A Retrospective Secondary Data Analysis of Telemedicine Service Utilization (2020–2023) Among Patients Covered By The Universal Coverage Scheme in Thailand

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Abstract

Objective: *The National Health Security Office in Thailand introduced a telemedicine program called "Telehealth/Telemedicine" in December 2020, which aimed to reimburse telemedicine services for patients with stable chronic diseases under the Universal Coverage Scheme (UCS). The current study investigated patient characteristics and trends in telemedicine service utilization under the UCS in Thailand and examined the impact of COVID-19 outbreaks on telemedicine services.*

Methods: *A retrospective secondary data analysis using e-claim data from December 1, 2020, to April 18, 2023, was conducted. The analytical methods included descriptive analysis and an interrupted time series analysis.*

Results: *During ~29 months, 110,153 unique patients used telemedicine services, leading to a total of 259,047 visits. The average age was 54 years, and most of patients were female (57%). Hypertension was the most common diagnosis for patients receiving telemedicine services. Patients with mental health conditions often engaged in telemedicine consultation with drug delivery. During the Delta and Omicron outbreaks, telemedicine service utilization significantly increased compared with that in any nonpandemic periods within the 29-month timeframe (odds ratio [OR]: 3.85,* p*-value <0.01; OR: 2.55,* p*-value <0.01).*

Conclusions: *The study findings highlight the initial trend of telemedicine services in Thailand from the start of the COVID-19 pandemic to the beginning of the post-COVID-19 period. As telemedicine will play a critical role in the future of health care, this information can support the scale-up of telemedicine, including monitoring and evaluation plans, to help improve the efficiency of the system.*

Keywords: *telehealth, telemedicine, utilization, Universal Coverage Scheme, Thailand*

Introduction

During the COVID-19 pandemic, digital health has played an important role in health care systems around the world. Telemedicine is among the digital health tools used for online treatment and consultation to ensure the continuity of patient care and prevent the spread of COVID-19.[1] The World Health Organization (WHO) defines telemedicine as "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communications technologies for

the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and the continuing education of health care workers, with the aim of advancing the health of individuals and communities."[2]

In Thailand, the Medical Council of Thailand defines telemedicine as "the transmission or communication of contemporary medical information by health care professionals, whether from public or private medical facilities to individuals in different locations through electronic means." This approach enables the provision of consultations and advice, allowing for the practice of medicine or delivery of medical treatment within the boundaries of medical expertise, considering the condition, nature, and prevailing circumstances. The responsibility for transmitting or communicating medical content lies with the individual overseeing the process."[3]

Many countries have been exploring efficient ways to incorporate telemedicine into existing health care systems.[4,5] Thailand is one of those countries where additional information about the trends and patterns of telemedicine utilization could be helpful in the future. In 2009, a survey of e-Health applications reported that a national telemedicine policy had not been implemented in Thailand, and the barriers to implementing telemedicine solutions included but were not limited to perceived high costs, underdeveloped infrastructure, a lack of policy frameworks, a lack of demand from health professionals, and a lack of nationally adopted standards.[6] Currently, the Strategic Direction for Digital Health in Thailand 2021–2025 includes telemedicine as the fifth tactic, that is, supporting the use of digital technology such as mobile health (m-health) and telemedicine to connect people to health care services quickly and easily, which aims to "integrate and promote the use of telemedicine for long-distance medical services, to support diagnosis and consultation services between medical professionals and physicians in distant hospitals, especially marginalized hospitals."[1] Therefore, telemedicine has become a focus of the Thai government.

In terms of the reimbursement system, the National Health Security Office (NHSO) is the government agency in Thailand that is responsible for managing funds, reimbursing health care providers, and ensuring that citizens have access to essential health services. In Thailand, three primary public health schemes exist: the Universal Coverage Scheme (UCS), the Civil Servant Medical Benefit Scheme, and the Social Security Scheme.[7] The NHSO is primarily responsible for patients enrolled in the UCS, which encompasses ~70% of Thai citizens.[7] However, the NHSO also provides health promotion and disease prevention services to all Thai citizens.[8]

Concerning telemedicine services, the NHSO initiated the "Telehealth/Telemedicine" program on December 1, 2020, to provide care for UCS patients with stable chronic diseases in six categories, namely, asthma, cancer, diabetes mellitus, hypertension, mental health, and other diseases.[9] Furthermore, in addition to the Telehealth/Telemedicine program, the NHSO has incorporated telemedicine as a health care benefit for COVID-19 patients covered by all public health schemes; this service was introduced approximately between July and August 2022 (COVID-19 Telemedicine).[10] In the 2023 fiscal year, the Ministry of Public Health (MoPH) in Thailand announced its policies and roadmap for the fiscal years ranging from 2023 to 2025. One of the six key components of this strategic framework is the transition of medical and public health services into the digital era, which includes the implementation of telemedicine in all hospitals.[11]

Subsequently, on April 3, 2023, a new pilot telemedicine program was introduced to support UCS patients in Bangkok with 42 specific diseases/conditions that typically require outpatient department visits (OP Telemedicine). This represents the latest initiative, which holds the potential for expansion to encompass all UCS patients across various provinces in Thailand.[12]

The objective of this study was to explore the characteristics of patients utilizing telemedicine services, the patterns of telemedicine usage among patients enrolled in the UCS, and the potential effect of COVID-19 outbreaks on the provision of telemedicine services in Thailand from the public health care payer's perspective.

Methods

This research was approved by the Institute for the Development of Human Research Protections, Health Systems Research Institute (COA No. IHRP2023042 and IHRP No. 024-2566). In this study, we used the STROBE checklist[13] as a reporting template to structure and present all the information. In addition, stakeholder meetings were used to validate face validity, ensuring the integrity of both the methodology and the results.[14–17]

STUDY DESIGN, SETTING, AND PARTICIPANTS

A retrospective secondary data analysis was conducted using claim and reimbursement data from the e-Claim system of the NHSO. The dataset provided by the NHSO for this study included anonymized patient-level health data acquired from hospitals partnering with the NHSO and offering telemedicine services. The dataset included several types of variables, for example, patient profile data, clinical diagnoses, hospital profiles, and telemedicine service data. The follow-up period for

these data started on December 1, 2020, and ran through April 18, 2023. The target population of this study was patients who had received at least one telemedicine service.

VARIABLES

Outcomes. The outcomes of interest were the number of patients who used telemedicine services (users) and the number of telemedicine services used (visits). The number of visits was determined by analyzing the encrypted transaction ID, where each unique ID denoted one telemedicine service visit. Similarly, the patients were counted using the encrypted patient ID to identify individual patients. Furthermore, the date of service was used to categorize the number of patients and telemedicine service visits by month and year.

Other variables. The provided dataset included various variables; however, the variables of interest included patient profile data (i.e., encrypted patient ID, age, and sex), clinical diagnoses (i.e., primary diagnosis [pdx] and secondary diagnosis [sdx]), hospital profiles (i.e., hospital code, hospital name, province, NHSO health region), telemedicine service data (i.e., date of service and encrypted transaction ID), and data related to drug delivery services (i.e., date of service and drug delivery status), as some telemedicine services included the delivery of medication by mail.

Some variables were categorized in accordance with the NHSO policies. For instance, patient ages were divided into four categories (i.e., 0–5, 6–24, 25–59, and ≥60).[12] In terms of geographical area, the NHSO classifies the 77 provinces of Thailand into 13 health regions[7] (for more details, refer to Supplementary Fig. S1). In regard to disease classification, the causes of telemedicine usage were categorized using the chapters of the International Statistical Classification of Diseases and Related Health Problems, 10th Revision (ICD-10), resulting in the segmentation of the number of telemedicine services into 22 groups.[18] The NHSO policy for the Telehealth/Telemedicine program divides diagnoses into six primary disease groups, namely, asthma, cancer, diabetes mellitus, hypertension, mental health, and other diseases.[19]

STATISTICAL METHODS

The data management and analysis for this study were conducted using R software version 4.2.2.

Descriptive statistics. Descriptive statistics, namely, total counts, minimum and maximum values, percentages, means, and standard deviations (SDs), were used to explore and summarize the baseline patient characteristics, as well as their medical history related to the use of telemedicine. In brief, we report the following dimensions of telemedicine usage: who (age, sex, and number of visits), what (common diagnoses), where (telemedicine reimbursement), when (usage trends), and how (patterns with drug delivery services).

Interrupted-time series analysis. To investigate the impact of the COVID-19 outbreak on the delivery of telemedicine services in Thailand, an interrupted time series analysis was conducted. The study period, which extended from December 1, 2020, to April 18, 2023, was divided into four distinct periods: no COVID-19 pandemic, Alpha-variant outbreak (April and May 2021), Delta-variant outbreak (June to August 2021), and Omicron-variant outbreak (December 2021 to Mar 2022). The utilization of telemedicine services during each outbreak was coded as 1 (Alpha variant), 2 (Delta variant), or 3 (Omicron variant), while the period of no COVID-19 pandemic was coded as 0. The utilization of telemedicine services during each outbreak was compared with that of the period of no COVID-19 pandemic by using the total number of visits (Y_t) per month (T). Therefore, in terms of the regression model, the following equation was used:[20]

$$Y_t = \beta_0 + \beta_1 T + \beta_2 X_t + \beta_3 T X_t$$

Results

PARTICIPANTS AND DESCRIPTIVE DATA

WHO (age, sex, and number of visits). During ∼29 months of follow-up, 110,153 patients used telemedicine services, resulting in a total of 259,047 visits. The mean age of the patients was 54 years (SD: 21), and the majority were female (57%). In terms of NHSO age categories, ∼48% of patients were aged 60 years and above, whereas the 25- to 59-year-old age group constituted ∼38% of the total. Most patients used telemedicine services only once (*Table 1*).

OUTCOME DATA AND MAIN RESULTS

What (common diagnoses). Among the disease groups classified by the 22 chapters of the ICD-10 codes, 94,727 out of the 259,047 visits were due to mental and behavioral disorders (Chapter V: F00-F99). This represented the highest proportion of telemedicine usage in comparison with other chapters.

The top five diagnoses for telemedicine usage, which collectively represented ∼ 29% of the total number of telemedicine services were (1) essential hypertension (12.63%); (2) non-insulin-dependent diabetes mellitus type 2 without complications (8.33%); 3) continuous paranoid schizophrenia, including treatment resistance (3.49%); (4) paranoid schizophrenia with episodic remittent features (2.42%); and (5) childhood autism (2.30%) (*Table 2*).

Table 1. Characteristics of Patients and Descriptive Data from Telemedicine Visits

CHARACTERISTICS[a]	RESULTS
1. Follow-up period (months)—*n*	29
2. Total number of visits—*n*	259,047
3. Total number of patients—*n*	110,153
4. Number of visits per patient—mean [min–max; SD]	2.35 [1–107; 2.96]
5. Age (years old)—mean [min–max; SD]	54 [0–123; 21]
6. Sex—*n* [%][b]	
Male	47,036 [42.70]
Female	63,117 [57.30]
7. Age group—*n* [%][b]	
0–5 years old	2,436 [2.21]
6–24 years old	12,509 [11.36]
25–59 years old	42,004 [38.13]
60 years old and above	53,204 [48.30]
8. Number of visits—*n* [%][b]	
1 time	65,525 [59.49]
2 time	17,614 [15.99]
3 time	8,984 [8.16]
4 time	5,148 [4.67]
5 time and more	12,882 [11.69]

[a]*n*, number; min; minimum number; max, maximum number; SD, standard deviation.

[b]The number of patients was categorized by sex, age group, or frequency of visits.

Table 2. The Five Most Frequently Diagnosed Diseases or Conditions

ICD-10: Diagnoses	Number of visits [%]
Total number of visits	259,047 [100]
Number of visits for the top 5 diagnoses	75,583 [29.18]
List of the top 5 diagnoses	
I10:Essential (primary) hypertension	32,729 [12.63]
E119: Non-insulin-dependent diabetes mellitus type 2 without complications	21,574 [8.33]
F2000: Paranoid schizophrenia, continuous (including treatment resistant)	9,035 [3.49]
F2003: Paranoid schizophrenia, episodic remittent	6,280 [2.42]
F840: Childhood autism	5,965 [2.30]

In relation to the NHSO policy of using six disease groups, the results indicated that 36.57% of the telemedicine usage was associated with mental health, followed by other diseases (34.27%). Within the group of other diseases, telemedicine was used for the follow-up of diseases related to various disease groups. The groups that contributed at least 10,000 visits (4%) were diseases of the nervous system, diseases of the circulatory system, and diseases of the musculoskeletal system and connective tissue, as well as factors influencing health status and contact with health services.

Where (telemedicine reimbursement). Over the 29-month follow-up period, hospitals in 61 out of the 77 provinces in Thailand sought reimbursement from the NHSO for telemedicine services. However, hospitals in the remaining 16 provinces had not yet made such requests. When examining services exclusively in 2021 and 2022, which provided complete 12-month data for the purpose of comparing the distribution of telemedicine services, no noticeable difference was observed between the years (***Fig. 1***).

Furthermore, when categorizing the number of telemedicine services used according to the 13 health regions of the NHSO, it was evident that the majority of the services were concentrated in health regions 11, that is, Surat Thani (21.26%), and 13, that is, Bangkok (45.66%). Conversely, some health regions, such as health regions 1, 3, 4, and 10, contributed less than one percentage point.

When (usage trends). Concerning the dataset's follow-up period, the highest number of telemedicine uses occurred in August 2021 during the Delta-variant outbreak, totalling 19,674 visits (***Fig. 2***). When comparing each outbreak with the nonpandemic period, statistically significant increases in telemedicine usage were observed during the Delta-variant outbreak (odds ratio [OR]: 3.85, p-value <0.01) and the Omicron-variant outbreak (OR: 2.55, p-value <0.01). However, during the Alpha-variant outbreak, the increase in usage was not significantly different from that during the nonpandemic period (OR: 2.36, p-value = 0.132).

How (patterns with drug delivery services and one-time users). Telemedicine serves various purposes and within the context of the NHSO policy for follow-up care, drug delivery services play an important role in enhancing patient care. The findings indicated that, during certain periods, the volume of patient visits involving both telemedicine and drug delivery services

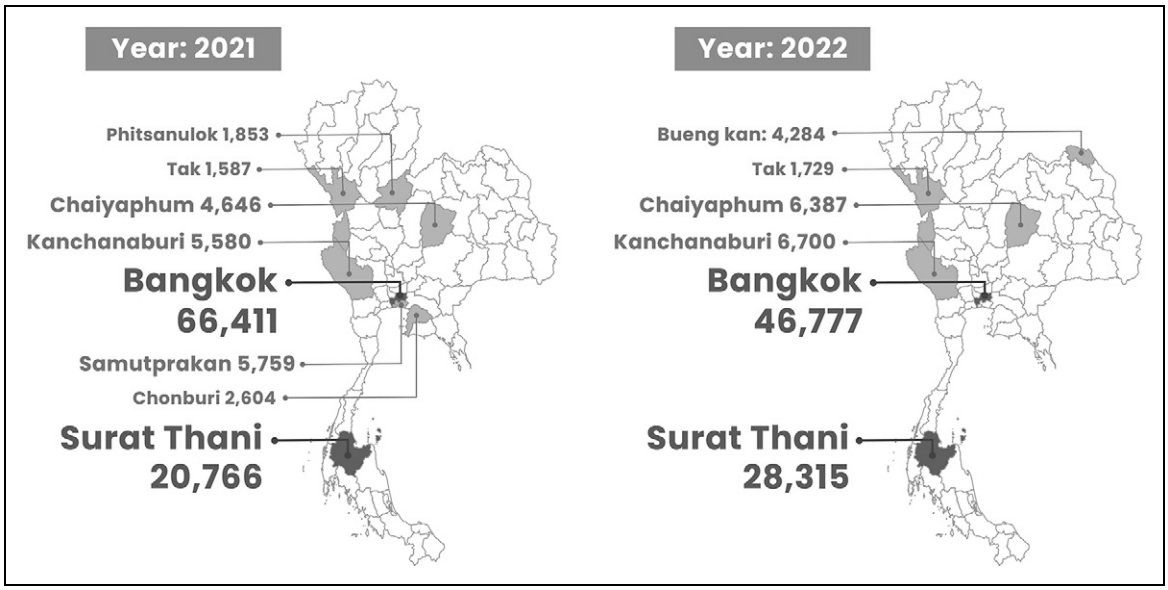

Fig. 1. The distribution of telemedicine services according to reimbursement data. The figure illustrates the provinces where the number of telemedicine services exceeded 1,000 visits per year.

closely mirrored that of telemedicine services alone (*Fig. 3*). However, upon conducting a subgroup analysis based on NHSO disease categories, the combination of telemedicine and drug delivery was commonly used when addressing mental health concerns more than other diseases (*Fig. 3*).

The mean number of visits per person was 2.35 (SD = 2.96). The majority of patients (~60%) used telemedicine services only once over the 29-month period, whereas ~12% of patients used telemedicine more than five times. A visual representation of monthly one-time users illustrated that the majority of patients accessed the services during the first quarter of 2023 (*Fig. 4*).

Discussion

This study aimed to investigate the patient characteristics and trends in telemedicine service utilization under the UCS in Thailand and to examine the impact of COVID-19 outbreaks on telemedicine services. We found that most telemedicine users were older and female. Based on data from the Demography, Population, and Housing Branch of the National Statistical Office of Thailand for 2021–2022,[21] the male population constituted 48.83% of the total population. The findings regarding telemedicine utilization align with these data, indicating that a greater proportion of females than males used the service. In terms of age groups, according to the demographic data for 2021–2022, elderly individuals (60 years and above) constituted 19.21% of the population. However, our analysis revealed that the older age group accounted for the highest proportion of telemedicine service users (48.30%). This observation might be attributed to the fact that older individuals tend to have a greater incidence of chronic diseases, and the NHSO's program specifically targets stable chronic conditions.

Regarding the most prevalent diseases according to the NHSO policy of six disease groups, hypertension stood out as the primary condition linked to the utilization of telemedicine services. This could be attributed to the high prevalence of hypertension in the Thai population, which is ~40% for people aged at least 15 years, as reported in the 6th National Health Examination Survey in 2020.[22] Moreover, the combination of telemedicine and drug delivery was more commonly used than telemedicine alone when addressing mental health issues. In terms of the distribution of telemedicine services provided nationwide, 61 out of 77 provinces required claims and reimbursement, and there seemed to be no differences between 2021 and 2022, as per visualization obtained using NHSO reimbursement data.

These results may need further investigation to explore potential causes, that is, using a qualitative approach as per the recommendations from the stakeholders' meeting.[17] Moreover, during the COVID-19 pandemic, there was an apparent surge in the use of telemedicine services, followed by a decline until approximately October 2022. Subsequently, there was a continuous resurgence in both overall usage and the number of one-time users. This resurgence may be linked to the MoPH's policy and roadmap regarding telemedicine services for the fiscal years ranging from 2023 to 2025, given that the fiscal year 2023 commenced on October 1, 2023. However, as the data for the most recent trimester have not yet been

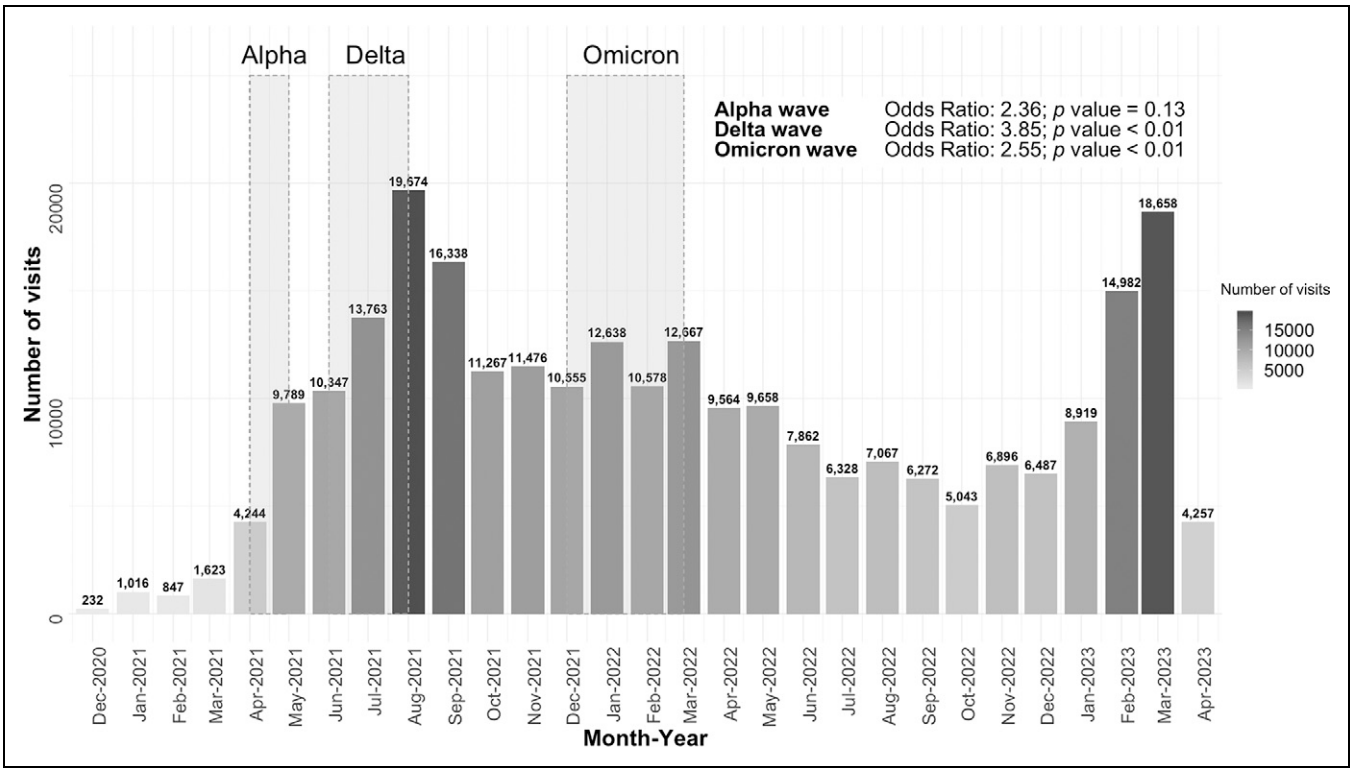

Fig. 2. Trend of the utilization of telemedicine services over ~29 months. The data for the most recent trimester were incomplete due to constraints within the timeline of the claim and reimbursement system.

completed, continuous monitoring and evaluation are crucial for investigating these trends.

Owing to the initial stages of the Telehealth/Telemedicine program of the NHSO in Thailand, this study encountered limitations regarding the analysis. Specifically, it was not possible to adjust the counts of telemedicine use, either on a per-person or per-visit basis, by the number of UCS beneficiaries in the same region or the population size of each province. This limitation arose from the relatively low level of telemedicine use during the early phase of the program. As a result, interpreting and comparing the results in terms of services in each area may prove challenging due to the aforementioned limitations. Owing to the lack of a standardized definition for telemedicine, it is possible that each hospital provided telemedicine services in various ways, such as through phone or video calls. This variability makes it difficult to confirm the consistency and quality of services across different hospitals.

In addition, the data used in this study were derived from the claim and reimbursement system, which means that data on the total actual services might be incomplete if some hospitals did not require payment through the system. These factors could have introduced selection bias into the analysis. Overall, because of the nascent stage of telemedicine services at the national scale in Thailand and the time constraints of this research study, the majority of the analyses were conducted utilizing descriptive statistics, which aimed to provide a foundation for future analyses. In addition, given the use of a real-world secondary dataset, there could be other interesting variables (such as clinical variables) that we did not have access to and that could be explored further in the future, especially to investigate the impact of telemedicine services.

In terms of generalizability, the results cannot represent all telemedicine services in Thailand because of the presence of three primary health schemes. However, this study included patients under the UCS, which accounts for ~ 70% of Thai patients. Similarly, our study does not encompass all the NHSO programs related to telemedicine services, as there are three such programs. Nevertheless, the data used in this analysis were derived from the telemedicine program designed for follow-up purposes (Telehealth/Telemedicine), which was implemented for several diseases and conditions at the national level.

Conclusions

The study findings represent a first look at the patterns and trends of telemedicine services in Thailand after the launch of the national program. This information can support the

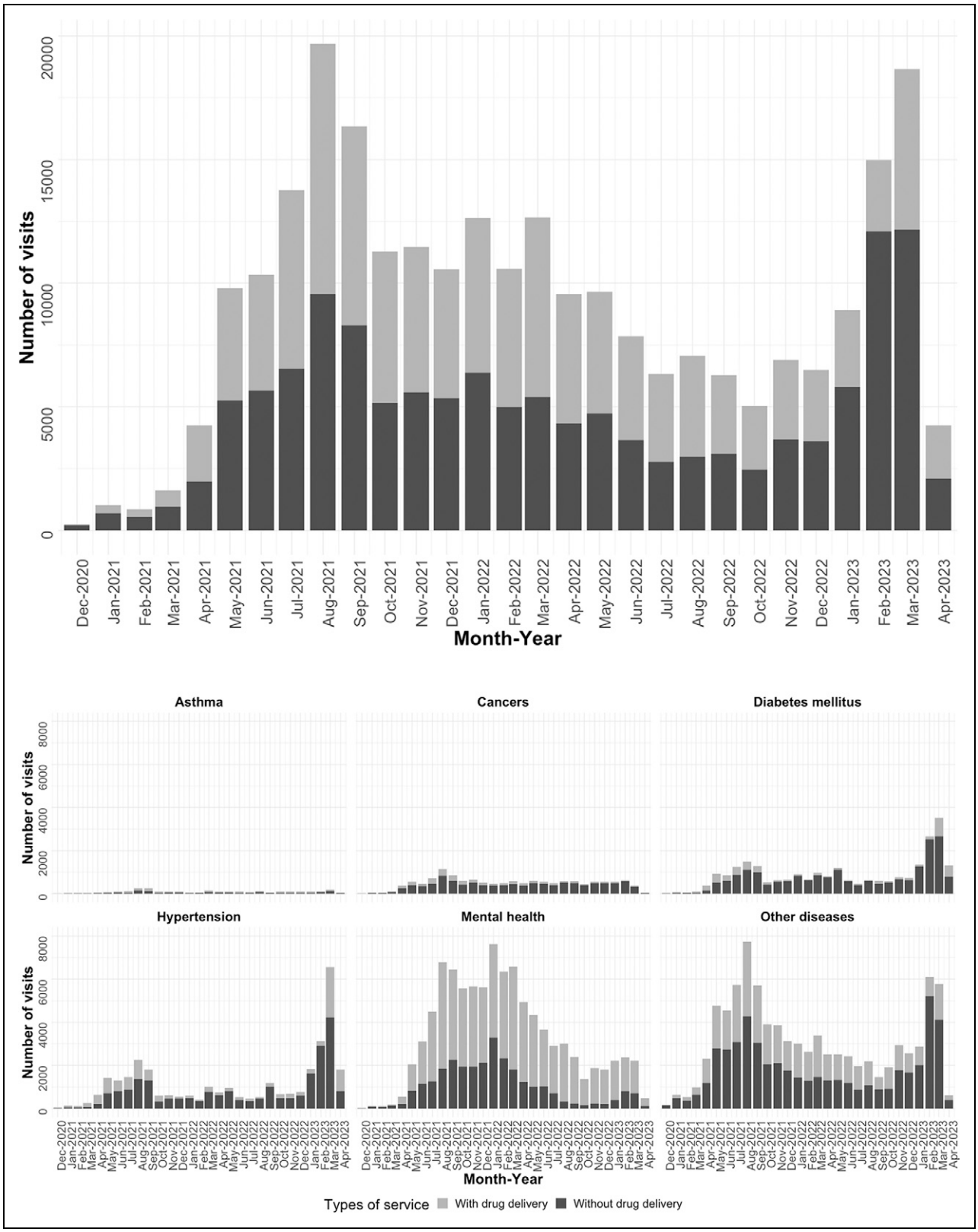

Fig. 3. Number of visits involving telemedicine services with or without drug delivery services. The data for the most recent trimester were incomplete due to constraints within the timeline of the claim and reimbursement system.

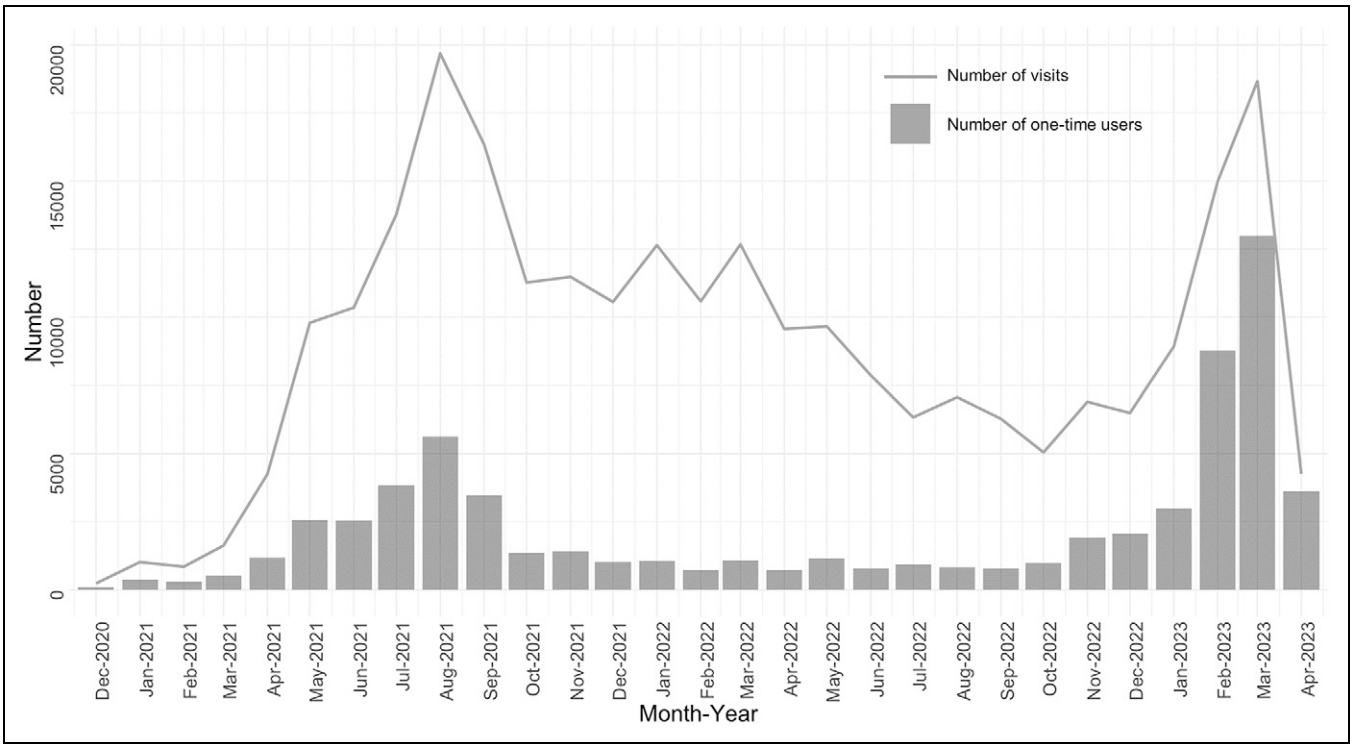

Fig. 4. Monthly trends in telemedicine utilization over time in comparison to the monthly count of one-time uses. The data for the most recent trimester were incomplete due to constraints within the timeline of the claim and reimbursement system.

planning of monitoring and evaluation for current programs in Thailand and other countries with similar contexts.

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Authors' Contributions

N.K.: Conceptualization (lead), data curation (equal), formal analysis (lead), investigation (lead), methodology (lead), project (lead), validation (equal), visualization (lead), writing—original draft (lead), and writing—review and editing (equal). T.S.: Data curation (equal), formal analysis (supporting), investigation (supporting), methodology (supporting), validation (equal), and visualization (lead). C.S.: Data curation (equal), formal analysis (supporting), investigation (supporting), validation (equal), visualization (supporting), writing—original draft (supporting), and writing—review and editing (equal). T.A.: Data curation (equal), investigation (supporting), validation (equal), and writing-original draft (supporting). P.N.: Conceptualization (lead), supervision (lead), validation (equal), and writing—review and editing (equal). T.K.: Data curation (equal) and validation (equal). P.G.: Conceptualization (supporting), investigation (supporting), and writing—review and editing (equal). S.K.: Conceptualization (supporting) and investigation (supporting). T.C.: Conceptualization (supporting) and investigation (supporting). S.L.: Conceptualization (supporting) and investigation (supporting). W.I.: Conceptualization (lead), investigation (lead), methodology (lead) project (lead), supervision (lead), validation (equal), and writing—review and editing (equal).

Disclaimer

The findings, interpretations, and conclusions expressed in this article do not necessarily reflect the views of the aforementioned funding agencies. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the article.

Ethical Approval

This study was performed in accordance with the principles of the Declaration of Helsinki. Ethical approval was granted

by the Institute for the Development of Human Research Protections (IHRP) (COA. No. IHRP2023042 and IHRP No. 024-2566). Consent was not required because the study used e-claim data, which were routinely collected for administrative purposes and deidentified for this study by the NHSO, Thailand.

Data Sharing

Owing to privacy concerns and ethical considerations, the raw data cannot be made publicly available. Access to the data is subject to permissions and approval from the National Health Security Officer (NHSO). Researchers interested in accessing the data should submit a formal request to the NHSO at saraban@nhso.go.th, indicating the purpose of data use and any relevant ethical considerations.

Disclosure Statement

The authors declare that they have no competing interests or financial relationships that could have influenced the work presented in this article. All sources of funding for the research were obtained and disclosed appropriately.

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Supplementary Material

Supplementary Figure S1

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