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Modified pharmacy counseling improves outpatient short-term antibiotic compliance in Bali Province

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ABSTRACT

Pharmacy counseling, which provides quality drug information, improves patient safety. However, this service is not optimally provided in Indonesia. A new model, modified pharmacy counseling (MPC), was developed to make it easier for service providers. We aimed to measure MPC effectiveness in improving short-term antibiotic compliance. This community trial (ISRCTN82062391) involved patients (age, ≥18 years) recruited from selected pharmacies between December 2020 and February 2021 in two Bali Province districts. At baseline, data regarding sociodemographic characteristics, knowledge levels, and attitudes toward antibiotic use were collected. MPC effectiveness was assessed using Morisky medication adherence scale-8. Of 300 recruited patients, 290 participated (response rate, 96.67%). The baseline study revealed that knowledge regarding short-term antibiotic use is lacking; however, awareness regarding antimicrobial resistance is high. MPC significantly improved short-term antibiotic compliance (risk ratio, 2.849; 95% confidence interval, 1.904-6.640; p<0.001). The mean rank significantly differed between the intervention (61.05) and control groups (37.95). The proportions of compliant patients in the intervention and control groups were 35.6% and 12.5%, respectively. The main reason for low compliance was forgetting and not being made aware by pharmacy workers in the intervention (46.8%) and control (55.6%) groups, respectively. These findings provide insights for improving pharmaceutical care.

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1. INTRODUCTION

Pharmaceutical services in Indonesia are following the global trend of expanding the social and clinical roles of pharmaceutical workers. There has been a paradigm shift from a "drug-oriented" to a "patient-oriented" focus in pharmaceutical services, which has been well received by all the involved parties, including the government, pharmacists, and community [1]. The influence of globalization has increased public awareness of health; therefore, public demands related to the quality of health services are increasing. Currently, pharmacy counseling services do not meet the standards [2]. Dissatisfaction regarding

communication, professionalism, and therapy management has highlighted the need for pharmacists to apply their skills and knowledge in providing the best service to patients [3]. In an interdisciplinary team, members efficiently exchange clinical information, build trust among professionals, and provide quality care [4].

The government faces major challenges in overcoming the antimicrobial resistance (AMR) problem in Indonesia. Policies related to AMR are limited, have not reached the target, and many doctors, pharmacists, and health workers are not aware of this policy [5]. Surveillance results show patterns of bacterial and antibiotic resistance in Indonesia [6], [7]. A factor that influences the occurrence AMR is the patient's non-compliance with antibiotics use [8], [9]. Medication compliance is defined as the extent to which a patient follows medical or health advice when taking medication, and the misuse of antibiotics is a major cause of the spread of antimicrobial resistance [8], [9]. Poor patient compliance with antibiotic regimens has often been reported across several studies [10]–[12], medication compliance is often less than optimal and is associated with poorer clinical outcomes, such as increased bacterial resistance [13]. Treatment noncompliance is influenced by multiple factors, including the interactions between health workers and patients, characteristics of care, and knowledge levels [14]–[19]

Preliminary research has revealed that in pharmacies, drug information is provided quickly at the time of drug delivery at the cashier area in approximately 2–3 min in a hurried and unstructured manner; contrarily, counseling, which is a longer interaction between pharmacists as information providers and patients, is rarely provided or in some pharmacies, is never provided. The modified pharmacy counseling (MPC) model was developed by researchers based on previous guideline [20] to aid in improving pharmaceutical counseling services. The MPC model is a practical guide or tool designed to provide clarifications and to make it easier for pharmacist assistants working in community pharmacy services to develop their skills based on the required competencies. This model was developed by considering various aspects of competence and infrastructural support [21]. The advantage of this guidance system is that it is based on a modification of the guidelines issued by the government; further, it is expected that it will be easy to adopt and that it can be used independently by service providers. This study aimed to examine the effectiveness of the MPC model in improving short-term antibiotic compliance in outpatients.

2. RESEARCH METHOD

This study was a community trial, which was conducted in two stages: the first stage involved the baseline study, and the second stage involved the MPC intervention and a posttest-only research design. The study was conducted from December 2020 to February 2021.

2.1. Sampling methods

Pharmacy selection was performed by cluster sampling. Two of the nine districts were chosen to represent the province of Bali (Denpasar and Badung). A total of eight pharmacies were randomly selected from each sub-district. Sample subjects were outpatients who met inclusion and exclusion criteria. The inclusion criteria were outpatients aged >18 years who visited a selected pharmacy with antibiotic prescriptions and were willing to become respondents by agreeing to the informed consent. The exclusion criteria were health workers. Drop out is when the patient cannot be contacted or hospitalized. The sample size of outpatients was calculated using the formula for comparing two independent means ($n = (Z\alpha/2+Z\beta)2 *2*\sigma2/d2$). The study sample comprised 300 patients. The baseline study was conducted using a self-administered questionnaire. A follow-up assessment, using the Morisky medication adherence scale-8 (MMAS-8) questionnaire, was conducted by telephone on days 3–7 when the antibiotics were estimated to run out.

2.2. Research instruments

A questionnaire created by modifying those applied in several previous studies was used in the baseline survey to collect sociodemographic information and to assess the patients' understanding of antibiotic use [15], [22], [23]. During the construction of the questionnaire, specialists from various fields were consulted regarding the logic and clarity of the content, and it was tested for validity and reliability. The questionnaire consisted of dichotomous questions and was scored using the Guttman scale. Data were measured based on the answer choices, Yes/True and No/False. Each correct answer was assigned a score of 1, and each wrong answer was assigned a score of 0. The level of knowledge was categorized as good (score, ≥5) or poor (score, <5). Patient attitude was categorized as good (score, ≥7) or poor (score, <7).

The follow-up questionnaire, the MMAS-8, was administered by telephone [24]. This questionnaire consists of eight questions with yes/no answers. Each answer in the compliant category receives a score of 1, and each answer in the noncompliant category receives a score of 0. The total score is classified into two categories: compliant (score, 8) and noncompliant (score, 0–7).

2.3. Ethics

This research was approved by the Research Ethics Commission of the Faculty of Medicine, Udayana University (No. 2144/UNUN.14.2.2.VII.14/LT/2020) on November 2, 2020.

2.4. Data analysis

Data were analyzed using the Mann–Whitney U test for assessing differences between groups. Multiple logistic regression analysis was performed to estimate the effect of the MPC model after adjusting for occupation, education level, number of medications prescribed, number of types of drugs, and perceptions of drug prices.

3. RESULTS AND DISCUSSION

A total of 300 patients were included in the study. Data were missing in the case of 10 patients (3.33%) for the following reasons: 6 (60%) could not be contacted, 1 (10%) was hospitalized during the data collection period, and 3 (30%) refused to continue participating. The data of 290 patients (response rate, 96.67%) were analyzed. Among them, 146 patients were assigned to the intervention group and were provided MPC, and 144 patients were assigned to the control group and were provided conventional information as shown in Figure 1.

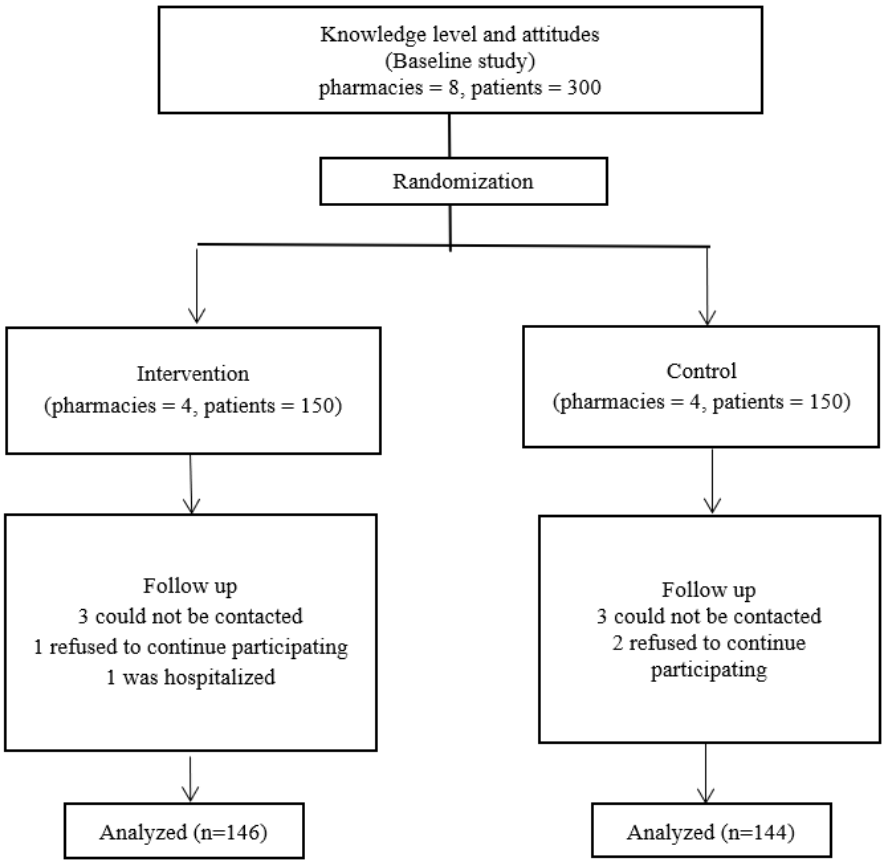

Figure 1. Subject selection

The data presented in Table 1 reveal that the intervention and control groups had the following similar characteristics: sex, education level, occupation, payment method, and the number of prescription drugs ($p>0.05$). In contrast, the age groups, perceptions of drug prices, names of antibiotics, number of antibiotics prescribed, frequency of administration, and duration of use were not comparable between the groups ($p<0.05$).

Table 1. Patient characteristics in the intervention and control groups

Variables	Intervention (n=146) n (%)	Control (n=144) n (%)	p
Age group (years)			
17-25	6 (4.1)	19 (13.2)	<0.001
16-35	40 (27.4)	61 (42.4)	
36-45	28 (19.2)	35 (24.2)	
46-55	46 (31.5)	19 (13.2)	
>55	26 (17.8)	10 (6.9)	
Sex			
Male	83 (56.8)	75 (52.1)	*0.415
Female	63 (43.2)	63 (47.9)	
Level of education			
Moderate	71 (48.6)	76 (52.8)	*0.480
High	75 (51.4)	68 (47.2)	
Occupation			
Employee	69 (47.3)	57 (39.6)	*0.480
Housewife	24 (16.4)	32 (22.2)	
Self-employed	23 (15.8)	26 (18.1)	
Not working	30 (20.5)	27 (20.1)	
Payment method			
Cash	67 (45.9)	58 (40.3)	*0.335
Insurance	79 (54.1)	86 (59.7)	
Perception of drug price			
Fair	136 (93.2)	123 (85.4)	0.033
High-priced	10 (6.8)	21 (14.6)	
Drugs prescribed (tablets)			
<10	36 (24.7)	44 (30.6)	<0.001
=10	98 (67.8)	66 (47.9)	
>10	12 (8.2)	34 (23.6)	
Frequency (daily)			
Once	8 (5.5)	15 (10.4)	0.003
Twice	77 (67.1)	95 (45.8)	
Three times	61 (41.8)	34 (23.6)	
Length of use (days)			
≤3	95 (65.1)	55 (38.2)	<0.001
4-5	43 (29.5)	64 (44.4)	
>5	8 (25.5)	25 (17.4)	
Number of types of drugs in the prescription			
<3 items	79 (54.1)	64 (44.4)	*0.251
3 items	44 (30.1)	51 (35.4)	
>3 items	23 (17.7)	29 (20.1)	

3.1. Baseline study

A baseline study was conducted at the beginning of the study to collect information on the level of knowledge and attitudes of the respondents regarding the short-term use of antibiotics before these variables were affected by the intervention. Figure 2 presents a description of the respondents' level of knowledge regarding the short-term use of antibiotics. Of the respondents, 96.6% (n=280) agreed that everyone has the immunity required to overcome disease; 46.9% (n=136) stated that antibiotics can be used for fever; 99.0% (n=287) understood that antibiotics were used for bacterial infections; 78.3% (n=227) answered that antibiotics could be used for viral infections; 48.6% (n=141) stated that antibiotics were used to treat influenza symptoms, such as coughs and colds; 74.5% (n=216) stated that antibiotics could be used for sore throats; and 57.2% (n=166) knew of or had heard of antibiotic resistance.

Figure 3 presents a description of the respondents' level of attitude regarding the short-term use of antibiotics. A total of 27.9% (n=81) of the respondents had bought antibiotics without a prescription in the past year, 82.4% (n=239) believed that antibiotics could be used to prevent the disease from getting worse, 28.3% (n=82) had asked a doctor to prescribe antibiotics, 74.1% (n=215) felt that antibiotics were safe to use, 87.2% (n=253) felt the need to seek additional information if antibiotics were prescribed, 85.2% (n=247) consulted a doctor, 70% (n=203) received advice from friends or family, 85.2% (n=247) shared antibiotics with their families if there was a concurrent illness, and 89.3% (n=259) believed that taking antibiotics could reduce antibiotic resistance.

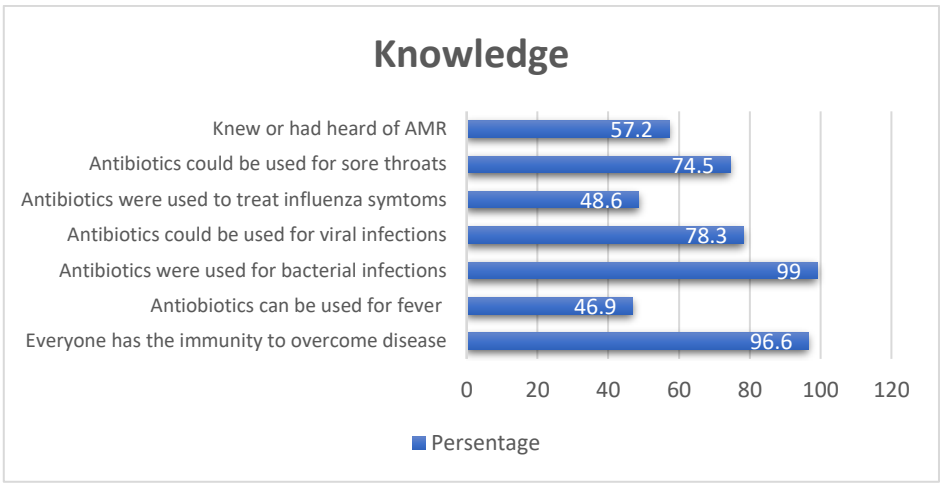

Figure 2. The respondents' level of knowledge

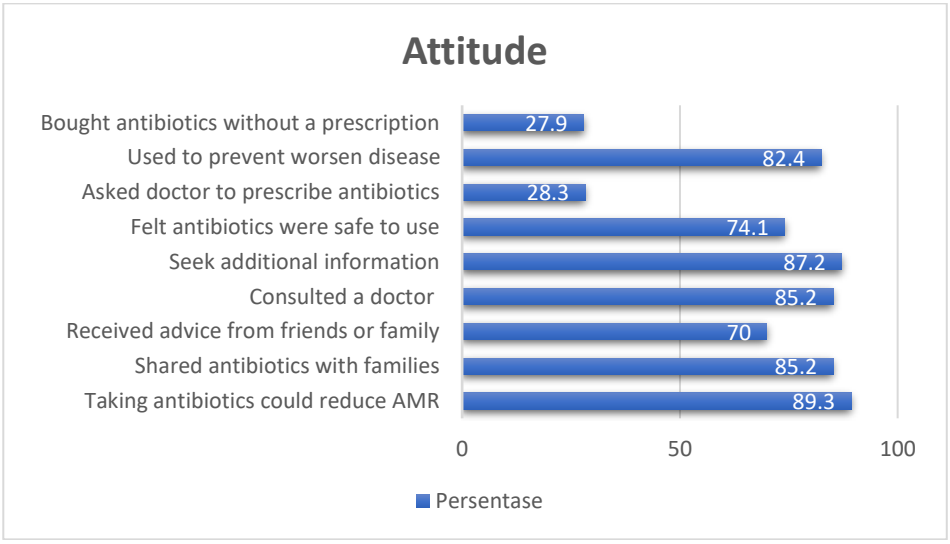

Figure 3. The respondents' level attitude

Table 2 reveals that the level of knowledge regarding the use of short-term antibiotics was still lacking in 58.3% (n=169) of the respondents (score, <5). A total of 66.6% (n=193) of the respondents had a poor attitude toward the use of antibiotics (score, <7). A relationship was noted between the duration of drug use (p=0.032) and level of knowledge; no relationship was observed between sociodemographic characteristics (p>0.05) and patient attitude.

3.2. MPC model

Table 3 presents the mean rank in the intervention group (160.68), which was significantly higher than that in the control group (130.11) (p=0.001). Moreover, the proportion of compliant patients in the intervention group (35.6%) was significantly larger than that in the control group (12.5%) (risk ratio (RR), 2.849; 95% confidence interval (CI)), 1.756–4.623; p<0.001). The predominant reason for noncompliance (score, <8) in the intervention group was forgetting (46.8%, n=44) and that in the control group was not knowing or not being told to take the medication regularly (55.6%, n=70). The logistic regression model that included four variables (MPC, occupation, numbers of tablet prescribed, and length of use) that were eligible to be included in the multivariate model (p<0.25) revealed that these variables affected compliance to short-term antibiotic use in 18.6% of the patients, whereas the rest of the patients were influenced by other variables. The only variable that significantly influenced compliance to short-term antibiotic use was the

MPC intervention (p<0.001). Abbreviations: MPC, modified pharmacy counseling; risk ratio (RR); confidence interval (CI); adjusted odds ratio (aOR).

Table 2. Knowledge level and attitude regarding antibiotic use (n=290)

Level	Knowledge n (%)	Attitude n (%)
Good	121 (41.7)	97 (33.4)
Poor	169 (58.3)	193 (66.6)
Variables	p	p
Age group	0.659	0.424
Sex	0.852	0.431
Level of education	0.266	0.649
Occupation	0.442	0.194
Payment methods	0.100	0.292
Perception of drug price	0.719	0.882
Prescription from doctor	0.155	0.379
Number of tablets prescribed	0.277	0.235
Frequency of taking medicine	0.265	0.462
Length of use	*0.032	0.292
Number of types of drugs in the prescription	0.535	0.089

*significance (p<0.05)

Table 3. Compliance with short-term antibiotic use

	Intervention n (%)	Control n (%)	RR	95% CI	p
Compliance					
Compliant (Score = 8)	52 (35.6)	18 (12.5)	2.849	1.756-4.623	<0.001
Noncompliant (Score <8)	94 (64.4)	126 (87.5)			
Compliance rate					
Mean rank	160.68	130.11	-	-	0.001
Variable			aOR	95% CI	p
MPC			4.316	2.251-8.275	*<0.001
Occupation					
Employee			1.526	0.699-3.331	0.288
Housewife			0.454	0.153-3.331	0.156
Self-employed			0.966	0.363-2.572	0.945
Not working			Ref	-	-
Number of tablets prescribed					
<10 tablets			1.672	0.539-5.186	0.373
=10 tablets			0.817	0.278-2.398	0.713
>10 tablets			Ref	-	-
Length of use					
≤3 days			2.094	0.497-8.828	0.314
4-5 days			3.917	0.932-16.469	0.062
>5 days			Ref	-	-

Note: Nagelkerke R2 = 0.186
*significance (p<0.05)

3.3. Overview of research

The MPC model is a practical guide or tool designed to provide clarifications to pharmacy workers working in community pharmaceutical services and to facilitate the development of their skills based on the required competencies. The expected benefits are that the model would increase the pharmacy workers' awareness regarding the significance of providing pharmaceutical counseling, which would have a positive influence on their duties; facilitate an understanding in the concepts of pharmaceutical counseling and effective communication; and enable them to practice the acquired skills in their respective work units [20], [21].

This research is part of the development of the MPC model, and its effectiveness was tested for the first time. In Indonesia, comprehensive research on the knowledge, attitudes, and practices related to the use of short-term antibiotics in outpatients who visit pharmacies has not been widely published. Pharmacies are the most easily accessible health facilities and are often accessed first instead of other facilities, such as hospitals and clinics, by the public. This research is the first step in obtaining basic quantitative data on the patterns of antibiotic use, knowledge levels, and attitudes toward antibiotic use in the Indonesian society. The data acquired in this study could assist in implementing current community educational campaigns on antibiotics, and they provide further insights that could aid in designing future multifaceted interventions targeting specific areas to promote the rational use of antibiotics; additionally, they complement existing knowledge on the subject and address attitude gaps in the fight against antibiotic resistance.

3.4. Comparison with previous studies

Currently, the level of knowledge regarding the use of antibiotics remains lacking among adult outpatients in Bali Province. This finding is comparable to those of previous studies. Further, a relationship was noted between the duration of antibiotic use and level of knowledge of the respondents. It has been reported that higher levels of knowledge do not always predict actual behavior patterns [25], [26].

Furthermore, this study revealed that the respondents' attitudes toward the use of antibiotics remain lacking. No relationship was observed between sociodemographic characteristics and the attitude toward the use of short-term antibiotics. Although the attitude score was low, awareness regarding antibiotic resistance was still high in the majority of participants. Similar conditions have been reported in Yogyakarta [22]. Several studies have shown that misconceptions about antibiotics are a major problem in both developing and developed countries [27], [28]. It is recommended to carry out an ongoing antibiotic campaign and the MPC model has the opportunity to be adopted as pharmaceutical care regarding the use of appropriate antibiotics to improve patient safety.

The MPC model has been shown to significantly improve compliance to short-term antibiotic regimens in patients visiting pharmacies where those provided MPC have an almost three times greater chance of compliance than those provided conventional drug information. The proportions of compliant patients in the intervention and control groups were 35.6% and 12.5%, respectively as shown in Table 3. These results strengthen those of research indicating that educational interventions significantly increase short-term antibiotic use compliance and reduce wastage [29]. Moreover, our findings are in line with those of systematic studies in which interventions were designed to increase compliance to treatment, and their effects on treatment compliance and healthcare outcomes were measured, producing significant results; specifically, 49% of the tested interventions were associated with increased medication compliance [30].

It takes approximately 10–15 min to provide a patient with MPC; this cannot be done during peak hours because of the limited availability of pharmacy staff to provide structured information or because the patients themselves are in a hurry owing to the discomfort of waiting in a line for a long time. Patients are generally anxious about their illness and thus, are not in an appropriate position to receive the information provided; therefore, doctors and pharmacists should use simple language to promote treatment compliance [31]. To overcome this, pharmacies are recommended to prepare a written message containing a schedule for taking medication according to the dose prescribed by the doctor, and several messages must be sent as reminders to patients.

Patients who did not adhere to the short-term use of antibiotics reported various reasons as shown in Table 4. The predominant reason was forgetting, followed by not knowing/not being told by the pharmacy worker. These reasons are similar to those reported in several previous studies, in addition to fear of side effects, preoccupation with studying or working, lazy to take medication, tendency to stop medication after the condition improves, difficulty in swallowing medication, and delaying completion of therapy to consult a doctor again [12].

The MPC model was developed based on pharmaceutical counseling guidelines and has not yet received approval from professional organizations; although research shows an increase in patient compliance, this model cannot be adopted immediately.

Table 4. Reasons for noncompliant with short-term use of antibiotics

Groups	Reasons	n	%
Intervention (n=94)	Forget	44	46.8
	Lazy	22	23.4
	Busy	10	10.6
	Feeling better	8	8.5
	Afraid to take medicine	4	4.3
	Hard to swallow	5	5.3
	Need to see the doctor again	1	1.1
Control (n=126)	Don't know/not told by pharmacy staff	70	55.6
	Lazy	16	12.7
	Forget	3	244
	Busy	3	2.4
	Hard to swallow	4	3.2
	Afraid to take medicine	5	4.3
	Need to see the doctor again	6	4.8

4. CONCLUSION

The results of this study show that compliance to short-term antibiotic use in outpatients can be improved by seeking the support of professional organizations to emphasize the need for the MPC model to be adopted as a routine procedure. Pharmacists could take additional steps to improve medication compliance by identifying patient-specific drug-related problems, and MPC could be part of the solution. Instructions provided to patients should be simple, in clear language, and always accompanied by a written version for the goals of therapy to be achieved. To improve services, periodic evaluations of these new services should be performed using a validated assessment tool. This study produces strong evidence suggesting that the MPC model adds additional value to the quality of pharmaceutical care; therefore, it can be one of the most effective strategies for improving patient compliance to therapy.

Collectively, these findings need to be triangulated from the perspectives of patients in referral health facilities and of other healthcare providers (such as doctors and independent practice nurses). Further research is suggested for developing counseling services provided through tele-pharmacy, which involves the use of information technology and electronic communication for providing comprehensive pharmaceutical services.

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