Effect of Medagogy-Based Medication Literacy Enhancement on Medication Adherence Among Older Persons with Physical Multimorbidity: Randomized Controlled Trial

Wichanee Jaimalai, Sirirat Panuthai, Rojanee Chintanawat, Phanida Juntasopeepun*

Abstract: Medication non-adherence leads to poor clinical outcomes, particularly in older people with physical multimorbidity. The Medagogy model is a patient education process which enhances medication literacy resulting in medication adherence. This randomized controlled trial examined the effect of the Medagogy-Based Medication Literacy Enhancement Program on medication adherence among older persons with physical multimorbidity. One hundred participants aged 60 and over with two or more physical chronic conditions living in northern Thailand were randomly assigned into either a control group (n = 50) or an experimental group (n = 50). The control group received only usual care, while the experimental group received the Medagogy-Based Medication Literacy Enhancement Program. The program consisted of exchanging information based on the P-pathophysiology, I-indication, T-treatment, and S-specific through transformative learning and the teach-back method, with six sessions, implemented twice a week for three weeks. Medication adherence was measured using the Brief Medication Questionnaire at the 8th week of the program. Data were analyzed using descriptive statistics and Paired and Independent t-tests.

The results showed that after receiving the program, the experimental group had a significantly higher mean score for medication adherence than the control group. The results indicated that enhancing medication literacy through transformative learning resulted in improvement in medication adherence among older persons with physical multimorbidity. Therefore, nurses can use the Medagogy-Based Medication Literacy Enhancement Program to improve medication adherence among this population group. Further testing in other chronic conditions for the generalizability of the program and integrating digital technology or e-Health into the program are suggested.

Keywords: Medagogy model, Medication literacy, Medication adherence, Older persons, Physical multimorbidity

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Introduction

Multimorbidity is a leading health issue in the healthcare system as it is a major cause of mortality.[1,2] In Thailand, the highest number of people with multimorbidity has been found in older persons.[3] Physical multimorbidity is the most common pattern of multimorbidity, including

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two or more chronic non-communicable and communicable diseases. Among physical multimorbidity, hypertension and diabetes have the highest prevalence.[4,5] Consistent with a Thai study, it was found that hypertension and diabetes are common diseases of physical multimorbidity.[6] Therefore, the researcher was interested in studying physical multimorbidity, emphasizing hypertension and diabetes as they were the most common diseases in older people with multimorbidity. The common management for older persons with physical multimorbidity is pharmacological management.[7,8,9]

The critical impact of physical multimorbidity is the treatment burden known as polypharmacy.[10] Polypharmacy, the management of multiple drugs, is often a complex phenomenon leading to various impacts, such as adverse events, poor clinical outcomes, and medication non-adherence.[7,8]

Medication non-adherence is a main problem of older patients with physical multimorbidity who received polypharmacy. The prevalence of medication non-adherence in older persons was 68.1% of the patients taking 1-2 drugs and 71.3% of those taking 3-4 drugs.[11] The main reason for medication non-adherence was a lack of knowledge about negative consequences of medication non-adherence.[12] This problem is leading to uncontrolled disease[13], which loses approximately $100 billion per year in preventable medical costs and causes 100,000 preventable deaths.[14] Thus, poor medication adherence among older people with multimorbidity should be addressed, as well as medication adherence should be improved for better clinical outcomes in older persons with multimorbidity.

Medication adherence refers to the correspondence between the person's behavior and the recommendations agreed upon by a health care provider.[15] Adherence to medication is an essential component of health outcomes as it can improve functional status, patient outcomes, and quality of life, as well as decrease disease progression, symptom burden, and mortality. A previous study also found that medication literacy was an important factor affecting medication adherence.[16] And strong evidence has been shown that medication literacy can enhance medication adherence.[17,18] Therefore, enhancing medication literacy may contribute to the improvement of medication non-adherence in older persons with physical multimorbidity. Patient education was an effective intervention for increasing medication literacy, leading to changes in medication adherence behavior.[18,19]

Medication literacy refers to the degree of individuals' cognitive and social skills aimed at using medication safely and effectively through the process of obtaining, comprehending, communicating, calculating, and processing medication information to make decisions on their health, regardless of the mode of content delivery.[20] Medication literacy comprises five elements, including 1) dosage literacy – understanding and managing medication; 2) adverse effects literacy – the ability to manage adverse effects of medication; 3) interaction literacy – the ability to realize, avoid, and manage to prevent the interaction between drug and alcohol and drug and food, 4) precautions literacy – the ability to comprehend the symbols on the label of medication; and 5) other information literacy – the ability to know medication expiration date, and to store medication safely.[21] As knowledge and medication information are important factors affecting medication literacy, patient education should be provided to enhance medication literacy.

The patient education intervention had a positive effect on medication literacy.[19,22] The previous studies demonstrated that patient education could improve medication literacy.[18] In addition, the existing evidence showed that patient education intervention providing knowledge and skills about the purpose of drug use, drug names, drug doses, potential drug interactions, and drug side effects through multi-media (web/DVD) and booklet could enhance health literacy about medication usage in older adults.[23] However, the intervention is one-way communication, which the healthcare provider cannot evaluate whether the patient understands or not, resulting in less improvement of social and communication skills, and there was no theoretical basis for this

intervention. Therefore, developing a patient education intervention based on education theories would enable patients to understand the learning process and achieve learning outcomes effectively.

Conceptual Framework for Study

The Medagogy model is an effective model which offers a theoretical foundation that healthcare providers can use to construct a model of patient education.[24] This model emphasizes identifying information flow throughout the process of patient education, starting with the initial information exchange between self-expert patients and health-expert healthcare providers through the internalization of information. The Medagogy attempts to capture the effect of individualism in the medagogic process of interpretation resulting from the fusion of new information with the personal world that leads to behavior changes. Furthermore, this model enables healthcare providers to assess the patient's comprehension of the provided content using the Understanding Personal Perception Scale (UPP scale). Therefore, using a Medagogy-based medication literacy enhancement intervention might improve medication adherence behavior. In terms of strategies used for patient education, it was found that transformative learning and the teach-back method are frequently used. Transformative learning is an adult education concept focusing on transformation through a process of changing perspectives, including self-understanding, belief change, and lifestyle modification.[25] Three main components of transformative learning were disorienting dilemma, critical reflection on assumptions including sources, nature, and outcomes of meaning viewpoint, and rational or critical discourse.[26] Applying transformative learning to educate patients can change their perspectives, beliefs, and behaviors to become healthy behaviors, including increased medication adherence. The teach-back method is a way to confirm the patient's understanding after the educator has explained the information to the patient. In addition, the teach-back method can improve communication between the patient and the staff, which is essential for effective health learning.[27,28] Furthermore, the Agency for Health Care Research and Quality (AHRQ) and the Institute for Healthcare Improvement (IHI) suggested the use of the teach-back method to improve health literacy,[29] which includes medication literacy.

This study used the Medagogy model combined with transformative learning[26] and teach-back[27] strategies in developing the Medagogy-Based Medication Literacy Enhancement Program (M-BMLEP). This program would test the effectiveness in older persons with physical multimorbidity. It was hypothesized that in the experiment group receiving the M-BMLEP, the medication adherence mean score is higher than that before receiving the program and higher than that of the control group.

Methods

Study Design: This study employed a randomized controlled trial, two-group pre-posttest design with single-blind (blinding data collection). The writing of this report follows the CONSORT 2010 checklist of information to include when reporting a randomized trial.

Sample and setting: The sample size was calculated by power analysis through the G*power program with a standard power of 0.80, a significance level of .05,[30] and an effect size of 0.53, showing a sample size of 45 participants per group, or 90 participants total. Anticipating a dropout rate of 10%[31], 50 participants per group or a total number of 100 participants were recruited. The inclusion criteria were 1) aged 60 and over; 2) being diagnosed with hypertension and diabetes; 3) receiving two or more medications; 4) being able to read and write the Thai language; 5) being willing to participate in the study; 5) having good cognitive functions with a score of at least 8 out of 10 assessed by the Mental State Questionnaire (SPMSQ) Thai version of the Chiang Mai Public Health Office;[32] and 6) having self-care ability with a score of at least 12 out of 20 assessed by the Barthel Activities of Daily

Living: ADL Thai version of the Department of Medical Services, Ministry of Public Health.[33] The exclusion criteria were 1) had complications and 2) no completion of participating in all program sessions.

The convenience sampling method was used to select one province in the north of Thailand comprising 25 districts. Drawing lots was used to randomly select one district, in which there were 19 primary care units (PCUs). Five PCUs were randomly selected as the number was suitable to deliver the intervention twice a week. Six hundred and fifty-four eligible potential participants were recruited from five PCUs. Drawing lots was used to select 100 from 654 participants, 20 participants per each PCU. All selected participants met the inclusion criteria. Then, 20 participants in each PCU were randomly selected into the experimental and control groups equally (10 per each group).

Randomization: The 20 participants were randomly selected by a research assistant using the computer program from the list of patients in each primary care. After that, block randomization was utilized in order to distribute 20 patients from each primary care unit into either the experimental (E) or the control (C) group. The size of this block randomization was four and fixed, which consists of six possible patterns. Simple random sampling with replacement was used to randomly select 20 participants in each primary care unit following block randomization patterns. Thus, each primary care unit had the control and the experimental participants of 10 equally. The research assistant kept the list of experimental and control participants' names in concealed envelopes and opened the sealed envelope once the eligible participants gave informed consent to participate in the study. The flow of participants is shown in **Figure 1.**

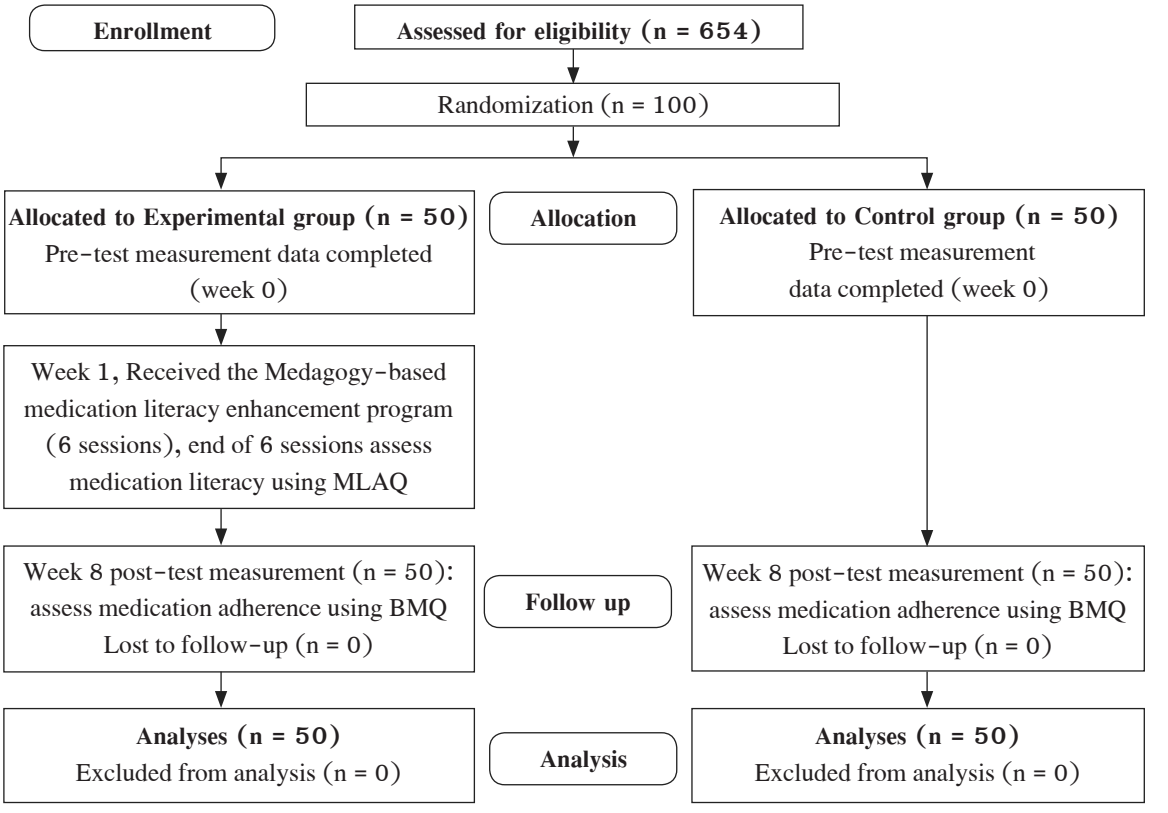

Figure 1. Diagram of the recruitment process and the process of this study

Ethical Considerations: This study received approval from the Research Ethics Committee within the Faculty of Nursing at Chiang Mai University (study code: 2564-EXP092). Participants were informed about the study's purposes, methods, benefits, and potential risks of participation, keeping confidentiality, and withdrawal. All participants were voluntary to participate in the study with signed informed consent.

Instruments: Data were collected using the following questionnaires.

The Demographic Data Form developed by the primary investigator (PI), was used to collect participants' personal data comprising gender, age, marital status, educational level, living arrangement and clinical data, including number of chronic diseases, duration being diagnosed, the number of medicines per meal, frequency of medicines taking per day.

The Brief Medication Questionnaire (BMQ) was originally developed by Svarstad and colleagues[34] and translated into the Thai language by Sriwarakorn and colleagues.[35] The BMQ Thai version is a 13-item questionnaire used to assess participants' medication adherence. It consists of four domains: the regimen domain (seven items), the belief domain (two items), the recall domain (two items), and the access domain (two items). Each item is scored either 0 or 1, where 0 is 'non-adherence to medication' and 1 is 'adherence to medication'. An example of the questionnaire is, "Did you stop taking any medications during last six months?" The total possible scores range from 0 to 13, with higher scores indicating higher medication adherence. The BMQ's sensitivity and specificity were acceptable.[35] The BMQ's reliability calculated using the Kuder-Richardson 20 method (KR-20) in this study was .82.

Medagogy-Based Medication Literacy Enhancement Program (M-BMLEP)

This program was developed by the primary investigator (PI) and was a group-based intervention providing the participants with information through the process of the Medagogy model. The program aimed to enhance medication literacy. The information provided was: 1) information exchange through transformative learning and teach-back strategies based on the PITS model 2) information exchange regarding the knowledge and skills of drug administration through transformative learning and teach-back strategies, and 3) informed decisions to change behaviors through transformative learning strategies. This program was divided into six sessions and lasted about 2 hours each **(Appendix, Table 1).** The program was conducted twice a week by the PI in the meeting room of each primary care unit. The content topics were pathophysiology, signs and symptoms, treatments, and medication literacy, including dosage literacy, effects literacy, interactions literacy, precautions literacy, and other information literacy. The M-BMLEP consisted of a medication literacy handbook, a VDO presentation for providing knowledge about hypertension and diabetes, and the Understanding Personal Perception Scale (UPP scale). The scale was used to evaluate the understanding of health information. The UPP scale was back-translated into Thai from the original English version of Stewart.[24] The UPP scale consisted of two questions: 1) How clear is your present understanding of this information, previously reviewed with or provided to you? and 2) How comfortable are you with your understanding and ability to act on or carry out this information? The UPP scale is a 5-point Likert scale ranging from 1 to 5 levels, with sun and cloud images to represent the level of understanding. The M-BMLEP was assessed for content validity by a panel of six experts comprising a physician specializing in chronic disease, two nurse instructors specializing in health literacy and medication, two nurse instructors specializing in chronic disease and patient education, and an educator specializing in transformative learning. The program was revised according to the experts' suggestions.

After immediately completing the M-BMLEP, the experimental participants were assessed medication literacy using the Medication Literacy Assessment Questionnaire (MLAQ), developed by Horvat and Kos,[21] and translated into the Thai language by Miresse.[16] There are 23 items with five subscales: 12 items for dosage literacy, two items for effects literacy, two items for interactions literacy, three items for precautions literacy, and four items for other information literacy. The MLAQ includes two types of questions: multiple-choice and fill-in-the-blank. Every single item selected 5-choice question is scored either 0 or 1, where 0 is 'incorrect answer/ no answer,' and 1 is 'correct answer.' Each fill-in-the-blank question is scored either 0 or 1, where 0 is 'incorrect answer/ no answer,' and 1 is 'correct answer.' An example of the questionnaire is, "From the information on the drug label, how do you take medicine?" The total possible scores range from 0 to 23, and they are divided into three levels based on class intervals: low level of medication literacy (0.00-7.66), moderate level of medication literacy (7.67-15.33), and high level of medication literacy (15.34-23.00). The MLAQ's reliability calculated using the Kuder-Richardson 20 method (KR-20) in this study was .80.

The Standard Care

The standard care consisted of physical examination and regular treatment protocol by a physician and a pharmacologist and a home visit by a nurse. Both the experiment and control groups received standard care.

Data Collection: The study was implemented at five primary care units during March-May 2022. Six research assistants (RAs) were trained by the PI about what they were responsible for doing regarding data collection for this study. After receiving permission to collect data, five research assistants (RAs) who were nurses working in each PCU recruited the eligible participants in each primary care unit. The sixth researcher assistant, who was a nurse working in the hospital, randomly assigned 20 patients in each primary care unit into either the experimental group or the control group using block randomization and sent an invitation letter to both the experimental and control participants. Then, she met the participants in each group on a different day. She informed the participants about the study's purpose, benefits and potential risks of the program, and protection of the participants' human rights. The PI implemented the 3-week, 6-session the M-BMLEP for the experimental group twice a week in addition to standard care, while the control participants received only standard care. The experimental participants were asked to keep confidentiality outside of sessions. For the experimental group, at the end of the 3-week program, five RAs measured the medication literacy of the participants using the MLAQ. If it was found that any participant's medication literacy level was not at a high level, the PI would provide additional information that she/he did not understand. Medication adherence of the experimental and control participants was collected by the five research assistants using the BMQ before and after the program. The five RAs were blinded to group allocation.

Data analysis: Data were analyzed using SPSS version 18. Descriptive statistics (frequency, percentage, mean and standard deviation) were utilized to analyze demographic data and mean scores of the dependent variable (medication adherence). The Kolmogorov-Smirnov test showed a normal distribution of the data; thus, independent t-test was used to compare the differences between post-test scores of medication adherence of the experimental and control groups, and a paired t-test was used to compare differences between the pretest and post-test scores of medication adherence of the experimental group.

Results

The majority of participants in the experimental and control groups were female, in the young-old age group (60-69 years old), married, primary school completion, lived with a spouse and descendant, had three chronic diseases, and had a duration of being diagnosed more than 10 years. The type of medication commonly used in both groups were antihypertensive drugs, diabetes drugs,

and antihyperlipidemic drugs. Regarding taking medications, most of the experimental participants took four tablets per meal three times per day, and the control participants took three tablets per meal two times per day. Four control participants took medications five times and over daily. All demographic data between the two groups were not significantly different (see **Table 2**).

Table 2. Demographic and clinical characteristics of participants (n = 100)

Demographic Characteristics	Control Group (n = 50)		Experimental Group (n = 50)		p-value
	n	%	n	%	
Gender					.685[a]
Male	20	40	22	44	
Female	30	60	28	56	
Age (year)					
Mean (SD)	68.10	(5.15)	67.96	(5.17)	1.00[b]
60-64	13	26	14	28	
65-69	18	36	17	34	
70-74	14	28	13	26	
75-79	4	8	5	10	
≥ 80	1	2	1	2	
Marital status					.742[b]
Single	4	8	5	10	
Married	34	68	30	60	
Widowed or divorced	12	24	15	30	
Educational level					.587[b]
Primary school	47	94	39	78	
Secondary school	3	6	7	14	
Certificate/Diploma	0	0	4	8	
Living arrangement					.823[a]
Alone	8	16	8	16	
Living with spouse	11	22	15	30	
Living with descendant	12	24	10	20	
Living with spouse and descendant	19	38	17	34	
Number of physical morbidities					.495[b]
2	8	16	4	8	
3	34	68	38	76	
≥ 4	8	16	8	16	
Duration of being diagnosed					.424[b]
< 6 months	1	2	0	0	
6 months − 5 years	5	10	9	18	
6-10 years	8	16	10	20	
> 10 years	36	72	31	62	
Number of medicines per meal					.118[b]
2	9	18	6	12	
3	16	32	17	34	
4	9	18	18	36	
5	7	14	7	14	
6	7	14	1	2	
7	2	4	1	2	

Table 2. Demographic and clinical characteristics of participants (n = 100) (Cont.)

Demographic Characteristics	Control Group (n = 50)		Experimental Group (n = 50)		p-value
	n	%	n	%	
Frequency of medicines taking per day					
2	22	44	20	40	.117[b]
3	18	36	26	52	
4	6	12	8	16	
≥ 5	4	8	0	0	
Complications of diseases					.617[b]
None	48	96	47	94	
Numbness	1	2	2	4	
CKD	1	2	1	2	

Effectiveness of M-BMLEP

The participants' total mean scores of understanding of health information after each session completion demonstrated a clear understanding of health information (M=1.08, SD= 0.07).

The result showed that the medication literacy of most participants was high (M=19.98, SD = 2.71). Three participants had a moderate level of medication literacy (range = 13-14), and the PI gave them additional knowledge and skills until their medication literacy improved and reached a high level (range = 18-19).

At baseline, the total medication adherence mean scores of the two groups were not significantly different. But at week 8, after completion of the program, the mean score of medication adherence of the experiment group (M = 10.92, SD = 1.78) was significantly higher than that of the control group (M = 8.84, SD = 2.06) and significantly higher than that of the baseline (M = 8.20, SD = 2.64) (all p-values < .001) (see **Table 3**). Considering each dimension of medication adherence in the experimental group, mean scores of regimen domain and belief domain of medication adherence at week 8 after completion of the program (M = 6.10, SD = 1.05; M = 1.96, SD = 0.20) were significantly higher than those of the baseline (M = 4.34, SD = 1.83; M = 1.62, SD = 0.57) (p < .001). Mean scores of recall domain and access domain of medication adherence at week 8 after completion of the program (M = 0.92, SD = 0.27; M = 1.96, SD=0.20) were significantly higher than those of the baseline (M = 0.60, SD = 0.53; M = 1.64, SD = 0.60) (p < .005). At week 8 after completion of the program, the medication adherence mean scores of all dimensions in the experimental group were significantly higher than those of the control group (p < .001) (see **Table 3**).

Table 3. Comparison of the total and subscale of medication adherence between the control and experimental groups and comparison of the total and subscale of medication adherence between before and after receiving the Medagogy-based medication literacy enhancement program in the experimental group

Medication adherence Total and subscale		Experimental group		Control group		t[1]	*p*-value
		Mean	SD	Mean	SD		
Total	Pre-test	8.20	2.64	7.98	2.49	-.427	.670
	Post-test	10.92	1.78	8.84	2.06	-5.39	< 0.001
	t[2]	-6.27					
	p-value	< 0.001					
Regimen domain	Pre-test	4.34	1.83	4.22	2.14	-.302	.764
	Post-test	6.1	1.05	5.12	1.44	-3.89	< 0.001
	t[2]	-5.832					
	p-value	< 0.001					

Table 3. Comparison of the total and subscale of medication adherence between the control and experimental groups and comparison of the total and subscale of medication adherence between before and after receiving the Medagogy-based medication literacy enhancement program in the experimental group (Cont.)

Medication adherence Total and subscale		Experimental group		Control group		t^1	*p*-value
		Mean	SD	Mean	SD		
Belief domain	Pre-test	1.62	0.57	1.54	0.54	-.721	.473
	Post-test	1.96	0.20	1.44	0.58	-6.03	< 0.001
	t^2	-4.05					
	p-value	< 0.001					
Recall domain	Pre-test	0.60	0.53	0.48	0.50	-1.15	.251
	Post-test	0.92	0.27	0.62	0.50	-3.77	< 0.001
	t^2	-3.64					
	p-value	< 0.001					
Access domain	Pre-test	1.64	0.60	1.74	0.49	.917	.361
	Post-test	1.96	0.20	1.66	0.51	-3.82	< 0.001
	t^2	-3.47					
	p-value	< 0.001					

Note. t^1 = independent t test

t^2 = dependent t-test

Discussion

The results of this study indicated that the M-BMLEP can improve medication adherence among older persons with physical multimorbidity. According to the conceptual framework, it is anticipated that participants would have good medication literacy after obtaining the program. The rationale is that the M-BMLEP provided exchanging health information based on the PITS and skill training in drug administration through transformative learning and the teach-back method. Once the program is completed, the participants' medication literacy would be assessed using the UPP scale and reinforced on any topics they did not understand until the medication literacy scores of all participants reached a high level. The high medication literacy can give rise to an increase in medication adherence as a result. That is, the M-BMLEP can enhance medication adherence through improved medication literacy. It can be explained according to the process and methods used in the M-BMLEP.

The M-BMLEP focuses on behavior changing process, the initial exchange between two experts: the provider, the expert of health, and the patient, the expert of self. Once the information is internalized and digested, the individual interprets it and makes a decision to change his/her behavior. The M-BMLEP begins with the PI's provision of health information based on PITS involving knowledge about diseases, signs and symptoms, complications, medication treatment, and drug administration of hypertension and diabetes disease. Such a method is different from the traditional one that gives knowledge about each topic separately. After that, the participants shared information about their health, including disease symptoms and progression, complications of diseases, management of symptoms and complications, understanding of medication usage, side effects of drugs for hypertension and diabetes, and drug administration. The participants' shared information enabled the PI to comprehend the participants' perception and management of diseases and drug administration. Consequently, the PI could give the participants the appropriate information to increase their understanding of health information, as well as specific suggestions for problems and difficulties that each participant encountered. After receiving the health

information and suggestions, the participants applied the obtained information to their real context, leading to changing drug administration behaviors. Additionally, the program provided skill training in drug administration through simulation for the participants. They were encouraged to practice using simulation to deal with frequently occurring problems in drug administration, such as the management of adverse drug reactions and forgetting to take medication. Therefore, the participants could apply the obtained knowledge and trained skills to perform in their daily lives and enhance their medication literacy. The findings of this study were consistent with previous studies reporting that health education can enhance health literacy and medication literacy.[36,37] Strong evidence also supported that patient education, skill development, and medication administration enhance medication literacy and lead to improving medication adherence.[38,39,40,41]

In addition, The M-BMLEP can enhance medication adherence through an increase in medication literacy using two main strategies of the program: transformative learning and the teach-back method. Transformative learning consists of three major elements: disorienting dilemma, critical reflection on assumptions including sources, nature, and outcomes of meaning viewpoint, and rational or critical discourse. Concerning the disorienting dilemma, the PI presented the situation about disease complications resulting from medication non-adherence and encouraged the participants to share their experience of disease management and drug administration via group discussion. With this strategy, the participants were encouraged to review their past experiences and learn about others' experiences. This led them to have various viewpoints and motivations to change their behaviors. Regarding critical reflection, the PI used open-ended questions to encourage the participants to critically reflect on obtained information or knowledge. This strategy contributed to individual interpretation and informed decisions for behavior change. The rational discourse was used to establish a discussion atmosphere in which the participants had the self-confidence to share opinions and exchange experiences with each other. It also enabled the PI to know the problems, difficulties, and limitations of medication adherence, and to give suggestions about how to deal with the problems appropriately, resulting in confidence in behavior change of the participants. The results of this study are supported by previous studies showing that transformative learning theory applies to health education to change attitudes and behavior and improve health outcomes.[42,43,44]

Another important strategy of the Medagogy model is the teach-back method, which is used for verifying patients' understanding of their health information in their own words. After the provision of health information, the researcher used open-ended questions and activities to encourage the participants to review information and describe their health information in their own words. Importantly, the researcher could confirm the participants' understanding of health information and give them additional information appropriately. Consequently, the participants' medication literacy could improve. This study's findings were consistent with the previous study, which utilized the teach-back method as an educational strategy to improve knowledge of the disease and its management, resulting in improvements in patient knowledge, medication adherence, and other health outcomes.[27,28,45]

In addition, the study results might be explained with the relationship between cognitive function and learning capacity. It can be supported by a study that reported a positive correlation between cognitive ability and health literacy and a significantly positive direct effect of health literacy on medication adherence.[46] As the majority of participants were in the young-old age group (60-69 years) (62%), with potentially good cognitive abilities compared to the middle-old and old-old age groups. These good cognitive abilities may have resulted in better medication literacy, which in turn may have led to better medication adherence. Moreover, learning methods used in the Medagogy model, especially transformative learning and teach-back

method, may assist participants in memory retrieval,[24] contributing to increased medication literacy and improved medication adherence consequently.

Limitations

As most participants in this study were young old, the study results might not be generalized to all old age. It is suggested that further studies investigate the effect of the Medagogy-based medication literacy enhancement programs among middle-old age and old-old age persons with physical multimorbidity. Also, the use of the program in older persons with a low level of education should be a concern because participants are required to reflect on what they perceive. Prior to the delivery of the program, nurses should be trained, especially in encouraging participants' reflection.

Conclusions and Implications for Nursing Practice

This study investigated whether the M-BMLEP, which used the Medagogy model combined with transformative learning and teach-back methods as a conceptual framework, can enhance medication adherence in older persons with multimorbidity. The study findings showed increased medication literacy, leading to improved medication adherence in the experimental group. From the findings of this study, nurses should be trained to apply the M-BMLEP to patient education for persons with physical multimorbidity in order to enhance their medication literacy and consequently improve their medication adherence behaviors. It is also suggested that nurse administrators should encourage nurses who work in chronic disease clinics, particularly hypertension and diabetes, to provide knowledge and skills for enhancing medication literacy. This performance can increase patients' medication adherence and improve key performance indicators of other health outcomes. Further testing in other chronic conditions for the generalizability of the program is needed.

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Appendix

Table 1. Content of the Medagogy-based medication literacy enhancement program

Session/Week Process	Objective/Strategies	Activities
Session 1-2 (1st week): Information exchange	To exchange information between the researcher and participants through PITS model/ Transformative learning and teach back method	**Session 1 (2 hr.)** 1. Giving information about the rules of a collaborative learning group and providing notebooks to all participants 2. Sharing illness experiences of participants used open-ended questions to encourage the participants to give the reason for taking medication and goals of pharmacotherapy. 3. Each participant recorded their expectations or goals of the pharmacotherapy in the notebooks. 4. Providing information using VDO presentation about the disease's pathophysiology based on the PITS model 5. Asking about the disease's pathophysiology and dividing the participants into two groups. Each group taught the researcher back with their own words. 6. Using the Understanding Personal Perception Scale to assess the participants' understanding of the information provided. If the participants did not understand information, the researcher would give additional information until they understood. **Session 2 (2 hr.)** 1. Reviewing the goals of pharmacotherapy of each participant as discussed in session 1; and asking about their physical and biochemical change in order to introduce this session's content 2. Using the PITS model as a framework to provide information about signs and symptoms, disease complications, and use of medication to reduce signs, symptoms and complications 3. Asking the participants about signs and symptoms, disease complications, and how to reduce the signs, symptoms, and complications; and dividing participants into two groups. Each group taught the researcher back. 4. Using the Understanding Personal Perception Scale to assess the participants' understanding of the information provided. If the participants did not understand the information, the researcher would give additional information until they understood. 5. Encouraging the participants to review their goals of pharmacotherapy, clarifying their goals with reasons for changing or remaining the goals, and planning for the approach to achieve them. All information was recorded in their notebook. The next appointment was made.

Table 1. Content of the Medagogy-based medication literacy enhancement program (Cont.)

Session/Week Process	Objective/Strategies	Activities
Session 3-4 (2nd week) Exchange information	To enhance medication literacy/ Transformative learning and teach back method	**Session 3 (2 hr.)** 1. Asking about whether and how the use of medication could decrease signs and symptoms, as well as disease complications, and bringing their answers to introduce this session's content about medication management 2. Using open-ended questions to encourage all participants to share their medication management 3. Using a video presentation to provide knowledge for enhancing medication literacy 4. Using the Understanding Personal Perception Scale to assess the participant's understanding of the information provided. If the participants did not understand the information, the researcher would give additional information until they understood. 5. Encouraging participants to give critical reflection on medication administration and to apply the provided information to their medication management. The participants recorded all information in their notebooks. The next appointment was made. **Session 4 (2 hr.)** 1. Asking about medication management and bringing their answers to introduce medication management skills 2. Dividing the participants into two subgroups to practice drug management skills and to teach back on the topic of medication management 3. Using the Understanding Personal Perception Scale to assess the participant's understanding of the information provided. If the participants did not understand the information, the researcher would give additional information until they understood. 4. Encouraging all participants to give their critical reflection on knowledge and skills of medication management and to express their confidence in applying them to manage their medication. The researcher then inquired for further information that the participants required and made the next appointment.
Session 5-6 (3rd week) Informed decision to change behavior	To encourage inform decision to change behavior to medication adherence/ Transformative learning	**Session 5 (2 hr.)** 1. Reviewing the previous session's content and introduced this session's content focusing on medication management's successes and barriers

Table 1. Content of the Medagogy-based medication literacy enhancement program (Cont.)

Session/Week Process	Objective/Strategies	Activities
		2. Using open-ended questions to encourage all participants to share their experiences applying the methods learned from the previous sessions, including success, problems/obstacles, and solutions. Then, the participant recorded information in their notebooks. 3. Providing additional information to ensure that the participants gained sufficient knowledge and appropriately managed their medication. Additional support resources involving social, environmental, and financial factors to reduce medication management problems and obstacles were also provided. **Session 6 (2 hr.)** 1. Reviewing the previous session's content and introducing this session's content about sustainable medication management planning 2. Encouraging all participants to share with each other about their medication management planning and support resources to achieve medication management's sustainable accuracy. Then, participants recorded information in their notebooks. 3. Research assistants measured the medication literacy of the participants using the Medication Literacy Assessment Questionnaire. If it was found that any participant's medication literacy level was not at a high level, the researcher would provide additional information that she/he did not understand.

ผลของการเสริมสร้างความรอบรู้ด้านยาตามรูปแบบการสอนเพื่อให้ผู้ป่วยเป็นผู้เชี่ยวชาญด้านสุขภาพต่อความร่วมมือในการใช้ยาในผู้สูงอายุโรคเรื้อรังทางกายร่วมหลายโรค: การทดลองแบบสุ่มและมีกลุ่มควบคุม

วิชานีย์ ใจมาลัย ศิริรัตน์ ปานอุทัย โรจนี จินตนาวัฒน์ พนิดา จันทโสภีพันธ์*

บทคัดย่อ: ความไม่ร่วมมือในการใช้ยาถือเป็นปัญหาที่สำคัญมากในผู้สูงอายุที่มีโรคเรื้อรังทางกายร่วมหลายโรคซึ่งได้รับยาหลายขนานส่งผลให้เกิดผลลัพธ์ด้านสุขภาพที่ไม่ดี รูปแบบการสอนเพื่อให้ผู้ป่วยเป็นผู้เชี่ยวชาญด้านสุขภาพ เป็นกระบวนการให้ความรู้ด้านสุขภาพเพื่อเสริมสร้างความรอบรู้ด้านยานำไปสู่การเกิดความร่วมมือในการใช้ยา การศึกษานี้เป็นการทดลองแบบสุ่มและมีกลุ่มควบคุม มีวัตถุประสงค์เพื่อทดสอบผลของการเสริมสร้างความรอบรู้ด้านยาตามรูปแบบการสอนเพื่อให้ผู้ป่วยเป็นผู้เชี่ยวชาญด้านสุขภาพต่อความร่วมมือในการใช้ยาในผู้สูงอายุที่มีโรคเรื้อรังทางกายร่วมหลายโรค โดยคัดเลือกกลุ่มตัวอย่างแบบสุ่ม กลุ่มตัวอย่างทั้งหมด 100 ราย ได้รับการสุ่มเข้ากลุ่มควบคุม และกลุ่มทดลอง กลุ่มละ 50 รายเท่ากัน กลุ่มควบคุมได้รับการดูแลตามปกติ กลุ่มทดลองได้รับการเสริมสร้างความรอบรู้ด้านยา ประกอบด้วยการแลกเปลี่ยนข้อมูลตามกรอบของพิตส์ (PITS model) ซึ่งเป็นข้อมูลเกี่ยวกับพยาธิสภาพของโรค (P-pathophysiology) อาการ (I-indication) การรักษา (T-treatment) และการรักษาเฉพาะ (S-specific)โดยใช้หลักการเรียนรู้สู่การเปลี่ยนแปลง และเทคนิคการสอนกลับ กิจกรรมจำนวน 6 ครั้ง สัปดาห์ละ 2 ครั้ง เป็นเวลา 3 สัปดาห์ และทำการเก็บรวบรวมข้อมูลความร่วมมือในการใช้ยาในสัปดาห์ที่ 8 โดยใช้แบบสอบถามความร่วมมือในการใช้ยา การวิเคราะห์ข้อมูลใช้สถิติพรรณนา การทดสอบที (t-test) ผลการศึกษาคือ หลังการได้รับโปรแกรมกลุ่มทดลองมีคะแนนเฉลี่ยความร่วมมือในการใช้ยาสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ จากผลการศึกษาพบว่าการเสริมสร้างความรอบรู้ด้านยาด้วยหลักการเรียนรู้สู่การเปลี่ยนแปลงส่งผลให้ผู้สูงอายุที่มีโรคเรื้อรังทางกายร่วมหลายโรคมีความร่วมมือในการใช้ยาดีขึ้น ดังนั้นพยาบาลสามารถนำโปรแกรมการเสริมสร้างความรอบรู้ด้านยาไปใช้เพื่อส่งเสริมความร่วมมือในผู้สูงอายุที่มีโรคเรื้อรังทางกายร่วมหลายโรค เสนอแนะให้มีการทดสอบโปรแกรมในผู้ป่วยกลุ่มอื่น ๆ เพื่อยืนยันผลการศึกษา รวมถึงการประยุกต์เทคโนโลยีดิจิทัลหรือเทคโนโลยีสารสนเทศทางสุขภาพมาใช้ในโปรแกรม

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คำสำคัญ: การสอนเพื่อให้ผู้ป่วยเป็นผู้เชี่ยวชาญด้านสุขภาพ ความรอบรู้ด้านยา ความร่วมมือในการใช้ยา ผู้สูงอายุ โรคเรื้อรังทางกายร่วมหลายโรค

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