Needs Communicative Digital Technology Program for Intubated Patients with Critical Illnesses: A Quasi-Experimental Study

*Nuttapol Chaihan, Winthanyou Bunthan**

Abstract: Patients with critical illnesses and on intubation cannot express their needs through verbal language. Thus, nurses and other healthcare professionals might not meet their needs, resulting in frustration and more stress for nurses and patients. This situation may interfere with patients' recovery. In this quasi-experiment study, we developed and tested the effectiveness of the Needs Communicative Digital Technology Program. Sixty participants who were critically ill and intubated were recruited from an intensive care unit of a secondary care hospital in a province close to Bangkok, Thailand. They were alternately assigned weekly to the experimental (n = 30) and control groups (n = 30). The experimental group received the program for 48 hours, including the usual care in the intensive care unit. The control group received only usual care in the intensive care unit. Questionnaires for data collection were a demographic data form, the Met Needs Questionnaire, and the Effectiveness of Communication Questionnaire. Data were analyzed using descriptive statistics, a chi-squared test, a Fisher exact test, a t-test, and ANCOVA.

Findings revealed that after 48 hours of program implementation, the experimental group had significantly higher mean scores on met needs and effective communication than before starting the program and higher than that of the control group. Thus, it can be concluded that this program effectively met the needs of intubated people with critical illnesses with advanced technology and communication strategies that can be used easily, conveniently, and quickly. Nurses can use this program in practice and further evaluate its effectiveness before widespread use in the country.

Pacific Rim Int J Nurs Res 2023; 27(3) 601-616

Keywords: Communicative technology, Communication program, Communication effectiveness, Critical Illness, Intubation, Met needs

Received 9 April 2023; Revised 15 June 2023; Accepted 16 June 2023

***Nuttapol Chaihan**, RN, MNS, Lecturer, Faculty of Nursing, Huachiew Chalermprakiet University, Thailand. E-mail: nuttapol.chaihan@gmail.com*
***Correspondence to: Winthanyou Bunthan**,* RN, PhD, Assistant Professor, Faculty of Nursing, Huachiew Chalermprakiet University, Thailand. E-mail: winthanyou@gmail.com*

Introduction

Patients with critical illnesses (PCI) with inadequate ventilation and respiratory failure usually need intubation, which helps oxygen flow throughout the body. However, intubation requires putting a tube into a bronchus, which passes and interferes with the function of the vocal cords.[1,2] Thus, PCI are unable to communicate verbally. Caretaking staff, therefore, need to understand what the patients try to communicate through nonverbal language, which may have an inaccurate understanding.[3] Consequently, they may provide care that differs from the patient's needs. These situations can escalate into conflicts between patients and the staff.[4] In this regard, the ineffectiveness of communication between PCI on intubation and the staff is a crucial problem that staff, especially the nurses,

must pay attention to and figure out means to cope with.[5] The nurse's role poses a challenge in providing communication aids and additional communication strategies to assist patients,[6] including appropriate solutions to overcome communication barriers with intubated patients.

An old strategy was communication boards, including image boards and letter boards, but newer innovative strategies now include technologies such as computers, smartphones, iPads, and tablets to facilitate the exchange of information.[7,8] Studies related to the use of devices in assisting PCI on intubation, in which communication boards are utilized with specified messages and pictures, allow the patients to communicate their needs and reduce their worries about being unable to speak.[9,10] Studies on the training programs for nurses regarding the use of communication devices for patients with intubation suggested that the patients received care that was more consistent with their needs, their frustration was lessened, and the nurses had increasing satisfaction with the use of devices.[6] A study concerning the use of visual communication cards and a list found that the patients had decreasing levels of communication.[11] However, previous studies indicate the advantages and limitations of communication boards. The advantages include that communication boards are easily obtained at a reasonable price, but materials are not durable, and many are required in communication.[6,10] It also takes time for the patients to find pictures that match their needs, and sometimes there are no pictures representing what the patients want to communicate.[9,11]

Concerning studies on the adoption of digital technology for communication among patients with intubation, some were conducted on the design of applications in notebooks containing messages and pictures so that the patients can press the items to communicate their needs, reducing worry during the intubation period.[12] However, the disadvantage was the notebooks were quite large, causing difficulties and inconvenience for the patients in their operation.[12] Furthermore, studies using voice messages and pictures for communication with doctors, nurses and caretaking relatives were found to decrease patients' anxiety with increasing convenience since the communication tablets are compact and portable, and the pictures are big enough to be seen clearly.[13] Communication on tablets can be done in several aspects, including pictures, text messages and voice, which can contain a large amount of information and can also be used by the patients in nearby beds.[14] Nonetheless, the limitations include the complicated steps in operation. Therefore, one needs to be trained before operating the system, and the patient's time to use the tablets should be extended.[15]

In the Thai context, PCI with intubation encountering difficulties in communication usually rely on pointing their fingers, waving their hands, moving their lips and writing.[16] Rarely have devices been provided to assist the patients with intubation in communicating their needs.[17] In practice, the nurses try to supply the devices that assist patients to communicate through writing on paper. In some instances, the patients attempt to write to express their needs, yet it has been observed that they cannot control their writing and deliver understandable messages.[18] Due to the above reasons, we recognized the need to develop and test the effectiveness of the Needs Communicative Digital Technology Program (NCDTP) to meet the PCI's needs.

The framework for this study, was the Petro-Yura and Walsh′s Theory of Individual Needs applied to create communication strategies with only digital technology. Needs are natural human desires that always arise, and all human beings have needs. Petro-Yura and Walsh[19] developed their theory to be used in nursing, comprising three aspects: 1) survival needs are those of food and water, getting enough oxygen, excretion to remove waste from the body, the need for rest, the need for adequate sleep, and safety needs from various dangers; 2) closeness needs consist of love, care, concern and other emotional needs; and 3) freedom needs consist of self-independence and the right to choose what one wishes for oneself, aesthetic experience, freedom from pain and discomfort, and the need for self-control.

When there is a life-threatening condition, there will be a need to reduce its severity to be able to live. However, a study applying the theory of needs of Yura and Walsh[19] of patients with liver and bile duct cancer before hospital discharge found that patients with hepatobiliary cancer needed physical readiness, knowledge of self-care, home care and support, and teaching practices before returning home.[20]

Intubated patients are considered to have critical illnesses. Their physical and mental conditions are exhausted, and their self-help ability is limited. Therefore, they want to communicate with the caregivers, nurses, and health workers to respond to their needs. Moreover, nurses, therefore, play an important role. Innovation technology is very promising to help both PCI and nurses communicate effectively. Thus, this study aimed to develop and test the effectiveness of the NCDTP for patients with critical illness and on intubation. The following hypothesis was set: participants in the experimental group who received NCDTP for 48 hours would have significantly higher met needs and communication effectiveness than before receiving the program, higher than those in the control group.

Methods

Design: The study was quasi-experimental research with a two-group pretest and posttest design. The Transparent Reporting of Evaluations with Non-Randomized Designs (TREND) checklist was utilized as a guideline for this study report.

Setting and Sample: The sample was hospitalized in the intensive care unit of a secondary hospital in one province vicinity to Bangkok, Thailand and based on the following inclusion criteria: 1) receive intubation within 24-48 hours; 2) remaining conscious with no confusional state; 3) age over 18 years; 4) having a pulse rate within 60-130/min, a respiratory rate at 16-26/min, systolic blood pressure at 90-139 mmHg, diastolic blood pressure at 60-90 mmHg, and oxygen saturation above or equal to 95%; 5) were not treated with sedative drugs injected continuously into veins (such as fentanyl, midazolam, or cisatracurium besylate); 6) had a motor power level at over 4; 7) could read and write in Thai; 8) had no hearing and vision problems; 9) could answer the questions by nodding; and 10) could read the text in Angsana New at 20 font size from a distance of 1-2 feet. The exclusion criteria were: 1) being infected with tuberculosis or coronavirus in a contagious period; 2) being diagnosed with Parkinson's disease, already detected with an unbalanced blood circulation system or diagnosed with schizophrenia. The discontinuation criteria were the patients who were: 1) found with an unstable state or life-threatening conditions (oxygen saturation < 95%, blood pressure < 90/60 mmHg); 2) self-extubating or having the tubes removed during the study; or 3) expressing their intention to withdraw from the study.

The sample size was calculated based on previous studies[16] and Cohen's formula[21] with a power of test at 0.8 and a statistically significant level of .05. The effect size of similar studies remained at 0.8. The sample size was 50, with 25 in each group. To prevent potential loss, the sample size was increased by 20% both for both groups at n = 30 each.

Sampling: Participants who met the inclusion criteria were recruited from an intensive care unit by convenience sampling. To avoid study contamination, the experiment and control group were conducted on alternate weeks. The first week was randomly selected as the intervention group. Thus, all the participants in the first and odd week were in the experimental group, while participants in the second and even week were in the control group until there were 30 in each group.

Ethical Considerations: The study was approved by the Institutional Review Board of Huachiew Chalermprakiat University in Thailand (IRB No. 1204/2565) and the participating hospital (IRB No. Oq03365). The primary investigator (PI) explained the research project and informed the participants that they could freely decide whether they would like to participate in the research project and could withdraw at any time.

The data obtained would be kept confidential. The results of the study would be presented as a group rather than individual data; if the participants were willing to participate in the study, they and their family caregivers signed informed consent before the study. The participants had to demonstrate their willingness to participate throughout the study.

Research Instruments: Research instruments consist of two parts: instruments used to collect data and the Needs Communicative Digital Technology Program (NCDTP).

Instruments: there were three instruments:

The Demographic Characteristics and Health Status Questionnaire developed by the PI was used to collect participant characteristics and medical data. It included gender, age, education level, diagnosis, intubation experience, medications that affect the patient's consciousness, and the motor power of the limb muscles.

The Met Needs Questionnaire (MNQ) was developed by the PI based on Petro-Yura and Walsh's theoretical framework of human needs,[19] assessing the degree to which nurses could meet their needs. It is composed of 30 items: 16 items about survival needs, seven items about closeness needs, and seven items about freedom needs. It employs a 5-point Likert scale ranging from 1 = minimal to 5 = the most. An example is, "When you have chest pain and palpitations, how much can the nurse help you?" The total scores range from 30 to 150, with a higher score indicating higher met needs. The MNQ was reviewed for content validity by five experts: a nurse experienced in caring for PCI and intubation, a physician specialized in PCI, a nursing instructor specializing in PCI and intubation, a nursing instructor specializing in human needs theory, and an engineering instructor specializing in technology. The content validity index (CVI) was 0.89. After that, 30 intubation patients who met the same criteria as the participants in the main study were used as a pilot group to test the questionnaire. Cronbach's alpha coefficients of the pilot sample and the main study were 0.82 and 0.86, respectively.

The Communication Effectiveness Questionnaire (CEQ) developed by the PI based on a literature review, determines the patient's perception of how much the nurses understand their needs and whether they can communicate the details of their messages easily, clearly, and immediately. Questions consist of eight items on a rating scale of 0-10, from 0 representing no effective communication to 10 representing the highest level of effective communication. The total scores range from 0 to 10. The score ranges from 0-80, with a higher score indicating a higher level of effective communication. An item example is, "The method of communication used makes it possible to communicate needs to others easily, quickly, and takes no time." The CEQ was reviewed for content validity by five experts, the same as the Met Needs Questionnaire. The content validity index (CVI) was 0.82. Cronbach's alpha coefficients of the pilot sample and the main study were 0.80 and 0.84, respectively.

Needs Communicative Digital Technology Program (NCDTP) and Implementations

The PI developed the NCDTP based on Petro-Yura and Walsh's Human Needs Theory, a literature review, and a group discussion of 18 nurses in charge of the intensive care unit to elicit the list of needs patients frequently communicate with nurses. Then the needs were categorized according to the theory[19] into three aspects: survival, closeness, and freedom needs. Then these 30 needs were transformed into texts, voice messages, and pictures expressing 30 messages of needs. Survival needs to contain 16 messages, for example, "unable to breathe," "help drain the mucus," and "chest pain or palpitation." Closeness needs contain seven messages, for example, "I want to see my family," "I want my family to be around me," and "I want support." Finally, freedom needs to contain seven messages, for example, "I want to take off the tube," "I want to go home.", and "I want to be informed of my health conditions." Then all these were loaded into a tablet, prepared to assist the patients in communicating their needs to nurses and other caregivers, including

physicians. When the patients press the screen to communicate their needs through the tablets, the voice messages will be delivered and passed to the computers at the nurse station. The nurse would know the needs of the patients and could respond to such needs in a timely manner **(see Figure 1).**

Figure 1. Examples of tools that assist in communication through digital technology

To assist patients in understanding their health problems and to use the Needs Communicative Digital Technology, three video presentations are loaded into a tablet that assists in communicating needs. The video presentations titled "The Lost Voice," "Voice Touch Tablets," and "Touching Voice to Communicate Ideas, Feelings, and Needs" were developed based on a related literature review. "The Lost Voice" is two minutes long, presenting the causes of an inability to communicate verbally. "Voice Touch Tablets" is two minutes long, presenting the strengths and benefits of using tablets to communicate needs. "Touching Voice to Communicate Ideas, Feelings, and Needs" is five minutes long, presenting the steps in using tablets for communicating needs by illustrating pictures and voice-over. The video presentations were reviewed by the same instrument experts and revised according to their suggestions.

The PI conducted the NCDTP in the experimental group during five visits with participants. On the first visit, the PI established relationships and provided information about the causes of intubation for each patient. Then the participants watched three video presentations to learn about their health problems and the benefits of the tablet for communicating their needs and feelings. Then the PI demonstrated the use of tablets to assist in the communication of needs and asked the patients to redemonstrate. On the second and third visits (the first day after participating in the experiment for 4 and 6 hours) and the fourth visit (after participating in the experiment for 24 hours), the PI followed up on the operation, identified problems or obstacles that might arise, and provided explanations based on the problems. Positive reinforcement was given to promote consistent use of the tablets. The fifth visit (after participating in the experiment for 48 hours) was to catch up with the research results. The NCDTP was reviewed by the same instrument experts and revised according to their suggestions. Then the program was pilot-tested to evaluate its practicability. Details of implementations of the NCDTP are shown in **Appendix, Table 1.**

Usual Care: In the intensive care unit, if the patients were intubated, non-verbal communication methods were used, namely pointing, nodding, and shaking. Most of the patients try to call the nurse by waving their hands and communicate by using their fingers to point to the position of the body for nurses to anticipate their needs. However, the nurse often takes a long time to interpret it. Sometimes nurses might not translate the patient's needs correctly. If the patients could write, paper and pencil were provided for them to indicate their needs with writing. Nevertheless, it was found that some patients could not control their hands to write comprehensible sentences and had difficulty writing to express their needs.

Data Collection: This study was conducted from October 2022 to January 2023, within the hospital standard prevention protocol for the COVID-19 pandemic. After the IRB approval, the PI contacted the head nurse of the hospital to inform the research objectives and procedures. The intensive care unit nurses were asked to recruit potential participants according to the inclusion criteria. Then the PI met with the participants and their relatives, informed them of the details of the study, and asked them both to sign consent forms. Two research assistants working at two ICUs, registered nurses with more than 3-year experience taking care of PCI and currently working in an ICU were trained to collect the data. They were informed about the research objectives but unaware of the group assignment. Demographic and medical data were obtained from medical records before the implementation of the NCDTP. The Met Needs and the Communication Effectiveness questionnaires were collected by research assistants who spent 20 minutes collecting data by reading the questions to the patients and having patients point out the answers on the answer board at baseline before implementing the NCDTP and 48 hours after. The NCDTP was delivered to the experimental group by the PI.

For the control group, the PI visited the participants twice. On the first visit, the PI met with the participants

and their relatives, informed them of the details of the study, and asked them both to sign consent forms. The procedure of data collection was the same as in the experiment group. For the second time, the PI visited the control group after they had participated in the research for 48 hours. In case that the participants in the control group were still intubated, we let them use the tablets to assist in communicating their needs in the same way as the experimental group until the tubes were removed. For this study, a control group of three patients remained intubated.

Data Analysis: Personal data were analyzed through descriptive statistics, frequency distribution, and percentage. Data distribution was examined through the Shapiro-Wilk test. The mean difference scores of met needs and communication effectiveness within the experimental group and the control group were compared by paired t-test. The mean difference scores of met needs and communication effectiveness between the experimental and control groups were compared by independent t-test, and ANCOVA was used to test the effectiveness of the program.

Results

Characteristics of Participants and Medical Data

A total of 60 participants remained in the study until the end. Most of the participants were male, the mean age was 63.22 years, 45% had no education, most were diagnosed with pneumonia, and none had experienced intubation prior to this study. They were still treated with lorazepam 0.5 mg. The characteristics, as well as medical data between the two groups, were not significantly different. Details of the characteristics and medical data are shown in **Table 1.**

Table 1. Personal demographic data

Characteristics	Frequency (%)			Statistic value	p-value
	Total (N = 60)	Experimental group (n = 30)	Control group (n = 30)		
Gender				.073 [a]	.787
Male	39 (65.00)	19 (63.33)	20 (66.67)		
Female	21 (35.00)	11 (36.67)	10 (33.33)		
Age (years) Mean (SD)	63.22 (10.57)	63.53 (11.04)	62.91(10.23)	.235 [t]	.815
18-40	9 (15.00)	4 (13.33)	5 (16.67)		
41-60	18 (30.00)	10 (33.33)	8 (26.67)		
> 60	33 (55.00)	16 (53.34)	17 (56.66)		
Education level				1.977 [a]	.372
Uneducated	27 (45.00)	15 (50.00)	12 (40.00)		
Elementary school	23 (38.33)	12 (40.00)	11 (36.67)		
Secondary education	10 (16.67)	3 (10.00)	7 (23.33)		
Diagnosis				3.810 [b]	.923
Pneumonia	18 (30.00)	9 (30.00)	9 (30.00)		
Pulmonary embolism	8 (13.33)	6 (20.00)	2 (6.67)		
Acute respiratory distress syndrome	2 (3.33)	1 (3.33)	1 (3.33)		
Hemoptysis	2 (3.33)	1 (3.33)	1 (3.33)		
COPD/Asthma	4 (6.67)	2 (6.67)	2 (6.67)		
STEMI/NSTEMI	6 (10.00)	2 (6.67)	4 (13.33)		

Table 1. Personal demographic data (Cont.)

Characteristics	Frequency (%)			Statistic value	p-value
	Total (N = 60)	Experimental group (n = 30)	Control group (n = 30)		
Congestive heart failure	4 (6.67)	2 (6.67)	2 (6.67)		
End-stage renal disease	7 (11.67)	3 (10.00)	4 (13.33)		
Septic shock	8 (13.33)	4 (13.33)	4 (13.33)		
Diabetic ketoacidosis	1 (1.67)	-	1 (3.33)		
Intubation experience				.618[a]	.734
Never received intubation	35 (58.33)	16 (53.33)	19 (63.33)		
Has been intubated once	16 (26.67)	9 (30.00)	7 (23.33)		
Has been intubated 2 times	9 (15.00)	5 (16.67)	4 (13.33)		
Medications affecting patients' consciousness				3.223[b]	.359
Not received	25 (41.67)	13 (43.33)	12 (40.00)		
Lorazepam 0.5 mg 1 tab oral hs	25 (41.67)	13 (43.33)	12 (40.00)		
Lorazepam 1 mg 1 tab oral hs	7 (11.66)	4 (13.33)	3 (10.00)		
Lorazepam 1 mg 2 tab oral hs	3 (5.00)	-	3 (10.00)		
Motor power of limb muscles				.659[a]	.417
Grade 4	21 (35.00)	9 (30.00)	12 (40.00)		
Grade 5	39 (65.00)	21 (70.00)	18 (60.00)		

t = t-test, [a] = Chi-square test, [b] = Fisher' Exact test, COPD = Chronic obstructive pulmonary disease, STEMI = ST-elevated myocardial infarction, NSTEMI = non-ST elevated myocardial infarction, ESRD = End-stage renal disease

Effectiveness of NCDTP

As shown in **Table 2**, after 48 hours of the program implementation, the mean scores of met needs and communication effectiveness in the experiment group were significantly higher than at baseline ($p < .001$). However, in the control group, the mean scores on met needs after 48 hours were not significantly different from baseline ($p > .05$), but the mean scores on communication effectiveness after 48 hours were significantly lower than those at baseline ($p < .001$). When comparing the two groups, it was found that at the baseline before the implementation of the program, the mean scores of met needs and communication effectiveness were significantly different between the groups. Thus, ANCOVA was used to test the effectiveness of the program (See **Table 3**).

Table 2. A comparison of the mean scores on met needs and communication effectiveness between and within groups before and after the experiment

Variables	Experimental group (n = 30)	Control group (n = 30)	t	p-value
	Mean (SD)	Mean (SD)		
Met Needs				
T1	67.30 (11.05)	60.23 (11.63)	-2.411[b]	.019
T2	87.50 (6.84)	59.53 (7.49)	-15.09[b]	.001
t	-9.781[a]	.513[a]		
p-value	.001	.612		

Table 2. A comparison of the mean scores on met needs and communication effectiveness between and within groups before and after the experiment (Cont.)

Variables	Experimental group (n = 30)	Control group (n = 30)	t	p-value
	Mean (SD)	Mean (SD)		
Communication effectiveness				
T1	35.66 (9.74)	29.93 (7.19)	-2.593[b]	.012
T2	64.23 (4.14)	25.36 (5.97)	-29.267[b]	.001
t	-15.665[a]	6.578[a]		
p-value	.001	.001		

T1 = Before the experiment, T2 = 48 hours of implementation the program

[a] = independent t-test, [b] = paired t-test

The results of the analysis of the pretest met needs scores and communication effectiveness scores were correlated with the posttest at the statistical significance ($F = 23.792$, $p = < .001$, and $F = 17.465$, $p = < .001$, respectively), in accordance with the agreement of using ANCOVA. When considering the post-experimental of both met needs and communication effectiveness mean scores after controlling the pre-experimental score, the posttest mean scores of the experimental group were significantly higher than those of the control group ($F = 240.792$, $p < .001$, and $F = 902.692$, $p < .001$, respectively) (See **Table 3**).

Table 3. A comparison of the mean met needs scores and communication efficiency after the experiment between the experimental group and the control group after the pre-test control scores

Source	SS	df	MS	F	p-value
Met Needs					
Covariate (Pre-test)	879.024	1	879.024	23.792	< .001
Between-group	8894.790	1	8894.790	240.792	< .001
Error	2105.943	57			
Total	338999.000	60			
Communication effectiveness					
Covariate (Pre-test)	359.864	1	359.864	17.465	< .001
Between-group	18599.724	1	18599.724	902.692	< .001
Error	1174.469	57			
Total	144616.000	60			

In addition, a comparison between the two groups at 48 hours of program implementation also indicated that mean difference scores on both met needs and communication effectiveness in the experiment group were significantly higher than those of the control group (See **Table 4**).

Table 4. A comparison of the mean difference scores on met needs and communication effectiveness between the experimental group and the control Group

Variable	n	Control Group		Experimental Group		t	p-value
Met Needs	60	-.700	7.474	20.200	11.311	-8.433	< .001
Communication effectiveness	60	-4.566	3.802	28.566	9.988	-16.980	< .001

Discussion

This study found that the NCDTP implemented for 48 hours was effective in participants' needs being met and increased communication effectiveness. The NCDTP's ability to respond to patient needs stems from the comprehensive integration of human needs as proposed by Petro-Yura and Walsh, [19] and from group discussion among 18 nurses working with PCI with intubation. These needs represent the actual experiences of PCI with intubation,[22] and when combined with digital technology through tablets, it is more convenient for both the patients and the nurses to communicate, and patients' needs are being met. In addition, the NCDTP was more effective as it could communicate visually, textually, and audibly. Also, it supports the validity and usefulness of Petro-Yura and Walsh's concept of human needs during threatening illnesses.[19] Previous studies support our findings in that providing information that nurses knew about the needs of intubated patients who were often communicated, useful for compiling and putting them in the form of visual, text, and audio communication programs via tablets resulted in an improvement in communication among patients with intubation.[16] Also, an integrated review of communication in patients intubated and on mechanical ventilators found that having a means of communicating through an intermediary or a program that captures patient needs can help nurses to communicate effectively and meet patients' needs.[6,23]

The nurses working in the ICU are the closest to the patient with intubation and are the ones who communicate with patients the most while they are being treated. It is a very challenging issue if nurses can find effective communication methods with advanced technology to help resolve patient communication problems. The initial development of the NCDTP required input from nurses working in the ICU to identify problems with patient-nurse communication. This is consistent with previous studies about the use of communication aids for intubation patients. Researchers searched for the original method of communication between patients and nurses and encountered problems communicating with each other, including searching for needs or phrases that are the basic needs of the patient to be packed into modern communication aids.[24,25] Additionally, these nurses discussed challenges they encountered when trying to communicate with patients using the typical techniques employed by nursing staff, such as lip reading, asking yes-or-no questions, and pointing. This is consistent with previous studies that provided information on the communication methods of intubated patients with staff.[5,28,29] These approaches were time-consuming and frustrating for both nursing staff and patients, in addition to being ineffective at understanding the patients' requirements. The nurses working in the ICU had the same opinion about presenting communication strategies using tablets to help communicate. In addition, nurses working in the ICU presented a list of needs that patients frequently communicated with them. This is important because it is contained within the tablet to help communicate. Our development was supported by previous studies where tablets were used to assist communication.[17] The tablet's user-friendly design and adequate illustration of needs and feelings for communicating with this group of patients may be the reason why it can improve communication efficacy. The nursing staff's conclusion that the application was appropriate for use demonstrated its apparent support.[25,26] The tablets offer two-way communication, which may make it easier to reach an understanding between the patients and the caregivers.[13,16] Therefore, it was not surprising that when they had a more effective and contemporary communication style, needs were met, and communication efficacy increased.

A strength for the NCDTP and a challenge for the PI to develop is the design of a need-communication tablet that can deliver voice messages to the nurse's station. It has not been shown in previous studies related to the design of communication strategies for intubated

patients, and it is considered a great innovation by Thai nurses. This allows the nurse at the station to hear the patient's needs and respond quickly. According to previous studies, when the needs of patients become faster and clearer through effective advanced communication devices, there is no doubt that they have been met with better needs. This leads to cooperation and participation in treatment. As a result, intubated patients can be well-being while intubated.[18,27,30] Unexpected for this study was that some patients' relatives saw the benefits of using digital communication technology through a tablet to help communicate needs, they would like to download an application to be packed into their own tablet for patients to use in cases where the patient is unable to remove the endotracheal tube and has a tracheostomy tube inserted and it is necessary to continue to communicate between patients and relatives at home. Previous studies support our study in that they found that family members are in need of a means to help communicate with patients when they visit them at the hospital. This includes if the patient has returned home but still has problems with verbal communication. They still want to get communication tools to use at home.[26]

However, we also found a limitation in the development of the NCDTP, namely, that the application package on the tablet helps communicate needs and can only be downloaded to the tablet or phone in the Android system. It would be better if it could be loaded on devices that are IOS systems, such as iPads, because, at present, iPads are used more than tablets, and iPads are larger than tablets. [30,31] Also, as mentioned above, the ability of the tablet to help communicate can send sound to the nursing station, and a list of requirements will appear on the computer on the nurse's desk. However, we could not determine how the nurses care for the patients. When they press communication needs, it would be even better if we knew how the nurses looked after the patient after needs were communicated.

Limitations and Future Research

There are limitations of this study; firstly, generalization is limited since the study was conducted in only one hospital in one province in the central area vicinity of Bangkok, so the results may not be applied to other settings. Secondly, a threat to the internal validity of the result cannot be avoided since participants were assigned to groups by week. Thus, the events in each week might not be the same, which could affect the results. Thirdly, the PI measured only met needs and effective communications; thus, in the future study, other outcomes, such as patients' satisfaction with this new innovative communication and length of stay in the ICU, should be incorporated.

Conclusions

The 48 hours-NCDTP was helpful in enhancing effective communication, which resulted in meeting the needs of patients with critical illness and intubation. This may reduce the frustration of patients. It is also beneficial for nurses to shorten the time spent in communicating with patients and reduce conflicts with patients who are unable to have their needs met in a timely manner or when nurses are unable to respond to their needs. The future development of the program is the connection of the patient′s needs signaling system to the desktop computer PC located in the nurse station, causing delays in responding to patient needs as nurses are caring for other patients or absent from the nurse station. Further development is also required in the connection to nurses' smartphones so that nurses can respond to the needs of patients quickly. Nurses and patients can use this program easily.

Acknowledgments

We would like to express sincere appreciation to all participants in this study and to Huachiew Chalermprakiet University, Thailand, for granting financial support to the study.

References

1. McGrath BA, Wallace S, Wilson M, Nicholson L, Felton T, Bowyer C, et al. Safety and feasibility of above cuff vocalization for ventilator-dependent patients with tracheostomies. J Intensive Care Soc. 2019; 20(1): 59-65. doi:10.1177/1751143718767055.
2. Wallace S, McGrath BA. Laryngeal complications after tracheal intubation and tracheostomy. BJA Educ. 2021; 21(7):250-7. doi:10.1016/j.bjae.2021.02.005.
3. Modrykamien AM. Strategies for communicating with conscious, mechanically ventilated critically ill patients. Proc (Bayl Univ Med Cent). 2019;32(4):534-7. doi: 10.1080/08998280.2019.1635413.
4. Holm A, Viftrup A, Karlsson V, Nikolajsen L, Dreyer P. Nurses' communication with mechanically ventilated patients in the intensive care unit: umbrella review. J Adv Nurs. 2020; 76(11):2909-20. doi:10.1111/jan.14524.
5. Kyranou M, Cheta C, Pampoulou E. Communicating with mechanically ventilated patients who are awake. a qualitative study on the experience of critical care nurses in Cyprus during the COVID-19 pandemic. PLoS One. 2022;17(12):e0278195. doi:10.1371/journal.pone.0278195.
6. Momennasab M, Mohammadi F, DehghanRad F, Jaberi A. Evaluation of the effectiveness of a training programme for nurses regarding augmentative and alternative communication with intubated patients using Kirkpatrick's model: a pilot study. Nurs Open. 2023;10(5):2895-903. doi:10.1002/nop2.1531.
7. Gropp M, Johnson E, Bornman J, Koul R. Nurses' perspectives about communication with patients in an intensive care setting using a communication board: a pilot study. Health SA. 2019; 24:1162. doi:10.4102/hsag.v24i0.1162.
8. Momennasab M, Ardakani MS, Rad FD, Dokoohaki R, Dakhesh R, Jaberi A. Quality of nurses' communication with mechanically ventilated patients in a cardiac surgery intensive care unit. Invest Educ Enferm. 2019;37(2):e02. doi:10.17533/idea. see.v37n2e02.
9. Hosseini SR, Valizad-Hasanloei MA, Feizi A. The effect of using communication boards on ease of communication and anxiety in mechanically ventilated conscious patients admitted to intensive care units. Iran J Nurs Midwifery Res. 2018;23(5):358-62. doi:10.4103/ijnmr.IJNMR_68_17.
10. Kaur S, Agnihotri M, Dhandapani M, Gopichandran L, Mukherjee KK, Dhandapani S. Effectiveness of communication chart on patient satisfaction among conscious intubated patients: a randomized controlled trial. J Nurs Science Pract. 2018; 8(3):15-23.
11. Albayram T, Yava A. The determination of the efficiency of visual communication cards developed for the purpose of communication with the intubated patients in the intensive care unit of cardiovascular surgery. Turk Klin Cardiovasc Sci. 2020;32(3):103-15. doi: 10.5336/cardiosci.2020-77327.
12. Ertürk Yavuz M, Gürsoy A. Computer-based communication tool provides effective communication for non-speaking patients: a quasi-experimental study. Clin Nurs Res. 2022; 31(4):656-65. doi:10.1177/10547738211038638.
13. Santiago C, Roza D, Porretta K, Smith O. The use of tablet and communication app for patients with endotracheal or tracheostomy tubes in the medical surgical intensive care unit: a pilot, feasibility study. CJCCN. 2019;30(1):17-23. doi:10.13140/RG.2.2.19835.57125.
14. Holm A, Dreyer P. Use of communication tools for mechanically ventilated patients in the intensive care unit. Comput Inform Nurs. 2018;36(8):398-405. doi:10.1097/CIN.0000000000000449.
15. Shaygan M, Jaberi A. The effect of a smartphone-based pain management application on pain intensity and quality of life in adolescents with chronic pain. Sci Rep. 2021; 11(1):6588. doi:10.1038/s41598-021-86156-8.
16. Klankhettakam J, Surit P. Effects of the Touch-to-Talk program via a tablet on communication effectiveness and satisfaction in intubated patients: a pilot study. Nurs Sci J Thail. 2021;39(2):24-35 (in Thai).
17. Tantacharoenrat C, Prasopkittikun T, Rungamornrat S, Limprayoon K. Use of a user-friendly tablet application to communicate with pediatric patients on mechanical ventilators. Aquichan. 2018;18(3):275-86. doi: 10.5294/aqui.2018.18.3.3.
18. Chaihan N, Kitsripisarn S, Pirompanich P. The effects of the use of a need communication assistance application on frustration and anxiety among intubation patients. Nurs J. 2022;49(1): 266-78 (in Thai).
19. Yura H, Walsh MB. Human needs 3 and the nursing process. New York: Appleton- Century-Crofts; 1983.

20. Rattanakanlaya K, Vuttanon N, Noppakun L, Sangwattanarat W, Boonyu N. Hospital discharge needs perspectives of patients with liver and bile duct cancer undergoing invasive percutaneous transhepatic biliary drainage and family caregivers. Nurs J. 2021; 48(3):260-73 (in Thai).
21. Cohen J. Statistical power analysis for the behavioral science. 2nd ed. Hillsdale NJ: Lawrence Erlbaum Associates; 1988. 567 p.
22. Karlsen M-MW, Holm A, Kvande ME, Dreyer P, Tate JA, Heyn LG, et al. Communication with mechanically ventilated patients in intensive care units: a concept analysis. J Adv Nurs. 2023;79(2):563-80. doi: 10.1111/jan.15501.
23. Salem A, Ahmad MM. Communication with invasive mechanically ventilated patients and the use of alternative devices: integrative review. J Res Nurs. 2018; 23(7):614-30. doi: 10.1177/1744987118785987.
24. Brunner TH, DiFortuna K, LeTang M, Murphy J, Stemplewicz K, Kovacs M, et al. Feasibility of an iPad to facilitate communication in postoperative patients with head and neck cancer. J Perianesth Nurs. 2018;33(4): 399-406. doi:10.1016/j.jopan.2016.10.008.
25. Yavuz ME, Gursoy A. Development of a computer-based communication tool for voiceless patients: AyMeSES. J Anesth Crit Care Open Access. 2022;14(4):112-4. doi:10.15406/jaccoa.2022.14.00519.
26. Shin JW, Happ MB, Tate JA. VidaTalk™ patient communication application "opened up" communication between nonvocal ICU patients and their family. Intensive Crit Care Nurs. 2021;66:103075. doi:10.1016/j.iccn. 2021.103075.
27. Dind AJ, Starr JS, Arora S. iPad-based apps to facilitate communication in critically ill patients with impaired ability to communicate: a preclinical analysis. Indian J Crit Care Med. 2021;25(11):1232-40. doi:10.5005/jp-journals-10071-24019.
28. Yamaguchi A, Ishii A, Fukushige H, Inoue Y, Akada I, Mitani R, et al. Opportunities for interactive communication in mechanically ventilated critically ill patients: a video-based observational study. Nurs Res Pract. 2022;2022:1885938. doi:10. 1155/2022/1885938.
29. Moraes TE, Silva CRL. Needs and perceptions of patients on mechanical ventilation: an integrative review. Rev Enferm UERJ, Rio de Janeiro. 2022;30:e67038. doi: http://dx.doi. org/10.12957/reuerj.2022.67038
30. Raju GM. iPad with iPad-based apps: an optimal communications tool in the intensive care unit? Indian J Crit Care Med. 2021; 25(11):1217-8. doi: 10.5005/jp-journals-10071-24034.
31. Guttormson JL, McAndrew NS. Usability testing of an iPad communication application for mechanically ventilated patients. Dimens Crit Care Nurs. 2022;41(6):340-6. doi:10.1097/DCC.0000000000000551.

Appendix

Table 1. Schedule and contents of the NCDTP

Session	Objectives	Program Activities	Media
Day 1 **Pretest** **1st visit** **40 minutes**	Introduction and baseline measurement	Explaining the objective and details of the NCDTP to patients with critical illnesses and on intubation, and participants were introduced to baseline measurement.	
	1. To make patients and families aware of the causes of intubation	*Activity 1* - Provided basic information regarding causes of intubation to patients and their families	
	2. To give the patient with intubation an understanding of the cause of the inability to communicate verbally	*Activity 2* - Providing information regarding causes of the inability to communicate verbally via video presentation with illustrating pictures and voice-over	The video presentation titled "The Lost Voice."
	3. To make intubated patients aware of the benefits and ease of using tablets to assist in the communication of needs	*Activity 3* - Presenting the strengths and benefits of using tablets to assist in the communication of needs via video presentation with illustrated pictures and voice-over	The video presentation titled "Voice Touch Tablets."
	4. To help patients intubation understand the process of using tablets to assist in the communication of needs	*Activity 4* - Presenting the steps in using tablets to assist in the communication of needs via video presentation with illustrated pictures and voice-over	The video presentation titled "Touching Voice to Communicate Ideas, Feelings, and Needs."
	5. To promote skills in using tablets to assist in the communication of needs	*Activity 5* - Demonstrated the use of tablets to assist in the communication of needs and asked the patients to redemonstrate	Needs Communicative Digital Technology: - "Tablets to assist in the communication of needs"
2nd visit **(After 4 hours of implementation of the program)** **20 minutes**	1. To promote patients use of tablets to assist in the communication of needs continuously	*Activity 1* - Track communication tablet usage and ask about problems and obstacles to using tablets; Including providing positive reinforcement for patients to use continuously	

Appendix

Table 1. Schedule and contents of the NCDTP (Cont.)

Session	Objectives	Program Activities	Media
3rd visit (After 6 hours of implementation of the program) 20 minutes	1. To promote patients use of tablets to assist in the communication of needs continuously	*Activity 1* - Track communication tablet usage and ask about problems and obstacles to using tablets; Including providing positive reinforcement for patients to use continuously	
Day 2 4th visit (After 24 hours of implementation of the program) 20 minutes	1. To promote patients use of tablets to assist in the communication of needs continuously	*Activity 1* - Track communication tablet usage and ask about problems and obstacles to using tablets; Including providing positive reinforcement for patients to use continuously	
Day 3 Posttest 5th visit (After 48 hours of implementation of the program) minutes	1. To evaluate the Met Needs Questionnaire and the Communication Effectiveness Questionnaire 2. To find more suggestions for the next program development	*Activity 1* - Participants answered the Met Needs Questionnaire and the Communication Effectiveness Questionnaire - The PI asked about problems and obstacles in using tablets to assist in the communication of needs from patients and nurses, including suggestions for further development.	

โปรแกรมสื่อสารความต้องการด้วยเทคโนโลยีดิจิทัลสำหรับผู้ป่วยวิกฤตที่ใส่ท่อช่วยหายใจ : การศึกษากึ่งทดลอง

*ณัฐพล ชัยหาญ วิญญ์ทัญญ บุญทัน**

บทคัดย่อ: ผู้ป่วยวิกฤตที่ใส่ท่อช่วยหายใจไม่สามารถสื่อสารความต้องการของตนเองด้วยการพูดได้ ดังนั้นพยาบาลและบุคลากรทางการแพทย์จึงไม่สามารถตอบสนองความต้องการของผู้ป่วยได้ ส่งผลให้ทั้งพยาบาลและผู้ป่วยเกิดความรู้สึกเครียดและคับข้องใจตามมา สถานการณ์นี้อาจรบกวนการฟื้นตัวของผู้ป่วย การศึกษากึ่งทดลองนี้มีวัตถุประสงค์เพื่อพัฒนาและทดสอบประสิทธิผลของโปรแกรมสื่อสารความต้องการด้วยเทคโนโลยีดิจิทัลสำหรับผู้ป่วยวิกฤตที่ใส่ท่อช่วยหายใจ กลุ่มตัวอย่างเป็นผู้ป่วยวิกฤตที่ใส่ท่อช่วยหายใจ จำนวน 60 คนที่คัดเลือกจากแผนกผู้ป่วยหนักของโรงพยาบาลระดับทุติยภูมิแห่งหนึ่งในจังหวัดใกล้เคียงกับกรุงเทพมหานคร ประเทศไทย กลุ่มตัวอย่างถูกกำหนดเข้ากลุ่มสลับกันเป็นรายสัปดาห์ คือ ในกลุ่มทดลอง (30 คน) และกลุ่มควบคุม (30 คน) กลุ่มทดลองได้รับโปรแกรมสื่อสารความต้องการด้วยเทคโนโลยีดิจิทัลเป็นเวลา 48 ชั่วโมง นอกเหนือจากการดูแลตามปกติ ส่วนกลุ่มควบคุมได้รับการดูแลตามปกติเท่านั้น เครื่องมือที่ใช้ในการรวบรวมข้อมูลประกอบด้วย แบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามการได้รับการดูแลตามความต้องการ และประสิทธิภาพการสื่อสาร วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา สถิติไคแสควร์ สถิติฟิชเชอร์ เอ็กแซคท์ สถิติทดสอบค่าทีคู่ สถิติทดสอบค่าทีอิสระ และการวิเคราะห์ความแปรปรวนร่วม

ผลการศึกษาพบว่า ภายหลังจากการได้รับโปรแกรมไปแล้ว 48 ชั่วโมง กลุ่มทดลองมีคะแนนเฉลี่ยการได้รับการดูแลตามความต้องการและประสิทธิภาพการสื่อสารสูงกว่าก่อนเริ่มโปรแกรมและสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญ ดังนั้นจึงสรุปได้ว่าโปรแกรมสื่อสารความต้องการด้วยเทคโนโลยีดิจิทัลนี้มีประสิทธิภาพในการตอบสนองความต้องการของผู้ป่วยวิกฤตที่ใส่ท่อช่วยหายใจ พยาบาลสามารถใช้โปรแกรมนี้ในทางปฏิบัติโดยประเมินประสิทธิผลของโปรแกรมเพิ่มเติมก่อนที่จะใช้อย่างแพร่หลายในประเทศ

Pacific Rim Int J Nurs Res 2023; 27(3) 601-616

คำสำคัญ: เทคโนโลยีการสื่อสาร โปรแกรมการสื่อสาร ประสิทธิผลในการสื่อสาร การเจ็บป่วยวิกฤต การใส่ท่อช่วยหายใจ การได้รับการดูแลตามความต้องการ

ณัฐพล ชัยหาญ *พยาบาลวิชาชีพ พย.ม. อาจารย์ประจำ คณะพยาบาลศาสตร์ มหาวิทยาลัยหัวเฉียวเฉลิมพระเกียรติ ประเทศไทย*
E-mail: nuttapol.chaihan@gmail.com
ติดต่อที่: วิญญ์ทัญญ บุญทัน*** *พยาบาลวิชาชีพ ปร.ด. ผู้ช่วยศาสตราจารย์ คณะพยาบาลศาสตร์ มหาวิทยาลัยหัวเฉียวเฉลิมพระเกียรติ ประเทศไทย*
E-mail: winthanyou@gmail.com