Original Article

Effects of Pharmaceutical Pictograms on Medication Adherence in Elderly Patients with Chronic Diseases at Primary Health Care Center in Hat Yai, Songkhla

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Objective: To compare drug adherence with or without pharmaceutical pictograms in the elderly with chronic diseases.

Materials and Methods: The present study was a randomized controlled trial conducted between April 2019 and June 2019 at a primary health care center in Hat Yai, Songkhla, Thailand. The elderly patients with chronic diseases were randomly allocated to the experimental group (n=25) and the control group (n=25). The experimental group received pictogram labels, text labels, and verbal information on the consumption of medications from the pharmacist. The control group received text labels and verbal information from the pharmacist. Both groups received follow-up home visits two weeks later.

Results: The present study results showed that medication adherence using pill counts in the experimental group was significantly higher than in the control group. The median medication adherence scores from pill counts was (interquartile range, IQR) 100 (100, 100) versus 95.56 (90.25, 100), respectively, p=0.011. The medication adherence with the medication taking behavior measure for Thai patients (MTB-Thai) significantly increased in the experimental group (100.0%) compared with the control group (45.8%) (p=0.0002).

Conclusion: The present study showed that medication adherence is greatly improved when the medication instruction is supplemented with pictograms. Therefore, medication should include pictograms on labels to better convey medical instructions to elderly patients with chronic diseases.

Keywords: Pharmaceutical pictograms, Medication adherence, Chronic disease, Elderly patients

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Thailand claimed the status of an ageing society in 2005 when 10.0% of the population was aged 60 years or more[1] Currently, Thailand is facing an ageing population, which is 16% of its total population. The elderlies have more underlying illnesses, and more medications are required. It inevitably leads to polypharmacy[2]. Chronic non-communicable diseases (NCD) were reported as two out of three causes of death in the Thai population in 2013[3]. The six most common causes of morbidity and mortality of NCD reported in Thailand were diabetes mellitus, cardiovascular and cerebrovascular diseases, emphysema, cancer, hypertension, and obesity[4].

In Thailand, the prevalence of elderly with polypharmacy ranges from 29.0% to 75.0%[2]. Several studies found that non-medication adherence in patients with chronic diseases range from 43.0% to 78.0%[5,6]. The reasons for 60.0% of the elderly patients not coming for appointments and having non-adherence to medication are due to problems reading medical instruction, inability to comprehend medication advices, physical problems such as memory and visual impairment, hearing problems, disability, psychological problems such as stress, anxiety, and low self-esteems[5,7]. The consequences from polypharmacy were inappropriate drug usage, adverse drug reactions, drug-drug interactions, drug-disease interactions, and non-adherence, which manifests a patient's disability, lower the quality of life, increase requirement for health care resource, increase medical cost, and affects the health care system[2]. Many reviews discovered that in developed countries, adherence among patients suffering from

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chronic diseases to long-term therapies, averages only 50.0% and in developing countries, it would be much lower[8]. The three most common causes of medication non-adherence were misunderstanding or lack of knowledge and awareness (25.6%), the development of the adverse drug events (18.9%), and suggestions of a friend or family member (16.2%)[9].

There are many methods of medication adherence measurement. Each method has its own unique advantages and disadvantages, and no method was considered the best available method. The most common method used to measure adherence, other than patient questioning has been pill counts. The most convenient, least expensive, and easiest way to assess medication adherence was self-reporting. The Morisky scale was one of the most widely used self-reported medication adherence measures[6,10]. The 8-item Morisky Medication Adherence Scale (8-item MMAS) was translated into Thai and was tested for Cronbach's alpha value of 0.61, which is lower than the acceptable value of 0.70. The Medication Taking Behavior measurements for Thai patients (MTB-Thai) was developed and tested for Thai patients and it had clearer and more specific wording, fewer items, and better reliability and validity (Cronbach's alpha value of 0.76 and intraclass correlation coefficients [ICC] of 0.83), which is more than the Thai version of 8-item MMAS[11]. Pharmaceutical pictograms have been designed to help people understand how to take their prescribed medication[12] and generally both the symbol plus text and the text-only conditions resulted in better performance than the symbol-only condition[13]. Pictograms can be easily recognized for their meaning with little or no dependence on language or cultural background and also have the potential to play an important role in improving compliance in the illiterate patient population because these can be recognized and recalled far better than words[12,14]. According to peer-reviewed studies, combining pictures with spoken or written text affects health communication in four aspects, which include drawing attention, helping people comprehend the information, increasing recall of information, and increasing adherence[15]. The aim of the present study is to evaluate the use of pharmaceutical pictograms for elderly with chronic diseases that could help increase the medication adherence.

Materials and Methods

Study design

Randomized controlled trial, single blind controlled trial.

Participants

Fifty elderly patients that were 60 years or older with the diagnosis of type 2 diabetic mellitus or primary hypertension, or dyslipidemia according to ICD-10 (E11-E11.9, I10, E78.0 and E78.2-E78.5) at Ban-Phru Municipal Public Health Center between April 1, and June 30, 2019 were enrolled.

Inclusion criteria

Participants were categorized to low and medium adherence according to MTB-Thai (score ≤23), had taken medication for chronic disease of more than one item, spoke and understood written Thai language, and prepared the medication themselves.

Exclusion criteria

Excluded parties were defined as having cognitive impairment according to mini-mental state examination Thai version (MMSE-Thai 2002) or defined as suspected depression cases according to depression screening questionnaire (2Q), others were defined as having visual impairment according to visual acuity of more than 20/50 from Snellen chart, and those with type 2 diabetic mellitus that received insulin injection.

Method

Participants were randomly assigned to the experimental group, which was pictogram plus text labels, and the control group, which was text labels only, by simple random sampling. Allocation concealment were conducted by using opaque sealed envelope technique. The experimental group received pictograms and text labels with the same instructions and were coached on how to use and interpret the pictograms. Both the experimental group and the control group received standard advice of text label by the pharmacist. The researcher developed the pharmaceutical pictograms, according to Angsuwattanakul et al (2014)[16,17] and Merks et al (2018)[18] and the pictograms were tested for their content validity by four experts that included a family practitioner, a pharmacist, a health academician, and a professional public relations officer. The reporting index of item objective congruence (IOC) was 0.75 to 1.0 (>0.5) in Figure 1.

Setting

Ban-Phru Municipal Public Health Center, Hat Yai, Songkhla.

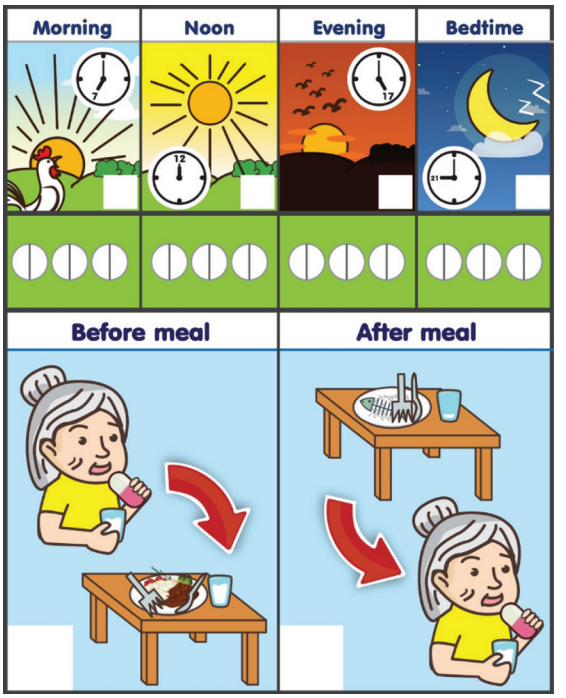

Figure 1. Pharmaceutical pictogram used in the experimental group.

Data collection

The sociodemographic characteristic questionnaires were carried out by the trained researcher's assistants. Information about underlying medical conditions and medications were reviewed from the OPD card and the JHCIS system. Medication adherence was measured by the researcher or the researcher's assistants by the Medication Taking Behavior measure for Thai patients (MTB-Thai) and pill count. Non-adherence was labelled at low and medium adherence (at 23 or less)[19].

Data editing

The data were double entered for detecting any inaccuracy in the records in a computer database management system by Epi-Data version 3.1 software.

Data analysis

R Studio version 3.6.1. was used for data analyses. Percentages were calculated for descriptive variables. Median and interquartile range (IQR) were also calculated for quantitative variables. Wilcoxon rank sum test, chi-square test, and Fisher exact test were applied to study the variables by adherence status, p-value of less than 0.05 was considered as statistically significant.

Ethics approval

The present study was conducted in line with the Belmont Report and was approved by the Human Research Ethics Committee (HREC), Faculty of Medicine, Prince of Songkla University (Ref no: REC.62-030-9-4).

Results

Participant's characteristic. The present study included 50 participants who met the criteria for inclusion but only 49 participants were analyzed. All participants were completely followed up, but one was excluded during the process of analysis due to using the previous medication. Participants in the experimental group had a median age slightly higher than in the control group at 71 (67, 79) and 68 (63, 76), respectively . The main socioeconomic characteristics and clinical baseline are summarized in Table 1.

Medication adherence in elderly with chronic disease

According to the medication adherence assessment with pill counts, the experimental group had median score of medication adherence of 100 (100, 100), which is higher than in the control group at 95.56 (90.25, 100). The medication adherence assessment in view of pill counts between the control group and the experimental group were significantly different (p=0.011). Medication adherence in view of MTB-Thai was significantly increased in the experimental group (100%) compared with in the control group (45.8%) (p=0.0002), as summarized in Table 2.

Median score between pretest and posttest of MTB-Thai was 23 (22, 23) and 24 (24, 24) in the experimental group and 22 (21, 23) and 23 (23, 24) in the control group, as summarized in Figure 2.

Discussion

The present study aimed to compare medication adherence between the experimental group that had pictogram plus text label and the control group that had text label only, in elderly patients with chronic diseases. The present study implied an adequate randomization, allocation, the sample size calculation because the sociodemographic characteristics and medication adherence assessment by pretest score of MTB-Thai between experimental group and control group were not significantly different (p>0.050).

The present study results showed that the number of participants of adherence group by MTB-Thai in the pictogram plus text label group were significantly

Table 1. Sociodemographic characteristics and clinical baseline between control group and experimental group (n=49)

Variable	Experimental group (n=25); n (%)	Control group (n=24); n (%)	p-value
Age (years); median (IQR)	71.0 (67.0, 79.0)	68.0 (63.0,76.0)	0.170[A]
Sex			0.376[B]
Male	8.0 (32.0)	5.0 (20.8)	
Female	17.0 (68.0)	19.0 (79.2)	
Education			0.080[C]
No education	7.0 (28.0)	1.0 (4.2)	
Primary school or below	16.0 (64.0)	21.0 (87.5)	
Secondary school or higher	2.0 (8.0)	2.0 (8.3)	
Marital status			0.320[B]
Married	17.0 (68.0)	13.0 (54.2)	
Widowed/Single/Separated	8.0 (32.0)	11.0 (45.8)	
Religion			0.490[C]
Buddhism	23.0 (92.0)	23.0 (95.8)	
Christian	0.0 (0.0)	1.0 (4.2)	
Muslim	2.0 (8.0)	0.0 (0.0)	
Income (Thai baht); median (IQR)	800 (700, 1000)	700 (600, 900)	0.286[A]
Number of comorbidities			0.682[B]
≤2	19.0 (76.0)	17.0 (70.8)	
≥3	6.0 (24.0)	7.0 (29.2)	
Comorbidities			
Type 2 diabetic mellitus	7.0 (28.0)	9.0 (37.5)	0.478[B]
Primary hypertension	25.0 (100.0)	23.0 (95.8)	0.490[C]
Dyslipidemia	23.0 (92.0)	20.0 (83.3)	0.417[C]
Number of tablets per day; median (IQR)	3.0 (2.0, 5.0)	4.0 (2.5, 6.0)	0.276[A]
Dosage frequency per day			0.484[B]
≤2	16.0 (64.0)	13.0 (54.2)	
≥3	9.0 (36.0)	11.0(45.8)	
Pre-MTB			0.269[B]
Low (≤21)	4.0 (16.0)	7.0 (29.2)	
Moderate (22 to 23)	21.0 (84.0)	17.0 (70.8)	

IQR=interquartile range; Pre-MTB=medication taking behavior measure for Thai patients (MTB-Thai) pretest score

[A] Wilcoxon rank sum test, [B] Chi-square test, [C] Fisher's exact test

Table 2. Medication adherence in view of MTB-Thai and pill counts between experimental group and control group

Outcome measurement	Experimental group (n=25)		Control group (n=24)		p-value
	Pre	Post	Pre	Post	
Pill count; median (IQR)	-	100 (100, 100)	-	95.56 (90.25, 100)	0.011*
MTB-Thai; n (%)					0.0002**
Non-adherence[Δ1]	25 (100)	0 (0.0)	24 (100)	13 (54.2)	
Adherence[Δ2]	0 (0.0)	25 (100)	0 (0.0)	11 (45.8)	

IQR=interquartile range; MTB-Thai=medication taking behavior measure for Thai patients

[Δ1] Low and moderate adherence, [Δ2] High adherence, * Wilcoxon rank sum test, ** Chi-square test

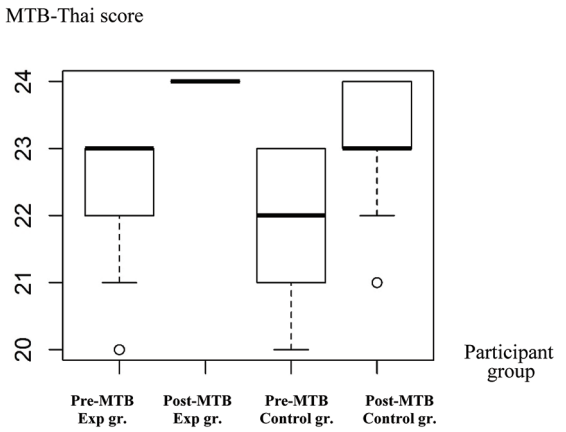

Figure 2. Box plot between pretest and posttest score of MTB-Thai between experimental group and control group.

Pre-MTB Exp gr.=The medication taking behavior measure for Thai patients (MTB-Thai) pretest score in experimental group

Post-MTB Exp gr.=The medication taking behavior measure for Thai patients (MTB-Thai) posttest score in experimental group

Pre-MTB Control gr.=The medication taking behavior measure for Thai patients (MTB-Thai) pretest score in control group

Post-MTB Control gr.=The medication taking behavior measure for Thai patients (MTB-Thai) posttest score in control group

higher than the text label group (p=0.0002) and the medication adherence by pill counts in the pictogram plus text label group were significantly higher than the text label group (p=0.011). This finding was consistent with recent studies that demonstrated the medication adherence was significantly higher in the pictogram group than in the control group. Phimarn et al (2014)[19] discovered that elderly patients with chronic diseases in the experimental group who had received pictogram had scored significantly higher in the understanding and accuracy of the drug use behavior score, and compliance was significantly higher than in the control group (p<0.050). Chaimol et al (2017)[14] discovered that diabetes patients in the experimental group who received knowledge about diabetes and pictograms from the pharmacist, had medication adherence scores significantly higher than in the control group (p=0.034). This result might be because people had a cognitive preference for picture-based medication instructions rather than text-based only or called "picture superiority effect" and the pictorial superiority effect demonstrated dominance when pictures were used in conjunction with verbal communication[15,20]. Pictorial instructions may be provided to make the procedural information more readily accessible. Comprehension of the pictograms was less dependent in the individual's background or prior knowledge. Pictures with text enhanced recall rates were most effective, particularly with the elderly[20]. A contributing factor to this enhanced adherence could be the success of pictograms in stimulating the memory and aiding recall of information over a prolonged period of time[21].

Medication adherence was assessed by MTB-Thai interview with follow-up home visits two weeks later. The authors found that both the experimental and the control groups had improved adherence in view of MTB-Thai. The reasons for this improvement may be because they had received more attention, counselling, and follow-up home visits than they normally would have in a standard outpatient clinic. But the experimental group had greater adherence than in the control group. Dowse et al (2005) and Jin et al (2016) demonstrated that developing trusting relationships and effective communication between health care providers and patients can improve older patient's adherence to medications[21,22].

The present study assessed the medication adherence with follow-up home visits within two weeks. According to the home visit, all participants in the experimental group who used pictograms did not use other devices to adjust their medication. Due to limited research time, follow-up home visits were carried out within two weeks. The results showed that medication adherence in the experimental group who received pictograms and text labels was much higher than in the control group who received only text labels. If the follow-up was at a longer period, the result on medication adherence might be lower than this, but participants received both pictograms plus text labels should have higher medication adherence than participants received text labels only. Houts et al (2005)[15] studied about recall memory in participants with just spoken instructions could remember 15% compared with participants who, received spoken instructions plus pharmaceutical pictograms, could remember 85%. The result yielded a significant difference (p<0.001). Recall memory on follow-up day four weeks later found that participants with the help of pictures could remember 72%. These findings suggested that pictograms can help increasing recall memory and cued recall could be a practical way to help people with low reading skills manage complex illnesses. This finding was consistent with the present study findings in the primary health care center that usually follow-up patients within one to three months in which patients may have decreased recall memory at the follow-up visits, but they would have instructions for their medications again during the follow-up visit.

Conclusion

The present study showed that the pharmaceutical pictograms have positive outcome on the aspects of medication adherence for elderly people. Pictograms should always be used with written or verbal information by the health care provider to avoid misunderstanding.

What is already known on this topic?

According to previous studies, Pharmaceutical pictograms have been designed to help people understand how to take their medication. Combining pictograms with spoken or written text increased medication adherence in an illiterate patient. Unfortunately, there is still limited data in elderly patient.

What this study adds?

The findings of this study showed that the pharmaceutical pictograms have positive outcomes on the aspect of medication adherence for elderly people with chronic diseases in a primary health care center setting.

Suggestion

Further research should be focused on the effects of pictograms in view of disease control and the quality of life for the elderly with chronic disease in accordance with the pictograms.

This study was carried out for the elderly with chronic diseases in a primary health care center setting. If the authors conduct studies with other groups of patients or in other settings, the result may be different and specific to that setting.

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Authors' contributions

Rungsriwattana V, Ngamchaliew P, and Buathong N contributed substantially to the conception and design of this study. Rungsriwattana V collected the data. Rungsriwattana V and Ngamchaliew P analyzed and interpreted the data. Rungsriwattana V and Ngamchaliew P drafted the manuscript. All authors revised and approved the final version of the manuscript submitted and take responsibility for statements made in the published article.

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Conflicts of interest

The authors do not have any conflicts of interest to declare.

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