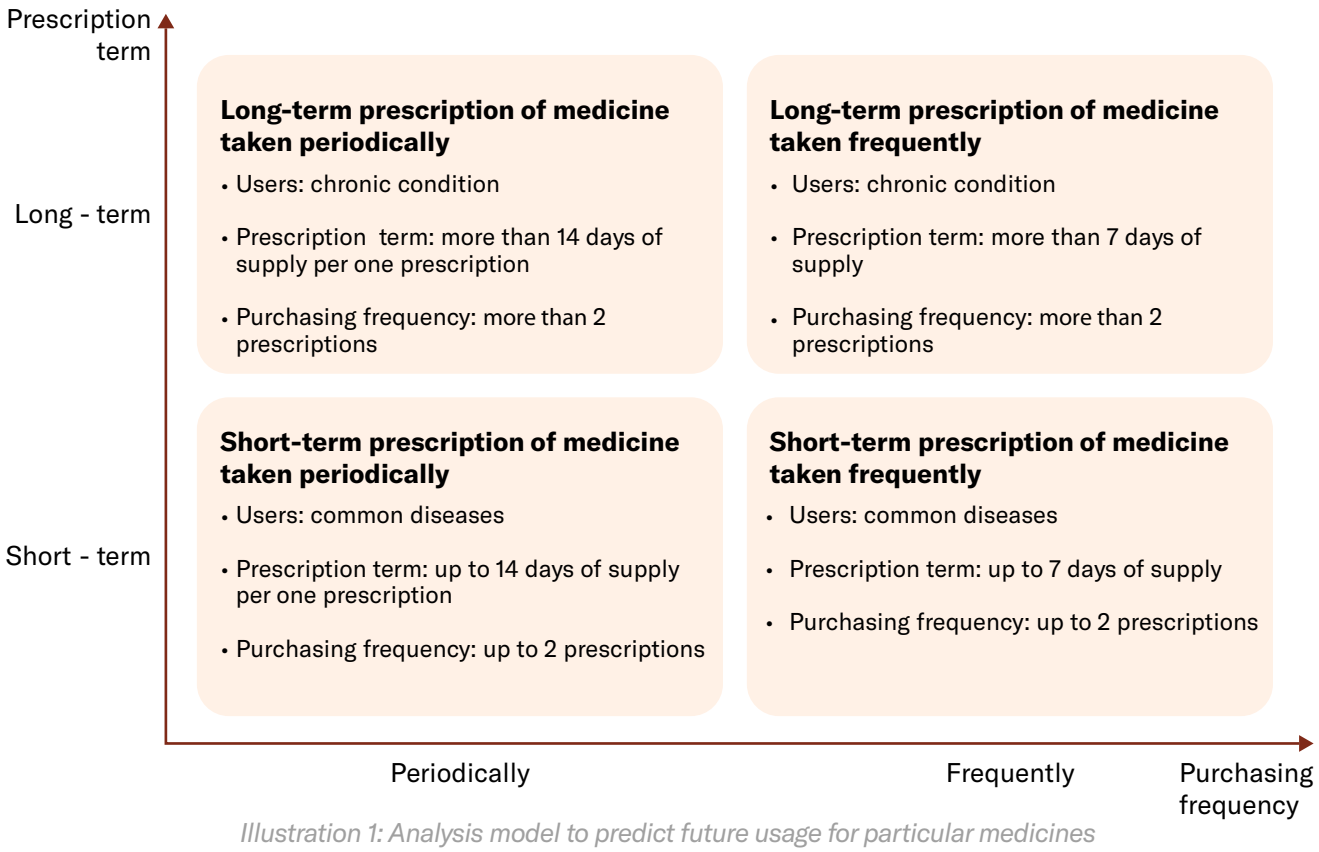

Illustration 1: Analysis model to predict future usage for particular medicines

The new system brings synthesis insights and analytics that help interpret data into actionable results. The observed value benefits not only pharmacists but also pharmacy's managers directly and patients indirectly (illustration 2).

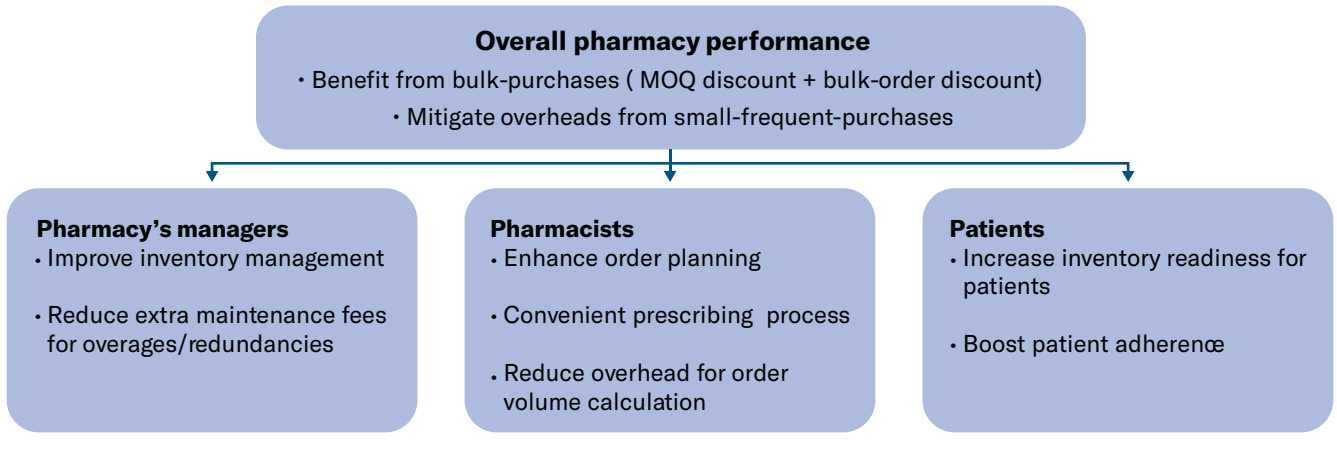

Illustration 2: Beneficiaries from the new analysis model

The Results

Increasing overall performance by reducing overheads.

Improving stock planning with accurate drug-consumption estimation.

Enhancing prescribing process and patient's medication control.

After 6 weeks of implementing the analysis for two particular medicines, the system results in the amount of each medicine taken for the following month with lowest variables:

- Analysis model to predict the future usage of medicine A within a month lowers the variables from 5% to 2.5% compared to before application;
- Analysis model to predict the future usage of medicine B within a month lowers the variables from 4.67% to 0.92% compared to before application.

The estimation can be calculated on-demand by different factors, such as ages, seasonal diseases, peak time purchase by hourly/weekly/monthly order.

As AI and Data Analytics are becoming the most desired technologies in pharmaceutical industry beside RPA and Telemedicine, the analysis model is expected to open other doors for a better and smarter way pharmacies work. This model is believed to approach further and apply to drug manufacturers, making all three elements of the supply chain communicate excellently.

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