

ผลของโปรแกรมเตรียมความพร้อมก่อนผ่าตัดผ่านแอปพลิเคชันต่อความวิตกกังวล และความสามารถในการดูแลตนเองของผู้ป่วยผ่าตัดต่อกระดูก

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บทคัดย่อ

ต่อกระดูกเป็นสาเหตุสำคัญของภาวะสายตาสีเทาในผู้สูงอายุ การเตรียมความพร้อมก่อนผ่าตัดจึงมีความสำคัญต่อผลลัพธ์และการดูแลตนเองของผู้ป่วย การศึกษาวิจัยครั้งนี้เป็นการศึกษาวิจัยแบบกึ่งทดลองแบบสองกลุ่มวัดผลก่อนและหลังทดลอง โดยมีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมการเตรียมความพร้อมก่อนผ่าตัดผ่านแอปพลิเคชันต่อความวิตกกังวล และความสามารถในการดูแลตนเองของผู้ป่วยที่ได้รับการผ่าตัดต่อกระดูก กลุ่มตัวอย่างเป็นผู้ป่วยที่ได้รับการวินิจฉัยจากแพทย์ว่าเป็นต่อกระดูก และได้รับการรักษาด้วยการผ่าตัดตามการนัดหมายผ่าตัดล่วงหน้า ณ โรงพยาบาลนครพิงค์ จำนวน 60 ราย แบ่งเป็นกลุ่มทดลอง จำนวน 30 ราย และกลุ่มควบคุม จำนวน 30 ราย โดยคัดเลือกแบบเฉพาะเจาะจง กลุ่มควบคุมได้รับการดูแลตามมาตรฐานของโรงพยาบาล และกลุ่มทดลองได้รับโปรแกรมการเตรียมความพร้อมก่อนผ่าตัดผ่านแอปพลิเคชันเป็นระยะเวลา 2 สัปดาห์ เก็บรวบรวมข้อมูลโดยใช้แบบสอบถามความวิตกกังวล และแบบสอบถามความสามารถในการดูแลตนเอง มีค่าดัชนีความตรงเชิงเนื้อหาเท่ากับ 1.0 และค่าสัมประสิทธิ์แอลฟาครอนบาคเท่ากับ 0.87 และ 0.92 ตามลำดับ วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา สถิติทีคู่ และสถิติทีอิสระ ผลการวิจัยพบว่า ภายหลังการทดลอง กลุ่มทดลองมีคะแนนเฉลี่ยความวิตกกังวลต่ำกว่าก่อนทดลองอย่างมีนัยสำคัญทางสถิติ ($p=0.007$) และมีคะแนนเฉลี่ยความสามารถในการดูแลตนเองสูงกว่าก่อนทดลองอย่างมีนัยสำคัญทางสถิติ ($p<0.001$) นอกจากนี้ กลุ่มทดลองมีคะแนนเฉลี่ยความวิตกกังวลต่ำกว่า และคะแนนเฉลี่ยความสามารถในการดูแลตนเองสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ($p<0.001$) ขนาดอิทธิพลอยู่ในระดับปานกลางถึงสูงมาก (Cohen's $d=0.76-2.96$) แสดงถึงนัยสำคัญทางปฏิบัติที่ชัดเจน ผลการวิจัยแสดงให้เห็นว่าโปรแกรมการเตรียมความพร้อมก่อนผ่าตัดผ่านแอปพลิเคชันสามารถลดความวิตกกังวล และส่งเสริมความสามารถในการดูแลตนเองของผู้ป่วยผ่าตัดต่อกระดูกได้อย่างมีประสิทธิภาพ จึงควรนำไปใช้ในการดูแลผู้ป่วยอย่างต่อเนื่อง

คำสำคัญ: โปรแกรมการเตรียมความพร้อมก่อนผ่าตัด; ความวิตกกังวล; ความสามารถในการดูแลตนเอง; ผ่าตัดต่อกระดูก

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Effect of a mobile application-based preoperative preparation program on anxiety and self-care ability among cataract surgery patients

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Abstract

Cataract is a major cause of visual impairment in the elderly, making preoperative preparation crucial for patient outcomes and self-care. This quasi-experimental study employed a two-group pre-test and post-test design to examine the effects of a mobile application-based preoperative preparation program on anxiety and self-care ability among cataract surgery patients. The sample consisted of 60 patients diagnosed with cataracts by physicians and scheduled for elective cataract surgery at Nakornping Hospital. Participants were divided into an experimental group (n=30) and a control group (n=30) using purposive sampling. The control group received standard hospital care, while the experimental group received the mobile application-based preoperative preparation program for two weeks. Data were collected using anxiety and self-care ability questionnaires with content validity indices of 1.0 and Cronbach's alpha coefficients of 0.87 and 0.92, respectively. Data were analyzed using descriptive statistics, paired t-test and independent t-test. The results revealed that the experimental group demonstrated significantly lower anxiety scores ($p=0.007$) and significantly higher self-care ability scores ($p<0.001$) compared to baseline. Furthermore, the experimental group exhibited significantly lower anxiety scores and higher self-care ability scores than the control group ($p<0.001$). Effect sizes ranged from medium to very large (Cohen's $d=0.76-2.96$), indicating strong practical significance. These findings demonstrate that the mobile application-based preoperative preparation program effectively reduces anxiety and enhances self-care ability among cataract surgery patients. Continuous implementation of this program in clinical practice is therefore recommended.

Keywords: preoperative preparation program; anxiety; self-care ability; cataract surgery

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Introduction

Cataract is an ocular condition that represents a leading cause of blindness and visual impairment worldwide. According to the World Health Organization, approximately 65 million individuals globally are affected by vision impairment due to cataracts, a figure expected to rise continuously as the elderly population expands¹. In Thailand, cataracts constitute the primary cause of blindness among older adults, with more than 100,000 patients awaiting surgical intervention annually². At Nakornping Hospital, cataract cases have demonstrated a consistent upward trend, increasing from 11,562 cases in 2021 to 16,476 in 2024³. Cataracts develop primarily due to age-related lens degeneration, with additional contributing factors including genetic predisposition, metabolic disorders, medication use, trauma, and congenital abnormalities. Risk factors encompass smoking, alcohol consumption, prolonged ultraviolet exposure, corticosteroid use, diabetes mellitus, and hypertension⁴. This condition exerts significant impacts across multiple dimensions. Physical consequences include functional limitations in daily activities, elevating accident risk and compromising personal safety⁵. Psychological impacts encompass anxiety, diminished self-confidence, and apprehension regarding independent functioning, potentially precipitating depressive symptoms⁶. Social ramifications include withdrawal from interpersonal interactions and increased reliance on caregivers⁷.

Contemporary cataract management primarily involves phacoemulsification and

intraocular lens implantation, procedures generally considered safe and highly efficacious. Nevertheless, postoperative complications remain a concern, with incidence rates ranging from 20% to 40% within two to five years following surgery^{8,9}. A review of the literature reveals prevalent self-care deficits, including non-adherence to prescribed medication regimens and inadequate compliance with infection prevention protocols¹⁰. Preoperative preparation constitutes an essential process ensuring patients are physically and psychologically prepared for surgery, thereby enhancing procedural safety while fostering patient confidence and optimizing recovery¹¹. However, evidence indicates that 20% to 25% of patients experience preoperative anxiety concerning potential infection and vision loss¹². Furthermore, certain patients express uncertainty regarding postoperative self-care behaviors¹³. Comprehensive patient education can effectively enhance confidence and mitigate anxiety, positively influencing surgical outcomes.

In light of these challenges, mobile health technology presents a promising avenue for delivering accessible and personalized patient education. A mobile application-based approach offers distinct advantages, including the capacity for patients to review educational content at their convenience, visual demonstrations of self-care procedures, and timely reminders for medication adherence. The researcher, a registered nurse in the ophthalmology outpatient department at Nakornping Hospital, developed a mobile

application-based preoperative preparation program to evaluate its effects on anxiety and self-care capabilities among cataract surgery patients. The specific objectives of this study are twofold: first, to compare mean anxiety and self-care ability scores before and after intervention in the experimental group; and second, to compare these scores post-intervention between the experimental group and the standard care group. The findings may contribute to improved treatment efficacy while advancing patient care quality and nursing practice in ophthalmological settings.

Materials and Methods

Study Design

This research applies Orem's Self-Care Theory¹⁴, which posits that when self-care requirements exceed individual capabilities, self-care deficit occurs, necessitating nursing support. The researcher integrated the Supportive-Educative Nursing System, promoting

self-care development through four methods: Teaching (providing knowledge and skills), Guiding (offering recommendations and problem-solving assistance), Supporting (providing encouragement and positive reinforcement), and Providing Environment (creating conditions conducive to self-care).

Anxiety and self-care ability were selected as dependent variables based on their theoretical interconnection: high anxiety impairs learning capacity and self-care development, while education reduces anxiety and enhances self-care skills. The mobile application-based program operationalizes these principles through three phases: Phase 1 (preoperative)—providing disease information, treatment procedures, and self-care instructions via LINE application; Phase 2 (surgery day)—reviewing care content; and Phase 3 (post-discharge)—following up on patient self-care practices (Figure 1).

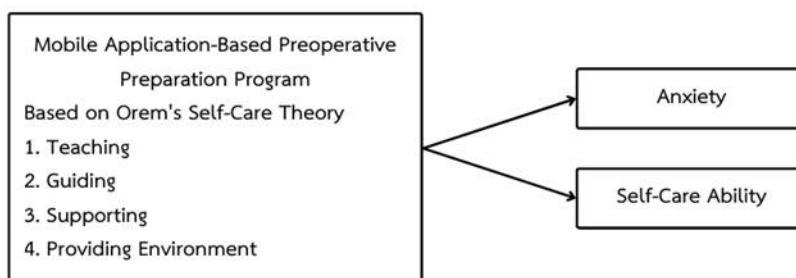


Figure 1 Conceptual framework

This study is a quasi-experimental research design with two groups, pretest-posttest design, collecting data from cataract surgery patients at the ophthalmology outpatient nursing unit, Nakornping Hospital, Chiang Mai Province. Sixty participants were divided into experimental group (30) and control group (30), from May to August 2025.

This research project has been reviewed and approved by the Human Research Ethics Committee of Nakornping Hospital, with approval number NKP No 024/68, approved on February 17, 2025, and expiring on February 16, 2026. The researcher explained the research details to participants. Participation in this research study was voluntary, and participants could withdraw from the research at any time without any impact on their treatment. All obtained data would be kept confidential, and questionnaire numbers would be used as codes to replace participants' names and surnames. Research results would be presented in aggregate form and would be used solely for research purposes.

Contamination Prevention

To minimize contamination between groups, the researcher implemented sequential data collection, completing the control group before enrolling the experimental group. Participants in the experimental group were instructed not to share program materials, and both groups attended the clinic on different appointment schedules to prevent contact.

Population and Sample

Population: Patients diagnosed by physicians with cataracts receiving scheduled cataract surgery with artificial lens implantation at the ophthalmology outpatient nursing unit, Nakornping Hospital, Chiang Mai Province.

Sample: Patients diagnosed with cataracts receiving scheduled cataract surgery with artificial lens implantation at the ophthalmology outpatient nursing unit, Nakornping Hospital, Chiang Mai Province. Sixty participants divided into experimental group (30) and control group (30), from March to May 2025. Sample selection criteria: Inclusion criteria: 1) Age 18 years and above; 2) Normal perception, understanding, and communication ability; 3) Ability to read, speak, and understand Thai; 4) First-time cataract surgery history; 5) Ability to use mobile phone with LINE application; and 6) Consent to participate. Exclusion criteria: 1) Patients with daily activity limitations; 2) Changed anesthesia method from local to general or combined anesthesia; 3) Incomplete research participation; 4) Withdrawal or refusal to participate; and 5) Inability to contact via LINE application (Figure 2).

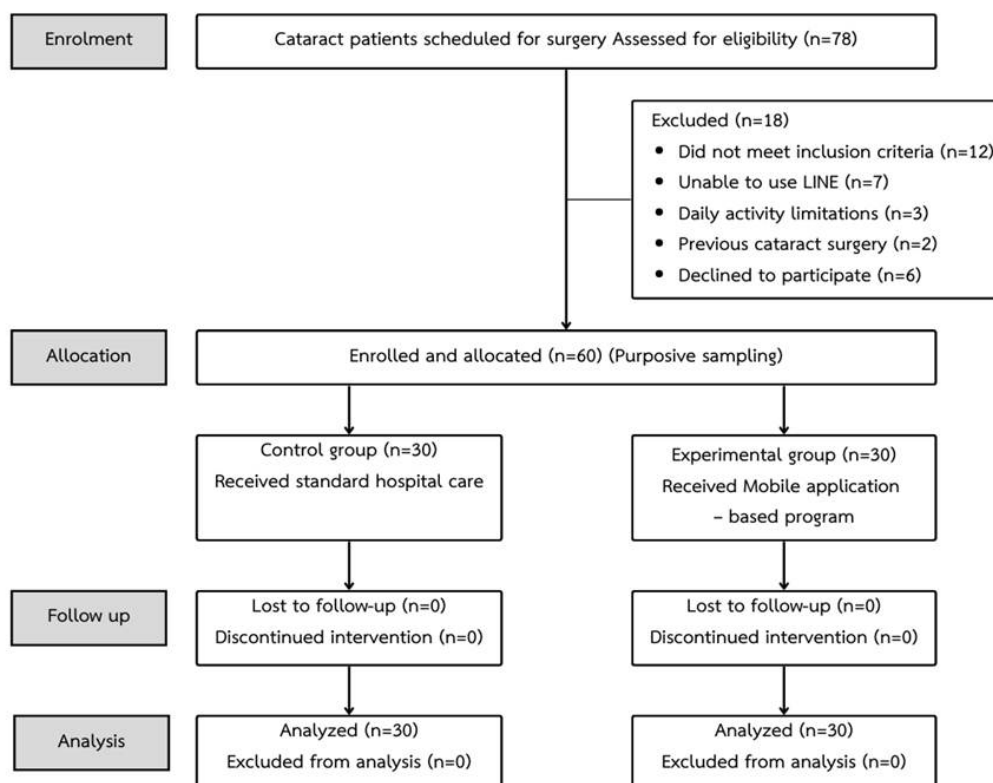


Figure 2 Flow diagram of participant selection

Sample Size Determination

Sample size was calculated using G*Power version 3.1.9.6 with power of test = 0.80, confidence level = 0.05, and effect size = 0.74 estimated from similar research by Benjawan P. et al.¹⁵, yielding 25 participants per group. To prevent data loss risk, sample size was increased by 20%¹⁶, resulting in 60 total participants: experimental group (30) and control group (30). Purposive sampling was used to select participants meeting inclusion criteria.

Research Instruments

The research instruments comprise two parts: instruments used for research implementation and instruments used for data collection.

1. Research Implementation Instruments:

1.1 Mobile application-based pre-operative preparation program for cataract surgery patients using Orem's supportive-educative nursing theory, incorporating four methods: teaching, guiding, supporting, and providing environment. The program contains pre-operative preparation content divided into three phases: Phase 1 - Pre-operative period (before surgery day), Phase 2 - Surgery Day, and Phase 3 - Post-discharge period.

1.2 Cataract pre-operative preparation record form developed by the researcher from literature review and documents related to cataract pre-operative preparation. This form is used to record individual patient care plans

through online forms via LINE application, comprising three phases: Phase 1 - Pre-operative period (assessing health history, family support, and disease knowledge), Phase 2 - Surgery Day (assessing waiting time for surgery and continuous post-operative patient care), and Phase 3 - Post-discharge period (regarding post-operative self-care).

1.3 Online health poster media about self-care for cataract surgery patients - poster media providing information to patients undergoing cataract surgery with artificial lens implantation. The researcher developed this from literature review and related documents, with content including disease information and pre-operative, intraoperative, and post-operative care instructions.

1.4 LINE application - a communication channel and method used for information exchange, knowledge provision, and guidance to help patients manage various symptoms that occur. It also serves as a reminder channel for patients regarding self-care for those who have undergone cataract surgery.

2. Data Collection Instruments comprising three sets:

2.1 Personal data record form - a multiple-choice and fill-in-the-blank questionnaire containing general information about the sample group, including gender, age, religion, marital status, education level, occupation, average monthly family income, healthcare benefits, and treatment history. The researcher personally collected this information from participants' medical records, including visual

acuity level, duration of vision loss, duration of cataract treatment initiation, chronic diseases, history of anticoagulant use, alcohol consumption, and smoking habits.

2.2 Anxiety questionnaire - For this research study, the researcher used the State-Trait Anxiety Inventory Form Y-1 (STAI Form Y-1) by Spielberger¹⁷, developed and translated into Thai by Darawan Tapinta¹⁸, to assess situational anxiety (anxiety state) in cataract surgery patients. The instrument contains 20 items divided into 10 positive questions and 10 negative questions, using a 4-point rating scale. The scoring criteria for each question divides feelings into 4 levels, with possible total scores ranging from 20-80 points. Score interpretation: higher scores indicate high situational anxiety, while lower scores indicate low situational anxiety.

2.3 Self-care ability questionnaire - a questionnaire created by the researcher from literature review and related documents, based on Orem's self-care conceptual framework. This instrument measures self-care ability for cataract surgery patients during pre-operative, intraoperative, and post-operative periods, containing 26 items. The questionnaire uses a 5-point rating scale, with self-care ability scoring criteria ranging from lowest to highest in 5 levels: lowest = 1 point to highest = 5 points, with total scores ranging from 26-130 points. Score interpretation: lower scores indicate self-care ability at the lowest level, while higher scores indicate self-care ability at the highest level.

Quality Verification of Research Instruments

1. Content Validity The researcher submitted the research implementation instruments, including the mobile application-based pre-operative preparation program for cataract surgery patients, the cataract pre-operative preparation record form, the health poster media about self-care for cataract surgery patients, and the data collection instruments, including the personal data record form and the self-care ability questionnaire, to five experts for content validity verification. The five experts consisted of one ophthalmologist specializing in cataract surgery patient care and treatment, two nursing instructors with expertise in nursing care for cataract surgery patients, and two nurses with expertise in caring for cataract surgery patients. They examined the accuracy, comprehensiveness, and appropriateness of the content. Subsequently, the Content Validity Index (CVI) was calculated and found to be 1.0 for all instruments.

2. Instrument Reliability The researcher pilot-tested the anxiety questionnaire and self-care ability questionnaire with 20 cataract surgery patients who had similar characteristics to the sample group and received services at the ophthalmology outpatient nursing unit, Outpatient and Emergency Building, Nakornping Hospital. Subsequently, reliability was calculated using Cronbach's Alpha coefficient, yielding values of 0.87 and 0.92, respectively. For the mobile application-based pre-operative preparation program for cataract surgery

patients, the researcher pilot-tested it with 10 cataract surgery patients who had similar characteristics to the sample group. The findings indicated that the program had appropriate content and the program procedures used in the study were feasible.

Data Collection

1. Experimental Preparation Procedures Following ethical approval from the Human Research Ethics Committee of Nakornping Hospital, the researcher obtained permission from the Hospital Director and attending physicians to conduct the study. Professional nurses at the ophthalmology outpatient unit screened potential participants according to eligibility criteria from the day patients were scheduled for cataract surgery. Eligible participants were informed of the study objectives, voluntary nature of participation, confidentiality measures, and their right to withdraw at any time without affecting their treatment. Written informed consent was obtained prior to enrollment.

2. Experimental Implementation Procedures

Prior to each session, the researcher reviewed participant medical records to assess physical and mental readiness. The control group received standard postoperative care according to the ophthalmology outpatient unit protocols, while the experimental group received the mobile application-based preoperative preparation program over a two-week period using a patient-centered approach (Table 1).

Table 1 Comparison of experimental implementation procedures between control and experimental groups

Session	Timing	Duration	Control group	Experimental group
1	Day of examination and surgery scheduling	20-30 minutes	Established LINE application contact for consultation; provided standard pre-operative instructions and confirmed surgery date	Activity 1: Building relationships and promoting awareness of pre-operative cataract surgery preparation Established rapport and LINE application contact; provided comprehensive pre-operative, intraoperative, and post-operative education via mobile application
2	Week 1, Day 1 (Pre-operative)	20-30 minutes	Conducted pre-test data collection; assessed readiness and reinforced admission instructions	Activity 2: Promoting awareness of pre-operative cataract surgery preparation Conducted pre-test evaluation; reinforced preparation knowledge via application; facilitated discussion on pain self-management
3	Day 1 post-operative	20-30 minutes	Provided standard post-operative self-care guidance; scheduled two-week follow-up	Activity 3: Promoting knowledge and self-care ability after cataract surgery Reviewed pre-operative knowledge; practiced self-care skills with patient and family; provided encouragement and reinforcement
4	Day 2 pre-discharge	20-30 minutes	-	Activity 4: Promoting readiness for home self-care after cataract surgery Reviewed post-operative self-care; addressed concerns; shared infographic materials via LINE application
5	Week 1 post-discharge	20-30 minutes	-	Activity 5: Stimulating, reinforcing, and supporting behavioral practices for post-operative cataract self-care through LINE application Facilitated problem-solving discussion via LINE application; provided continuous support and reinforcement
6	Week 2 follow-up appointment	15-20 minutes	Conducted post-test evaluation; provided additional self-care education and infographic materials	Activity 6: Supporting continuous behavioral practices for post-operative cataract self-care and evaluation at the ophthalmology outpatient unit, Nakhon Ping Hospital Conducted post-test evaluation; compared pre-post results; summarized program outcomes

Program Adherence Assessment

Program adherence was assessed through LINE's read receipt function, participant response records, and attendance tracking across six sessions. All 30 experimental group participants completed every session (100% adherence rate), with a 95.6% average message read rate, demonstrating good intervention fidelity.

Data Analysis

Statistical analyses were performed using SPSS version 29.0 with a significance level of 0.05. One-tailed hypothesis testing was employed based on consistent empirical evidence from prior studies demonstrating that preoperative preparation programs reduce anxiety and enhance self-care ability in cataract surgery patients, thereby justifying increased statistical power for detecting anticipated effects. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize personal data. Chi-square test and Fisher's exact test were employed to compare categorical demographic variables between groups, while independent t-test was used for continuous variables. Paired t-test was utilized to compare within-group differences in anxiety and self-care ability scores before and after intervention, whereas independent t-test was applied for between-group comparisons. Effect sizes were calculated using Cohen's *d* to evaluate practical significance of the findings.

Results

1. Personal Data

The sample consisted of 60 participants divided into an experimental group that received the mobile application-based pre-operative preparation program (30 participants) and a control group that received standard hospital care (30 participants). The personal data of both groups before the experiment showed no statistically significant differences. The experimental group was predominantly female, aged 61 years and above, Buddhist, married, with primary education level, currently unemployed, with average monthly income less than 10,000 baht, covered by universal healthcare and had visual limitations. The control group was predominantly female, aged 61-70 years, Buddhist, married, with primary education level, currently unemployed, with average monthly income less than 10,000 baht, covered by universal healthcare and had visual limitations. Comparison of baseline demographic characteristics between the two groups revealed no statistically significant differences ($p>0.05$), indicating homogeneity of the sample prior to the intervention (Table 2).

Table 2 Comparison of demographic characteristics between the experimental and control groups (n=60)

Demographic characteristics	Experimental group (n=30)		Control group (n=30)		p-value
	Number	Percent	Number	Percent	
Sex					0.121 ^b
Male	11	36.67	17	56.67	
Female	19	63.33	13	43.33	
Age (years)					0.758 ^a
Below 50	1	3.33	1	3.33	
50-60	7	18.33	4	13.33	
61-70	11	36.67	14	46.67	
Above 70	11	36.67	11	36.67	
Mean±SD = 67.82±8.305					
Religion					0.301 ^b
Buddhism	27	90.00	29	96.67	
Christianity	3	10.00	1	3.33	
Marital status					0.686 ^a
Single	5	16.67	6	20.00	
Married	18	60.00	20	55.67	
Divorced	2	6.67	2	6.67	
Widowed	5	16.67	2	6.67	
Education					0.730 ^a
Below primary education	11	36.67	7	23.33	
Elementary	7	23.33	10	33.33	
High school	5	16.67	4	13.33	
Vocational certificate	3	10.00	5	16.67	
Bachelor degree	4	13.33	4	13.33	
Occupation					0.644 ^a
Government employee	3	10.00	1	3.33	
Private company employee	2	6.67	1	3.33	
Business owner	7	23.33	10	33.33	
Farmer	5	16.67	3	10.00	
Unemployed	15	43.33	15	50.00	
Average monthly household income (baht)					0.102 ^a
Below 10,000	22	73.33	17	56.67	
10,001 - 20,000	4	13.33	11	36.67	
Above 20,000	4	13.33	2	6.67	

Table 2 Continued

Demographic characteristics	Experimental group (n=30)		Control group (n=30)		p-value
	Number	Percent	Number	Percent	
Mean±SD = 12,933.33±10,152.843					
Health insurance					0.073 ^b
Company health insurance	2	6.67	7	76.67	
Universal health coverage	28	93.33	23	23.33	
Vision level					0.648 ^a
Normal	4	13.33	2	6.67	
Partial vision	9	30.00	11	36.67	
Limited vision	17	56.67	17	56.67	
Duration of vision loss					0.583 ^a
Less than 1 month	2	6.67	1	1.67	
1-3 months	4	13.33	5	16.67	
3-6 months	5	16.67	2	6.67	
More than 6 months	19	63.33	22	73.33	

^a=Chi-square test, ^b=Fisher's exact test

2. Comparison of Mean Anxiety Scores and Self-Care Ability Scores in Cataract Surgery Patients Before and After the Intervention in the Group Receiving the Pre-Operative Preparation Program.

The findings showed that after the intervention, the experimental group that received the pre-operative preparation program

had significantly lower mean anxiety scores compared to before the intervention at the 0.05 statistical significance level ($p=0.007$) and significantly higher mean self-care ability scores compared to before the intervention at the 0.05 statistical significance level ($p<0.001$) (Table 3).

Table 3 Comparison of average scores of anxiety and self-care ability before and after experiment with in experimental group analyzed by Paired t-test (n=30)

Variable	$\bar{X}$	SD	Mean difference	t	df	95% CI of mean difference	Cohen's d	p-value
Anxiety								
Before	36.87	8.102	5.94	2.898	29	1.747 to 10.120	0.76	0.007
After	30.93	7.746						
Self-care ability								
Before	102.53	12.955	-15.20	-5.963	29	-20.413 to -9.987	1.45	<0.001
After	117.73	7.187						

3. Comparison of Mean Anxiety Scores and Self-Care Ability Scores in Cataract Surgery Patients After the Intervention Between the Group Receiving the Pre-Operative Preparation Program and the Group Receiving Standard Care.

The findings showed that after the intervention, the experimental group that

received the pre-operative preparation program had significantly lower mean anxiety scores compared to the control group at the 0.01 statistical significance level ($p < 0.001$) and significantly higher mean self-care ability scores compared to the control group at the 0.01 statistical significance level ($p < 0.001$) (Table 4).

Table 4 Comparison of average scores of anxiety and self-care ability after experiment with in experimental group analyzed by independent t-test (n=60)

Variable	$\bar{x}$	SD	Mean difference	t	df	95% CI of mean difference	Cohen's d	p-value
Anxiety								
Experimental group (n=30)	30.93	7.746	-8.60	-4.831	58	-12.168 to -5.032	1.25	<0.001
Control group (n=30)	39.53	5.923						
Self-care ability								
Experimental group (n=30)	117.73	7.187	26.30	11.461	58	21.705 to 30.895	2.96	<0.001
Control group (n=30)	91.43	10.311						

Discussion

The findings revealed that the experimental group receiving the mobile application-based preoperative preparation program demonstrated significantly lower anxiety scores ($p=0.007$) and higher self-care ability scores ($p < 0.001$) compared to baseline. Additionally, the experimental group exhibited significantly lower anxiety scores and higher self-care ability scores than the control group ($p < 0.001$). These results indicate that the intervention effectively achieved its intended objectives of reducing preoperative anxiety

and enhancing self-care capabilities among cataract surgery patients.

These findings can be explained through the theoretical framework of Orem's Self-Care Theory, specifically the Supportive-Educative Nursing System, which emphasizes promoting patient learning and developing appropriate self-care abilities. The researcher facilitated patients' self-care capabilities through four systematic methods: (1) Teaching - providing comprehensive information regarding disease pathophysiology, treatment modalities, preoperative preparation, intraoperative

procedures, and postoperative care through LINE application, enabling patients to acquire essential knowledge and problem-solving skills; (2) Guiding – conducting regular follow-up visits via LINE application to monitor patient self-care practices including wound care, pain management, medication administration, and recognition of abnormal symptoms, thereby providing information for informed decision-making; (3) Supporting – offering continuous encouragement, psychological support, and positive reinforcement when patients successfully performed self-care activities, along with accessible consultation channels and supplementary educational materials; and (4) Providing environment – arranging conditions conducive to self-care and preparing necessary equipment while planning goal-oriented activities within specified timeframes. This study extends Orem's Self-Care Theory by demonstrating that the Supportive-Educative Nursing System can be effectively implemented through digital technology platforms, confirming that these four nursing methods delivered via mobile application significantly reduce self-care deficit while simultaneously decreasing anxiety.

The findings are consistent with previous research. Regarding anxiety reduction, Thongnuch S. et al.¹⁹ examined the effects of a preoperative preparation program on anxiety reduction in elderly cataract surgery patients at a tertiary hospital, reporting that the experimental group demonstrated significantly lower anxiety scores compared to both baseline and control group ($p < 0.001$). Similarly, Yoochachwal P.²⁰

investigated the effectiveness of a knowledge promotion and preoperative behavior program for cataract surgery patients, finding that patients receiving the intervention demonstrated significantly higher knowledge and behavior scores ($p < 0.001$) and significantly lower anxiety scores compared to the standard care group ($p < 0.001$). Regarding self-care ability enhancement, the results align with findings from Thaweewannakij A. and Thappa J.²¹, who reported that participants demonstrated significantly higher knowledge and self-care behaviors following a health self-care promotion program ($p < 0.05$). Furthermore, Phankasikaorn P. and Kitsripaisarn S.²² found that a self-care promotion program incorporating educational videos, sterile technique demonstrations, self-care manuals, and telephone follow-up resulted in significantly higher knowledge and self-care behavior scores compared to both baseline and control group ($p < 0.05$).

The findings demonstrate meaningful clinical significance beyond statistical results. Anxiety scores decreased by 5.94 points, representing a 16.1% reduction and indicating a clinically meaningful shift from moderate to low anxiety levels, with a medium-to-large effect size (Cohen's $d = 0.76$). Self-care ability scores increased by 15.20 points, representing a 14.8% improvement, with a very large effect size (Cohen's $d = 1.45$). Between-group comparisons post-intervention revealed even more pronounced effects, with Cohen's $d = 1.25$ for anxiety and $d = 2.96$ for self-care ability, confirming substantial practical benefits of the mobile application-based intervention for clinical implementation.

However, certain limitations should be acknowledged. This study was conducted at a single tertiary care hospital with a relatively small sample size of 60 participants over a brief two-week follow-up period, which precluded long-term outcome assessment and may limit the generalizability of findings to diverse healthcare settings and patient populations. Additionally, varying technological proficiency among elderly participants and unmeasured baseline knowledge may have influenced the results. Future research should investigate long-term outcomes at 3-, 6-, and 12-month post-intervention intervals, including complication rates, readmission rates, and sustainability of self-care adherence. Multicenter studies with larger samples are recommended to enhance generalizability, and the program should be further developed into a comprehensive mHealth platform incorporating automated reminders and video instructions. For clinical practice, nurses and healthcare personnel can implement this mobile application-based preoperative preparation program to effectively reduce anxiety and enhance self-care ability among cataract surgery patients.

Conclusions

The results of this research study demonstrate that the mobile application-based pre-operative preparation program implemented over a 2-week period effectively reduces anxiety and promotes self-care ability in cataract surgery patients. Therefore, this program should be continuously implemented for patients.

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