PSYCHOLOGY AND EDUCATION (2021) 58(5): 6210-6214
ISSN: 1553-6939

Healthcare Education Process Adopting the Line Application in Conjunction with Tele-Counseling to Improve Knowledge, Behavior and Satisfaction among Elderly with Diabetes Mellitus during the COVID-19 Pandemic

Jukkrit Wungrath[1*] Supaprawat Siripipatthanakul[2] Bordin Phayaphrom[2]
[1]Unitar International University, Malaysia
[2]Asia eLearning Management Center, Singapore
*Corresponding author email: jukkrit.w@gmail.com

ABSTRACT

The COVID-19 pandemic has had an extraordinary impact on people's life. The elderly, however, suffer unique obstacles and healthcare providers must recognize and address their unique requirements so that they can be effectively protected and supported during these trying times. The objectives of this research were to improve the desirable healthcare knowledge and behavior among the elderly with diabetes mellitus using Line application in conjunction with tele-counseling during the COVID-19 pandemic. The sample was elderly with diabetes mellitus in Chiang Mai Province. There were two groups, namely the intervention group (n=30) and the control group (n=30). The sample was selected based on simple random sampling. After using Line application and tele-counseling, the results showed that the intervention group had a higher mean score of healthcare knowledge and behavior after using Line application and tele-counseling than before. The intervention group had a higher mean score of healthcare knowledge and behavior than the control group, with a statistical significance ($p < 0.001$). Overall satisfaction was the average of 4.63 (SD=0.56), indicating that the users had a high level of satisfaction when participated the program. In order to promote the healthcare knowledge and behavior of the elderly with diabetes mellitus, related personnel should use the study findings by applying Line application and new networking tools that can also reach the elderly.

Keywords

Line application; tele-counseling, healthcare; elderly, diabetes mellitus; covid-19.

Introduction

According to a survey by the National Statistical Office, in recent years, the population of elderly people (age 60 and over) in Thailand has increased significantly. The annual figures during 2015-2019 show increases of 15.9%, 16.5%, 16.7%, 18.0%, and 19.7%, respectively (National Statistical Office of Thailand, 2020). In addition, after Singapore, Thailand ranked second oldest company in South-East Asia ("World Health Organization. Older Population and Health System: a Profile of Thailand. 2015; 10:2015.,"). Thailand needs to develop contingency plans to meet the demands of a rapidly growing aging society, suggests this rapid expansion. As the elderly are at high risk of disease due to deteriorated health (Koojareonpasit & Pumpinyo, 2020). The Elderly are more vulnerable than younger adults to insufficient healthcare knowledge and behavior, the higher chance of serious health problems (Azzolino et al., 2020). The causes of insufficient healthcare knowledge and behavior in the elderly are likely to be multifactorial and reflect physical and physiological impairments, both psychological and physical influences include sensory changes, decreased taste sensation, and in particular, example, hypertension, diabetes mellitus, kidney disease, stroke, etc. changes in sensory function (Azzolino et al., 2020; Ghazi et al., 2015). Another 2% to 16% of community elderly people are estimated to suffer from a serious health problem and may rise to 35% in individuals over 65 years of age (Nichol et al., 2007). Different health concerns relate to insufficient health and conduct in older adults (Zhang et al., 2017). Inadequate healthcare knowledge and performance leads to weak immune systems, an increase in the risk of infection, poor wound treatment, reduced drug efficacy, and muscle weakness which leads to further falls and fractures. Inadequate healthcare knowledge and performance leads to weak immune systems, an increase in the risk of infection, poor wound treatment, reduced drug efficacy, and muscle

weakness which leads to further falls and fractures (Fávaro-Moreira et al., 2016; Zhang et al., 2017).

The Elderly should maintain proper knowledge in healthcare and behavior to prevent different unwanted health issues Almeida and colleagues suggested (De Almeida et al., 2001). However, during the period of the Covid-19 epidemic in Thailand, it was a time when the people of the country had many hardships. Elderly people with diabetes are also among the most affected. These elderly people face difficulties and obstacles in seeing a doctor at the hospital causing the treatment process to not meet its objectives (Meethien et al., 2011). Therefore, promoting the right health knowledge and behavior is an important strategy for improving health, reducing the risk of diabetes mellitus complications, longevity, and improve life quality. Interventions to promote healthcare knowledge, attitudes, and behavior among the elderly are an effective means of promoting (De Almeida et al., 2001; Meethien et al., 2011). Multiple education methods, motivation, and group participation are specifically effective ways to enhance the health and behavior of elderly people (Ammerman et al., 2002; Baker & Figueroa, 2021; Hoevenaars et al., 2020). Theoretical educational programs have also been used efficiently to promote individuals' and groups' health knowledge and behavior (Ammerman et al., 2002). Most of these education programs, however, used methods of teaching or training. Although a range of programs has been developed to support behavior in the health promotion sector, there is no program to improve and/or maintain elderly health knowledge and behavior, using tele-counseling and the line application. According to previous research, it was found that elderly people used Line application, Facebook and website were the most popular, respectively (Jukkrit et al., 2021; Wungrath, 2020). Elderly people used the line application to communicate with careers, relatives, and friends to share and look for various health information (Chaichuy, 2017). Their interest and expertise, such as Line, Facebook, Instagram, e-mail, etc. have been implemented through the line application program, including health communication between elderly members and family members. The elderly choose to search for and share health information via the line application for several reasons, including simple accessibility, no time and place restrictions, freedom to use, entertainment, and up-to-date data (Bliemel & Hassanein, 2007; Jukkrit et al., 2021).

The main concept and tool for developing health education programs for elderly patients with diabetes is a "PDSA" concept adopted by researchers in this research. PDSA is not just a plan-oriented concept but emphasizes systematic operation to continuously improve. The administrative procedures implemented under PDSA are systematic, complete, and appropriate for the organization's productivity activities. The situation of the organization, such as production or employees, is examined to provide input for the planning and implementation of the health education program. Periodic assessments make it possible to adjust the plan to the situation. Furthermore, the success analysis of the project demonstrated the weaknesses, strengths of the operation and is a lesson to be learned for further operation and improvements and real development can be achieved. There is, therefore, a possibility of proper and directional further development.

The coronavirus disease 2019 coronavirus or COVID-19 pandemic is rapidly transforming the healthcare system, as one of the main drivers of change is telehealth and social media. The COVID-19 pandemic has had a huge influence on people's lives, regardless of their social demographics. The elderly, on the other hand, face particular challenges, and healthcare providers must understand and address these needs in order to successfully safeguard and support them during these challenging times. There are several reasons why the elderly are particularly vulnerable. There has been some acknowledgment of these issues, which has resulted in progress in putting measures in place to address them. Based on a large academic healthcare system with an existing telehealth facility at the COVID-19 epicenter, this report demonstrates empirically the transformative impact of telehealth on healthcare provision and the rapid shift of patient and provider adoption to telehealth (Mann et al., 2020). COVID-19 is transforming the telehealth landscape breathtakingly quickly. Social distance and quarantine were the only widely available

interventions that provided an overriding reason for in-person alternative treatments without vaccines and effective treatments. With these adjustments, the health of television is increased at enormous speeds and scales and becomes the pandemic front line. The emerging telemedicine literature in COVID-19 has focused on the information infrastructure and primary care visits, using audio technology in particular (Mann et al., 2020; Piette et al., 2011).

The objectives of this research were to improve the healthcare knowledge and behavior among the elderly with diabetes mellitus using Line application in conjunction with tele-counseling as well as to study the satisfaction of those who have participated in such programs during the COVID-19 pandemic in Chiang Mai Province, Thailand.

Methodology

This study was a quasi-experimental research with a two-group pretest-posttest design, conducted from June to August 2021.

1. Population and sample

The population in this study were elderly with diabetes mellitus in Muang District, Chiang Mai province. The sample size was determined by using G*Power at the power of the test was set at 0.60, with a 0.05 level of significance and 0.50 effects size. The sample size was 26 people per group. To prevent the loss of the sample, an additional 10% was added. The sample size of 30 people per group, intervention, and a control group. The inclusion criteria were those who have been diagnosed by a physician with type 2 diabetes for at least one year, could communicate in Thai, have a smartphone, and can use the Line application, and can participate in activities for 6 weeks.

2. The research instruments consisted of:

2.1 The intervention for the Intervention group

2.1.1 Activities via the line group: The researcher submitted 5 video clips and 10 infographics. Each video included 5-7 minutes of content regarding suitable drug use, blood serum level control, foot care, nutrition and diet, physical activity & exercise. In all video clips and infographics were developed through a literature review by the researcher. The content validity of each component was verified by three experts. After correcting according to the expert's advice, all the experts found the program content and materials to be appropriate and valid.

The video clips and infographics with related content are sent through the line group during the 1st -4th week, twice a week one on Monday and another one on Friday. The video clips and infographics will be saved in line's note, the elderly can watch whenever they want. After sending each clip and infographic, researchers will have discussions with group members to inquire for understanding, explain further in case members do not understand, and allowing for the exchange of ideas between members of the group with the researcher being controlled throughout the study period.

2.1.2 Tele-counseling: The 1-4th week of the program was scheduled once a week for 5-10 minutes, as counseling to the researchers. Tele-counseling helped elderly people through trouble-solving activities to solve problems that could occur when they practiced healthily, i.e., obstacles to the adoption of health information; adjustments to their dairy drug plan; and realistic targeting for a healthy practice. The elderly were also provided with the telephone number of their researcher and encouraged to contact the research if additional nutritional assistance was required.

In addition to the education using the line application in conjunction with the tele-counseling program, the elderly in the Intervention group received usual healthcare and routine health education activities from their respective community healthcare providers.

2.2 The intervention for the control group

Intervention for the control group: In normal healthcare and routine health education activities, elders in the control group had their respective Community care providers. But for four weeks the elderly in the control group were not trained with the line application in conjunction with the intervention group tele-counseling program.

After the Intervention group completed the intervention program and all data were collected, the researchers provided the control group members the same intervention as those in the Intervention group.

2.3 The instrument used to collect data that the researcher developed through literature review is divided into three parts as follows:

Part 1: Demographic data of the sample.

Part 2: The Healthcare Knowledge Test. Fifteen questions with 2 choice options (true or false), which focus on assessing desirable health knowledge for the elderly with diabetes mellitus. The test was verified by 3 experts for content consistency. All items were found to have an Item of Congruence index (IOC) of more than 0.80 for each item. The reliability was tested with 30 elderlies with diabetes mellitus who were not in the sample group and was determined by the Kuder-Richardson formula to be 0.82. The criteria used to divide the knowledge level was:

- Knowledge average score 00.00 - 05.00 means a low level of knowledge
- Knowledge average score 06.00 - 09.00 means a moderate level of knowledge
- Knowledge average score 10.00 - 15.00 means a good level of knowledge

Part 3: Healthcare Behavior Assessment Questionnaire. The questions were focused on the desirable healthcare behavior regarding the elderly with diabetes mellitus. Total of 18 questions with 3 ratings (regularly practice, sometimes practice, and not practice at all). A positive behavior was rated 3, 2, and 1, while a negative behavior was rated 1, 2, and 3, respectively. The questions passed three expert examinations for content validity. All items were found to have an item of congruence index (IOC) of more than 0.80. The reliability was tested with 30 participants for the elderly who were not in the sample group. The Cronbach's alpha coefficient was 0.89. The criteria used to divide the behavior level was

- Behavior average score 18.00 - 30.00 means a low level of behavior
- Behavior average score 31.00 - 42.00 means a moderate level of behavior
- Behavior average score 43.00 - 54.00 means a high level of behavior

Part 4: Satisfaction evaluation form with a rating scale of 1 to 5. The interpretation of mean scores was low satisfaction (1.00 - 2.33 scores), moderate satisfaction (2.34 - 3.67 scores), and high satisfaction (3.68 - 5.00 scores).

3. Data collection

Upon identification of elders in both the intervention group and control group, baseline information was obtained during a visit during the first week of the study protocol in the community healthcare of their communities. The survey was conducted from June to August 2021.Intervention and control groups activities took approximately 5 weeks, as shown in Figure 1:

Ethical considerations

This study was approved by The Ethical Review Committee for Human Research, Faculty of Public Health, Chiang Mai University (ET021/2021).

Data Analysis

Demographic data were analyzed using descriptive statistics, these are frequency, percentage, mean and standard deviation. Inferential Statistics, Chi-square, and Fisher's exact test to compare common data differences between the control and the intervention group. Paired t-test statistics were used to compare the means of the healthcare knowledge and behavior between the intervention group and the control group, before and after participating in the program. The means of the healthcare knowledge and behavior between the intervention group and the control group were compared using independent t-test statistics. A p-value < 0.05 was considered statistically significant.

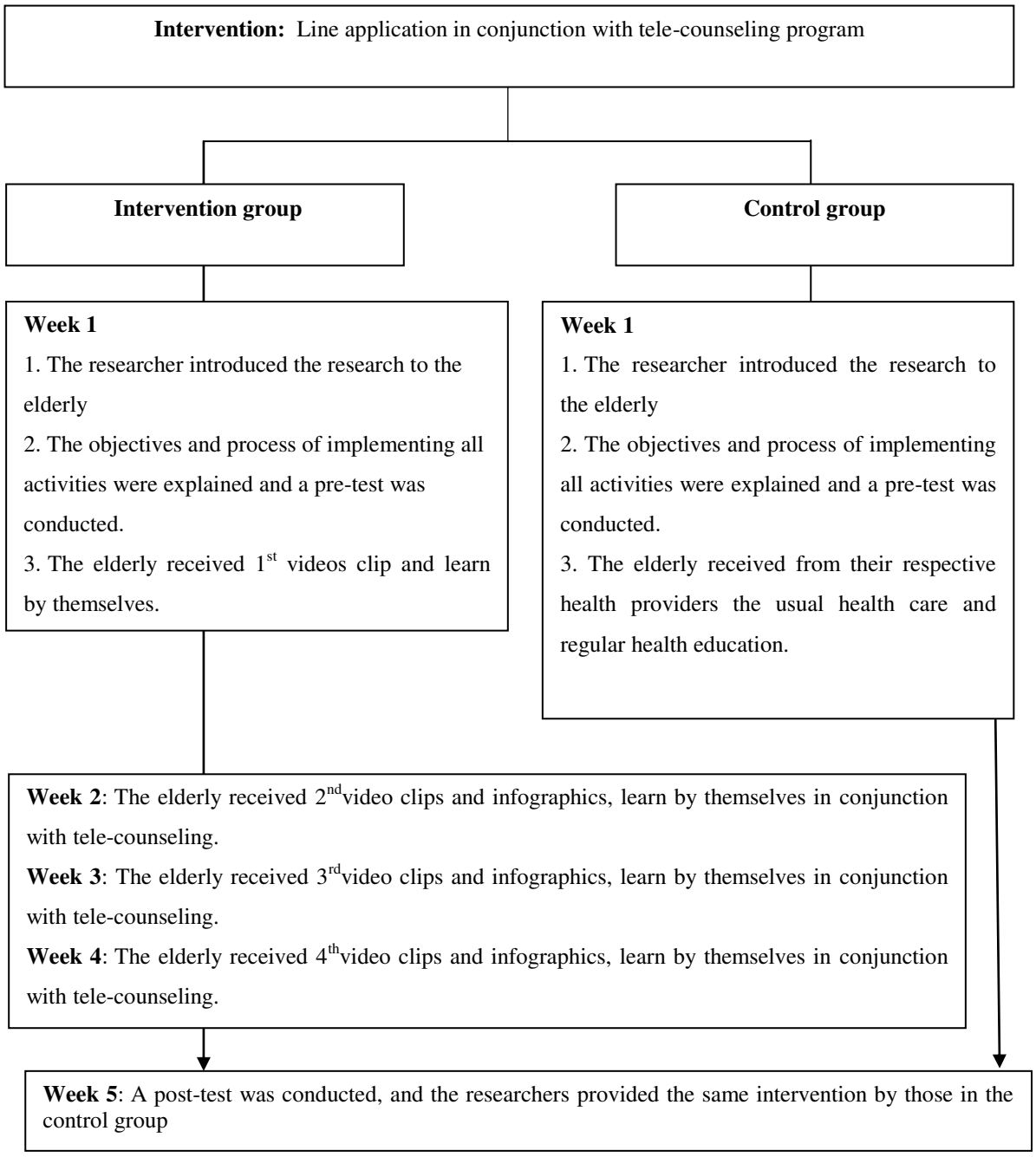

Figure 1: Intervention procedures flow diagram

Results

1. General information of the sample

The mean age of the elderly was 66.65 years, and 53.33 % were females. There was no significant difference in demographic characteristics between the intervention and control groups, as shown in Table 1.

Table 1: Demographic characteristics of the elderly in the control group and Intervention group

General information	Control group n (%)	Intervention group n (%)	Total n (%)	P-value
Gender				
Male	15(50.00)	13(43.33)	28(46.67)	.796[a]
Female	15(50.00)	17(56.67)	32(53.33)	
Age (Year)				
60-69	21(70.00)	21(70.00)	42(70.00)	.992[a]
70-79	5(16.67)	6(20.00)	11(18.33)	
>80	4(13.33)	3(10.00)	7(11.67)	
Mean (SD)	67.30	66.00	66.65	
Main caregiver in the family				
Son or daughter	6(20.00)	7(23.33)	13(21.67)	1.00[b]
Spouse	20(66.67)	20(66.67)	40(66.67)	
Relatives	4(13.33)	3(10.00)	7(11.66)	
Education level				
Primary	5(16.67)	1(3.33)	6(10.00)	
High school	7(23.33)	8(26.67)	15(25.00)	.377[b]
Diploma	8(26.67)	11(36.67)	19(31.67)	
Bachelor's degree or higher	10(33.33)	10(33.33)	20(33.33)	
Occupation before retirement				
Farmer	4(13.33)	5(16.67)	9(15.00)	
Vendor/Employee	8(26.67)	10(33.33)	18(30.00)	.953[b]
Civil servant/State officer	13(43.33)	11(36.67)	24(40.00)	
Private company officer	2(6.67)	2(6.67)	4(6.67)	
Unemployed	3(10.00)	2(6.66)	5(8.33)	
Average family income (Baht)				
10,000-20,000	19(63.33)	16(53.33)	35(58.33)	.601[b]
> 20,000	11(36.67)	14(46.67)	25(41.67)	
Medical Condition of older persons under their care (1 or more can be reported)				
Diabetes mellitus	23(76.66)	26(86.66)	49(81.66)	
Hypertension	21(70.00)	23(76.66)	44(73.33)	
Coronary heart disease	4(13.33)	5(16.66)	9(15.00)	.671[b]
Musculoskeletal disorders	16(53.33)	9(30.00)	25(41.66)	
Nervous system disease	6(20.00)	8(26.66)	14(23.33)	

Remark: SD = Standard Deviation, [a] = Fisher's exact test (p value < 0.05), [b] = Chi-square test (p- value < 0.05)

2. The effectiveness of the line application in conjunction with tele-counseling on healthcare knowledge among the elderly with diabetes mellitus

The pretest and post-test mean scores of the healthcare knowledge of the intervention group were 7.67(SD=0.71) and 12.77(SD=0.86), respectively. It was found that the post-test mean score of healthcare knowledge was higher than the pretest mean score, with a statistical significance ($p < 0.05$), as shown in Table 2.

Table 2 Comparison of the mean average score of healthcare knowledge between intervention and control group before and after the experiment

	Pre-test Mean (SD)	Level	Post-test Mean (SD)	Level	t	p-value
Intervention group	7.67(0.71)	Moderate	12.77(0.86)	Good	-23.02	.000***
Control group	7.63(0.72)	Moderate	7.83(0.87)	Moderate	-1.53	.136

The post-test mean scores of healthcare knowledge between the Intervention group and the control group were 12.77(SD=0.86), and 7.83(SD=0.87), respectively. It was also found that the mean score of healthcare knowledge in the intervention group was higher than that of the control group, with a statistical significance ($p < 0.001$), as shown in Table 3.

Table 3 Comparison of the mean average score of healthcare knowledge between intervention and control group after the experiment

	Intervention group	Control group	t	p-value
Post-test Mean (SD)	12.77(0.86)	7.83(0.87)	-22.31	.000***
Level	Good	Moderate		

***$p < 0.001$

3. The effectiveness of the line application in conjunction with tele-counseling on healthcare behavior among the elderly with diabetes mellitus

The pretest and post-test mean scores of the healthcare behavior of the Intervention group were 31.74(SD=1.33) and 45.07(SD=2.42), respectively. It was found that the post-test mean score of healthcare behavior was higher than the pretest mean score, with a statistical significance ($p < 0.001$), as shown in Table 4.

Table 4 Comparison of the mean average score of healthcare behavior between intervention and control group before and after the experiment

	Pre-test Mean (SD)	level	Post-test Mean (SD)	level	t	p-value
Intervention group	31.74(1.33)	Moderate	45.07(2.42)	Good	-24.00	<.000***
Control group	31.30(1.26)	Moderate	31.40(1.22)	Moderate	-0.82	.415

***$p < 0.001$

The post-test mean scores of healthcare behavior between the intervention group and the control group were 45.07(SD=2.42) and 31.40(SD=1.22), respectively. It was also found that the mean score of the healthcare behavior in the intervention group was higher than that of the control group, with a statistical significance ($p < 0.001$), as shown in Table 5.

Table 5 Comparison of the mean average score of healthcare behavior between intervention and control group after the experiment.

	Intervention group	Control group	t	p-value
Post-test Mean (SD)	45.07(2.42)	31.40(1.22)	-27.61	.000***
Level	Good	Moderate		

****p* < 0.001

4. Satisfaction in using the line application in conjunction with tele-counseling among the intervention group

Overall satisfaction was the average of 4.63 (SD=0.56), indicating that the users had a high level of satisfaction when considering each item, it was found that the first five issues that most users were the content of the video clips and infographics match the purpose of the program was 4.73 (SD=0.45), followed by the video clips and infographics accurate and up to date was 4.65 (SD=0.56), Video clips and infographics are clear, beautiful was 4.63 (SD=0.49), the video clips and infographics easy to understand no confusion was 4.60 (SD=0.50) and the video clips and infographics can be used in everyday life was 4.57 (SD=0.57), respectively, as shown in Table 6.

Table 6 Satisfaction in using the line application in conjunction with tele-Counseling among the intervention group

Satisfaction Issue	$\bar{x}$±SD	Satisfaction Level
1. The content of the video clips and infographics match the purpose of the program.	4.73±0.45	High
2. Video clips and infographics are easy to understand with no confusion.	4.60±0.50	High
3. Video clips and infographics accurate and up to date	4.65±0.56	High
4. Video clips and infographics can be used in everyday life.	4.57±0.57	High
5. Video clips and infographics are clear, beautiful.	4.63±0.49	High
6. Telephone consultation covers the issues and content required to take care of your health.	4.50±0.57	High
7. Phone counseling can help solve health problems.	4.30±0.60	High
8. Telephone consultations have a reasonable time not too long or too short.	4.40±0.56	High
9. Telephone consultant is appropriate. Knowledgeable and capable of consulting	4.53±0.51	High
Overall satisfaction	**4.63±0.56**	**High**

5. The PDSA Analysis

This study uses the PDSA principle to develop the healthcare service process including knowledge on healthcare which leads to desirable healthcare behavior among elderly patients with diabetes with the following concepts:

Plan: Set the objectives base on the service and patient needs.
The researchers plan to employ telehealth to deliver healthcare services and impart desirable health information to the target population. The line application in conjunction with consulting via telephone (tele-counseling) will be used as the tool. To keep things on track, educational activities have been built in the form of video clips using the line application, which was made by researching significant academic knowledge to generate a video clip and will also feature a systematic telephone consultation form.

Do: Implement the plan
six weeks of intervention will be conducted among 2 groups of the sample which are the intervention and control group, with 30 samples in each group. The activities as shown in the research methods below.

Study: Analyst the result obtains
There are 2 outcomes of this study as 1) healthcare knowledge and 2) healthcare behavior. We expected that after participating in the research activities, both outcomes will be higher than before and higher than those who did not participate. Therefore, we will measure and analyze such results. Using paired t-test statistics, the means of healthcare knowledge and behavior were compared between the intervention and control groups before and after participation in the program. The intervention and control groups' mean of desirable healthcare knowledge and nutritional behavior were compared using independent t-test statistics. Statistical significance was defined as a p-value of less than 0.05.

Act: Ensure the improvements are implemented.
If the designed activity was successful in educating and motivating the sample group to adopt healthier habits. We anticipate that these events will continue to support good health and awareness among older diabetes, as well as be valuable to ongoing healthcare. The researcher intends to give relevant community organizations the guidelines that have been created to be utilized as routine work for educating patients, particularly in critical conditions where access to medical services is limited.

Discussions

The results show that the elderly who received the health education program, together with the telecommunication application, had significantly higher averages than elders who received only regular healthcare and routine health-learning activities from their health facilities. the elderly received the healthcare training program through the. The findings also confirmed the beneficial effects of the healthcare education program using the line application in conjunction with the tele-counseling program. The positive effects of the program likely were due to the use of well-designed according to the principles of the PDSA model (Molenda, 2015) which consists of five phases namely Plan, Do, Study, and Act. This is consistent with the several pieces of research that developed applications to promote healthcare in the elderly by using the PDSA model as a design guideline results in high quality and high-performance applications. Continuous quality improvement using the PDSA technique. Because it is used to organize and structure all improvement efforts inside each program, the method is a significant part of most quality improvement projects (Speroff & O'Connor, 2004; Walley & Gowland, 2004). One of PDSA's main goals is to identify a link between process improvements and changes in outcomes in healthcare systems. The essential paradigm for displaying such functional correlations is the time-series design. Replication schemes and research techniques are used to overcome foreign problems which reduce the validity of observational studies and enhance the rigor of a PDSA design study for improvement (Speroff & O'Connor, 2004). The video clip and infographic contents were developed following the active conceptual learning environment, emphasizing a learning management process that enables students to learn and practice themselves through effective material and telephone supervision, enabling them to maintain stable, longer learning outcomes than with a classic learning process. Many studies have indicated that participants who take part in a program base on this concept could improve their knowledge and behavior (Chantem et al., 2018;

Robrujen, 2017; Wungrath et al., 2020). Furthermore, to maximize the provision of better health services, healthcare facilities and providers need to employ a combination of information and communications technology, formal and informal techniques for providing diverse and limited knowledge where necessary. Several studies suggest a link between the practice of knowledge management and health facilities and the performance of providers. Knowledge management (KM) interventions in healthcare are motivated by the fact that healthcare is a knowledge-based community in which knowledge is a critical commodity (Alajmi et al., 2016). The current health situation gives patients and health providers exceptionally big information problems. The speed with which information is produced and the complexity of the relationships between patients, health professionals, and healthcare systems are challenging. Knowing that a flood of data, unequal information, and patient satisfaction challenges the complex health information system in the COVID-19 pandemic era in the country, this study highlights the potential role that knowledge management could play in improving services provided to the health service provider. Health information systems. The study highlights how well. In this study, the processes of acquiring, sharing, generating, and using knowledge are perceived and defined. In the know-how process, explicit and implicit knowledge requires more than IT application to store best practice; it involves more communities, by sharing what they know, building on what is shared, and adapting it to their use, to maintain the know-how of the topic (Alajmi et al., 2016; Vold & Haave, 2020).

The growth of smartphones, tablets, and mobile applications represents important advances in health and medical care, in particular, the line app that offers education and cooperation for busy physicians and peers support and education in public health. In the 21st century, effective use of social media smartphones is part of communication between physicians and patients. Recent trends in social media include social networking services and mobile tools, like Instagram, WhatsApp, Facebook and Line (Kamel Boulos et al., 2016; Thongprasit, 2020) as a viable medium for sharing and discussing clinical cases and medical and health knowledge. There has also been and is popular in medical and healthcare sectors a growing number of social media and networking services. The focus of this study is a social media that is most popular in Thailand, namely the line application, a photo and video sharing instant message client. In medicine and health, the company has found a niche among health professionals who communicate and encourage social and mobile learning using hospital-specific and dedicated accounts and groups on these platforms. The line is free and easy to use, allowing all kinds of clinical exchanges and non-clinical exchanges, and supporting mobile education. It is available on the Android and iOS platforms and allows users to send text messages to their personal and professional learning networks and to share video and voice messages and images over the internet. The line Group Chat feature enables users to chat with 400 people at once and thus enables them to share content even better for clinical use. This is why line is the most popular application for Thai people with many advantages of line. Not even for the elderly, the line applications with different purposes have an extremely high use rate. However, health promotion is a key reason for line's use (Thongprasit, 2020).

Several studies have investigated the advantage of the line application in healthcare and health promotion purposes. Thubklong (2020) found that a significant mean score of understanding risk of Diabetes Mellitus (DM) complications in the intervention group who participate in the line applications health media to diabetic knowledge and understanding program was higher than the control group. The line Applications Health Media, which comprises cartoon images and short sentences related to Diabetes Mellitus. A benefit to the users is more understanding of the risk of diabetes complications which can be applied for taking care of themselves in their daily life. A further study by Suthirit (2018). It showed that, after taking part in the line's application program, the food consumption behavior and the exercise behavior of samples overweight were considerably better than the program before, and these results were better than the control group. The line was also assessed to be a communication method among overweight health volunteers in Thailand. In addition, the body mass index and the

intervention group's waist circumference were significantly lower than before the program and significantly lower than the control group. Along the same line, Chantem and colleagues (Chantem et al., 2018) evaluated the learning achievement from using the line application with collaborative learning in healthy exercise for the elderly. After learning together through the line-group, the exchange of knowledge and participation in the society of the elderly on fitness for health. As a result, the elderly has faster and more convenient communication. Similarly, Buapradit and Saokaew (Buapradit & Saokaew, 2020) concluded that a program for media literacy in advertising using the lines application has increased knowledge, skills, and desirable behaviors on the selection of health products among elderly patients. However, according to the literature review for foreign research, it hardly found any research that use the line application for health promotion. Because the line application is not widely used in foreign countries. But you will find the use of an application that is similar to the line application that is WhatsApp a lot as a tool to promote health among people. Several studies have studied the usefulness of WhatsApp in various groups of targets in clinical, health, and health promotion. WhatsApp has some useful advantages here and its growing popularity has led to several research studies (Cheung et al., 2015; Muntaner-Mas et al., 2017; Petruzzi & De Benedittis, 2016; Saavedra Ramirez, 2015; Willemse, 2015).

Counseling, another key strategy in this study was carried out via tele-counseling. Prior research has found the advice to improve the behaviors of elderly people. Tele-consulting can potentially improve the implementation of the following: 1.) Capacities for self-management of patients; 2.) adherence to medication; 3) Access to health resources; 5. Education in health (Piette et al., 2011). Chang and Colleague (Chang et al., 2019) reported that a supported tele-counseling program with a healthcare provider appears to be a feasible strategy to improve health quality, even in patients with diabetes and early chronic kidney disease. Moreover, Surveyed patients in Honduras with chronically ill conditions showed that more than 25% had been illiterate and 84% had either mobile telephone or "landline" telephone. 88% would be willing to receive telephone calls for upcoming appointments, 80% would want televised health monitoring for symptoms, and 81% would wish to take part in automated automatic self-management learning. Along the same line with Wolf et al.(Wolf et al., 2014) has been found that community health center telephone education and counseling appears more feasible than clinical models. In comparison with those with a conventional approach, the patients receiving telephone health education and counseling demonstrated better clinical results.

In the duration of COVID-19, since the first sine was adopted in many countries, including Thailand until the third wave of this public safety pandemic including reduced social contact and lockdown. However, the risk factors for various health disorders, the reduction in social support, and the under detection of health needs could be associated with social distancing and insulation. In addition, social distancing identifies a significant barrier to direct access to psychiatric services. The pandemic creates the pressing need for technology to be integrated into innovative models of mental health. Telehealth services involve the use of information technology, especially the application of social media to provide healthcare services to patients. It is a process that is widely accepted around the world may be particularly feasible and appropriate for the support of patients, family members, and healthcare providers during this COVID-19 pandemic. The integration of social media, application in line with other technological innovations (e.g., mobile applications, virtual reality, big data, and artificial intelligence), provides interesting prospects for improving healthcare. The Tele counseling the line application is a successful, growing way for elderly people with diabetes mellitus to provide healthcare. The COVID-19 pandemic can provide opportunities for introducing and promoting knowledge of digital possibilities among many health professionals (Di Carlo et al., 2021). Address challenges in developing countries to the implementation of telehealth services. Indeed, hospitals around the world are currently flooded with patients with COVID-19, causing hard decisions about the allocation of staff and resources. In the middle of the infectious outbreak and subsequent panic of this public health crisis,

the restructuring of healthcare is immediately necessary. Overall, telemedicine has emerged as an option to protect health providers on the frontline and help vulnerable chronic patients. The effective deployment of telemedicine has been avoided by the socioeconomic and racial disparities in low and middle-income countries. However, the desirable health knowledge and behavior in developing and developed countries is often neglected, but a critical element for telemedicine implementation (Butler, 2020; Nair et al., 2020; Neubeck et al., 2020).

The finding of this research it can be seen that the sample group had a high level of satisfaction with the program. Patient satisfaction is a major influencer of patients' behavior and an important indicator of healthcare quality since it reflects how effectively a provider meets their customers' expectations. In the healthcare industry, quality of care is an essential topic in quality assurance and improvement programs. Although the value of quality has always been acknowledged in the healthcare industry, it has risen in recent years because of increased quality insurance, quality improvement activities, and patient agendas. While the quality of care is more important than cost in healthcare, judging a patient's technical ability, as well as the immediate repercussions of many medicines, is difficult. The structure, techniques, and outcomes of healthcare have all been said to be used to assess its quality. While the goals of healthcare efficacy and safety are essentially universal, patient-centeredness, timeliness, efficiency, and equity are valued differently in different communities and cultures around the world. Healthcare measurements, such as process measures, are designed for a variety of audiences that may desire to use them to acquire, use, or improve healthcare performance. For all of these reasons, they must be relevant, scientifically valid, generalizable, and interpretable.

Patient satisfaction is a critical indicator of healthcare quality because it reflects how well a provider satisfies the client's most important expectations. Patient happiness has been linked to favorable outcomes such as increased compliance, lower medical service consumption, fewer malpractice lawsuits, and a better prognosis. The absence of a sound conceptual base and a consistent measuring tool to satisfy consumers, all of which help to identify tangible priorities for quality improvements and a proliferation of surveys that focus on patient experience only, such as aspects of the care experience, such as waiting times, the quality of basic services and communication with health care providers (Batbaatar et al., 2017). Some academics believe that improving quality from the perspective of patients delivers more value for money by improving safety, accessibility, equity, and comprehensiveness of care, although improving quality from the perspective of providers may be more beneficial. Patient happiness is one of the top concerns for every medical practitioner for a variety of reasons.

The results of this study show that the use of a wide range of widely accepted computer tools and patients, who vary from cultural to socio-economic standard, from literacy and elders with diabetes mellitus management, in combination with tele-counselling, is feasible. The combination of line application and tele-counselling enhances the intensity and breadth of patient information about themselves.

Conclusion

COVID-19's aftereffects are widely assumed to last significantly longer than they now do. To limit viral exposure, vulnerable persons, such as the elderly, would have to continue to undertake varying degrees of lifestyle adjustments. Elderly care research would continue to accommodate to their "new normal" for the benefit of communities and patients. Even though the problems we face are complex and cannot be solved with a single, all-encompassing answer, telehealth-based interventions appear to be a promising way to augment our efforts in this area. Telehealth is beneficial to both the elderly and healthcare practitioners in terms of giving quality treatment

without needing to move. Care teams and health systems across the world must work together to design and develop breakthrough technology to include virtual care into cancer practice. Telemedicine is here to stay, and it will have a significant impact on geriatric care in the future. It has the potential to improve the elderly's health and quality of life while also reducing access to healthcare services, hospitalization, and costs.

We've demonstrated how the PDSA technique may be utilized as an effective tool in the early stages of developing an intervention for knowledge and behavior delivery to elderly with diabetes mellitus during the covid-19 pandemic and to generate and test ideas prior to implementation. This technique is recommended because it is straightforward and intuitive for all members of the multidisciplinary team to utilize, and it enables for good reporting and documenting of the development process in service improvement project.

Acknowledgement

We sincerely thank all the participants for their valuable time in supporting the data collection for this study. We also thank Unitar International University, Malaysia and Asia eLearning Management Center, Singapore for their supports of our study.

References

[1] Alajmi, B.M., Marouf, L.N., & Chaudhry, A. S. (2016). Knowledge management for healthcare: Investigating practices that drive performance. Journal of Information & Knowledge Management, 15(02), 1650014.

[2] Ammerman, A.S., Lindquist, C.H., Lohr, K.N., & Hersey, J. (2002). The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence. Prev Med, 35(1), 25-41. https://doi.org/10.1006/pmed.2002.1028

[3] Azzolino, D., Arosio, B., Marzetti, E., Calvani, R., & Cesari, M. (2020). Nutritional status as a mediator of fatigue and its underlying mechanisms in older people. Nutrients, 12(2), 444.

[4] Baker, K., & Figueroa, R. (2021). Motivation, Attitudes, and Diet Quality Among US Parents and Adolescents. American Journal of Health Behavior, 45(1), 125-137.

[5] Batbaatar, E., Dorjdagva, J., Luvsannyam, A., Savino, M.M., & Amenta, P. (2017). Determinants of patient satisfaction: a systematic review. Perspectives in public health, 137(2), 89-101.

[6] Bliemel, M., & Hassanein, K. (2007). Consumer satisfaction with online health information retrieval: a model and empirical study. E-service Journal, 5(2), 53-84.

[7] Buapradit, A., & Saokaew, S. (2020). Effects of the Program for Media Literacy in Advertising on Consumption Behavior of Health Products among Elderlies Using Line Application in Nakhon Nayok Thai Journal of Pharmacy Practice, 12(4), 932-942.

[8] Butler, S.M. (2020). After COVID-19: thinking differently about running the health care system. Jama, 323(24), 2450-2451.

[9] Chaichuy, W. (2017). The use of LINE by the elderly: a phenomenological study. Veridian E-Journal, Silpakorn University (Humanities, Social Sciences and arts), 10(1), 905-918.

[10] Chang, A. R., Bailey-Davis, L., Yule, C., Kwiecen, S., Graboski, E., Juraschek, S., Krekel, C., Collins, C., & Anderson, C. (2019). Effects of Dietary App-Supported Tele-Counseling on Sodium Intake, Diet Quality, and Blood Pressure in Patients With Diabetes and Kidney Disease. Circulation, 139.

[11] Chantem, A., Chuathong, S., & Supinanont, P. (2018). The Development of Application using collaborative learning on the topic “Healthy Exercise for the Elderly. Veridian E-Journal, Silpakorn University (Humanities, Social Sciences and arts), 11(1), 1371-1385.

[12] Cheung, Y.T.D., Chan, C.H.H., Lai, C.K.J., Chan, W.F.V., Wang, M.P., Li, H.C.W., Chan, S.S.C., & Lam, T.H. (2015). Using WhatsApp and Facebook online social groups for smoking relapse prevention for recent quitters: a pilot pragmatic cluster randomized

controlled trial. Journal of medical Internet research, 17(10), e238.

[13] De Almeida, M., Graca, P., Afonso, C., Kearney, J., & Gibney, M. (2001). Healthy eating in European elderly: concepts, barriers and benefits. The journal of nutrition, health & aging, 5(4), 217-219.

[14] Di Carlo, F., Sociali, A., Picutti, E., Pettorruso, M., Vellante, F., Verrastro, V., Martinotti, G., & di Giannantonio, M. (2021). Telepsychiatry and other cutting-edge technologies in COVID-19 pandemic: Bridging the distance in mental health assistance. International journal of clinical practice, 75(1).

[15] Fávaro-Moreira, N.C., Krausch-Hofmann, S., Matthys, C., Vereecken, C., Vanhauwaert, E., Declercq, A., Bekkering, G. E., & Duyck, J. (2016). Risk factors for malnutrition in older adults: a systematic review of the literature based on longitudinal data. Advances in nutrition, 7(3), 507-522.

[16] Ghazi, L., Fereshtehnejad, S.M., Abbasi Fard, S., Sadeghi, M., Shahidi, G.A., & Lökk, J. (2015). Mini Nutritional Assessment (MNA) is rather a reliable and valid instrument to assess nutritional status in Iranian healthy adults and elderly with a chronic disease. Ecology of food and nutrition, 54(4), 342-357.

[17] Hoevenaars, F.P. M., Berendsen, C.M.M., Pasman, W.J., van den Broek, T. J., Barrat, E., de Hoogh, I. M., & Wopereis, S. (2020). Evaluation of Food-Intake Behavior in a Healthy Population: Personalized vs. One-Size-Fits-All. Nutrients, 12(9). https://doi.org/10.3390/nu12092819

[18] Jukkrit, W., Nuttida, K., & Piyawat, S. (2021). The Effect of Nutritional Education Using Line Application in Conjunction with Tele-Counseling on Nutritional Knowledge and Behavior Among the Elderly with Chronic Diseases. International Journal of Pharmaceutical Research, 13(1), 5805-5812.

[19] Kamel Boulos, MN., Giustini, D. M., & Wheeler, S. (2016). Instagram and WhatsApp in Health and Healthcare: An Overview. Future Internet, 8(3), 37. https://www.mdpi.com/1999-5903/8/3/37

[20] Koojareonpasit, S., & Pumpinyo, S. (2020). The behavior of preparing for retirement in thailand. Global Journal of Accounting and Economy Research, 1(2), 109-117.

[21] Mann, D.M., Chen, J., Chunara, R., Testa, P.A., & Nov, O. (2020). COVID-19 transforms health care through telemedicine: evidence from the field. Journal of the American Medical Informatics Association, 27(7), 1132-1135.

[22] Meethien, N., Pothiban, L., Ostwald, S., Sucamvang, K., & Panuthai, S. (2011). Effectiveness of Nutritional Education in Promoting Healthy Eating among Elders in Northeastern Thailand. Pacific Rim international journal of nursing research, 15, 188-202.

[23] Molenda, M. (2015). In search of the elusive ADDIE model. Performance Improvement, 54(2), 40-42.

[24] Muntaner-Mas, A., Vidal-Conti, J., Borras, P.A., Ortega, F.B., & Palou, P. (2017). Effects of a Whatsapp-delivered physical activity intervention to enhance health-related physical fitness components and cardiovascular disease risk factors in older adults. J Sports Med Phys Fitness, 57(1-2), 90-102.

[25] Nair, S.C., Satish, K.P., Sreedharan, J., Muttappallymyalil, J., & Ibrahim, H. (2020). Letter to the Editor: Improving health literacy critical to optimize global telemedicine during COVID-19. Telemedicine and e-Health, 26(11), 1325-1325.

[26] National Statistical Office of Thailand. (2020). The Survey of Thai Elderly Population 2019 https://www.msociety.go.th/article_attach/14494/1814 5.pdf

[27] Neubeck, L., Hansen, T., Jaarsma, T., Klompstra, L., & Gallagher, R. (2020). Delivering healthcare remotely to cardiovascular patients during COVID-19: a rapid review of the evidence. European Journal of Cardiovascular Nursing, 19(6), 486-494.

[28] Nichol, K.L., Nordin, J.D., Nelson, D.B., Mullooly, J. P., & Hak, E. (2007). Effectiveness of influenza vaccine in the

community-dwelling elderly. New England Journal of Medicine, 357(14), 1373-1381.

[29] Petruzzi, M., & De Benedittis, M. (2016). WhatsApp: a telemedicine platform for facilitating remote oral medicine consultation and improving clinical examinations. Oral surgery, oral medicine, oral pathology and oral radiology, 121(3), 248-254.

[30] Piette, J.D., Blaya, J.A., Lange, I., & Sanchis, J. B. B. (2011). Experiences in mHealth for chronic disease management in 4 countries. Proceedings of the 4th International Symposium on Applied Sciences in Biomedical and Communication Technologies,

[31] Robrujen, S. (2017). Development of the Elderly Care Model for Elderly Caregivers. Princess of Naradhiwa University Journal 9(3), 57-69.

[32] Saavedra Ramirez, J.F. (2015). Social networks as a means of monitoring patients with hypertension and diabetes success story/Las redes sociales como medio de monitoreo en pacientes con hipertension y diabetes una historia de exito. International Journal of Integrated Care, 15(8).

[33] Speroff, T., & O'Connor, G.T. (2004). Study designs for PDSA quality improvement research. Quality Management in Healthcare, 13(1), 17-32.

[34] Thongprasit, J. (2020). Elderly User's Usage Behavior of Line Application on a Smartphone. The Journal of KMUTNB, 30(118-129).

[35] Vold, A.T., & Haave, H.M. (2020). Relevance of adult higher education on knowledge management in the healthcare sector.

[36] Walley, P., & Gowland, B. (2004). Completing the circle: from PD to PDSA. International Journal of Health Care Quality Assurance.

[37] Willemse, J. J. (2015). Undergraduate nurses reflections on Whatsapp use in improving primary health care education. curationis, 38(2), 1-7.

[38] Wolf, M.S., Seligman, H., Davis, T.C., Fleming, D.A., Curtis, L.M., Pandit, A.U., Parker, R. M., Schillinger, D., & DeWalt, D. A. (2014). Clinic-based versus outsourced implementation of a diabetes health literacy intervention. Journal of general internal medicine, 29(1), 59-67.

[39] World Health Organization. Older Population and Health System: a Profile of Thailand. 2015; 10:2015.

[40] Wungrath, J. (2020). Health Information-Seeking Behavior among Elderly in Northern Thailand International Journal of Innovative Science and Research Technology 6(1), 7-3.

[41] Wungrath, J., Mongkol, P., Chanwikrai, Y., & (2020). Nutrition Education Using Nutrition Handbook and Tele-Counselling Improved Nutritional Knowledge and Behaviour of Elderly in Northern Thailand Asian Journal of Dietetics, 3(1), 165-170.

[42] Zhang, Z., Pereira, S.L., Luo, M., & Matheson, E.M. (2017). Evaluation of blood biomarkers associated with risk of malnutrition in older adults: a systematic review and meta-analysis. Nutrients, 9(8), 829.