รูปแบบการให้บริการเภสัชกรรมทางไกลและองค์ประกอบสนับสนุนการให้บริการเภสัชกรรมทางไกลของโรงพยาบาลสังกัดกระทรวงสาธารณสุข
The Telepharmacy Service Model and Supportive Components of Telepharmacy Service in Hospitals under the Ministry of Public Health

นิพนธ์ต้นฉบับ

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Original Article

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บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษารูปแบบการให้บริการเภสัชกรรมทางไกลและองค์ประกอบสนับสนุนการให้บริการเภสัชกรรมทางไกลของโรงพยาบาลสังกัดกระทรวงสาธารณสุข **วิธีการศึกษา:** การวิจัยเชิงพรรณนาแบบภาคตัดขวาง ประชากร คือ โรงพยาบาลสังกัดกระทรวงสาธารณสุข เลือกตัวอย่างแบบโควตาตามประเภทโรงพยาบาล เก็บข้อมูลระหว่าง วันที่ 15 มกราคม - 15 กุมภาพันธ์ พ.ศ. 2566 ด้วยแบบสอบถามทางไปรษณีย์ ที่ถามข้อมูลของโรงพยาบาล องค์ประกอบสนับสนุนบริการเภสัชกรรมทางไกล และบริการเภสัชกรรมทางไกล วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา **ผลการศึกษา:** มีโรงพยาบาลเข้าร่วมการศึกษา 421 แห่ง มีบริการเภสัชกรรมทางไกล 165 แห่ง (39.19%) โรงพยาบาลเฉพาะทางให้บริการมากที่สุด (28 แห่ง, 80.00%) รองลงมา คือ โรงพยาบาลทั่วไปขนาดใหญ่ (18 แห่ง, 72.00%) รูปแบบที่พบมาก คือ บริการแพทย์ทางไกลร่วมกับบริการเภสัชกรรมทางไกล (52.12%) ตามด้วยบริการการแพทย์ที่โรงพยาบาลร่วมกับบริการเภสัชกรรมทางไกล (39.39%) พบองค์ประกอบตามกรอบ 6 Building Blocks คือ การสนับสนุนจากผู้บริหาร (91.52%) กำหนดเป็นนโยบาย (มากกว่า 70%) กำหนดแนวปฏิบัติและขั้นตอน (56.97%) เข้าร่วมประชุมวิชาการการให้บริการเภสัชกรรมทางไกล การรับบริการเภสัชกรรมทางไกลในบางโรงพยาบาลผู้ป่วยต้องชำระค่าบริการเพิ่มเติม มากกว่า 50% เป็นผู้ป่วยสิทธิข้าราชการและประกันสังคม กลุ่มตัวอย่าง 59.39% มีระบบฐานข้อมูลที่ครอบคลุมการให้บริการเภสัชกรรมทางไกล และมีเพียง 13.16% ที่สามารถส่งต่อข้อมูลระหว่างเครือข่ายบริการ และช่องทางการสื่อสารที่ใช้มากที่สุด คือ แอปพลิเคชัน Line 79.39% **สรุป:** รูปแบบการให้บริการเภสัชกรรมทางไกลมีความแตกต่างกันตามบริบทและทรัพยากรของแต่ละโรงพยาบาล องค์ประกอบสนับสนุนที่สำคัญ คือ นโยบาย การจัดสรรและพัฒนาบุคลากร การสนับสนุนด้านการเงิน การพัฒนาระบบสารสนเทศสุขภาพ และเทคโนโลยีทางการแพทย์

คำสำคัญ: บริการเภสัชกรรมทางไกล; บริการแพทย์ทางไกล; กรอบแนวคิด 6 เสาหลักของระบบสุขภาพ

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Abstract

Objective: To study telepharmacy service models and supportive components for telepharmacy service in hospitals under the Ministry of Public Health (MOPH). **Method:** This descriptive cross-sectional study was conducted to collect data among hospitals under the MOPH using the quota sampling method to select the respondents. A postal questionnaire was used to collect data between January 15 - February 15, 2023. The questionnaire included general hospital information, supportive components for telepharmacy service, and telepharmacy operation. Descriptive statistics were used to analyze the data. **Results:** A total of 421 hospitals completed the questionnaire. Telepharmacy was provided in 165 hospitals, or 39.19%. Specialized hospitals provided the services the most in 28 locations (80.00%), followed by large general hospitals in 18 locations (72.00%). The most common service model was telemedicine in conjunction with telepharmacy (52.12%), followed by medical services at the hospital in conjunction with telepharmacy (39.39%). Community hospitals provided an additional service, i.e., a collaborative service between hospitals and sub-district health-promoting hospitals. For supportive components from hospital directors based on WHO 6 building blocks, 91.52% had executive supports, more than 70% had established policy, and 56.97% had established protocol. Additional fee for the service was found in some hospitals. More than 50% of patients were under the Civil Servant Medical Benefit and Social Security schemes. 59.39% of hospitals had database systems covering telepharmacy services where only 13.16% could transfer data in the networks. LINE application was the most used channel (79.39%). **Conclusion:** Telepharmacy service models differed depending on individual hospital's context and resources. Important supportive components included policies, allocation and development of personnel, financial support, and health information systems and medical technologies development.

Keywords: telepharmacy; telemedicine; six building blocks

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Introduction

The advancement of information and communication technology (ICT) has resulted in a change in the modalities of medical services to be more efficient and accessible to the public.[1] The World Health Organization (WHO) stated that the application of ICT could provide cost-effective and safe health services and enhance fundamental human rights by promoting equality, quality of life, and quality of healthcare for people.[2] Telemedicine is the application of ICT to deliver health services, support remote health services through the use of ICT by medical practitioners, and exchange medical

information for the diagnosis, treatment, disease prevention, research studies, and professional education for medical practitioners in order to promote the well-being of individuals and communities.[3] Telepharmacy, as a part of telemedicine, is a pharmaceutical service that involves medication consultation. This practice identifies, prevents, and solves drug-related problems, as well as facilitates drug monitoring programs and other medication-related services. The service allows communication between pharmacists and their service recipients through long-distance communication systems.[4]

The COVID-19 pandemic has driven the use of ICT to ensure that patients can access health services continuously and safely and reduce the spread of the virus.[5] The Ministry of Public Health (MOPH) has released a policy supporting telehealth services to alleviate hospital congestion, shorten waiting times, cut travel costs, and reduce the risk of COVID-19 infection.[6] As many professional councils have established their service standards, the Pharmacy Council of Thailand (PCT) announced a guideline for implementing standards for telepharmacy, which requires pharmacists to perform the service following relevant laws. The telepharmacy service requirements include attending a telepharmacy training course approved by the PCT, working as a person responsible for the duty in a service unit, medical facility, or registered community pharmacy, and providing the service following professional standards.[7] In addition, the Healthcare Accreditation Institute (Public Organization) (HAI) added telehealth services to the hospital and healthcare standards 5th edition to promote hospital quality improvement and match current academic and technological advances.[8] Moreover, the National Health Security Office (NHSO) supported telehealth services through medical reimbursements for patients with chronic diseases under the Universal Health Coverage (UHC) scheme.[9]

Hospitals under the MOPH have therefore developed service models consistent with the policies released by the MOPH. A literature review showed that most studies on telepharmacy in hospitals under the MOPH, both at the tertiary and secondary levels, modify hospital services. The telepharmacy service is expected to promote the development of work from each hospital's resources and capacities and evaluate clinical outcomes, satisfaction results, and economic outcomes resulting from hospital operations.[10-13] A variety of telepharmacy services were observed, including receiving medical services at the hospital in conjunction with telepharmacy, telemedicine in conjunction with telepharmacy, medical services at hospitals in conjunction with services at community pharmacies[10], telepharmacy services for medication consultation and monitoring of drug use[11-13], telemedicine in conjunction with telepharmacy and services at Sub-District Health Promoting Hospitals (SHPHs), and telepharmacy for patients with chronic diseases requiring medication refills.[14] Nevertheless, studies have yet to be aimed at collecting comprehensive data on telepharmacy conducted in hospitals under the MOPH in the country.

The development of telehealth service systems consists of various components acting in concert. It is, therefore, complicated to apply the technology with existing resources within the organization, as management methods and the organization's environment could affect service outcomes.[15] This study was designed to explore the supportive components for telepharmacy using the WHO framework for health systems development called six building blocks, comprising six core components namely leadership and governance, health workforce, health information systems, medical products, technologies, health system financing, and service delivery.[16] Findings could be useful for developing a more effective telepharmacy service system. This study aimed to collect data on telepharmacy service models and supportive components for telepharmacy conducted in hospitals under the Ministry of Public Health of Thailand.

Methods

This cross-sectional descriptive study collected data between January 15 and February 15, 2023. The study population was defined as 952 hospitals under the MOPH.[17-20] The sample size was calculated using the Krejcie and Morgan formula at a 95% confidence level.[21] A sample of 274 hospitals was then selected by using the quota sampling method based on types of hospitals namely hospitals under the Office of the Permanent Secretary, Ministry of Public Health, divided by types of service plan (small community hospitals, medium-sized community hospitals, large community hospitals, middle-level referral hospitals, small general hospitals, large general hospitals, and regional hospitals)[22] and specialized hospitals[18–20] (hospitals under the Department of Medical Services, hospitals under the Department of Mental Health, and hospitals under the Department of Disease Control). A literature review showed that survey response rates for mail questionnaires were 25 –

50%.[23,24] Therefore, the researcher sent the questionnaire to the entire study population.

Research instrument

The data collection tool was a questionnaire developed from a literature review of telepharmacy service models from previous studies and the WHO framework for health systems.[10,15,16] The questionnaire was divided into three parts. In Part 1, the questionnaire collected hospital general information consisting of 4 question items, a combination of closed-ended and open-ended questions. Part 2 collected supportive components for telepharmacy consisting of 14 questions on leadership and governance, the health workforce, health information systems, communication tools, and health expenditure in the form of closed-ended questions (yes or no), followed by semi-closed and open-ended questions to obtain detailed information on each component with the “yes” answer. Part 3 asked about telepharmacy services consisting of 9 questions on types of telepharmacy, types of telepharmacy activities, selection criteria for patients for telepharmacy, and outcome evaluation methods for telepharmacy services. The questions were formatted with closed-ended questions, followed by semi-closed and open-ended questions to obtain detailed information. A total of 27 questions were assessed for the quality of the instrument using content validity performed by five experts, consisting of 3 experienced pharmacists in telepharmacy and two university instructors of pharmacy management. All question items had an Index of Item-Objective Congruence (IOC) greater than 0.5, except for 2 questions on health information systems, which had an IOC of 0.4. The questions were subsequently modified per the experts' suggestions to create the final version of the questionnaire.

Participant ethical protection

The study was approved by the Human Research Ethics Committee, Faculty of Pharmacy, Chiang Mai University (approval number: 026/2565/E; approval date: December 20, 2022). The participation was voluntary.

Data collection

The questionnaire was mailed to respondents who were either heads of hospital pharmacy departments, pharmacists in charge of telepharmacy, or persons appointed by the heads of hospital pharmacy departments to answer it. The study respondents could the completed questionnaire through three channels specifically filling the questionnaire via Google Form, mailing the questionnaire via postage service using the free reply-paid envelope, and emailing the questionnaire in the form of a PDF file. A QR code was used to download the PDF template. To ensure respondent confidentiality, the researcher assigned each respondent a unique password for the questionnaire.

Data analysis

Descriptive statistics were used to analyze the data. The analyzed data were presented in the form of frequency and percentage.

Results

The researcher received 421 copies that could be utilized to evaluate the data, representing a response rate of 44.22%. The majority of returned questionnaires was postage mail (219 copies or 52.02%), followed by Google Form (201 copies or 47.74%). Out of a total of 421 hospitals, the majority of respondents was medium-sized community hospitals (205 hospitals, 48.69%), followed by small community hospitals (43 hospitals, 10.21%), and middle-level referral hospitals (36 hospitals, 8.55%). Telepharmacy services were provided in 165 out of 421 hospitals (39.19%). Among these 421 hospitals, telepharmacy services were most frequently found in specialized hospitals (28 hospitals, or 80.0%), followed by large general hospitals (18 hospitals, or 72.00%) and regional hospitals (12 hospitals, or 70.59%). The number of pharmacists in hospitals was mostly found to be between 1 and 10 (310 out of 421 hospitals, 73.63%) (Table 1).

Table 1 General information of respondents (N = 421).

General information	Telepharmacy provision, number (%)	
	Providing telepharmacy	Not providing telepharmacy
Hospital category*		
Small community hospital (n = 43)	11 (25.58)	32 (74.42)
Medium-sized community hospital (n = 205)	58 (28.29)	147 (71.71)
Large community hospital (n = 33)	9 (27.27)	24 (72.73)
Middle-level referral hospital (n = 36)	10 (27.78)	26 (72.22)
Small general hospital (n = 27)	19 (70.37)	8 (29.63)
Large general hospital (n = 25)	18 (72.00)	7 (28.00)
Regional hospital (n = 17)	12 (70.59)	5 (29.41)
Specialized hospital (n = 35)	28 (80.00)	7 (20.00)
Number of pharmacists in the hospital**		
1 - 10 (n = 310)	100 (32.26)	210 (67.74)
11 - 20 (n = 62)	28 (45.16)	34 (54.84)
> 20 (n = 49)	37 (75.51)	12 (24.49)
Total	165 (39.19)	256 (60.81)

* % was based on the total number of hospitals within their own category.
** % was based on the total number of hospitals within their own size.

Telepharmacy service models

A total of 7 service models for telepharmacy were observed in the respondents of hospitals. The service models could be grouped into two categories 1) telepharmacy in conjunction with medical services, and 2) telepharmacy without medical services.

In the **first category**, **telemedicine in conjunction with telepharmacy (n = 165)**, there were five models. Model 1 was a service model where patients receive medical treatment through telemedicine and subsequently receive medication consultation by pharmacists through telepharmacy and home delivery of medication (86 hospitals, 52.12%) (Table 2).

Model 2 was a service model where patients receive medical treatment at the hospitals and get registered for the Home Medicine Delivery Program. The patients will then receive medication consultations by pharmacists through telepharmacy and home delivery of medication (65 hospitals, 39.39%) (Table 2).

In Model 3, it was telemedicine in conjunction with telepharmacy and services at Sub-district Health Promotion Hospital (SHPH) which was a service model where patients receive medical treatment through telemedicine and subsequently receive medication consultation by pharmacists through telepharmacy. The prescribed medicines will be sent to the SHPHs to be either picked up by the patients or delivered to the patient's homes by Village Health Volunteers (VHVs) (51 hospitals, 30.91%) (Table 2).

In Model 4, it was medical services at the hospitals in conjunction with telepharmacy and services at SHPHs which was a service model where patients receive medical treatment at the hospitals and get registered for the SHPH Medicine Delivery Program. The patients will then receive medication consultations from pharmacists through telepharmacy. The prescribed medicines will be sent to the SHPH to be either picked up by the patients or delivered to the patient's homes by VHVs (42 hospitals, 25.45%) (Table 2).

Model 5 was medical services at the hospital in conjunction with services at community pharmacies which was a service model where patients receive medical treatment at the hospitals. The prescribed medicines will be prepared and delivered in one of the three following means. First, prescriptions are prepared for each patient by hospital pharmacists and sent to a community pharmacy. Second, prescriptions are dispensed from the pharmaceutical supply that is provided by the hospitals at a community pharmacy. Third, prescriptions are dispensed from the inventory of a community pharmacy. Community pharmacists will provide the patients with medication consultation through telepharmacy and home delivery of medications (17 hospitals, 10.30%) (Table 2).

In the **second category**, **telepharmacy without medical services**, there were two models (i.e., Models 6 - 7) (Table 2). Model 6 was telepharmacy for medication consultation and drug use monitoring which is a service model where patients receive medication consultation and monitoring of drug use from pharmacists through telepharmacy, such as medication adherence, adverse drug reactions, and health promotion (58 hospitals, 35.15%).

Model 7 was telepharmacy for patients with chronic diseases requiring medication refills. It is a service model where pharmacists perform monitoring of drug use, such as medication adherence and adverse drug reactions, through telepharmacy and then provide the patients with home delivery of medication (51 hospitals, 30.91%) (Table 2).

Table 2 Telepharmacy service models by hospital category (N = 165).

General information	Telepharmacy service models, number (%), by model						
	1	2	3	4	5	6	7
Small community hospital (n = 11)	2 (18.18)	0	7 (63.64)	3 (27.27)	0	3 (27.27)	4 (36.36)
Medium-sized community hospital (n = 58)	19 (32.76)	13 (22.41)	28 (48.28)	21 (36.21)	0	16 (27.59)	11 (18.97)
Large community hospital (n = 9)	4 (44.44)	6 (66.67)	5 (55.56)	7 (77.78)	0	3 (33.33)	1 (11.11)
Middle-level referral hospital (n = 10)	7 (70.00)	5 (50.00)	3 (30.00)	4 (40.00)	0	6 (60.00)	4 (40.00)
Small general hospital (n = 19)	13 (68.42)	10 (52.63)	3 (15.79)	4 (21.05)	3 (15.79)	10 (52.63)	9 (47.37)
Large general hospital (n = 18)	10 (55.56)	13 (72.22)	5 (27.78)	3 (16.67)	4 (22.22)	5 (27.78)	7 (38.89)
Regional hospital (n = 12)	4 (33.33)	11 (91.67)	0	0	8 (66.67)	4 (33.33)	8 (66.67)
Specialized hospital (n = 28)	27 (96.43)	7 (25.00)	0	0	2 (7.14)	11 (39.29)	7 (25.00)
Total**	86 (52.12)	65 (39.39)	51 (30.91)	42 (25.45)	17 (10.30)	58 (35.15)	51 (30.91)

* % was based on the total number of hospitals within their own category.

** % was based on the total number of hospitals with services provided.

When categorizing telepharmacy services based on types of hospitals, it was found that Model 1 service (i.e., telemedicine in conjunction with telepharmacy) was primarily found in specialized hospitals (27 out of 28 hospitals, 96.43%) (Table 2). Regional and large general hospitals mainly provided Model 2 service (i.e., medical services at the hospitals in conjunction with telepharmacy), in 11 out of 12 hospitals (91.67%) and 13 out of 18 hospitals (72.22%),

respectively. Regarding community hospitals, most of them were found to provide services in conjunction with those at SHPHs. The Model 3 service (i.e., telemedicine in conjunction with telepharmacy and SHPH services) was mostly often found in medium-sized and small-sized community hospitals in 28 out of 58 4hospitals (48.28%) and 7 out of 11 hospitals (63.64%), respectively (Table 2).

Patient selection criteria for telepharmacy

The most commonly used criterion by the respondents to identify eligible patients for telepharmacy was patient consent to receive the service (135 out of 165 hospitals, 81.82%), followed by patients with chronic diseases (126 hospitals, 76.36%) and patients with stable symptoms and reasonable control of the diseases (106 hospitals, 64.24%). The most frequently reported disease to receive telepharmacy was hypertension (102 hospitals, 61.82%), followed by diabetes (98 hospitals, 59.39%) and hyperlipidemia (64 hospitals, 38.79%) (Table 3).

Table 3 Patient selection criteria for telepharmacy.

Patient selection criteria	N (%)
Patient types* (n = 165)	
Patients consenting to receive the service	135 (81.82)
Patients with chronic diseases	126 (76.36)
Patients with stable symptoms and good control of the disease	106 (64.24)
Patients with transportation difficulties	97 (58.79)
Patients with movement difficulties	54 (32.73)
Patients who has communication tools	42 (25.45)
Patients with digital literacy	22 (13.33)
Others**	21 (12.73)
Disease types receiving telepharmacy* (n = 165)	
Hypertension	102 (61.82)
Diabetes	98 (59.39)
Hyperlipidemia	64 (38.79)
Mental disorder	55 (33.33)
COVID-19 infection	49 (29.70)
Cardiovascular disease	35 (21.21)
Asthma	33 (20.00)
Kidney disease	25 (15.15)
Cancer	17 (10.30)
Others$	25 (15.15)

* More than one answer was applicable.

** Other criteria included patients on high-alert medications that have the high risk of causing side effects, patients on medicines requiring specific administration techniques, patients receiving palliative care, patients experiencing side effects of medicines and patients experiencing drug-related problems.

$ Other disease types included HIV infection, ENT disorders, skin diseases, drug addiction recovery, tuberculosis, neurological diseases, eye diseases, rheumatoid arthritis, SLE, thyroid disease, bone and joint disease and hematologic disease.

Activities of telepharmacy services

The most commonly provided activity of telepharmacy services was medication use consultation (160 out of 165 hospitals, 96.97%), followed by medication review and identification of drug-related problems (156 hospitals, 94.55%), and monitoring of patient's medication use (149 hospitals, 90.30%). The least common activity was patient referral to hospitals (78 hospitals, 47.27%) (Table 4).

Table 4 Activities of telepharmacy services (N = 165).

Activities of telepharmacy services	Number (%)
Patient or patients' relatives interviews to collect data	137 (83.03)
Medication review and identification of drug related problems	156 (94.55)
Medication use consultation	160 (96.97)
Monitoring of drug use	149 (90.30)
Patient referral to medical facilities	78 (47.27)
Patient education on health promotion	116 (70.30)

* More than one answer was applicable.

Of the 165 hospitals, regarding medication preparation and delivery, it was found that the most commonly provided activity among the respondents was a pharmacist's verification of the correctness and completeness during drug preparation before drug delivery (134 hospitals, 81.21%), followed by the determination of types or categories of medicines suitable for delivery (101 hospitals, 61.21%). The least common activity was temperature control in cold chain distribution as appropriate for medication types, which was observed in only 19 institutions (11.52%). Postal delivery was the most popular delivery method (100 hospitals, 60.61%).

Outcome evaluation methods for telepharmacy services

Data collection in the form of Key Performance Indicators (KPIs) for telepharmacy was performed in 99 hospitals (60.00%) of the respondents. The data revealed that most of the respondents (68 out of 99 hospitals, or 68.69%) collected two types of data, clinical or medication-related outcomes and service outcomes. The most frequently collected type of data on clinical or medication-related outcomes was adverse drug reactions (67 hospitals, 67.68%), followed by medication adherence (66 hospitals, 66.67%). Regarding service outcomes, the most frequently collected data on service outcomes was the number of patients receiving telepharmacy (68 hospitals, 68.69%), followed by patient satisfaction (52 hospitals, 52.53%) (Table 5).

Concerning the utilization of the service outcomes, it was found that the respondents mostly adopted the results from the service assessment for development and improvement (77 out of 99 hospitals, 77.78%). In comparison, the least adopted result was observed in the section on disseminating and exchanging information about the provision of the services (19 hospitals, 19.19%) (Table 5).

Table 5 Outcome evaluation methods of telepharmacy.

Outcome evaluation methods of telepharmacy	N (%)
Clinical/medication use outcomes (n = 99)	
Adverse drug reactions	67 (67.68)
Medication adherence	66 (66.67)
Medication errors	53 (53.54)
Drug-related problems	52 (52.53)
Knowledge on medication use	39 (39.39)
Laboratory tests	26 (26.26)
Vital signs	20 (20.20)
Others**	19 (19.19)
Service outcomes (n = 99)	
Number of patients receiving telepharmacy	68 (68.69)
Patient satisfaction	52 (52.53)
Delivery problems	29 (29.29)
Waiting time to receive services in the hospitals	20 (20.20)
Delivery time	16 (16.16)
Service provider expenses	10 (10.10)
Laboratory tests	26 (26.26)
Vital signs	20 (20.20)
Others**	19 (19.19)

* More than one answer was applicable.

** Other clinical/medication use outcomes included scoring assessments of disease control and hospital readmission.

Table 6 Supportive components for telepharmacy.

Supportive components for telepharmacy	N (%)
Leadership and governance	
Establishment of policies and practice guidelines* (n = 165)	
Establishment of service policies	151 (91.52)
Allocation of equipment, tools for proving the services	128 (77.58)
Establishment of practice guidelines and service procedures	118 (71.52)
Establishment of service standards	108 (65.45)
Allocation of areas for proving the services	99 (60.00)
Allocation of personnel for providing the services	94 (56.97)
Allocation of budget for providing the services	86 (52.12)
Appointment of committees for planning, supervising, monitoring and evaluating (n = 165)	
The appointment of the committees is present	110 (66.67)
The appointment of the committees is absent	55 (33.33)
Health workforce	
Number of pharmacists in charge of telepharmacy (person/day) (n = 165)	
1	124 (75.15)
2	38 (23.03)
3	3 (1.82)
Number of days to perform telepharmacy (day/week) (n = 159)	
< 2	37 (23.07)
2 - 3	85 (53.46)
≥ 4	37 (23.07)
History of attended conferences on telepharmacy (n = 165)	
Yes	94 (56.97)
No	71 (43.03)
Health information systems	
Database systems covering telepharmacy services (n = 165)	
Database systems are present* (n=98)	
Service recipient registration system	87 (88.78)
Services record system	68 (69.39)
Pharmaceutical care record system	62 (63.27)
Medication delivery record system	57 (58.16)
Data transfer between database systems (n = 98)	
Database systems can transfer data* (n = 76)	
Data transfers within the hospitals	66 (86.84)
Data transfers between service networks	10 (13.16)
Communication tools	
Communication tools used for telepharmacy* (n = 165)	
Mobile phones	140 (84.85)
Computers	125 (75.76)
Tablet computers	35 (21.21)
Communication channels used for telepharmacy* (n = 165)	
Mobile phones	129 (78.18)
Application/platform*	131 (79.39)
Applications/platforms used for telepharmacy* (n = 131)	
LINE	104 (79.39)
LINE Official Account	45 (34.35)
Application/platform exclusively developed for telepharmacy**	37 (28.24)
Zoom	9 (6.87)
Others#	3 (2.29)

* More than one answer is possible.

** The applications developed for telepharmacy included DMS telemedicine, applications developed by private sector and applications developed by hospitals.

Other applications/platforms, e.g., Microsoft teams and Google meet.

Supportive components for telepharmacy services

A) Leadership and governance

Among the respondents of hospitals that provide telepharmacy services, it was most commonly found that their hospital directors had established a policy on the services (151 out of 165 hospitals, 91.52%), followed by supplying tools and equipment necessary for the services (128 hospitals, 77.58%), and providing practice guidelines and procedures for the services (118 hospitals, 71.52%) (Table 6).

Regarding the appointment of a committee for planning, supervising, monitoring, and evaluating the results of telepharmacy services, the data showed that the respondents of 110 out of 165 hospitals (66.67%) had appointed a committee. The most commonly appointed committee was a committee related to the development of telehealth services (37 hospitals, 33.64%), followed by the Pharmacy and Therapeutic Committee (PTC) (33 hospitals, 30.00%) (Table 6).

B) Health workforce

The most commonly reported number of pharmacists performing telepharmacy was 1 person/day (124 out of 165 hospitals, 75.15%), while the number of days per week to perform telepharmacy was in a range of 2-3 days/week (85 hospitals, 53.46%) (Table 6).

Regarding knowledge and skill development for telepharmacy services, it was found that pharmacists in 94 hospitals (56.97%) of the respondents had attended an academic conference on telepharmacy (Table 6).

C) Health information systems

The respondents of 98 out of 165 hospitals (59.39%) had a database system covering telepharmacy services. The most common type of database was the service recipient registration system (87 hospitals, 88.78%), followed by the service record system (68 hospitals, 69.39%). Regarding the referral information system, it was found that the respondents of 76 hospitals (77.55%) had a database that could transfer data. Out of these hospitals, there were only 10 hospitals (13.16%) could transfer data across the service networks (Table 6).

D) Communication tools

Mobile phones were the most frequently utilized communication tool in the respondents of 140 hospitals

(84.85%). Mobile applications and online platforms were the most frequently used communication channels in 131 hospitals (79.39%), while the LINE application was reported to be the most commonly used application for telepharmacy in 104 hospitals (79.39%), followed by the LINE Official Account in 45 hospitals (34.35%) (Table 6).

E) Health expenditure

Regarding public health insurance schemes covering telepharmacy services, it was found that all 165 hospitals (100%) in the sample group provided patients under the Universal Health Coverage (UHC) scheme with telepharmacy services, followed by patients under the Civil Servant Medical Benefit Scheme (CSMBS) in 134 hospitals (81.21%) and the Social Security Scheme (SSS) in 125 hospitals (75.76%). Regarding the telepharmacy service fee, patients under the UHC scheme mostly received the services without any charge in 119 hospitals (72.12%), while patients under the CSMBS and SSS receiving the services were subject to the service fee, which was most commonly collected in a range of 50 - 100 Thai Baht in 65 hospitals (48.51%) and 62 hospitals (49.60%), respectively (Table 7).

Table 7 Telepharmacy service fee divided by types of public health insurance scheme.

Service fee (Thai baht/service performed)	Health insurance scheme*, Number (%)		
	UHC (n = 165)	UHC (n = 165)	UHC (n = 165)
No fee	119 (72.12)	59 (44.03)	58 (46.40)
< 50	2 (1.21)	0	0
50 - 100	41 (24.85)	65 (48.51)	62 (49.60)
> 100	3 (1.82)	10 (7.46)	5 (4.00)

* More than one answer is possible. Percentage value is calculated from the base value of hospitals providing patients under each health insurance scheme with the service.

Discussions and Conclusion

Most of the hospitals under the MOPH providing telepharmacy services were general hospitals or those at higher levels. The services were mostly provided in specialized hospitals, followed by large general and regional hospitals, with a proportion of 80.00%, 72.00%, and 70.59%, respectively, compared with the same category of hospitals. In contrast, community hospitals were reported to provide the services in a proportion between 25 and 30%. Telepharmacy services provided by various hospitals under the MOPH were found to be consistent with the MOPH policies in support of telehealth services.[6]

Telepharmacy service models

The most commonly used service model of telepharmacy among the respondents of hospitals was telemedicine in conjunction with telepharmacy, followed by medical services at the hospitals in conjunction with telepharmacy, with a proportion of 52.12% and 39.39%, respectively. The least common service model was medical services at hospitals in conjunction with services at community pharmacies (10.30%). The service models provided in hospitals under the MOPH presented in this study are consistent with the service models reported in the study by Lertsinudom et al[10], which provides a policy brief regarding the integration of telepharmacy and healthcare services if patients receive health services from hospitals. The suggested three service models are: 1) medical services at the hospitals in conjunction with telepharmacy, 2) telemedicine in conjunction with telepharmacy, and 3) medical services at the hospitals in conjunction with services at community pharmacies.

Service models of telepharmacy varied depending on hospital types. Specialized hospitals, regional hospitals, and general hospitals mainly provided the services in the form of telemedicine in conjunction with telepharmacy and medical services at the hospitals in conjunction with telepharmacy. These service models could be seen as a service development within the service unit, supposedly in response to hospital congestion. According to the data collected in 2012 - 2021, there was a continuous increase in the number of outpatient visits by the public. In 2021, the number of outpatient visits reached 175 million visits[25], causing considerable problems, particularly for large hospitals, both regional and general hospitals.[26] The problem resulted in a longer waiting time for the patients to receive health services, with an average of 3 - 5 hours.[27,28] Therefore, the MOPH released a policy in order to promote the use of telehealth services to alleviate the problem.[6] The introduction of a service plan by the MOPH allows the execution framework necessary for capacity building of the service units to be consistent with predetermined competencies. Resource allocation in terms of budget, tools, and personnel was then conducted in accordance with the service plan.[29] As a result, telepharmacy service models may vary depending on the capacities and resources of each hospital.

Regarding community hospitals, an additional service involving collaboration between hospitals and SHPHs was introduced as a part of the telepharmacy service model,

making them unique from other types of hospitals. The reason for the service model was probably due to the MOPH policy which requires collaborative working from all relevant sectors. With the resource integration within the context of a given area, there is a network formation between hospitals and SHPHs, to take care of the health and well-being of the public.[30] The study conducted by Buncherd and Anukulpracha[31] revealed that community hospitals had worked with SHPHs to deliver medicines to patients with chronic diseases in their assigned area. The network and continued collaboration between hospitals and SHPHs might have played an essential role in designing a telepharmacy service model in which network partners can provide health services in the service unit to people in the community.

The service model of receiving medical services at hospitals in conjunction with services at community pharmacies was found to be the least adopted service model, with only 10% among the respondents. Study results from the Receipt of Medicines in Pharmacy to Reduce Hospital Congestion Initiative[27,32,33] suggested that the problem was due to the need for participating community pharmacies in some areas preventing some patients from joining the program. Participating community pharmacies must be ready for the services in terms of management and information systems to ensure the effective transfer of data necessary for patient care. These challenges might be why the service model of receiving medical services at hospitals in conjunction with services at community pharmacies was ranked the lowest. However, the service model of receiving medical services at hospitals in conjunction with services at community pharmacies could alleviate hospital congestion and reduce hospital pharmacists' workload. Therefore, there should be more support to encourage hospitals to provide such a service model.

In addition, there were 2 types of telepharmacy service models conducted without medical services involved namely 1) telepharmacy for medication consultation and monitoring of drug use and 2) telepharmacy for patients with chronic diseases requiring medication refills. A literature review showed that telepharmacy was used to provide medication consultation and monitor drug use among patients with various diseases. Some examples of its intended purpose include monitoring medication adherence, side effects from medicines, clinical symptoms of patients, patient education about diseases, and health promotion.[11-13] Although many hospitals had resorted to postal medication delivery services to reduce hospital overcrowding, the medication was not delivered by a pharmacist, leaving the burden of reading medication labels and instructions to the patients.[14] The study of medication refilling and home delivery of medication without telepharmacy revealed that 49.30% of patients reported having drug-related problems.[34] Telepharmacy is a professional service that helps enhance the efficiency of the provided pharmaceutical services. It can be used as a communication channel where patients can receive medication consultation and advice directly from pharmacists. As a result, the pharmacists' role in a multidisciplinary team will be enhanced to identify, prevent, and solve drug-related problems in order to maximize the benefits and increase the safety of medication use by the roles of pharmacists specified in the Pharmaceutical Profession Act (No. 2), B.E. 2558.[35]

Service activities and patient selection criteria for telepharmacy

According to the Pharmacy Council of Thailand's professional practice criteria, more than 80% of the respondents provided pharmaceutical care activities in accordance with a guideline for the execution of telepharmacy service standards B.E. 2565.[7] This strategy was implemented to ensure the efficiency of telepharmacy services while also increasing the benefits to service recipients. Nevertheless, patient referral service to hospitals was performed only in 47.27% of the respondents, which was believed to be associated with patient selection criteria for telepharmacy set by the MOPH. This is because the criteria only allow patients with chronic diseases who have stable symptoms and reasonable control of the diseases to receive the service.[6]

Regarding medication delivery, the study results showed that the medication preparation process involved verifying the correctness and completeness of prepared medicines by pharmacists before delivery in 81.21 % of the respondents. In comparison, 61.21% had determined types or categories of medicines suitable for delivery. For home delivery of medication, it was found that the most commonly used channel for delivery was through postal delivery in 60.61% of the respondents. This was because postal delivery has capabilities and networks throughout Thailand, especially in remote areas. The medicines were sent by Express Mail Service (EMS), which offers a Track & Trace system to monitor the status of the sent package.[36] The medication

preparation and delivery conducted by the respondents undergoing a series of activities prior to the delivery. These activities included the verification of correctness, consideration of types of medicines suitable for delivery methods, monitoring of the delivery status and problems through the tracking system, and using the delivery services that offer a service guarantee to prevent the loss of the package. Therefore, the medication delivery seemed to be conducted following the announcement of the Pharmacy Council of Thailand Re: a guideline for implementation of standards for telepharmacy service B.E. 2565.[7]

However, only 11.52% of the respondents implemented a temperature control for the entire delivery process. This finding raises a concerns since quality of medicines could be compromised during storage and transportation. According to Limpananon et al[37], the researchers investigated temperatures inside packages and envelopes used for medication delivery via postal delivery. They found that the temperatures had reached more than 30 ˚C. Regardless of the study's findings, actual temperatures are predicted to be lower than those measured in the study because goods are typically kept in cars during delivery. Temperature monitoring for drug storage during delivery should therefore be encouraged in order to assure the quality and stability of the medicines throughout the delivery procedure.

As for the patient selection criteria used by the respondents for telepharmacy, the most commonly used criterion was patient consent to receive the service, followed by patients with stable symptoms and reasonable control of the diseases, with a proportion of 81.82%, 76.36%, and 62.24%, respectively. Patients with hypertension were found to be most commonly provided with telepharmacy, followed by patients with diabetes and hyperlipidemia, with a proportion of 61.82%, 59.39%, and 38.79%, respectively. A literature review showed that telepharmacy positively affects clinical outcomes, allowing patients to better control their diseases by achieving treatment targets, increasing patient engagement in their care, and enhancing medication adherence.[11,12,38] The service could also facilitate patients living in remote or underprivileged areas to access adequate health services, save travel costs and increase the satisfaction of the patients.[10,38] Considering the patient selection criteria for telehealth services set by the MOPH, the criteria allow former patients with chronic diseases with stable symptoms and reasonable control of the disease to receive the services.[6] The criteria are considered suitable as hospitals can provide all patients with the services regardless of the type of disease. This policy will not only result in the increased opportunity for patients to access telehealth services but also offer additional service options to the patients, which will ultimately positively impact the reduction in hospital congestion.

Outcome evaluation methods of telepharmacy services

The study revealed that 60.00% of the respondents of hospitals collected data on telepharmacy to measure the quality of the service through the use of KPIs. Most respondents (68.69%) collected clinical/medication use and service outcomes. The most frequently collected data on clinical/medication use outcomes were adverse drug reactions, followed by the number of medication adherence, with a proportion of 67.68% and 66.67%, respectively. Regarding service outcomes, the number of patients receiving telepharmacy was most commonly recorded, followed by patient satisfaction, with a proportion of 68.69% and 52.53%, respectively. A literature review showed that the MOPH had set the indicators for telehealth services in the fiscal year 2023, which require all hospitals to collect data on the number of the provided services. The collected data only involve using quantitative indicators[39] and may lack the inclusion of qualitative aspects to help practitioners develop various success indicators. In addition, the indicators set in the early stages, which require data at the provincial level, may result in the need for more indicator data collected in some hospitals. Rational Drug Use (RDU) Hospital PLEASE program[40] represents an excellent example of setting clear indicators. The indicators were separated into those for hospitals and SHPHs, comprising the indicators to measure the quality of process, output, and outcomes. The clear indicators could help ensure that hospitals at all levels can have concrete measures about RDU.

Supportive components for telepharmacy

The analysis of supportive components for telepharmacy using WHO's six building blocks of the health system. This study defined the service system as telepharmacy. The findings are as follows.

A) Governance and leadership

Most respondents of the hospitals (91.52%) where telepharmacy was provided had a specific policy on

telepharmacy established by their hospital directors. Additionally, more than 70% of the hospitals were provided with tools and equipment necessary for the service, practice guidelines, and service procedures following the policy promoting telehealth services of the MOPH[6] and the Hospital and healthcare standards 5th edition which require organizations to implement systems and practice guidelines and to provide necessary resources in support of telemedicine.[8]

As for the appointment of a committee for planning, supervising, monitoring, and evaluating the results of telepharmacy services, it was found that 66.67% of the respondents had appointed a committee. Piyasin et al[27] discovered that an important strategy for project implementation is to ensure that an appointed committee includes stakeholders from all sectors and has regular follow-up meetings to present the results of the operations.

B) Health workforce

Most respondents (75.15%) had one pharmacist performing telepharmacy every day. According to the respondents, telepharmacy has impacted the current pharmaceutical services performed in hospitals due to increased workload and given the expected increase in patients requiring telepharmacy. The current number of pharmacists who can perform the service appears insufficient. The pharmacists' roles specified in Pharmaceutical Profession Act (No. 2), B.E. 2558[35] include medication review, dispensing, medication consultation, and collaboration with other healthcare providers as a multidisciplinary team to prevent and solve drug-related problems. Telepharmacy has broadened the scope of pharmacists' roles to cover medication preparation and delivery.[7] Therefore, this could lead to the increased workload of hospital pharmacists, which is consistent with the results of the study conducted by La-ee et al[41] revealing the multifaceted workload of hospital pharmacists. Therefore, an adequate workforce is necessary due to changes in society.

Regarding knowledge and skill development for providing telepharmacy, the announcement of the Pharmacy Council of Thailand Re: a guideline for implementation of standards for telepharmacy service B.E. 2565 has set requirements for pharmacists in charge of telepharmacy to follow including attending a telepharmacy training course approved by the Pharmacy Council of Thailand (PCT) and getting registered as a qualified pharmacist by following requirements set by the PCT.[7] This study reveals that 56.97% of the respondents had a pharmacist(s) who had attended a conference on telepharmacy. According to the study by Sittiworanan et al[42], the results suggested that pharmacists were confronted with challenges that prevented them from attending academic conferences due to the workload and time challenges. The PCT responded to the problem by promoting continuing pharmacy education on telepharmacy, including training courses on telepharmacy conducted through video conferencing and developing a learning management system to allow pharmacists to develop desired skills in their efforts and repeat the courses as desired.[43,44] The development of training models by the PCT could overcome time challenges and save travel costs leading to increased access to continuing pharmacy education on telepharmacy.

C) Health expenditure

Among three public health insurance schemes, the sampled hospitals most commonly provided patients under Universal Health Coverage (UHC) scheme with telepharmacy, followed by patients under the Civil Servant Medical Benefit Scheme (CSMBS) and Social Security Scheme (SSS), with a proportion of 100%, 81.21%, and 75.76%, respectively. It is evident that patients under the UHC scheme could access telepharmacy more than those under other healthcare schemes. This can be explained by the fact that 71.13% of Thailand's population use UHC as their primary healthcare scheme.[6] The support for telepharmacy from the National Health Security Office (NHSO) also allocates budget for the reimbursement of telepharmacy service fees for patients under UHC scheme. The telepharmacy fees include the service fee of 30 Thai Baht for each service performed and the delivery fee for medicines and medical supplies at 50 Thai Baht for each delivery.[9]

Some hospitals may require patients to pay additional fees, mostly 50 - 100 Thai Baht, as observed in more than 50% of the patients under CSMBS and SSS. The respondents stated that the budget allocated for package preparation and delivery was the obstacle to the provision of telepharmacy. This is consistent with the finding from the study of Sunthorn et al[14] which revealed that some hospitals had collected the delivery fee through postal delivery from patients. The collected fee was reported to be 50-100 Thai Baht depending on types of payment schemes.

D) Health information systems

Database systems covering telepharmacy services were found in 59.39% of the respondents of hospitals providing telepharmacy. The availability of the databases is consistent with the announcement of the PCT Re: a guideline for implementation of standards for telepharmacy service B.E. 2565[7] which requires service-providing facilities to have a health information system designed for telepharmacy to ensure the efficiency of the provided service and provide evidence to protect the rights.

Regarding data transfers between databases, it was found that the respondents of hospitals that can transfer data between service networks was found only in 10 hospitals (13.16%). The study conducted by Limpananont et al[37] revealed that the software used by each hospital for data documentation was different, resulting in differences in the data structure of documented data, leading to complicated data exchanges. Many studies[32,33,45] found that data transfers between hospitals and service units are necessary for pharmaceutical care services provided to patients. Either the lack of or incomplete data transfer systems could result in troubles when exchanging data between hospitals and service units, leading to the increased workloads caused by the preparation of data and documents for further transfers between service units.

E) Communication tools

The study results revealed that mobile phones were the most commonly used communication tool among the respondents of hospitals (84.85%), while the most common communication channel was through applications/platforms (79.39%). LINE application was the most frequently used application, followed by LINE Official Account, with a proportion of 79.39% and 34.35%, respectively. The announcement of the Pharmacy Council of Thailand Re: a guideline for implementing standards for telepharmacy service B.E. 2565[7] provides guidance on the application features for telepharmacy. It offers a voluntary request for application approval. Many studies have adopted the LINE application as a communication channel for providing patients with telepharmacy services, including medication consultation, monitoring of drug use, and patient education about health care.[11,12] Given that the LINE application is free to use and can allow its users to have a variety of communication forms, including text, sound, **image**, and motion[46], these reasons probably explain why the application has been widely used. Nevertheless, application systems not developed exclusively for telepharmacy could cause concerns over privacy and confidentiality issues.[15]

Summary and recommendations

Telepharmacy service models are different depending on the context of each hospital because supportive components, including workforce allocation, financial support, the development of health information systems, and medical technologies, influence the service model. This study proposes policy recommendations as follows:

Concerning leadership and governance, the MOPH should consider adjusting KPIs at the hospital level and increasing service quality indicators such as medicine compliance, patient satisfaction, to provide evaluation of the service covers the performance of the service and may develop insurance quality of service. to develop a standard for remote pharmacy service Quality service, safety, and meeting the needs of service users.

For the health workforce, the hospital administrator is responsible for continuously monitoring and assessing telepharmacy service delivery to adjust the workforce based on service delivery needs and the number of service recipients.

Recommendations on health expenditure include the expansion of the scope of reimbursement for telehealth services by the Comptroller General's Department and the Social Security Office and agreement on the cooperation between the MOPH and delivery service providers, such as Thailand Post, to establish an appropriate standardized fee for medication delivery.

Concerning health information systems, the MOPH and associated agencies should build data exchange systems to convey data required for patient care to other network service units. Furthermore, access to data should be controlled based on the needs of service units while keeping the privacy and confidentiality of personal information about service receivers in mind.

In terms of service systems, the MOPH and delivery service providers such as Thailand Post are encouraged to collaborate on developing a storage condition monitoring system for medication delivery in order to ensure delivery and develop a system to monitor the storage environment of drugs

during delivery. Keep the drug's quality and stability throughout the delivery process.

Research limitations

This research was carried out at a time when telepharmacy standards continue to progress and telepharmacy service models may be developed and adjusted to suit the service setting of each hospital institution according to changes in policies and supportive elements. As a result, additional data should be collected.

Recommendations for further studies

A qualitative study of telepharmacy should be undertaken to collect in-depth data on the service, such as steps of service procedures, challenges and hurdles to delivering telepharmacy, and advice on developing telepharmacy based on the setting of each institution.

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