A LOGISTICAL APPROACH TO FACILITATE THE TREATMENT CONTROL PROCESS FOR HOSPITAL

MỘT CÁCH TIẾP CẬN LOGISTICS ĐỂ GIA TĂNG HIỆU QUẢ QUÁ TRÌNH KIỂM SOÁT ĐIỀU TRỊ CHO CÁC BỆNH VIỆN

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Abstract: *The treatment control process in hospitals in Vietnam is still ineffective due to paper-based documents, poor information flow between related parties, incorrect data, inefficient working methods, and so on… In medical service, medication errors such as prescribing, omission, wrong time, administration error, compliance error… are very serious problems due to the negative effects on patient's health. Thus, accuracy is a must in this industry. These problems are not only apparent in Vietnam but also obvious on over the world. This article needs to show some reasons and suggest a model to solve the problem based on the logistics angle view. Some knowledge about the Logistics information system and Logistics service outsourcing model is used to facilitate the treatment control process for hospitals. This article aims to optimize the information flow, operations to increase the timeliness, accuracy, decrease the operating cost, and improve safety.*

Keywords: *Barcode, hospital, Logistics, logistics information system, outsourcing, treatment control.*

Classification code: *9*

Tóm tắt: *Quá trình kiểm soát điều trị bệnh trong các bệnh viện Việt Nam còn chưa hiệu quả bởi còn sử dụng các chứng từ giấy, dòng thông tin giữa các bên liên quan chưa được tối ưu tốt, dữ liệu còn sai sót và phương pháp làm việc chưa hiệu quả… Trong lĩnh vực y tế, các sai sót về quản lý thuốc và bệnh nhân là một trong những sai sót rất nghiêm trọng vì có thể ảnh hưởng tiêu cực đến sức khỏe người bệnh. Bài báo này sẽ đề cập đến vài nguyên nhân của vấn đề trên và đề xuất mô hình để có thể giải quyết căn bản dựa vào gốc nhìn của Logistics. Những kiến thức về hệ thống thông tin logistics và mô hình thuê ngoài dịch vụ logistics được sử dụng để gia tăng hiệu quả quá trình kiểm soát điều trị cho bệnh viện. Mục tiêu của bài báo là tối ưu hóa dòng thông tin, cách thức hoạt động để đảm bảo tính kịp thời, độ chính xác, giảm chi phí hoạt động và gia tăng sự an toàn trong điều trị.*

Từ khóa: *Bệnh viện, hệ thống thông tin logistics, kiểm soát điều trị, Logistics, mã vạch, thuê ngoài.*

Mã phân loại: *9*

1. Introduction

In Vietnam, most of the hospitals are still using paper-based documents to log the treatment process of patients. When a doctor visits his patient, he will note the status in a log and give related medical instruction (what medicine should be taken). This log is attached to the sickbed. However, not only one doctor examines this patient, every day goes by, various doctors turn by turn do this process. A doctor needs to know exactly what his colleagues did in previous days to give appropriate instruction, otherwise, the treatment process can be surrendered. Shortly afterward a nurse will prepare medicine by herself. She collects all instructions and prepares medicines altogether, no sorting for each patient is executed. She asks the patient's name and then sorts medicine basing on medical instruction.

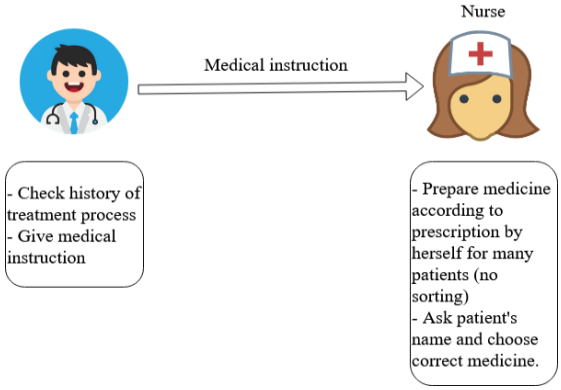

Figure 1. *A current treatment process model.*

Source. *Author.*

Using this procedure may encounter some problems. Firstly, paper-based documents can be damaged, lost due to long

time effects and insects. For some reason, the log attached to the sickbed may be lost, interchanged with others. If this situation isn't managed carefully, it might raise serious problems. Secondly, nurses might make mistakes because of handwriting characters and wrong identification of patients and medicine. There are some types of medication error such as [1]:

+ Prescribing

+ Omission

+ Wrong time

+ Improper dose

+ Administration errors including the incorrect route of administration, giving the drug to the wrong patient, extra dose, or wrong rate.

+ Compliance error such as not following protocol or rules established for dispensing and prescribing medications.

According to a research of Nguyen H., et al (2013) [2] for some hospitals in Viet Nam, for 152 cases of study, there are 65 cases of improper dose (42.8%), wrong usage (28.6%), etc… See Figure 2 for more details.

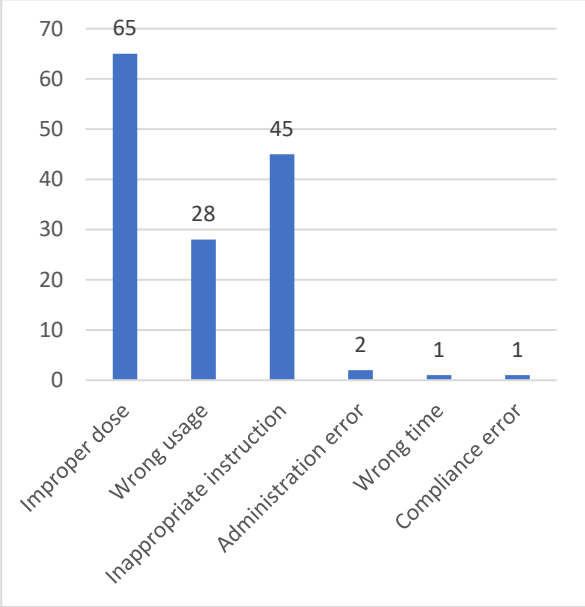

Figure 2. *Number cases of medication error from 152 cases of study [2].*

From a statistic from Viet Nam Ministry of Health (10/2019 – 5/2021) [6], it figures out that there are 12 hospitals has deployed patient portal but they are just simple one, they play a role as a e-notebooks to save all the patient data, they lack the connection with other related parties to boost the effectiveness.

In medical service, one or more medication errors are still serious problems that easily have negative impacts on a patient's health. So, it is very important to keep free of medication errors whether it is the small or big ones. Accuracy is a must in a hospital.

In this paper, the author suggests a new approach to solve this problem by applying technologies that are widely used in the Logistics industry. The author will use the barcode (or RFID – Radio frequency identification if possible), ERP (Enterprise resource planning), and outsourcing method to make this procedure easier, especially more accurate, clearer in medicine procurement and supply. A bar code is the representation of a number or code in a form suitable for reading by machines. Bar codes are widely used throughout the supply chain to identify and track goods at all stages in the process. While an ERP system – also called an ERP suite – is made up of different enterprise resource planning applications that talk to each other and share a database. However, not applying a true ERP from a famous company is ERP usage, we can use the ERP philosophy to build our system to centralize the data from other departments.

2. Solution to problems

When a patient comes into a hospital, a receptionist issues a barcode to distinguish the various patients with a sample format like this: Patient1, Patient2, Patient3, so on… and this receptionist will construct a new data record to manage patient with detail personal information. Simultaneously, the receptionist prints a barcode containing the patient ID and securely attaches it to the patient's hand.

Table 1. *A sample of the patient database.*

Patient ID	Full name	Date of birth	Sex	Age	Address
Patient1	xxxxxxx	12/1/2000	Male	21	Ho Chi Minh
…	…	…	…	…	…

Source. *Author*.

For the first examination, a doctor will construct a data record related to the treatment process like this:

Table 2. *A sample of the treatment database.*

Instruction ID	**Patient ID**	**Doctor ID**	**Exam date**	**Status**	**Morning time**	**Noon time**	**Afternoon time**	**Evening time**
InID1	Patient1	Dr1	13/1/2020	dry cough	1111			
InID2	Patient1	Dr1	13/1/2020	dry cough		2222		
InID3	Patient1	Dr1	13/1/2020	dry cough			3333	
InID4	Patient1	Dr1	13/1/2020	dry cough				4444

Source. *Author*.

Where: 1111, 2222, 3333, 4444, and so on… are the medical instructions.

Table 2 shows which patient is under treatment by which doctor and detail medical instruction for every period. The next examination will be going on repetitively. Hospital also builds a centralized information system to store all data. An ERP package that consists of many functions of hospital management such as finance, treatment management, supply chain management, inventory… may be considered significantly. Whenever the doctor notes the instruction, all data will be updated in this system and it can be shared easily with the medical supplier. Due to the digitalization of medicine names, the doctor can't note wrongly, all medicine data are stored in the system in advance, he just types few words to search and chooses from the drop-down list. Due to long and difficult names to remember, doctors just write few beginning words to show the medicine name. This will eliminate the error of handwriting recognition.

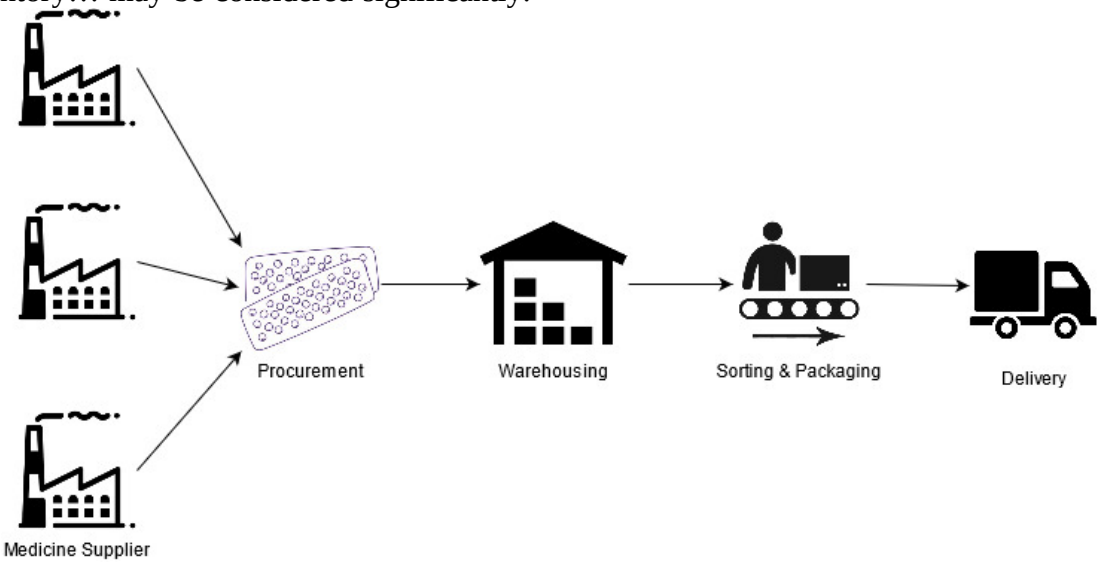

Figure 3. *Outsourcing model for LSP.*

Source. *Author*.

Medicine supplier may be a third-party logistics service provider (LSP), it provides the hospital with some services such as:

+ Procurement: After receiving notifications of prescriptions in the system, they build a plan to invite bids for medicine. They will choose the most suitable medicine providers according to some factors such as quality, time, quantity, diversity, competitive price, availability, etc… To ensure readiness, LSP may hold some inventory to meet the sudden demand. Base on the history of usage, the kind of diseases that hospitals can handle, and some tools, models of demand forecast, they store some of the popular medicine that is used regularly. This method will not make the supplier passive in sudden situations due to the fluctuations of demand or time. Bypassing the procurement to LSP, the hospital can have some benefits. The hospital can have medicine with competitive price, not be engaged in complex, time-wasted contract seeking and negotiations, especially, the supply is always guaranteed as this is the LSP's responsibility.

+ Storage: LSP is equipped with the tools, facilities such as racks, cold warehouse to store medicine, they choose the best way to retain the right temperature, right humidity, and other physical factors to ensure the medicine is always in the best condition. Medicine won't be outdated, damaged, degraded by LSP's careful preservation procedure. LSP can help hospitals save money by no warehouse investment, not buying facilities that sometimes are very expensive, save space for other buildings, not hiring labor to operate warehouse; managing labor may be the toughest task due to disputes between employee and employer.

+ Sorting: Base on the medical instruction saved in the hospital database system, LSP will pick medicine from a storage area, sort items into a separate package for every patient. Each patient has him/her package containing the medicine every time in a day. The medicine will be divided into small bags corresponding with each phase of time. These small bags will be gathered into one package for each day. LSP will place a label containing the barcode of patient ID to help nurses identify patients more accurately and faster. The doctor's instruction is also included in each small bag before being packed. LSP has its management system to ensure accuracy because accuracy is the most vital thing. No error is accepted in this business.

+ Transportation: When the sorting and packaging are finished, LSP will use special trucks to maintain the best condition during the transportation. LSP has to apply software and GPS technology to track the truck and find the best road to the hospital to minimize the time of delivery. As time is the most critical matter in this operation. Each day, the medicine should be delivered in the morning time for the next day of treatment. If the medicine is delivered lately, patients will not have medicine to use, which will hurt the effectiveness of the treatment or the patient's health. To ensure everything is good, minimize the probabilities of failed supply. LSP can deliver medicine just one day in advance. The time should not be longer due to spoilage of it. The medicine supply occurs daily despite amount to ensure the best quality, however, the large amount of the whole hospital will offset the cost of transportation. The LSP will ensure the quality of service with the right time, right place, right product, right quantity, right quality, right condition.

After receiving the medicine from the supplier (LSP), nurses just move it to patients and use a barcode reader to read the patient's ID attached to the medicine package. The hospital information system will check it with the patient's ID in the database. If they match together the detailed information of the doctor's instruction will be displayed on the tablet. To ensure the right patient, right medicine, the right amount, and right time, she also scans the barcode attached to the patient's hand to identify the correct one. This is 2 phase-verification method. It means that the patient's ID on the medicine package, ID on-screen, ID on the patient's hand are the same. If all is correct, she can take the medicine package to the patient

safely. With this procedure, nurses will not have to remember the types of medicine, which patient, what instruction, etc… the only action she should do is to scan the barcode to identify the patient. She has peace of mind while working as she has many things to do besides the medicine distribution.

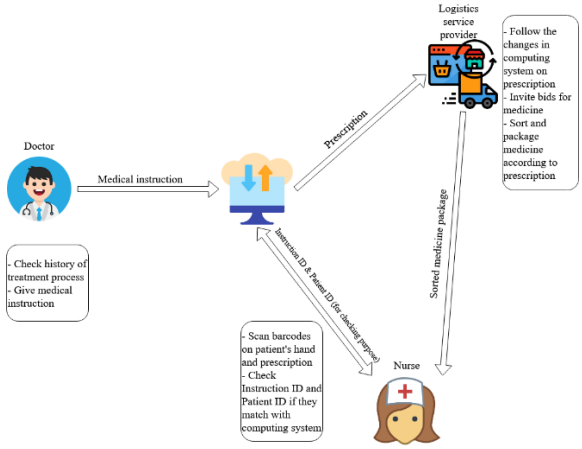

Figure 4. *Suggested model by author.*

Source. *Author.*

3. Conclusion

This article just suggests a general idea to solve the practical problem under the Logistics view. To apply, we must think of more details and need to illustrate the information flow concretely between related subjects in this case. However, with this simple approach, the article shows some positive results and can figure out some tangible benefits:

- Paper-based documents will not be used anymore, all data will be digitalized and stored in the centralized system. This will decrease the cost of usage of paper, store information safer and longer, especially information is shared easily to related parties and more correct.

- A hire of a Logistics service provider can lead to the explicitness of medicine purchase contract, exactitude, and 7Rs (right patient, right medicine, right amount, right time, right usage, right condition, and right quality).

To implement this model successfully, some prerequisites must be met:

+ A fluency in a computer using a skill is required for doctors, nurses in hospitals.

+ Hospital must have a robust network system to transmit data through applications and parties.

+ Hospital must have a software company building a solution to manage the patient portal.

+ Finally, the capital for investment must be qualified because this model costs a lot for an information system. The cost for software is difficult to be measured exactly. It may cost thousands or millions of dollars depending on the knowledge or efforts of coders.

Another application that can be derived from this approach that the author doesn't mention in this article is the control of discharging process from the hospital, this application bases on the usage of RFID for patients (this technology is a variant of barcode) to identify someone eligible to be discharged❑

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