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Effects of Integrated Ventilator Weaning Program on the Reduction of Uncertainty Feeling in Older Patients

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Abstract

A number of patients with critical illness are intubated until their clinical condition is better. Weaning elderly patients off of ventilators is challenging. This study aimed to examine the effects of an integrated ventilator weaning program on the uncertainty and time spent in breathing as tolerate during weaning process of older patients at a university hospital in Southern Thailand. First 25 patients and 25 family caregivers were purposively selected to be in the control group which received usual care. After data collection of the control group completion, 25 patients and 25 family caregivers were purposively selected to be in the experimental group. The experimental group received the integrated ventilator weaning program which was developed based on the uncertainty in illness framework of Mishel. Instruments used for data collection included (1) the Demographic and Illness Questionnaire (DIQ), (2) the Uncertainty for Weaning Assessment (UWA), (3) The Weaning Flow Sheet (WFS) for recording time and parameters during weaning, and (4) The semi structured interview questions. Five participants who were successfully removed endotracheal tube during the program were interviewed to explore their experience during the weaning phase. Demographic data were analyzed by using descriptive statistics and Chi-Square test. The uncertainty scores and time spent during the weaning process were analyzed by using paired t-test and independent t-test. Content analysis was used to analyze qualitative data.

After intervention completion, mean scores of uncertainty of the intervention group were statistically significantly lower than before receiving the intervention (p< .05), mean scores of uncertainty of the intervention group were statistically significantly lower than those in the control group (p< .05). There was no statically significant difference of time spent in weaning process between both groups. Qualitative data analysis revealed that the integrated ventilator weaning program helped the patients reduce uncertainty and promote their ability of breathing.

The findings indicate that the integrated ventilator weaning program could reduce uncertainty feeling in older patients. However, the program could not extend time of breathing as tolerate during weaning process.

Keywords: intubated older patients, uncertainty, ventilator weaning program

Introduction

Weaning from mechanical ventilation means the reduction of respirator in order for patients to gradually increase the ability to breathe on their own without having to use respirator.[1] Weaning from mechanical ventilation in older patients is usually slow and more difficult than that of young and adult patients due to the degeneration of organs and comorbid diseases related to abnormality of lung functions.[2] These diseases include chronic obstructive pulmonary disease (COPD) and emphysema resulting in poor distensibility of lung and dyspnea which included mental problems such as uncertain feeling causing prolong weaning from mechanical ventilation[3]. Uncertain feeling refers to ambiguity feeling, not knowing and not understanding about weaning from mechanical ventilation and not being able to predict the result of weaning[4] which is found in elderly due to the deterioration of thought and memory. During retaining endotracheal tube and on ventilators, older patients could not communicate as desired resulting in incorrectness of information receiving and interpretation[5]. This situation prevented older patients from knowing and understanding about weaning from mechanical ventilation which eventually causes uncertainty in these patients. Based on Mishel's uncertainty in illness framework, factors that cause uncertain feeling are: (1) patterns of stimulus, (2) intellectual and perception abilities, and (3) supporting resources[6,7]. During the process of weaning, patterns of stimulus that cause uncertain feelings[4] in these patients are a result of dyspnea that the patients have to exert to breathe on their own and the complexity of procedure of weaning including environments around the patients.[8] Decreased intellectual and perceptual abilities are due to the restriction of movement and communication obstacles during weaning process resulting in inability of gathering information and interpretation to conform to the fact which causes uncertain feeling.[4,5]

In addition, lack of supporting resources from low education level, society and family also causes the increase of uncertainty in patients[6]. During the weaning process, patients with no experience do not have information, do not know and do not understand about weaning from mechanical ventilation[4]. This phenomenon created ambiguity and uncertain feeling for the patients. In addition, during the weaning process, having complex symptoms and receiving complex treatments surrounded unfamiliar environment, such as intensive care unit or respiratory care unite, the patients have limited resources[9]. These situations result in a lack of support from families which also cause uncertain feeling for the patients. Older patients have to face the phase of weaning from mechanical ventilation in an unfamiliar environment.[10,11] According to this phenomenon, it was found that weaning from mechanical ventilation is something that causes gladness and fear. What makes them glad is that endotracheal would be removed while what makes them afraid is ineffective breathing and uncertain feeling whether respirator can really be weaning off. In case of weaning the patients off of ventilators, the patients will have to exert even more to breathe on their own during the weaning phase. At this point, it might cause the patients exhausted. Regarding this event, the patients do not want their respirators to be removed.[11]

To reduce uncertain feeling, older patients must be helped to understand and perceive the correctness of weaning from mechanical ventilation in order to reduce uncertainty throughout the weaning processes.[6,7] According to the literature reviews related to nursing guidelines to enhancing the successful weaning of the patients off of ventilators, there are several methods that support the success of weaning. Based on these documented methods, giving information and encouraging family members to take care of the patients during the phase of weaning are parts of the guidelines. Providing particular information related to weaning process, as well as possible signs and symptoms during the phase of weaning can also reduce factors that cause uncertain feeling[12]. In addition,

previous study suggested that reducing uncertainty during weaning patients off of ventilators might be associated with reduction of time spent in breathing as tolerate during weaning process.[12] However, no existing ventilator weaning program integrated with reducing uncertainty for older patients has been found. In order to promote weaning success in older patients off of ventilators by reducing uncertainty, the researcher developed an integrated ventilator weaning program by applying uncertainty in illness framework of Mishel.[6,7]

Objective

This study aimed to examine the effects of an integrated ventilator weaning program on the reduction of uncertainty and time spent in breathing as tolerate during weaning process of older patients at a university hospital in Southern Thailand.

Conceptual Framework

Based on literature review, feeling uncertainty is a main factor of unsuccessful weaning older patients off of ventilators. In the present study, the researcher used the theory of uncertainty in illness of Mishel as a theoretical framework in developing an integrated ventilator weaning program for weaning older patients off of ventilators. Mishel's uncertainty in illness theory explains the use of thinking system to interpret the meanings of what happen. The theory comprises 4 patterns as follows: (1) Ambiguity concerning illness, (2) Complexity of treatment and care system, (3) Lack of information related diagnose the illness, and (4) Not be able to predict the results and progress of illness. There are 3 main factors that cause uncertainty. These factors are[6,7]:

1. Pattern of stimulus. Patterns of stimulus during weaning older patients off of ventilators included dyspnea, procedure and method of weaning protocol that the patients are unfamiliar with, and do not understand about weaning from mechanical ventilation.

These phenomena contribute uncertain feeling in older patients.

2. Intellectual and perception abilities. Intellectual and perception abilities refer to the ability to interpreted information and making decision. For older patients whose thinking, memory and the 5 senses decreased, their ability in gathering information and interpretation are decreased. This situation influences high feeling of uncertain.

3. Source of support. Source of support refers to resources or facilities that help a person gather the information and interpret the information. Sources of support include education level, social and family support including confidence in health team. These factors will help reduce uncertain feeling of patients.

Thus, the researcher is interested in examining the effects of an integrated ventilator weaning program based on uncertainty in illness of Mishel's framework on the reduction of uncertain feeling in older patients.

Methods

This is a quasi-experimental research pretest-posttest, control group design aimed to examine the effect of an integrated ventilator weaning program on the reduction of uncertainty feeling in older patients at a university hospital in Southern Thailand.

Sample

Firstly, sample size was calculated based on the effect size of the previous study of Rujee[12] which had effect size of 2.06. As the effect size of the previous study was consider large effect size, the researcher decided to use effect size of 0.8, power 0.8 and level of significance 95%. Based on sample size determination using published tables (p.424),[13] the sample needed for each group is 25. Thus, first 25 patients and 25 family caregivers were purposively selected to be in the control group which received usual care. After data collection of the control group completion, later 25 patients and 25 family caregivers

were purposively selected to be in the experimental group. The experimental group received the integrated ventilator weaning program which was developed by the researcher based on the uncertainty in illness framework of Mishel.

Inclusion criteria

1. $\geq$ 60 years old

2. being 1st time of retaining ET-tube, and be ready for weaning off ventilator

3. using spontaneous breathing trial or gradual weaning technique in weaning off ventilator

4. having normal vital signs

5. having Glasgow coma scale 10T

6. having no cognitive impairment

7. in case of having comorbidity, the condition can be controlled, and having no complication

8. one caregiver could be presenting during the first 3 days of weaning off ventilator.

Ethical Considerations

This study was approved by the Research Ethical Committee of a university hospital in southern Thailand (REC approval number: PSU 58-128-19-9). A detailed description of the study, the risks and benefits, the matter of confidentiality, and the informed consent procedures were explained to the potential participants. The written consent form was signed before collecting the baseline data.

Instruments

1. Instrument for data collection

1.1 Demographic and Illness Questionnaire (DIQ)

The DIQ was developed by the researcher. This questionnaire assessed demographic information included gender, age, education, occupation, religion, illness, treatment and medication.

1.2 The Uncertainty for Weaning Assessment (UWA)

The UWA was developed by Rujee[12] based on the uncertainty in illness framework of Mishel.

This questionnaire was modified by the researcher to be appropriate for older patients. There are 20 items with 4 Liker scales 1 (strong disagree) to 4 (strong agree). Higher scores show higher level of uncertainty.

1.3 The Weaning Flow Sheet (WFS)

The WFS was used to record the data related to weaning off mechanical ventilation such as mode, parameter, time and vital signs during weaning.

1.4 The semi structured interview questions The semi structured interview questions were used to interview the participants who have successful weaning off mechanical ventilation and could remove endotracheal tube during participation in the program.

2. An integrated ventilator weaning program

This program was developed to help reduce uncertain feeling in older patients and their caregivers in order to encourage the success of weaning older patients off of ventilators. The researcher designed activities in the program based on Michel's theory of uncertainty in illness and nursing guidelines. The program started with assessment regarding the information need of patients and family caregivers. In this study the assessment was developed covering 4 patterns of Mishel's uncertainty within contexts of weaning off of ventilators. The following nursing activities were given based on the assessment. For example, if the highest score related to complexity of treatment and care system, the researcher explained the process of treatment regarding weaning off of ventilator, as well as its significance. Then, other nursing activities will be provided based on the assessment included giving information in points that are in line with problems and priority need of the patients such as the objectives of weaning from mechanical ventilation, process of weaning and appropriate behaviors during weaning. Concerning with intellectual and perception abilities, as the older patients whose thinking, memory and the 5 senses decreased, the information was given, re-assessed and re-explained in parts that the patients perceived ambiguous. To deal with patterns of stimulus

during weaning off of ventilators, such as dyspnea, the program also included breathing exercise, coughing and chest percussion, communication skill asking for help. As a source of support, a family caregiver was asked to be presenting with the patients 3 consecutive days during the program in order to provide mentally support and enhance comfort. A booklet related to family support during weaning off mechanical ventilation was given to a family caregiver. Only the first author was the person who provided the program for all participants, one by one. The program lasted 60 minutes each session, 3 days consecutively.

For the control group who received usual care, in the morning after the patients were assessed and met the weaning criteria, the physicians or nurses informed the patients briefly regarding the process of weaning off mechanical ventilation. The patients were not assessed what they concerned or particular information they need. During the weaning process, the patients will be given a bell to call if they need help. The physicians or nurses are usually presenting during the earlier of weaning phase and they will leave as the vital signs seem to be stable. No family caregiver accompanied to help or provide mentally support. Vital signs were monitored regularly based on the guideline.

Validity and Reliabily

All instruments and the integrated ventilator weaning program were examined by 3 experts and were revised based on their suggestions. Then the UWA for the patients' version and the family version were tested with 20 patients and 20 family caregivers. The test- retest reliability yielded 0.96 for the patients' version and 0.86 for the family version.

Data collection

Participants were asked to complete a set of questionnaire at baseline and after the program completion in day 3. The set of questionnaire include 1) the Demographic and Illness Questionnaire (DIQ), 2) the Uncertainty for Weaning Assessment (UWA), 3) The Weaning Flow Sheet (WFS), and (4) The semi structured interview questions. All quantitative data were collected by the research assistant who was trained by the researcher. Qualitative data were collected by the researcher. There were 5 participants (3 in the experimental group and 2 in the control group) who were able to successfully remove endotracheal tube during the program. These participants were interviewed by the researcher when they were able to verbally express their recollection during the weaning phase. The interview questions focused on needs, obstacles, difficulty, and feelings during the weaning phase.

Data analysis

Demographic data were analyzed by using descriptive statistics and Chi-Square test. The uncertainty scores were analyzed by using paired t-test and independent t-test. Content analysis was used to analyze qualitative data.

Results

The majority of the participants were male (72%), Buddhists. The mean age of intervention group was 71.92 years old (SD=7.28) while that of the control group was 72.40 years old (SD=7.92). Most participants were married with 72% of the intervention group and 80% of the control group. Most of the participants have secondary level of education with 76% of the intervention group and 80% of the control group. The main reason for retaining endotracheal tube in both groups was having pneumonia. Duration of intubation before commencing of the study ranged from 1-14 days. Regarding type of weaning, all participants were given gradual weaning from mechanical ventilation (100%). According to the analysis, there was no significant difference in relation to personal characteristics and illness in terms of co-morbidity between the 2 groups as shown in Table 1.

Table 1 Number, percentage and comparison concerning personal characteristics and illness of participants in the intervention group and the control group (N=50)

Personal characteristics	control group (n=25)		intervention group (n=25)		Statistics values	P value
	number	percent	number	percent		
Gender					0.00[a]	1.00
male	18	72	18	72		
female	7	28	7	28		
Age (year)	M = 72.40, SD = 7.92		M = 71.92, SD = 7.28		14.17[c]	.82
60-70	9	36	9	36		
70-80	16	64	16	61		
Marital status					.44[a]	.50
married	20	80	18	72		
widowed	5	20	7	28		
Education level					3.13[c]	.53
uneducated	1	4	0	0		
primary	20	80	19	76		
secondary	1	4	3	12		
diploma	1	4	2	8		
bachelor	2	8	1	4		
Religion					3.55[b]	.59
Buddhism	25	100	20	80		
Islam	0	0	5	20		
Duration of intubation before commencing of the study (day)	M=3.36, SD=2.54 Min=1, Max=14		M=3.20, SD=1.55 Min=2, Max=8		8.82[c]	.26

a = Pearson Chi-Square, b = Continuity correction, c = Likelihood Ratio

Comparison the average score of uncertainty of older patients between 2 groups during weaning from mechanical ventilation before and after the experiment

The average score of uncertainty at baseline of older patients in the intervention group was 75.28 (SD=1.64) whereas the average score of uncertainty after the intervention completion was 21.72 (SD=1.48). That is after the intervention completion, mean scores of uncertainty of the intervention group were statistically significantly lower than before receiving the intervention ($p< .05$). The average score of uncertainty at baseline of the control group was 71.40 (SD=2.29) whereas that after the intervention was 71.12 (SD=2.27). For within-group testing by using pair t-test, the result showed that after the intervention the mean score of uncertainty of the intervention group was lower than at baseline (t = 123.88, p = .00). For the control group, the mean score of uncertainty at baseline and at the intervention completion was not statistically significant different ($p>.05$) as shown in Table 2.

Table 2 Compare the mean score of uncertainty of older patients during weaning from mechanical ventilation of the intervention group and the control group before and after the intervention (N=50)

Uncertainty scores	Pre–test		Post–test		t	P value
	M	SD	M	SD		
control group (n=25)	71.40	2.29	71.12	2.27	.96	.35
intervention group (n=25)	75.28	1.64	21.72	1.48	123.88	.00

Compare the difference of mean time spent (minute) in weaning process at day1 to day3 between the intervention group and the control group

Time in weaning process refers to duration of time in minute that participants could breathe as tolerated during weaning of ventilators. The longer time spent in minute indicated that the patients could breathe in the weaning mode longer before changing to the full support mode. When comparing mean time in weaning process of the patients in the intervention group and those in the control group at day 1, day 2, and day 3, the results showed there were not statically significant different ($t = -.73$, $p=.45$; $t =.36$, $p=.71$; $t = -1.01$, $p =.31$ respectively) as shown in Table 3.

Table 3 Compare the difference mean time spent (minute) in weaning process at day1 to day3 between the intervention group and the control group using independent t-test (N=50)

Time in weaning process at day1 to day3	M (minute)	SD	t	P value
Day 1				
control group (n=25)	353.40	116.04	-.73	.45
intervention group (n=25)	371.60	37.60		
Day 2				
control group (n=25)	374.40	112.54	.36	.71
intervention group (n=25)	365.40	48.38		
Day 3				
control group (n=25)	276.60	138.70	-1.01	.31
intervention group (n=25)	312.50	107.22		

Qualitative data

Qualitative data were collected by interviewing 5 patients (3 in the experimental group and 2 in the control group) who were able to successfully remove endotracheal tube during the program. Data were analyzed using content analysis. The findings revealed that there are 3 groups of issues related to uncertainty during the phase of weaning. First, there was the ambiguity concerning weaning process because the patients did not know about process of weaning from mechanical ventilation. Second, there was the complexity of the treatment during the phase of weaning. Regarding the complexity of the treatment, the patients did not clear what to do or how to behave during the phase of weaning. Third, the patients were unable to predict the consequences of breathing exercise during the phase of weaning. Regarding the perception of the patients who received the integrated ventilator weaning program, there were 3 groups of positive feeling: 1) Feeling good and safe that nurses and family members were around during the phase of weaning, 2) Feeling confident

in behaving during the phase of weaning because they were advised, coached and given information, and 3) Feeling that they were able to be removed endotracheal tube within short time. These patients indicated that the integrated ventilator weaning program helped them weaned off of ventilator successfully.

Discussion

The results showed that the integrated ventilator weaning program developed based on Michel's theory of uncertain in illness is able to reduce uncertainty of older patients during weaning from mechanical ventilator. This program was designed to deal with the three factors that cause uncertainty namely (1) pattern of stimulus during weaning off of ventilators such as dyspnea, (2) intellectual and perception abilities such as decreasing abilities of thinking and memory, and (3) supporting sources that help a person gather the information such as education, family members and society.[6,7] According to the assessment of problems and need of patients at baseline, it was found that the top three problems regarding uncertainty in older patients during weaning from mechanical ventilator are 1) they want to know how to behave during the phase of weaning, 2) they want a family member or close person to be presenting during the phase of weaning, and 3) they want to know how to wean from mechanical ventilation. When these issues and needs are acknowledged and responded, the patients could overcome their concern issues. They could pay attention in practicing breathing exercise and coughing. In addition, inviting a family member to be presenting to provide care and emotional support during the program was beneficial for older patients. This phenomenon helped the patients to reduce uncertainty feeling and wean from mechanical ventilator smoothly as reported by 3 patients in the intervention group who were able to successfully remove endotracheal tube. Giving information related

particular points that the patients felt unclear is therefore a way to reduce uncertainty. This finding is congruent with the late study of Rujee.[12] This study found that giving information is able to help the patients reduce uncertain feeling during the phase of weaning. Additionally, a study of Patima[14], conducted among patients who suffered from chronic obstructive pulmonary disease (COPD), found that giving related information helped COPD patients to reduce uncertainty during weaning as well. Patima[14] also reported that a nursing program based on Michel's theory of uncertain in illness could help the patients to predict the outcomes of treatment and progress of weaning off of ventilators.

For older patients whose cognitive function might work less than young adults, usual care with limited information providing could not help them to understand their illness and treatment. Thus, providing a particular program to help reducing uncertain feeling is appropriate for older patients. Moreover, inviting a family member to be presenting to provide mentally support and enhance comfort during the process of weaning off of ventilators is beneficial for older patients. In the present study, the mean time spent in weaning process at day1 to day3 of the intervention group was no statistically significant difference compared to that of the control group. However, the mean time spent in weaning process at day1 and day3 of the intervention group tended to higher than that of the control group. A possible reason that prevented the difference mean time of weaning process between the 2 groups is the weaning protocol. Although all units in this hospital use the same standard usual care for weaning, some units did not allow the patients to breathe as tolerate during the weaning mode. For example, the patients might be set on the weaning mode for 2 hours then they were changed to the full support mode immediately. Indeed, the patients could breathe as tolerate during the weaning mode

longer than 2 hours. This event prevented the study to capture the difference mean time of weaning process between the 2 groups.

Conclusion

Once the older patients receive sufficient information and support both physically and mentally, they would be confident in weaning from mechanical ventilator and their uncertainty would be reduced. The findings of this study indicate that the integrated ventilator weaning program could reduce uncertainty feeling in older patients. However, the program could not extend time as the tolerated of in weaning

process of the patients. In addition, inviting a family member to be presenting during the weaning process tends to enhance positive outcomes in weaning patients from mechanical ventilator.

Recommendations

The integrated ventilator weaning program should be implemented with other groups of patients who are fully conscious and having normal cognition. Healthcare providers working in Respiratory Care Units may consider testing the program in their units.

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