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Analysis and Design of Information Systems of Drug Use as a Media for Pharmaceutical Communication to Patients During the Covid-19 Pandemic

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Abstract. Transmission of the coronavirus continues to increase in many areas since the pandemic occurred. The increase in cases is due to the high level of transmission through droplets that can occur due to physical contact and communication made by Covid-19 sufferers. Face-to-face relationships between pharmacists and patients are vulnerable to the spread of Covid-19. Therefore, through the appeal of the Ministry of Health of the Republic of Indonesia by utilizing information technology as a medium in communicating with patients, a Communication, Information, and Education (KIE) information system was created. The purpose of this research is to produce a KIE information system as part of the duties and responsibilities of the pharmacy in terms of providing drug information. The research method with the prototype method starts from system requirements analysis and system design. The system requirements analysis interview was conducted using the PIECES method and made a system design using context diagrams and Data Flow Diagrams (DFD). The data taken is in the form of points submitted by the pharmacy in conducting KIE. This study uses data from interviews and observations of KIE points at the Pundong Clinic. The results showed that there were 8 main points conveyed by the pharmacy in conveying information on drug use to patients. The design of the KIE information system using the PIECES method resulted in a new system that can assist pharmaceuticals in conveying information on drug use to patients accurately, completely, and avoiding the transmission of Covid-19.

Keywords : Communication, information, education, telemedicine, pharmacy

INTRODUCTION

Corona Virus Disease 2019 (Covid-19) has been declared by WHO as a pandemic and Indonesia has declared a non-natural national disaster caused by Covid-19 through Presidential Decree No. 12 of 2020 [1]. The spread of Covid-19 in Indonesia is currently increasing and expanding across regions and across countries, which is marked by an increase in the number of cases and spreads and epidemiological transmission has occurred.

Covid-19 can be transmitted from human to human through droplets. People who are most at risk of contracting this disease are people who are in close contact with Covid-19 patients, including health workers in providing health services to patients. People infected with Covid-19 have various symptoms even without symptoms, both as People Without Symptoms (OTG), People Under Supervision (ODP), and Patients Under Supervision (PDP). Limiting physical contact and face-to-face communication is an appeal set by the government as an effort to avoid transmission through droplets [2][3].

According to the Minister of Health No. 73 of 2016 concerning Pharmaceutical Service Standards in Pharmacy that Communication, Information, and Education (KIE) are the main duties and responsibilities of a pharmacist in providing health services. Pharmacists are responsible for the drugs received by patients by treatment instructions accompanied by education so that the therapy that the patient undergoes can run well [4]. The government's appeal to limit physical contact and communication to prevent the spread of Covid-19 has limited the main task of pharmacy to carry out KIE.

To-face relationship between pharmacies as health care providers with patients as recipients of health care are vulnerable to the spread of infectious diseases including Covid-19. For this reason, steps are needed to prevent the spread of Covid-19, one of which is by limiting face-to-face health services through the use of information technology. Based on the report of the Institute of Medicine (IOM) in 2001 that the use of information technology is the first key step in health services to achieve better and safer services [5].

The Director-General of Health Services, Ministry of Health of the Republic of Indonesia issued a circular letter number YR.03.03/III/III8/2020 in the form of an appeal for health workers to develop remote services and or other online applications in providing services to patients and their families. The circular is intended as a reference in providing health services to take advantage of information and communication technologies for prevent deployment Covid-19, in addition to their use of information technology in health care can reduce medication errors, reducing adverse drug reactions, and improving compliance to practice guidelines [5][6].

The utilization of information technology in the world of health has been applied in several health care facilities. The utilization of information technology in the form of telemedicine-based on Wenhang's research has proven to be effective in improving the quality of care for chronic disease patients, one of which is increasing medication adherence. Utilization of information technology is also carried out in pharmaceutical services, namely the use of telepharmacy in 52 pharmacies in the United Arab Emirates which has been proven to reduce pharmacist counseling errors to patients compared to pharmacies without using telepharmacy [7][8].

Therefore, based on the above background, with the government's appeal for the use of information technology in providing health services and based on several studies related to the use of information technology in health services, researchers are interested in designing a Communication, Information, and Education information system so that pharmacists can convey information on the use of information technology. medicines to patients in the right, complete and avoid the transmission of covid-19.

The design of a website-based Communication, Information, and Education system model requires system analysis and system design. The role of the system analysis is to describe what the KIE information system must do to meet the user's information needs, while the system design will determine how the information system fulfills these goals. According to Silbershatz et al., (2005). The design of the system using Context Diagrams and Data Flow Diagrams (DFD) which previously interviewed the system requirements analysis using the PIECES method [9].

The existence of a website-based information system to perform this KIE by entering the patient's number on the website that has been created, information and education on the treatment taken by the patient that was previously inputted by the pharmacy will appear. The case study in this research is at the Pundong Clinic.

METHODS

Research design

This research uses a prototype method starting from requirements analysis and system design. The data collection method for analyzing system requirements is carried out prospectively (interviews with the PIECES framework (Performance, Information, Economics, Control, Efficiency, and Service)), after obtaining a system requirements analysis, the next system design is made using context diagrams and Data Flow Diagrams (DFD). The sample criteria for a system needs analysis using the PIECES method is to conduct interviews with the pharmacist in Pundong Clinic.

Research Instruments

Instruments /measuring tools in this study are interview guidelines with the PIECES framework (Performance, Information, Economics, Control, Efficiency, and Service), Lexicom, and DIH (Drug Information Handbook). Data collection sheets are needed to identify the points conveyed by the pharmacy in communication, information, and education the use of drugs to patients.

Time and Place of Research

This research was conducted on March 2021. The place of this research was carried out in the pharmacy section of the Pundong Clinic. Prospective data in the form of interviews with pharmacists at the Pundong Clinic pharmacy using the PIECES framework (Performance, Information, Economics, Control, Efficiency and Service).

RESULTS AND DISCUSSION

The design of this Communication, Information, and Education information system was carried out to facilitate and develop the system previously carried out by researchers related to the prescription screening information system. The prescription screening management information system was created by researchers in 2020 to facilitate the process of assessing the suitability of prescriptions to reduce medication errors, furthermore, to facilitate the delivery of drug information by pharmacies to patients during the Covid-19 pandemic, a Communication, Information, and Education information system was created [10].

Communication, information and education conducted in pharmacies at the Pundong Clinic were previously done manually, namely by providing direct information. This direct provision of information also occurred during the Covid-19 pandemic by limiting physical boxes between pharmacists and patients by providing drug information through glass counters and with a limited time. Limitation of physical contact can be a pharmaceutical barrier in providing information to patients. Based on the results of discussions, interviews, and observations of related parties, namely Pharmacy Staff at the Pundong Clinic, it is necessary to create a new system by utilizing information technology as a means of communication, information, and pharmacy education to patients during the Covid-19 pandemic.

The design of the Communication, Information and Education system aims to ensure that health services provided by the pharmacy to patients can be complete and avoid the spread of Covid-19. The design of the Communication, Information, and Education system at the Pundong Clinic pharmacy begins with the system requirements analysis stage using the PIECES method so that the design is made according to the needs of users at the Pundong Clinic.

The development of the Communication, Information and Education system begins with an analysis of system requirements [11], including the identification of drugs needed to compile a system database, points in drug information and system requirements analysis using the PIECES framework (Performance, Information, Economics, Control, Efficiency and Service) conducted by interviewing pharmacists at the Pundong Clinic [12].

Identification of Drug Information

Identify the information conveyed during communication between the pharmacy and the patient by looking for references to important points that must be conveyed during counseling. Based on the identification results at the Pundong Clinic Pharmacy, there were 8 important points conveyed by the pharmacy in providing information on drug use to patients. The provision of drug information includes related to drug names and indications, rules for using drugs, how to use drugs, duration of drug use, side effects of drugs, signs of toxicity, and how to store drugs. The eight information on drug use was submitted by the pharmacy at the Pundong Clinic based on the rules for information on drug use as regulated in the regulation of the minister of health regarding pharmaceutical service standards at pharmacies number 72 of 2016 [4]. Based on Farida Baroroh's 2015 research, it was found that the information aspects of drug names and treatment goals, rules of use, drug use schedules, and duration of drug use were well conveyed, with a value of >70% . While the aspects of drug side effects and drug storage methods are not well conveyed, namely with a value of <70%. Then regarding the aspect of drug information regarding the signs of drug toxicity and what to do in case of drug toxicity, it only reached 33.90 % so that based on this research a communication, information and education system is needed to support the delivery of information between the pharmacy and the patient so that all aspects can be conveyed [13].

System Feasibility Study using the PIECES Method

The design of the KIE information system feasibility study was carried out using the PIECES method. A feasibility study was carried out so that the system created was by the needs for health services at the Pundong Clinic pharmacy. The feasibility study with PIECES method consists of Performance, Information, Economic, Control,

Efficiency and Service. The feasibility study was carried out by conducting interviews with pharmacists at the Pundong Clinic. The results of interviews with the PIECES method can be seen in table 1.

Based on the results of interviews using the PIECES method, a new system is needed at the Pundong Clinic so that all aspects of drug information provided by the pharmacy can be conveyed to patients . Research conducted by Nur Choirul in 2019 that using information systems can help health workers in providing health services to patients and is one of the factors that can affect patient satisfaction and loyalty [14].

There is an analysis of the needs of the system so that the KIE information system is made by the expectations of users, namely pharmacists to make it easier for patients to understand the drug information submitted by the pharmacy with the limitation of physical contact during the Covid-19 pandemic.

TABLE 1. Communication, Information, and Education (KIE) information system requirements analysis interview using the PIECES method by comparing the old system with the new system

Analysis	Old System	New System
Performance	The amount of pharmacy workload in the clinic is quite large. Every day the pharmacy serves 70 prescriptions a day. Not all patients were given complete drug information because of the limitation of physical contact.	Will help pharmacy work in carrying out pharmaceutical services, namely by making it easier to provide drug information. With the new system, it is hoped that the provision of drug information can be well documented.
Information	Information on the use of drugs is conveyed directly to patients with limited physical contact in the form of giving glass at the counter for drug collection.	The use of technology-based information systems is expected that patients can fully understand the information provided by the pharmacy to patients.
Economic	Use with the old system using paper, ink, writing instruments in the form of ballpoint pens.	Stationery is often lost, especially ballpoint pens. The use of the new system is expected to make writing easier and if an error occurs, it can be immediately corrected neatly and correctly.
Control	Providing information on pharmaceutical drugs to patients during the Covid-19 pandemic was limited to using glass counters and pharmaceutical personnel using Personal Protective Equipment while providing drug information.	Communication, information, and education systems are expected to help pharmacies provide drug information safely and completely.
Efficiency	It takes a long time for each patient to be given complete information on drug use.	Pharmaceutical service work that is carried out by pharmacies can be assisted by information systems.
Service	Providing drug information only includes the name of the drug, the rules of use, and the duration of treatment. Provision of drug information is not maximal because of restrictions on physical contact between pharmacies and patients.	Patients can obtain information on drug names and indications, drug usage rules, how to use drugs, duration of drug use, drug side effects, signs of toxicity, and how to store drugs.

Information System Design

The design of the information system is made based on the system requirements analysis that has been carried out using the PIECES method so that the system design is made based on user needs. In this study, the system design was made to facilitate the implementation of the system. Data Flow Diagram (DFD) as a guide in system design.

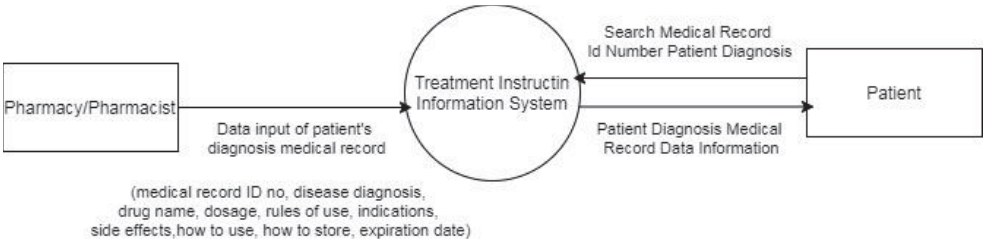

FIGURE 1. Context Diagram/DFD Level 0 starting from the pharmacy entering patient data until the patient can see the treatment instructions

System information KIE is a system that serves to help pharmacies in delivering complete drug information to patients by way of listening back instruction manual treatment that has been delivered by pharmacists.

The way the Medical Instruction Information System works, which consists of 2 main menus. First, Pharmacists input data on the Medical Record Data Input Form for patient diagnosis in the form of (medical record ID number, disease diagnosis, drug name, dosage, usage rules, indications, side effects, method of use, method of storage, expiration date) into the system. Second, patients can see written treatment instructions on the system by entering the Medical Record ID Number and patient name on the form that has been prepared by the system.

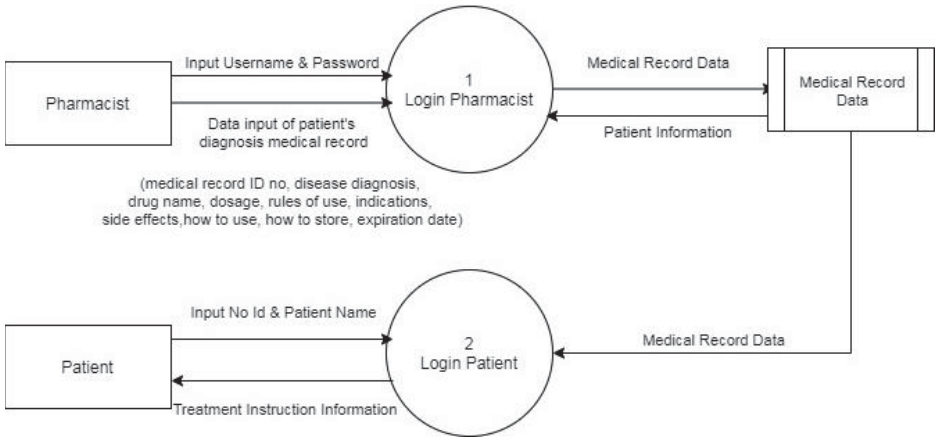

FIGURE 2. DFD Level 1 consists of the design process l ogin pharmacist and login p patient

Based on DFD Level 0, the process design can be broken down into several more detailed system processes. Figure 2 above is a Level 1 DFD. Level 1 DFD consists of 2 process designs, namely Pharmacist Login and Patient Login.

Pharmacist login serves as a system interface for Pharmacists. The pharmacist must enter a username and password in the system to be able to log in. Usernames and passwords for all users are the same in the sense that they have been determined. After the pharmacist can log in to the system, the pharmacist will be faced with an interface to input the patient's medical record data. Then the pharmacist inputs the patient's medical record data in the form of medical record id number, diagnosis of disease, drug name, dosage, rules of use, indications, side effects, method of use, storage method, expiration date. The medical record id number will appear sequentially and automatically. The inputted medical record data will be automatically stored in the system database.

Patient login serves as a system interface for the Patient/Patient. Patients can view information on treatment instructions by entering the patient's medical record id no and the patient's name in the system. After the patient inputs the medical record ID number and the patient's name, the inputted data will be checked for its existence in the database. If the data exists, the system will display information on the patient's treatment instructions.

User Interface

The pharmacist login interface design consists of 3 pages, namely the main page, the pharmacist login page, and the patient medical record data input page. The main page has 2 main menus, namely the pharmacist login button and the patient login button. The pharmacist button is selected by clicking on the mouse, it will go to the pharmacist login page. On the pharmacist login page, enter the username and password data then click the login button. After clicking the login button, it will go to the patient's medical record data input page, that's where the pharmacist can input treatment data and save the data (save button). The back button on the patient's medical record data input page functions to return to exploring the next page, namely the pharmacist login page. The black home button on the pharmacist login page serves to return to the main menu page.

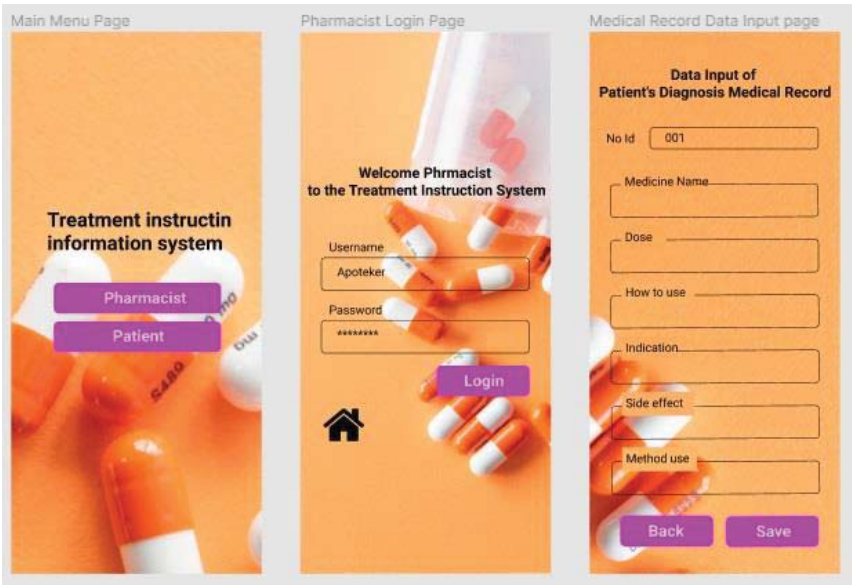

FIGURE 3. Pharmacist Login User Interface in the form of the main page, pharmacist login page, and patient medical record data input page

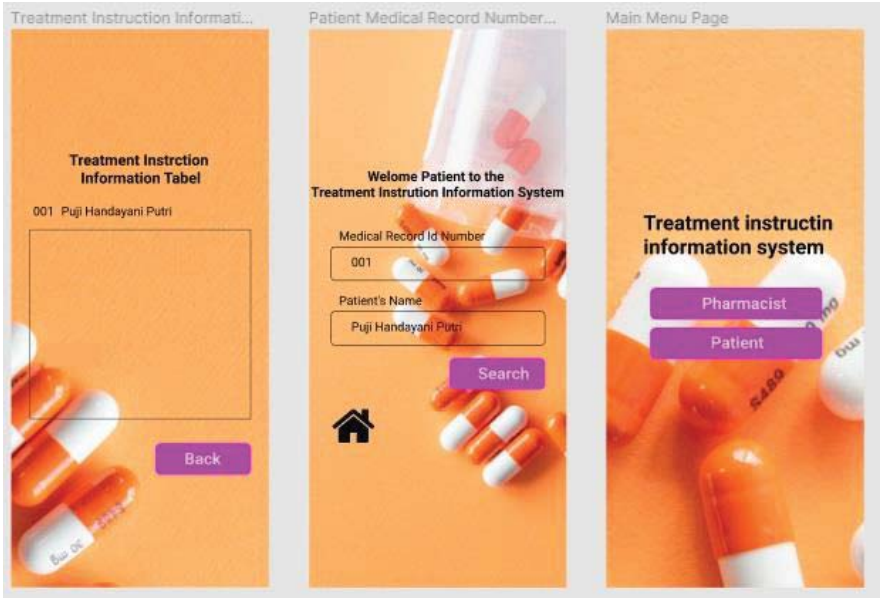

FIGURE 4. The Patient Login User Interface consists of the main page, patient login page, and patient treatment information page information

The design of the patient login interface begins with the on-mouse click of the patient button on the main menu page. After that, you can go to the next page, namely the patient login page. The patient login page functions to check and retrieve patient data that is in the database by entering the patient's medical record ID number and the patient's name then on the mouse click the search button. If the data of the medical record ID number and the patient's name match in the sense that they are listed in the database, the system will display information on the patient's treatment instructions.

Patients can re-understand manual medication instructions that have been delivered by pharmacists so that although there are restrictions on communication and physical contact between pharmacists and patients, the information can be understood completely and accurately by patients. This is by research conducted by Rita Komalasari in 2020 that the use of information technology in health services to patients during the Covid-19 pandemic can be beneficial to avoid the transmission of Covid-19 [15]. Research conducted by Zidni shows that telemedicine has a strong correlation with the government's appeal (Pearson coefficient correlation = 0.91) which makes telemedicine a solution for health services in Indonesia during the Covid-19 pandemic [16].

The existence of this KIE information system can not only prevent pharmacists from transmitting Covid-19 but can also become a supporting medium in terms of reducing medication errors, namely prescribing errors. Some examples of problems in terms of prescribing errors are incomplete information about patients, writing prescriptions that are not clear or unreadable, errors in writing doses, not including drug use rules, and not writing down the route of drug administration [17].

CONCLUSION

Based on the results of the research on the design of the Communication, Information, and Education (KIE) information system, it was concluded that there were 8 main points conveyed by the pharmacy in conveying information on drug use to patients. The provision of drug information includes related to drug names and indications, rules for using drugs, how to use drugs, duration of drug use, side effects of drugs, signs of toxicity and how to store drugs. The existence of an KIE information system can help pharmaceuticals in conveying information on drug use to patients in a precise, complete manner and avoid the transmission of Covid-19.

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