ผลของนวัตกรรมกระเป๋ายาเตือนความจำ ที่มีต่อการรับประทานยาต่อเนื่องและคุณภาพของยา
Effects of Medication Reminder Innovation on Adherence and the Quality of Medicine

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บทคัดย่อ

ยาที่ดีที่สุดก็ไม่มีประโยชน์ หากผู้ป่วยไม่รับประทานมัน มีการใช้วิธีการที่หลากหลายเพื่อช่วยให้ผู้ป่วยรับประทานยาอย่างต่อเนื่อง แต่อัตราที่ผู้ป่วยรับประทานยาอย่างไม่ต่อเนื่องยังคงสูงถึงร้อยละ 24 ในกลุ่มผู้ป่วยทางกาย และร้อยละ 42 ในผู้ป่วยทางจิต ยิ่งไปกว่านั้นผู้ป่วยอาจจะรู้สึกไม่มีความมั่นใจเมื่อต้องพกยาไปด้วยทุกที่ กล่องใส่ยาในท้องตลาดส่วนใหญ่ไม่มีเสียงเตือน ในขณะที่กล่องแบบที่มีเสียงเตือนก็มีขนาดใหญ่ไม่สะดวกในการพกพาและอาจจะถูกลืมทิ้งไว้ที่บ้านได้ ดังนั้นกระเป๋ายาเตือนความจำ หรือ Medication Reminder (MR) ได้ถูกคิดค้นขึ้น MR เป็นกล่องใส่ยาที่มีเสียงเตือนผู้ป่วยเมื่อถึงเวลายาและมีไฟอยู่ตามช่อง ซึ่งจะสว่างเตือนว่าเวลานี้จะต้องหยิบยาช่องไหน กล่องใส่ยานี้ถูกบรรจุในกระเป๋าสตางค์ เนื่องจากคนส่วนใหญ่มักลืมพกยาแต่ไม่ลืมพกเงิน เมื่อออกนอกบ้าน งานวิจัยนี้เป็นการพัฒนานวัตกรรมที่ช่วยให้ผู้ป่วยรับประทานยาตรงเวลา กลุ่มตัวอย่าง ได้แก่ อาสาสมัคร 24 คน ที่ต้องทำงานนอกบ้านทุกวัน เม็ดยาแบบเคลือบ ไม่เคลือบและแคปซูล ถูกบรรจุในภาชนะ 3 แบบ ได้แก่ MR, ถุงพลาสติกที่มีซิปล็อค และกล่องใส่ยาพลาสติก อาสาสมัครถูกแบ่งเป็น 3 กลุ่ม ๆ ละ 8 คน โดยแต่ละกลุ่มพกภาชนะ 1 แบบที่มียาทั้ง 3 ชนิดบรรจุอยู่ หลังจากนั้น 7 วัน ผู้วิจัยนำเม็ดยาเข้าไปในห้องทดลองเพื่อทดสอบคุณภาพทางกายภาพ ได้แก่ ลักษณะภายนอก กลิ่น สี ความแข็ง และน้ำหนัก เครื่องมือที่ใช้คือ แบบสอบถามการรับประทานยาต่อเนื่องและแบบสอบถามความพึงพอใจ

ผลการทดลองพบว่า คะแนนการรับประทานยาต่อเนื่องสูงขึ้นในผู้ที่พก MR มากกว่าผู้ที่พกถุงพลาสติกที่มีซิปล็อค และกล่องใส่ยาพลาสติก อย่างมีนัยสำคัญทางสถิติที่ p<.001, $\overline{X}$(SD) = 11.16(0.75), 7.83(0.98), 8.83(1.32) ตามลำดับ ส่วนการทดสอบคุณภาพของบรรจุภัณฑ์พบว่า MR และกล่องใส่ยาพลาสติก สามารถปกป้องเม็ดยาได้มากกว่าถุงพลาสติกที่มีซิปล็อค อย่างมีนัยสำคัญทางสถิติที่ p<.001, $\overline{X}$(SD) = 4(0.00), 4(0.00), 2.5(0.54) ตามลำดับ อาสาสมัครส่วนใหญ่ที่พก MR มีคะแนนความพึงพอใจกับนวัตกรรมในระดับดีมาก (4.54 ใน 5 คะแนน)

คำสำคัญ : ยา, เตือนความจำ, การรับประทานยาต่อเนื่อง, ความพึงพอใจ

Abstract

The best medicine will not work if the patient does not take them. There are several methods developed to help patients to be adherent to medicine. However, non-adherent rate still high: 24% in physically ill and 42% in mentally ill patients. Moreover, patients might feel less confident when carrying medicine around. Normal medicine box has no alarm; whereas the one with alarm is not handy and might be left at home. Therefore, Medication Reminder (MR) was invented. MR is a medicine pocket that has an alarm clock to remind the patient when it is the time to take medicine. It also has a small light indicating the medicine the patient has to take. This pocket is attached within a purse or wallet because most people forget medicine but do not forget to take their money. This research was conducted to develop an innovation assisting patients to take their medicine on time. Samples were 24 volunteers who went out to work every day. Uncoated tablets, coated tablets and capsules were filled in three types of containers: MR, plastic bag with zip lock, and normal plastic box. Volunteers were divided into three groups; eight persons in each group. Each group carried one type of containers filled with three types of medicine everywhere during day time. After seven days, medicines were tested for physical quality (appearance, odor, color, hardness, and weight) in laboratory. Medication adherence and satisfaction questionnaires were completed by participants. The results revealed that, MR showed significant improvement in participants' adherence than plastic bag with zip lock, and normal plastic box at p<.001 ($\overline{X}$(SD) = 11.16(0.75), 7.83(0.98), 8.83(1.32), respectively). Based on the quality te,st MR and normal plastic box significantly better protected medicine than plastic bag with zip lock at p<.001 ($\overline{X}$(SD) = 4(0.00), 4(0.00), 2.5(0.54), respectively). Most participants who carried MR were satisfied with the innovation in very good level (4.54 out of 5). MR has a potential to improve adherent rates of participants and therefore to be an innovation that help reducing the cost of treatment due to non-adherence.

Keywords : Medication, Reminder, Adherence, Satisfaction

Introduction

Adherence is one of primary factors resulting in the success of treatment, particularly in chronic illness. People with chronic illness who are elderly or who have to work outside the house may forget to take medication. Therefore, the best medication treatment will not be efficient if the patient does not take them[1]. There are several methods developed to help patients to be adherence to medicine[2]. However, non-adherence rate still high: 24% in physically ill and 42% in mentally ill patients[3]. Moreover, patients might feel their image when taking medicine.Bringing medicine outside may increase degradation of active pharmaceutical ingredients. That will affect the medicine level in serum resulting in prolong or incurable disease. Normal medicine box has no alarm; whereas the one with alarm is not handy and might be left at home. Therefore, Medication Reminder (MR) was invented. MR is a medicine pocket that have alarm clock to remind the patients when it is the time to take medicine. It also has a small light designate which medicine the patients should take at the time. This pocket is attached within a purse or wallet because most people forget medicine but do not forget to take their money. This research was conducted to develop an innovation assisting patients to take their medicine on time. The conceptual framework is shown in Fig.1.

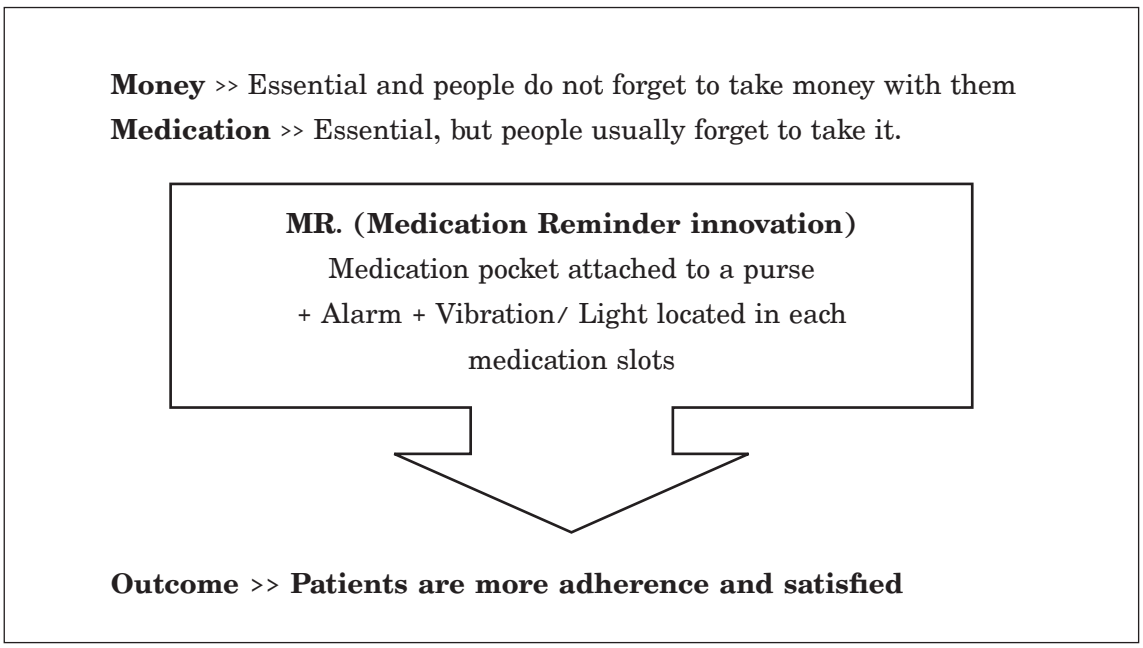

Fig. 1 Conceptual Framework

Objectives

1. To compare the adherence of the participants.

2. To compare the quality of medicine between those packed in MR, plastic bag with zip lock, and normal plastic box.

3. To assess satisfaction of participants who use MR.

Definitions of the terms

1. **Medication Reminder (MR)** is defined as an innovative medicine pocket that have alarm clock to remind the patients when it is the time to take medicine. It also has a small light designate which medicine the patients should take at the time. This pocket is attached within a purse or wallet

2. **Medication adherence** is defined as the extent to which the patients follow the physician's instruction in taking medication and treatment to relieve symptoms, cure or prevent disease[4]. For example, the patients take the right dose of medicine and take it on time, or never adjust medication by themselves.

3. **Quality of medicine** is defined as physical quality of the medication. Good quality means each medicine does not have fragment, broken or abnormal surface and the color is not different or fade away after being filled in the MR. in 1, 3, and 7 days. In addition, the weight of medication and loss on drying after being filled in the MR were considered.

4. **Weight of medication** is defined as percentage of medication weight that is reduced after being filled in the MR. in 1, 3, and 7 days.

$$\textbf{\% Weight of medication} = \frac{(\text{Pre-weight} - \text{Post-weight}) \times 100}{\text{Pre-weight}}$$

5. **Loss on Drying** is defined as percentage of capsule medication that reduces after being filled in the MR. in 1, 3, and 7 days.

$$\textbf{\% Loss on Drying} = \frac{(\text{Pre-weight} - \text{Post-weight}) \times 100}{\text{Pre-weight}}$$

Research methodology

1. Research design This post-experimental research design was conducted in 2017 as a pilot study. The research project was approved by ethic committee of Boromarajonani College of Nursing Changwat Nonthaburi (IRB number 8/2559). Eligible 24 samples were workers who went out to work every day in Kanchanabhishek Institute of Medical and Public Health Technology. They had no illness and were able to carry the package outside the house all day long. Samples were selected using convenient sample technique. Uncoated tablets, coated tablets and capsules were filled in three types of containers: MR, plastic bag with zip lock, and normal plastic box. Volunteers were divided into three equal groups; eight persons in each group. Each group carried one type of containers filled with three types of medicine everywhere during day time. After seven days, medicines were tested for physical quality (appearance, odor, color, hardness, and weight) in laboratory. Medication adherence and satisfaction questionnaires were completed by participants.

2. Research instruments

2.1 MR innovation is medicine pocket that has an alarm clock to remind the patients when it is the time to take medicine. It also has a small light designate which medicine the patients should take at the time. This pocket is attached within a purse or wallet because most people forget medicine but do not forget to take their money. The quality of medicine pocket was tested in laboratory. The purse used in this research is a normal purse. It can be fabric, plastic, leather with zip lock. The electric circuit is generated and built into the purse to make alarm clock that can be set up for 4 times. Figure 2 shows the electric circuit and figure 3 show how to integrate the compound of medicine box into the purse. Two pharmacist and one nurse experts approved the quality and feasibility of the purse with MR.

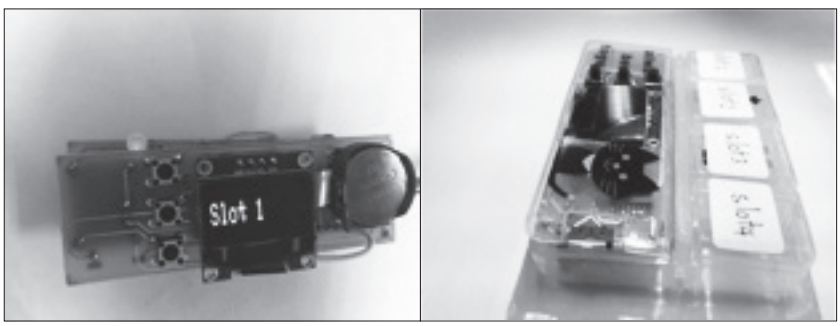

Fig. 2 The electric circuit attached to the medicine box

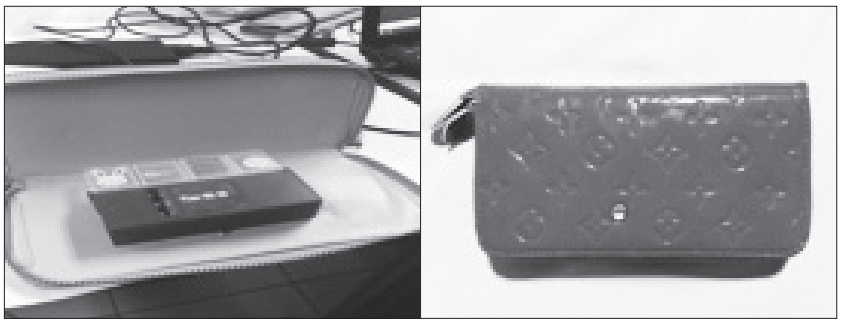

Fig. 3 show how to integrate the compound of medicine box into the purse

2.2 **Instrument for data collection**

2.2.1 Medication adherence questionnaire designed by the researchers is composed of 12 items with true or false answer. The total score is 12. This questionnaire is used to evaluate the accuracy in time to pick up the medicine during 7 days. If the participant picked up medicine in time due to the alarm, the 1 score is assigned. Two pharmacists and one nurse lecturer were the experts who validated the quality of the questionnaire and the Content Validity Index is 0.78.

2.2.2 Satisfaction questionnaire is a self-administered questionnaire composed of seven items exploring satisfaction after using the MR.

Innovation development process

1. Prototype development

1.1 Planning to do MR innovation.

1.2 Making electronic parts to be composed with eight purses.

2. Testing for quality

2.1 Asking eight participants who volunteered to carry three types of medication packages in their daily life.

2.2 Medication used in the test were in three categories, including uncoated tablets, coated tablets and capsules were filled in three types of containers: MR, plastic bag with zip lock, and normal plastic box. These are provided in eight sets for eight participants.

2.3 After 1, 3, 5 and 7 days, participants delivered all medicine packages to one of the researchers who then tested all medicines in laboratory. After three days, medicines were physically tested (appearance, odor, color, hardness, and weight) in laboratory. If the medicine was unbroken, the score of 1 was assigned. If the medicine was broken, the score of 0 was assigned. Medication adherence and satisfaction questionnaires were done by participants.

Data analysis

General information was analyzed by using descriptive statistics. Difference in adherence rate and medication quality between packages was tested using the Kruskal–Wallis test.

Results

1. **Adherent rate** Participants carrying MR showed significant adherence than those carrying other containers ($p<.001$), as shown in Table 1.

Table 1 Difference in adherence rates among different containers

Group	Mean rank	p-value
MR	20.31	0.000***
Plastic bag with zip lock	6.81	
Normal plastic box	10.38	

***p<0.001

2. **Quality of medicine** When comparing the physical quality of medicine packed in different containers, MR and normal plastic box showed significantly better quality of medicine than those contained in plastic bag with zip lock ($p<.001$), as shown in Table 2.

Table 2 Physical quality of medicine packed in different containers

Group	Mean rank	p-value
MR	16.5	0.000***
Normal plastic box	16.5	
Plastic bag with zip lock	4.5	

***p<0.001

3. **Satisfaction of participants** Satisfaction was measured in participants who carried MR only. At post-test, most participants were satisfied with the MR innovation in very good level (4.54 out of 5), as shown in Table 3.

Table 3 Mean and standard deviation for satisfaction questionnaire

Satisfaction	$\bar{X}$	S.D.	Level
1. Design and appearance of MR			
1.1 Nice design suitable for usage	4.70	0.46	Very good
1.2 Appropriate size	4.57	0.50	Very good
1.3 Durability of materials	4.60	0.50	Very good
2. Applicability			
2.1 Audible sound	4.67	0.48	Very good
2.2 Clear light status	4.40	0.62	Good
2.3 Vibration system	4.47	0.50	Good
2.4 Can be used as a purse	4.40	0.62	Good
Total	**4.54**	**0.52**	**Very good**

Discussions

MR has a potential to be an innovation that help reducing the cost of treatment due to non-adherence. Based on the results on satisfaction, participants were satisfied with the MR. because it is convenient to carry around like their own purse. They can carry both money and medicine in one single purse. In addition, the alarm clock is punctual and can motivate them to take medicine. This finding is relevant to the study by a pharmacist team from Chiang Mai University, Thailand and the Northern School for the Blind under Patronage of the Queen. They invent "Genius alarm" for blind students[5]. Thirty-five blind students reported very good satisfaction after trying to use Genius alarm (satisfaction score = 4.50). MR helps motivating people not to forget medicine. This could be explained using Cue-Stimulus Theory. MR has alarm sound to stimulate participants to think about medicine. Participants in this study might have not thought about medicine but when they heard the sound of the alarm they realized about medicine. Therefore, the rate of adherence is increasing.

Recommendations

1. The electric parts of MR can be modified to be more portable and the medicine box can be larger. The level of alarm voice can be adjusted.

2. The design of the purse should be more suitable for different gender and age.

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