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Effects of Preparatory Information via Line Application on Anxiety and Adherence in Patients Undergoing Magnetic Resonance Imaging (MRI): A Pilot Study Findings from Thailand

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Abstract— objective: *To study the effects of Preparatory Information via Line application on anxiety and adherence in patients undergoing Magnetic Resonance Imaging (MRI).* ***Methodology:*** *A quasi-experimental pilot study using a one-group pretest-posttest design with 8 outpatients undergoing MRI of the head or spine for the first time who were selected by simple random sampling from the diagnostic radiology department in a tertiary care hospital. The participants were required to use the Line Application for patients undergoing magnetic resonance imaging to prepare before the examination. The research instruments consisted of 1) Demographic Data Collection Questionnaire, 2) Anxiety Assessment Form in MRI, and 3) Adherence Assessment Form in MRI.* ***Results:*** *It was found that after providing information to prepare through the Line Application the participants had the median scores of anxiety lower than before, comparing the median scores of 33 (IQR = 29.5-40) and 21.50 (IQR = 19.5-23.5), respectively. The difference in the score of anxiety was statistically significant $p < 0.05$. Moreover, the participants were highly adherence with a percentage of 100.* ***Conclusion:*** *The results showed that providing Preparatory Information via Line Application for patients undergoing magnetic resonance imaging reduced anxiety and increased adherence in the examination. However, this is a pilot study. Therefore, a further experimental study using a larger sample size should be implemented.*

Keywords— *Adherence, anxiety, Line Application, Patients Undergoing Magnetic Resonance Imaging, Preparatory Information.*

I. INTRODUCTION

Magnetic resonance imaging (MRI) is a process that creates detailed images of organs and tissues within the body using powerful magnetic fields and radio waves [1]. It is a test with a high degree of precision and accuracy, and it is beneficial for diagnosis of disorders for treatment and follow-up [2].

Currently, more than 150 million patients worldwide undergoing MRI, and approximately 10 million patients undergoing MRI annually [3]. Statistics of patients receiving Magnetic Resonance examination at a tertiary care hospital in Thailand from November 2018 to January 2019 were 370,374 and 375 cases. From statistics, it was found that the number of patients receiving MRI in the spine was the highest number of 44.61%, followed by the head at 34.40%.

Although MRI can be extremely helpful in making a diagnosis, the procedure can affect the patient's mind. These things start with information before the examination. Providing insufficient information or providing written information alone may affect patient perception of misunderstanding, anxiety, and lack of confidence in the examination. In addition, during the MRI examination may affect the patient's mind as well, such as the nature of the enclosed and narrow tunnel, the loud noise of the machine [4], the temperature warming up while the machine is running [5], and Length of examination [4]. These things make the patient feel uncomfortable [6] and have fear. Patients also need to be treated during the examination, such as lying still and not moving, which can make the patient feel more uncomfortable, uneasy, and anxious, especially in patients undergoing MRI in the first time and the patient undergoes an examination of the head and spine as almost every part of the body must be in the tunnel [4].

Mental effects cause problems such as motion artifact [7], longer examination times or patients may not adherence with the examination, making the doctor unable to diagnose the disease and the treatment of the disease and the disease may get worse [4]. In addition, the increased anxiety may lead to the need for anesthesia to calm the patient [8], thus affecting costs and lengthening hospital stays and unsuccessful or lengthy scans affect the expenses of the organization [9].

To explicit the effects of MRI on patients undergoing MRI for the first time in the context of the study, the researchers surveyed preliminary data from the diagnostic radiology department in a tertiary hospital. The survey was an anxiety questionnaire in 10 patients using a numeric scale. There was no anxiety of 2 patients, mild anxiety of 3 patients, moderate anxiety of 3 patients, and extreme anxiety of 2 patients. Two patients without anxiety were examined in the knee area and eight patients with anxiety were examined in the head and spine.

A review of the literature reveals a guideline for preparing patients undergoing MRI using videos and guidance documents. The results showed that it reduced anxiety and enabled the patient to complete the magnetic resonance examination until the end of the procedure. In addition, research suggests that the machine and the MRI process should be visualized via video. The video should be developed even if the patient is able to find information via the website as each the MRI machine and procedure may differ and the

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information provided to the patient should meet the needs of the patients [4,7]. Based on the current informational guidelines in Thailand, most patients will be able to obtain information by reading only the written guidance information. They will receive a magnetic resonance examination instruction sheet immediately after the nurse's appointment and a brief explanation from the examination room nurse prior to the examination.

Based on the above data, the researchers saw problems with preparatory information in patients undergoing MRI. Limitations of preparatory information with the various methods currently in use and little research on this subject. At present, Thailand has reformed the health care system to a new era that uses information technology as a main tool. The Line Application is one of the key technologies in this regard as it is an information technology designed to enable people to connect and stay connected via the internet and is increasingly being used in healthcare systems which had a very low cost of communication links [10]. After considering the advantages and limitations of each preparatory information method, the researcher selected preparatory information via Line Application in this pilot study and tested the effects of this Line Application on anxiety and adherence in the examination. The conceptual framework of the research was based on Preparatory Information from Leventhal & Johnson's Self-Regulation Theory (1983) [11].

II. Methodology

A. Study Design and Setting

This quasi-experimental study was conducted in an outpatient who undergoes a Magnetic Resonance Imaging of the head or spine for the first time at a diagnostic radiology department in a tertiary care hospital in Thailand. The sample consisted of patients who met the following criteria: 1) Patients aged 18 years and over. 2) Patients are good consciousness and able to answer the correct date, time, and place. 3) Patients can communicate by reading, writing, and listening to Thai. 4) Patients are willing to participate in the research. 5) Patients have a smartphone device and are willing to use the Line Application of the research project. 6) Patients have no contraindications to MRI Safety such as pacemakers, neurostimulators and cochlear implants, bullets, and explosive debris. The patients were selected simple random sampling.

B. Sample Size

The sample size was calculated using G power with data from The Effects of the Communication Accompanied with Music Therapy on the Anxiety of the Patients during the MRI Examination by Yong-Hak Yoon et al. (2016) [12]. The confidence level was set at 95% and the power of test was set at 0.8. The sample was calculated for 6 people. To prevent loss, the researcher increased the sample size by 30% [13]. The sample number was increased to 8 people. The researcher selected the sample by simple random sampling.

C. Research Instruments and Quality of the Instrument

Instruments for data collection including Demographic Data Collection Questionnaire, Anxiety Assessment Form in magnetic resonance imaging and Adherence Assessment Form in magnetic resonance imaging; and instrument for research intervention comprising a Line Application for patients undergoing magnetic resonance imaging (MRI).

The Demographic Data Collection Questionnaire consists of 2 parts: Part 1 provides general information including gender, age, marital status, religion, education level, occupation, and income. Part 2 is information about illness and treatment, including the date of the patient's Magnetic Resonance examination, diagnosis, medical condition, and history of using sleeping pills or tranquilizers.

The Anxiety Assessment form in magnetic resonance imaging (MRI). The authors used the Magnetic Resonance Immunization-Anxiety Questionnaire (MRI-AQ) instrument of Ahlander et. al. (2016) [14], which had a CVI value of 0.99, mean test-retest value of 0.61, the Intraclass Correlation Coefficient (ICC) was 0.90, and the Concordance Correlation Coefficient (CCC) was 0.90. The researcher put the instruments into the translation process, used a back-translation with a bilingual test. Three experts translated independently. After that, they consulted each other to compare the differences from the original. The patient is asked to answer questions before the examination measures the expected sensation in the magnetic resonance examination room and after the examination the patient recalls the feelings experienced while in the magnetic resonance examination room. The assessment consisted of 15 questions divided into three levels of measurement. 15-30 points indicate a low level of anxiety, 31-45 points indicate a moderate anxiety level, and 46-60 points indicate a high level of anxiety. In this data, Cronbach's coefficient alpha is 0.92.

The adherence assessment form in magnetic resonance imaging is an assessment form created by the researcher from a literature review consisting of 3 topics: Article 1 Lying still, not moving during the examination. Article 2 Do not use hands to touch or release the equipment used for examination. Article 3 Press the emergency button to ask for help when there are abnormal symptoms. The nurse will evaluate. The assessment was divided into adherence and non-adherence. Assessments were measured using frequency and percentage. The researcher used the content validity index (CVI) assessment form from 5 experts with a CVI value of 1 and reliability of the instruments using the Kuder-Richardson reliability was equal to 0.85.

Finally, the research instrument was a Line Application for patients undergoing magnetic resonance imaging (MRI). The researcher developed according to the Preparatory Information from Leventhal & Johnson's self-regulation theory (1983) [11] for use to prepare patients undergoing MRI. The information includes videos with animations and sounds simulated from real-life situations, along with frequently asked questions and recommendations for MRI. This instrument has passed the Item Objective Congruence index (IOC) from 3 experts and has an IOC of 0.97.

D. Ethical Considerations

This research has been approved on ethics by the Human Research Ethics Committee, Khon Kaen University on July 29, 2020, No. HE 632161. The researcher has defended the

rights of the samples as follows: The subjects were informed about the research objectives and the procedure for participating in the research before signing the consent form. Subjects were able to refuse to participate in the study at any stage without affecting treatment. The information of the sample was kept confidential and the information was presented as a whole. In addition, the researcher prevented the risk of the sample while participating in the study by closely monitoring for any abnormalities. If they were found to have abnormal symptoms, activities will stop and seek help immediately. In this research, the sample group did not have any abnormal symptoms and was able to participate in the research at all stages.

E. Data Collection

The researcher selected the samples according to the criteria specified in the appointment schedule by evaluating the data from the medical records and then performing the simple random sampling. Two research assistants are responsible for meeting patients, explaining preliminary project details, research objectives, explaining the data collection process, patient rights, potential benefits, or risks, and requesting participant consent in the subject undergoing MRI for the first time. If the patient is willing to participate in the research, the research assistant has the patient sign the consent form. After that, the researcher visits the patient. The meeting of the patients for the selection of this sample will be made during the hours of 8:00 a.m. to 8:00 p.m. as it is the normal time that the examination room is open for business. For the unselected patients, the researcher clarified that this selection had no effect on care.

First, the questionnaire for demographic information, information about illness, and treatment was assessed with a total of 7 items by recording data from medical records, asking additional patients, and assessing anxiety in 15-item magnetic resonance imaging tests by having the patient read and respond themselves, which will take about 15 minutes. Second, the researcher will have the patient download the Line Application for patients undergoing MRI via QR code. Once the patient has downloaded the application, the researcher will explain how to use the application and will assist until the patient is able to use the application for approximately 5 minutes. The researcher will allow the patient to study the application on their own for about 15 minutes. Third, the research assistant explained the examination in approximately 5 minutes about the organs being examined, the examination period, the examination posture, gave the patient an opportunity to ask questions and took the patient to the magnetic resonance examination room using the time check for about 45 minutes. During the examination, the research assistant observes the patient's adherence in the examination. the last one, the patient was evaluated anxiety in the magnetic resonance examination of 15 items by having the patient read and answer by themselves, it took about 10 minutes, which is done after leaving the examination room.

F. Data Analysis

Analyzed using SPSS STATA version 10 program, defined significance level (α) at 0.05. The demographic data and variables studied by descriptive statistics were analyzed: frequency, percentage, mean, standard deviation, median, and Inter-Quartile Range (IQR). Compare the scores of anxiety before and after the experiment with the Wilcoxon signed-rank test because the sample size is small.

III. RESULTS

A. Chracteristics of the Participants

The demographic information was that most of the volunteers are males 75%, mean age was 40.75 years (SD = 12.35, min = 21, max = 57), marital status of 75%, all Buddhists, had secondary education/vocational certificate /diploma accounted for 50%, wage employment accounted for 50%, the income of 20,001-30,000 baht accounted for 50%, having a diagnosis of spinal disease (Low back pain, HNP, and Radiculopathy) accounted for was 75% and no underlying disease accounted for 87.50% as shown in Table I.

TABLE I. Demographic characteristics of the participants (n=8)

Variables	Characteristics	Frequency	Percentage
Gender	Male	6	75
	Female	2	25
Age (years)	min = 21, max = 57, Mean = 40.75, S.D. = 12.35		
Marital status	Single	2	25
	Married	6	75
Religion	Buddhist	8	100
Education level	Secondary education/ Vocational certificate/ Diploma	4	50
	High Vocational/ Bachelor's Degree	3	37.50
	Higher than bachelor's degree	1	12.50
Career	Employee	4	50
	Business owner/merchants	1	12.50
	Government service/state enterprise	2	25
	Agriculture	1	12.50
Income (baht)	20,001-30,000	4	50
	30,001-40,000	3	37.50
	40,000 baht or higher	1	12.50
Diagnosis	Spine (Low back pain, HNP and Radiculopathy)	6	75
	Tension headache	2	25
Medical condition	No medical condition	7	87.50
	Hypertension	1	12.50

B. The anxiety score in Magnetic Resonance Imaging (MRI)

The results of the trial to test the preparatory information via Line Application hypothesis on anxiety of patients undergoing MRI before the trial had a median of 33 (IQR=29.5-40). After the experiment, the median was 21.50 (IQR = 19.5 - 23.5). Anxiety scores in MRI before and after the experiment were compared with statistically significant differences at $p < 0.05$ as shown in Table II.

TABLE II. Comparison of the anxiety score in Magnetic Resonance Imaging (MRI) before and after the trial (n=8).

Anxiety	Mean	S.D.	min	max	median	IQR	p-value
Before the experiment	36.38	11.22	26	60	33	29.5-40.0	0.006
After the experiment	21.5	3.42	16	27	21.50	19.5-23.5	

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C. The Adherence in Magnetic Resonance Imaging (MRI)

Adherence in Magnetic Resonance examination in patients receiving Preparatory Information via Line Application showed that the adherence to the examination was as follows: 1.) lying still and not moving while examining for adherence of 8 cases (100%). 2.) Do not use hands to touch or disengage the equipment used for examination for adherence of 8 cases (100%). 3.) Press the emergency button to ask for help when there are abnormal symptoms during the examination. All eight patients had no abnormal symptoms during the examination as shown in Table III.

TABLE III. Frequency and percentage of adherence in post-experimental magnetic resonance imaging (n=8).

Subjects	Frequency	Percentage
1. Lie still and do not move during the examination - Adherence	8	100
2. Do not use your hands to touch or disconnect the device used for examination. - Adherence	8	100
3. Press the emergency button to ask for help when there are abnormal symptoms during the examination - No abnormal symptoms	0	0

IV. Discussion

The characteristics of most of the samples in this study were consistent with previous studies in which marital couples had diagnoses of low back pain, HNP, and radiculopathy and had never been tested for MRI before. While the MRI can affect the patient's psyche, it is especially important in patients undergoing MRI for the first time and patients undergoing head and spine examinations as almost every part of the body must be in a tunnel [4].

The results of this study revealed that the anxiety scores in MRI before and after the trial were significantly different at $p<0.05$. This indicated that patients undergoing MRI have reduced anxiety levels from using the Line Application for patients MRI due to the presence of clear preparatory information on methods, details, procedures of the examination, feelings of confrontation, behaviors that should be performed, and information about coping with magnetic resonance examination. This is consistent with a study by Tugwell & Pritchard (2018) [7] that found that preparing for a MRI test and providing clear information tailored to individual needs can reduce anxiety and lead to greater understanding. The study was also consistent with the Munn & Jordan study (2013) [9]. It was found that providing information about MRI, textual examination advice, the use of imaging, cognitive manipulation, relaxation techniques, and breathing techniques was effective in reducing anxiety.

The results of this study also showed that subjects had 100% adherence to MRI, as the Line Application for patients undergoing MRI contained preparatory information on the examination, enabling patients to be educated, understand, and act properly. This is in Line with the study by Chamnian Phatthanachak (2018) [15], which found that preparatory information prior to coronary artery bypass catheterization made patients understand and follow the examination properly and was able to provide adherence throughout the period of examination. The study is also consistent with a study by Jesada Sriboonlert (2011) [16] who found that video preparatory information led to patients adhering to liver cancer screening with intravenous chemotherapy.

V. Other Recommendations

This pilot study was conducted in a sample of only 8 people. The research model did not compare the trials with the control group. The sample was recruited only to magnetic resonance patients who examined the head and spine, making the sample specific, which may not be representative of all magnetic resonance patients. However, well-designed of study and larger sample size were needed and research should be conducted among patients receiving magnetic resonance imaging in other areas for future study.

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