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Original Research

Development and evaluation of a user-centric database of drug information and images at Warinchamrab Hospital

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Abstract

Background: The COVID-19 pandemic situation has emphasized the need for accessible drug information in primary healthcare, mainly owing to limited hospital visits. Patients with chronic illnesses experience difficulties obtaining regular medications, and this problem is worsened by the unavailability of drugs and prescriptions shared via mail. Hospitals are actively working to develop user-friendly drug information databases to enhance medication management in their facilities. **Objective:** In this study, we aimed to establish a hospital database for improved medication management that can serve the purposes of both healthcare providers and patients. **Methods:** This study comprised two parts: 1) the development of drug information and image database websites, involving the survey of user needs, designing the website, compiling drug lists and related data, recording images of tablets and capsules, creating the website, and testing its functionality; 2) the evaluation of the user interface satisfaction with the drug database website. **Results:** Part 1: A database was developed using comprehensive details of 710 hospital drugs, including tablets, capsules, and liquids. Images of the medications were integrated to enable users to search for drug information. Three types of reports are generated to fulfill the user requirements. Part 2: Thirty-one pharmacy staff members evaluated satisfaction across four aspects; high mean scores (± standard deviations) for attitude and intention to use (4.33 ± 0.067), searching and display (4.32 ± 0.000), display results (4.30 ± 0.042), and structure and operation (4.12 ± 0.097) indicated high user satisfaction. **Conclusion:** A comprehensive hospital-based drug database has been developed. This database is associated with a user-friendly website with robust search capabilities. The three report types cater to diverse user requirements. Further analyses of this database revealed high user interface satisfaction across various aspects, particularly in terms of clarity, ease of use, search efficiency, and image quality.

Keywords: website; drug database; drug images; medical management; hospital; Thailand

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INTRODUCTION

The global healthcare system has been majorly affected by the COVID-19 pandemic, which posed a crucial need for reliable and readily accessible drug information, particularly in primary care settings.[1,2] Owing to the pandemic-induced restrictions on hospital visits, many individuals, particularly those with chronic ailments, have sought continuous treatment from primary care providers.[3] Hence, medication reconciliation and information dissemination, have emerged as crucial components for patient safety and quality care.[4,5] However, the process of medication reconciliation, designed to prevent medication errors during care transitions, was notably associated with challenges during the pandemic.[4]

Moreover, patients, especially those with chronic diseases such as diabetes, hypertension, and asthma, experienced significant challenges in securing regular medication brands during this pandemic.[6-9] Moreover, the unavailability of common brands of drugs in hospitals exacerbates the problem.[8,10] A more complicated situation may involve prescriptions, dispatched via mail, introducing patients to unfamiliar drug brands during restricted hospital visits.[11,12] This scenario highlights the impact of accurate and easily accessible medication information.[11,12]

A comprehensive set of information, including the name and photographs of the prescribed medicines, can significantly contribute to safety and informed decision-making processes for both healthcare providers and patients. Clear and easily understandable information can avoid ambiguity, and can

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help patients be introduced to new or alternative brands of drug through postal deliveries.[11] Quick identification and clear information about medications is crucial for the treatment of patients with chronic disease, who often need consistent medication management; clear information helps patients and their healthcare providers avoid potential medication errors and effectively manage chronic conditions in presence of the ongoing healthcare challenges.[13,14] To address these challenges, hospitals target to create a user-friendly database of drug information supporting the identification of medications to strengthen the medical management system, primarily in primary care systems.[14-16] However, a research gap associated with the lack of a hospital-based drug database catering to the unique demands of in-hospital drug management has been identified. Hence, a tailored drug management system developed in the hospital can simplify drug storage management and minimize medication errors.[17,18] A hospital-specific database inclusive of drug photographs can support physicians in prescribing, aid pharmacists and pharmacy officers in organizing and dispensing drugs, and assist nurses and patients in verifying medications.[19-21] The aforementioned knowledge gap can be addressed via improved drug management established in hospital settings by connecting databases from diverse sources and tailoring them to meet the specific needs of individual hospitals.[22-24] Warinchamrab Hospital, a 200-bed general facility, leads the way in the Hospital Information System program, serving its network of 22 hospitals. Their commitment to enhancing drug information includes using Thai drug names, adding pregnancy categories to labels, and expanding the availability of information. They prioritize medication safety and have integrated drug interactions and allergy data with a notification system for specific patient groups. They are dedicated to leveraging technology to advance its pharmaceutical informatics and support research aiming to develop a user-friendly, regularly updated drug information and image database seamlessly integrated with their drug management system, beginning at Warinchamrab Hospital.

METHODS

Study design

This study was conducted in Warinchamrab Hospital, a 200-bed general hospital, and included a comprehensive list of 710 medications. The study comprised two parts: 1) the development of the drug information and image database website for the hospital, and 2) the evaluation of user interface satisfaction with the drug database website. The research protocol was approved by the Research Ethics Committee of Warinchamrap Hospital (Approval No. 02/2563, #01; June 8, 2020).

Part 1: Development of the Drug Information and Drug Images Database website of Warinchamrap Hospital. The development steps are listed below.

1.Literature review and compilation of information about the drug database used in the drug management system of the hospital included in the study.

2.Planning and designing the presentation of various data in the database and website, which included the following steps:

2.1. The system information required by users was acquired through interviews with relevant personnel involved in system design.

2.2. The research team initially designed the database system.

3.Preparation of drug-related data and images for the database:

3.1. The list of drugs available in the hospital was acquired by coordinating with the pharmacy department of Warinchamrab Hospital to obtain.

3.2. Hospital drugs were prepared for photography.

3.3. Photographs associated with drug blister packs, boxes, characteristics of the drugs were recorded, the size of pills was measured, and other details, such as drug registration number, trade name, generic name, strength, color, size, and other physical information needed for drug identification, were recorded.

3.4. Drug information was obtained by coordinating with relevant agencies, such as the Ministry of Public Health, and Food and Drug Administration of Thailand.

3.5.The drug database and image database were developed, which were accessible through the website. The details of the data compiled in this phase are discussed below.

1. Design of functions: This design included several functions: login through a user account, drug inventory search, and a bookmark feature facilitating the selection of drug lists and export/print functions. The export function was developed for three categories of medicines available in the hospital formulary: groups of medicines available only in Warinchamrab Hospital, only in satellite hospitals under the care of Warinchamrab Hospital, and in both.

2. Development of the database of drugs and drug images

The team searched and collected various data on drugs from the reference list available at Warinchamrab Hospital using either the registration number or the generic name and the Microsoft Office Excel software. The crucial drug information was included in the database (listed below).

1.ID Hospital drug code

2.Generic name (English, Thai), drug strength, drug classification

3.Trade name (English, Thai)

4.Dosage forms in Thai and English (1. Capsules 2. Tablets 3. Parenteral 4. Non-Parenteral)

5.Indication

6.How to use the drug

7.Things to inform the doctor or pharmacist when you use this medicine

8.If you forget to take the medicine

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9.General side effects

10.Side effects that must be reported to a doctor or pharmacist immediately |

11.How to store the medicine

12.Medicine code of the Hospital

13.Drug registration number

14.Manufacturer

15.License holder

16.Distributor

17.Medicine groups included in the hospital formulary, which were categorized based on their availability (1. Items available only at Warinchamrab Hospital; 2. items available only in satellite hospitals under Warinchamrab Hospital care, and 3. items available at Warinchamrab Hospital and its satellite hospitals).

18.Categorization of Essential Drug (ED): Listed on the National Essential Drug List (ED, non-ED; ED listings categorized into Lists A, B, C, D, E [1], and E [2])

19.Date of the latest update

20.Last person to update

21.Drug information for patients by the generic name

Part 2: Evaluation of user interface satisfaction of the drug database website.

For this process, the developed database of drug information and images on the website were used in the drug management system of the Warinchamrab Hospital. In this study, user satisfaction with the system was assessed over two weeks.

-User satisfaction among 58 pharmacy staff members at Warinchamrab Hospital was considered.

Instruments

Research tools used in this study are divided into two categories:

1.The tools required to create the database of drug information and images and to integrate it into the drug management system of the Warinchamrab Hospital are listed below:

1.1The tools used for developing the database include:

-Microsoft Office Excel

-Google Drive File Stream

-Microsoft Photos

1.2. Tools used for website development:

-Microsoft Visual Studio Code

-Sequel Ace

-Google Chrome and Safari

-PHP 7.x programming; HTML, CSS3, JavaScript; MySQL database management system (used for website development)

1.3. Drug information used in the database:

-Drug registration and deregistration data were obtained from the Drug Office, Food and Drug Administration, and Ministry of Public Health from 1983 to 2020.

-The drug identification database for tablets and capsules in Thailand was acquired from the Faculty of Pharmaceutical Sciences, Ubon Ratchathani University (www.drugiden.ubu.ac.th).

-Drug records available in Warinchamrab Hospital; drug registration numbers were acquired for further photography and uploading information to the database.

-DSLR camera, LED portable photo studio, green oak picture frame, and electronic digital caliper were used to record photographs and to measure tablets.

2.Tools for the data collection:

-A self-administered questionnaire was used for surveying user satisfaction for the drug information database developed to support the drug management system at Warinchamrab Hospital. The questionnaire equipped with multiple-choice answers was divided into four sections, comprising a total of 16 items and 5 Likert scales for satisfaction. The collected data in four sections included structure and operation, search and display of results, outcome of use, attitudes, and overall satisfaction, which were assessed after database development.

The five levels of the satisfaction scale were defined as follows;

-Least = the least level of satisfaction, equivalent to 1 point.

-Low = a low level of satisfaction, equivalent to 2 points.

-Moderate = a moderate level of satisfaction, equivalent to 3 points.

-High = a high level of satisfaction, equivalent to 4 points.

-Highest = the highest level of satisfaction, equivalent to 5 points.

To verify the quality of the tools, the content validity method was used to analyze the Item-Objective Congruence Index (IOC) values. Each item had an IOC value of at least 0.5. Items with an IOC value < 0.50 were revised or removed, as deemed appropriate, by three experts. Reliability was determined using Cronbach's Alpha Coefficient, with alpha values not less than 0.7. The reliability scores of the tool were as follows: 1. Structure and operation, 0.655; 2. Search and display of results, 0.823; 3. Outcome of use, 0.825; 4. Attitudes, 0.816; Overall satisfaction, 0.871.

Data collection

We recruited 58 staff members of a pharmacy department, selected using convenience sampling, in this study; the team comprised pharmacists, pharmaceutical officers, and various staff members. Participants were selected based on several inclusion criteria: adults 1) capable of making their own decisions, 2) employed within the pharmacy department, and 3) having at least a year of experience at the hospital were

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recruited. Additionally, proficiency in using computers and mobile phones and expressing their willingness to participate in the project were considered crucial inclusion criteria. The primary exclusion criterion was unwillingness to participate in the project. Self-administered questionnaires were distributed to the participants for data collection.

Data analysis

Data analysis was performed using descriptive statistics, including frequencies, percentages, means, and standard deviations.

RESULTS

Part 1. Results of database development

After the compilation of data from various units to create a database of medicines and images of drugs, we obtained drug information from the Food and Drug Administration (FDA). Drug images were sourced from the Drug Identification Database, a database for verifying the identity of tablets and capsules in Thailand, the Faculty of Pharmacy, Ubon Ratchathani University; moreover, photos of drugs, which were recorded at Warinchamrab Hospital, were used. The drugs that were collected based on the entire list of 710 drugs available at Warinchamrab Hospital categorized as shown in Table 1.

A website named the "Drug Information and Visual Drug Identification Database for Supporting the Medical Management System" was developed (Figure 1 and Figure 2). The search tool supported searching for generic and brand names of drugs, manufacturers, and availability in hospitals or community health centers; three main types of reports are generated:

1. Type 1 reports provide quick information about the medicines, which includes their trade names, generic names, and photos of the pill. The report format is designed for healthcare professionals (Figure 3). It served as a double-check system when pharmacy technicians prepared medications before dispensing them, which allowed verification of the medications by pharmacists and aided nurses in administering medications to patients in the ward.

Table 1. Number of drugs of different types

Drug Type		Number of Drug Items	Percentage (%)
1.	Tablets	258	36.34
2.	Capsules	45	6.34
3.	Parenteral liquids	216	30.42
4.	Non-parenteral liquids	191	26.90
Total		**710**	**100**

2. Type 2 reports provide information on the complete medication list and the drug information of individual patients (Figure 4). This information included the trade name, generic name, indication, and instructions on how to use the medicine, including dosage instructions.

3. Type 3 reports provide comprehensive medication information (Figure 5). They were suitable for patients who are receiving new medications, undergoing medication changes, or unable to collect medications from the hospital during emergencies, such as flooding, or situations posing restrictions on hospital visits, similar to the COVID-19 pandemic situation.

Part 2: Evaluation of user interface satisfaction of the drug database website.

A total of 31 of the 58 pharmacy staff members at Warinchamrab Hospital participated in this study; the majority were female (93.55%) and aged 25–29 years (32.26%). Most participants (70.97%) held bachelor's degrees. The sample included 14 pharmacists (45.16%), 10 pharmacy technicians (32.26%), and seven pharmacy staff (22.58%), offering a diverse professional perspective for the study (Table 2). In the satisfaction assessment of the database, participants rated various relevant aspects on a five-point scale. The highest scores were noted for 'Language clarity' (average 4.29) and

Figure 1. Main page of the website.

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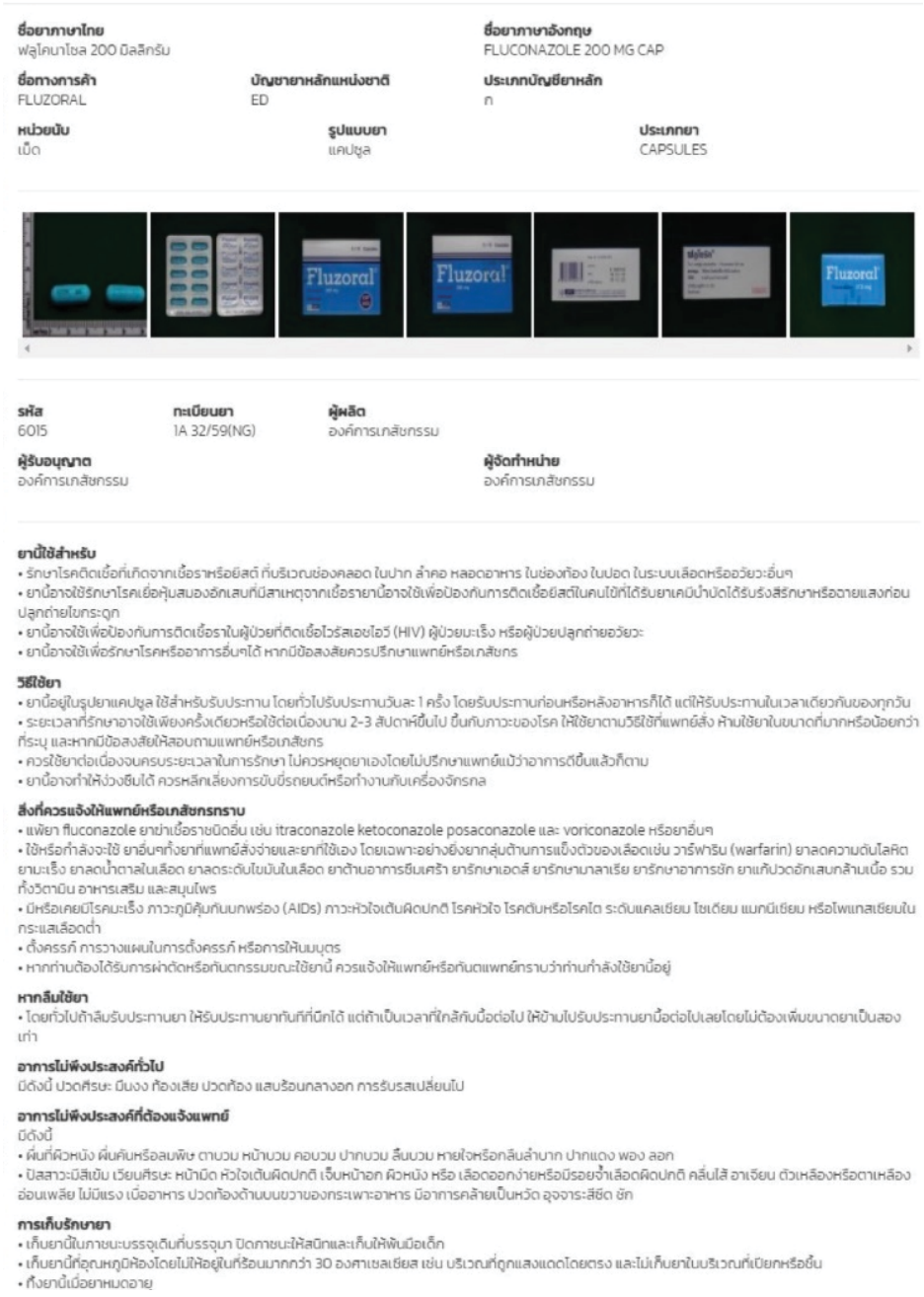

Figure 2. An example of a screen depicting drug information.

Table 2. Characteristics of participants (n=31)		
Gender	**Frequency**	**Percentage (%)**
Male	2	6.45
Female	29	93.55
Age (years)		
20–24 years	1	3.23
25–29 years	10	32.26
30–34 years	5	16.13
35–39 years	9	29.03
≥40 years	6	19.35
Educational qualification		
Diploma	3	9.68
Bachelor's degree	22	70.97
Master's degree	6	19.35
Professional role		
Pharmacist	14	45.16
Pharmacy technicians	10	32.26
Pharmacy staff	7	22.58

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ระบบฐานข้อมูลสารสนเทศทางยา
คณะเภสัชศาสตร์ มหาวิทยาลัยอุบลราชธานี

เม็ดยา	บรรจุภัณฑ์	รายละเอียด
		ชื่อยา CLINDAMYCIN 300 MG CAP ชื่อการค้า CLINDA GPO 300 MG เลขทะเบียน 1A 277/54 ประเภทบัญชียาหลัก ข
		ชื่อยา FLUCONAZOLE 200 MG CAP ชื่อการค้า FLUZORAL เลขทะเบียน 1A 32/59(NG) ประเภทบัญชียาหลัก ก

Figure 3. The Type 1 report provides essential medication information, such as trade names, generic names, and photos of the pill; it serves as a double-check system for healthcare professionals during medication preparation and administration.

โรงพยาบาลวารินชำราบ
คณะเภสัชศาสตร์ มหาวิทยาลัยอุบลราชธานี

No.	รูปภาพยา	ชื่อสามัญและความแรง/ชื่อทางการค้า	ข้อบ่งใช้	วิธีการใช้ยา
1		CLINDAMYCIN 300 MG CAP	• ยานี้ใช้เพื่อรักษาโรคติดเชื้อแบคทีเรีย เช่น โรคติดเชื้อที่ระบบทางเดินหายใจ ระบบเลือด ระบบทางเดินปัสสาวะ ผิวหนัง และอวัยวะภายใน • อาจใช้เพื่อรักษาโรคหรืออาการอื่นๆได้ ดังนั้น หากมีข้อสงสัยควรสอบถามแพทย์หรือเภสัชกร	• ยานี้อยู่ในรูปแบบยาแคปซูล ใช้สำหรับรับประทาน โดยทั่วไปรับประทานวันละ 3-4 ครั้ง ก่อนอาหารหรือหลังอาหารก็ได้ ดื่มน้ำตามมากๆ ให้รับประทานในเวลาเดียวกันของทุกวัน โดยระยะเวลาในการรับประทานยาขึ้นอยู่กับประเภทของการติดเชื้อ • หรือให้ใช้ยานี้ตามวิธีใช้ที่ระบุบนฉลากยาอย่างเคร่งครัด โดยห้ามใช้ยาในขนาดที่มากหรือน้อยกว่าที่ระบุ และหากมีข้อสงสัยให้สอบถามแพทย์หรือเภสัชกร • รับประทานยานี้จนยาหมดตามแพทย์สั่ง แม้ว่าอาการจะดีขึ้นแล้วก็ตาม การหยุดยาเองก่อน อาจจะรักษาไม่หายและทำให้เชื้อดื้อยาได้
2		FLUCONAZOLE 200 MG CAP	• รักษาโรคติดเชื้อที่เกิดจากเชื้อราหรือยีสต์ ที่บริเวณช่องคลอด ในปาก ลำคอ หลอดอาหาร ในช่องท้อง ในปอด ในระบบเลือดหรืออวัยวะอื่นๆ • ยานี้อาจใช้เพื่อรักษาโรคเยื่อหุ้มสมองอักเสบที่มีสาเหตุจากเชื้อรายานี้อาจใช้เพื่อป้องกันการติดเชื้อยีสต์ในคนไข้ที่ได้รับยาเคมีบำบัดได้รับรังสีรักษาหรือฉายแสงก่อนปลูกถ่ายไขกระดูก • ยานี้อาจใช้เพื่อป้องกันการติดเชื้อราในผู้ป่วยที่ติดเชื้อไวรัสเอชไอวี (HIV) ผู้ป่วยมะเร็งหรือผู้ป่วยปลูกถ่ายอวัยวะ • ยานี้อาจใช้เพื่อรักษาโรคหรืออาการอื่นๆได้ หากมีข้อสงสัยควรปรึกษาแพทย์หรือเภสัชกร	• ยานี้อยู่ในรูปยาแคปซูล ใช้สำหรับรับประทาน โดยทั่วไปรับประทานวันละ 1 ครั้ง โดยรับประทานก่อนหรือหลังอาหารก็ได้ แต่ให้รับประทานในเวลาเดียวกันของทุกวัน • ระยะเวลาที่รักษาอาจใช้เพียงครั้งเดียวหรือใช้ต่อเนื่องนาน 2-3 สัปดาห์ขึ้นไป ขึ้นกับภาวะของโรค ให้ใช้ยาตามวิธีใช้ที่แพทย์สั่ง ห้ามใช้ยาในขนาดที่มากหรือน้อยกว่าที่ระบุ และหากมีข้อสงสัยให้สอบถามแพทย์หรือเภสัชกร • ควรใช้ยาต่อเนื่องจนครบระยะเวลาในการรักษา ไม่ควรหยุดยาเองโดยไม่ปรึกษาแพทย์แม้ว่าอาการดีขึ้นแล้วก็ตาม • ยานี้อาจทำให้ง่วงซึมได้ ควรหลีกเลี่ยงการขับขี่รถยนต์หรือทำงานกับเครื่องจักรกล

Figure 4. Type 2 reports include the complete list of medication prescribed to individual patients, which comprises trade names, generic names, indications, and usage instructions, including dosage.as trade names, generic names, and photos of the pill; it serves as a double-check system for healthcare professionals during medication preparation and administration.

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ระบบฐานข้อมูลสารสนเทศทางยา
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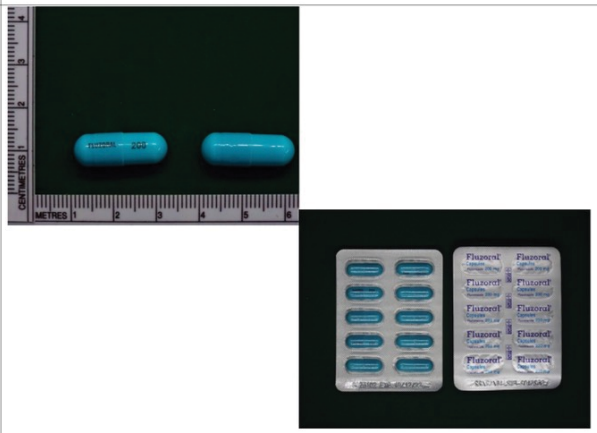
รายการยาแต่ละตัวสำหรับผู้ป่วย

ชื่อยาสามัญ	FLUCONAZOLE 200 MG CAP
ชื่อยาภาษาภาษาไทย	ฟลูโคนาโซล 200 มิลลิกรัม
ชื่อทางการค้า	FLUZORAL
รูปภาพยา	
รูปแบบยา	แคปซูล
ยานี้ใช้สำหรับ	• รักษาโรคติดเชื้อที่เกิดจากเชื้อราหรือยีสต์ ที่บริเวณช่องคลอด ในปาก ลำคอ หลอดอาหาร ในช่องท้อง ในปอด ในระบบเลือดหรืออวัยวะอื่นๆ • ยานี้อาจใช้รักษาโรคเยื่อหุ้มสมองอักเสบที่มีสาเหตุจากเชื้อรายานี้อาจใช้เพื่อป้องกันการติดเชื้อยีสต์ในคนไข้ที่ได้รับยาเคมีบำบัดได้รับรังสีรักษาหรือฉายแสงก่อนปลูกถ่ายไขกระดูก • ยานี้อาจใช้เพื่อป้องกันการติดเชื้อราในผู้ป่วยที่ติดเชื้อไวรัสเอชไอวี (HIV) ผู้ป่วยมะเร็งหรือผู้ป่วยปลูกถ่ายอวัยวะ • ยานี้อาจใช้เพื่อรักษาโรคหรืออาการอื่นๆได้ หากมีข้อสงสัยควรปรึกษาแพทย์หรือเภสัชกร
วิธีการใช้ยา	• ยานี้อยู่ในรูปยาแคปซูล ใช้สำหรับรับประทาน โดยทั่วไปรับประทานวันละ 1 ครั้ง โดยรับประทานก่อนหรือหลังอาหารก็ได้ แต่ให้รับประทานในเวลาเดียวกันของทุกวัน • ระยะเวลาที่รักษาอาจใช้เพียงครั้งเดียวหรือใช้ต่อเนื่องนาน 2-3 สัปดาห์ขึ้นไป ขึ้นกับภาวะของโรค ให้ใช้ยาตามวิธีใช้ที่แพทย์สั่ง ห้ามใช้ยาในขนาดที่มากหรือน้อยกว่าที่ระบุ และหากมีข้อสงสัยให้สอบถามแพทย์หรือเภสัชกร • ควรใช้ยาต่อเนื่องจนครบระยะเวลาในการรักษา ไม่ควรหยุดยาเองโดยไม่ปรึกษาแพทย์แม้ว่าอาการดีขึ้นแล้วก็ตาม • ยานี้อาจทำให้ง่วงซึมได้ ควรหลีกเลี่ยงการขับขี่รถยนต์หรือทำงานกับเครื่องจักรกล
สิ่งที่ควรแจ้งให้แพทย์หรือเภสัชกรทราบ	• แพ้ยา fluconazole ยาฆ่าเชื้อราชนิดอื่น เช่น itraconazole ketoconazole posaconazole และ voriconazole หรือยาอื่นๆ • ใช้หรือกำลังจะใช้ ยาอื่นๆทั้งยาที่แพทย์สั่งจ่ายและยาที่ใช้เอง โดยเฉพาะอย่างยิ่งยากลุ่มต้านการแข็งตัวของเลือดเช่น วาร์ฟาริน (warfarin) ยาลดความดันโลหิต ยามะเร็ง ยาลดน้ำตาลในเลือด ยาลดระดับไขมันในเลือด ยาต้านอาการซึมเศร้า ยารักษาเอดส์ ยารักษามาลาเรีย ยารักษาอาการชัก ยาแก้ปวดอักเสบกล้ามเนื้อ รวมทั้งวิตามิน อาหารเสริม และสมุนไพร •

ชื่อผู้ใช้งาน..... 3 / 4 14/01/2021 21:40

Figure 5. Type 3 reports offer comprehensive information on medication prescribed in various situations, including those associated with the introduction or alteration of medications and emergency circumstances like flooding or restricted visits to hospitals during the COVID-19 pandemic.

'Ease of use' (average 4.16) in the category 'Structure and operation'; moreover, 'Search tool clarity' and 'Help system appropriateness' were highly rated (average 4.13 and 4.10, respectively) by participants. In 'Search and display of results,' 'Search convenience' and 'Image quality' were highly rated (average 4.32 each). The 'Outcome of use' category indicated strong satisfaction, with an average score of 4.32 acquired for 'Getting desired drug information' and 'Search and processing speed' (Table 3). Overall, the results indicated a high level of user satisfaction across all evaluated aspects of the database. However, users provided suggestions about easier access, such as access through a mobile application, the need for special instructions, such as techniques for specific medications, and highlighting key medication details. Additionally, a more appealing website design has been recommended. They appreciated the user-friendliness and modern appearance of this database as well as the shared valuable information that could benefit future patient education.

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Table 3. User interface satisfaction of the drug database website

Satisfaction criteria	Most satisfied N(%)	Satisfied N(%)	Moderate N(%)	Less satisfied N(%)	Least satisfied N(%)	N/A	Average score
Category 1: Structure and operation							
Website appearance	4 (12.90%)	24 (77.42%)	3 (9.68%)	0	0	0	4.03
Font size and style	6 (19.35%)	20 (64.52%)	5 (16.13%)	0	0	0	4.03
Language clarity	11 (35.48%)	18 (58.06%)	2 (6.45%)	0	0	0	4.29
Ease of use	8 (25.81%)	20 (64.52%)	3 (9.68%)	0	0	0	4.16
Search tool clarity	5 (16.13%)	25 (80.65%)	1 (3.23%)	0	0	0	4.13
Help system appropriateness	6 (19.35%)	22 (70.97%)	3 (9.68%)	0	0	0	4.10
Category 2: Search and display of results							
Search convenience	12 (38.71%)	17 (54.84%)	2 (6.45%)	0	0	0	4.32
Image quality	11 (35.48%)	19 (61.29%)	1 (3.23%)	0	0	0	4.32
Category 3: Outcome of use							
Search and processing speed	8 (25.81%)	22 (70.97%)	1 (3.23%)	0	0	0	4.23
Getting desired drug information	11 (35.48%)	19 (61.29%)	1 (3.23%)	0	0	0	4.32

DISCUSSION

The COVID-19 pandemic has posed significant challenges to healthcare, especially primary care.[25] This study emphasizes the significance of easy access to comprehensive drug information and effective medication management during crises. It introduces a hospital-focused drug information database and analyzes the associated user satisfaction levels. The pandemic posed challenges for patients with chronic illnesses typically entailing hospital visits for acquiring medications. Crucial viral transmission management strategies, such as social distancing and lockdowns, disrupt routine healthcare access for these patient populations, making medication management more difficult.[25,26] Sometimes, the common medicine brands are unavailable and hospitals run out of stock.[27,28] Moreover, patients occasionally acquire unfamiliar brands through mail deliveries.[6,10,29,30] However, clear drug information is crucial, especially for administering new brands of medications.[31-34]

We developed a drug information database for Warinchamrab Hospital using data collected from various sources, which involves user-friendly websites. This database aims to make drug management easier and reduce medication errors in the hospital. The database generating three types of reports for both healthcare professionals and patients was associated with high user satisfaction levels. The users appreciated the language clarity, ease of use, and other features, including those supporting the availability of the necessary drug information.

However, this study has some limitations. As it was conducted in one hospital, the findings may not apply to other places. This study mostly focused on the views of healthcare professionals, and hence, future research should consider the patients' interpretations of the database. Additionally, the long-term effects of the database on medication management and patient health remain unexplored. Future studies can advance this study by addressing these limitations. For instance, the experiences and feedback of patients, particularly those managing chronic conditions, are crucial for acquiring valuable insights into the influences of accessible drug information on medication adherence, overall health, and satisfaction with healthcare services.[35,36]

Additionally, an assessment of the long-term effects of hospital-centric drug databases on medication management practices and patient safety can reveal trends and changes that may not be immediately apparent, offering a more comprehensive knowledge of its effectiveness.[30]

Furthermore, the integration of drug databases with telehealth services should be explored to enhance medication management, crucial for effective remote healthcare. Investigations on strategies supporting the seamless incorporation of the database into telehealth platforms can improve medication adherence and streamline healthcare delivery in remote care.[37-39] Conclusively, future research on these facts can potentially support advances in medication management practices, patient safety, and healthcare efficacy. This study will contribute to the ongoing improvement of healthcare services, particularly in primary care settings where accurate drug information and efficient medication management are crucial.

CONCLUSIONS

In this study, a user-friendly drug database was developed at Warinchamrab using compiled data acquired from various sources, which enables users to search for drugs according to their name, manufacturer, and availability. Three types of generated reports cater to different user needs. User satisfaction assessment revealed high scores for its various aspects. Valuable feedback was collected, which included suggestions for improvements, such as the involvement of the mobile app, highlighted key details, and enhanced aesthetics. This database addresses medication management challenges, particularly those experienced during crises, such

as the COVID-19 pandemic. Medication management, patient safety, and healthcare quality can be further improved by implementing enhancements based on user feedback.

CONFLICTS OF INTEREST

All authors declare that they have no conflicts of interest.

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AUTHOR CONTRIBUTIONS

Teeraporn Sadira Supapaan: Conceptualization, Methodology, Data collection, Formal analysis, Writing-original draft preparation; Surat Somsorn: Conceptualization, Methodology, Data collection, Formal analysis; Natthida Saensupha: Conceptualization, Methodology, Data collection, Formal analysis; Thanatcha Songmuang: Conceptualization, Methodology, Data collection, Formal analysis; Ananya Songmuang: Validation, Formal analysis; Aporn Jaturapattarawong: Conceptualization, Validation; Saksit Sripa: Conceptualization, Writing-reviewing and editing; Peerawat Jinatongthai: Validation, Writing-reviewing and editing; Jintana Napaporn: Conceptualization, Formal analysis, Writing-reviewing and editing.

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