Final Technical Report

for

Research Project

Development of Antimicrobial Use Monitoring System in Bangkok Primary Care Units

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Abbreviations and acronyms

ABC	Antibacterial consumption
AD	Acute diarrhea
AMC	Antimicrobial consumption
AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
AMU	Antimicrobial use
ATC	Anatomical Therapeutic Chemical
AWaRe	Access, Watch, Reserve classification of antibiotic
Aw	Average weight at the time of treatment
BKK	Bangkok
DDD	Defined Daily Dose
DID	Defined Daily Doses/1000 inhabitants/day
DUE	Drug Utilization Evaluation
FTW	Fresh traumatic wounds
ICD-10	10th revision of the International Classification of Diseases
N	Number
NHSO	National Health Security Office
IHPP	International Health Policy Program
MOPH	Ministry of Public Health
NARST	National Surveillance System for Antimicrobial Resistance
NSP-AMR	The National Strategic Plan on Antimicrobial Resistance
OP	Out-Patients
PCU	Primary care unit
PHC	Primary Health Care unit
RDU	Rational Drug Use
SAC	National Surveillance of Antimicrobial Consumption
UCS	Universal Health Coverage scheme
URI	Upper respiratory infection
WHO	World Health Organization

Introduction

Antimicrobial resistance (AMR) is one of the global public health concerns. The discovery of antibiotics in 1928 saves millions of people from bacterial infections. However, at present, many antibiotics have become less effective due to the emergence of resistant bacteria. World Health Organization (WHO) reported that the number of bacteria with AMR is increasing while the effectiveness of currently available antibiotics has been declining. This situation demonstrated that the world population are at risk of entering a post-antibiotic era in which currently minor bacterial infections could become fatal. (1)

Similar to other countries, AMR is one of major public health threats in Thailand. Previous study in Thailand revealed 88,000 cases of antimicrobial resistant bacterial infection in humans each year and 38,000 mortalities in 2010. (2) Nosocomial infection from resistant gram-negative bacteria in hospitals is the major cause of these mortalities. (2) An inappropriate use of antimicrobial in clinical practice, public health, veterinary practice, and agriculture are the key drivers of AMR. In healthcare setting, inappropriate use of antimicrobials could be observed at all levels. In 2012, the National Health Security Office (NHSO) reported that more than 80% of total upper respiratory tract infection (URI) patients have been prescribed inappropriate antibiotics. Meanwhile, most hospitals significantly prescribed antibiotics at a higher rate than the defined standard.(3)

Optimising use of antimicrobials is one of the key strategies in addressing AMR in Thailand. The National Strategic Plan on Antimicrobial Resistance (NSP-AMR) 2017-2021 comprises five goals and six strategies. The key strategies are 'strengthening infection prevention and control,' 'improving antimicrobial stewardship' and 'increasing public knowledge on AMR and awareness of appropriate use of antimicrobials.' Moreover, five national goals were agreed in the national plan; with 20% reduction in antimicrobial consumption in human sector by the year 2021. (4) In response to the national plan, the Ministry of Public Health has integrated AMR and Rational Drug Use (RDU) into the service plan since 2017. Under the program, strengthening antimicrobial stewardship (AMS) has been introduced to hospitals, for example, a national manual of AMS and guideline on antibiotic use, drug use evaluation program, indicator on antimicrobial use in three clinical conditions (URI, diarrhea, and fresh wound), and antibiotic preauthorization process. However, these interventions have yet to extend its implementation beyond MOPH's hospitals or primary health care in Bangkok.

Monitoring antimicrobial use (AMU) is critical to measure the success of AMS and RDU interventions. In Thailand, the Health Policy and Systems Research on AMR Network has established National Surveillance of Antimicrobial Consumption (SAC) in humans and animals and produced One Health Reports in 2017, 2018, 2019, and 2020. The recent report in 2020 revealed decreasing trend of AMC in humans from 54.6 in 2017 to 46.3 defined daily dose per 1,000 inhabitants per day (DID) (5); however, with this pace of progress, it would not achieve the national goal of 20% AMC reduction by 2021. Although Thailand SAC is macro-level monitoring of AMC at national level; more granularity of AMU at healthcare facilities can inform micro-level stewardship improvement through tailored-targeted interventions. Previously, the Health Administration Division (an organization under the MOPH) established the AMU monitoring system for all MOPH hospitals. This system has been integrated as a part of a routine monitoring system of all service plans called "Health Data Center". DDD, DID, and percentage of antibiotic use in targeted conditions (URI, diarrhea, and clean wound) are monitored. However, there is no AMU monitoring

systems in healthcare facilities in Bangkok mostly are private and non-MOPH public hospitals as well as in primary care.

There were few studies about AMU in specific settings in Thailand. Several knowledge gaps on AMU in Bangkok still remains such as no data on the current situation and existing interventions about AMU in PHC. In developed countries, the mandatory national electronic prescription database is the foundation for a regular monitoring of AMU in different levels such as healthcare facilities, retail pharmacies, primary care, and elderly home. There is neither such mechanisms in Thailand nor in the policy radars to establish one. To rectify this weakness, Point Prevalence Survey of AMU in national representative hospitals can be a national AMU monitoring tool. A recent attempt to monitor AMU in healthcare facilities was conducted in 2021 which the WHO's point prevalence survey on AMU protocol was applied in 41 hospitals. The study revealed prevalence of antimicrobial use in Thailand was 53% of inpatients on the census date received at least one dose of antibiotics which was stable when comparing with previous study conducted in 2018. (6) In 2013, a cross-sectional study using NHSO's reimbursement database to estimate amounts of antibacterial agents prescribed in outpatient departments across the country, reported a national average of 7.1 DDD per 1000 inhabitants per day (DID) while Mae Hong Son, Ayutthaya, Samut Songkhram and Phatthalung had the highest DID. (7) Nonetheless, the study did not report DID in Bangkok due to lack of data. To our knowledge, there has been no surveillance system on AMU in primary care setting which is crucial for accelerating progress on the national plan target.

In parallel of AMU monitoring system in healthcare facilities, understanding knowledge, attitudes, and practices of healthcare professionals and enabling system for AMS are crucial for the design of effective AMS interventions in healthcare facilities. Previous study identified few key determinants influencing prescribing practice including 1) Predisposing factors including knowledge, experience, familiarity, and belief of prescribers, 2) Reinforcing determinants including demand from patients and leaders, and 3) Enabling factors including drug formulary, RDU strategic action in hospitals, and communication. (7) Physicians as a prescriber and pharmacists as a dispenser are key change agents of AMU in healthcare facilities. The causes of inappropriate AMU are multiples including lacking understanding, clarity, and knowledge about antibiotics, AMU, and AMR. (8) However, physicians potentially lack knowledge about the rational use of antibiotics as well as awareness of the problem caused by drug-resistant bacteria. (9) However, there are still gaps of AMU determinants (in primary care system and professional factors) which need to rectify.

This study aims to develop AMU monitoring system in primary care units in Bangkok. It will also address a current situation on AMU monitoring and AMS practices in PHC. The findings of the study will help further development of the AMU monitoring system in primary care units and national AMR policies to optimising antimicrobial use in PHC.

Objectives

General objective:

To develop AMU monitoring system in primary care units under Universal Coverage Scheme (UCS) in Bangkok

Specific objectives:

1. To develop AMU monitoring system based on routine primary care database for quantifying and benchmarking a pattern of AMU among primary care units in Bangkok.
2. To explore the current situation on AMU monitoring and AMS practices in primary care units in Bangkok.

Methodology

1. Overall study design

This project employed a mixed method approach, including quantitative and qualitative methods. Each objective had its own data collection method. For the first specific objective, prescription data was retrospectively analyzed to measure AMU in primary care units. For the second specific objective, a mixed-method approach comprising interview, questionnaire, and stakeholder consultation, was applied to explore the current situation of AMS in primary care settings. The project framework is divided into two boxes based on specific objectives (Figure 1).

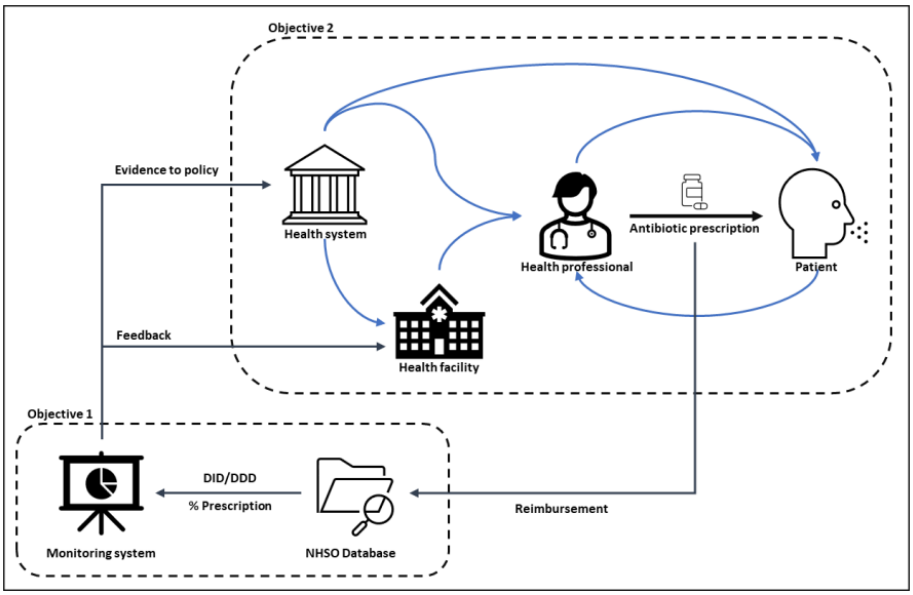


Figure 1 A project framework

2. Overall study setting and population

This study focused on specific research setting and population. The project took place in Bangkok, where nearly half of the population (3.5 million) is registered under the Universal Coverage Scheme (UCS). The scope of the study encompassed policies and practices related to antibiotic use monitoring and antimicrobial stewardship in primary care settings under the UCS in Bangkok.

In this study, primary care units were defined as 1) private clinics under the UCS and 2) public Primary Care Units (PCUs), which include public health centers and PCUs operated by public hospitals. Each research method had its own specific target population. The targeted population for this project included all UCS patients who visited PCUs in Bangkok, primary care providers (doctors, pharmacists, and dispensing nurses), and policymakers at both the Bangkok and national levels.

3. Objective 1: To develop AMU monitoring system based on routine primary care database for quantifying and benchmarking a pattern of AMU among PCUs in Bangkok

In a part of AMU monitoring system development, exploring potential database was done at the first step. Under the new payment mechanism in BKK, a fee schedule system, the UCS database is supposed to be one of the most complete health service data. As a result, the NHSO's routine reimbursement database was explored for gathering AMU data. Two primary databases contained UCS's outpatient data in Bangkok during the study period: the OPBKK database (covering up to the year 2021) and the E-Claim database (from the year 2022 onward). Key variables in both database suitable for AMU monitoring include age, sex, diagnosis by ICD-10, antibiotics prescribed with TMT code, amount of antibiotics, date of service, and service providers. Both databases were ultimately included in this study.

The second step of this objective was analysis of AMU data from these potential databases. Primary care service data during 1 April 2021 – 31 March 2022 was analyzed retrospectively. There were two AMU measurements calculated. These included 1) defined daily dose (DDD) and defined daily dose per 1000 inhabitants per day (DID), and 2) the antibiotic prescription percentage in specific diseases.

Defined daily dose (DDD) and defined daily dose per 1,000 inhabitants per day (DID)

Defined daily dose (DDD) and defined daily dose per 1,000 inhabitants per day (DID) are an international metric for estimating AMU. DDD is a fixed unit of measurement for each Anatomical Therapeutic Chemical (ATC) code and route of administration. Researchers calculate DDDs to assess trends in drug utilization in each specific setting while DIDs represents the volume of AMU at a population level. Thus, DIDs are suitable for comparison across regions and countries.

In the NHSO reimbursement databases, the Thai Medicines Terminology (TMT), serving as a standard for medicinal data in Thailand, is documented. Matching between the TMT code and ATC code was conducted to identify antibiotics in NHSO electronic patient records. All records with the J01 ATC code were included in this analysis. The quantity of prescribed drugs was collected for the calculation of the total amount of antibiotics in each Primary Care Unit (PCU). Subsequently, the volume of Defined Daily Doses (DDD) was computed. For comparison between primary care facilities, the numerator will be the DDD of the primary care unit during the study period, and the denominator will be the average registered population in each facility during April 2021 and March 2022 (10). The formulars of DDD and DID are shown below.

$$Defined\ Daily\ Dose\ (DDD) = \frac{Amount\ of\ drug\ per\ item}{WHO\ recommended\ DDD\ of\ drug}$$

$$DDD\ per\ 1{,}000\ inhabitants\ per\ day = \frac{Total\ DDD\ x\ 1{,}000}{Inhabitants\ registered\ in\ each\ primary\ care\ per\ day}$$

The antibiotic prescription percentage in specific diseases

Three proxy diseases were used in this study: URI, acute diarrhea, and UTI. URI and acute diarrhea are Rational Drug Use indicators monitored as a part of Antimicrobial Stewardship (AMS) performance in public health centers—a primary care facility under the Department of Health, Bangkok Metropolitan Administration (10). However, UTI was identified as a common infectious disease in primary care during interviews. Therefore, the research team added UTI to the list of diseases to be explored. The identification of three diseases was based on ICD-10 code obtained from both principal diagnosis (PDx) and other diagnosis (SDx). The list of ICD-10 code used in each disease group can be found in Appendices table 7-8 Patient records with at least one prescribed antibiotic for systemic use (ATC J01) were counted. The formular is shown below.

$$Antibiotic\ prescription\ percentage = \frac{Number\ of\ Antibiotic\ prescriptions\ for\ patient\ with\ A\ disease}{Total\ prescriptions\ for\ patient\ with\ A\ disease}$$

Statistical analysis

Descriptive statistics were employed to analyze antimicrobial usage (AMU) in primary care in Bangkok, utilizing three distinct measurements: Defined Daily Doses (DDD), Days of Therapy (DID), and the prescription percentage for upper respiratory infections (URI), acute diarrhea, and urinary tract infections (UTI). A comparative analysis between public and private Primary Care Units (PCUs), districts, and health zones was conducted. To facilitate benchmarking, a district heatmap was generated. Microsoft® Excel and STATA were utilized for the entirety of this analytical process.

4. Objective 2: To explore the current situation on AMU monitoring and AMS practices in PCUs in Bangkok

In this objective, a situation analysis of AMU monitoring and AMS in primary care practice was a core activity. This aim is to understand the current situation for designing primary care specific AMU monitoring system that supports AMS practices in terms of feedback and benchmarking. To gain insights into the landscape of AMU and AMS in primary care, there were three main research methods applied.

A literature reviews

A review of literature on the AMU monitoring system and AMS situation and interventions in Bangkok was conducted to recognize the challenges and supporting system. Publication, gray literature, technical document, manual, and other related documents were included in this step through internet search.

An online survey

This method was administered to assess 1) the knowledge, attitudes, and practices of primary care providers and 2) supporting systems concerning antimicrobial resistance (AMR) and AMU. A questionnaire was developed based on 1) a recent research on Antimicrobial Stewardship Competencies (10) and 2) a survey of healthcare workers knowledge and attitudes about antibiotics and antibiotic resistance(8) Additional questions on AMS supporting system were included in the survey tool. The questionnaire used in this project can be seen in Annex 2.

Researchers solicited the address of all public health centers and all UCS private clinics. These units consist of 69 public health centers and 289 private clinics. On average, each public health center has two full-time doctors and one full-time pharmacist, while each UCS clinic has only one full-time doctor and

some have one part- time pharmacist. The online self-administered questionnaire survey using Google forms was circulated to doctors and pharmacists in all primary care units during 16th November and 8th December 2023. The eligible criteria for questionnaire respondents are a pharmacist or doctor in primary care unit under UCS in Bangkok. Analysis was done by descriptive statistic using Microsoft® Excel.

A semi-structure interviews

Semi-structured interviews were conducted to garner a deeper understanding of AMU practices among primary care doctors and pharmacists This method aimed to identify the existing AMU monitoring system, supporting system for AMS and its function and effectiveness. Interview guide was developed based on literature review. Study sites were selected by purposive sampling method by type of PCUs and location. Totally, 10 private clinics and 5 public health centers were selected. One doctor and one pharmacist from each study site were invited to participate in semi-structured interviews. Transcription and field notes were analyzed using the content analysis method. Data triangulation was done.

5. Stakeholder engagement

Stakeholder engagement was a cross cutting strategy in this project. Relevant stakeholders were identified and engaged to respond to this objective. The stakeholders that participated in this project are listed below.

1. National Health Security Office
2. Department of health, Bangkok Metropolitan Administration (BMA)
3. Department of Health Service Support, Ministry of Public Health
4. Health Administration Division, Ministry of Public Health
5. Office of Primary Healthcare System Support, Ministry of Public Health
6. UCS Community Clinic Association

Totally, two meeting among key stakeholders were conducted on 2nd March and 19th December 2023. The hybrid online and onsite meetings were convened at the International Health Policy Program. The first meeting, which was held before the project launch, aimed to identify AMU and AMR related policies and practices in different organizations and to seek support from each of them. In the second meeting, the research team invited key actors and primary care providers to present research results, which included AMU data from the reimbursement database and findings from qualitative research. At the conclusion of the meeting, stakeholders collaboratively identified potential actions for the development of an AMU monitoring and antimicrobial stewardship system in primary care in Bangkok

Table 1 Summary of data collection methods for each specific objective

Specific objective	Data collection method
1. To develop AMU monitoring system based on routine primary care database	- Secondary data analysis - Stakeholder meeting
2. To explore a current situation on AMU monitoring and AMS practices in primary care units in Bangkok	- Review literature - Self-administered questionnaire survey - Semi-structure interview - Stakeholder meeting

Findings / Results

1. Analysis of the Antibiotic consumption (Quantitative)

The analysis included prescriptions from 286 Primary Care Units (PCUs) in Bangkok during the period from April 2021 to March 2022. Within this period, a total of 1,482,095 patients made 3,621,838 visits to these PCUs. The demographic characteristics of the patients were summarized in Table 2. The patients were 55% female, and most were 55-64 years of age (18%). Notably, approximately 63.54% of outpatient visits (2,301,389 visits) occurred at private clinics, as shown in Figure 2. Out of the total of visits, 129,897 (3.59%) had the prescription of one or more antibiotics on the day of inclusion.

Table 2 Number of outpatients and visits in PCUs by age-group and sex, Bangkok, Thailand–April 1, 2021–March 31, 2022

Age group	Male		Female		Total	
	Patient (%)	Visit (%)	Patient (%)	Visit (%)	Patient (%)	Visit (%)
under 5	27,941 (4.18%	46,885 (3.00%)	24,119 (2.96%)	39,539 (1.92%)	52,060 (3.51%)	86,424 (2.39%)
5-14 Year	84,168 (12.59%	124,684 (7.98%)	77,406 (9.51%)	112,322 (5.45%)	161,574 (10.90%)	237,006 (6.54%)
15-24 Year	117,722 (17.61%	185,056 (11.85%)	123,268 (15.15%)	196,825 (9.55%)	240,990 (16.26%)	381,881 (10.54%)
25-34 Year	65,506 (9.80%	109,459 (7.01%)	63,094 (7.76%)	111,022 (5.39%)	128,600 (8.68%)	220,481 (6.09%)
35-44 Year	67,604 (10.11%	135,123 (8.65%)	68,494 (8.42%)	142,853 (6.93%)	136,098 (9.18%)	277,976 (7.67%)
45-54 Year	84,689 (12.67%	216,581 (13.87%)	107,389 (13.20%)	285,793 (13.87%)	192,078 (12.96%)	502,374 (13.87%)
55-64 Year	108,652 (16.25%	345,000 (22.09%)	157,553 (19.37%)	502,274 (24.38%)	266,205 (17.96%)	847,274 (23.39%)
65-74 Year	78,363 (11.72%	279,398 (17.89%)	126,782 15.58%)	448,482 (21.77%)	205,145 (13.84%)	727,880 (20.10%)
> 74 Year	33,865	119,596	65,480	220,946	99,345	340,542

Age group	Male		Female		Total	
	Patient (%)	Visit (%)	Patient (%)	Visit (%)	Patient (%)	Visit (%)
	(5.07%	(7.66%)	(8.05%)	(10.73%)	(6.70%)	(9.40%)
Total	668,510 (100.00%)	1,561,782 (100.00%)	813,585 (100.00%)	2,060,056 (100.00%)	1,482,095 (100.00%)	3,621,838 (100.00%)

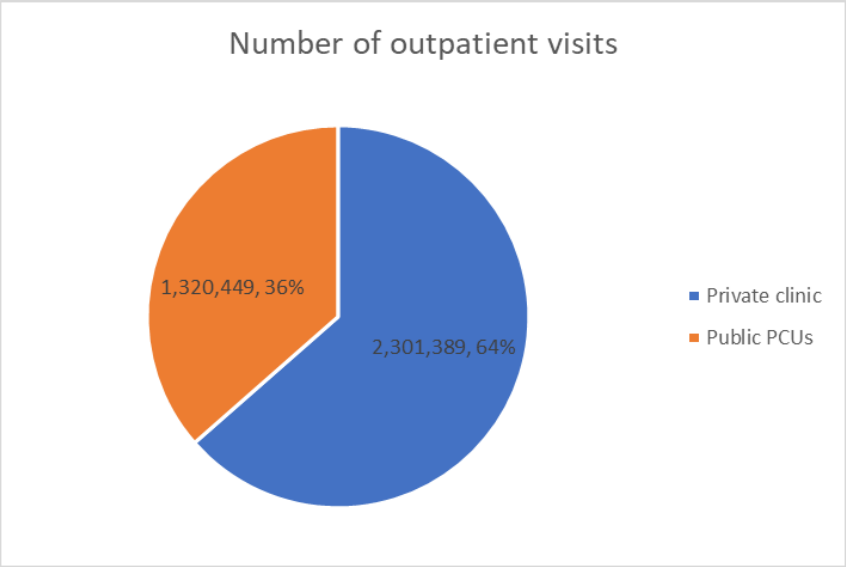


Figure 2 Number and percentage of outpatient visits in primary care units

1 Amount of antibiotics used in primary care units

1.1 Defined Daily Dose

During the 12-months study period, 3.59% of outpatient visits were prescribed at least one antibiotic, accounting for 129,897 prescriptions (Figure 3). A total of 25 antibiotics at ATC 5 level were identified from 129,897 prescriptions. Out of the 721,099.40 DDD of antibiotics observed in this study, the majority of antibiotic prescriptions was Amoxicillin (36.81%). Other commonly prescribed antibiotics included Amoxicillin/clavulanic acid (16.41%) and Dicloxacillin (16.05%), as shown in Table 3. Top 10 antibacterial drugs used by type of PCUs were also illustrated in Figure 4.

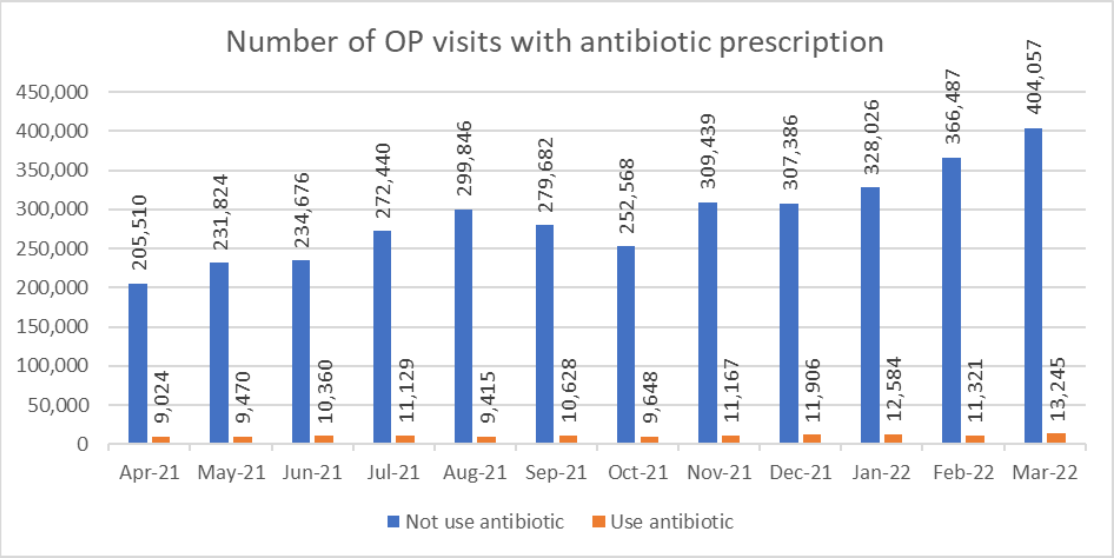


Figure 3 Number of outpatient visits with antibiotic prescription in PCUs by month, Bangkok, Thailand– April 1, 2021–March 31, 2022

Table 3 Total DDD of All Antibiotics Prescribed to Patients in Primary Care Units by ATC Level 5, Bangkok, Thailand– between 1 April 2021 and 31 March 2022

ATC	Antibiotic	Oral	Parenteral	DDD	%
J01CA04	Amoxicillin	✓	×	265,420.00	36.81
J01CR02	Amoxicillin/clavulanic acid	✓	×	118,306.20	16.41
J01CF01	Dicloxacillin	✓	×	115,736.40	16.05
J01MA06	Norfloxacin	✓	×	59,361.75	8.23
J01FA06	Roxithromycin	✓	×	45,795.83	6.35
J01MA02	Ciprofloxacin	✓	✓	41,607.25	5.77
J01AA02	Doxycycline	✓	×	27,750.00	3.85
J01MA01	Ofloxacin	✓	×	14,138.50	1.96
J01FF01	Clindamycin	✓	×	12,269.25	1.70
J01DD04	Ceftriaxone	×	✓	5,585.75	0.77
J01EE01	Sulfamethoxazole/trimethoprim	✓	×	5,054.25	0.70
J01MA12	Levofloxacin	✓	×	2,471.00	0.34
J01FA10	Azithromycin	✓	×	2,161.50	0.30
J01FA09	Clarithromycin	✓	×	1,540.00	0.21

ATC	Antibiotic	Oral	Parenteral	DDD	%
J01DB01	Cefalexin	✓	×	1,304.88	0.18
J01CF02	Cloxacillin	×	✓	1,297.75	0.18
J01FA01	Erythromycin	✓	×	807.00	0.11
J01FF02	Lincomycin	×	✓	304.50	0.04
J01DD08	Cefixime	✓	×	91.50	0.01
J01DD54	Ceftriaxone, combinations	×	✓	57.88	0.01
J01CE08	Benzathine-benzylpenicillin	×	✓	29.50	<0.01
J01DD02	Ceftazidime	×	✓	6.00	<0.01
J01DD01	Cefotaxime	×	✓	1.50	<0.01
J01GA01	Streptomycin IV	✓	✓	1.00	<0.01
J01BA01	Chloramphenicol	×	✓	0.33	<0.01
Total				**721,099.40**	**100.00**

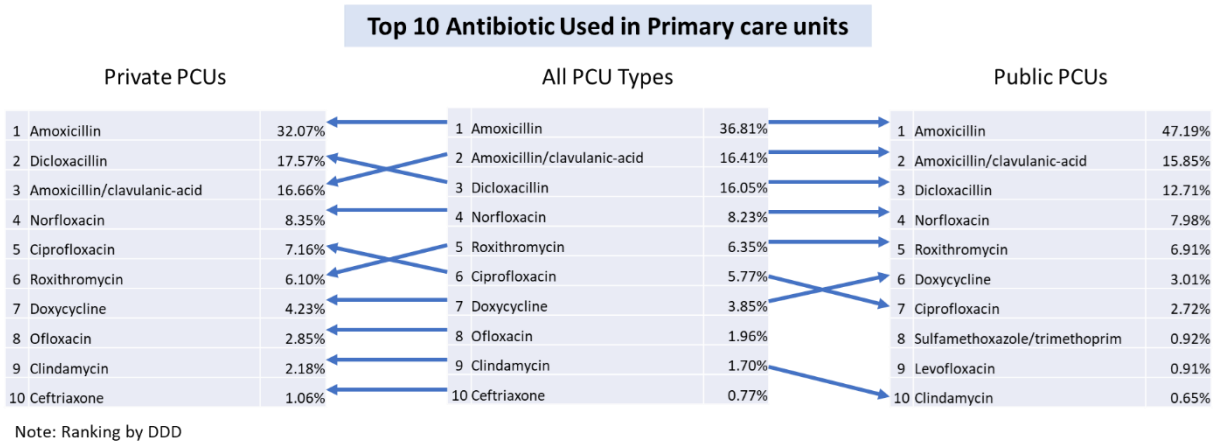


Figure 4 Top 10 antibacterial drugs used by type of PCUs.

In primary care settings, prescribed antibiotics were classified into 11 antibiotic groups. Penicillin accounted for the majority of prescriptions (53.04%), followed by Beta-lactam/beta-lactamase inhibitor (16.41%), and Fluoroquinolones (16.31%). This prescription pattern remains consistent across both private and public primary care units (Figure 5). Figure 6 also shows the AWaRe classification for the antibiotics prescribed. In this study, the main class of antibiotics prescribed to this population of PCUs belong to the Access group (75.88%) and Watch antibiotics were also prescribed (24.12%). However, there was no Reserved group (Figure 6).

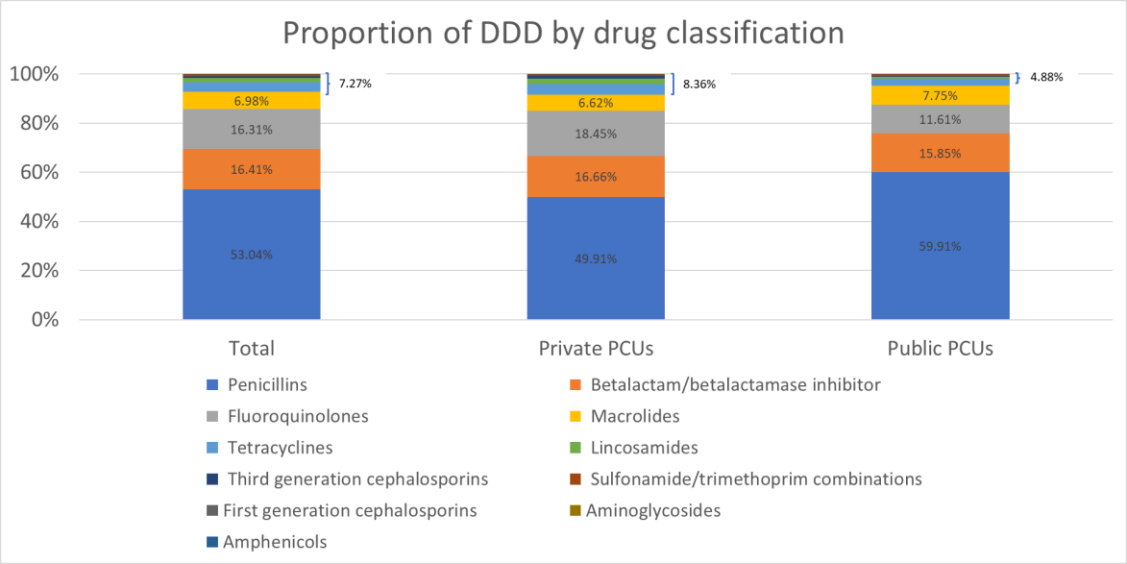


Figure 5 Proportion of DDD of All Antibiotics Prescribed to Patients in Primary Care Units by ATC Level 4, Bangkok, Thailand, between 1 April 2021 and 31 March 2022

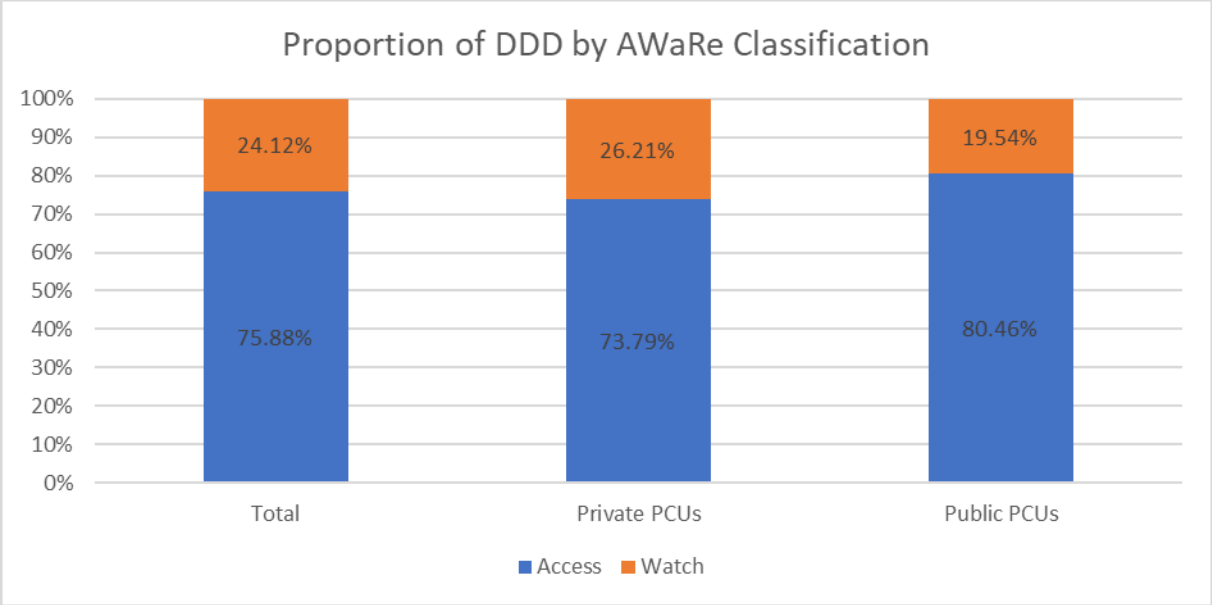


Figure 6 Proportion of DDD of All Antibiotics Prescribed to Patients in Primary Care Units by AWaRe Classification, Bangkok, Thailand, between 1 April 2021 and 31 March 2022

Out of 25 antibiotics used in Primary Care Units (PCUs), 10 were parenteral antibiotics (Table 4); however, their usage was minimal (0.01%). The majority of antibiotics prescribed in PCUs were in oral form (99.17%). This pattern is consistent in both public and private PCUs (Table 4).

Table 4 DDD of antibiotic in PCUs by dosage form

Dosage forms	All PCU types DDD (%)	Private clinic DDD (%)	Public PCUs DDD (%)
Oral	715,094.5 99.17%	489,666.10 98.88%	225,428.4 99.81%
Parenteral	6,004.96 0.01%	5,567.208 0.01%	437.75 < 0.01
Total	721,099.40 100.00%	495,233.3 100.00%	225,866.2 100.00%

1.2 Defined Daily Dose per 1,000 inhabitants per day (DID)

A total of 2,243,589 adults were registered across 286 PCUs in Bangkok (Table 5), with 1,269,279 individuals (56.57%) registered at private clinics, and the remaining registered at public PCUs. The overall number of DID of antibiotic used at PCUs in Bangkok was 0.88. Private clinics had a higher DID value compared to public PCUs (1.07 and 0.64, respectively), as shown in Table 6.

Table 5 Number of primary care facilities and registered population by type and location

Health zone	Private clinic		Public health center	
	N of PCUs	N of adult population	N of PCUs	N of adult population
Central BKK	24	159,092	14	140,216
Eastern BKK	60	311,031	12	135,681
Northern BKK	37	237,831	14	113,327
Northern Thonburi	22	154,135	11	222,597
Southern BKK	33	208,299	17	184,531
Southern Thonburi	31	198,891	11	177,958
Total **(% of total PCUs or adult population)**	**207** **(72.38%)**	**1,269,279** **(56.57%)**	**79** **(27.62%)**	**974,310** **(43.43%)**

Table 6 DID of Prescribed Antibiotics by PCUs type, Bangkok, Thailand–April 1, 2021–March 31, 2022

Type	Adult population	DDD	DID
Private PCUs	1,269,279	495,233.30	1.07
Public PCUs	974,310	225,866.20	0.64
Total	**2,243,589**	**721,099.40**	**0.88**

The analysis of the population level of the DID from the DDD was performed to compare antibiotic use across districts and health zones in Bangkok. The areas with the highest antibiotic use were Eastern Bangkok, Northern Bangkok, and Southern Thonburi zones (Table 7). Figure 7 shows that the highest number of DID was observed for Nong Chok (5.24), followed by Khan Na Yao (1.46), Bang Sue (1.26), Lat Krabang (1.24), and Bang Na (1.15).

Table 7 DID of Prescribed Antibiotics by Bangkok Health Zone, Bangkok, Thailand–April 1, 2021–March 31, 2022

Zone	Adult population	DDD	DID
Central BKK	299,308	71,890.42	0.66
Eastern BKK	446,712	212,496.60	1.30
Northern BKK	351,158	127,923.40	1.00
Northern Thonburi	376,732	86,532.12	0.63
Southern BKK	392,830	105,472.40	0.74
Southern Thonburi	376,849	116,784.40	0.85
Total	**2,243,589**	**721,099.40**	**0.88**

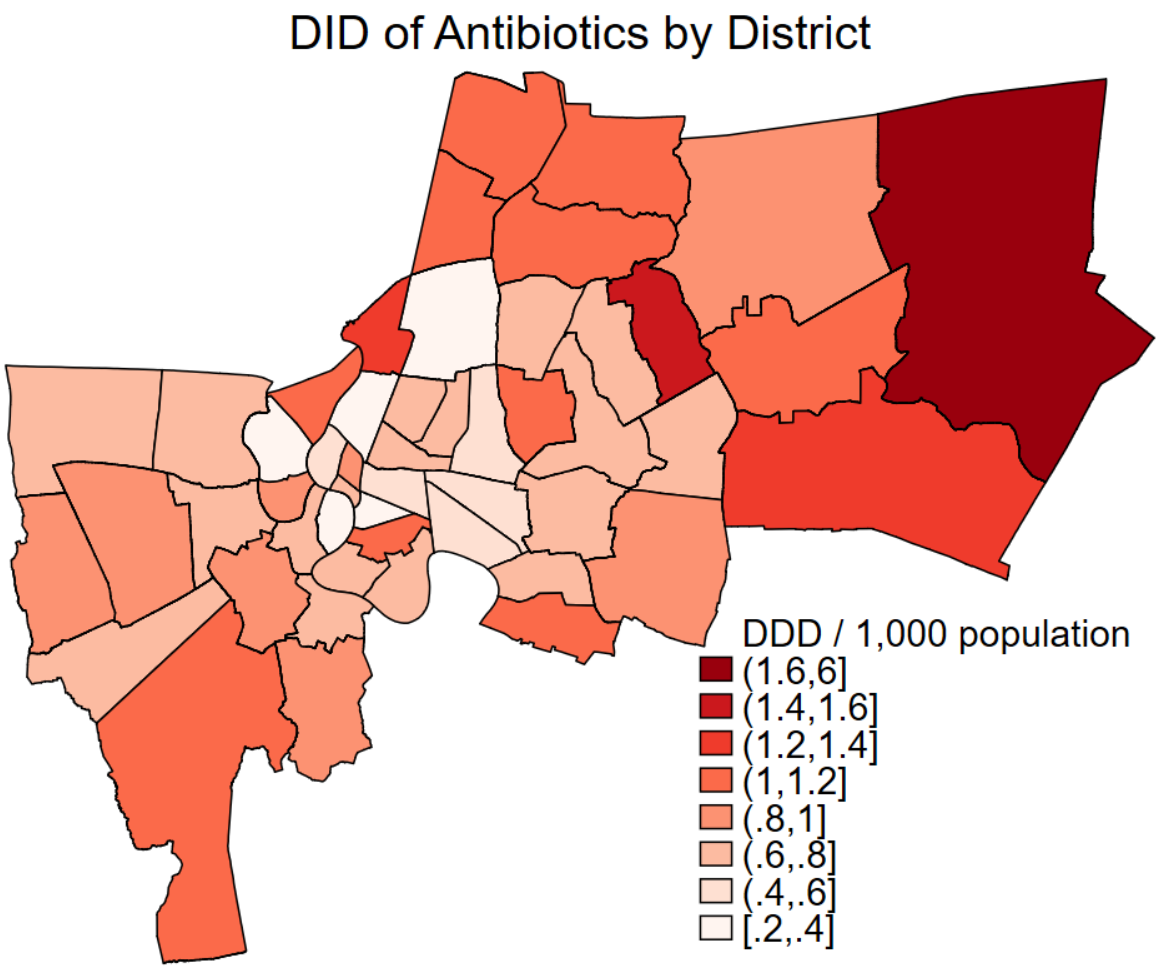


Figure 7 DID by geographic location of the districts in Bangkok

2 Percentage of antibiotic use in specific diseases

In this section, three groups of diseases were categorized by ICD-10, which included 1) Upper respiratory tract infection (URI), 2) Acute diarrhea, and 3) Urinary tract infection (UTI). URI and acute diarrhea are proxy indicators of rational drug use in Thailand while UTI has been identified as one of the common problems with antibiotic use in primary care settings based on semi-structure interviews. The proportion of antibiotic use of each disease was calculated and shown in this section.

2.1 Antibiotic use in upper respiratory tract infection

During one year of the study, there were 93,204 outpatient visits diagnosed with URI. The percentage of antibiotic use in patients with URI was calculated, with approximately 33.23% of total URI cases involving antibiotic use. When comparing antibiotic use between sexes, similar proportions were found for both males and females (33.24% and 33.22%). The highest antibiotic usage was also observed in the 15-24 age group (42.80%), while the lowest percentage of AMU was found in patients aged more than 74 years old (21.00%). Private clinics had higher antibiotic use than Public Health Centers, 36.92% and 25.92% respectively. Within the Bangkok Health Zone, the Eastern Bangkok zone had the highest antibiotic use cases (40.80%) and Northern Thonburi was the lowest ranking. See table 8.

Table 8 percentage of antibiotic use in patients with urinary tract infection

Characteristic	URI cases	AMU in URI	% AMU in URI
Total	93,204	30,973	33.23%
Sex			
• Male	40,729	13,540	33.24%
• Female	52,475	17,433	33.22%
Age group			
• under 5	12,043	3,415	28.36%
• 5-14 Year	12,773	4,813	37.68%
• 15-24 Year	11,241	4,811	42.80%
• 25-34 Year	6,252	2,460	39.35%
• 35-44 Year	7,245	2,813	38.83%
• 45-54 Year	10,262	3,599	35.07%
• 55-64 Year	15,285	4,687	30.66%
• 65-74 Year	12,447	3,187	25.60%
• > 74 Year	5,656	1,188	21.00%
Type of PCUs			
• Private	61,944	22,871	36.92%
• Public	31,260	8,102	25.92%
Bangkok Health Zone			
• Northern BKK	13,219	4,496	34.01%
• Southern BKK	15,818	4,546	28.74%
• Central BKK	8,053	2,671	33.17%
• Eastern BKK	30,521	12,454	40.80%
• Northern Thonburi	11,598	3,081	26.56%
• Southern Thonburi	13,995	3,725	26.62%

Figure 8 illustrates the percentage of antibiotic use in URI patients by district. The intensity of color indicates antibiotic use, with the darkest color observed in the Nong Chok district, situated in the Eastern zone of Bangkok, where approximately 64.53% of URI patients were prescribed antibiotics. Following was Samphanthawong district, located in the Central BKK zone, with antibiotic use ranging from 52.91%. The lightest color is Bangkok Noi district, located in the Northern Thonburi, with antibiotic use ranging from 7.22%.

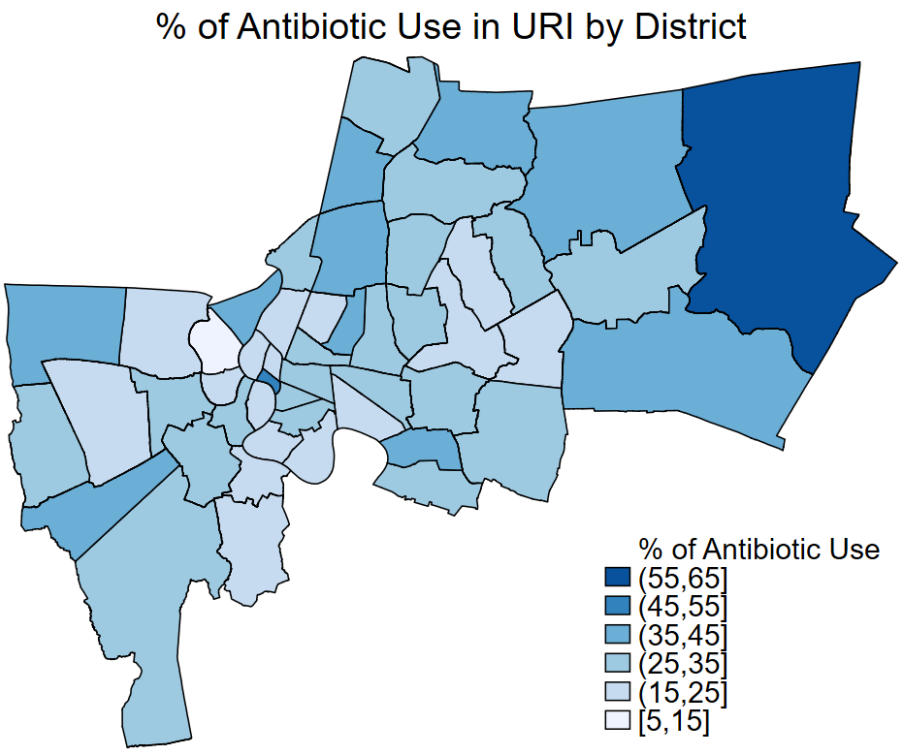


Figure 8 Percentage of antibiotic use in upper respiratory tract infection by district

2.2 Antibiotic use in acute diarrhea

Over the course of a year-long study, there were 17,163 patients visiting primary care units with acute diarrhea. The percentage of antibiotic use in this patient group was approximately 36.04% of total acute diarrhea cases. When comparing antibiotic use between sex, females used antibiotics more than males (36.59% and 35.24% respectively). The highest antibiotic usage was also observed in the 25-34 age group (42.14%) and the lowest antibiotic use was shown in children under 5 years old (24.86%). Private clinics had higher antibiotic use than Public Health Centers. Within the Bangkok Health Zone, the Northern Bangkok zone had the highest antibiotic use cases when compared to other areas (41.14%), while primary care units in Southern Bangkok prescribed the fewest antibiotics for acute diarrhea (32.66%). See table 9.

Table 9 percentage of antibiotic use in patients with acute diarrhea

Characteristic	Acute diarrhea cases	AMU in acute diarrhea	% AMU in acute diarrhea
Total	17,163	6,186	36.04%
Sex			
• Male	7,014	2,472	35.24%
• Female	10,149	3,714	36.59%
Age group			
• under 5	2,876	715	24.86%
• 5-14 Year	2,098	706	33.65%
• 15-24 Year	2,390	950	39.75%
• 25-34 Year	1,403	595	42.41%
• 35-44 Year	1,216	485	39.88%
• 45-54 Year	1,541	602	39.07%
• 55-64 Year	2,426	938	38.66%
• 65-74 Year	2,083	784	37.64%
• > 74 Year	1,130	411	36.37%
Type of PCUs			
• Private	11,565	4,343	37.55%
• Public	5,598	1,843	32.92%
Bangkok Health Zone			
• Northern BKK	2,754	1,133	41.14%
• Southern BKK	2,838	927	32.66%
• Central BKK	1,555	518	33.31%
• Eastern BKK	4,597	1,637	35.61%
• Northern Thonburi	2,235	830	37.14%
• Southern Thonburi	3,184	1,141	35.84%

Figure 9 illustrates the percentage of antibiotic use among patients with acute diarrhea categorized by district. The intensity of color indicates antibiotic use, notably the top three darkest colors were in the Bang Sue, Pathum Wan, and Chom Thong district, with approximately 62.79%, 53.98%, and 53.26% of antibiotic use in acute diarrhea, respectively. The top three lightest color were Khlong San, Phaya Thai, and Khlong Toei district, with antibiotic use lower than 20% of acute diarrhea diagnosis (13.64%, 18.33%, and 19.76% respectively).

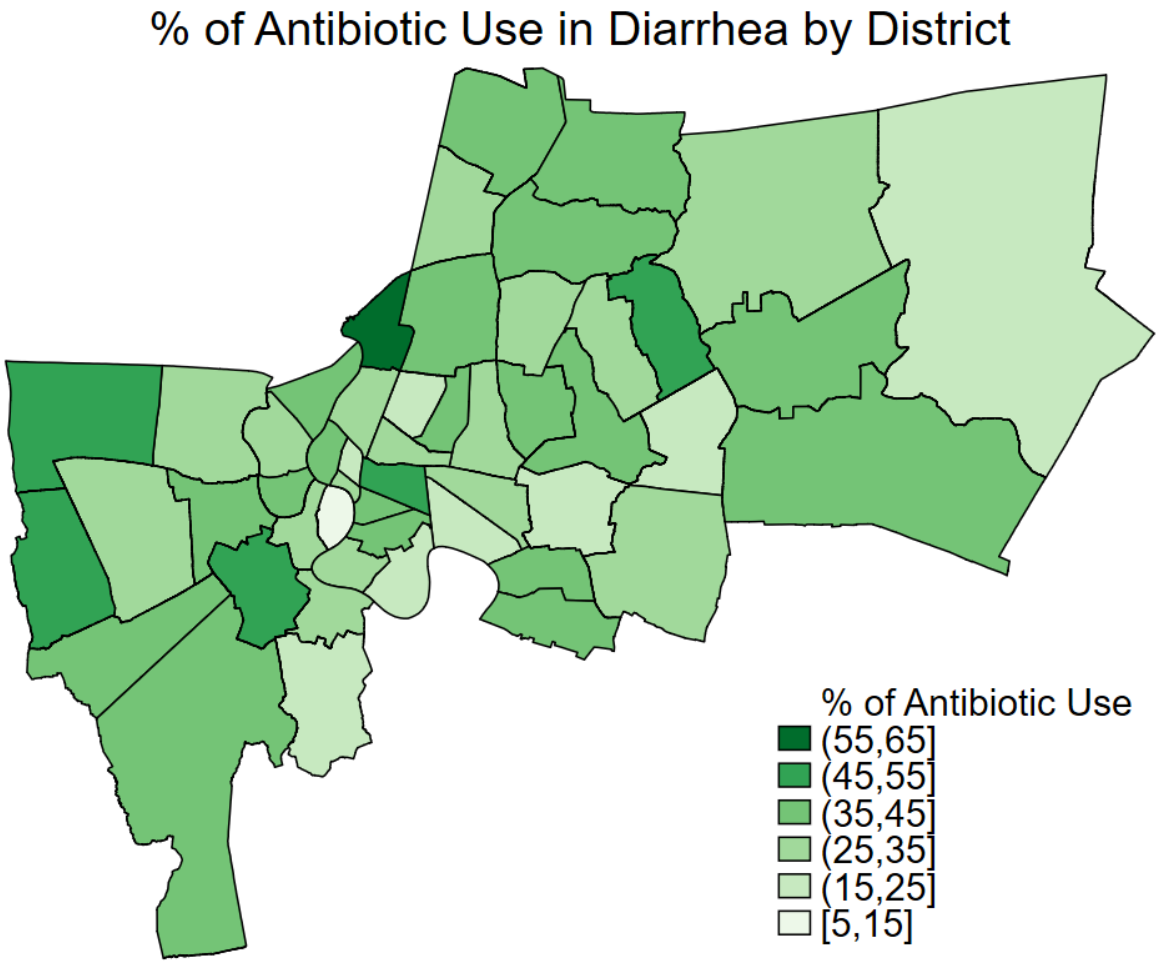


Figure 9 Percentage of antibiotic use in acute diarrhea by district

2.3 Antibiotic use in urinary tract infection

Between April 2021 and March 2022, there were 17,073 patients diagnosed with UTI in primary care units under the Universal Coverage Scheme in Bangkok. Female patients constituted a larger portion of UTI cases compared to males (12,860 and 4,213 patients). The percentage of antibiotic use in patients with urinary tract infection was approximately 53.04% of total UTI cases involving antibiotic use. When comparing antibiotic use between sex, female used antibiotics more than male (55.92% and 44.27%). The highest antibiotic usage was observed in the 25-34 age group (59.29%) and the lowest proportion of antibiotic use was in children aged under five years old (28.40%). Private PCUs had higher antibiotic use

than Public Health Centers (54.26% and 49.27%). Within the Bangkok Health Zone, the Eastern Bangkok zone (61.41%) had the highest antibiotic use cases when compared to other areas. See table 10.

Table 10 percentage of antibiotic use in patients with urinary tract infection

Characteristic	UTI cases	AMU in UTI	% AMU in UTI
Total	17,073	9,056	53.04%
Sex			
• Male	4,213	1,865	44.27%
• Female	12,860	7,191	55.92%
Age group			
• under 5	250	71	28.40%
• 5-14 Year	450	208	46.22%
• 15-24 Year	1,432	847	59.15%
• 25-34 Year	985	584	59.29%
• 35-44 Year	1,239	693	55.93%
• 45-54 Year	2,324	1,302	56.02%
• 55-64 Year	4,129	2,261	54.76%
• 65-74 Year	3,855	2,027	52.58%
• > 74 Year	2,409	1,063	44.13%
Type of PCUs			
• Private	12,908	7,004	54.26%
• Public	4,165	2,052	49.27%
Bangkok Health Zone			
• Northern BKK	3,732	1,832	49.09%
• Southern BKK	2,376	1,191	50.13%
• Central BKK	1,832	913	49.84%
• Eastern BKK	4,568	2,805	61.41%
• Northern Thonburi	1,993	1,011	50.73%

Characteristic	UTI cases	AMU in UTI	% AMU in UTI
• Southern Thonburi	2,572	1,304	50.70%

In Figure 10, the percentage of antibiotic use in UTI by district, with darker colors indicating higher antibiotic use. Notably, the Pathum Wan district, situated in the Southern BKK zone, exhibits the darkest shade, with approximately 78.69% of prescriptions involving at least one antibiotic. In the Eastern BKK zone, Min Buri, Nong Chok, and Lat Krabang districts show a substantial proportion of antibiotic use, standing at 71.91%, 69.09%, and 69.03%, respectively. Conversely, the Dusit district in the Central BKK zone appears in the lightest color, denoting an antibiotic use rate of 32.00%.

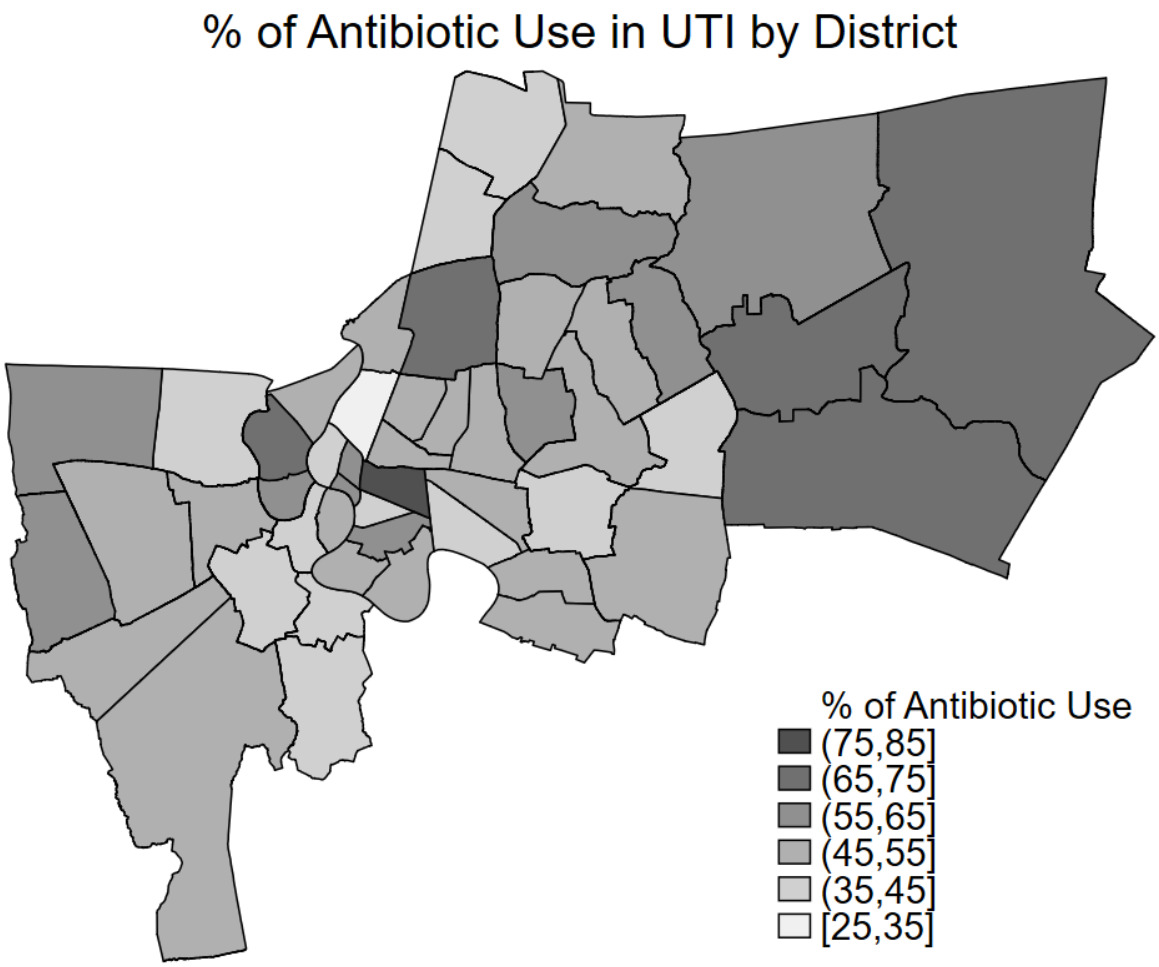


Figure 10 Percentage of antibiotic use in urinary tract infection by district

2. literature review and semi-structure interview

Policy-Related AMU and AMU monitoring in Primary Care Units

Thailand's National Strategic Plan on Antimicrobial Resistance 2017-2022 serves as the primary policy addressing the escalating issue of antimicrobial resistance through six key strategies. These strategies have been instrumental in formulating policies and strategic plans across various public health organizations, ensuring a unified one health approach. However, the policy pertaining to antimicrobial use in the previous strategic plan predominantly focuses on hospital settings, which is considered the most problematic setting. Given that a significant portion of health services in Thailand takes place in primary care settings, the lack of data on antimicrobial use in this setting leaves a notable gap in the system. The upcoming Thailand National Strategic Plan on Antimicrobial Resistance 2023-2027 aims to be more focused on primary care settings. Monitoring antimicrobial use in primary care settings is identified as one of the strategic actions in the upcoming national AMR plan. This section aims to reveal the policies related to AMU and AMU monitoring in Primary Care Units (PCUs) settings in Thailand, with a specific focus on Bangkok. It incorporates data obtained from a literature review and semi-structured interviews conducted with seven officers working in five organizations related to primary care.

National Health Security Office (NHSO)

The NHSO functions as a purchaser for the UCS. The office can oversee all healthcare facilities under the insurance scheme. NHSO had improved the efficiency and quality of primary healthcare services through the Quality and Outcome Framework (QoF) policy, which revealed indicators pertaining to antimicrobial stewardship. To incentivize program enhancement, healthcare services under Universal Health Coverage, including hospitals and primary care units, that successfully attained strategic goals were rewarded with financial benefits linked to Key Performance Indicators (KPIs). The two KPIs' categories were the national KPIs and the area specific KPIs. AMS, which indicated to disease-group specified OP services, namely acute diarrhea and upper respiratory infection (URI), was involved in the national KPIs. The prescription of antibiotic drugs was generally unnecessary for their treatment. The percentage of antibiotic prescriptions for each disease was evaluated. The lower antibiotic use, the more appropriate use. Healthcare units were rewarded by the NHSO based on scoring criteria (11). Healthcare facilities that achieve less than 20% of antibiotic usage were rewarded. However, this policy was terminated in 2021.

ตัวชี้วัดที่ 5 : ร้อยละการใช้ยาปฏิชีวนะอย่างรับผิดชอบในผู้ป่วยนอก 5.1. ร้อยละการใช้ยาปฏิชีวนะอย่างรับผิดชอบในผู้ป่วยนอกโรคอุจจาระร่วงเฉียบพลัน (Acute Diarrhea)		
Baseline ประเทศ	ปี 2561 21.60 %	
Baseline กทม.	ปี 2559 รพ. 49.52 % คลินิกชุมชนอบอุ่นและศูนย์บริการสาธารณสุข 51.64 % ปี 2560 รพ. 49.63 % คลินิกชุมชนอบอุ่นและศูนย์บริการสาธารณสุข 51.36 % ปี 2561 รพ. 40.36 % คลินิกชุมชนอบอุ่นและศูนย์บริการสาธารณสุข 38.57 %	
เป้าหมาย	ไม่เกินร้อยละ 30	
เกณฑ์การให้คะแนน	>30.0%	0
	>27.5 – 30.0 %	1
	>25.0 – 27.5 %	2
	>22.5 – 25.0 %	3
	>20.0 – 22.5 %	4
	≤20 %	5

ตัวชี้วัดที่ 5 : ร้อยละการใช้ยาปฏิชีวนะอย่างรับผิดชอบในผู้ป่วยนอก 5.2. ร้อยละการใช้ยาปฏิชีวนะอย่างรับผิดชอบในผู้ป่วยนอกโรคติดเชื้อระบบทางเดินหายใจ (Respiratory Infection)		
Baseline ประเทศ	ปี 2561 = 17.48 %	
Baseline กทม.	ปี 2559 รพ. 49.72 % คลินิกชุมชนอบอุ่นและศูนย์บริการสาธารณสุข 47.52 % ปี 2560 รพ. 53.75 % คลินิกชุมชนอบอุ่นและศูนย์บริการสาธารณสุข 47.08 % ปี 2561 รพ. 45.36 % คลินิกชุมชนอบอุ่นและศูนย์บริการสาธารณสุข 36.05 %	
เป้าหมาย	ไม่เกินร้อยละ 30	
เกณฑ์การให้คะแนน	> 30.0 %	0
	> 27.5 % – 30.0 %	1
	> 25.0 % – 27.5 %	2
	> 22.5 % – 25.0 %	3
	> 20.0 % – 22.5 %	4
	≤ 20.0 %	5

Figure 11 Scoring Criteria for Antibiotic Usage in Acute Diarrhea and Respiratory Infections

Health Administration Division, MoPH

The MOPH has implemented a policy to emphasize service excellence of the ministry's healthcare facilities by developing the service plan's indicators. In 2016, the first year of AMR national strategic plan, the MOPH initiated AMR and RDU service plan. To enhance the quality of standard health services, the RDU Guidance was introduced. This plan and guidance framework actively advocate for rational drug use in healthcare settings and address medication issues within the community. In healthcare settings, both hospitals and primary care units are targeted; nonetheless, the focus is on hospital settings. While AMS is one part of the RDU policy, the percentage of antibiotic use in four medical conditions is monitored: URI, acute diarrhea, fresh wound, and normal childbirth. This indicator is mandatory for hospitals and health centers under MOPH. Additionally, DDD of antibiotics, DDD per 1,000 patient visits and DDD per 100 patient-day are also monitored, but they are optional. The database for monitoring is 43 Folders database managed by MOPH's Health Data Center.

In addition to the RDU Service Plan, there is also the development of an Antimicrobial Resistance (AMR) Service Plan, with performance indicators set by the Ministry of Public Health. This indicator includes the percentage of patients with bacteremia infected with eight types of drug-resistant bacteria. Moreover, the framework of Integrated AMR Management in hospital (IAM) has been introduced in hospital settings. This framework includes a wide range of interventions in hospitals: infection prevention and control, surveillance system, antimicrobial stewardship, and leadership and governance mechanisms. However, there is no intervention on AMR in primary care settings.

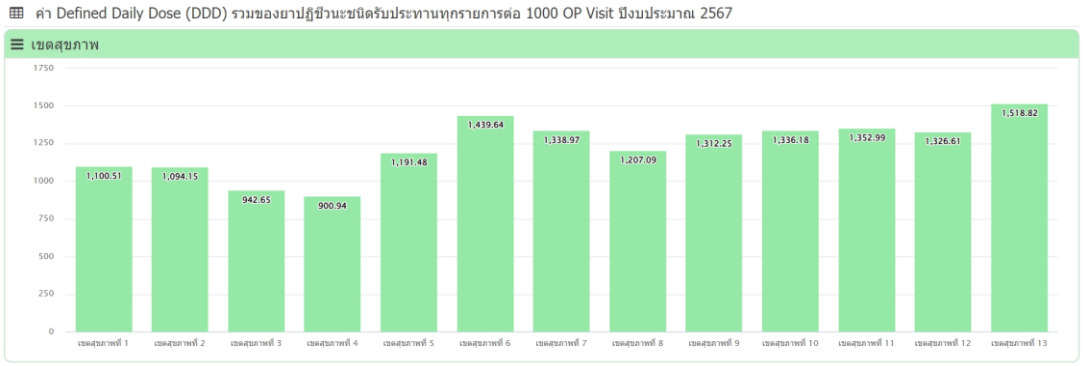


Figure 12 Defined Daily Dose (DDD) total of all oral antibiotics per 1000 OP Visits, fiscal year 2024.

Department of Health Service Support, MOPH

The department is mandated to register and oversee private clinics and hospitals. The organization has established standards for private medical clinics, with a primary focus on infrastructure, medical equipment and lifesaving equipment, essential medicine stock and supply, and infection prevention and control. In addition, adequately labeled drugs must meet the legal requirements and ensure that no expired or damaged medications are present. Annually, clinics are required to submit a self-report detailing the number of patients and health services provided, a list of medical equipment, and implemented infection prevention and control measures. However, there is currently no mandatory standard for antimicrobial stewardship in private clinics (12, 13).

In addition to the standard for medical clinics, the department has introduced a rational drug use policy in private clinics and private hospitals since 2020. Under the RDU policy, there is a practice guideline and

an annual electronic self-assessment for rational drug use. There are 16 questions in a self-assessment form for medical clinics, and two of them are related to antibiotic use. This assessment is voluntarily conducted through the department's website. However, in the latest survey in 2022, the response rate was low; there were only 396 clinics responding to the survey .(14)

ลำดับ	หัวข้อการประเมิน	ผลการประเมิน			ดำเนินการตามกุญแจ PLEASE ของ RDU
		ไม่มี (๐)	กำลังดำเนินการ (๑)	ดำเนินการแล้ว (๒)	
๑๐	แพทย์และบุคลากรทางการแพทย์มีการพัฒนาองค์ความรู้ที่ทันสมัยผ่านการศึกษาต่อเนื่องอย่างสม่ำเสมอ อย่างน้อยตามที่สภาวิชาชีพกำหนด				Es การดำเนินการข้อ ๒,๓
๑๑	บุคลากรทางการแพทย์อย่างน้อยร้อยละ ๘๐ เข้าร่วมการอบรมที่สร้างความตระหนักรู้ต่อการใช้ยาอย่างสมเหตุผลอย่างน้อยปีละ ๑ ครั้ง				Es การดำเนินการข้อ ๑,๒,๓
๑๒	**มีแนวทางการจัดการการดื้อยาต้านจุลชีพ (Antimicrobial resistance ; AMR) ได้แก่**				
	๑๒.๑ การทำ Antibiotic Stewardship Program				Es การดำเนินการข้อ ๔
	๑๒.๒ ห้องแยกสำหรับผู้ป่วยติดเชื้อดื้อยา				Es การดำเนินการข้อ ๔
	๑๒.๓ วิธีปฏิบัติในการเฝ้าระวังทางห้องปฏิบัติการกรณีพบเชื้อดื้อยา				Es การดำเนินการข้อ ๔
	๑๒.๔ วิธีปฏิบัติในการสื่อสารข้อมูลระหว่างนักเทคนิคการแพทย์ เภสัชกร พยาบาลควบคุมการติดเชื้อ (IC) และแพทย์ เมื่อพบผู้ป่วยติดเชื้อดื้อยา				Es การดำเนินการข้อ ๔
	๑๒.๕ ระบบการรายงานข้อมูลเกี่ยวกับเชื้อดื้อยาต่อกรมควบคุมโรค				Es การดำเนินการข้อ ๔
	๑๒.๖ ระบบการรับ-ส่งต่อผู้ป่วยติดเชื้อดื้อยา				Es การดำเนินการข้อ ๔
	๑๒.๗ โรงพยาบาลของท่านมีแนวทางการจัดการการดื้อยาต้านจุลชีพ (AMR) อย่างไรอีกบ้าง				
๑๓	มีการให้ความรู้เรื่องการใช้ยาอย่างสมเหตุผลแก่ผู้รับบริการผ่านช่องทางต่างๆ เช่น แผ่นพับ การประชุมวิชาการ โปสเตอร์ สื่อประชาสัมพันธ์ social media เป็นต้น				A การดำเนินการข้อ ๖

Figure 13 Self-assessment form for medical clinics related to antibiotic use.

Division of Primary Healthcare Support, MOPH

The Division of Primary Healthcare Support oversees registered primary care units under the Primary Care Act B.E. 2560. As of 2023, there are 4,035 registered primary care units. The division has developed standards for primary care services to ensure the provision of comprehensive and quality care in Primary Care Units (PCUs). These standards encompass various health services in primary care settings, such as health promotion, disease control, disease prevention, diagnostic testing, medical treatment, and health rehabilitation. Additionally, the standards include pharmaceutical management system which safe and rational drug use is covered.(15) However, the Primary Care Standard was recently launched earlier this year (2023), and the implementation process is currently underway. The division has a plan to link health data from all PCUs, but the project is still under development.

หน่วยบริการ.....อำเภอ.....จังหวัด.....

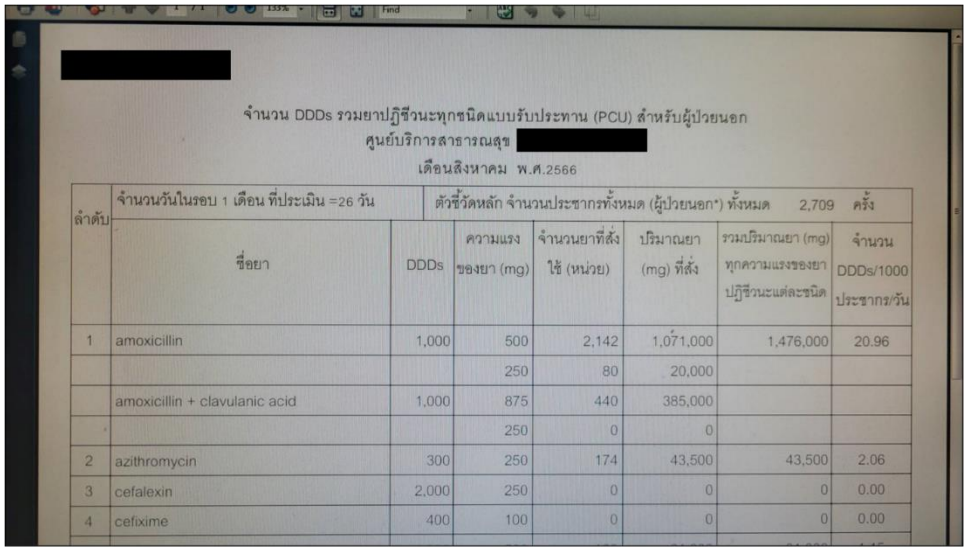
1. ด้านการจัดบริการเภสัชกรรม (RDU)

หัวข้อ	ประเด็นการประเมิน	รายการประเมิน	คะแนนเต็ม	คะแนนที่ได้	หลักฐาน/แหล่งข้อมูล	หมายเหตุ
1.	**การบริหารจัดการระบบยา**					
	การบริหารจัดการ ระบบยา โดยการมีส่วนร่วมของเภสัชกร รพ.แม่ข่าย กับโรงพยาบาลส่งเสริมสุขภาพตำบล	1. มีคำสั่งแต่งตั้งคณะกรรมการเภสัชกรรมและการบำบัดในการจัดการระบบยาระดับอำเภอ 2. มีแผนการปฏิบัติการและปฏิบัติงานจริงตามแผน อย่างน้อยปีละ 4 ครั้ง 3. มีการสนับสนุนวิชาการจากเภสัชกร รพ.แม่ข่าย ได้แก่ การจัดอบรมวิชาการ, คู่มือ/สื่อการใช้ยา ใน รพ.สต.	1 1 1		1. คำสั่งคณะกรรมการเภสัชกรรมและการบำบัดฯ ระดับอำเภอ 2. แผนการปฏิบัติการฯ 3. สมุดเยี่ยม หรือผลปฏิบัติงาน หรือเอกสารอื่นๆ ฯลฯ 4. คู่มือ/สื่อการใช้ยา ใน รพ.สต.	
2.	**การคัดเลือก การส่งมอบยาที่ปลอดภัยและมีคุณภาพ**					
	2.1 มียาใช้อย่างเหมาะสม และเพียงพอ	1. มีบัญชีรายการยา รพ.สต. 2. มียาช่วยชีวิตใน รพ.สต. และคู่มือการใช้ยาช่วยชีวิต 3. มีหลักเกณฑ์หรือขอบเขตในการสั่งใช้ยาที่สอดคล้องกับศักยภาพผู้สั่งใช้ยา	1 1 1		1. บัญชีรายการยา รพ.สต. 2. ตรวจสอบ Emergency box และมียาช่วยชีวิตมีดังนี้ 2.1 Adrenaline injection 1:1000 2.2 Steroid injection เช่น Dexa injection หรือ Hydrocortisone injection 2.3 Chlorpheniramine injection 2.4 50% Glucose injection	

Figure 14 Primary Care Standards in the Rational Drug Use

Department of health, Bangkok Metropolitan Administration

The Department of Health oversees 69 public health centers in Bangkok. The Division of Pharmacy, operating under the Department of Health, has implemented the Rational Drug Use (RDU) policy in all public health centers. Data is recorded by the Healthcare Information System (HCIS), the health information system of the Department of Health. This database includes a drug dispensing and pharmaceutical management system, enabling the analysis and reporting of RDU indicators. These indicators encompass the percentage of prescribed antibiotics for upper respiratory infections (URI), acute diarrhea, and fresh wounds. Under the RDU policy, the Drug Utilization Evaluation (DUE) measure is also applied in public health centers. Additionally, the Pharmacy Division produces informational materials for public awareness and distributes them to public health centers. This includes promoting knowledge about three diseases that can be treated without antibiotics, distributing guides on the rational use of antibiotics through brochures, and educating both healthcare providers and the general public that antibiotics are not anti-inflammatory drugs (16).



จำนวน DDDs รวมยาปฏิชีวนะทุกชนิดแบบรับประทาน (PCU) สำหรับผู้ป่วยนอก
ศูนย์บริการสาธารณสุข [redacted]
เดือนสิงหาคม พ.ศ.2566

ลำดับ	จำนวนวันในรอบ 1 เดือน ที่ประเมิน =26 วัน	ตัวชี้วัดหลัก จำนวนประชากรทั้งหมด (ผู้ป่วยนอก*) ทั้งหมด 2,709 ครั้ง					
	ชื่อยา	DDDs	ความแรงของยา (mg)	จำนวนยาที่สั่งใช้ (หน่วย)	ปริมาณยา (mg) ที่สั่ง	รวมปริมาณยา (mg) ทุกความแรงของยาปฏิชีวนะแต่ละชนิด	จำนวน DDDs/1000 ประชากร/วัน
1	amoxicillin	1,000	500	2,142	1,071,000	1,476,000	20.96
			250	80	20,000		
	amoxicillin + clavulanic acid	1,000	875	440	385,000		
			250	0	0		
2	azithromycin	300	250	174	43,500	43,500	2.06
3	cefalexin	2,000	250	0	0	0	0.00
4	cefixime	400	100	0	0	0	0.00

Figure 15 The number of DDDs on All Antibiotic (Oral) for OP in PCU

Table 11 Summary of policy-related to antimicrobial use in primary care units

Organization	Healthcare facilities under the authority	Policy	Policy mechanism	Database	Limitation
1 National Health Security Office	PCUs and hospitals under the UCS	Quality and Outcome Framework which there were two AMU related KPIs.	Financial incentive for the achievement of KPIs.	E-claim	Termination in 2021
2 Health Administration Division, MOPH	Regional hospitals, provincial hospitals, district hospitals, and health centers	Service plan on Rational Drug Use	1 RDU guideline and manual in hospital, primary care and community settings 2 Routine monitoring on RDU indicators, including the % AMU in specific conditions 3 monitoring on DDD and DDD per workload (optional)	Health Data Center (HDC)	Only healthcare facilities under MOPH and locate outside BKK
3 Department of Health Service support, MOPH	Private clinics and hospitals	Policy on Rational Drug Use	1 RDU guideline and manual 2 Voluntary self-assessment survey on RDU	Electronic self-assessment survey on RDU	1 not mandatory, low response rate 2 lack of regulation capacity
4 Division of Primary Healthcare Support, MOPH	Registered PCUs under the Primary Care Act	Standard for Primary care service, including RDU standard	Requirement for clinics and public health centers to be qualified as primary care units	No database	Not fully implement, under development
5 Department of Health, BMA	Public Health Centers under BMA	Policy on Rational Drug Use	1 Routine monitoring on RDU indicators, including the % AMU in specific conditions 2 AMS intervention e.g. DUE 3 Public awareness media	Health Center Information System (HCIS) Database	Only public health centers in BKK, exclude private clinics

3. Analysis of the results of interview (Qualitative)

Factors associated with AMU in PCUs

As the results of interviews with 16 doctors, 6 pharmacists, and 2 dispensing nurses working in primary health care units (as shown in Table 12, it was found that factors influencing the prescribing of antibiotics can be categorized into four aspects: 1) Healthcare Professionals, 2) Patients, 3) Health care units, and 4) Healthcare System. Each aspect includes subtopics and details (as shown in Table 13). The details of factors associated with the prescribing of antibiotics are described as follows.

Table 12 Number of key informants for semi-structure interview

Types of key informants	**Number of key informants for semi-structure interview (N = 31)**	
	Full time (N = 29)	**Part time (N = 2)**
Doctors		
- Public health center	5	1
- UCS community Clinic	10	0
Pharmacists/Nurses (dispensing)		
- Public health center	4	0
- UCS community Clinic	1 Pharmacist and 2 Nurses	1

Table 13 Factors associated with the prescribing of antibiotics

Aspects	**Factors associated with the prescribing of antibiotics**
Healthcare professionals	- Knowledge of doctors - Prescribing practices - Relationships (Doctor-Patient, Doctor-Pharmacist, and Pharmacist-Patient)
Patients	- Physical characteristics (sign and symptoms, age, risk of complications, medical history, and revisit) - Preferences • Knowledge • Health insurance
Health care units	- System/ regulations (Indicators and DUE) - Organizational cultures (Satisfaction and Profit)

Aspects	Factors associated with the prescribing of antibiotics
	- Service capacity (Laboratory and Medicines) - Number of patients
Healthcare systems	- Health policy related to healthcare professionals • Policy communication • Reimbursement - Health policy related to patients • Easy access to medicines • Public awareness

1. Healthcare professionals

1.1. Knowledge of doctors

Many doctors regularly attend training sessions to enhance their knowledge and practice guidelines, such as vaccinations for epidemics, diabetes, and hypertension. However, there is limited training on the use of antibiotics. Some doctors update their medical knowledge through informal online media, such as Facebook pages, which help them properly give treatment, while some do not actively seek knowledge updates through training sessions in which their practices rely on their work experience or previous education. Some doctors suggest that there should be clear treatment guidelines and knowledge provided for treatment so that they can prescribe the antibiotics appropriately.

“There should be a meeting with at least an update on new guidelines, or if it has not been updated, it should be like a guideline summary. It should be a meeting of rational drug use, not just antibiotics. I would like to have it cover all kinds of medicines.” (said Doctor 14)

"If there is any policy [on practice guideline], just direct it. It means that when we organize knowledge in this direction, the approach will go the same way. If not stated directly, they [medical practices] may be uncontrollable. … It is because we have been molded and embedded like this. Believe in this. If believed, then we follow our beliefs." (said Doctor 01)

1.2. Prescribing Practices

Doctors often perceive themselves as prescribing antibiotics appropriately because they feel knowledgeable in prescribing the antibiotics judiciously following the treatment guidelines. They also believe that advising patients not to use antibiotics is an appropriate practice.

Most doctors often rely on experiential knowledge when prescribing antibiotics, especially in cases where the need for medication is not immediate; they may schedule a follow-up examination. This approach is known as “delayed prescribing”; however, they are often unaware of this term, even if they regularly practice the technique. There are variations in its application between physicians working in public health centers and clinics.

In public health centers, when a doctor evaluates a patient and finds no immediate need for medication, they explain the condition to the patient and schedule a follow-up appointment to reassess the necessity of prescribing medicine. Alternatively, if the patient's condition does not improve, the doctor may consider prescribing antibiotics or referring the patient to a hospital for further treatment.

" If it's not necessary to take it, I'll explain that it might be a virus or seasonal flu, for which antibiotics are unnecessary. …. Then, we'll repeat it one more time and say one more reassuring sentence: If you finish the medication and don't see improvement, come back to see the doctor again. This is to instill confidence that if the condition doesn't improve or worsens, it's okay to come back and see the doctor again." (said Doctor 12)

In clinics, some doctors employ delayed prescribing techniques and advise patients to revisit once they have not recovered. However, some doctors prescribe antibiotics instantly, even if the patient's symptoms do not necessitate immediate treatment. Patients may be advised to take the prescribed antibiotics if their condition does not improve, indicating an approach to prescription practices to satisfy patient expectations.

"It's my way to avoid following up endlessly. For example, if a patient wants to request antibiotics on the first day, I would say, 'Take it for three days, and let's meet again later.' However, if there's no improvement, be sure to come back for a definite solution." (said Doctor 10)

1.3. Relationships

1) Doctor – Patient relationships

The relationship between doctors and patients is crucial in a physician's decision-making process regarding medication prescriptions. This relationship can have both positive and negative aspects. In the doctor's view, the positive relationship between doctors and patients is characterized by patients being open-minded and willing to listen. When patients accept the doctor's explanation of the unnecessary use of antibiotics, it leads to understanding, and they refrain from demanding antibiotics.

"As soon as I continued to treat them, they felt like me as a relative. Sometimes, they didn't need any treatment, but maybe they weren't sure if this medicine was okay to take. They will come and talk to me." (said Doctor 06)

On the other hand, the negative relationship is manifested when doctors fear the accusation from patients. This fear arises when doctors, upon evaluation, find that patients do not necessarily need antibiotics, but the patients still desire them. Consequently, physicians may prescribe antibiotics. to reduce conflict and the likelihood of legal action.

"If patient's really difficult to talk, I'll just explain the issue of antibiotic resistance and the risk of antibiotic resistance to him/her. If they can accept it, just let it be. I won't argue much about it." (said Doctor 04)

2) Doctor – Pharmacist relationships

In the medication prescribing process, there is a collaborative effort between doctors and pharmacists. The physician takes on the role of prescribing the medication, while the pharmacist is responsible for verifying the accuracy and appropriateness of the prescription. The nature of this collaboration varies between public health centers and clinics.

In public healthcare centers, doctors and pharmacists collaborate. Doctors consult pharmacists when they have questions about medications, such as pediatric dosages. Similarly, if pharmacists encounter issues with medication prescriptions, such as prescribing drugs to patients with allergies or inappropriate dosages, and they promptly consult doctors. Sometimes, pharmacists encounter problems with inappropriate medication prescriptions. Doctors may express dissatisfaction upon consulting doctors, leading pharmacists to hesitate to consult doctors.

"For example, the doctor prescribed amoxicillin 1 tab 3 times a day, right? Generally, doctors don't usually prescribe just 10 tablets. Some doctors might give only 10 tablets, so we'll ask the patient why they received only 10 tablets. If the patient doesn't clarify, we'll take the prescription back to the doctor for further clarification." (said Pharmacist 04)

"Sometimes, it is like doctors aggressively talk to me with the patient's weight being this, the dose is this, then you calculate it, and that is the end of speaking. Then, I admitted it, but if the prescribed dose exceeds the maximum dose, it should not be overdosed." (said pharmacist 03)

Most pharmacists working in clinics are often part-time and typically work a few days a week. These pharmacists play a role in verifying the accuracy of prescriptions before dispensing medication to patients. They may not interact extensively with doctors because they believe in the doctor's decision-making authority in prescribing. In clinic settings, doctors usually play a primary role in overseeing medication prescriptions, while the pharmacist's responsibility revolves around dispensing medications according to the physician's orders.

3) Pharmacist – Patient relationships

When pharmacists explain the usage of medications and dispense them to patients, patients often inquire about the medications, including some they think they should receive but have not. Pharmacists explain the necessity or non-necessity of the medications, and if the patient does not understand, they are referred to consult with a doctor again.

2. Patients

2.1 Physical characteristics

Doctors primarily base their treatment decisions on the signs and symptoms presented by the patients. They consider the patient's risk factors for complications, such as age, gender, and review the patient's medical history. If the patient's symptoms meet the criteria for treatment, physicians will consider prescribing antibiotics.

"If patients are diagnosed for common cold, doctor investigated that they have no sore throat, high fever, normal colored rhinorrhea not green or yellow. Their symptoms are not indicated to prescribing the antibiotics." (said Doctor 04)

2.2 Patient preferences

Preferences on medication, especially antibiotics, significantly influence a physician's decision to prescribe medication. It has been found that antibiotic requests are often caused by incorrect patient knowledge. Many doctors explained how a range of patients favored antibiotics due to their misunderstandings of antibiotic use. Most patients understand that anti-inflammatory drugs are similar to antibiotics. They usually believe that these drugs can treat their symptoms effectively. When patients feel ill, they mainly express preferences for an anti-inflammatory drug or antibiotics, even if their signs and symptoms were not indicated for antibiotic treatment.

"They always believe that getting antibiotics or anti-inflammatory drugs will help them get well soon in almost every case." (said Pharmacist 01)

"They want to have [antibiotic] more than they need. If they do not get it, it feels like nothing will heal. It's a thought deeply ingrained in people's minds that they cannot recover by themselves" (said Doctor 04)

In addition, most self-pay patients expected antibiotics or more convenience when they came to see the doctors at healthcare facilities, both public health centers and private clinics. They misunderstand that antibiotics, especially injected antibiotics, can speedily resolve their symptoms. The expectation from self-pay patients greatly affected the doctor's decision for antibiotic prescribing.

"Most of the patients paid by cash desire for the antibiotics. They're quite expected from us, and I felt their needs made them willing to pay cash." (said Doctor 04)

3. Healthcare units

3.1. System or regulations to control antibiotic use

The antimicrobial stewardship, which oversees the management of antimicrobial drug use, and antimicrobial use monitoring system operate differently between the public and private sectors.

In public health centers, there is a Rational Drug Use (RDU) policy, which involves the establishment of indicators for RDU. This policy promotes appropriate use of antibiotic in three disease groups: upper respiratory infection (URI), acute diarrhea (AD), and fresh traumatic wounds (FTW). Additionally, Drug Utilization Evaluation (DUE) is conducted for specific drugs, such as ciprofloxacin, to encourage rational medication use.

"There is an antibiotic that we have to do a DUE for. We follow the criteria. If it's basic, we prescribe it right away. However, for instance, if it involves prescribing ciprofloxacin, the doctor must have a DUE assessment form sent to the pharmacy, indicating the necessity for its use." (said Pharmacist 03)

In term of monitoring system, a reporting system can gather data through electronic health information system, enabling the documentation of drug usage in various indicators. Two indicators related to antimicrobial stewardship are the percentage of prescribed antibiotics categorized by diseases (URI, AD, and FTW) and Defined Daily Doses (DDD). A pharmacist is responsible for reporting RDU indicators and presenting them to relevant physicians and a medical director. While the percentage of prescribed antibiotics by three diseases are well known and regularly monitored, most pharmacists are unaware of monitoring DDD.

The crucial factor for the effective implementation of Rational Drug Use (RDU) in public health centers is having strong leadership of medical director and pharmacist in charge. Leadership plays a significant role in ensuring compliance with RDU policies. In other words, even with good policies in place, if the leadership is ineffective, the implementation of RDU may not be successful.

"The director has helped a lot and is open-minded. He recognizes the importance of these RDU indicators because they indicate the quality of patient care." (said Pharmacist 06)

In clinics, there is no formal policy guiding medication prescription practices or antimicrobial stewardship practices. The decision to prescribe medications is at the physician's discretion and is often based on treatment guidelines. Moreover, there is currently no clear system in place to track medication usage.

Furthermore, there is a difference in public awareness campaigns about three non-essential antibiotic-requiring diseases between public health centers and clinics. Public health centers often have clear and visible informational materials installed for patients to observe. In contrast, clinics lack prominent educational materials at present.

3.2. Organizational culture

The organizational culture in the clinic emphasizes creating satisfaction for patients receiving services and generating revenue from patient care. Sometimes, when patients strongly desire medications, even if the physician explains that they are unnecessary, antibiotics may be prescribed to ensure patient satisfaction, as there is a fear of patient complaints.

As for the clinics, the owner or clinic manager does not play a role in the physician's prescription of antibiotics. In contrast, in public health centers, there is continued oversight by leaders and the pharmacy department to monitor medication usage by treatment guidelines and the appropriateness of prescription practices.

“If there is a slight complaint at the clinics, it must report what happened to the manager. Sometimes, patients do not understand the unnecessary use of antibiotics, but they think the doctor would not give the medicines to them. This has affected the doctor's decision. Patients will complain.” (said doctor 09)

3.3. Service capacity

The laboratory's capabilities in conducting tests impact the prescribing of antibiotics for the treatment of certain diseases. Laboratory tests often need to be outsourced to external facilities, and the healthcare service unit does not have its own laboratory testing. For example, a comprehensive medical history and a urinalysis are necessary to diagnose urinary tract infections. However, the significant time required for urinalysis may lead physicians to decide to prescribe antibiotics for treatment first, as mentioned by a physician involved in treating cystitis.

“When ordering the laboratory test, its results will not be shown in the day, it might need to prescribe the antibiotics in advanced, but actually I also want to consider the lab test result to make my decision of treatment clearly.” (said doctor 05)

According to most physicians, drug list coverage is considered sufficient for treating infectious diseases. They believe that the number of drug listings is adequate and does not significantly impact prescription

practices, as mentioned by physicians. The limited number of drug options helps control prescription practices, as physicians tend to prescribe only the available drugs in the drug lists.

3.4. Large number of patients

The large number of patients seeking medical treatment in proportion to the number of doctors has implications for the duration of treatment, including the limited time available for explaining diseases or necessary medications during patient visits. If physicians feel that they have sufficient time to explain the unnecessary use of antibiotics to patients, some patients listen and understand, refraining from demanding antibiotics, as stated by a physician from the public sector.

"If I have more time to advise the patients about the treatment. Most of them will accept to listen. Some patients may not have the correct knowledge. They listened to me, not to use antibiotics. It's only a few people that, even after explaining, still need antibiotics." (said Doctor14)

4. Healthcare systems

4.1 Policy related to healthcare professionals

1) Unclear health policy communication

Factors related to the healthcare system are influenced by operational policies. Regarding the RDU policy, it is more prominently implemented in the public health center setting compared to clinics. Personnel involved are more aware of RDU policies. Physicians have discussed the RDU policy, highlighting its importance. On the other hand, both physicians and pharmacists in the public health center and clinic settings, while understand importance of controlling AMR, are not well-informed about the details of the AMR policy or the AMR management strategy.

There are doctors in some PCUs who mentioned that there is no clear system or policy related to controlling antibiotic use. They said the communication from policymakers to healthcare providers could be more efficient, so they need to learn more about the policies.

"I don't see it often. Most are more focused on vaccines. I don't see much about medicine at all—very little. As far as I see about medicines, it's just a request for research and data collection. I can't see it. At most, it is a book that talks about medicine and discusses medication use with patients. It is just public information." (said Doctor 14)

2) Reimbursement

Regarding changes in the reimbursement system of UCS in BKK, which is called 'Model 5'. The current reimbursement system applies fee for service provider payment system; this is changed from the previous capitation system. However, most doctors in private clinics and public health centers are not aware of this change. It does not significantly impact the prescribing patterns of antibiotics by physicians. Few private clinic's doctors mentioned that it might lead to an increase in the prescription of non-antibiotic medications in their clinic settings.

4.2 Health policy related to patients

1) Easy access to medicines

Easy access to antibiotics in communities contributes to increased antibiotic use by patients, possibly without proper justification. Some physicians mentioned that even though antibiotic prescriptions are controlled within public health service centers or private clinics under UCS, patients may still purchase antibiotics from a pharmacy store or be prescribed by other private clinics.

"Some patients experience back pain, go to the pharmacy, and ask for an anti-inflammatory medicine, usually in black-red pills [Amoxicillin capsule]. .... I feel that some pharmacies have no pharmacist, and it seems that people when they're sick, find it easier to access pharmacies than anything else." (said Doctor 10)

2) Public awareness

Many doctors and pharmacists noted that public knowledge about antibiotic use and antibiotic resistance (AMR) is limited. This lack of patients' awareness poses challenges for doctors in prescribing antibiotics appropriately. Recognizing this as a key factor, most healthcare professionals emphasize the importance of increasing public awareness to support effective antimicrobial stewardship practices.

"We might need to consider providing public education on a broader scale, especially on what diseases need to be treated by antibiotics or not, and make them truly understand whether using them is unnecessary. We must start at the root cause because solving this problem with doctors is a consequence point in which requesting antibiotics is the main cause; then, the patient may end up buying it at a pharmacy store." (said Doctor 08)

4. Analysis of the Questionnaire (Qualitative)

After one month since the survey was launched, we gathered responses from 97 participants. Among them, 57 were doctors, and 40 were pharmacists. A significant portion of these professionals worked in private clinics, comprising 35 doctors and 19 pharmacists. Additionally, 43 respondents were associated with public health centers, including 22 doctors and 21 pharmacists. The majority of participants were full-time staff, accounting for 79 respondents (52 doctors and 27 pharmacists). See Table 14.

Table 14 Number of Questionnaire respondents

Types of key informants	Number of Questionnaire respondents (N = 97)	
	Full time	Part time
Doctors	52	5
- Public health center	22	-
- UCS community Clinic	30	5
Pharmacists	27	13
- Public health center	20	1
- UCS community Clinic	7	12

For the assessment of professional competency in AMR and AMS, doctors were presented with 12 questions, while pharmacists had 16 questions. The percentage of the full score was calculated. Among doctors, those from public health centers demonstrated a higher average competency score than their counterparts in private clinics (81.06 and 77.14); however, this difference was not statistically significant. A similar pattern emerged among pharmacists, where those from public health centers had a higher average score compared to private pharmacists (80.65 and 74.01), although this difference was not statistically significant. See Table 15.

Table 15 Average competency score by professional and type of PCUs

Professional	Type of PCUs	n	Mean	95% CI	p value
Doctor	Private clinic	35	77.14	72.42 - 81.87	0.26
	Public health center	22	81.06	76.20 - 85.92	
	Total	**57**	**78.65**	**75.26 - 82.05**	
Pharmacist	Private clinic	19	74.01	65.07 - 82.95	0.16
	Public health center	21	80.65	75.99 - 85.32	
	Total	**40**	**77.50**	**72.71 - 82.29**	

The findings highlight various challenges in providing advice to patients regarding antimicrobial use in primary care practice. Common barriers encompassed patient reluctance to receive guidance (60.82%) and constrained time of health professionals for advising in daily practice (57.73%). Moreover, issues related to patients' ability to adhere to recommendations were identified (29.90%). Pharmacists also faced challenges, notably difficulties in communicating with prescribers (30.00% of pharmacists). See Figure 16.

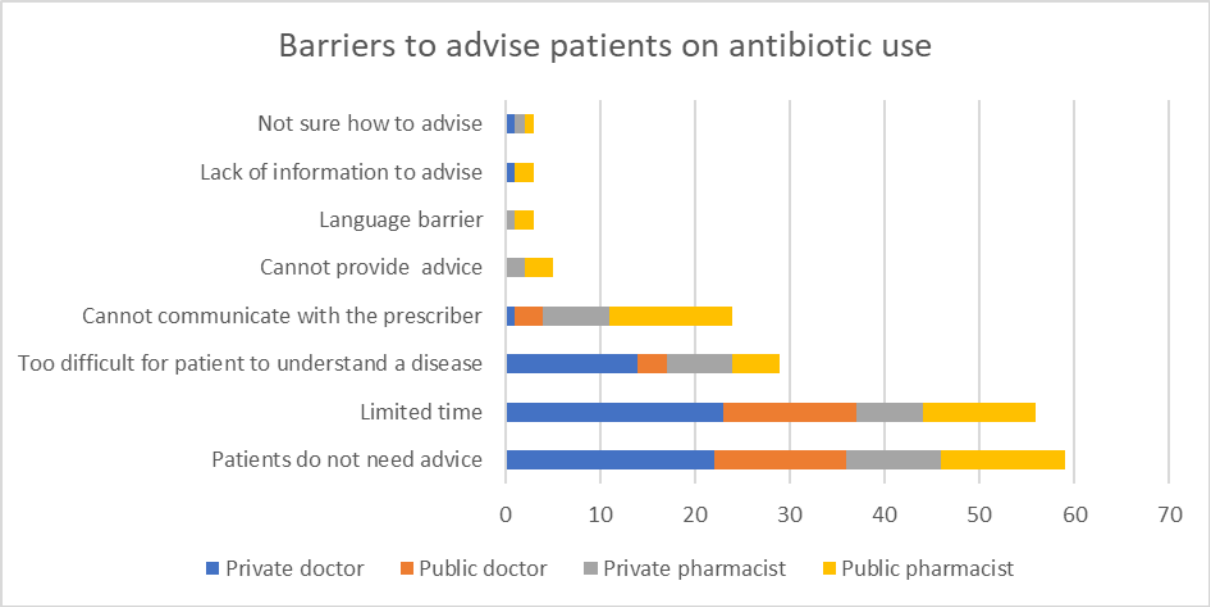


Figure 16 Barriers to advise patients on AMU

For obtaining knowledge on AMU, primary care providers relied on various resources. Clinical practice guidelines emerged as the most common source (89.69%), followed by training programs (45.36%).

Medical journals (36.08%), social media (36.08%), and practical working experiences (35.05%) were also frequently cited. See Figure 17.

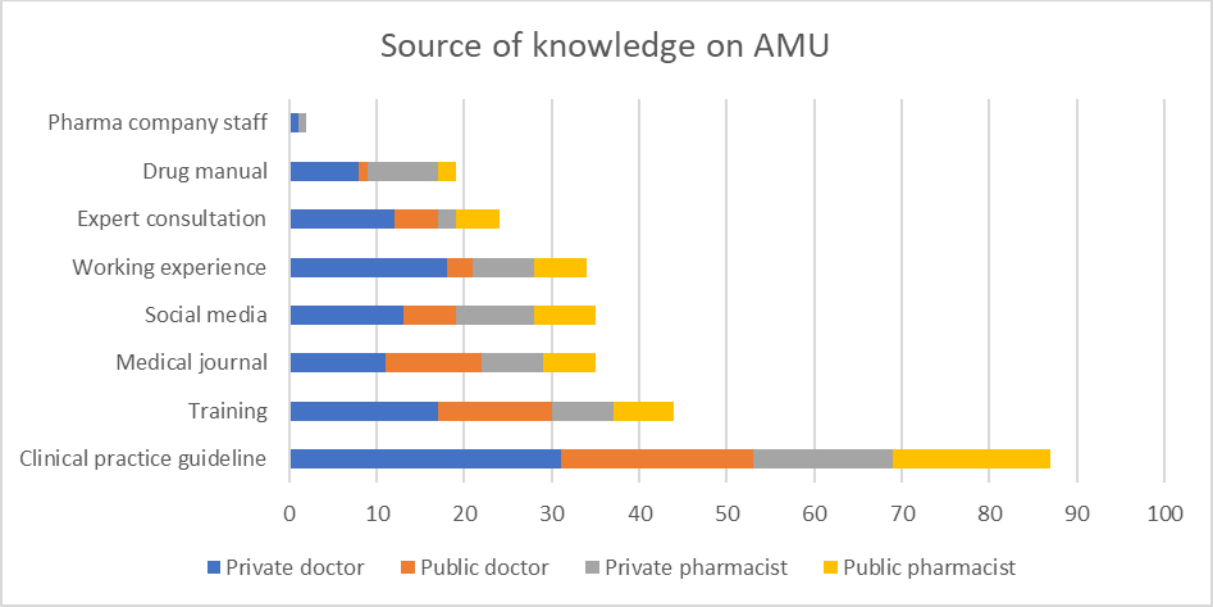


Figure 17 Source of knowledge on AMU

When primary care providers were asked about their practices on AMS, the three most common interventions implemented were restrictions on antibiotic prescription in three common diseases (RDU indicators) (62.89%), Drug Use Evaluation (56.70%), and Delayed prescriptions (46.39%). However, antibiogram or drug susceptibility table were less likely to be mentioned in the survey (17.53%). See Figure 18.

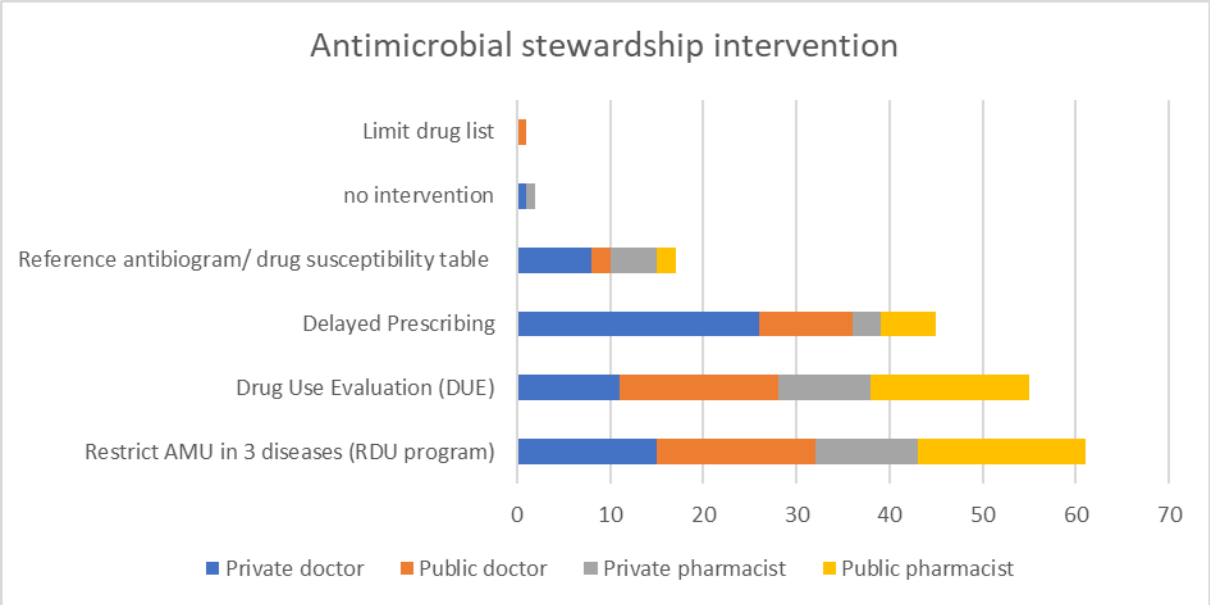


Figure 18 Antimicrobial stewardship intervention in PCUs

Discussion

The amount of antibiotic usage in primary care settings in Bangkok

In this study, the overall DID of antibiotics use in PCUs in Bangkok was 0.88. This figure is notably lower compared to previous studies conducted in Thailand. One prior study, which focused on antibiotics prescribed to UCS beneficiaries during outpatient visits in 2013 (excluding Bangkok), reported a total DID of 7.1.(7) However, it is worth noting that this study calculated DID from all types of healthcare facilities, including hospitals, which can contribute a higher DID than our study. Additionally, when examining the national volume of in-country antibiotic consumption, the DID values of J01 ATC drugs for 2018, 2019, and 2020 were 36.15, 33.23, 32.69, and 27.18, respectively.(17) Nonetheless, as our study specifically measured antibiotic use in primary care, the findings may reflect a smaller proportion compared to the national consumption. This figure closely resembles the findings of the study conducted in Malaysia which three primary care clinics in Selangor State reported DID of 2.675. (18)

In terms of common antibiotics used in primary care, the Penicillins group emerged as the most frequently prescribed drugs. This finding is consistent with the findings from interviews with primary care providers; they indicated that upper urinary tract infection was the most common cause of antibiotic use in their facilities. This finding aligns with several studies. In Thailand, the Food and Drug Authority reported in the Surveillance of Antimicrobials Consumption Annual Report that the Penicillins group ranked highest in antibiotic consumption (ref). Similarly, studies conducted in the UK and Malaysia revealed that amoxicillin was the most prescribed antibiotic in primary care settings. (18)

Our study reveals that three-quarters of all PCUs prescriptions were composed of Access-group antibiotics. This adherence aligns with the WHO recommendation which suggests that the Access-group antibiotics should constitute a minimum of 60% of the total antibiotic usage. This finding is consistent with a prior systematic literature review and meta-analysis encompassing antibiotic prescription practices in primary care across low- and middle-income countries. The analysis discovered that Access-group antibiotics constituted over 60% of prescriptions in 13 studies from 12 countries.(19) Additionally, our study reports that there was no reserve group prescription. The limited drug lists in primary care settings may contribute to this phenomenon, as there is no antibiotic classified in the Reserve group in the fee schedule for primary care.

The percentage of antibiotic use in three common diseases was high in primary care units in Bangkok. The analysis of patient records showed that 33.23% 36.04% and 53.04% of patients with URI, acute diarrhea, and UTI, respectively, received at least one antibiotic. It means that overall antibiotic use in URI and acute diarrhea does not achieve the national target of less than 20%. When compared with the national figure of antibiotic use in URI and acute diarrhea (18.80% and 22.89%)(20), this study shows higher percentage. While there is no national benchmark for UTI, this figure is lower than the studies in Europe. In Switzerland, England and Ireland, 91.8%, 85.7% and 56% patients diagnosed with UTI received antibiotic, respectively. (21, 22, 23)

Factor influencing AMU in primary care settings

The factors influencing the prescribing of antibiotics can be categorized into four aspects: 1) Healthcare Professionals, 2) Patients, 3) Health care units, and 4) Healthcare System.

From the healthcare professional's perspective of antibiotic prescribing, their practices are based on their working experiences and seeking updated knowledge. However, lack of formal training on antibiotic use was mentioned in most doctors; they updated their practice from informal sources or social media. Additionally, some doctors tend to prescribe antibiotics before the laboratory results come out, which

makes doctors feel safe for patient outcomes. Prescriber's fear on bad medical outcome is also mentioned in other publication. (18, 24) In terms of doctor and patient interaction, patients' preference for antibiotics is crucial in doctors' decision to prescribe antibiotics. This is similar to the study of Doris Burtscher et al.(25) and Haak & Radyowijati(24), in which patients expected and insisted on receiving antibiotics from doctors even though their symptoms were not indicated to be treated by antibiotics.

Our study found that leadership of pharmacists and doctors play a significant role in ensuring compliance with AMS related policy. In the PHC settings, where medical director and pharmacist are responsible for RDU indicators, it can be clearly seen that these policies have been implemented. However, there is no formal policy guiding medication prescription in clinics. This finding is consistent with a result from a literature review and interviews of policy makers: insufficient policy to control antibiotic use in private clinics. The consequence of the lack of AMS measure in private clinics can be seen evidently in quantitative analysis while DID of private clinics significantly higher than public health centers (1.07 and 0.64, respectively) This pattern can also be observed in the percentage of antibiotic use in URI, acute diarrhea, and UTI.

In addition, after Model 5 implementation, the assumption of antibiotic utilization may be increased due to gaining reimbursement through fee for service payment. However, the finding from interviews demonstrated that antibiotic prescribing is based on the patient's characteristics. The payment system might affect other medicines. However, our quantitative analysis, being one-year cross sectional study, cannot capture the trend of antibiotic use across multiple years.

Strengths and Limitations

There are some strengths of this study. This study conducted mixed method research. This combination of quantitative and qualitative methods can show a wider perspective of antibiotic use in primary care settings in Bangkok. Our findings from both methods can be triangulated. The research team can access the outpatient database from NHSO which is the most complete health database among public health insurance schemes. In addition, we can reassure that all the medical records of UCS patients in Bangkok, including prescribed drugs and quantity, are submitted to NHSO for reimbursement because of the Fee schedule payment system.

In terms of limitations, the amount of antibiotic use in this study does not represent the antibiotic utilization for the whole population in Bangkok. There are a few explanations. First, the data on antibiotic use derived from the NHSO, specifically for patients with UCS was 52.6% of the overall population in Bangkok.(26) This study does not cover patients with other health insurance schemes. Second, notably, this excluded data for outpatients and inpatients obtaining antibiotics from hospitals. Last, patients might purchase antibiotics from pharmacy stores; the 2021 Health and Welfare Survey(27) showed that patients in Bangkok compared with other regions taken antibiotics from pharmacy stores and PCUs were 22% (166,602/757,125) and 7% (5,183/358,796), respectively. (27) The future study should combine outpatient visits in both primary care and hospital settings which can illustrate a more comprehensive perspective on antimicrobial use.

It is worth realizing that, in this study, DID (DDD per 1,000 habitants per day) in healthcare facility level might not be comparable due to the Model 5 policy. This study analyzed the data under the Model 5 policy, enabling patients to receive medical care anywhere, not restricted to registered PCUs. Nonetheless, a key assumption in this study is that patients visit their registered PCUs. Consequently, the denominator for DID calculation is based on a registered population in each PCUs. This policy could result in misleading data, as healthcare units with fewer registered patients might provide healthcare services to unregistered patients, which may reflect a higher DID than usual.

The study explored antibiotic use during the transition from a capitation payment system to a fee schedule and our result is based on the fee schedule payment system. Although our qualitative study reveals that prescribers unrealize difference between their antibiotic prescription practices, the comparative study between antibiotic use under capitation and fee schedule payments should be conducted.

Recommendations

To enhance the AMU monitoring system in PCUs in Bangkok, it is essential to integrate the routinely collected patient-level claims from the NHSO into the disaggregated data reporting system. Consistently offering feedback on antibiotic prescribing at the healthcare unit level within PCUs, including geographical trends in DID of antibiotic use or other comprehensive measurements, is crucial for capacity-building and instigating timely corrective actions by healthcare professionals. Furthermore, supporting collaboration across organizations is crucial, involving standardized approaches in data collection, analysis, interpretation, and sharing. Sustaining the feedback intervention on a systemwide scale, such as utilizing monthly aggregated claims data to provide personalized antibiotic prescription feedback to healthcare professionals, is recommended.

To implement an antimicrobial stewardship (AMS) system in private clinics, particularly an AMU monitoring system, should be concretely implemented to control antibiotic use. This system will track the situation and trends in the use of antibiotics in the clinics, for example, monitoring the quantity of antibiotic use in DDD or DID. It could be the analysis according to AWaRe classification or Critically Important Antibiotics (CIAs). To implement AMS, clinics should have an information technology service (IT service) that links relevant databases, such as patient data, medication usage, and laboratory data. It will support the AMS system and enable the clinics to monitor antibiotic use in their clinics. In addition, NHSO should have treatment guidelines for unnecessary antibiotic use in non-bacterial infections and ensure appropriate use of antibiotics in bacterial infections.

References

1. World Health Organization. GLOBAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE. Geneva, Switzerland: World Health Organization; 2015. Report No.: 978 92 4 150976 3.
2. Panumart Phumart TP, Visanu Thamlikitkul, Arthorn Riewpaiboon,Phusit Prakongsai,Supon Limwattananon,. Health and Economic Impacts of Antimicrobial Resistant Infections in Thailand : A Preliminary Study. Journal of Health Systems Research. 2012;6(3):352-60.
3. Food and Drug Administration. ANTIMICROBIAL RESISTANCE Thailand: Food and Drug Administration,; [Available from: https://amrthailand.net/.
4. Food and Drug Administration. THAILAND'S NATIONAL STRATEGIC PLAN ON ANTIMICROBIAL RESISTANCE 2017-2021. Thailand; 2017 - 2021 2017-2021.
5. International Health Policy Program MoPH. Thailand's One Health Report on Antimicrobial Consumption and Antimicrobial Resistance. Thailand: International Health Policy Program; 2020 September 2022.
6. Atchara Chaitham HC. Development of the System for Rational Antibiotic Prescribing:Case Studies of Respiratory Infections and Simple Traumatic Wound in a Community Hospital in Upper Northern Thai Journal of Pharmacy Practice. 2021;13(1).
7. Noppakun Thammatacharee OW, Chulaporn Limwattananon,. Antibacterials Prescribed to Universal Health Coverage Beneficiaries in Outpatient Departments, Thailand. Journal of Health Systems Research. 2017;11(4).
8. Ashiru-Oredope D, Hopkins S, Vasandani S, Umoh E, Oloyede O, Nilsson A, et al. Healthcare workers' knowledge, attitudes and behaviours with respect to antibiotics, antibiotic use and antibiotic resistance across 30 EU/EEA countries in 2019. Euro Surveill. 2021;26(12).
9. Rattanaumpawan P, Chuenchom N, Thamlikitkul V. Perception, attitude, knowledge and learning style preference on challenges of antimicrobial resistance and antimicrobial overuse among first year doctors in training and final year medical students. Antimicrobial Resistance & Infection Control. 2019;8(1):142.
10. Rungpetch Sakulbumrungsil NK, Inthira Kanchanaphibool, Khunjira Udomaksorn,Sitanan Poonpolsub,Wirumporn Watcharapinchai,Manthana Laichapit,Chosita Lapchaicharoenkit,Nutcha Umtade,Sujittra Khontiyachai,. Antimicrobial Stewardship Competency Assessment Tool Development for Pre-Service Physician, Pharmacist, and Veterinarian Students in Thailand. The RTG-WHO Country Cooperation Strategy Program on AMR (CCS-AMR program); 2021.
11. National Health Security Office (NHSO). Quality and Outcome Framework (QOF) 2017 [Available from: http://hdc-mkho.moph.go.th/download/hosxp/HOSxP&HOSxP_PCU/Programs%20Install/Standardcode43_v2.2%20+%20QOF%202560/%E0%B9%81%E0%B8%99%E0%B8%A7%E0%B8%97%E0%B8%B2%E0%B8%87-QOF-%E0%B9%81%E0%B8%A5%E0%B8%B0-Template-%E0%B8%95%E0%B8%B1%E0%B8%A7%E0%B8%8A%E0%B8%B5%E0%B9%89%E0%B8%A7%E0%B8%B1%E0%B8%94-%E0%B8%9B%E0%B8%B5%E0%B8%87%E0%B8%9A%E0%B8%9B%E0%B8%A3%E0%B8%B0%E0%B8%A1%E0%B8%B2%E0%B8%93-2560.pdf.
12. Support DoHS. Medical and health data warehouse system Ministry of Public Health 2023 [Available from: https://hdcservice.moph.go.th/hdc/main/index_pk.php.
13. Department of Health Service Support. Medical clinic standard examination records 2023 [Available from: https://translate.google.com/?sl=th&tl=en&text=%E0%B8%9A%E0%B8%B1%E0%B8%99%E0%B8%97%E0%B8%B6%E0%B8%81%E0%B8%81%E0%B8%B2%E0%B8%A3%E0%B8%95%E0%B8%A3%E0%B8%A7%E0

%B8%88%E0%B8%A1%E0%B8%B2%E0%B8%95%E0%B8%A3%E0%B8%90%E0%B8%B2%E0%B8%99%E0%B8%84%E0%B8%A5%E0%B8%B4%E0%B8%99%E0%B8%B4%E0%B8%81%E0%B9%80%E0%B8%A7%E0%B8%8A%E0%B8%81%E0%B8%A3%E0%B8%A3%E0%B8%A1&op=translate.
14. Department of Health Service Support. Results of the RDU assessment Department of Health Service Support,: Department of Health Service Support,; 2022 [Available from: https://mrd.hss.moph.go.th/mrd1_hss/?p=6784.
15. Division of Primary Healthcare Support. Division of Primary Healthcare Support, MOPH Division of Primary Healthcare Support,: Division of Primary Healthcare Support,; 2023 [Available from: https://online.anyflip.com/hhjej/vcnt/mobile/.
16. Department of health Bangkok Metropolitan Administration. Department of health Bangkok Metropolitan Administration 2023 [Available from: https://webportal.bangkok.go.th/health/index?cover=1.
17. Food and Drug Administration. Thailand Surveillance of Antimicrobials Consumption (Thai SAC) :2020 Report in Human and Food-producing Animals Use and 2017-2020 Trends. Food and Drug Administration,: Food and Drug Administration,; 2017-2020.
18. Shamsuddin S, Akkawi ME, Zaidi ST, Ming LC, Manan MM. Antimicrobial drug use in primary healthcare clinics: a retrospective evaluation. Int J Infect Dis. 2016;52:16-22.
19. Sulis G, Adam P, Nafade V, Gore G, Daniels B, Daftary A, et al. Antibiotic prescription practices in primary care in low- and middle-income countries: A systematic review and meta-analysis. PLoS Med. 2020;17(6):e1003139.
20. Health Administration Division. Information to respond to the Service Plan of RDU branch Health Administration Division,: Health Administration Division,; 2023 [Available from: https://hdcservice.moph.go.th/hdc/reports/page.php?cat_id=03b912ab9ccb4c07280a89bf05e5900e.
21. Pujades-Rodriguez M, West RM, Wilcox MH, Sandoe J. Lower Urinary Tract Infections: Management, Outcomes and Risk Factors for Antibiotic Re-prescription in Primary Care. eClinicalMedicine. 2019;14:23-31.
22. Vellinga A, Cormican M, Hanahoe B, Bennett K, Murphy AW. Antimicrobial management and appropriateness of treatment of urinary tract infection in general practice in Ireland. BMC Family Practice. 2011;12(1):108.
23. Plate A, Kronenberg A, Risch M, Mueller Y, Di Gangi S, Rosemann T, et al. Treatment of urinary tract infections in Swiss primary care: quality and determinants of antibiotic prescribing. BMC Family Practice. 2020;21(1):125.
24. Haak H, Radyowijati A. Determinants of Antimicrobial Use: Poorly Understood–Poorly Researched. 2010. p. 283-300.
25. Burtscher D, Van den Bergh R, Nasim M, Mahama G, Au S, Williams A, et al. 'They eat it like sweets': A mixed methods study of antibiotic perceptions and their use among patients, prescribers and pharmacists in a district hospital in Kabul, Afghanistan. PLoS One. 2021;16(11):e0260096.
26. National Health Security Office (NHSO). UCS coverage report National Health Security Office (NHSO),: National Health Security Office (NHSO),; 2021 [Available from: https://ucinfo.nhso.go.th/ucinfo/RptRegisPop-6.
27. National Statistical Office. Health Welfare Survey 2021. National Statistical Office,: National Statistical Office,; 2021.

Appendices

Table 1: Number of outpatient visits with antibiotic prescription in PCUs by month, Bangkok, Thailand–April 1, 2021–March 31, 2022

Month	Antibiotic use	No antibiotic use	Total
April 2021	9,024	205,510	214,534
May 2021	9,470	231,824	241,294
June 2021	10,360	234,676	245,036
July 2021	11,129	272,440	283,569
August 2021	9,415	299,846	309,261
September 2021	10,628	279,682	290,310
October 2021	9,648	252,568	262,216
November 2021	11,167	309,439	320,606
December 2021	11,906	307,386	319,292
January 2022	12,584	328,026	340,610
February 2022	11,321	366,487	377,808
March 2022	13,245	404,057	417,302
Total	**129,897**	**3,491,941**	**3,621,838**

Table 2: DDD of Top 10 Most Commonly Prescribed Antibiotics in PCUs, Bangkok by ATC Level 5, Thailand–April 1, 2021–March 31, 2022

ATC	Antibiotic	Private PCUs	Public PCUs	Total
J01CA04	Amoxicillin	158,840.50	106,579.50	265,420.00
J01CR02	Amoxicillin/clavulanic acid	82,511.97	35,794.18	118,306.20
J01CF01	Dicloxacillin	87,025.63	28,710.75	115,736.40
J01MA06	Norfloxacin	41,342.50	18,019.25	59,361.75
J01FA06	Roxithromycin	30,185.83	15,610.00	45,795.83
J01MA02	Ciprofloxacin	35,462.25	6,145.00	41,607.25
J01AA02	Doxycycline	20,945.00	6,805.00	27,750.00
J01MA01	Ofloxacin	14,126.00	12.50	14,138.50
J01FF01	Clindamycin	10,806.00	1,463.25	12,269.25
J01DD04	Ceftriaxone	5,231.13	354.63	5,585.75
Others		8,756.46	6,372.13	15,128.58
Total		**495,233.3**	**225,866.2**	**721,099.40**

Table 3: Proportion of DDD of All Antibiotics Prescribed to Patients in Primary Care Units by ATC 4 Level, Bangkok, Thailand–April 1, 2021–March 31, 2022

Antibiotic classification	DDD	Total	Private PCUs	Public PCUs
Penicillins	382,483.65	53.04%	49.91%	59.91%
Betalactam/betalactamase inhibitor	118,306.20	16.41%	16.66%	15.85%

Antibiotic classification	DDD	Total	Private PCUs	Public PCUs
Fluoroquinolones	117,578.50	16.31%	18.45%	11.61%
Macrolides	50,304.33	6.98%	6.62%	7.75%
Tetracyclines	27,750.00	3.85%	4.23%	3.01%
Lincosamides	12,573.75	1.74%	2.24%	0.66%
Third generation cephalosporins	5,742.63	0.80%	1.08%	0.17%
Sulfonamide/trimethoprim combinations	5,054.25	0.70%	0.60%	0.92%
First generation cephalosporins	1,304.88	0.18%	0.21%	0.11%
Aminoglycosides	1.00	0.00%	0.00%	0.00%
Amphenicols	0.33	0.00%	0.00%	0.00%
Total	**721,099.40**	**100.00%**	**100.00%**	**100.00%**

Table 4: Proportion of DDD of All Antibiotics Prescribed to Patients in Primary Care Units by AWaRe Classification, Bangkok, Thailand–April 1, 2021–March 31, 2022

AWaRe Category	Total	Private PCUs	Public PCUs
Access	75.88%	73.79%	80.46%
Watch	24.12%	26.21%	19.54%
Total	**100.00%**	**100.00%**	**100.00%**

Table 5: DID by geographic location of the districts in Bangkok, Thailand–April 1, 2021–March 31, 2022

District	Adult population	DDD	DID
Nong Chok	33,126	63,391.46	5.24
Khan Na Yao	34,851	18,597.79	1.46
Bang Sue	37,927	17,493.58	1.26
Lat Krabang	56,435	25,455.29	1.24
Bang Na	50,563	21,257.04	1.15
Lak Si	28,583	11,845.17	1.14
Min Buri	61,229	25,280.83	1.13
Sai Mai	64,762	25,927.17	1.10
Bang Khen	75,825	30,345.13	1.10
Don Mueang	68,654	25,950.29	1.04
Bang Khun Thian	57,511	21,630.42	1.03
Sathon	53,848	20,066.75	1.02
Bang Phlat	45,223	16,701.79	1.01
Wang Thonglang	41,481	15,238.79	1.01
Thung Khru	42,951	15,642.21	1.00
Prawet	61,249	21,779.13	0.97
Khlong Sam Wa	55,872	19,176.75	0.94
Bang Khae	73,958	24,448.00	0.91

District	Adult population	DDD	DID
Bangkok Yai	40,362	13,179.17	0.89
Pom Prap Sattru Phai	19,335	6,292.58	0.89
Chom Thong	37,160	11,505.96	0.85
Nong Khaem	59,174	17,555.13	0.81
Thawi Watthana	30,884	8,871.79	0.79
Saphan Sung	34,052	9,752.04	0.78
Bueng Kum	56,817	16,042.08	0.77
Phaya Thai	23,602	6,469.63	0.75
Phasi Charoen	52,825	14,469.37	0.75
Bang Bon	53,953	14,331.88	0.73
Lat Phrao	47,434	12,579.29	0.73
Yan Nawa	52,932	13,942.42	0.72
Thon Buri	64,380	16,660.87	0.71
Samphanthawong	13,006	3,240.42	0.68
Ratchathewi	26,039	6,425.17	0.68
Bang Kapi	53,082	13,021.25	0.67
Phra Khanong	29,995	7,355.57	0.67
Din Daeng	69,947	16,994.79	0.67
Rat Burana	36,477	8,707.42	0.65
Taling Chan	38,481	8,886.42	0.63
Bang Kho Laem	48,766	11,116.37	0.62
Suan Luang	45,586	10,009.13	0.60
Watthana	35,270	7,630.75	0.59
Huai Khwang	30,441	6,188.54	0.56
Pathum Wan	25,255	5,045.46	0.55
Khlong Toei	33,178	6,545.08	0.54
Phra Nakhon	26,058	3,933.46	0.41
Dusit	49,400	7,107.04	0.39
Bang Rak	17,436	2,503.88	0.39
Chatuchak	27,972	3,782.79	0.37
Khlong San	26,573	3,457.58	0.36
Bangkok Noi	93,669	7,268.54	0.21
Total	**2,243,589**	**721,099.40**	**0.88**

Table 6: percentage of antibiotic use in URI, acute diarrhea, and UTI

District	URI cases	AMU in URI	% AMU in URI	Diarrhea cases	AMU in diarrhea	% AMU in diarrhea	UTI cases	AMU in UTI	% AMU in UTI
Khlong Toei	1,455	348	23.92%	248	49	19.76%	142	63	44.37%
Khlong San	560	87	15.54%	132	18	13.64%	165	80	48.48%

District	URI cases	AMU in URI	% AMU in URI	Diarrhea cases	AMU in diarrhea	% AMU in diarrhea	UTI cases	AMU in UTI	% AMU in UTI
Khlong Sam Wa	2,612	1,015	38.86%	491	148	30.14%	468	292	62.39%
Khan Na Yao	2,929	871	29.74%	512	238	46.48%	673	407	60.48%
Chatuchak	334	144	43.11%	63	24	38.10%	80	54	67.50%
Chom Thong	1,592	552	34.67%	291	155	53.26%	235	95	40.43%
Don Mueang	3,366	995	29.56%	904	366	40.49%	867	357	41.18%
Din Daeng	2,278	985	43.24%	329	139	42.25%	387	189	48.84%
Dusit	807	171	21.19%	150	46	30.67%	225	72	32.00%
Taling Chan	1,081	238	22.02%	326	110	33.74%	230	100	43.48%
Thawi Watthana	945	424	44.87%	144	71	49.31%	173	110	63.58%
Thung Khru	1,954	373	19.09%	416	95	22.84%	334	142	42.51%
Thon Buri	2,491	776	31.15%	492	149	30.28%	332	143	43.07%
Bang Khen	2,354	731	31.05%	440	197	44.77%	1,050	606	57.71%
Bang Khae	2,970	631	21.25%	771	210	27.24%	688	346	50.29%
Bangkok Yai	2,079	460	22.13%	343	138	40.23%	327	183	55.96%
Bangkok Noi	1,676	121	7.22%	162	55	33.95%	138	96	69.57%
Bang Kapi	2,253	551	24.46%	274	106	38.69%	312	159	50.96%
Bang Khun Thian	2,239	655	29.25%	605	266	43.97%	422	232	54.98%
Bang Kho Laem	2,243	439	19.57%	478	152	31.80%	395	181	45.82%
Bang Sue	2,339	801	34.25%	301	189	62.79%	292	155	53.08%
Bang Na	2,934	938	31.97%	519	228	43.93%	401	197	49.13%
Bang Bon	1,769	649	36.69%	397	166	41.81%	376	184	48.94%
Bang Phlat	1,174	423	36.03%	345	134	38.84%	393	204	51.91%
Bang Rak	268	85	31.72%	62	25	40.32%	26	10	38.46%
Bueng Kum	2,352	468	19.90%	336	91	27.08%	319	145	45.45%
Pathum Wan	492	130	26.42%	113	61	53.98%	61	48	78.69%
Prawet	2,538	804	31.68%	479	163	34.03%	523	274	52.39%
Pom Prap Sattru Phai	761	183	24.05%	170	42	24.71%	164	97	59.15%
Phaya Thai	573	119	20.77%	180	33	18.33%	267	131	49.06%
Phra Khanong	950	383	40.32%	156	55	35.26%	226	104	46.02%
Phra Nakhon	546	112	20.51%	43	16	37.21%	125	54	43.20%
Phasi Charoen	1,375	388	28.22%	351	136	38.75%	265	131	49.43%
Min Buri	3,421	883	25.81%	846	318	37.59%	719	517	71.91%
Yan Nawa	2,450	544	22.20%	418	97	23.21%	291	136	46.74%
Ratchathewi	897	311	34.67%	85	28	32.94%	151	79	52.32%
Rat Burana	1,731	415	23.97%	244	78	31.97%	196	82	41.84%
Lat Krabang	3,073	1,151	37.46%	901	394	43.73%	1,088	751	69.03%
Lat Phrao	1,233	404	32.77%	290	83	28.62%	414	208	50.24%

District	URI cases	AMU in URI	% AMU in URI	Diarrhea cases	AMU in diarrhea	% AMU in diarrhea	UTI cases	AMU in UTI	% AMU in UTI
Wang Thonglang	1,321	426	32.25%	400	147	36.75%	328	188	57.32%
Watthana	896	308	34.38%	100	32	32.00%	106	52	49.06%
Suan Luang	1,353	431	31.86%	253	51	20.16%	253	113	44.66%
Saphan Sung	1,452	328	22.59%	233	58	24.89%	191	70	36.65%
Samphanthawong	344	182	52.91%	46	16	34.78%	38	23	60.53%
Sathon	2,777	940	33.85%	491	177	36.05%	475	287	60.42%
Sai Mai	2,685	1,091	40.63%	514	195	37.94%	780	360	46.15%
Nong Khaem	1,957	614	31.37%	400	190	47.50%	291	187	64.26%
Nong Chok	9,891	6,383	64.53%	525	121	23.05%	275	190	69.09%
Lak Si	908	330	36.34%	242	79	32.64%	249	92	36.95%
Huai Khwang	526	182	34.60%	152	51	33.55%	147	80	54.42%

Table 7: ICD10 URI

ICD10	Name
B053	Measles complicated by otitis media (H67.1*)Post measles otitis media
J00	Acute nasopharyngitis [common cold]
J010	Acute maxillary sinusitis
J011	Acute frontal sinusitis
J012	Acute ethmoidal sinusitis
J013	Acute sphenoidal sinusitis
J014	Acute pansinusitis
J018	Other acute sinusitis
J019	Acute sinusitis, unspecified
J020	Streptococcal pharyngitis
J029	Acute pharyngitis, unspecified
J030	Streptococcal tonsillitis
J038	Acute tonsillitis due to other specified organisms
J039	Acute tonsillitis, unspecified
J040	Acute laryngitis
J041	Acute tracheitis
J042	Acute laryngotracheitis
J050	Acute obstructive laryngitis [croup]
J051	Acute epiglottitis

ICD10	Name
J060	Acute laryngopharyngitis
J068	Other acute upper respiratory infections of multiple sites
J069	Acute upper respiratory infection, unspecified
J101	Influenza with other respiratory manifestations, seasonal influenza virus identified
J111	Influenza with other respiratory manifestations, virus not identified
J200	Acute bronchitis due to Mycoplasma pneumoniae
J201	Acute bronchitis due to Haemophilus influenzae
J202	Acute bronchitis due to streptococcus
J203	Acute bronchitis due to coxsackievirus
J204	Acute bronchitis due to parainfluenza virus
J205	Acute bronchitis due to respiratory syncytial virus
J206	Acute bronchitis due to rhinovirus
J207	Acute bronchitis due to echovirus
J208	Acute bronchitis due to other specified organisms
J209	Acute bronchitis, unspecified
J210	Acute bronchiolitis due to respiratory syncytial virus
J218	Acute bronchiolitis due to other specified organisms
J219	Acute bronchiolitis, unspecified
H650	Acute serous otitis media
H651	Other acute nonsuppurative otitis media
H659	Nonsuppurative otitis media, unspecified
H660	Acute suppurative otitis media
H664	Suppurative otitis media, unspecified
H669	Otitis media, unspecified Otitis media:
H670	Otitis media in bacterial diseases classified elsewhere
H671	Otitis media in viral diseases classified elsewhere
H720	Central perforation of tympanic membrane
H721	Attic perforation of tympanic membrane
H722	Other marginal perforations of tympanic membrane
H728	Other perforations of tympanic membrane
H729	Perforation of tympanic membrane, unspecified

Table 8: ICD10 UTI

ICD-10	Name
N300	Acute cystitis
N30.1	Interstitial cystitis (chronic)
N30.2	Other chronic cystitis
N30.3	Trigonitis Urethrotrigonitis
N30.4	Irradiation cystitis
N30.8	Other cystitis Abscess of bladder
N30.9	Cystitis, unspecified

Table 9: ICD10 AD

ICD-10	Name
A000	Cholera due to Vibrio cholerae 01, biovar cholerae
A001	Cholera due to Vibrio cholerae 01, biovar eltor
A009	Cholera, unspecified
A020	Salmonella enteritis
A030	Shigellosis due to Shigella dysenteriae
A031	Shigellosis due to Shigella flexneri
A032	Shigellosis due to Shigella boydii
A033	Shigellosis due to Shigella sonnei
A038	Other shigellosis
A039	Shigellosis, unspecified
A040	Enteropathogenic Escherichia coli infection
A041	Enterotoxigenic Escherichia coli infection
A042	Enteroinvasive Escherichia coli infection
A043	Enterohaemorrhagic Escherichia coli infection
A044	Other intestinal Escherichia coli infections
A045	Campylobacter enteritis

ICD-10	Name
A046	Enteritis due to Yersinia enterocolitica
A047	Enterocolitis due to Clostridium difficile
A048	Other specified bacterial intestinal infections
A049	Bacterial intestinal infection, unspecified
A050	Foodborne staphylococcal intoxication
A053	Foodborne Vibrio parahaemolyticus intoxication
A054	Foodborne Bacillus cereus intoxication
A059	Bacterial foodborne intoxication, unspecified
A080	Rotaviral enteritis
A081	Acute gastroenteropathy due to Norovirus
A082	Adenoviral enteritis
A083	Other viral enteritis
A084	Viral intestinal infection, unspecified
A085	Other specified intestinal infections
A09	Other gastroenteritis and colitis of infectious and unspecified origin
A090	Other and unspecified gastroenteritis and colitis of infectious origin
A099	Gastroenteritis and colitis of unspecified origin
K521	Toxic gastroenteritis and colitis
K528	Other specified noninfective gastroenteritis and colitis

Table 10 : BKK 50 Districts relates BKK Zones

BKK Zones	Districts
Central BKK	Phra Nakhon, Dusit, Pom Prap Sattru Phai, Samphanthawong, Din Daeng, Huai Khwang, Phaya Thai, Ratchathewi and Wang Thonglang Districts.
Southern BKK	Pathumwan, Bangrak, Sathorn, Bang Kho Laem, Yannawa, Khlong Toei, Watthana, Phra Khanong, Suan Luang and Bangna Districts.
Northern BKK	Chatuchak, Bang Sue, Lat Phrao, Lak Si, Don Mueang, Sai Mai and Bang Khen Districts.
Eastern BKK	Bang Kapi, Saphan Sung, Bueng Kum, Khan Na Yao, Lat Krabang, Min Buri, Nong Chok, Khlong Sam Wa and Prawet Districts.

BKK Zones	Districts
Northern Thonburi	Thonburi, Khlong San, Chom Thong, Bangkok Yai, Bangkok Noi, Bang Phlat, Taling Chan and Thawi Watthana Districts.
Southern Thonburi	Phasi Charoen, Bang Khae, Nong Khaem, Bang Khun Thian, Bang Bon, Rat Burana and Thung Khru Districts.

Annex

1. Variable and definition for secondary data
2. Data collection form(s)
    a. Antimicrobial Use Questionnaire Administered to Pharmacists
    b. Questionnaires for Physician about Antimicrobial use
    c. Interview Question Guide for Physicians and Pharmacists
3. National/institutional ethical approval
4. Related images about research

1. Variable and definition for secondary data

Variable	Definition
TXID	Visit number
HPID	Personal ID
Sex	Sex
Age	Age (year)
HCODE	Hospital code
DATESRV	Date of service
TIMESRV	Time of service
OPTYPE	Type of visit
HMIP	Referral hospital
HMOP	Main hospital
HSUB	Primary care unit
SUBINSCL	Insurance type
PMODEL	Model of contracting
PDx	Principle diagnosis
Other Dx	Other diagnosis
Antibiotic Use	Antibiotic Use
Drug code (TMT code)	Drug code
Amount	Number of prescribed medicines
Unit	Unit of medicine

2. Data collection form(s)

2.1. Antimicrobial Use Questionnaire Administered to Pharmacists (Eng)

Antimicrobial Use Questionnaire Administered to Pharmacists

This questionnaire is part of the research project on the Development of Antimicrobial Use (AMU) Monitoring System in Bangkok Primary Care Units aims to develop AMU monitoring system in primary care units under Universal Coverage Scheme in Bangkok. The information obtained from this questionnaire cannot indicate the respondent's specifics. Therefore, we would like to request your kind cooperation in answering the questionnaire truthfully. In this regard, the researchers would like to thank you very much for your cooperation.

This questionnaire consists of two sections:

Section 1 Antimicrobial use in pharmacist
Section 2 Personal information

Section 1 Antimicrobial Use in Pharmacist

1. Please rate your level of agreement with the following statements.

Statements	Level of agreement				
	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
I know there is a connection between my prescribing or dispensing of antibiotics and the emergence and spread of antibiotic resistant bacteria.					
I know what information to give to individuals about prudent use of antibiotics and antibiotic resistance.					
I have a key role in helping control antibiotic resistance.					
I have easy access to guidelines on managing infections.					
I have good opportunities to provide advice on prudent antibiotic use to individuals.					

Instructions: Please answer the following questions by selecting the item that you agree with the most.

2. Nalin thinks that her child has a cold, so she takes her child to the doctor and hopes that the doctor will prescribe antibiotics for him" Should the doctor prescribe antibiotics for him?
    - Prescribe the antibiotics
    - Do not prescribe the antibiotics.
    - Not sure
3. Nalin suspected that antibiotics could destroy pathogenic and non-pathogenic bacteria. So, she asked her mother. Nalin's mother said that "Antibiotics only kill the pathogenic bacteria." Did Nalin's mother understand correctly?
    - Correct
    - Incorrect
    - Not sure

4. “Drug-resistant bacteria can transmit between species from animals to humans (or from humans to animals)” Is this statement correct?
    - Correct
    - Incorrect
    - Not sure
5. What is the cause(s) of antimicrobial resistance? (Note: it is possible to give more than one answer)
    - Gene mutation or inherited antibiotic resistance gene Misuse or overuse of antibiotics
    - Use of antibiotics to accelerate growth
    - Not sure/ Do not know
6. “Nalin had an asymptomatic drug-resistant bacterial infection. Exposing to Nalin’s secretion, health care workers can carry drug-resistant bacteria and transmit to other people and the environment.” Do you agree with the statement?
    - Agree
    - Disagree
    - Not sure
7. “Hospital-acquired infection in the patient can be transmitted to others” Do you agree with the statement?
    - Agree
    - Disagree
    - Not sure
8. Which hand cleansing product(s) can be used to reduce the spread of bacteria? (Note: it is possible to give more than one answer)
    - Soap and water
    - Soap containing bacteria precursors and water.
    - Alcohol product e.g., Spray, Gel, Pad
    - Not sure
9. Nalin was given antibiotic drugs for treating diarrhea. After using it for one day, her diarrhea condition improved, so she decided to stop using antibiotic drugs. Did Nalin make the right decision?
    - Correct
    - Incorrect
    - Not sure
10. “The main cause of antimicrobial resistance is inappropriate drug use by patients” Do you agree with this statement?
    - Agree
    - Disagree
    - Not sure
11. “It is the responsibility of physicians to deal with antimicrobial use problems” Do you agree with the statement?
    - Agree
    - Disagree
    - Not sure

Questions for Pharmacist

Please answer the following questions.

12. "Taking milk or antacid with Fluoroquinolones drugs can cause antimicrobial resistance" Is this statement correct?
    - Correct
    - Incorrect
    - Not sure
13. Do you agree Vancomycin should be reserved for patients with drug resistance bacteria infections?
    - Agree
    - Disagree
    - Not sure
14. "Using substandard antibiotic drugs for example the amount of active pharmaceutical ingredient is less than standard requirement can cause antimicrobial resistance." Is this statement correct?"
    - Agree / Correct
    - Disagree / Incorrect
    - Not sure
15. Do you know NARST, a national antimicrobial resistance surveillance that is responsible for monitoring and spreading information about antimicrobial resistance? (Note: NARST= National Antimicrobial Resistant Surveillance Center, Thailand)
    - Know
    - Do not know
    - Not sure
16. How often do you use the antibiogram or Drug susceptibility table to refer for empiric treatment? (Note: Antibiogram is an overall profile of antimicrobial susceptibility testing results of a specific microorganism to a battery of antimicrobial drugs.)
    - Usually
    - Sometimes
    - Never
    - Not sure
17. "Antibiogram or Drug susceptibility table is needed for setting policies to control the use of antibiotic drugs in hospitals" Do you agree with the statement? (Note: Antibiogram is an overall profile of antimicrobial susceptibility testing results of a specific microorganism to a battery of antimicrobial drugs.)
    - Agree
    - Disagree
    - Not sure
18. "Delay prescribing is when the physician refuses to prescribe but asks the patient to see him/her again when symptom is progressed or when the physician prescribes antimicrobial but ask the patient to take the medication after a certain time if the symptom is progressed" Do you agree delay prescribing is one of the techniques that can reduce unnecessary prescribing in some mild infections?
    - Agree
    - Disagree

- Not sure

19. Considering the last week only in your clinical practice, please answer how frequently you give advice on prudent antibiotic use to patients.
    - None
    - 1-2 times/week
    - 3-4 times/week
    - ≥ 5 times/week

20. If you were not able to give out advice on prudent antibiotic use as frequently as you prescribed, why was this? (Note: it is possible to give more than one answer)

    - Patient does not require information
    - Insufficient time
    - Difficulty getting patient to understand diagnosis
    - Language barriers
    - No resources available
    - I was not sure what advice to provide.
    - I was not able to give advice as needed.
    - Other, please specify……..

21. In the treatment of infections, which of these do you use regularly? (Note: it is possible to give more than one answer)
    - Clinical practice guidelines
    - Documentation from the pharmaceutical industry
    - Medical representatives from industry
    - Previous clinical experience
    - Continuing education training courses
    - Expert opinions from infectious diseases physicians or pediatric infectious diseases physicians
    - Medical journals
    - Social media
    - Other, please specify …….
22. In the treatment of infections, which of these do you use regularly? (Note: it is possible to give more than one answer)

    - Clinical practice guidelines
    - Documentation from the pharmaceutical industry
    - Medical representatives from industry
    - Previous clinical experience
    - Continuing education training courses
    - Expert opinions from infectious diseases physicians or pediatric infectious diseases physicians
    - Medical journals
    - Social media
    - Other, please specify…….
23. Considering the last week only in your clinical practice, how frequently have you prescribed antibiotics for patients who did not need them?

- None
- 1-2 times/week
- 3-4 times/week
- ≥ 5 times/week

24. What policies promote rational antibiotic use in Thailand? (Note: if you know them, please specify)

……
……

25. What do you think of the Drug Use Evaluation (DUE) policy? (Please briefly describe it)

……
……

26. How is your organization implementing the monitoring and evaluation system to promote the policy of rational antibiotic use?

……
……

Section 2 Personal Information

Instructions: Please answer the following questions by writing your answers or ticking in front of the spaces provided.

1. Gender?
   - Male
   - Female
2. Age …… Years
3. What is your type of healthcare service?
   - Community clinic
   - Public health center
4. Work experience……. Year (s)
5. What is your type of employment?
   - Civil servant
   - Part-time work
   - Full-time work
6. Which part of Bangkok is your healthcare service located? (If you answered this question, please answer question 8.)
   - North
   - Central
   - South
   - East
   - North Thonburi
   - South Thonburi
7. Please fill in your Public Health Center's name
   ……

2.2. Antimicrobial Use Questionnaire Administered to Pharmacists (Thai)

แบบสอบถามเพื่อประเมินการดูแลการใช้ยาปฏิชีวนะของเภสัชกร

คำชี้แจง : แบบสอบถามฉบับนี้เป็นส่วนหนึ่งของโครงการวิจัยเรื่อง การพัฒนาระบบติดตามการใช้ยาปฏิชีวนะของหน่วยบริการปฐมภูมิในกรุงเทพมหานคร (Development of Antimicrobial Use Monitoring System in Bangkok Primary Care Units) มีวัตถุประสงค์เพื่อพัฒนาระบบติดตามการใช้ยาปฏิชีวนะในหน่วยบริการ ปฐมภูมิภายใต้ระบบหลักประกันสุขภาพถ้วนหน้าในพื้นที่กรุงเทพมหานคร สำหรับข้อมูลที่ได้จากแบบสอบถามนี้จะไม่มีข้อมูลส่วนใดที่สามารถบ่งชี้ถึงข้อมูลเฉพาะของผู้ตอบแบบสอบถาม จึงขอความร่วมมือจากทุกท่านตอบแบบสอบถามตามความเป็นจริง ทั้งนี้ ผู้วิจัยขอขอบพระคุณเป็นอย่างสูงในความร่วมมือของท่านมา ณ โอกาสนี้

แบบสอบถามนี้ ประกอบด้วย 2 ส่วน คือ

ส่วนที่ 1 คำถามประเมินการดูแลการใช้ยาปฏิชีวนะ

ส่วนที่ 2 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

<u>ส่วนที่ 1</u> คำถามประเมินการดูแลการใช้ยาปฏิชีวนะ

1. กรุณาประเมินความคิดเห็น โดยทำเครื่องหมาย √ ในช่องระดับความคิดเห็น

ข้อคิดเห็น	ระดับความคิดเห็น				
	1 ไม่เห็นด้วยอย่างยิ่ง	2 ไม่เห็นด้วย	3 เห็นเป็นกลาง	4 เห็นด้วย	5 เห็นด้วยอย่างยิ่ง
การสั่งใช้หรือการจ่ายยาปฏิชีวนะมีความสัมพันธ์กับการเกิดเชื้อแบคทีเรียดื้อยาปฏิชีวนะ					
ฉันทราบข้อมูลเกี่ยวกับการใช้ยาปฏิชีวนะและเชื้อดื้อยาที่ต้องแนะนำให้กับผู้ป่วย					
ฉันมีบทบาทหลักในการควบคุมการดื้อยาปฏิชีวนะ					
ฉันสามารถเข้าถึงแนวทางเวชปฏิบัติเกี่ยวกับการรักษาการติดเชื้อ					
ฉันมีโอกาสให้คำแนะนำการใช้ยาปฏิชีวนะอย่างสมเหตุผลกับผู้ป่วยแต่ละรายได้					

คำชี้แจง กรุณาตอบคำถามต่อไปนี้ โดยเลือกข้อที่ท่านเห็นด้วย

2. นลินคิดว่า ลูกเป็นหวัดจึงพาไปพบแพทย์ที่คลินิก โดยหวังว่าแพทย์จะจ่ายยาปฏิชีวนะให้แล้วจะทำให้อาการของลูกหาย แพทย์ตรวจไม่พบอาการหรืออาการแสดงของการติดเชื้อแบคทีเรีย **ท่านคิดว่า แพทย์ควรทำตามที่นลินคาดหวังหรือไม่**

    ○ ทำตาม “สั่งจ่ายยา”

    ○ ไม่ทำตาม “ไม่สั่งจ่ายยา”

    ○ ไม่แน่ใจ

3. นลินสงสัยว่า ยาปฏิชีวนะสามารถทำลายเชื้อแบคทีเรียที่ก่อโรคและไม่ก่อโรค เธอจึงโทรถามแม่ของเธอแม่ของนลินบอกว่า ยาปฏิชีวนะทำลายแค่เชื้อแบคทีเรียที่ก่อโรคเท่านั้น แม่ของนลินเข้าใจถูกต้องหรือไม่

    ○ ถูกต้อง

    ○ ไม่ถูกต้อง

    ○ ไม่แน่ใจ

4. “เชื้อแบคทีเรียดื้อยาปฏิชีวนะสามารถแพร่กระจายจากคนสู่สัตว์หรือสัตว์สู่คนได้” ความคิดเห็นนี้ถูกต้องหรือไม่

    ○ ถูกต้อง

    ○ ไม่ถูกต้อง

    ○ ไม่แน่ใจ

5. สาเหตุของเชื้อดื้อยาปฏิชีวนะเกิดจากอะไรได้บ้าง (ตอบได้มากกว่า 1 ข้อ)

    ○ การกลายพันธุ์ของยีนหรือได้รับการส่งต่อยีนดื้อยาปฏิชีวนะ

    ○ การใช้ยาปฏิชีวนะผิดจุดประสงค์หรือใช้มากเกินความจำเป็น

    ○ การใช้ยาปฏิชีวนะสำหรับเร่งการเจริญเติบโต (Growth promoter)

    ○ ไม่แน่ใจ/ไม่ทราบ

6. “นลินติดเชื้อแบคทีเรียที่ดื้อยาปฏิชีวนะ มือของบุคลากรที่สัมผัสสารคัดหลั่งของนลินก็สามารถแพร่เชื้อแบคทีเรียดื้อยาปฏิชีวนะนั้นไปยังผู้ป่วยคนอื่น ๆ และสิ่งแวดล้อมได้ แม้ว่านลินจะมีอาการเจ็บป่วยหรือไม่มีอาการก็ตาม” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่

    ○ เห็นด้วย

    ○ ไม่เห็นด้วย

    ○ ไม่แน่ใจ

7. “การติดเชื้อแบคทีเรียที่เกิดขึ้นในโรงพยาบาล (Hospital-acquired infection) ในผู้ป่วยคนหนึ่ง สามารถแพร่เชื้อไปยังผู้ป่วยคนอื่นได้” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่

    ○ เห็นด้วย

    ○ ไม่เห็นด้วย

    ○ ไม่แน่ใจ

8. ผลิตภัณฑ์ทำความสะอาดมือชนิดใด ที่สามารถช่วยลดความเสี่ยงในการแพร่เชื้อแบคทีเรียได้ (ตอบได้มากกว่า 1 ข้อ)

    ○ สบู่ธรรมดาและน้ำเปล่า

    ○ สบู่ที่มีส่วนผสมของสารตั้งต้นเชื้อแบคทีเรียและน้ำเปล่า

    ○ ผลิตภัณฑ์แอลกอฮอล์ต่างๆเช่น Spray, Gel, Pad เป็นต้น

    ○ ไม่แน่ใจ/ไม่ทราบ

9. นลินได้รับยาปฏิชีวนะเพื่อรักษาอาการท้องเสีย หลังจากใช้ยาไปหนึ่งวันอาการท้องเสียดีขึ้นจึงตัดสินใจหยุดใช้ยาปฏิชีวนะนลินปฏิบัติถูกต้องหรือไม่

    ○ ถูกต้อง

    ○ ไม่ถูกต้อง

    ○ ไม่แน่ใจ

10. “สาเหตุหลักของการดื้อยาปฏิชีวนะเกิดจากการใช้ยาที่ไม่ถูกต้องของผู้ป่วย” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่

    ○ เห็นด้วย

    ○ ไม่เห็นด้วย

    ○ ไม่แน่ใจ

11. “เมื่อเกิดปัญหาการใช้ยาปฏิชีวนะเป็นความรับผิดชอบของเภสัชกรที่ต้องมีส่วนร่วมในการออกแบบระบบเพื่อดำเนินการแก้ปัญหาหรือบรรเทาปัญหา” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่

    ○ เห็นด้วย

    ○ ไม่เห็นด้วย

    ○ ไม่แน่ใจ

คำถามเฉพาะสำหรับเภสัชกร

คำชี้แจง ในฐานะเภสัชกร โปรดตอบคำถามต่อไปนี้

12. “การรับประทานนมหรือยาลดกรดร่วมกับยากลุ่ม Fluoroquinolones อาจทำให้เกิดเชื้อดื้อยาได้” ข้อความข้างต้นกล่าวถูกต้องหรือไม่

    ○ ถูกต้อง

    ○ ไม่ถูกต้อง

    ○ ไม่แน่ใจ

13. ท่านเห็นด้วยหรือไม่ว่า Vancomycin เป็นรายการยาที่ควรสงวนไว้ใช้สำหรับกรณีเชื้อดื้อยาเท่านั้น

    ○ เห็นด้วย

    ○ ไม่เห็นด้วย

    ○ ไม่แน่ใจ

14. “การใช้ยาปฏิชีวนะที่มีคุณภาพต่ำกว่ามาตรฐาน เช่น ปริมาณตัวยาสำคัญน้อยกว่าเกณฑ์ที่กำหนดเป็นสาเหตุทำให้เชื้อดื้อยาได้” ข้อความข้างต้นกล่าวถูกต้องหรือไม่

    ○ ถูกต้อง

    ○ ไม่ถูกต้อง

    ○ ไม่แน่ใจ

15. ท่านอ้างอิง Antibiogram/ Drug susceptibility table ในการสั่งจ่ายยากรณี Empiric treatment อย่างไรหมายเหตุ (หมายเหตุ Antibiogram คือรายงานสถิติสรุปผลการทดลองความไวของเชื้อแบคทีเรียต่อยาปฏิชีวนะในโรงพยาบาล)

    ○ อ้างอิงเป็นส่วนใหญ่

    ○ อ้างอิงบางครั้ง

    ○ ไม่ได้ใช้อ้างอิง

    ○ ไม่แน่ใจ

16. “การกำหนดนโยบายควบคุมการใช้ยาปฏิชีวนะในโรงพยาบาลมีความจำเป็นต้องใช้ข้อมูล Antibiogram หรือ Drug susceptibility table” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่ (หมายเหตุ Antibiogram คือรายงานสถิติสรุปผลการทดสอบความไวของเชื้อแบคทีเรียต่อยาปฏิชีวนะในโรงพยาบาล)

    ○ เห็นด้วย

    ○ ไม่เห็นด้วย

○ ไม่แน่ใจ

17. ท่านเห็นด้วยหรือไม่ ว่า Delayed prescribing เป็นวิธีการหนึ่งในการลดใช้ยาปฏิชีวนะโดยไม่จำเป็นในโรคติดเชื้อที่ไม่ได้มีความรุนแรงบางชนิด (หมายเหตุ Delayed prescribing หมายถึง การปฏิเสธการจ่ายยาปฏิชีวนะ แต่นัดให้ผู้ป่วยกลับมาพบหากมีอาการมากขึ้น หรือหมายถึงการจ่ายยาปฏิชีวนะให้แก่ผู้ป่วย แต่มิได้ให้ผู้ป่วยรับประทานในทันที โดยกำหนดระยะเวลาให้ผู้ป่วยว่า หากอาการของผู้ป่วยไม่ดีขึ้นภายในระยะเวลาเท่าใด ถึงจะเริ่มให้รับประทานยา)

○ เห็นด้วย

○ ไม่เห็นด้วย

○ ไม่แน่ใจ

18. ในหนึ่งสัปดาห์ที่ผ่านมา ท่านให้คำปรึกษาหรือคำแนะนำเกี่ยวกับการใช้ยาปฏิชีวนะอย่างสมเหตุผลกับผู้ป่วยแต่ละรายมากน้อยเพียงใด (โปรดทำเครื่องหมาย √ หน้าข้อความที่ท่านเห็นด้วย)

○ ไม่มีการให้คำปรึกษาหรือคำแนะนำในหนึ่งสัปดาห์ที่ผ่านมา

○ 1-2 ครั้งต่อสัปดาห์

○ 3-4 ครั้งต่อสัปดาห์

○ มากกว่าหรือเท่ากับ 5 ครั้งต่อสัปดาห์

19. ท่านคิดว่าสาเหตุใด ส่งผลให้ท่านไม่สามารถให้คำปรึกษาหรือคำแนะนำเกี่ยวกับการใช้ยาปฏิชีวนะอย่างสมเหตุผล (ตอบได้มากกว่า 1 ข้อ)

○ ผู้ป่วยไม่ต้องการคำปรึกษาหรือคำแนะนำ

○ มีเวลาไม่เพียงพอ

○ เป็นไปได้ยากที่จะทำให้ผู้ป่วยเข้าใจการวินิจฉัยโรค

○ ข้อจำกัดทางภาษา

○ ไม่มีแหล่งข้อมูลที่จะให้คำปรึกษาหรือคำแนะนำ

○ ไม่แน่ใจว่าจะต้องให้คำปรึกษาหรือคำแนะนำอย่างไร

○ ไม่สามารถให้คำปรึกษาหรือคำแนะนำได้

○ สาเหตุอื่น ๆ (โปรดระบุ) .....

20. ในการรักษาการติดเชื้อ แหล่งข้อมูลหรือวิธีการใดที่ท่านใช้เป็นประจำ (สามารถตอบได้มากกว่า 1 ข้อ)

○ แนวทางเวชปฏิบัติ

○ เอกสารกำกับยาจากบริษัทยา

○ ผู้แทนยาจากบริษัทยา

- ○ ประสบการณ์ทางคลินิกในการรักษาการติดเชื้อ
- ○ การเข้าฝึกอบรมความรู้ทางเวชปฏิบัติ
- ○ ความคิดเห็นจากแพทย์ผู้เชี่ยวชาญ อนุสาขาอายุรศาสตร์โรคติดเชื้อหรือ กุมารเวชศาสตร์โรคติดเชื้อ
- ○ วารสารทางการแพทย์
- ○ สื่อข้อมูลออนไลน์ (Social media)
- ○ มีแหล่งข้อมูลหรือวิธีการอื่น ๆ (โปรดระบุ) .....

21. ในหนึ่งสัปดาห์ที่ผ่านมา ท่านต้องจ่ายยาปฏิชีวนะให้กับผู้ป่วยที่ไม่มีความจำเป็นต้องใช้ยาปฏิชีวนะบ่อยเพียงใด
    - ○ ไม่ได้สั่งใช้ยาปฏิชีวนะ
    - ○ 1-2 ครั้งต่อสัปดาห์
    - ○ 3-4 ครั้งต่อสัปดาห์
    - ○ มากกว่าหรือเท่ากับ 5 ครั้งต่อสัปดาห์
    - ○ จ่ายยาปฏิชีวนะให้แก่ผู้ป่วยที่มีความจำเป็นต้องใช้ทุกราย
22. นโยบายส่งเสริมการใช้ยาปฏิชีวนะอย่างสมเหตุสมผลในหน่วยงานของท่านมีอะไรบ้าง
    - ○ การใช้เอกสาร Drug Use Evaluation (DUE)
    - ○ การจำกัดการใช้ยาปฏิชีวนะใน 3 กลุ่มโรคติดเชื้อตาม Rationale Drug Use (RDU)
    - ○ การใช้วิธี Delayed Prescribing
    - ○ การอ้างอิง Antibiogram/ Drug susceptibility table ในการสั่งจ่ายยา
    - ○ อื่น ๆ โปรดระบุ.....
23. ท่านคิดว่า นโยบายส่งเสริมการใช้ยาปฏิชีวนะอย่างสมเหตุสมผลในหน่วยงานของท่าน มีจุดที่ควรพัฒนาอย่างไร โปรดอธิบาย

    .....

    .....
24. ในหน่วยงานของท่าน มีระบบติดตามและประเมินผลของนโยบายส่งเสริมการใช้ยาปฏิชีวนะอย่างสมเหตุผลอย่างไร

    .....

    .....

<u>ส่วนที่ 2</u> ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

คำชี้แจง กรุณากรอกข้อมูลของท่านตามความเป็นจริง

1. เพศ (Sex)
    - ชาย
    - หญิง
2. อายุ.....ปี
3. รูปแบบหน่วยการให้บริการที่ท่านทำงาน
    - คลินิกชุมชนอบอุ่น
    - ศูนย์บริการสาธารณสุข
4. ประสบการณ์การทำงานของท่านตั้งแต่จบปริญญาตรี.....ปี (ถ้ามากกว่าหรือเท่ากับ 6 เดือน ให้นับเป็น 1 ปี)
5. ตำแหน่ง
    - ข้าราชการ
    - เภสัชกรห้วงเวลา
6. หน่วยบริการที่ท่านทำงานอยู่ในในกลุ่มเขตใด
    - กลุ่มเขตกรุงเทพเหนือ
    - กลุ่มเขตกรุงเทพกลาง
    - กลุ่มเขตกรุงเทพใต้
    - กลุ่มเขตกรุงธนเหนือ
    - กลุ่มเขตกรุงธนใต้

2.3. Questionnaires for Physicians about Antimicrobial use (Eng)

Questionnaires for Physicians about Antimicrobial use

This questionnaire is part of the research project on the Development of Antimicrobial Use (AMU) Monitoring System in Bangkok Primary Care Units aims to develop AMU monitoring system in primary care units under Universal Coverage Scheme in Bangkok. The information obtained from this questionnaire cannot indicate the respondent's specifics. Therefore, we would like to request your kind cooperation in answering the questionnaire truthfully. In this regard, the researchers would like to thank you very much for your cooperation.

This questionnaire consists of two sections:

Section 1 Antimicrobial use in Physician
Section 2 Personal information

Section 1 Antimicrobial Use in Physician

1. Please rate your level of agreement with the following statements.

Statements	Level of agreement				
	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
I know there is a connection between my prescribing or dispensing of antibiotics and the emergence and spread of antibiotic bacteria.					
I know what information to give to individuals about prudent use of antibiotics and antibiotic resistance.					
I have a key role in helping control antibiotic resistance.					
I have easy access to guidelines on managing infections.					
I have good opportunities to provide advice on prudent antibiotic use to individuals.					

Instructions: Please answer the following questions by selecting the item that you agree with the most.

2. Nalin thinks that her child has a cold, so she takes her child to the doctor and hopes that the doctor will prescribe antibiotics for him" Should the doctor prescribe antibiotics for him?

   ○ Prescribe the antibiotics

   ○ Do not prescribe the antibiotics.

   ○ Not sure

3. Nalin suspected that antibiotics could destroy pathogenic and non-pathogenic bacteria. So, she asked her mother. Nalin's mother said that "Antibiotics only kill the pathogenic bacteria." Did Nalin's mother understand correctly?

- ○ Correct
- ○ Incorrect
- ○ Not sure

4. “Drug-resistant bacteria can transmit between species from animals to humans (or from humans to animals)” Is this statement correct?
   - ○ Correct
   - ○ Incorrect
   - ○ Not sure
5. What is the cause(s) of antimicrobial resistance? (Note: it is possible to give more than one answer)
   - ○ Gene mutation or inherited antibiotic resistance gene
   - ○ Misuse or overuse of antibiotics
   - ○ Use of antibiotics to accelerate growth
   - ○ Not sure/ Do not know
6. “Nalin had an asymptomatic drug-resistant bacterial infection. Exposing to Nalin’s secretion, health care workers can carry drug-resistant bacteria and transmit to other people and the environment.” Do you agree with the statement?
   - ○ Agree
   - ○ Disagree
   - ○ Not sure
7. “Hospital-acquired infection in the patient can be transmitted to others” Do you agree with the statement?
   - ○ Agree
   - ○ Disagree
   - ○ Not sure
8. Which hand cleansing product(s) can be used to reduce the spread of bacteria?
   (Note: it is possible to give more than one answer)
   - ○ Soap and water
   - ○ Soap containing bacteria precursors and water.
   - ○ Alcohol product e.g., Spray, Gel, Pad
   - ○ Not sure

9. Nalin was given antibiotic drugs for treating diarrhea. After using it for one day, her diarrhea condition improved, so she decided to stop using antibiotic drugs. Did Nalin make the right decision?

    ○ Correct

    ○ Incorrect

    ○ Not sure

10. "The main cause of antimicrobial resistance is inappropriate drug use by patients" Do you agree with this statement?

    ○ Agree

    ○ Disagree

    ○ Not sure

Questions for Physician

Please answer the following questions.

11. "Recording of a diagnosis by using ICD-10 coding standard is useful for monitoring antibiotic use" Do you agree with the statement?

    ○ Agree

    ○ Disagree

    ○ Not sure

12. Do you know NARST, a national antimicrobial resistance surveillance that is responsible for monitoring and giving information about antimicrobial resistance? (NARST= National Antimicrobial Resistant Surveillance Center, Thailand)

    ○ Know

    ○ Do not know

    ○ Not sure

13. "Delay prescribing is when the physician refuses to prescribe but asks the patient to see him/her again when symptom is progressed or when the physician prescribes antimicrobial but ask the patient to take the medication after a certain time if the symptom is progressed" Do you agree delay prescribing is one of the techniques that can reduce unnecessary prescribing in some mild infections?

    ○ Agree

    ○ Disagree

    ○ Not sure

14. What strategies do you employ to prescribe antibiotics prudently? (Note: it is possible to give more than one answer) Delayed prescribing/ Back-up prescribing (delayed prescribing is a

method whereby a prescription is issued by a health professional for use by the patient later, if their symptoms do not improve)

- ○ Patient education
- ○ Alternative medicine e.g. *Andrographis paniculata* (Fa Thalai Chon)
- ○ Drug Use Evaluation
- ○ Limitation of certain drugs in the drug list
- ○ None
- ○ Other, please specify …….

15. Considering the last week only in your clinical practice, please answer how frequently you give advice on prudent antibiotic use to patients.

- ○ None
- ○ 1-2 times/week
- ○ 3-4 times/week
- ○ ≥ 5 times/week

16. If you were not able to give out advice on prudent antibiotic use as frequently as you prescribed, why was this? (Note: it is possible to give more than one answer)

- ○ Patient does not require information
- ○ Insufficient time
- ○ Difficulty getting patient to understand diagnosis
- ○ Language barriers
- ○ No resources available
- ○ I was not sure what advice to provide.
- ○ I was not able to give advice as needed.
- ○ Other, please specify ……..

17. In the treatment of infections, which of these do you use regularly? (Note: it is possible to give more than one answer)

- ○ Clinical practice guidelines
- ○ Documentation from the pharmaceutical industry
- ○ Medical representatives from industry
- ○ Previous clinical experience
- ○ Continuing education training courses
- ○ Expert opinions from infectious diseases physicians or pediatric infectious diseases physicians

- ○ Medical journals
- ○ Social media
- ○ Other, please specify…….

18. Considering the last week only in your clinical practice, how frequently have you prescribed antibiotics for patients who did not need them?
    - ○ None
    - ○ 1-2 times/week
    - ○ 3-4 times/week
    - ○ ≥ 5 times/week
19. What policies promote rational antibiotic use in Thailand? (Note: if you know them, please specify)
    ……
    ……
20. What do you think of the Drug Use Evaluation (DUE) policy? (Please briefly describe it)
    ……
    ……
21. How is your organization implementing the monitoring and evaluation system to promote the policy of rational antibiotic use?
    ……
    ……

Section 2 Personal information

Instructions: Please answer the following questions by writing your answers or ticking in front of the spaces provided.

1. Gender?
   - o Male
   - o Female
2. Age …….. Years
3. Profession
   - o General Practitioner
   - o Specialties 1) …….
     2)……..
4. What is your type of healthcare service?
   - o Community clinic
   - o Public health center
5. Work experience …….. Year (s)
6. What is your type of employment?
   - o Civil servant
   - o Part-time work
   - o Full-time work

7. Which part of Bangkok is your healthcare service located? (If you answered this question, please answer question 8.)
    - North
    - Central
    - South
    - East
    - North Thonburi
    - South Thonburi
8. Please fill in your Public Health Center's name

    ……..

2.4 Questionnaires for Physicians about Antimicrobial use (Thai)

แบบสอบถามเพื่อประเมินการดูแลการใช้ยาต้านจุลชีพของแพทย์

คำชี้แจง : แบบสอบถามฉบับนี้เป็นส่วนหนึ่งของโครงการวิจัยเรื่อง การพัฒนาระบบติดตามการใช้ยาปฏิชีวนะของหน่วยบริการปฐมภูมิในกรุงเทพมหานคร (Development of Antimicrobial Use Monitoring System in Bangkok Primary Care Units) มีวัตถุประสงค์เพื่อพัฒนาระบบติดตามการใช้ยาปฏิชีวนะในหน่วยบริการ ปฐมภูมิภายใต้ระบบหลักประกันสุขภาพถ้วนหน้าในพื้นที่กรุงเทพมหานคร สำหรับข้อมูลที่ได้จากแบบสอบถามนี้จะไม่มีข้อมูลส่วนใดที่สามารถบ่งชี้ถึงข้อมูลเฉพาะของผู้ตอบแบบสอบถาม จึงขอความร่วมมือจากทุกท่านตอบแบบสอบถามตามความเป็นจริง ทั้งนี้ ผู้วิจัยขอขอบพระคุณเป็นอย่างสูงในความร่วมมือของท่านมา ณ โอกาสนี้

แบบสอบถามนี้ ประกอบด้วย 2 ส่วน คือ

ส่วนที่ 1 คำถามประเมินการดูแลการใช้ยาปฏิชีวนะ

ส่วนที่ 2 ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

<u>ส่วนที่ 1</u> คำถามประเมินการดูแลการใช้ยาปฏิชีวนะ

25. กรุณาประเมินความคิดเห็น โดยทำเครื่องหมาย √ ในช่องระดับความคิดเห็น

ข้อคิดเห็น	ระดับความคิดเห็น				
	1 ไม่เห็นด้วยอย่างยิ่ง	2 ไม่เห็นด้วย	3 เห็นเป็นกลาง	4 เห็นด้วย	5 เห็นด้วยอย่างยิ่ง
การสั่งใช้หรือการจ่ายยาปฏิชีวนะมีความสัมพันธ์กับการเกิดเชื้อแบคทีเรียดื้อยาปฏิชีวนะ					
ฉันทราบข้อมูลเกี่ยวกับการใช้ยาปฏิชีวนะและเชื้อดื้อยาที่ต้องแนะนำให้กับผู้ป่วย					
ฉันมีบทบาทหลักในการควบคุมการดื้อยาปฏิชีวนะ					
ฉันสามารถเข้าถึงแนวทางเวชปฏิบัติเกี่ยวกับการรักษาการติดเชื้อ					
ฉันมีโอกาสให้คำแนะนำการใช้ยาปฏิชีวนะอย่างสมเหตุผลกับผู้ป่วยแต่ละรายได้					

คำชี้แจง กรุณาตอบคำถามต่อไปนี้ โดยเลือกข้อที่ท่านเห็นด้วย

26. นลินคิดว่า ลูกเป็นหวัดจึงพาไปพบแพทย์ที่คลินิก โดยหวังว่าแพทย์จะจ่ายยาปฏิชีวนะให้แล้วจะทำให้อาการของลูกหาย แพทย์ตรวจไม่พบอาการหรืออาการแสดงของการติดเชื้อแบคทีเรีย **ท่านคิดว่า แพทย์ควรทำตามที่นลินคาดหวังหรือไม่**

○ ทำตาม “สั่งจ่ายยา”

- ○ ไม่ทำตาม “ไม่สั่งจ่ายยา”
- ○ ไม่แน่ใจ

27. นลินสงสัยว่า ยาปฏิชีวนะสามารถทำลายเชื้อแบคทีเรียที่ก่อโรคและไม่ก่อโรค เธอจึงโทรถามแม่ของเธอแม่ของนลินบอกว่า ยาปฏิชีวนะทำลายแค่เชื้อแบคทีเรียที่ก่อโรคเท่านั้น แม่ของนลินเข้าใจถูกต้องหรือไม่
    - ○ ถูกต้อง
    - ○ ไม่ถูกต้อง
    - ○ ไม่แน่ใจ
28. “เชื้อแบคทีเรียดื้อยาปฏิชีวนะสามารถแพร่กระจายจากคนสู่สัตว์หรือสัตว์สู่คนได้” ความคิดเห็นนี้ถูกต้องหรือไม่
    - ○ ถูกต้อง
    - ○ ไม่ถูกต้อง
    - ○ ไม่แน่ใจ
29. สาเหตุของเชื้อดื้อยาปฏิชีวนะเกิดจากอะไรได้บ้าง (ตอบได้มากกว่า 1 ข้อ)
    - ○ การกลายพันธุ์ของยีนหรือได้รับการส่งต่อยีนดื้อยาปฏิชีวนะ
    - ○ การใช้ยาปฏิชีวนะผิดจุดประสงค์หรือใช้มากเกินความจำเป็น
    - ○ การใช้ยาปฏิชีวนะสำหรับเร่งการเจริญเติบโต (Growth promoter)
    - ○ ไม่แน่ใจ/ไม่ทราบ
30. “นลินติดเชื้อแบคทีเรียที่ดื้อยาปฏิชีวนะ มือของบุคลากรที่สัมผัสสารคัดหลั่งของนลินก็สามารถแพร่เชื้อแบคทีเรียดื้อยาปฏิชีวนะนั้นไปยังผู้ป่วยคนอื่น ๆ และสิ่งแวดล้อมได้ แม้ว่านลินจะมีอาการเจ็บป่วยหรือไม่มีอาการก็ตาม” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่
    - ○ เห็นด้วย
    - ○ ไม่เห็นด้วย
    - ○ ไม่แน่ใจ
31. “การติดเชื้อแบคทีเรียที่เกิดขึ้นในโรงพยาบาล (Hospital-acquired infection) ในผู้ป่วยคนหนึ่ง สามารถแพร่เชื้อไปยังผู้ป่วยคนอื่นได้” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่
    - ○ เห็นด้วย
    - ○ ไม่เห็นด้วย

○ ไม่แน่ใจ

32. ผลิตภัณฑ์ทำความสะอาดมือชนิดใด ที่สามารถช่วยลดความเสี่ยงในการแพร่เชื้อแบคทีเรียได้ (ตอบได้มากกว่า 1 ข้อ)

○ สบู่ธรรมดาและน้ำเปล่า

○ สบู่ที่มีส่วนผสมของสารตั้งต้นเชื้อแบคทีเรียและน้ำเปล่า

○ ผลิตภัณฑ์แอลกอฮอล์ต่างๆเช่น Spray, Gel, Pad เป็นต้น

○ ไม่แน่ใจ/ไม่ทราบ

33. นลินได้รับยาปฏิชีวนะเพื่อรักษาอาการท้องเสีย หลังจากใช้ยาไปหนึ่งวันอาการท้องเสียดีขึ้นจึงตัดสินใจหยุดใช้ยาปฏิชีวนะนลินปฏิบัติถูกต้องหรือไม่

○ ถูกต้อง

○ ไม่ถูกต้อง

○ ไม่แน่ใจ

34. “สาเหตุหลักของการดื้อยาปฏิชีวนะเกิดจากการใช้ยาที่ไม่ถูกต้องของผู้ป่วย” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่

○ เห็นด้วย

○ ไม่เห็นด้วย

○ ไม่แน่ใจ

35. “เมื่อเกิดปัญหาการใช้ยาปฏิชีวนะเป็นความรับผิดชอบของเภสัชกรที่ต้องมีส่วนร่วมในการออกแบบระบบเพื่อดำเนินการแก้ปัญหาหรือบรรเทาปัญหา” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่

○ เห็นด้วย

○ ไม่เห็นด้วย

○ ไม่แน่ใจ

คำถามเฉพาะสำหรับแพทย์

คำชี้แจง ในฐานะแพทย์ กรุณาตอบคำถามต่อไปนี้

36. “การบันทึกการวินิจฉัยโรคโดยใช้รหัสมาตรฐาน ICD 10 เป็นประโยชน์ในการติดตามการใช้ยาปฏิชีวนะ” ท่านเห็นด้วยกับข้อความข้างต้นหรือไม่

○ เห็นด้วย

○ ไม่เห็นด้วย

○ ไม่แน่ใจ

37. ท่านเห็นด้วยหรือไม่ ว่า Delayed prescribing เป็นวิธีการหนึ่งในการลดใช้ยาปฏิชีวนะโดยไม่จำเป็นในโรคติดเชื้อที่ไม่ได้มีความรุนแรงบางชนิด (หมายเหตุ Delayed prescribing หมายถึง การปฏิเสธการจ่ายยาปฏิชีวนะ แต่นัดให้ผู้ป่วยกลับมาพบหากมีอาการมากขึ้น หรือหมายถึงการจ่ายยาปฏิชีวนะให้แก่ผู้ป่วย แต่มิได้ให้ผู้ป่วยรับประทานในทันที โดยกำหนดระยะเวลาให้ผู้ป่วยว่า หากอาการของผู้ป่วยไม่ดีขึ้นภายในระยะเวลาเท่าใด ถึงจะเริ่มให้รับประทานยา)

○ เห็นด้วย

○ ไม่เห็นด้วย

○ ไม่แน่ใจ

38. ท่านมีวิธีการใดที่จะช่วยให้สั่งใช้ยาปฏิชีวนะได้อย่างสมเหตุผล (ตอบได้มากกว่า 1 ข้อ)

○ การปฏิเสธการจ่ายยาปฏิชีวนะ แต่นัดให้ผู้ป่วยกลับมาพบหากมีอาการมากขึ้น (Delayed prescribing)

○ การให้คำแนะนำกับผู้ป่วยที่จำเป็นหรือไม่จำเป็นต้องใช้ยาปฏิชีวนะ (Patient education)

○ การใช้ยาทางเลือกอื่นในการักษา เช่น ฟ้าทะลายโจร เป็นต้น

○ การใช้แบบฟอร์มการประเมินการใช้ยา (Drug Use Evaluation; DUE)

○ การจำกัดบางรายการยาในบัญชียา

○ ไม่มีวิธีการ

○ มีวิธีการอื่นๆ (โปรดระบุ) .....

39. ในหนึ่งสัปดาห์ที่ผ่านมา ท่านให้คำปรึกษาหรือคำแนะนำเกี่ยวกับการใช้ยาปฏิชีวนะอย่างสมเหตุผลกับผู้ป่วยแต่ละรายมากน้อยเพียงใด (โปรดทำเครื่องหมาย √ หน้าข้อความที่ท่านเห็นด้วย)

○ ไม่มีการให้คำปรึกษาหรือคำแนะนำในหนึ่งสัปดาห์ที่ผ่านมา

○ 1-2 ครั้งต่อสัปดาห์

○ 3-4 ครั้งต่อสัปดาห์

○ มากกว่าหรือเท่ากับ 5 ครั้งต่อสัปดาห์

40. ท่านคิดว่าสาเหตุใด ส่งผลให้ท่านไม่สามารถให้คำปรึกษาหรือคำแนะนำเกี่ยวกับการใช้ยาปฏิชีวนะอย่างสมเหตุผลอย่างมีประสิทธิภาพ (สามารถตอบได้มากกว่าหนึ่งข้อ)

○ ผู้ป่วยไม่ต้องการคำปรึกษาหรือคำแนะนำ

○ มีเวลาไม่เพียงพอ

○ เป็นไปได้ยากที่จะทำให้ผู้ป่วยเข้าใจการวินิจฉัยโรค

○ ข้อจำกัดทางภาษา

- ○ ไม่มีแหล่งข้อมูลที่จะให้คำปรึกษาหรือคำแนะนำ
- ○ ไม่แน่ใจว่าจะต้องให้คำปรึกษาหรือคำแนะนำอย่างไร
- ○ ไม่สามารถให้คำปรึกษาหรือคำแนะนำได้
- ○ สาเหตุอื่น ๆ (โปรดระบุ) .....

41. ในการรักษาการติดเชื้อ แหล่งข้อมูลหรือวิธีการใดที่ท่านใช้เป็นประจำ (สามารถตอบได้มากกว่า 1 ข้อ)

- ○ แนวทางเวชปฏิบัติ
- ○ เอกสารกำกับยาจากบริษัทยา
- ○ ผู้แทนยาจากบริษัทยา
- ○ ประสบการณ์ทางคลินิกในการรักษาการติดเชื้อ
- ○ การเข้าฝึกอบรมความรู้ทางเวชปฏิบัติ
- ○ ความคิดเห็นจากแพทย์ผู้เชี่ยวชาญ อนุสาขาอายุรศาสตร์โรคติดเชื้อหรือ กุมารเวชศาสตร์โรคติดเชื้อ
- ○ วารสารทางการแพทย์
- ○ สื่อข้อมูลออนไลน์ (Social media)
- ○ มีแหล่งข้อมูลหรือวิธีการอื่น ๆ (โปรดระบุ) .....

42. ในหนึ่งสัปดาห์ที่ผ่านมา ท่านต้องสั่งใช้ยาปฏิชีวนะให้กับผู้ป่วยที่ไม่มีความจำเป็นต้องใช้ยาปฏิชีวนะบ่อยเพียงใด

- ○ ไม่ได้สั่งใช้ยาปฏิชีวนะ
- ○ 1-2 ครั้งต่อสัปดาห์
- ○ 3-4 ครั้งต่อสัปดาห์
- ○ มากกว่าหรือเท่ากับ 5 ครั้งต่อสัปดาห์

43. นโยบายส่งเสริมการใช้ยาปฏิชีวนะอย่างสมเหตุสมผลในหน่วยงานของท่านมีอะไรบ้าง

- ○ การใช้เอกสาร Drug Use Evaluation (DUE)
- ○ การจำกัดการใช้ยาปฏิชีวนะใน 3 กลุ่มโรคติดเชื้อตาม Rationale Drug Use (RDU)
- ○ การใช้วิธี Delayed Prescribing
- ○ การอ้างอิง Antibiogram/ Drug susceptibility table ในการสั่งจ่ายยา
- ○ อื่น ๆ โปรดระบุ.....

44. ท่านคิดว่า นโยบายส่งเสริมการใช้ยาปฏิชีวนะอย่างสมเหตุสมผลในหน่วยงานของท่าน มีจุดที่ควรพัฒนาอย่างไร โปรดอธิบาย

    .....

    .....

45. ในหน่วยงานของท่าน มีระบบติดตามและประเมินผลของนโยบายส่งเสริมการใช้ยาปฏิชีวนะอย่างสมเหตุผลอย่างไร

    .....

    .....

<u>ส่วนที่ 2</u> ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

คำชี้แจง โปรดกรอกข้อมูลของท่านตามความเป็นจริง

7. เพศ (Sex)

    ○ ชาย

    ○ หญิง

8. อายุ.....ปี

9. ความเชี่ยวชาญของท่าน

    ○ แพทย์เวชปฏิบัติทั่วไป

    ○ แพทย์ผู้เชี่ยวชาญ สาขา 1).....

    2).....

10. รูปแบบหน่วยบริการที่ท่านทำงาน

    ○ คลินิกชุมชนอบอุ่น

    ○ ศูนย์บริการสาธารณสุข

11. ประสบการณ์การทำงานของท่านตั้งแต่จบปริญญาตรี.....ปี (ถ้ามากกว่าหรือเท่ากับ 6 เดือน ให้นับเป็น 1 ปี)

12. ตำแหน่ง

    ○ ข้าราชการ

    ○ แพทย์ห้วงเวลา

    ○ แพทย์ประจำคลินิก (Full time)

13. หน่วยบริการที่ท่านทำงานอยู่ในกลุ่มเขตใด

    ○ กลุ่มเขตกรุงเทพเหนือ

- ○ กลุ่มเขตกรุงเทพกลาง
- ○ กลุ่มเขตกรุงเทพใต้
- ○ กลุ่มเขตกรุงเทพตะวันออก
- ○ กลุ่มเขตกรุงธนเหนือ
- ○ กลุ่มเขตกรุงธนใต้

2.4. Interview Question Guide for Physicians and Pharmacists (Eng)

1. **General information**
    a. Information of individuals
        i. Background of work
        ii. Duration of Work Experience
        iii. Roles and responsibilities for antimicrobial use control
    b. Information of organization
        i. Type of healthcare service
        ii. Number of personnel
        iii. Turnover of healthcare providers
2. **Personal factors**
    a. Awareness of policies related to antimicrobial resistance
    b. Work experiences related to antimicrobial agents prescribing (giving some examples)
    c. Perspectives on limitations of antimicrobial use
    d. Perspectives on antimicrobial use monitoring in primary healthcare services
3. **Organization factors**
    a. Explain about roles of antimicrobial agents prescribing and dispensing
    b. Explain about policies related to limitations of antimicrobial use
    c. Assess the results of applying the mentioned policies in your healthcare service

Finding the key successes and policy problems (i.e., internal factors and external factors, for example, financial policy, governance policy etc.)

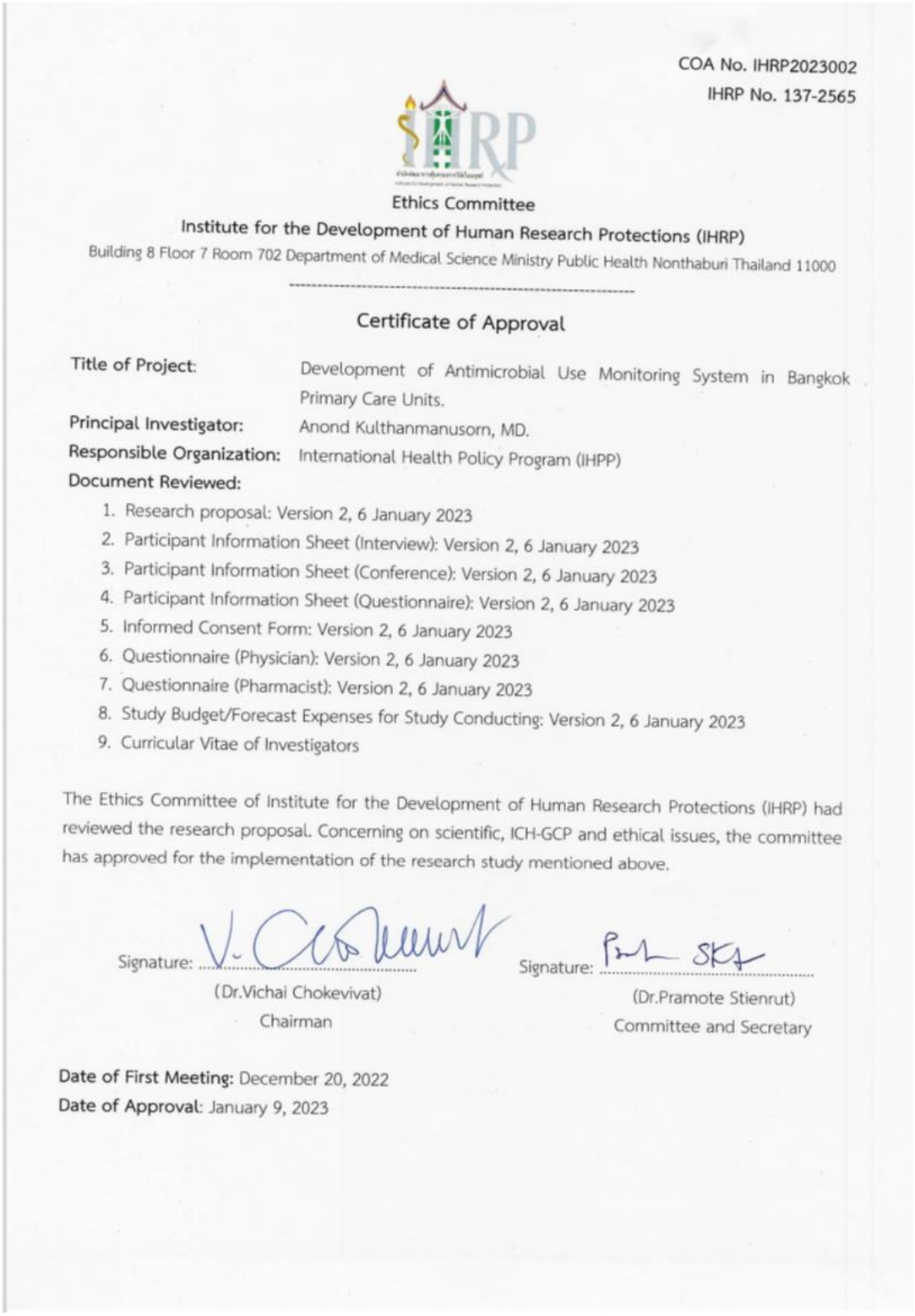
2.5. Interview Question Guide for Physicians and Pharmacists (Thai)

แนวคำถามสำหรับสัมภาษณ์

1. ข้อมูลทั่วไป
   i. ข้อมูลผู้ถูกสัมภาษณ์ เช่น อายุงาน ประสบการณ์ทำงาน บทบาทที่เกี่ยวข้องกับการจำกัดการใช้ยาต้านจุลชีพ
   ii. ข้อมูลหน่วยงาน เช่น ประเภทหน่วยบริการ จำนวนบุคลากรทั้งหมด และเฉพาะวิชาชีพแพทย์และเภสัช การหมุนเวียนของบุคลากร
2. ปัจจัยด้านตัวบุคลล
   i. การรับรู้นโยบายที่เกี่ยวข้องกับการดื้อยาต้านจุลชีพ
   ii. ประสบการณ์ทำงานที่เกี่ยวข้องกับการจ่ายยาต้านจุลชีพ อาจยกกรณีตัวอย่างให้ฟัง
   iii. มุมมองต่อนโยบายจำกัดการใช้ยาต้านจุลชีพ
   iv. มุมมองต่อการติดตามปริมาณการใช้ยาต้านจุลชีพในหน่วยบริการ
3. ปัจจัยด้านองค์กร
   i. อธิบายการปฏิบัติที่เกี่ยวข้องกับการจ่ายยาต้านจุลชีพในหน่วยงาน
   ii. อธิบายนโยบายด้านจำกัดการใช้ยาต้านจุลชีพในหน่วยงาน
   iii. ประเมินผลของการนำนโยบายดังกล่าวไปปฏิบัติของหน่วยงานตนเอง
   iv. ค้นหาปัจจัยสำเร็จ และปัญหา/อุปสรรคของการดำเนินนโยบาย (ปัจจัยภายใน)
   v. ปัจจัยอื่นภายนอกที่สนับสนุนหรือขัดขวางการดำเนินนโยบาย เช่น นโยบายการเงิน นโยบายผู้บริหารสำนัก นโยบายจากกระทรวงสาธารณสุข

3. National/institutional ethical approval

3.1 Certificate of Approval ,Ethics Committee Institute for the Development of Human Research Protections (IHRP)



COA No. IHRP2023002
IHRP No. 137-2565

Ethics Committee
Institute for the Development of Human Research Protections (IHRP)
Building 8 Floor 7 Room 702 Department of Medical Science Ministry Public Health Nonthaburi Thailand 11000

Certificate of Approval

Title of Project: Development of Antimicrobial Use Monitoring System in Bangkok Primary Care Units.
Principal Investigator: Anond Kulthanmanusorn, MD.
Responsible Organization: International Health Policy Program (IHPP)
Document Reviewed:

1. Research proposal: Version 2, 6 January 2023
2. Participant Information Sheet (Interview): Version 2, 6 January 2023
3. Participant Information Sheet (Conference): Version 2, 6 January 2023
4. Participant Information Sheet (Questionnaire): Version 2, 6 January 2023
5. Informed Consent Form: Version 2, 6 January 2023
6. Questionnaire (Physician): Version 2, 6 January 2023
7. Questionnaire (Pharmacist): Version 2, 6 January 2023
8. Study Budget/Forecast Expenses for Study Conducting: Version 2, 6 January 2023
9. Curricular Vitae of Investigators

The Ethics Committee of Institute for the Development of Human Research Protections (IHRP) had reviewed the research proposal. Concerning on scientific, ICH-GCP and ethical issues, the committee has approved for the implementation of the research study mentioned above.

Signature: .....
(Dr.Vichai Chokevivat)
Chairman

Signature: .....
(Dr.Pramote Stienrut)
Committee and Secretary

Date of First Meeting: December 20, 2022
Date of Approval: January 9, 2023

3.2 SEARO ERC Approval

World Health Organization South-East Asia

SEARO Research Ethics Review Committee
(SEARO-ERC)
World Health House, Indraprastha Estate,
Mahatma Gandhi Marg, New Delhi-11001, India

SEARO ERC Approval

Unique Proposal ID: 2023.13. Tha

Protocol Title: Development of Antimicrobial Use Monitoring System in Bangkok Primary Care Units

Version, Dated 17 April 2023

WHO responsible office: WCO, Thailand

WHO responsible unit/department: WHO, Thailand Country office, Department of Health Emergencies and AMR.

Principal investigators: Dr. Anond Kulthanmanusorn, International Health Policy Program, Ministry of Public Health (MOPH), Thailand

WHO responsible technical officer: Richard Clive Brown, WCO, Thailand

SEARO role in Research: Main funder for proposed research (24 890 USD); technical assistance & collaboration

Local ethical review: Ethical approval obtained from the Ethics Committee, Institute for the Development of Human Research Protections (IHRP), via their approval letter dated 9 January 2023.

Dear Mr Richard Clive Brown,

Thank you for submitting the above-referenced protocol to SEARO-ERC. On initial screening, the proposal was found to be eligible for expedited review.

Decision on expedited review: The proposal is **approved** on expedited review by SEARO-ERC[1]. This approval is valid for the entire duration of the study.

The following suggestions are provided by the reviewers from SEARO-ERC for the consideration of research team:

1. The proposal states 'One doctor and one pharmacist from each primary care facility will be invited to respond to a questionnaire.' There is need to state the inclusion and exclusion criteria for selection of healthcare workers in cases where there is more than one professional present.
2. Table 1 shows that focus groups are to be conducted. It is not clear who will attend these and where they will be done.
3. A data collection tool for the collection of secondary data is needed.

The responsible technical officer for the research project shall submit the following documents to the Secretariat of SEARO-ERC on health research portal (https://researchportal.searo.who.int):

[1] Please note that SEARO-ERC approval does not constitute budget approval or approval for procurement matters which should be approved as per Delegation of Authority.

World Health Organization South-East Asia

SEARO Research Ethics Review Committee
(SEARO-ERC)
World Health House, Indraprastha Estate,
Mahatma Gandhi Marg, New Delhi-11001, India

- Annual progress report (if the duration of the research is more than 1 year)
- Final scientific Report
- Any adverse reports
- Patient/participant feedback (if any).

Chairperson:

Name: Dr. Suman Rijal

Date: 01. 05.2023

3.3 Certificate of Approval ,Ethics Committee Bangkok

AL 04.1/03.0
ฉบับที่ 3.0 เริ่มใช้ 15 พฤศจิกายน 2566

คณะกรรมการจริยธรรมการวิจัยในคน กรุงเทพมหานคร
หนังสือรับรองโครงการวิจัย

คณะกรรมการจริยธรรมการวิจัยในคน กรุงเทพมหานคร ดำเนินการให้การรับรองโครงการวิจัยตามแนวทางหลักจริยธรรมการวิจัยในคนที่เป็นมาตรฐานสากล ได้แก่ Declaration of Helsinki, Belmont Report, CIOMS Guidelines และ ICH-GCP Guidelines

ชื่อโครงการวิจัย : การพัฒนาระบบติดตามการใช้ยาปฏิชีวนะของหน่วยบริการปฐมภูมิในกรุงเทพมหานคร
รหัสโครงการ : E017hh/66_EXP
ผู้วิจัยหลัก : นายแพทย์อานนท์ กุลธรรมานุสรณ์/มูลนิธิเพื่อการพัฒนานโยบายสุขภาพระหว่างประเทศ
ผู้วิจัยร่วม : 1. พญ.ภัทธิยา วิชญพงศ์/สำนักอนามัย กรุงเทพมหานคร
2. นายคณิต พิศวงศ์/มูลนิธิเพื่อการพัฒนานโยบายสุขภาพระหว่างประเทศ
3. นางสาวพิสภาสินี พิศาลสินธุ์/มูลนิธิเพื่อการพัฒนานโยบายสุขภาพระหว่างประเทศ
4. นางสาวณัฐณิชา ทาทอง/มูลนิธิเพื่อการพัฒนานโยบายสุขภาพระหว่างประเทศ
สถานที่ทำวิจัย : 1. ศูนย์บริการสาธารณสุข 48 แห่ง สำนักอนามัย กรุงเทพมหานคร
2. คลินิกชุมชนอบอุ่น 200 แห่ง ในกรุงเทพมหานคร

เอกสารที่ได้รับการพิจารณา :

1. โครงร่างการวิจัย	ฉบับที่ 2 ลงวันที่ 6 พฤศจิกายน 2566
2. เอกสารชี้แจงข้อมูลแก่ผู้เข้าร่วมการวิจัย - สำหรับผู้ให้เข้าร่วมการประชุมรับฟังความคิดเห็น - สำหรับผู้ตอบแบบสอบถาม - สำหรับผู้ให้สัมภาษณ์	ฉบับที่ 2 ลงวันที่ 6 พฤศจิกายน 2566
3. หนังสือแสดงเจตนายินยอมเข้าร่วมการวิจัย	ฉบับที่ 2 ลงวันที่ 6 พฤศจิกายน 2566
4. ประวัติและผลงานผู้วิจัย	
5. แบบสอบถาม - เพื่อการประเมินการดูแลการใช้ยาต้านจุลชีพของแพทย์ - เพื่อการประเมินการดูแลการใช้ยาปฏิชีวะของเภสัชกร	ฉบับที่ 2 ลงวันที่ 6 พฤศจิกายน 2566
6. แนวคำถามสัมภาษณ์	ฉบับที่ 2 ลงวันที่ 6 พฤศจิกายน 2566

(ศาสตราจารย์พิเศษมานิต ศรีประโมทย์)
ประธานคณะกรรมการฯ

(นายชาตรี วัฒนเชจร)
รองปลัดกรุงเทพมหานคร

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การรับรองนี้มีเงื่อนไขตามที่ระบุไว้ (ดูด้านหลังของหนังสือรับรองโครงการวิจัย)

4. Related images about research

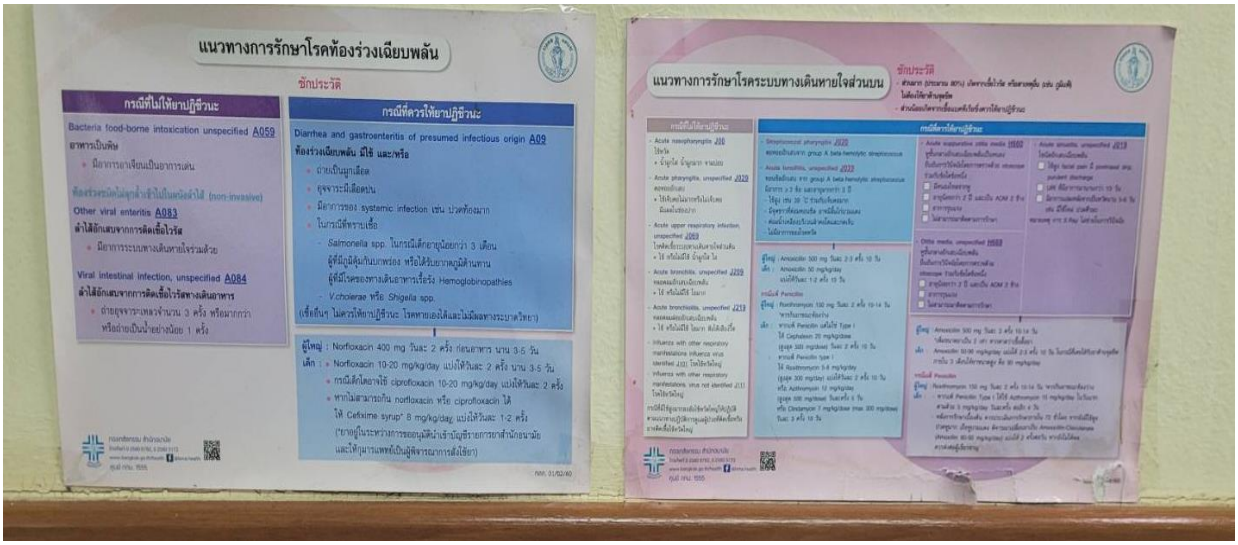

Figure 1 AMU Treatment Guideline for AD & URI in PCU

Figure 2 Antimicrobial & Antibiotic stock in Clinic