



Research article

Telepharmacy services to support patients with epilepsy in Thailand: A descriptive study

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ABSTRACT

Background: Telepharmacy shows an effective option to provide pharmacy services in several settings. It could improve patients' outcomes and save costs. However, the impact of a telepharmacy services in low resource settings remains limited.

Objectives: This study assessed the feasibility and effect of telepharmacy services on patient-reported clinical and economic outcomes among patients with epilepsy in Thailand.

Methods: A prospective descriptive study was conducted at a university hospital. Patients with epilepsy visiting the clinic from February 2021–December 2021 were included. Telepharmacy services were provided by hospital pharmacists through an application platform. Patients met a pharmacist synchronously using a video conference feature embedded in our developed website. Patients were interviewed for improved clinical symptoms, drug-related problems (DRPs), and health and social behaviors. Travel costs, food and accommodation costs and productivity costs due to hospital visits were also evaluated.

Results: A total of 80 patients were included. Of those, 39 patients (48.75%) were men, averaging 35.44 ± 15.09 years old. A total of 22 patients (27.50%) reported better clinical symptoms after the telepharmacy service. Sixty-four DRPs (69.56%) were observed, along with 28 health and social behavior problems (30.44%). The most common DRPs were adverse drug reactions (20/64; 69.56%), followed by patients' non-adherence (20/64; 31.25%). Sixty-six problems (68.04%) were corrected during the telepharmacy service. From the patient's perspective, the average direct nonmedical cost per visit was 1257 ± 857 THB/visit. Travel costs were the major cost driver, accounting for 67.7% of the total cost. Cost savings averaged 6511 ± 4996 THB/year or 54.75% of usual care.

Conclusion: Telepharmacy services are likely to improve patient outcomes, detect DRPs, and effectively provide cost-savings. However, further studies hosting a larger number of participants are warranted to assess the impacts of telepharmacy services.

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1. Introduction

Telehealth played an important role in several clinical services during the COVID-19 pandemic. It uses a technology-based virtual platform to deliver health information, and prevent and monitor medical care [1]. Telepharmacy, analogous to telehealth, is defined as the delivery of pharmacy services using information technology for patients at a distance [2]. It involves a wide range of pharmacy services, such as medication reviews, drug information services, drug monitoring and patient counseling [3–5].

Telepharmacy is an effective option to provide pharmacy services in several settings. A systematic review of 34 studies on clinical outcomes of telepharmacy in several chronic diseases revealed telepharmacy has a positive impact on clinical outcomes in outpatient or ambulatory settings [6]. Another review indicated that telepharmacy positively impacts clinical outcomes among patients with diabetes [7]. Studies among patients with asthma also indicated that telepharmacy services could improve asthma control compared with usual care [8–10]. Telepharmacy creates a positive impact on clinical outcomes, and prevents medication errors. A study in the United Arab Emirates showed the effectiveness of telepharmacy on medication dispensing errors and prescription-related errors in community pharmacy settings [11].

Epilepsy is an important chronic neurologic disease. A recent systematic review indicated the incidence rate of epilepsy is 61.4 per 100,000 person-years and is higher in low and middle-income countries (139.0 per 100,000 person-years) than in high income countries (48.9 per 100,000 person-years) [12]. In addition, the lifetime prevalence of epilepsy was 7.60 per 1000 population, which is higher in low and middle income countries (8.75 per 1000 population) than in high income countries (5.18 per 1000 population) [12]. Patients with active epilepsy should be closely monitored. However, the COVID-19 pandemic created challenges for patients with epilepsy to visit an epilepsy clinic.

An outpatient epilepsy clinic at a university hospital in Thailand has developed a telepharmacy program providing pharmaceutical care services for patients with epilepsy who were unable to visit their epilepsy clinic. This study aimed to assess the feasibility and potential effect of a telepharmacy services on patient-reported clinical and economic outcomes among patients with epilepsy in an outpatient epilepsy clinic at a university hospital in Thailand.

2. Material and methods

2.1. Overall description

A prospective descriptive study was conducted in an epilepsy clinic at a university hospital in Thailand. Patients visiting the clinic from February 2021 to December 2021 were invited to participate in this study. This study was approved by the Center for Ethics in Human Research, Khon Kaen University (approval number: HE641019).

2.2. Patient selection

Patients meeting the following inclusion criteria were eligible for this study. The inclusion criteria were: 1) aged 18 years or older, 2) diagnosed with epilepsy, 3) visited an epilepsy clinic at a university hospital in northern Thailand from February to December 2021, 4) able to use telecommunication technology such as web application, video conference application, voice call or telephone and 4) agreed to participate in telepharmacy services at least twice during the study. Informed consent was retrieved before providing interventions to patients.

2.3. Telepharmacy service intervention

Pharmacists provided telepharmacy services through a web application platform developed by our research team. The platform could be used by healthcare professionals, including physicians, pharmacists, nurses and other healthcare providers. Data within the platform could be transferred to other providers when data owners allowed it. It could also be used in hospitals, pharmacies and other

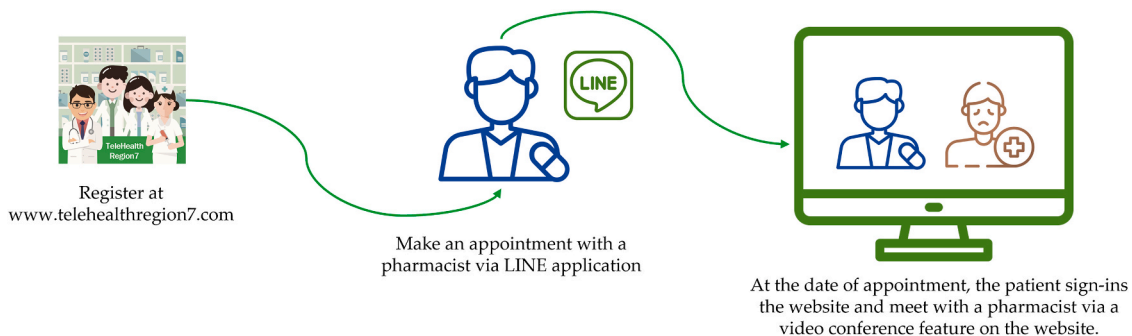


Fig. 1. Process of telepharmacy services provided in this study.

settings.

Patients who participated in this study were asked to register on the web application (www.telehealthregion7.com) and agree to the terms and conditions of the application. After registering, pharmacists providing telepharmacy services made an appointment with patients using the LINE application.

On the date of appointment, patients must sign in to the web application using the last 4-digits of their identification number, then look for pharmacists with whom they made an appointment with. The patient met a pharmacist as a synchronized telepharmacy service using a video conference feature embedded in the web application (Fig. 1). The telepharmacy services included monitoring disease, counseling pharmacy, assessing patients' adherence, assessing drug-related problem (DRP), and health behavior assessment. The prescribed medications were sent to patients using a business mailing service. All patients received telepharmacy services at least twice during the study period.

2.4. Outcome measures

Patient-reported clinical outcomes were collected using interviews by a trained pharmacist. Patients were asked to self-assess their improved clinical symptoms (improved, remained the same, or worsened). In addition, uncontrolled seizures were also assessed. Patients were also asked to assess DRPs and health and social behaviors. The DRPs assessed in this study were the delayed receiving of mailed medications at the time of telepharmacy services, patients' adherence, adverse drug reactions, drug-drug interactions, unnecessary use of herbal and alternative medicine and leftover medications. Health behaviors assessed in this study included exercise behaviors, diet control behaviors, smoking or second-hand smoking and mental stress.

The cost-savings of telepharmacy services was also estimated from a patient perspective. The cost of telepharmacy services was compared with the cost of usual care. Based on most patients under health insurance coverage in Thailand, small amounts of direct medical costs incurred in hospitals were out-of-pocket costs. In addition, the direct medical costs did not differ between telepharmacy services and usual care. Thus, only direct nonmedical costs including travel costs, additional food and accommodation costs, productivity costs due to hospital visit and the cost of mailing the medications were estimated. The cost of mailing the medications was included in this study because patients need to pay out-of-pocket for 100 THB each time of mailing their medication to their home.

The number of hospital visits was assumed according to their health insurance schemes. Because patients under the universal health coverage scheme (UC) and social security insurance scheme (SSI) usually meet their neurologists every six months and need to refill their prescriptions every six weeks, a total of nine hospital visits/year was assumed for usual care (as a hypothetical scenario) of the patients. For patients under the civil servant medical benefit scheme (CSMBS), they usually meet their neurologists every six months and need to refill their prescriptions every three months. Thus, a total of four hospital visits/year was assumed for the usual care of these patients. For telepharmacy services, patients did need to refill their prescriptions at the hospital. Patients only needed to visit the hospital to meet their neurologists. Thus, a total of three and two hospital visits/year were assumed for patients under UC or SSS, and CSMBS, respectively. Patients were also asked to estimate their direct nonmedical costs during the interview.

2.5. Analysis

Descriptive statistics were used to determine patients' demographics and outcomes. Mean and standard deviation were used to present continuous data, while counts and percentages were used to present categorical data. The cost-saving by the telepharmacy services from the patient's perspective was calculated by comparing the annual cost of the telepharmacy service with usual care.

3. Results

3.1. Patient characteristics

A total of 80 patients were included. Of those, 39 patients (48.75%) were men, with an average age of 35.44 ± 15.09 years. The total number of telepharmacy services was 170. The average number of dispensed medications was 2.94 ± 1.59 items (Table 1).

3.2. Patient reported clinical outcomes

A total of 22 patients (27.50%) reported better clinical symptoms after the telepharmacy service, while 57 patients (71.25%)

Table 1
Patients' demographics.

Demographics	Number (%) (Total number of patients = 80)
Number of telepharmacy services	170
Average age (standard deviation)	35.44 ± 15.09
Sex	39 (48.75)
Male	41 (51.25)
Female	
The average number of dispensed medications	2.94 ± 1.59

reported similar clinical symptoms. Only one patient (1.25%) reported worsening clinical symptoms after telepharmacy services.

3.3. Drug-related and health behavior problems

A total of 92 problems from 80 patients were detected by pharmacists providing telepharmacy services. Of those, 64 problems (69.56%) were DRPs, while 28 problems (30.44%) were health behavior problems, respectively.

Adverse drug reaction (20/64; 69.56%) was the most drug-related problem detected by pharmacists providing telepharmacy services followed by patients' non-adherence (20/64; 31.25%) and delayed receiving mailed medications (15/64; 23.44%). Diet control (15/28; 53.57%) and mental stress (7/28; 25.00%) were the most common health behavior problems among patients with epilepsy (Table 2).

During telepharmacy service, pharmacists attempted to solve patients' problems. Of the 92 problems, 66 problems (68.04%) were corrected, while the rest were still unsolved.

3.4. Cost and cost-saving due to telepharmacy services

From the patients' perspective, the average direct nonmedical cost per visit was 1257 ± 857 THB/visit. Of those, travel costs were the major cost driver. A total of 67.7% of the total cost was from travel costs (852 ± 604 THB/visit). Based on the assumption of hospital visits for usual care mentioned above, annual cost of usual care was $10,736 \pm 7441$ THB, while annual cost of telepharmacy services was 4225 ± 2494 THB. Cost-saving due to telepharmacy services was on average 6511 ± 4996 THB/year or 54.75% of cost of usual care. The details of cost and cost-saving are presented in Table 3.

4. Discussion

This study aimed to evaluate a telepharmacy services on patient reported clinical outcomes, drug-related and health behavior problems and the cost of a telepharmacy services in Thailand. Based on a descriptive nature, we found telepharmacy services to be effective in detecting clinical outcomes, DRPs and behavioral health problems among patients with epilepsy. In addition, telepharmacy could probably constitute a cost-saving from the patient's perspective.

In addition to face-to-face pharmaceutical care services, telepharmacy could be an option for patients unable to frequently visit hospitals for clinical follow-up and medication refills. Based on our findings, it could detect patients' problems early, including clinical worsening, DRPs and behavior-related problems. Our findings were in line with a related study in Thailand which evaluated the impact of telepharmacy on DRPs [13]. They found that a total of 427 DRPs of 449 patients with chronic diseases was detected during telepharmacy services. The most common DRPs were changes in drug packaging, leftover medications and nonadherence. They also found that the number of medications used daily and history of dyslipidemia were associated with the occurrence of DRPs, while non-adherence was associated with leftover medicine.

Many advantages of telepharmacy have been discussed. First, telepharmacy could provide better access to healthcare services, especially in remote areas [14]. Telepharmacy could increase access to pharmacy services, especially the round-the-clock medication order review by pharmacists in small hospitals [15]. Second, telepharmacy increased patients' access to health services and clinical outcomes. A study in Saudi Arabia assessing telepharmacy for patients with anticoagulants indicated that telepharmacy was as effective as a face-to-face consultation [16]. Another study, conducted in the USA, assessed the clinical impact of personalized telepharmacy services for outpatient care on the hospital admission rate. The study showed that telepharmacy had a lower hospital admission rate than no telepharmacy [17]. Third, telepharmacy could probably create a cost savings from both the provider's and patients' perspectives. Regarding the providers' perspective, a related study in the USA indicated that telepharmacy could generate a saving of \$21,772 weekly or approximately \$1.1 million annually for the hospital system [18]. On the other hand, from the patients' perspective, patients could generate a cost savings due to reduced travel and additional costs. A study from rural Alberta, conducted

Table 2
Drug-related, health behaviors and social behavior problems.

Detected problems	Number (%)
Total number of detected problems	92
Drug-related problems	64 (69.56%)
Adverse drug reaction	20 (31.25%)
Patients' nonadherence	15 (23.44%)
Delayed receiving of mailed medications	11 (17.19%)
Leftover medications	9 (14.06%)
Unnecessary use of herbal or alternative medicine	5 (7.81%)
Drug-drug interaction	3 (4.69%)
Incorrect number of medications received	1 (1.56%)
Health behavior problems	28 (30.44%)
Diet control behavior	15 (53.57%)
Mental stress	7 (25.00%)
Exercise behavior	3 (10.71%)
Smoking or second-hand smoker	3 (10.71%)

Table 3
Cost and cost-saving due to telepharmacy services from the patient's perspective.

Cost	Average cost/ visit (THB)	The annual cost of usual care (THB)	The annual cost of telepharmacy service (THB)	Cost-savings by telepharmacy service (THB)	% of cost- savings
Travel cost	852 ± 604	7200 ± 5050	2463 ± 1704	4737 ± 3377	65.37%
Food and accommodation cost	244 ± 234	2087 ± 1994	710 ± 673	1376 ± 1327	60.22%
Productivity cost due to hospital visit	161 ± 546	1449 ± 4921	483 ± 1640	966 ± 3280	10.39%
Cost of mailing medication	N/A	N/A	568 ± 107	- 568 ± 107	N/A
Total cost	1257 ± 857	10,736 ± 7441	4225 ± 2494	6511 ± 4966	54.75%

Abbreviations: N/A; not applicable, THB; Thai baht.

among 47 patients with cancer with eight months of follow-up, indicated that patients could avert approximately 45,000 km of travel to hospitals, which could save patient costs. Our findings emphasized the advantages of telepharmacy, especially for the patient's cost-saving. We found that telepharmacy could generate a cost-saving due to travel costs of approximately 60% or 4700 THB per patient yearly.

Specific to epilepsy care, our finding, indicating that telepharmacy could improve epilepsy care, was consistent with related studies showing the benefits of telemedicine among patients with epilepsy [19,20]. A study from the US indicated that telemedicine could support high-quality care among patients with epilepsy. The study showed that telemedicine could achieve a 94% completion proportion in standardized epilepsy care [19]. Another study was conducted in the US to examine feasibility, patient satisfaction and potential cost-saving of telemedicine for epilepsy ambulatory care. Telemedicine provided high patient satisfaction with financial benefits without compromising epilepsy care. Approximately 89% of patients would like to continue telemedicine in the post COVID era [20]. These findings showed the benefits of telemedicine or telepharmacy among patients with epilepsy.

To our knowledge, our study constitutes the most updated study showing both the clinical and economic benefits of telepharmacy services in Thailand, where healthcare resources are limited. In addition, our findings could probably reflect the real-world pharmacy practices of using telepharmacy to improve patient care in large healthcare settings where hospital systems are complex. Our study could be used as an example to expand telepharmacy services in other settings where healthcare systems and telepharmacy services are similar.

The limitations of this study should be discussed. First, this research employed a pilot study with a small number of participants. It might not reflect the actual effect of telepharmacy on both clinical and economic outcomes. In addition, we conducted this study in a large healthcare setting. Our findings might only be applicable to some healthcare settings. However, our findings showed a trend of the benefits of telepharmacy among patients with epilepsy in large hospitals but limited resource settings. Second, our telepharmacy intervention intensively relied on our developed web-based platform. It limited the implication in settings where no web-based platform was available or most patients had no mobile devices or computers with the applications. Increasing the availability of our web-based platform is crucial to expand the use of our telepharmacy services for patients with epilepsy. Third, patients receiving telepharmacy services had to be able to use the application, which would limit accessibility to our telepharmacy services for patients unable to use these applications. Telepharmacy using other strategies such as telephone services might be considered for patients unable to use the application. Fourth, our study used patient-reported clinical outcomes to evaluate the clinical impacts of telepharmacy services. It might have differed if another clinical evaluation was used. However, we intended to use patient-reported outcomes to reflect the impact of telepharmacy from the patients' perspective instead of the healthcare providers' perspective. Last, the costs incurred in this study were based on patient interviews, which might differ among diverse patients or settings. Thus, the generalizability of our findings should be limited to healthcare settings where patient characteristics and healthcare systems are similar to our study.

5. Conclusion

Our pilot study indicated that a telepharmacy services were likely effective in improving patient clinical outcomes and detecting drug-related problems among patients with epilepsy. Approximately two thirds of patients with epilepsy could from the telepharmacy because it could early detect DRPs. In addition, health behavior problems could be detected early in one third of the patients. Moreover, telepharmacy could probably generate cost-savings from the patients' perspective. However, based on our limitations, further studies with a larger number of participants are warranted to assess the clinical and economic impacts of a telepharmacy services.

Author contribution statement

Sunee Lertsinudom: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Somsak Tiampakao: Conceived and designed the experiment, Performed the experiments; Wrote the paper.

Sineenard Mungmanitmongkol: Performed the experiments; Wrote the paper.

Piyameth Dilokthornsakul: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the

paper.

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Data availability statement

Data will be made available on request.

Declaration of interest's statement

The authors declare no competing interests.

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