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Pharmaceutical Supply Chain in Vietnam: Innovating Independent Community Pharmacy Services with Smartphones

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Abstract:- The healthcare industry is constantly evolving and striving to embrace the latest forms of technology to optimize functionality in the healthcare system. Many opportunities for smartphone applications tailored to the healthcare sector are now emerging. The emergence of the COVID-19 epidemic led to a reduction in direct person-to-person contact. Customers can use the smartphone app to search for pharmacies in the area. Pharmacists, through the remote consultation app, perform pharmaceutical care and deliver medicines to the home. This study aims to present a solution with a connected mobile application that forms an ecosystem around community of independent pharmacy in Vietnam. Research and develop applications on mobile phones as a solution to connect pharmacy care services at community pharmacies to drug buyers and users. The research results have registered an industrial mark in Vietnam and developed application products on mobile phones to be implemented in reality for users.

Keywords:- *Telemedicine; E-Pharmacy; Supply Chain; Mobile Application; Communication Pharmacy.*

I. INTRODUCTION

Many studies show that with the development of the social economy, the wide application of information technology improves traditional industries' work efficiency, reduces enterprises' operating costs, and improves services[1]. In the field of pharmaceuticals and healthcare in Vietnam, many customers have a habit of going to the store to tell their illness, asking the pharmacist for advice, and buying medicine. In addition, pharmaceuticals are not products sold online, so modern drug retail chains are still limited in attracting customers. The traditional independent pharmacy model in Vietnam still has a lot of potentials[2]. Pharmacy retail establishments have not yet operated in-home community-care pharmacy services [3, 4].

The disease caused by coronavirus 19 (COVID-19) is spreading rapidly from China and globally. In the face of a violent increase in COVID-19 cases, pharmaceutical services are one of the key pillars of public health to prevent and contain the COVID-19 pandemic. Developed countries are leveraging a wide range of community pharmacy services to improve access to essential health care and medical services. Pharmaceutical care goes beyond a community pharmacy's usual operations (reviewing medications, assisting with prescriptions, and advising patients) [5]. A well-designed mobile access and mobile platform technology application helps pharmacies have health plans to meet the healthcare needs of the surrounding community when needed and convenient for customers[6]. Changing patient behavior and a contactless economy have made the immediate and complex free delivery value proposition attractive [7]. New business models in the pharmacy ecosystem are driven by the COVID-19 pandemic[8].

Number, contributing to promoting the provision and access of medical services quickly, anytime, and anywhere[8]. In Vietnam, policies to develop research and application of new information technology to improve the utilization rate of existing resources are urgent to achieve economic and social development requirements. Vietnam's Ministry of Health promulgates a health digital transformation program to 2025, with a vision of 2030. The Ministry of Health wishes that the digital transformation process will impact, leading to a positive change in the health sector's activities in providing and accessing health services from traditional methods to technology-based ones[9].

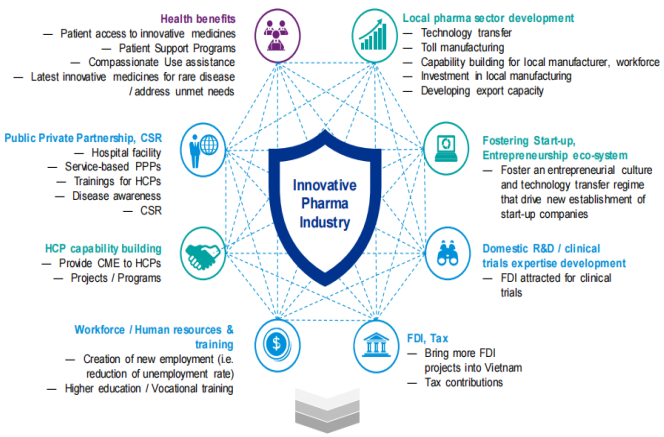

Fig. 1. *Developing the innovative pharmaceutical industry in Vietnam*

"Fig. 1," developing the innovative pharmaceutical industry in Vietnam will drive sector and economic growth and improve health outcomes. Vietnam is known to be the 13th most populous country globally, with about 96 million in 2018. A rapidly aging population is likely to accelerate age-related diseases such as diabetes: sugar, and cardiovascular problems. Meanwhile, Vietnam has reached the status of a low-middle-income economy. Growing disposable income is likely to boost consumer spending in holistic healthcare services and pave the way for innovative healthcare solutions. Vietnam has the potential to increase its domestic innovative pharmaceutical market[10].

Pharmacy service innovation is seen as a valuable addition to the pharmacy. It is a clear strategic direction that guides the overall strategic flexibility in the pharmacy, not just with regards to service delivery. Information technology is also used as a key element of service delivery. This is only successful when the pharmacy owner is committed to service delivery and seeks to improve [5].

This article provides information on designing an application model on mobile phones, serving the needs of drug buyers and users for pharmacy services in Vietnam. This study aims to develop a mobile application design model with the relationship between the independent pharmacy and the customer connection. Customers can interact and exploit the services the pharmacy provides.

II. RESEARCH APPROACH

The definition of a community pharmacy varies from country to country. However, most define it as a type of health care facility that provides specific services or with a certain mission in medicine. Current definitions of pharmacy services do not include the provision of complete community pharmacy services. They focus on defining services arising from the concept of pharmacy care or are otherwise limited for specific services provided by a pharmacist [3]. In Vietnam, community pharmacies are chain pharmacies and independent pharmacies. The Ministry of Health stipulates good practice for drug retailers that "Drug retailing" is a professional activity of a drug retailer, including the supply and retail of drugs directly to drug users along with providing advice and guidance on safe and effective drug use for users"[11]. "Fig. 2," the pharmaceutical supply chain is the vehicle through which medicines are delivered to patients[12]. Many studies have published many variations from the basic structure of the supply chain, the organizations and individuals involved in the supply chain are constantly evolving, and commercial relationships are also very different due to geography, type of medicine, and other factors [12, 13].

Before researching to design mobile app pharmacy services for independent pharmacies in the community: The first step, we performed a cross-sectional study, interviewing and collecting opinions about pharmacy service in 2018. This is a descriptive study of the service characteristics of pharmacies, using a questionnaire designed from a literature review and asking for comments from pharmaceutical experts and pharmacists at community independent pharmacies. "Table 1" a random survey was sent to Ho Chi Minh City[14]. Ho Chi Minh City is one of the largest cities in Vietnam. The study results show the current state of the pharmaceutical care service in community pharmacies, the final step of the pharmaceutical supply chain in Ho Chi Minh City. Results of pharmacies' location reveal that majority of independent pharmacies and chain pharmacies have a good and very good site. Both groups think there should be regulations of distance among pharmacies. This result shows that the location of a pharmacy is one of the key factors influencing its services and business. Pharmacies in the community are unevenly distributed, mainly in the areas surrounding the hospital and private clinics. Regulations on distance among community pharmacies should be implemented to ensure the adequate supply of drugs and pharmaceutical care services to the community

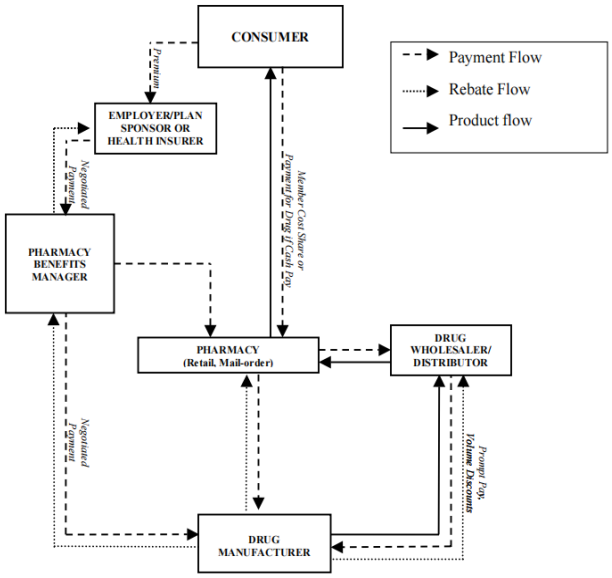

Fig. 2. *The U.S. Commercial Pharmaceutical Supply chain*

The next step, the literature review was carried out by retrieving documents from domestic and foreign research articles based on primary theoretical classification and status of research related to internet technology, mobile health system mobile, smart hospital, hospital information system…[1]. Approved materials include journal articles, conference papers, and edited volumes[15]

III. RESEARCH SETTING AND ACTION PLANNING

The study proposes a model to connect the participation between pharmacies and drug buyers and users, which is a model with many potentials. It is the basis of the pharmacy's service definition. Retail pharmaceutical supply chain, independent pharmacies need to improve pharmacy care services better, focusing on human-centered collaboration with pharmacy services at the pharmacy. The main feature of this model is the participation of pharmacists with customers, based on the ability to promote images and suitable products

and services, from service delivery through customer loyalty. It accompanies the sale "[5].

We all know that the average person goes to the pharmacy more often than the doctor. This makes the pharmacist's pharmacy the most frequent interaction in the entire healthcare system. It's not just the frequency of visits that makes the pharmacy important in terms of care, but also its place in the healthcare ecosystem. “Fig. 3,” we are building an ecosystem for the independent pharmacy that enables greater convenience, expanded accessibility, and personalization to meet the new needs and expectations of our customers[7]. Three main trends drive this separation: (i) Directly to consumer models that address convenience and easy customer experience; (ii) Cash to reduce costs for the pharmacy model of pharmacy care to address the need ; (iii) End-to-end data integration addresses the need to measure health-based outcomes and provide more personalized services [7]. The pharmacy is truly the central node in the pharmaceutical supply chain, working on the relationships of the patient, supplier, payer, and manufacturer. The model connecting the participation of private retail pharmacies and drug buyers and users according to supply chain management theory[16]:

- **Connectivity**: Members with a smartphone vehicle participating in the ecosystem, even geographically distant, can still interact and communicate through the internet, electronic data transfer, and many more tools.
- **Visibility**: Visibility in the ecosystem helps users in real-time, allowing for behavioral adjustments. The parties involved in the generation system eliminate waste, saving costs and time.
- **Collaboration:** With the ability to connect and display, information is like a "glue" between suppliers and customers in the ecosystem. The application facilitates easy data sharing and cooperation while ensuring information security.
- **Optimal:** The stakeholders in the ecosystem can make appropriate decisions regarding the relevant service/commodity standards, determine the trustworthiness of where to buy products from the physical pharmaceutical supply chain real.
- **Operations:** The application promotes daily and hourly business process activities conveniently and quickly. Information is connected, displayed, and shared among members for better storage management.

TABLE 1: SURVEY RESULTS RELATED TO PHARMACEUTICAL CARE AT COMMUNITY PHARMACIES IN HO CHI MINH CITY

		no interference		Poor		fair		Good		Very good	
Item	**Pharmacy**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**
Convenient location for a drug retailer	Independent	0%	0	1.4%	1	23.6%	17	34.7%	25	40.3%	29
	Chain	0%	0	6.1%	2	15.2%	5	36.4%	12	42.4%	14
Regulations on distance among community pharmacies	Independent	1.4%	1	9.7%	7	18.1%	13	38.9%	28	31.9%	23
	Chain	3.0%	1	21.2%	7	12.1%	4	45.5%	15	18.2%	6
Room for patient counseling	Independent	1.4%	1	26.4%	19	45.8%	33	25.0%	18	1.4%	1
	Chain	0.0%	0	18.2%	6	45.5%	15	24.2%	8	12.1%	4
Use of information technology in drug management (buying and selling).	Independent	2.8%	2	11.1%	8	19.4%	14	43.1%	31	23.6%	17
	Chain	0.0%	0	3.0%	1	21.2%	7	48.5%	16	27.3%	9
Use of information technology in patient management.	Independent	8.3%	6	16.7%	12	30.6%	22	34.7%	25	9.7%	7
	Chain	6.1%	2	21.2%	7	24.2%	8	30.3%	10	18.2%	6
Use of available soft wares in Vietnam to control drug interactions.	Independent	8.3%	6	12.5%	9	33.3%	24	37.5%	27	8.3%	6
	Chain	9.1%	3	6.1%	2	30.3%	10	45.5%	15	9.1%	3
Monitoring adverse reactions of drugs according to ADR center guides.	Independent	2.8%	2	18.1%	13	37.5%	27	31.9%	23	9.7%	7
	Chain	0.0%	0	0.0%	0	36.4%	12	54.5%	18	9.1%	3
Consultation, discussion with a doctor in case of a non-logical prescription	Independent	0.0%	0	11.1%	8	27.8%	20	43.1%	31	18.1%	13
	Chain	0.0%	0	0.0%	0	30.3%	10	42.4%	14	27.3%	9
Participation in training courses, improving the skills of pharmaceutical care	Independent	4.2%	3	11.1%	8	20.8%	15	36.1%	26	27.8%	20
	Chain	0.0%	0	6.1%	2	33.3%	11	48.5%	16	18.2%	6
Training staff and responding to patients ‘questions directly by the pharmacist	Independent	4.2%	3	13.9%	10	11.1%	8	30.6%	22	40.3%	29
	Chain	0.0%	0	0.0%	0	15.2%	5	57.6%	19	27.3%	9
Building patient education program in some chronic diseases.	Independent	1.4%	1	11.1%	8	27.8%	20	34.7%	25	25.0%	18
	Chain	0.0%	0	0.0%	0	33.3%	11	45.5%	15	21.2%	7
Patients counseling via telephone or by coming home	Independent	16.7%	12	34.7%	25	26.4%	19	22.2%	16	0.0%	0
	Chain	6.1%	2	34.7%	12	39.4%	13	18.2%	6	0.0%	0
Listing drug price and not sell higher than the list price	Independent	0.0%	0	5.6%	4	25.0%	18	41.7%	30	27.8%	20
	Chain	0.0%	0	0.0%	0	18.2%	6	45.5%	15	36.4%	12
Participation in the pharmaceutical market stabilization program of Ho Chi Minh City Health Department	Independent	2.8%	2	4.2%	3	27.8%	20	34.7%	25	30.6%	22
	Chain	0.0%	0	0.0%	0	9.1%	3	63.6%	21	27.3%	9

A total of 105 respondents: 73 independent pharmacies and 32 chain pharmacies.
Issues related to pharmaceutical care at community pharmacies were evaluated on a 5-point scale, where 1 = no interference and 5 = very good. Level of confidence 95%

- **Speed:** Applied as an information technology solution to help suppliers respond quickly to customer requirements in terms of space and time to support the physical pharmaceutical supply chain.

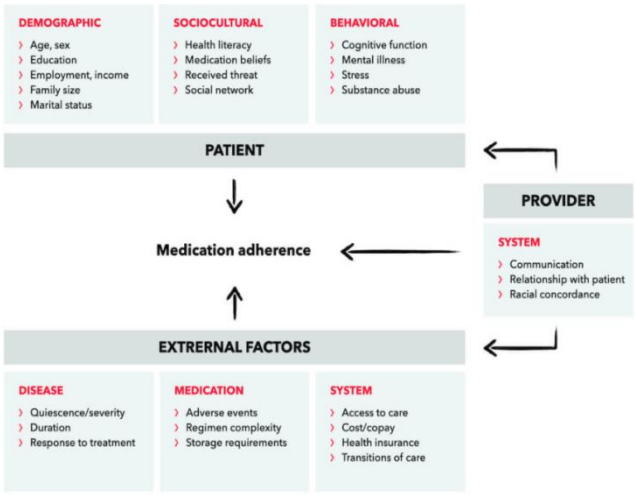

Fig. 3. *Collaborative pharmacists help patients stay compliant between doctor visits and pharmacy visits.*

This study develops an application for pharmacy services of independent pharmacies in the pharmaceutical supply chain on smartphones. Solutions and features to solve real-world problems of Tele-pharmacist and supply chain management theory:

- Locate all independent pharmacies participating in the pharmacy network. Application users can see pharmaceutical retail establishments meeting the standards of good pharmacy practice licensed by the state management agency.
- The application provides a list of pharmacies participating in creating a pharmacy ecosystem. Customers connected to the ecosystem are directed to the pharmacy. Application users can see the certificate of good pharmacy practice issued to the pharmacy by the state agency.
- Summary and claim history of pharmaceutical and medical beneficiaries. Connecting app users contact pharmacists for advice and purchase products
- Customers send pictures of doctors' prescriptions and clinical advice from community pharmacists. Application users can make product purchasing decisions with the pharmacy. The pharmacy where the product is responsible. Customers can reduce the risk when buying products from social networks or online sales channels
- Pharmacists provide reminders and warnings about patient compliance with prescriptions.
- The pharmacy and the customer decide whether the order is received or delivered to the home.
- Scan QR code with the origin and manage purchased and used products

IV. RESULT AND DISCUSSION

Clinical applications have a beneficial impact on all patient care areas, such as diagnostic, therapeutic, and monitoring services. “Fig. 3,” they are powered by real-time or store-and-forward technology, from telephone to fax machine, e-mail, chat rooms, discussion boards, and audio and video conferencing. The choice of technology and mode of infusion depends mainly on the limitations of the setting, patient needs, and practitioner preferences. The model implementation and development results apply to users with the product launch time on June 22, 2021. We registered the intellectual property of the trademark (GP E-Pharmacy&Healthcare) as the application's logo on August 10, 2020 in Viet Nam. We made the copyright registration for the application on April 12, 2021. Currently, the application has Google's app store and Apple's app store, which users can download with the name GP e-pharmacy.

Fig. 4. *The application (GP E-Pharmacy&Healthcare) with smartphone*

“Fig. 4,” this application (GP E-Pharmacy&Healthcare) helps users to use and interact right on the smartphone according to the model shown. The study wishes to bring users a better experience with the benefits brought to the pharmacy and the community around the pharmacy:

First, a networked information technology pharmacy provides a wide range of products and services that meet all buyers' needs. Convenient customers in a specific geographical area reduce waste of time without going to the pharmacy directly actively. In addition, pharmacists connect with drug buyers and users around the pharmacy to perform pharmacy care at home[4, 17].

Second, pharmacy owners need to recognize the strengths and acknowledge the location limitations of their pharmacy with different locations. Pharmacies need to deploy services based on the suitability of the pharmacy location's physical cost in terms of pharmacy space, staff, existing resources, and infrastructure. The basis for dividing services between pharmacies is to reach more important customers than waiting for customers to buy like a traditional independent pharmacy. Traditional independent pharmacies no longer depend too much on location and space. They connect pharmacies into a network of community care pharmacies and connect and share information with other services (clinics, medical tests, medical equipment sales establishments)[18, 19].

Third, pharmacies need to have a strategy to practice cooperation with patients and customers with health care needs in the area around the pharmacy. Patients with unclear health symptoms should consult a pharmacist near their home before going to the examination and treatment facility. Buyers and users of drugs do not have to go to the pharmacy, find out the nearest pharmacy for advice, and purchase transactions[20].

Fourth, the pharmacy model is based on a network of pharmacies connected through a mobile phone application, helping control travel and prevent the spread of COVID-19 epidemic prevention and control[21]. Pharmacists actively counsel and educate patients on drug information, sales, and home delivery arrangements[22]. Implementing these telemedicine services provides access to out-of-hospital pharmaceutical care and helps reduce the risk of hospital-acquired infections[23]. The positive effects of these telemedicine services on patient care during epidemics are helpful for the pharmacy industry to establish further the professional role of pharmacists[24].

Fifth, the "branding" of independent pharmacy is seen as helpful in meeting the needs of different local market segments. The application of information technology should be given more importance in the private pharmacy retail establishments in the community [25]. Users can use the application to develop monitoring systems, identify pharmacies and create efficiency in providing quality pharmaceutical care products and services to each buyer and drug user. Customers traveling or from other localities using the application can easily find or contact the pharmacy when necessary if the local pharmacy participates in the supplier channel[19].

V. CONCLUSION

In a society with the elderly, there is a need for primary health care and reduced direct exposure to COVID-19 disease. Well-designed mobile access and mobile platform technology application help private retailers have health plans that meet the healthcare needs of the surrounding community when needed. Application of (GP E-Pharmacy&Healthcare) in research has developed. This application serves as a decision support tool for pharmacy service providers. The application builds a pharmacy ecosystem. It allows independent pharmacies to connect program members, encouraging healthy behaviors in buying and selling pharmaceuticals[26]. Pharmacists provide remote consultations and home delivery of medicines. The application is a digital marketing channel that introduces healthcare products/services advertising from pharmaceutical distributors to pharmacies and app customers.

In Vietnam, e-commerce is growing. Online buying and selling of pharmaceutical products, functional foods, and health care products is a trend of choice for everyone [27]. We recommend other studies approaching the behavior of sellers, buyers, and users of drugs. Medicine is a special commodity, the process of selling and buying drugs by prescription requires a doctor's prescription. Pharmacists need the high degree of integrity necessary to maintain health standards and fulfill their ethical responsibilities to provide optimal care to patients[28]. In the following research direction, we will evaluate users' needs and help improve the limits of the application[29].

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