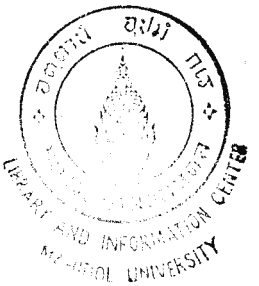
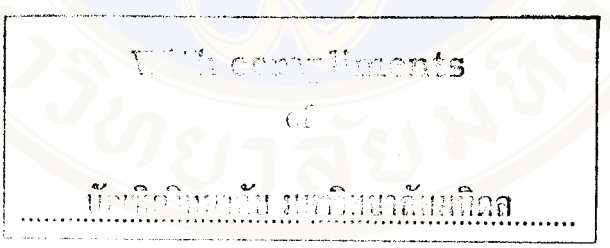


THE EFFECTS OF THE NURSES' WEANING COMPETENCY-PROMOTING PROGRAM ON NURSES' PERFORMANCE AND SATISFACTION IN WEANING PATIENTS FROM MECHANICAL VENTILATORS

SOUNTAREE JIANVITAYAKIJ



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Sountaree Jianvitayakij

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ABSTRACT

The purpose of this quasi-experimental research design was to demonstrate the effects of the nurses' weaning competency-promoting program on nurses' performance and satisfaction in weaning patients from mechanical ventilators. The study also aimed to examine weaning outcomes of the patients with mechanical ventilators. The purposive samples were 34 nurses who worked in the Intermediate Ward at Ramathibodi Hospital. The nurses' weaning competency-promoting program consisted of teaching, demonstrating, training, and counseling about weaning, weaning readiness assessment tool, and nursing guidelines for weaning were used during weaning. The nurse sample was asked to answer the nurse's weaning performance and nurse's weaning satisfaction questionnaires before and after participation in the program. The patients purposive sample consisted of 40 cases, 20 cases in each group. The weaning outcome data of the patients were collected before and after nurses' participation in the program.

The results of this study indicated that the mean scores of nurses' weaning performance after participation in the program were significantly higher than before participation in the program ($p < .01$). There was no statistically significant difference in the weaning satisfaction of nurses before and after participation in the program ($p > .05$). In addition, there was no statistically significant difference in weaning outcomes of the patients before and after nurses' participation in the program ($p > .05$). The findings of the study provide guideline to develop nursing competency for improved outcome of care.

KEY WORDS: WEANING PROGRAM / NURSES' PERFORMANCE / SATISFACTION / WEANING OUTCOMES / MECHANICAL VENTILATOR

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ผลของโปรแกรมการส่งเสริมความสามารถของพยาบาลในการหย่าเครื่องช่วยหายใจต่อการปฏิบัติและความพึงพอใจของพยาบาลในการหย่าเครื่องช่วยหายใจ (THE EFFECTS OF THE NURSES' WEANING COMPETENCY-PROMOTING PROGRAM ON NURSES' PERFORMANCE AND SATISFACTION IN WEANING PATIENTS FROM MECHANICAL VENTILATORS)

สุนทรี เจียรวิทยกิจ 4236653 RAAN/M

พย.ม. (การพยาบาลผู้ใหญ่)

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บทคัดย่อ

การศึกษาครั้งนี้เป็นการวิจัยกึ่งทดลอง เพื่อศึกษาผลของโปรแกรมการส่งเสริมความสามารถของพยาบาลในการหย่าเครื่องช่วยหายใจ ต่อการปฏิบัติและความพึงพอใจของพยาบาลในการหย่าเครื่องช่วยหายใจ รวมทั้งศึกษาผลของการหย่าเครื่องช่วยหายใจในผู้ป่วยที่ใช้เครื่องช่วยหายใจ การคัดเลือกกลุ่มตัวอย่างแบบเฉพาะเจาะจงตามเกณฑ์ กลุ่มตัวอย่างเป็นพยาบาล 34 คนที่ปฏิบัติงานในหอผู้ป่วยIntermediate โรงพยาบาลรามาธิบดี โปรแกรมการส่งเสริมความสามารถของพยาบาลในการหย่าเครื่องช่วยหายใจ ประกอบด้วยการสอนความรู้เกี่ยวกับการหย่าเครื่องช่วยหายใจ การสาธิตการใช้เครื่องมือประเมินความพร้อมในการหย่าเครื่องช่วยหายใจ การฝึกทักษะการปฏิบัติการพยาบาลตามแนวทางการพยาบาลในหย่าเครื่องช่วยหายใจ และการให้คำปรึกษาขณะพยาบาลปฏิบัติการพยาบาล ก่อนเริ่มโปรแกรมผู้วิจัยเก็บข้อมูลผลของการหย่าเครื่องช่วยหายใจในผู้ป่วยจนครบ 20 คน หลังจากนั้นให้พยาบาลผู้เข้าร่วมโปรแกรมทำแบบสอบถามเกี่ยวกับความสามารถในการปฏิบัติและความพึงพอใจในการหย่าเครื่องช่วยหายใจแล้วจึงเริ่มโปรแกรม การสอนการสาธิตและการฝึกทักษะใช้เวลาประมาณ 2 อาทิตย์ หลังจากนั้นพยาบาลปฏิบัติการพยาบาลตามแนวทางการพยาบาลในการหย่าเครื่องช่วยหายใจในขณะที่ผู้วิจัยเป็นผู้ให้คำปรึกษาและทำการเก็บข้อมูลผู้ป่วย เมื่อได้ผลของการหย่าเครื่องช่วยหายใจของผู้ป่วยจนครบ 20 คนแล้ว จึงให้พยาบาลทำแบบสอบถามการปฏิบัติและความพึงพอใจในการหย่าเครื่องช่วยหายใจภายหลังเข้าร่วมโปรแกรม

ผลการศึกษาพบว่าค่าเฉลี่ยคะแนนการปฏิบัติการพยาบาลในการหย่าเครื่องช่วยหายใจภายหลังเข้าร่วมโปรแกรมสูงกว่าก่อนเข้าร่วมโปรแกรมอย่างมีนัยสำคัญทางสถิติที่ระดับ.01 โดยใช้สถิติ paired t- test แต่ความพึงพอใจในการหย่าเครื่องช่วยหายใจของพยาบาลและผลของการหย่าเครื่องช่วยหายใจในผู้ป่วยไม่มีความแตกต่างกัน การวิจัยครั้งนี้สามารถใช้เป็นแนวทางในการส่งเสริมความสามารถของพยาบาลในการปฏิบัติการพยาบาลเพื่อช่วยผู้ป่วยในการหย่าเครื่องช่วยหายใจ

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CHAPTER I
INTRODUCTION

Background and rationale

In this age of high technology health care, mechanical ventilation is frequently used for treatment of patients with acute respiratory failure. Improvements in the acute management of patients and the increasing utilization of a mechanical ventilation have increased the numbers of mechanical ventilatory support in acute care hospitals (Swinburne, et al.,1988 cited by Popovich, 1991: 4). Ramathibodi Hospital, a tertiary care center, has a role in the delivery of effective health care service for patients with complex health problems. However, it has limited critical care beds. From this reason, the Intermediate ward was established in Ramathibodi Hospital, in 1998, to provide a reasonable alternative to critical care units. The Intermediate ward aims to be a step- down unit for critical care and high risk patients who require a lower level of monitoring than that provided by the Intensive Care Unit, especially weaning patients from mechanical ventilation. Therefore, the patients in this unit require more intensive nursing care than patients in a general medical ward, and the registered nurses who provide regular nursing care need to enhance nursing competency to provide special care.

The benefit of using ventilatory support can be lifesaving for patients with acute respiratory failure. Unfortunately mechanical ventilation is also associated with substantial risks, including ventilator- associated pneumonia, airway injury, barotrauma, gastrointestinal bleeding, and thromboembolism. Some of these complications increase with the prolonged duration of intubation; its also increase cost and mortality rate (Davis, et al., 1980 cited by Krieger, 1994: 1223; Epstein, 2002: 454). Therefore, once the patient has adequately recovered, efforts should focus on weaning the patient from the ventilator as rapidly as possible (Manthous, et al, 1998: 886).

Most researches related to weaning were focused on the assessment of weaning readiness (Fiastro,et al.,1988: 232-238; Krieger, et al., 1989: 858-861; Morganroth, et al., 1984: 1012-1016) and comparisons of various weaning methods (Brochard, et al., 1994: 896-903; Esteban, et al., 1995: 345-350). Computerized weaning programs, protocols, outcome management, a multidisciplinary ventilator management team, and a collaborative weaning plan were examined its effects on weaning process and weaning outcome (Cohen, et al., 1991: 1278-1284; Ely, et al., 1996: 1864-1869; Henneman, et al., 2001: 297-303; Knebel, 1996: 550- 559; Kollef, et al., 1997: 567-574; Smith, 1998: 61- 72; Stickland & Hasson, 1991: 1096- 1099, 1993:1220-1226).

The quality of assessment and improvement in nursing practice of weaning patients from the mechanical ventilator are interesting by nurses (Stewart, et al., 1992: 44). Many studies reported that the quality of nursing care affected on weaning outcome of patients with mechanical ventilators (Durbin, 1996; Cull & Inwood, 1999; Thorens, et al., 1995 cited by Price, 2001: 174).

The usual nursing care for weaning in the Intermediate Ward is started when a physician gives prescriptions of weaning. Then nurses assess vital signs, spontaneous tidal volume, and minute ventilation. They also encourage the patients keep breathing and make patients' confidence in their abilities to breathe. The process of weaning does not occur when having weaning prescription. Nurses should prepare patients with mechanical ventilators to wean since they use ventilatory support. Nursing care to improve influencing factors for patients' readiness to wean through the weaning process is need. However, nurses do not pay attention at the influencing factors of weaning as much as patients' need. Therefore, weaning the patients from mechanical ventilators are not fully success that lead prolong using mechanical ventilation and risk to complication. In order to increase rate of weaning success, the researcher intended to enhance nursing capability in weaning patients from mechanical ventilator throughout the process of weaning by using the nurses' weaning competency- promoting program. This program consisted of 4 strategies: 1) teaching knowledge base about weaning, 2) demonstrating the use of the weaning readiness assessment tool, 3) training nursing practice according to guideline for weaning, and 4) counseling for nurses during performing weaning.

The nursing guideline for weaning of the program is based on the weaning concept of the American Association of Critical Care Nurses (AACN)' s Third National Study Group (Knebel, et al., 1994: 416- 420, 1998: 149-152) which described three stages: 1) pre- weaning stage, 2) weaning process stage, and 3) weaning outcome stage. In the pre- weaning stage, nursing intervention focuses on assessing of the patient' s readiness to start weaning and prevent any complications that may interfere with weaning. In the weaning process stage, the nurse must assess the readiness of the patient and the appropriate time to stop weaning. Finally, the weaning outcome stage is concerned with the results of weaning. For the appropriateness of the study, the researcher modified the third stage, weaning outcome, to the post- weaning stage focused on nursing care for prevention of repeat use ventilatory support or reintubation.

The researcher anticipate that, after nurses participate in the program, they will increase their nursing capability in weaning by increasing performance and satisfaction in weaning patients from mechanical ventilators. Moreover, the researcher expects that improving nursing capability could impact upon the successful weaning outcome of patients with mechanical ventilators.

Conceptual Framework

This study is based on a conceptual framework of the theory of nursing system, one of three interrelated theories, of the Orem' s general theory of nursing (Orem, 1985; Orem & Taylor, 1986 cited by Somchit Hanucharurnkul, B.E. 2540: 20-21). The nursing system is series and sequences of deliberate practical actions of nurses, performed at times in coordination with actions of their patients to meet the patients' demand (Orem, 1995: 459). The capabilities of nurse to perform deliberate practical actions to meet patients' demand are called nursing agency.

For a legitimate service, there are three enabling power components of nursing agency, developed into a set of desirable nurse characteristics (Orem, 1995: 248):

1) Social characteristics: specialized knowledge of the particular social and legal dimensions of some types of nursing situations;

2) Interpersonal characteristics: knowledge of conditions necessary for the development of improved relations between nurse and patient;

3) Technological characteristics: specialized education and training to extend or deepen the area of nursing practice with respect to nursing populations.

These characteristics are important to increase nursing agency. The researcher developed the nurses' weaning competency-promoting program aimed to enhance nursing agency. For developing social characteristics, the program teaches the nurses to know the role of weaning patients from mechanical ventilator within limits of nursing professional rights, and perform collaborative role with physicians. For increasing interpersonal characteristics, the nursing guideline for weaning and the weaning readiness assessment tool in the program provide the nurses perform relationships with patients. Assessing and reducing patients' physical discomfort, pain, and anxiety according to the nursing guideline of the program require the nurse-patient relationships. Teaching to gain knowledge about weaning, demonstrating the use of assessment tool, and training of nursing practice according to guideline for weaning are related to improve technological characteristics in patients with mechanical ventilators. Training and providing guideline are also contributed to nurses' confidence in take care of weaning patients.

From the above reason, the nurses' weaning competency- promoting program is designed to assist nurses developing their nursing capabilities to weaning patients from mechanical ventilators. Therefore, the researcher was interested in determining the effects of the nurses' weaning competency-promoting program on performance and satisfaction of nurses in weaning, and would also be expected to impact upon the weaning outcomes of patients with mechanical ventilators. Model of the conceptual framework from this study is presented at Figure 1.

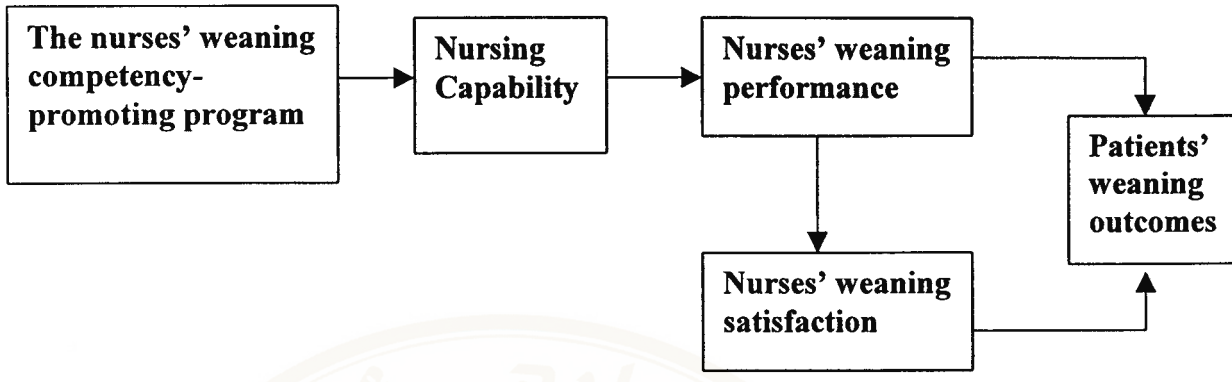

Figure 1. Model of the conceptual framework

Purposes of the study

The purposes of the study are as follows:

1. To compare nurses' weaning performance before and after participating in the program.
2. To compare nurses' weaning satisfaction before and after participating in the program.
3. To compare the weaning outcomes of the patients with mechanical ventilators before and after nurses' participation in the program.

Research hypotheses

1. The post- test weaning performance scores of nurses, after participating in the program, will be higher than the pre- test weaning performance scores.
2. The post- test weaning satisfaction scores of nurses, after participating in the program, will be higher than the pre- test weaning satisfaction scores.
3. After the nurses have participated in the program, the patients with mechanical ventilator will have greater success in weaning than patients did before nurses participated in the program.

Scope of the study

This study focuses on nurses who provide directly nursing care for patients with mechanical ventilators in the Intermediate Ward, Department of Medicine, Faculty of Medicine, Ramathibodi Hospital during February 2001 to August 2001.

Definition of Terms

The nurses' weaning competency-promoting program refers to teaching, providing support and environment for weaning in order to help nurses providing nursing care more effectively and efficiency in weaning patients from mechanical ventilators. This program is composed of teaching, demonstrating, training, and counseling strategies. The literature review and the weaning concept of the AACN's Third National Study Group are utilized in constructing the program content by the researcher. The researcher acts as an advanced practice nurse (APN) who provides advance nursing practice through staff nurses.

Nurses' performance in weaning refers to action of nurses performing the nursing intervention based on knowledge and decision-making for weaning patients from mechanical ventilators. The nurses' performance in weaning is evaluated from the nurses' weaning performance questionnaire. The researcher developed the questionnaire based on the literature review. Higher scores indicate higher performance.

Nurses' satisfaction in weaning refers to the self-perception of nurses about their intervention in weaning patients from mechanical ventilators. The perception results from work factors that respond appropriately to patients' physical and psychological demands. The nurses' satisfaction in weaning is measured by the nurses' weaning satisfaction questionnaire that was developed by the researcher, based on Herzberg's Two- factor theory: the motivation factor and the hygiene factor. Higher scores indicate higher nurses' satisfaction in weaning.

Weaning outcomes refers to the results of weaning patients from mechanical ventilators within 2 weeks. Weaning outcomes are classified into 2 categories: weaning success and weaning failure. Weaning success means the patient can breathe without ventilatory support for more than 24 hours. Weaning failure means the patient can not be disconnected from ventilatory support.

CHAPTER II
LITERATURE REVIEW

This research aimed to study the effects of the nurses' weaning competency-promoting program on performance and satisfaction of nurses in weaning patients from mechanical ventilators. It would also be expected to impact weaning outcomes of patients with mechanical ventilators.

The researcher reviewed related literature in the following topics:

1. The medical weaning concept
2. The weaning continuum model
3. The weaning readiness assessment tool
4. Nursing agency
5. Nurses' satisfaction

The medical weaning concept

Invasive mechanical ventilation is commonly required for patients with acute respiratory failure. Although it can be lifesaving, it is also associated with substantial complications such as ventilator- associated pneumonia, pneumothorax, and psychological distress. Some of those complications may increase the duration of intubation, and its consequences are costly of care and increase mortality rate (Ely, et al., 1996:1864- 1869; Fagon, et al., 1989: 877- 884; Pingleton, 1988:1463- 1493). Therefore, once the patient has adequately recovered, efforts should focus on weaning the patient from the ventilatory as rapidly as possible (Epstein, 2002: 454).

Weaning from mechanical ventilator represents the period of transition from total ventilatory support to spontaneous breathing (Mancebo, 1996 cited by Blackwood, 2000: 146). The transition period may take many forms ranging from abrupt withdrawal to gradual withdrawal from ventilatory support. Regardless of the form of transition taken, consideration of patient readiness for weaning is needed. Considerations of patient readiness for weaning from mechanical ventilator include

clinical factors, pulmonary gas exchange, and pulmonary mechanics. Those weaning parameters are given in Table 1 (Sumalee Kiatboonsri, B.E. 2545: 315).

Table 1 Weaning criteria

Clinical factors

1. cause of respiratory failure resolved or resolving
2. hemodynamic stability
3. absence of septicemia
4. absence of severe acid- base and electrolytes imbalance

Pulmonary gas exchange

1. Arterial oxygen tension (PaO_2) > 60 mm.Hg with FiO_2 < 0.4
2. Positive end expiratory pressure (PEEP) < 5 cm.H_2O
3. $P_{(A-a)}\ O_2$ < 350 mm.Hg, PaO_2/ FiO_2 > 200 with FiO_2 1
4. Cardiac index > 2.1 L/min/ m^2
5. Absence of lactic acidosis
6. V_D/V_T < 0.55- 0.6

Pulmonary mechanics

1. Tidal volume (V_T)> 5 ml/kg
2. Vital capacity (VC) > 10 ml/kg,
   Maximum inspiratory pressure (MIP) > 30 cm.H_2O
3. Minute ventilation (V_E)(rest) < 10 L/min
4. Maximum voluntary ventilation (MMV) > 2 x V_E
5. Tension- time index of the diaphragm (TTdi) < 0.15, $P_{0.1}$ < 6 cm.H_2O
6. f/ V_T < 105
7. Patient- ventilator system compliance > 30 cm.H_2O

Abbreviations:

$P_{(A-a)}\ O_2$ = alveolar- arterial oxygen gradient

V_D = dead space

f = breathing frequency

The weaning techniques

Although the focus on how to wean the patient from mechanical ventilation are varied, the main techniques are different in supportive reduction of respiratory rate, or volume/ pressure, or both supportive reduction (Sumalee Kiatboonsri, B.E. 2545: 321). The weaning techniques comprised of the conventional T- piece method, continuous positive airway pressure, synchronized intermittent mandatory ventilation, and pressure support ventilation as follows:

The conventional T- piece method

This technique is a supportive reduction of both respiratory rate and pressure (volume) at the same time. The method of weaning is to disconnect the patient from ventilator and allow the patient to breathe spontaneously with oxygen given through a T- piece circuit. There are two variations in T-tube trials. The first is single T-piece trial. The mechanical ventilator is discontinued and the patient breaths spontaneously through the T- piece circuit for 1-2 hour and a decision will be made to extubate. The second is intermittent T- piece trial, the duration of spontaneous breathing through the T- piece is gradually increased with periods of a few rest on mechanical ventilation between weaning process.

Continuous positive airway pressure (CPAP)

CPAP is to allow the patient to breathe spontaneously and positive baseline pressure is given for increased mean airway pressure and decreased work of breathing. This technique is a supportive reduction of respiratory rate, but still support with pressure.

Synchronized Intermittent Mandatory Ventilation (SIMV)

It involves a gradual reduction in the amount of ventilatory support and a gradual increase in the amount of patient' s respiratory work. It delivers a preset number of volume controlled breaths per minute whilst allowing the patient to take spontaneous breaths in between machine breaths. SIMV should be combined with flow by, or PEEP, or inspiratory pressure support to decreased work of breathing during patient breaths spontaneously.

Pressure Support Ventilation (PSV) (Higgins & Stoller, 1992: 1032; Blackwood, 2000: 147)

This technique allows the patient to breathe spontaneously while receiving mechanical assistance with each breath. Whilst the positive pressure is set by the doctor, the patient has control over the respiratory rate, inspiratory time and flow rate. During PSV, the level of inspiratory pressure support is slowly decreased, and the patient gradually assures more of the inspiratory work.

There are several studies comparing the efficacy of weaning techniques. Brochard and colleagues (1994: 896-903) studied 109 patients with mechanical ventilators who could not sustain 2 hours of spontaneous breathing. Those patients were randomly assigned to be weaned with T-piece trials, with SIMV, or with PSV. They found that using PSV had successful weaning outcome more than using T-piece or SIMV. Whereas, Esteban and colleagues (1995: 345-350) studied 130 patients with mechanical ventilators who had respiratory distress during a two-hour trial of spontaneous breathing. Those patients' were randomly assigned to be weaned with one of four techniques: IMV, PSV, intermittent T-piece trials, and once daily T-piece trial. The results shown a once-daily T-piece trial had the rate of successful weaning higher than IMV, or PSV, but had equally successful with intermittent T-piece trial.

Respiratory muscle training, biofeedback, and relaxation technique were used to facilitate improving weaning outcomes (Aldrich, et al., 1989: 143- 147; Holliday & Hyers, 1990:1214- 1220). In addition, using protocols to wean patients from mechanical ventilators was effective in reducing duration of mechanical ventilatory support (Ely, et al., 1996: 1864-1869; Marelich, et al., 2000: 459-467). A study was found that protocol-directed weaning safe and resulted in a shorter duration of mechanical ventilation compared with a traditional practice of physician-directed weaning (Kollef, et al., 1997: 567-574). In a recent study, the institution of collaborative or multidisciplinary approaches was shown to decrease ICU length of stay and length of ventilator time (Cohen, et al., 1991: 1278- 1284; Henneman, et al., 2001: 297-303).

Termination of weaning

Clinical signs indicate to stop weaning the patient from mechanical ventilation as follows (Chaiwat Bumrungkit, B.E. 2545: 255; Sumalee Kiatboonsri, B.E. 2545: 332-333):

- Changing of vital signs:
  - Heart rate increasing by 20 per minute
  - Respiratory rate > 30 per minute
  - Blood pressure change > 20% baseline
- Changing of pulmonary mechanics:
  - Tidal volume (V_T) < 200 ml
  - Minute ventilation (V_E) < 5 liters or > 12 liters
  - Rapid shallow breathing index (RSBI) > 105
- Paradoxical breathing or respiratory alternans
- Changing of Arterial Blood Glass:
  - $PaCO_2$ > 45 mm.Hg (except COPD)
  - pH < 7.35
  - PaO_2 < 60 mm.Hg
  - SpO_2 < 90%

The weaning continuum model

In 1994, the third National Study Group sponsored by the American Association of Critical Care Nurses (AACN) proposed a model of weaning to provide an organizing framework for the discussion and study of issue related to weaning from mechanical ventilatory support (Knebel, et al., 1994: 416-420). The model described the three phases: pre-weaning, weaning process, and weaning outcome phase.

During the pre-weaning phase, active weaning is not a reasonable expectation because the event that precipitated the need for mechanical ventilation has not been solved. Events precipitating the need for mechanical ventilatory support must be addressed, and attempts are made to prevent complications that may interfere with weaning. The decisions during pre- weaning involve determining if the patient is ready to begin weaning, selecting an approach to weaning, and deciding on a mode of weaning.

The weaning process phase was focused on the factors that must be optimized to increase the chances for a successful weaning outcome. The parameters that determine when to stop the weaning trial should be assessed. Using facilitative therapies during the weaning process for difficult-to-wean patients is considered. The weaning process is terminated when one of several outcomes is achieved. The weaning outcomes phase include complete weaning (weaning success), incomplete weaning (weaning unsuccess), and terminal weaning.

In 1998, this model was refined and called the Weaning Continuum Model (Knebel, et al., 1998: 149-152). In the refined model, the phases are called stages, a readiness threshold has been added, and the outcome of terminal weaning has been removed. The stages are called to connote forward progression and complication of one stage before movement to another. A readiness threshold has been added to mark the transition from the pre-weaning stage to the weaning stage and reflects physiological stability. This model will continue to be refined so that it is a useful tool for clinicians helping patients wean from mechanical ventilatory support.

In this study, the researcher used the concept of the weaning continuum model to develop nursing guideline for weaning. Although, the third stage of the model was described about weaning outcomes when the weaning process stage was terminated. For appropriateness of the study, the researcher modified the third stage to be a stage of prevention patient reused ventilatory support or reintubate endotracheal tube and called the post-weaning stage.

The weaning readiness assessment tool

Before initiating a weaning trial, some conditions should be met for health care providers assure that their patients will be able to wean. The conditions as criteria for weaning should be assessed for helping the patient weaning from mechanical ventilation as fast as possible. Most of predictors have focused on respiratory parameters, but few of them correlated respiratory parameters with other physiologic determinants of weaning.

In this study, the researcher used the Burns Wean Assessment Program (BWAP) bedside worksheet as a tool to evaluate patient' s weaning readiness because of its usefulness (see Appendix C) (Burns, et al., 1991: 372-387, 1995: 12; Burns,

1998: 90, 1999: 472). The BWAP, a comprehensive weaning readiness assessment tool, is used to evaluate weaning trial readiness, track progress, and keep care planning on target. The scores of this tool were also used as a criterion for initiating active weaning trials and as an extubation criterion. The tool combined 12 general factors and 14 respiratory factors that impact the patient's ability to wean.

For understanding the importance of non-pulmonary factors that indirectly impact the patient' s ability to wean, Burns and colleagues (Burns, et al., 1991: 373-382) described these factors as follows:

Hemodynamic instability, metabolism, and hematocrit relate with tissue oxygenation. Hemodynamic unstable can be exacerbated by weaning trials and result in inability to wean. Therefore, a stable cardiac status is essential prior to initiating wean trials. The less hematocrit can reduce oxygen carrying capacity that delivery to the respiratory muscle fatigue and wean failure. Metabolic rate can also affect oxygenation. Patients experiencing sepsis, fever, seizures, or hyperthyroidism have an increased metabolic rate, which results in increased oxygen consumption and carbon dioxide production.

Hydration, nutrition, electrolytes, and bowel elimination are complex interrelationship. Malnutrition may result in respiratory muscle fatigue, electrolytes disturbances, inefficient gas transport, and weakness. Albumin and pre albumin levels can be followed to assess trends in nutritional status. There was a study indicates that an albumin less than 3 mg/dl correlates with failure to wean and death. Moreover, carbohydrate loading is discouraged because the injudicious provision of carbohydrates results in increased carbon dioxide production and a high respiratory quotient (RQ). Nutritional regimens rich in lipids produce lesser degrees of carbon dioxide excretion and result in lower RQs. Elimination problems result in inadequate enteral absorption, abdominal discomfort, electrolytes abnormalities, and inadequate respiratory muscle function. Calcium, magnesium, and phosphate are especially important in the weaning patient since low levels result in muscular weakness and inadequate diaphragm function. Low levels of phosphate result in decreased 2,3-DPG levels (2,3-diphosphoglycerate), thus shifting the oxygen dissociation curve to the left and decreasing tissue oxygen availability.

Anxiety of patients who depend on mechanical ventilation can be associated with feelings of insecurity and fear of death. The psychological problems are related to factors such as cardiovascular, lung performance and cause unsuccessful weaning. Therefore, coaching, encouragement of weaning patients, and establishing confidence are imperative.

Comfort, sleep, and rest are essential for weaning. When necessary, a pain management regimen should be instituted prior to beginning wean trials to ensure patient comfort. A common sleep problem of patients in critical care unit is sleep deprivation. Clinical manifestations of sleep deprivation include irritability, anxiety, exercise intolerance, and inappropriate thought processes. These manifestations interfere with patients' weaning. Therefore, adequate rest periods, at least 2 to 4 hour intervals of uninterrupted sleep should be promoted.

Activity in movements associated with daily living or attempts to enhance the strength and endurance of muscle is the goal of balance work and rest. Nutrition status, hematocrit level, and hemodynamic stability affect general body strength and endurance. If these factors are addressed, the next step is to progress from a passive to an active exercise program.

The pulmonary factors affecting weaning success must be assess prior to begin weaning. Burns and colleague (Burns, et al., 1991: 382-385) described the pulmonary factors including gas flow and work of breathing, airway clearance, strength and endurance, acid- base status and gas exchange as follows:

Gas flow and work of breathing can be assessed in both physical and mechanical factors. The physical factors comprise of assessing respiratory rate and pattern, auscultating adventitious and secretion sounds, and assessing chest deformities, ascites, and obesity. The mechanical factor is the assessment of artificial airways. The physical and mechanical factors need to be identified and corrected because those factors increase respiratory muscle work that lead to failure of weaning. The assessment and interpretation of the finding are described as follows:

- Respiratory rate and pattern assessing can indicate dyspnea and tachypnea that occur from respiratory muscle fatigue.
- Chest auscultation may reveal adventitious breath sounds indicative of fluid, secretions, bronchospasm, and disease of the airway or lung

parenchyma. Secretion can impede gas flow resulting in decreased tidal volume and increased respiratory rate.

- Artificial airways, obesity, ascites and chest deformities can also increase resistance to gas flow and work of breathing.

Airway clearance of patient can be assessed from cough and swallow reflexes. If evaluation of inspiratory and expiratory muscle strength reveals low values, airway patency may be compromised and a tracheotomy needed for airway clearance.

Strength and endurance are related to evidence of fatigue and ability to cough. Standard parameters, such as tidal volume, vital capacity, negative inspiratory pressure, and positive expiratory pressure are helpful in assessing strength and endurance. Interventions to improve strength and endurance include improving general condition, selecting the appropriate ventilator modes, and using inspiratory resistive breathing devices.

Acid-base status and gas exchange are important condition of weaning. The metabolic acidosis can increase minute ventilation and metabolic alkalosis result in decreased oxygen delivery and compensatory hypercarbia.

The researcher expected the weaning readiness assessment tool be useful for nurses to evaluate patient' s weaning ability and give the direction to correct factors that are impediments to weaning for successful weaning outcome of the patients.

Nursing agency (Orem, 1995: 246-252)

The theoretical concept of nursing agency is a formulation of insights about powers of nurses to deliberately interact with persons with legitimate needs for nursing and to produce nursing for them and when possible with them. Nursing agency is analogous to self- care agency. They differ in that nursing agency is developed and exercised for the benefit of others and self- care agency is developed and exercised for the sake of one' s self. Nursing agency is a power developed by maturing or mature persons thorough: specialized education, training of self to master the cognitive and practical operations of nursing practice, clinical experiences in nursing practice situation under the guidance of advance nursing practitioners, and clinical nursing

experiences in providing nursing to persons representing some range of types of nursing cases.

Nurses' performance of the operation of nursing practice to know and meet patients' demands requires enabling capabilities or power components. The power components include valid and reliable knowledge of all three areas of nursing operation (social, interpersonal, professional- technologic); intellectual and practical skills specific to the three areas; sustaining motives; willingness to provide nursing; ability to unify different action sequences toward result achievement; consistency in performance of nursing operations; making adjustments in them because of prevailing or emerging conditions; and ability to manage self as the essential professional operative element in nursing practice situations. The forgoing summary of the enabling power components of nursing agency was developed into a set of desirable nurse characteristics:

1) social characteristics: specialize knowledge of the particular social and legal dimensions of some types of nursing situations;
2) interpersonal characteristics: knowledge of conditions necessary for the development of improved relations between nurse and patient;
3) technological characteristic: specialized education and training to extend or deepen the area of nursing practice with respect to nursing populations.

According to Benner (1994) nurses develop "expert" nursing through their experiences over a long period of time. Benner has used the Dreyfus model to study the development of skills and the competency of the staff nurses in a clinical setting. Through an analysis of qualitative data, Benner has identified five levels of performance characteristics: novice, advance beginner, competent, proficient, and expert. Novice is referred to as beginners, who do not have experience of the situation in which they are expected to perform. Advanced beginners are those persons who can demonstrate marginally acceptable performance, persons who can cope with real life situations. Competence is classified for the nurse who has been on the job in the same or similar situations for two to three years. Performance skills of competence level develop when the nurse is consciously aware his or her actions in term of long-range goals or plans. Proficient nurses understand a situation as a whole because they perceive its meaning in terms of long- term goals. Proficient performance can usually

be found in nurses who have worked with similar patient populations for approximately three to five years. The expert nurse, with an enormous background of experiences, now has an intuitive grasp of each situation and zeroes in on an accurate region of the problem without wasteful consideration of a large range of unfruitful, alternative diagnoses and solutions (Benner, 1984: 13-84).

The nurse's weaning competency-promoting program in this study was developed to assist nurses increased their capabilities of nursing practice in weaning patients from mechanical ventilators. In addition, the program leads the researcher developing the role of advanced nursing practice. The Thai Nursing Council (B.E. 2541). has specified the role and responsibilities of advanced nursing practice into six role components as follows:

Expert practitioner: Advanced practice nurses would be able to provide direct care for complicated patients and/ or critical patients by using advanced knowledge and specialized skills.

Administrator: Advanced practice nurses serve as a leader and manager by integrating their advanced knowledge and specialized skill to achieve collaboration and change agents.

Educator: Their responsibilities are to plan and teach nurses and clients according to their needs and health problems, to cooperate and assist nurses to develop health education program for clients and families, and to be a preceptor for students and nurse generalists.

Consultant: They would be consultants for nurses and other healthcare team members to solve problems and meet the healthcare needs, as well as, to develop themselves and the nursing profession.

Researcher: They should recognize the importance of contribution of the research to improve the quality of nursing and participation in others' research in their areas. In addition, they should analyze, disseminate, and apply the research results to improve the nursing practice.

Ethical and legal role: They should have morality and ethics to provide care of clients, families, communities, and healthcare teams. They should perform according to the obligation of the Thai Nursing Council and be able to use ethical decision- making skills under the nursing practice act and protection of the human' s

right. In this study, the researcher acts educator and consultant role of APN for providing advance nursing practice through staff nurses by enhancing nurses' competency in weaning.

The nurse' satisfaction

In this research, the researcher studied satisfaction of nurses about their job in weaning patients from mechanical ventilator based on Herzberg' s two-factor theory. Herzberg and colleagues (1959: 58) claimed that job satisfaction was people's positive feeling about their task. This belief leading to Herzberg developed a motivation-hygiene, or two-factor theory. This theory specifically addresses human needs at work. The two-factor theory describes motivation factors as factors that produce job satisfaction, and hygiene factors as factors leading to job dissatisfaction.

Motivation factors or intrinsic factors are the primary cause of job satisfaction. They are intrinsic to the job and relate directly to the real nature of the job that a person performed. Different persons require different kinds and degrees of motivation. Lack of motivation factors lead to job dissatisfaction, but adequacy of motivation factors causes job satisfaction. The following are examples of motivation factors or intrinsic factors:

1. Achievement. The opportunity to achieve or contribute something of value can serve as a source of job satisfaction and participate for successful in the job.
2. Recognition. The intelligent manager would let employees know that the manager appreciates them.
3. Responsibility. The potential for acquiring new duties and responsibilities can be powerful motivator for some employees.
4. Advancement. The opportunity to improve one' s position as a result of job performance gives employees a clear reason for high performance.
5. Work itself. When a job provides the opportunity for self- expression and meaningful challenge, employees are likely to perform the job with enthusiasm.

Hygiene factors or extrinsic factors are extrinsic to the job, and they are parts of the job environment. When hygiene factors that a manager' s offering is low of quality, employees feel job dissatisfaction. Hygiene factors in themselves do not

motivate but they are needed to create an environment that encourages the employees toward the higher- level needs. The following are some examples of extrinsic factors:

1. Salary. To prevent job dissatisfaction, a manager should provide adequate salaries, wages, and fringe benefits.

2. Interpersonal relationship among peers, subordinates, and supervisors. In an organization with high- quality social supports, the employees will enjoy working and these will be high production.

3. Status. Managers who are mindful of the importance of hygiene factors will offer job titles, privileges, and other symbols of position and rank.

4. Policy and administration. To prevent job dissatisfaction, manager should provide policies and guidelines for administer the organization fairly.

5. Working conditions. Manager should ensure adequate ventilation, heat, light, and hour of work to prevent job dissatisfacton.

6. Job security. The feeling' s person effect to job security, for examples, security of organization, tenure.

7. Supervision- technical. When employees do not receive answers to job-related questions, they become frustrated. Providing high- quality of technical supervision for employees prevent frustration.

8. Factors in personal life as the good or worse feeling effect to job' s position. When employees are rotated to new area, the feeling job dissatisfaction would be occurred.

9. Possibility of growth. The opportunity to increase knowledge and personal development is likely to lead to job satisfaction.

There are several studies on job satisfaction of the staff nurses. The majority of results revealed that the overall job satisfaction of staff nurses was at a moderate level (Pooneung, 2000: 84; Rodngam, 1999: 72; Rungpakdee, 2000: 111). If the staff nurses have a high job satisfaction level, the outcomes of nurses' job satisfaction were quality of nursing care, and patient satisfaction (Goodell & Coeling, 1994: 87).

Summary

The transition from mechanical ventilatory support to spontaneous breathing can be a critical period for patients with mechanical ventilators. Role of nurses is significant in weaning patients from mechanical ventilator. Preparing physical and psychological readiness of the patients in pre-weaning stage is important in determining a successful weaning outcome. Performing optimal nursing intervention in the weaning stage can increase the chances of a successful weaning outcome. Monitoring in the post-weaning stage is necessary to prevention the reuse of ventilatory support or reintubation. The nurses should have capabilities for those nursing intervention. The nurses' weaning competency-promoting program in this study is provided for enhancing nurses' ability in weaning patients from mechanical ventilators. The program is also provided the guideline of weaning practice (environment factor) for organizing patient care and for preventing nurses' frustration in the weaning situation. The effective nurses' management of weaning will also make a significant impact on weaning outcomes and contribute satisfaction on healthcare providers.

CHAPTER III
MATERIALS AND METHODS

This study was single- group pre-test/ post-test design for evaluating the nurses' performance and satisfaction in weaning patients from mechanical ventilators. For patients' weaning outcomes, the design was quasi- experimental study.

Population and Sample

In this study, the populations were consisted of two groups: the nurses and the patients. The population of nurses was the nurses who provided nursing care to patients with mechanical ventilators at Ramathibodi Hospital. The sample was selected by purposive sampling technique. The inclusion criteria were nurses who a) worked at the Intermediate Ward, Medical department, and b) were willing to participate in this study.

The sample size was consistent with the recommendation of Polit & Hungler (1983: 426). It was suggested that a quasi- experimental design should consist of a sample size of at least ten persons, though preferably twenty to thirty persons. All of the thirty-four nurses in the Intermediate Ward were willing to participate in this study.

The sample of patients was composed of the patients with mechanical ventilator who were admitted in the Intermediate Ward during the study period (February to August 2001). The patient samples were selected by purposive sampling. The inclusion criteria were the patients with mechanical ventilator who a) had stable hemodynamics, and b) used $FiO_2 < 0.6$. The exclusion criteria were the patients with mechanical ventilator who a) had deteriorated clinically from their pathology or had recurrent cause, and b) were unable to start weaning within two weeks.

The number of patient samples was consistent with recommendation given by Polit & Hungler (1983: 426). It was recognized that a quasi- experimental design should include at least twenty to thirty persons in the sample. For comparison cases,

the number of samples in each group should not be less than ten cases. Therefore, the researcher considered using forty cases as the total sample size, with twenty cases in each group. The first twenty patient samples received normal nursing care for weaning from mechanical ventilation, from a nurse, before the nurse participated in the weaning competency-promoting program. The remaining twenty patient samples received nursing care for weaning patients from the same group of nurse, after participating in the weaning competency-promoting program.

Setting

This study was conducted in the Intermediate Ward at Ramathibodi Hospital. This unit comprised of twenty beds. Patients admitted to this unit need to have their vital signs monitored and receive close nursing care. Most of the patients have respiratory problems and need oxygen therapy. Some are intubated patients and receive mechanical ventilation. Thirty- four nurses provide direct care to the patients in this ward. The nurse to patient ratio is 1: 3 or 1: 4 in each 8- hour shift. The usual nursing care for weaning in the Intermediate Ward started when the physician gave prescriptions of weaning. Nursing activities were assessment of vital signs, lung volume, assess muscle strength. They also encourage the patients keep breathing and make patients' confidence in their abilities to breathe.

Intervention program

The researcher developed the nurses' weaning competency-promoting program to support the staff nurse function more effectively and efficiently in weaning patients from mechanical ventilator. This program included the following strategies:

1. Teaching

The researcher provided teaching in order to assist the nurses gain knowledge about weaning the patients from mechanical ventilation. In order to maximize the effectiveness of teaching learning. The 34 nurse participants were divided into 3 groups, with 10- 12 per group for a teaching class. The period of teaching was 1 hour for each group. The contents was concerned with the weaning concept, influencing factors in weaning, and nursing care for weaning patients with mechanical ventilator. The researcher conducted the contents by using the relevant information gathered in

the literature review. The content outline was given to the nurses and its detail is shown in Appendix B.

2. Demonstrating the use of the weaning readiness assessment tool

The weaning readiness assessment tool was developed and used as part of nursing guideline for weaning patients with mechanical ventilator. This tool was modified from the Burns Wean Assessment Program (BWAP), a comprehensive weaning readiness assessment tool, which was developed by Burns and colleague (Burns, et al., 1991). The tool consists of 26 factors, including 12 general and 14 respiratory factors, which are important factors for weaning potential. In this study, the researcher modified only 1 item from a total of 26 items in the tool. The item "hematocrit" was changed from 25% to 30%, by following the co- advisor' s recommendation. The aim of using this tool was to evaluate the patient' s weaning ability, follow up weaning progress, and guide the nursing care planning for weaning success.

The researcher demonstrated procedure for using the weaning readiness assessment tool for about 30 minutes following the teaching session. This demonstration aimed to help the nurse participants understand how to use the tool for evaluating patients' weaning readiness.

Procedure for using the weaning readiness assessment tool.

1. record the patient' s name and identification number.
2. assess weaning readiness factors and mark either
   - "Yes" if the factor is met or
   - "No" if the factor is not met or
   - "NA (not assessed)" if the information of that factor is not available.
3. calculate the score to a percentage by using the following formula:

$$\frac{\text{Total "Yes" scores}}{\text{Total "Yes" scores + Total "No" scores}} \times 100\%$$

This tool was mentioned that if the score approaches 50%, weaning should be initiated.

4. assess the patient with this tool every Monday, Wednesday, and Friday until the patient succeeds in weaning.

An example of the weaning readiness assessment tool is shown in Appendix C.

3. Training

After teaching and demonstrating, the nurse participants were trained by the researcher to ensure their nursing intervention adhered to the nursing guideline for weaning mechanically ventilated patients in a real situation. The nursing guideline for weaning patients with mechanical ventilators was developed by the researcher using the literature review and the concept of weaning continuum model of the American Association of Critical Care Nurses (AACN)'s Third National Study Group (Knebel, et al, 1998: 149-152).

The nursing guideline for weaning patients with mechanical ventilators consists of three stages. When a patient met the study criteria, the nurses who cared for the patient started the pre-weaning stage. First, the nurses evaluated the weaning ability of the patient by using the weaning readiness assessment tool. After that, the nurses developed a nursing care plan and provided nursing intervention to improve influencing factors to help the patient start weaning earlier.

When the patients could start the weaning process, the optimal nursing intervention in the weaning stage was performed to increase the chances of a successful weaning outcome. The nurses continued to use the weaning readiness assessment tool for nursing care plan to correct any factors that interfered with weaning and to maintain those factors that supported weaning. In addition bedside monitoring, and assessment to suspend weaning and psychological support were provided. When the patient was successfully weaned, the nursing intervention in the post-weaning stage was carried out. Bedside monitoring was focused on prevention of mechanical ventilator reused or reintubation.

The training session period was taken place for two weeks for each nurse participate or until the nurse has skills and familiar to use the guideline. During the training period, the researcher was available for consultation during the training session to clarify directions on the use of the weaning assessment tool and the nursing intervention according to guideline. The flowchart of the nursing guideline for weaning patients with mechanical ventilators was developed by the researcher to facilitate nursing performance at the work area (Appendix D).

4. Counseling

In order to promote successful weaning, the researcher provided consultations for the nurse participants to solve problems of weaning and to facilitate using the nursing guideline for weaning. The researcher was available for counseling while the nurses were undertaking weaning.

Instruments for data collection

The instruments used for data collection in this study consisted of the following questionnaires.

1. The nurses' demographic questionnaire (Appendix E) included information about age, years of clinical experience in nursing, educational level, and experience in training course on weaning.

2. The nurse's weaning performance questionnaire (Appendix F) indicated nursing activities for weaning patients from mechanical ventilator. The researcher developed the questionnaire using a literature review that was related to nursing care for weaning and the concept of the weaning continuum model. The questionnaire was composed of 62 items that were divided into three stages of the weaning process, as follows:

The pre- weaning stage comprised of 41 items relating to nurses' assessment of patients' weaning ability and nursing care to improve factors influencing weaning (No. 1- 41);

The weaning stage comprised of 12 items relating to nurses' performance of nursing care to enhance weaning success (No. 42- 53);

The post- weaning stage comprised of 9 items relating to nurses' performance of nursing care to prevent the reused of ventilation, or reintubation (No. 54- 62).

The nurses' weaning performance questionnaire had Likert- type scales with 5 levels of evaluation. Scores ranged from 0 – 4, and had the following meaning:

A score of 0 means the nurse never performed those nursing activities for any patient;

A score of 1 means the nurse performed those nursing activities for a few patients;

A score of 2 means the nurse performed those nursing activities for some patients;

A score of 3 means the nurse performed those nursing activities for most patients;

A score of 4 means the nurse performed those nursing activities for every patient.

The maximum total score was 248 points (range 0 – 248). A high score indicates high nursing performance in weaning, and similarly a low score indicates less nursing performance in weaning.

3. The nurse' s weaning satisfaction questionnaire (Appendix G) indicates nurses' perception of their work in weaning patients from mechanical ventilation. The researcher developed this questionnaire based on Herzberg' s two- factor theory: motivation factors and hygiene factors.

The motivation factor in this study included 4 factors, which are achievement, recognition, the work itself, and responsibility factors. Items 1 – 4 represent the achievement factor. Items 5 – 7 represent the recognition factor. Item 10 represents the work itself factor. Items 8 and 15 represent the responsibility factor. There are 10 items for the motivation factor.

The hygiene factor in this study is the interpersonal relationship and the possibility of growth. Items 11- 14 represent the interpersonal relations. Item 9 represents the possibility of growth. There are 5 hygiene factor items.

The nurses' weaning satisfaction questionnaire is rated using a Likert- type scale with 5 levels of evaluation, with scores ranging from 1- 5, which mean the following:

A score of 1 indicates "very low", which means the nurse has the lowest satisfaction with that statement.

A score of 2 indicates "low", which means the nurse has low satisfaction with that statement.

A score of 3 indicates "moderate", which means the nurse has moderate satisfaction with that statement.

A score of 4 indicates "high", which means the nurse has high satisfaction with that statement.

A score of 5 indicates "very high", which means the nurse has the highest satisfaction with that statement.

Total scores range from 15 - 75 points; high scores indicate high satisfaction, and low scores indicate low satisfaction

. **4. The patient profile form** (Appendix H) included information concerning gender, age, marital status, and occupation. This form also included data related to the disease, type of intubation, type of ventilation, ventilatory period before weaning, weaning method, complication during weaning, and weaning outcome.

Validity and reliability

Three experts (see Appendix J) in the Critical Care Unit approved the content validity of the nurse's weaning performance questionnaire and the nurse' s weaning satisfaction questionnaire.

The questionnaires were revised strictly according to the experts' recommendations and then tried out with 30 nurses who had conditions similar to the sample group. After that, the total scores were analyzed to determine the questionnaires' reliability by using the Cronbach' s alpha, calculated at 0.86, for the nurse's weaning performance questionnaire and 0.97 for the nurse' s weaning satisfaction questionnaire.

Protection of Human Subjects

This study was conducted based on the protection of human rights, and getting the permission of the Faculty of Medicine, Ramathibodi Hospital (Appendix A). The sample in this study had been given the appropriate information concerning this study and the right to participate or to withdraw from the study at any time. The nurses who agreed to participate were informed and assured that the data would be keep confidential and presented as a group report.

Study Procedures and Data Collection

In this research, the implementation procedures were as follows:

1. Preparation

1.1 The researcher requested a letter from the Faculty of Graduate Studies, Mahidol University, to be sent to the Dean of the Faculty of Medicine, Ramathibodi Hospital, requesting permission to collect data.

1.2 After obtaining approval, the researcher contacted the head nurse of the Intermediate Ward to explain the research details and data collection.

2. Data collection before intervention program

2.1 The patient samples who met the inclusion criteria were identified from their medical records. Then the researcher collected the demographic data and weaning outcome data by using the patient profile form, until 20 patient samples were accumulated.

2.2 The researcher met the staff nurses of the Intermediate Ward to explain the purpose of the study and the protection of human subjects. After the staff nurses agreed to participate in the study, they were asked to sign the consent form. Then the researcher asked the nurse participants to answer the pre-test questionnaires, including the nurse's demographic data, the nurse's weaning performance, and the nurse's weaning satisfaction questionnaires. The completed pre-test questionnaires were returned within 1 week.

3. Implementation of the nurses' weaning competency-promoting program

The researcher made appointments with the nurse participants, to provide teaching and demonstrating of nursing activities for weaning, in the conference room of the Intermediate Ward. Teaching and demonstrating class took time about one and half-hour per group per day. The researcher began the training strategies when the nurse participants had completed the teaching and demonstrating classes. The researcher trained the nurse participants to perform nursing interventions of weaning according to the nursing guideline for weaning patients from mechanical ventilator in a real situation. This part of the program took 2 weeks. After that, the nurse participants continued to perform the nursing intervention according to the guideline, while the researcher provided counseling.

4. Data collection after the nurse samples participated in the intervention program

4.1 While the nurse participants continued to perform the nursing intervention according to the guideline, the researcher identified the patients with mechanical ventilators who met the inclusion criteria, and collected the demographic data and weaning outcome data from the medical records using the patient profile form.

4.2 After the data collection for the 20 patient samples was completed, the nurse participants were asked to answer the post- test questionnaires including the nurse's weaning performance and the nurse' s weaning satisfaction questionnaires. The completed post- test questionnaires were returned within 1 week.

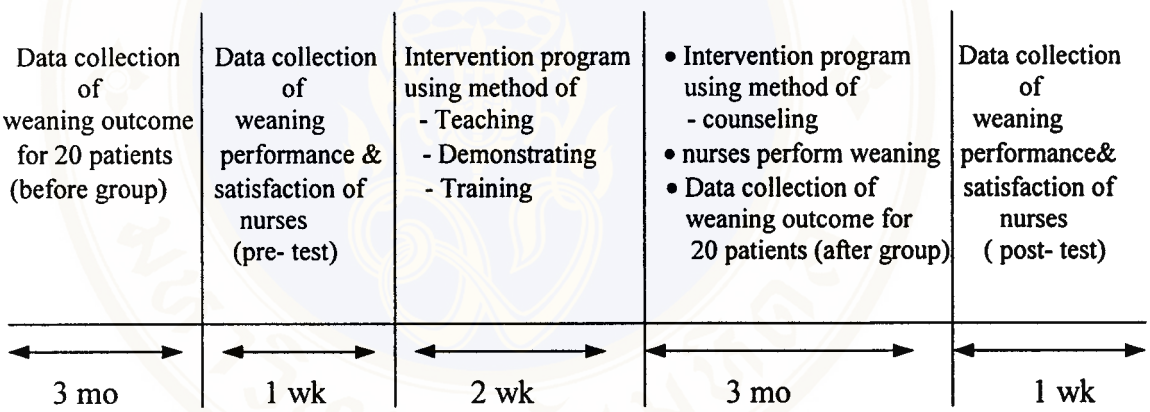

Figure 2. The process of intervention and data collection

Data Analysis

Analysis of the data was conducted using the computer software "Statistical Package for the Social Sciences for Windows" (SPSS/FW).

1. The demographic data were described using frequency, percentage, mean, range and standard deviation.

2. Comparison of the demographic data between two groups of the patients with mechanical ventilators was performed using Chi- square and Fisher' s Exact test.

3. The differences in the pre- test and post- test scores for the weaning performance and the weaning satisfaction within the nurse group were analyzed by Paired t- test.

4. The differences in weaning outcome between the two groups of patients with mechanical ventilators were analyzed by Fisher' s exact test.

CHAPTER IV
RESULTS

This quasi– experimental research design aimed to compare nurses' weaning performance and satisfaction before and after participating in the nurses' weaning competency-promoting program. This study also aimed to examine the weaning outcomes of patients with mechanical ventilators before and after the nurses' participation in the program. In this chapter, the results of the data analysis are presented in two parts:

Part 1: Descriptive data of the sample:

1.1 Demographic data of the nurse sample included age, clinical experience in the unit, education level, and experience in training course on weaning.

1.2 Demographic data of the patient sample included gender, age, marital status, occupation, ventilation period before weaning, causes of respiratory failure, underlying disease, weaning method, and complication during weaning.

Part 2: The results of hypothesis testing

Part 1: Descriptive data of the sample

1.1 Demographic data of nurse sample

All of the nurses who worked in the Intermediate Ward participated in the study. Their ages ranged from 21 to 49 years. The mean age was 26.44 ± 6.77 years. Most nurses (70%) had 1-3 years' clinical experience in the unit, with a mean of 4.35 ± 5.73 years. Ninety- four percent of the nurses had received a bachelor degree. More than half of the nurses (65%) had never participated in a training course on weaning patient from mechanical ventilation.

Table 2 Numbers and percentage of nurses' characteristic data (N = 34)

Characteristic	n	percentage
Age (years old)		
20-29	28	82
30-39	9	9
40-49	3	9
Range 21-49, Mean 26.44, SD 6.77		
Clinical experience in the unit (year)		
1-3	24	70
> 3	10	30
Range 1-25, Mean 4.35, SD 5.73		
Educational level		
Bachelor	32	94
Master	2	6
Experience in training course on weaning		
Yes	12	35
No	22	65

1.2 Demographic data of the patients with mechanical ventilators

The characteristics of the patients with mechanical ventilators, before and after the nurses' participation in the nurses' weaning competency-promoting program, are shown in Table 3. The characteristics of both groups of the patients were tested for any differences using Chi- square.

Table 3 Comparison of the characteristics between the patient groups by Chi-square (n = 20 in each group).

Characteristic	Before nurses' participation in program		After nurses' participation in program		χ^2
	n	percentage	n	percentage	
Gender					
Male	9	45	10	50	.752 ns
Female	11	55	10	50	
Age (year)					
< 50	3	15	1	5	.303 ns
50-59	2	10	3	15	
60-69	7	35	3	15	
70-79	7	35	9	45	
> 79	1	5	4	20	
	Range = 45-91, Mean = 65.9, SD = 12.12		Range = 58-90,Mean = 70.10, SD = 11.73,		
Marital status					
Single	0	0	1	5	.425 ns
Married	16	80	13	65	
Windowed	4	20	6	30	
Occupation					
Commercial	1	5	1	5	.849 ns
Employee	4	20	2	10	
Government	1	5	1	5	
Unemployed	14	70	16	80	
Ventilation period before weaning (day)					
≤ 3	13	65	14	70	.914 ns
4-7	3	15	3	15	
> 7	4	20	3	15	
	Mean = 4.35, SD = 5.30		Mean = 2.21, SD = 2.12		

ns $p > .05$

As shown in table 3, there were 11 (55%) female in the patient group before the nurses participated in the program. There were 10(50%) females in the patient group after the nurses participated in the program. The majority of patients in both groups were elderly. The mean age was 65.9 ± 12.12 years in the patient group before the nurses participated in the program, and 70.10 ± 11.73 years in the patient group after the nurses participated in the program. Most patients in both groups were married and unemployed. Before starting weaning from the mechanical ventilator, the "before" patient group used the mechanical ventilation for 1 to 14 days (mean 4.35 ± 5.30 days), whereas the "after" patient group used the mechanical ventilation for 1 to 9 days (mean 2.21 ± 2.12 days). There were no statistically significant differences in age, gender, marital status, occupation and ventilation period before weaning between two groups of the mechanically ventilated patients.

Cause of respiratory failure, underlying disease, type of intubation, type of ventilation, weaning method and complication during weaning of the patient groups before and after the nurses' participation in the program are shown in table 4. The Chi-square and Fisher' s Exact test were used to test for different characteristics in both groups of patients.

As shown in table 4, respiratory problem were the cause of using mechanical ventilation in both groups: "before" "after" the program interventions, 50% and 45%, respectively. The majority of underlying disease in both groups were cardiovascular system (35% of the "before" patient group and 30% of the "after" patient group) followed by respiratory system (25% of the "before" patient group and 35% of the "after" patient group).

Ninety percent of the patient group before the nurses' participation in the program was intubated with an oro- endotracheal tube and 95% of the patient group after the nurses' participation in the program was intubated with an oro- endotracheal tube. Volume ventilators (MAI and Bennett 7200) were frequently used for supportive respiratory failure conditions in both groups of the patients. Five percent of the "before" patients group used a pressure ventilator (Bird' s respirator), whereas no patient of the "after" group used pressure ventilator.

Table 4 Comparison of disease, type of intubation and ventilation, weaning method, and complication during weaning between of the patient groups by Chi- square and Fisher' s Exact test (n = 20 in each group)

Characteristic	Before nurses' participation in program		After nurses' participation in program		χ^2
	n	%	n	%	
Cause of respiratory failure					
Respiratory	10	50	9	45	.445 ns(a)
Cardiac	2	10	1	5	
Neuromuscular	7	35	5	25	
Renal	0	0	2	10	
Infection	1	5	3	15	
Underlying disease					
Respiratory	5	25	7	35	.799 ns(a)
Cardiovascular	7	35	6	30	
Neurologic	2	10	2	10	
Renal	1	5	3	15	
Infection	1	5	1	5	
None	2	10	1	5	
Type of intubation					
Oral	18	90	19	95	1.00 ns(b)
Tracheostomy	2	10	1	5	
Type of ventilation					
MAI	11	55	9	45	.433 ns(a)
Bennett 7200	8	40	11	55	
Bird' s respirator	1	5	0	0	
Weaning method					
T- piece	5	25	6	30	.490 ns(a)
CPAP	13	65	7	35	
SIMV+PS	2	10	7	35	
Complication during weaning					
No	16	80	19	95	.342 ns(b)
Yes	4	20	1	5	
Reintubation	3	15	1	5	
Respiratory distress	1	15	0	0	

ns $p > .05$, a = Chi- square test; b = Fisher's exact test

The T- piece weaning method was used less than weaning with using supportive modes of mechanical ventilation (CPAP, SIMV+PS) in both groups of the patients. Only 25% of patients of the "before" group weaned with T- piece method and 30% of the patients of the "after" patient group weaned with T- piece method. The

majority of the "before" patients (80%) and almost all (95%) of the "after" patient group did not have complications during the weaning period.

There were no statistically significant differences between the two groups of the patients in cause of respiratory failure, underlying disease, type of intubation, type of ventilation, weaning method, and complication during the weaning process.

Part 2: Results of hypothesis testing

2.1 Hypothesis 1 stated that " The post- test weaning performance scores of nurses, after participating in the program, will be higher than the pre- test weaning performance scores." The effect of the nurses' weaning competency- promoting program on weaning performance is presented in table 5.

Table 5 Comparison of the mean weaning performance scores, before and after nurses' participation in the program, by paired t- test (N = 34)

Group	Possible scores	Actual scores	Mean	SD	t	p
After	0-248	169-236	210.5	20.63	5.882	< .01
Before	0-248	136-228	187.97	27.45		

Table 5 showed that the mean of weaning performance scores of the nurses after participating in the program (210.50) were higher than the mean weaning performance scores before participating in the program (187.97). There was a statistically significant difference of the mean scores for weaning performance between before and after nurses' participation in the program ($p < .01$).

This finding indicated that after the nurses participated in the nurses' weaning competency- promoting program, they had significantly increased their weaning capabilities. Therefore, the result supported hypothesis 1.

2.2 Hypothesis 2 stated that "The post- test weaning satisfaction scores of nurses, after participating in the program, will be higher than the pre- test weaning satisfaction scores".

Table 6 Comparison of the mean scores for nurses' weaning satisfaction before and after participating in the program by paired t-test (N = 34)

Group	Possible scores	Actual scores	Mean	SD	t	p
After	15-75	53-75	65.38	6.85	.722	> .05
Before	15-75	44-75	64.38			

As shown in table 6, the mean weaning satisfaction scores of the nurses after participating in the program (65.38) were higher than before participating in the program (64.38). However, there was no statistically significant difference in the mean scores for weaning satisfaction before and after the nurses' participation in the program ($p > .05$).

This finding indicated that the program had not influenced the weaning satisfaction scores of nurses with statistic significance.

2.3 Hypothesis 3 stated that "After the nurses have participated in the program, the mechanically ventilated patients will have greater success in weaning than patients did before the nurses participated in the program".

Table 7 shows that the percentage of the mechanically ventilated patients who succeed in weaning in the "after" group (95%) was higher than the "before" group (85%). However, there was no statistically significant difference in weaning outcomes between the two groups of mechanically ventilated patients ($p > .05$). This result indicated that the program could not influence the weaning outcome of patients with mechanical ventilation.

Table 7 Comparison of weaning outcomes before and after the nurses participated in the program, by Fisher's Exact test

Weaning outcome	Before nurses participated in program		After nurses participated in program		χ^2	p
	n	%	n	%		
Successful weaning	17	85	19	95	.605	>.05
Failure weaning	3	15	1	5		

CHAPTER V
DISCUSSION

The research aimed to determine the effects of the nurses' weaning competency-promoting program on performance and satisfaction in weaning patients from mechanical ventilators of nurses. In addition, the study aimed to compare the weaning outcomes of the patients with mechanical ventilators between before and after nurses participating in the program. In this section, the results of this study are discussed in accordance with the hypotheses as follows:

Hypothesis 1: the post- test weaning performance scores of nurses, after participating in the program, will be higher than the pre- test weaning performance scores.

This study found that the mean weaning performance scores of the nurses before participating in the program was 187.97 and a higher mean weaning performance scores of the nurses after participating in the program was 210.50. The finding of this study showed significant support to hypothesis 1. The nurses' weaning performance post-test mean scores were significantly higher than pre- test mean scores ($p < .01$)(Table 4). It can be explained that the nurses' weaning competency-promoting program had a positive effect on weaning performance of the nurses.

Teaching is a method of helping a person who needs instruction to develop knowledge or particular skills (Orem, 1995: 19). Therefore, teaching concept of weaning and demonstrating the use of the weaning readiness assessment tool of the program in the study are a method for helping nurse participants to develop knowledge and skill to perform nursing practice for weaning patients from mechanical ventilator. Moreover, teaching method is offered the reassurance of common to new and complex information (Dunn, S., 1992: 72).

Training nursing practice according to guideline in the real situation and training the use of the weaning readiness assessment tool provided the nurses increased their skills and confidence to decision-making for caring mechanically ventilated patients. In addition, the nurse participants could consult the researcher about the problem while they were performing weaning as the guideline. Counseling process can enhance the learning and skill of both the consultee and the consultant (Barron & White, 1996:179-180).

For the above reasons, the program was effective on learning and retention of knowledge for the nurses. These learners bring to the encounter a lifetime of experience and learning upon which to build and, as adult learners, they prefer self-directed learning opportunities. Learning is a process of "sensory perception, conceptualization and critical thinking and involving multiple experiences in which changes in concepts and skills (King, 1986: 24 cited by Dougal & Gonterman, 1999: 205-209). In a clinical setting, increased learning in a real situation may improve the competency of either care providers or practicing nurses.

Benner (1984: 13-38) has used the Dreyfus model to describe the development of skills and the competency of the staff nurses in a clinical setting. She has identified five levels of performance characteristics: novice, advance beginner, competent, proficient, and expert. Competency and performance of practice nurses from novice to expert could improve by experience and mastery of the skill. From the demographic data, most nurse participants in this study consisted of advance beginner because they had at least 1-year clinical experience at working in the Intermediate ward. The characteristic of advance beginner level was those persons who can demonstrate marginally acceptable performance, and can cope with real life situations, or to have pointed out to them by a mentor. The advance beginner need support in the clinical setting and need help in setting priorities. According to the program, the nursing guideline for weaning and its flow chart in the program was provided for nurse recognizing. In addition, the researcher provided continuous follow- up instructions and consultation so that nursing intervention was fully implemented.

In addition, the result in the study shown 65% of the nurse sample had never had experience in training course of weaning. That can prove the nurses' weaning

competency-promoting program in this study could provide nurses learning and improve ability to weaning patients from mechanical ventilator.

From the program, the researcher functioned as an educator by teaching nurses new information about weaning. In addition, the researcher was consultant for nurses to facilitate and solve problems through the program. Educator and consultant are role components of advance nursing practice to assist nurses develop their nursing agency and for the researcher develop role to be a advance practice nurse.

Hypothesis 2: the post-test weaning satisfaction scores of nurses, after participating in the program, will be higher than the pre-test weaning satisfaction scores.

The study found that the post-test mean weaning satisfaction score was 65.38, whereas the pre-test mean score was 64.38. Although the mean weaning satisfaction score of the post-test was higher than the pre-test, this result was not statistically significant difference. This finding was not support the hypothesis 2. There was no statistically significant difference in the mean weaning satisfaction scores before and after nurses participating in the nurses' weaning competency-promoting program ($p > .05$) (Table 5). This finding indicated that the nurses' weaning competency-promoting program had not influenced over weaning satisfaction score of nurses with statistically significant.

There may be some reasons for this non-significant finding. From the objective of the intermediate ward that was establish for caring the patients who have respiratory problems. The patients who receive ventilatory support with mechanical ventilator need caring in this ward. The nurses who work in this ward should have nursing standard for caring mechanically ventilated patients. Although, 65% of the nurse sample had never had experience in training course of weaning, they can gain experience or clinical knowledge by job-training in the place of their work. Before nurse participating in the program, the result of the pre-test mean weaning satisfaction score showed a high satisfaction scores that prove the nurses had a high level satisfaction in their nursing practice for weaning. Synthesizing the detail of nursing guideline for weaning in the program have a standard like as the nurses performed in their work except evaluating patient's weaning ability using the weaning readiness

assessment tool. It could made a little increased of the post-test mean weaning satisfaction score after nurse participating in the program, but could not make statistically significant difference.

In the detail of questionnaire, the majority of the nurses suggested that they felt their nursing performance in weaning improved after participation the program. However, some of the nurse commented that they lack of time due to their clinical workload made them dissatisfied with the weaning readiness assessment tool in the program. The nurses felt workloads that affected nurses' dissatisfaction in work itself. The work itself is one of motivation factors, lack of the factor lead to job dissatisfaction. In addition, some nurses commented they could not correct the impede factor that they assessed because it depended on physician treatment. Autonomy, or control over work activities is a major factor in job satisfaction in the nursing professions (Wolf & Orem, 1994: 199-201), so lack of control over work in weaning can made the nurse participants dissatisfied of weaning performance.

Therefore, the nurses' weaning competency-promoting program had not affected over weaning satisfaction of nurses in the Intermediate Ward at Ramathibodi Hospital that have a standard nursing care for weaning patients with mechanical ventilatators.

Hypothesis 3: after the nurses have participated in the program, the patients with mechanical ventilator will have greater success in weaning than patients did before nurses participated in the program.

The study found the mechanically ventilated patients who succeed in weaning were 19 (95%) in the "after" group, while the "before" patients were 17 (85%). However, there was no statistically significant difference in weaning outcome between the two groups of mechanically ventilated patients ($p > .05$) (Table 6). It means after nurses participated in the program can not increase the number of weaning success. This finding did not support the hypothesis 3.

According to the nurses in the Intermediate Ward have a standard nursing care for weaning patients from mechanical ventilator. The finding of the study shows the successful rate of weaning of the "before group" patients are 85%. It reflects the "ceiling effect". Thus it is too hard to increase successful weaning outcome after the

nurses participating in the program because there is no more room for the intervention effect to make the different outcome. Although the program in this study that assist nurses improved their performance could not affected the weaning outcome with statistically significant. The finding showed improving weaning outcome. The successful weaning outcome of the patients group after nurses participated in the program has number more than the patients group before nurses participated in the program.

There is only one patients of the "after group" who was failure to wean within two weeks due to her disease process and personal factor. This patient was eighty-nine years old, Ischemic heart disease and congestive heart failure causing acute respiratory failure. She needs mechanical ventilatory support. At the end of the program, the patient stills continue weaning with CPAP pus pressure support mode. Age of the patient is that may influence on weaning outcome. It was found that patients over sixty- five years old have enlarged trachea bronchial cartilage and alveolar ducts, but chest wall becomes stiffer. This results is an increase of dead space, decreased lung expansion, compliance and muscle strength (Thompson, 1996: 7- 14). These caused the reduction of vital capacity, an increase in residual volume, and consequent failure to wean.

In addition, the respiratory distress complication during the weaning of the patients group after nurses participated in the program have number less than the patients group before nurses participated in the program. That proves the program can maintain standard nursing care in the study, the weaning outcome did not go worse. The weaning outcomes may be improved if the program is implemented in the unit that does not have standard weaning patients from mechanical ventilators.

The program is emphasized the assessment of influencing factors for weaning and correcting the impede factor to assist weaning quickly and also focus on weaning outcome. From the table 4, most patients in both groups had the ventilation period before weaning $\leq$ 3 days (65% of the "before" patient group, and 70% of the "after" patient group). It presents the aimed of the program in correcting impede factor did not approach to this patient group. Therefore, the program may affect weaning outcome in the patient with long term mechanical ventilation.

In conclusion, after implementation of the nurses' weaning competency-promoting program in the Intermediate ward, most likely respiratory care unit of service, nurses' capabilities of weaning patients from mechanical ventilators are improved. The strategies in the program including teaching concept about weaning, demonstrating the use of the weaning assessment tool, training nursing practice in weaning, and counseling are assisted nurses to develop nursing capability for weaning.

CHAPTER VI
CONCLUSIONS

In this chapter, the conclusion of the study will be presented, followed by limitations of this study and recommendations for nursing practice and the further study.

Conclusion of the study

This study was a single-group pre-test / post-test design for the staff nurse and a quasi- experimental design for the patients. The purposes of the research were to demonstrate the effects of the nurses' weaning competency-promoting program on nurses' performance and satisfaction in weaning patients from mechanical ventilators. In addition, it aimed to examine the weaning outcome of patients with mechanical ventilators. The theoretical framework of this research was the Orem' s nursing theory.

The study was undertaken in the Intermediate ward at Ramathibodi Hospital, Bangkok, Thailand. All of 34 nurses who worked in the Intermediate Ward participated the study. The period of intervention and data collection was from February to August 2001.

The researcher developed the nurses' weaning competency-promoting program for intervention of the study. The research instruments used for collecting data consisted of the nurses' questionnaire and the patient' s profile. The nurses' questionnaire combined three parts: 1) the nurse's demographic questionnaire, 2) the nurse' s weaning performance questionnaire, and 3) the nurse' s weaning satisfaction questionnaire. Three experts in the Critical Care Unit approved content validity of the nurse's questionnaires. The reliability of the questionnaires was also tested. The Cronbach' s alpha coefficient for the nurse' s weaning performance questionnaire was 0.86 and the nurse' s weaning satisfaction questionnaire was 0.97.

Before the intervention program was conducted, the researcher collected the data of patients with mechanical ventilators who met the inclusion criteria until the weaning outcome of 20 patients were completed. After that, the nurse participants were asked to answer the pre-test questionnaires. When the completed pre-test questionnaires were returned, the intervention program was started.

The nurses' weaning competency-promoting program consisted of 4 strategies: teaching, demonstrating, training, and counseling. The nurse participants were divided into 3 groups of 10-12 per group for a teaching class. The researcher provided teaching in order to assist the nurses gain knowledge about weaning. After that, the researcher demonstrated the procedure of using the weaning readiness assessment tool. The teaching and demonstrating period took about one hour and thirty minutes.

When all of the nurse participants passed teaching and demonstrating session, they were trained to perform nursing intervention according to nursing guideline for weaning. The nursing guideline was developed by the researcher from using BWAP and the weaning continuum model of the AACN' s Third National Study Group. It consisted of 3 stages: the pre-weaning stage, the weaning process stage, and the post-weaning stage. In the pre-weaning stage, nurses should assess weaning ability of the patients and perform nursing intervention to improve influencing factors for the patients can start weaning earlier. The optimal nursing intervention in the weaning process stage was done for increasing the chances of a successful weaning outcome. The post-weaning stage was focused on the prevention of reused mechanical ventilatory support or reintubation endotracheal tube.

The period of training session was two weeks. After that, the nurse participants performed nursing intervention according to the guideline by themselves whereas, the researcher provided counseling to solve problem and encouraging for the nurses fully implementation of guideline for weaning.

During the nurse participants performed nursing intervention, the researcher collected the weaning outcome data of the patients who met inclusion criteria. When the weaning outcome data of 20 patients were completed, the intervention program finished. The researcher asked the nurse participants to answer the post-test of nurse's

weaning performance and nurse's satisfaction questionnaires. The questionnaires were returned to the researcher within 1 week.

The data were analyzed using descriptive statistics, chi- square, and paired t-test. The results of the study can be summarized as follows:

1. There was a statistically significant difference in the weaning performance of the nurses before and after participating in the program ($p < .01$). The mean scores of nurses' weaning performance after participating in the program were higher than before participating in the program.

2. There was no statistically significant difference in the weaning satisfaction of the nurses before and after participating in the program ($p > .05$). However, trend of nurses' weaning satisfaction after participating in the program was higher than before participating in the program.

3. There was no statistically significant difference in weaning outcomes of the patients with mechanical ventilator before and after nurses participating in the program ($p > .05$).

Limitations of the study

1. The study was undertaken in a unique setting at the Intermediate Ward of Ramathibodi Hospital. The results of this study may not be generalized with other setting.

2. In the study, the researcher could not control situation of the patients before and after nurses' participation in the program, such as the physician rotation that may effect treatment and planning in weaning patients.

Recommendation for nursing practice

The result of this study indicated the nurses' weaning competency- promoting program have a positive effect on performance in weaning of nurses. The effective of this program should be developed as a standard of care for any unit caring mechanical ventilated patients. Moreover, the benefits of strategies in the program can be addressed at in-service education program for professional, especially novice and advance beginner nurses. The program could help them to gain knowledge and increase confidence to provide standard nursing care efficiently. The weaning

readiness assessment tool, that combined physiology parameters and psychology parameters, is important to evaluate patients comprehensively. Clinical practice guideline or this program will be very useful in setting where there are limited numbers of staff or young staff.

Recommendation for further study

The effectiveness of the nurses' weaning competency- promoting program should be tested in patients with mechanical ventilators in other setting, especially in the unit without weaning guideline. Another suggestion for testing is the effective of the weaning readiness assessment tool and the program in the patients with long- term mechanical ventilation.

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APPENDIX A

APPENDIX A

CONSENT TO PARTICIPATE IN RESEARCH STUDY

คำชี้แจงและพิทักษ์สิทธิของพยาบาลประจำการในการเข้าร่วมการวิจัย

ดิฉัน นางสาวสุนทรี เจียรวิทยกิจ นักศึกษาพยาบาล หลักสูตรพยาบาลศาสตรมหาบัณฑิต ภาควิชาพยาบาลศาสตร์ คณะแพทย์ศาสตร์ โรงพยาบาลรามาธิบดี มีความสนใจศึกษาผลของการส่งเสริมความสามารถของพยาบาลในการหย่าเครื่องช่วยหายใจ เพื่อนำผลการวิจัยไปใช้เป็นแนวทางในการปฏิบัติการพยาบาลให้มีประสิทธิภาพมากยิ่งขึ้น ซึ่งโครงการนี้จะสำเร็จได้โดยอาศัยความร่วมมือของคุณที่เข้าร่วมโครงการ

เมื่อคุณเข้าร่วมโครงการคุณจะได้รับความรู้และฝึกทักษะเพิ่มเติมเกี่ยวกับการดูแลผู้ป่วยที่หย่าเครื่องช่วยหายใจ และดิฉันขอความร่วมมือในการตอบแบบสอบถามข้อมูลส่วนบุคคล แบบสอบถามการปฏิบัติการพยาบาลในการหย่าเครื่องช่วยหายใจและแบบสอบถามความพึงพอใจในการพยาบาลผู้ป่วยที่หย่าเครื่องช่วยหายใจ ก่อนและหลังการเข้าร่วมโครงการ

คุณมีสิทธิ์ตอบรับ/ปฏิเสธการเข้าร่วมวิจัยครั้งนี้ได้ และในระหว่างการวิจัยคุณมีสิทธิ์ที่จะขอยกเลิกการเข้าร่วมวิจัยครั้งนี้ได้ตลอดเวลาที่คุณต้องการ โดยไม่มีผลต่อการปฏิบัติงานของคุณแต่อย่างใด ข้อมูลทั้งหมดที่คุณตอบแบบสอบถาม จะถูกเก็บไว้เป็นความลับและนำมาใช้เพื่อเป็นแนวทางในการศึกษาวิจัยเท่านั้น โดยท่านจะไม่ได้รับผลเสียใดๆ จากการตอบแบบสอบถามครั้งนี้ ดิฉันหวังว่าจะได้รับความร่วมมือจากคุณ เมื่อคุณยินดีเข้าร่วมโครงการ กรุณาลงชื่อในเอกสารนี้ด้วย จักเป็นพระคุณยิ่ง

ขอขอบคุณที่ให้ความร่วมมือ

.....

สุนทรี เจียรวิทยกิจ

ผู้วิจัย

สำหรับผู้เข้าร่วมวิจัย

ข้าพเจ้าได้รับการอธิบายตามรายละเอียดข้างบน มีความเข้าใจ และยินดีเข้าร่วมการวิจัยนี้

(ลงชื่อ).....

(.....)

วันที่ ..... เดือน ..... พ.ศ. 2544

APPENDIX B

APPENDIX B

CONTENT OUTLINE

02.00- 03.00 p.m. Teaching class

- definition of weaning
- weaning criteria
- factors influencing weaning
- weaning techniques
- nursing guideline for weaning patients from mechanical ventilator

03.00- 03.30 p.m. Demonstrating:

- how to use the weaning readiness assessment tool

APPENDIX C

APPENDIX C

THE WEANING READINESS ASSESSMENT TOOL

Patient name..... Age..... HN .....

Y = Patient meets standard for this parameter.
N = Patient does not meet standard for this parameter.
NA = The information of this parameter is not available.

Parameter \ Date									
	Y	N	NA	Y	N	NA	Y	N	NA
I. General Assessment									
1. Hemodynamically stable? (Pulse rate, cardiac output)									
2. Free from factors that increase or decrease metabolic rate (seizures, temperature, sepsis, bacteremia, hypo / hyper thyroid)?									
3. Hematocrit > 30% (or baseline)?									
4. Systemically hydrated? (weight at or near baseline, balanced intake and output)?									
5. Nourished (albumin > 2.5 parenteral/ enteral feedings maximized)?									
6. Electrolytes within normal limits (including Ca^{++}, Mg^{+}, PO_4)?									
7. Pain controlled? (subjective determination)									
8. Adequate sleep/rest? (subjective determination)									
9. Appropriate level of anxiety and nervousness?(subjective determination)									
10. Absence of bowel problems (diarrhea, constipation, ileus)?									
11. Improved general body strength/ endurance (i.e., out of bed in chair, progressive activity program)?									
12. Chest x-ray improving?									

Parameter \ Date									
	Y	N	NA	Y	N	NA	Y	N	N
II. Respiratory Assessment									
Gas flow and work of breathing									
13. Eupnic resiratory rate and pattern (spontaneous RR < 25, without dyspnea, absence of accessory muscle use)?									
14. Absence of adventitious breath sounds (rhonchi, rate, wheezing)?									
15. Secretions thin and minimal?									
16. Absence of neuromuscular disease/deformity?									
17. Absence of abdominal distention/obesity/ascites?									
18. Oral ETT > # 7.5 or trach > #7.5?									
Airway clearance									
19. Cough and swallow reflexes adequate?									
Strength									
20. NIP < -20 (negative inspiratory pressure)?									
21. PEP > +30 (positive expiratory pressure)?									
Endurance									
22. STV > 5 ml/kg (spontaneous tidal volume)?									
23. VC > 10-15 ml/kg (vital capacity)?									
ABGs									
24. pH 7.30 – 7.45?									
25. $PaCO_2$ 40 mmHg (or baseline) with MV < 10 L/min?									
26. PaO_2 >60 on FiO_2 < 40%									
% of Yes (yes ÷ total assess) x 100									
signature									

Modified from BWAP bedside assessment worksheet (Burns, et al., 1995) with permission of author

APPENDIX D

APPENDIX D
FLOWCHART OF NURSING GUIDELINE FOR WEANING PATIENTS FROM MECHANICAL VENTILATORS

The pre-weaning stage

- ประเมินความพร้อมในการหย่าเครื่องช่วยหายใจ โดยใช้ the weaning readiness assessment tool ทุกวันจันทร์- พุธ- ศุกร์
- แก้ไขปัจจัยที่เป็นอุปสรรคต่อการหย่าเครื่องช่วยหายใจ
- รายงานแพทย์เพื่อพิจารณาร่วมกันว่า ผู้ป่วยสามารถเริ่มการหย่าเครื่องช่วยหายใจได้หรือไม่ เมื่อ
  - PaO_2 > 60 mmHg (SpO_2 > 90%) on $FiO_2 \leq 0.4$
  - VT ≥ 5 ml/kg, VE< 10L/min
  - f/VT < 100-105 breaths/ min/ L
  - Weaning readiness assessment score ≥ 50 %

The weaning stage

- อธิบายเป้าหมายและ ขั้นตอนของการ wean
- ก่อนเริ่ม wean suction และให้พักหลังดูดเสมหะประมาณ 15 นาที จึงจะเริ่ม wean
- จัดท่านั่งศีรษะสูง (ถ้าไม่มีข้อห้าม)
- ประเมินและบันทึก vital signs, Sat O_2, VT, VE ก่อนเริ่ม wean และประเมินขณะ wean ทุก 1 hr
- ประเมินการตอบสนองของผู้ป่วยต่อweaning mode ที่ใช้
- ประเมินความก้าวหน้าในการหย่าเครื่องช่วยหายใจ โดยใช้ the weaning readiness assessment tool ทุกวันจันทร์- พุธ- ศุกร์
- แก้ไขปัจจัยที่ยังเป็นอุปสรรคต่อการwean
- ดูแลผู้ป่วยอย่างใกล้ชิด รวมถึงบอกความก้าวหน้าในการweanเป็นระยะ
- พักการหย่าเครื่องช่วยหายใจและรายงานแพทย์ ถ้าผู้ป่วยมีอาการและอาการแสดงดังต่อไปนี้
  - alteration of conscious
  - ผู้ป่วยบอกว่าหายใจเองไม่ไหว
  - RR > 35/min และรูปแบบการหายใจเปลี่ยนแปลง
  - BP change > 20%, HR > 120/min bradycardia, arrhythmia
  - pH < 7.25, $PaCO_2$ rising > 10 mmHg

The post- weaning stage

Nursing guideline to correct problem

<u>Airway management</u>

1. เลือกขนาดของ EET ให้เหมาะสม ไม่เลือกเล็กเกินไป
2. ตัดปลาย EET ให้เหลือประมาณ 1½- 2 นิ้วเหนือริมฝีปาก หลังจากประเมินตำแหน่งEET ที่เหมาะสมแล้ว
3. ปิดพลาสเตอร์ยึดEET เพื่อป้องกันการเลื่อนหลุด
4. ดูดเสมหะอย่างมีประสิทธิภาพ
5. เปลี่ยนท่านอนทุก 2 ชั่วโมง
6. เคาะปอดวันละ 1-2 ครั้ง (ถ้าไม่มีข้อห้าม)

<u>Metabolic problem</u>

1. ติดตามผล electrolyte โดยเฉพาะ Ca, Mg, PO_4
2. ร่วมมือกับแพทย์ในการแก้ไขภาวะอิเลคโตรลัยต์ที่ผิดปกติ
3. ประเมินและบันทึก intake/ output ทุก 8 ชั่วโมง
4. ดูแลให้ผู้ป่วยได้รับน้ำอย่างเพียงพอและเหมาะสม

<u>Nutrition</u>

1. ดูแลให้ผู้ป่วยได้รับสารอาหารที่มีพลังงานเพียงพอกับความต้องการของร่างกาย (25-35 kcal/kgBW)
2. ชั่งน้ำหนักอย่างน้อยสัปดาห์ละ 1 ครั้ง
3. ติดตามผลalbumin เพื่อประเมินภาวะโภชนาการ
4. ประเมินความสามารถในการย่อยอาหาร
5. ดูแลให้ผู้ป่วยมีการขับถ่ายเป็นปกติ

<u>Pain management</u>

1. ประเมินความรุนแรงของความเจ็บปวดโดยใช้ numeric scales
2. บรรเทาอาการเจ็บปวด ใช้ยา/ไม่ใช้ยา

<u>Exercise</u>

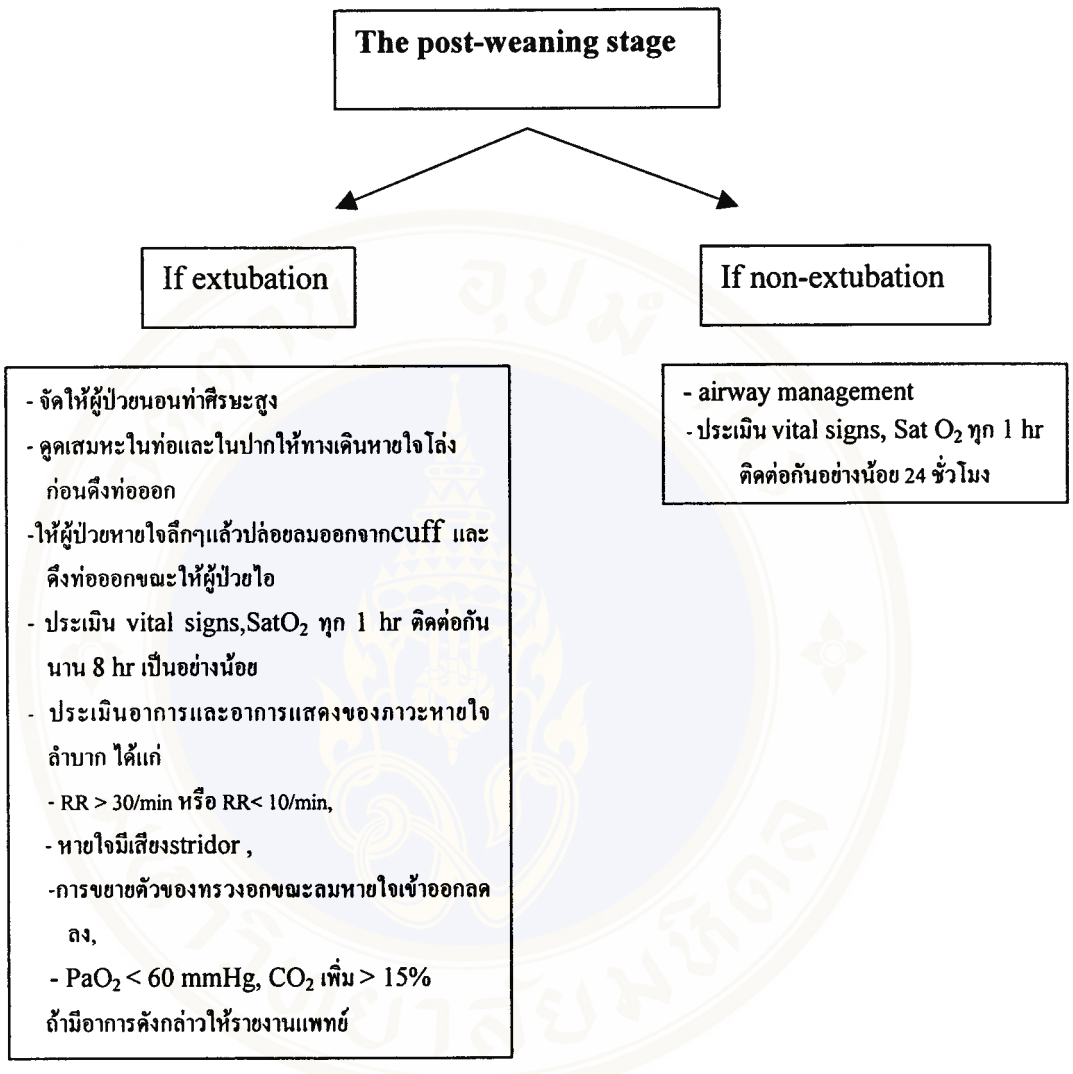
ถ้าไม่มีข้อห้ามให้ปฏิบัติกับผู้ป่วยดังต่อไปนี้

1. Passive range of motion อย่างน้อยวันละ 1 ครั้ง
2. กระตุ้นให้ผู้ป่วยปฏิบัติกิจวัตรประจำวันเท่าที่สามารถจะทำได้
3. จัดการให้ผู้ป่วยลุกนั่งห้อยขาบนเตียงหรือลงมานั่งข้างเตียงเท่าที่จะทำได้

<u>Psychological support</u>

1. ดูแล เฝ้าระวังและค้นพบความผิดปกติได้ตั้งแต่เริ่มแรก เพื่อให้ผู้ป่วยเกิดความรู้สึกมั่นใจในการรักษาพยาบาล
2. อธิบายเป้าหมาย วิธีการรักษาและการมีส่วนร่วมของผู้ป่วย เพื่อเตรียมความพร้อมสำหรับหย่าเครื่องช่วยหายใจ
3. บอกความก้าวหน้าในการwean ให้ผู้ป่วยทราบเป็นระยะ
4. สนับสนุนให้ญาติเข้ามามีส่วนร่วมในการดูแลผู้ป่วยขณะ wean
5. จัดหาสิ่งที่ผู้ป่วยสนใจมาให้เพื่อช่วยคลายความเครียด ลดความวิตกกังวลที่ต้องหายใจเอง

Flowchart of nursing guideline for weaning patients from mechanical ventilator (cont.)



APPENDIX E

APPENDIX E

THE NURSE' S DEMOGRAPHIC QUESTIONNAIRE

แบบสอบถามข้อมูลส่วนบุคคลของพยาบาล

คำชี้แจง โปรดทำเครื่องหมาย ✓ ลงในช่อง [ ] และ / หรือเติมคำลงในช่องว่างตามความเป็นจริงเกี่ยวกับตัวท่าน

1. ปัจจุบันท่านอายุ _____ ปี

2. ระยะเวลาที่ท่านปฏิบัติงานในวิชาชีพการพยาบาล _____ ปี

3. ระดับการศึกษาสูงสุดทางการพยาบาล
   [ ] ปริญญาตรี
   [ ] ปริญญาโท สาขา _____

4. การอบรมศึกษาเพิ่มเติมภายหลังการศึกษาระดับปริญญาตรีทางการพยาบาล
   [ ] ปริญญาตรี สาขา _____
   [ ] หลักสูตรเฉพาะทาง _____

5. ท่านเคยได้รับการฝึกอบรม/ประชุมวิชาการหรือการศึกษาเพิ่มเติมที่เกี่ยวกับการปฏิบัติการพยาบาลเพื่อช่วยเหลือผู้ป่วยให้หย่าเครื่องช่วยหายใจ หรือไม่
   [ ] ไม่เคย
   [ ] เคย จำนวน ___ ครั้ง

6. การมีความรู้ทางการพยาบาลเกี่ยวกับการหย่าเครื่องช่วยหายใจมีความสำคัญต่อการปฏิบัติการพยาบาลของท่าน
   [ ] เห็นด้วยอย่างยิ่ง [ ] เห็นด้วย [ ] ไม่เห็นด้วย [ ] ไม่เห็นด้วยอย่างยิ่ง

APPENDIX F

APPENDIX F
THE NURSE' S WEANING PERFORMANCE QUESTIONNAIRE

แบบสอบถามการปฏิบัติการพยาบาลในการหย่าเครื่องช่วยหายใจ

คำชี้แจง โปรดวงกลมล้อมรอบตัวเลขที่ตรงกับการปฏิบัติของท่านตามความเป็นจริง

0 หมายถึง ไม่ได้ปฏิบัติกับผู้ป่วยรายใดเลย

1 หมายถึง ปฏิบัติกับผู้ป่วยน้อยราย

2 หมายถึง ปฏิบัติกับผู้ป่วยบางราย

3 หมายถึง ปฏิบัติกับผู้ป่วยส่วนมาก

4 หมายถึง ปฏิบัติกับผู้ป่วยทุกราย

ข้อความ	ไม่ได้ปฏิบัติกับผู้ป่วยรายใดเลย				ปฏิบัติกับผู้ป่วยทุกราย
<u>ระยะก่อนหย่าเครื่องช่วยหายใจ</u>					
1. ฉันประเมินความพร้อมในการหย่าเครื่องช่วยหายใจตั้งแต่ผู้ป่วยที่ใช้เครื่องช่วยหายใจมีอาการคงที่	0	1	2	3	4
.....					
<u>ระยะทำการหย่าเครื่องช่วยหายใจ</u>					
42. ฉันอธิบายเป้าหมายและขั้นตอนของการหย่าเครื่องช่วยหายใจ รวมทั้งการมีส่วนร่วมของผู้ป่วยในการหย่าเครื่องช่วยหายใจ	0	1	2	3	4
. .....					
<u>ระยะหลังการหย่าเครื่องช่วยหายใจ</u>					
54. ฉันดูแลทางเดินหายใจของผู้ป่วยให้โล่ง โดยกระตุ้นให้ผู้ป่วยไอ ช่วยดูดเสมหะหรือให้ยาขยายหลอดลมตามแผนการรักษาของแพทย์	0	1	2	3	4
.....					
62. ฉันประเมินสัญญาณชีพ และลักษณะการหายใจ ค่า oxygen saturation และ ค่า arterial blood gas เพื่อระวังภาวะหายใจลำบากที่อาจเกิดกับผู้ป่วย 24 ชั่วโมงแรกภายหลังถอดท่อหลอดลมคอ	0	1	2	3	4

☒ท่านมีข้อคิดเห็นเกี่ยวกับการปฏิบัติการพยาบาลตามโปรแกรมนี้อย่างไรบ้าง (โปรดระบุ)

.....

.....

APPENDIX G

APPENDIX G
THE NURSE' S WEANING SATISFACTION QUESTIONNAIRE

แบบสอบถามความพึงพอใจในการหย่าเครื่องช่วยหายใจของพยาบาล

คำชี้แจง โปรดทำเครื่องหมาย ✓ ลงในช่อง ตามความเป็นจริงว่าท่านมีความพึงพอใจมากน้อยเพียงใดในข้อความต่อไปนี้

มากที่สุด หมายถึง ท่านพึงพอใจหรือเห็นด้วยกับข้อความนั้นมากที่สุด

มาก หมายถึง ท่านพึงพอใจหรือเห็นด้วยกับข้อความนั้นมาก

ปานกลาง หมายถึง ท่านพึงพอใจหรือเห็นด้วยกับข้อความนั้นปานกลาง

น้อย หมายถึง ท่านพึงพอใจหรือเห็นด้วยกับข้อความนั้นน้อย

น้อยที่สุด หมายถึง ท่านพึงพอใจหรือเห็นด้วยกับข้อความนั้นน้อยที่สุด

ข้อความ	ระดับความพึงพอใจ				
	มากที่สุด	มาก	ปานกลาง	น้อย	น้อยที่สุด
1. ฉันพึงพอใจที่ตนเองทำให้ผู้ป่วยได้เริ่มการหย่าเครื่องช่วยหายใจได้เร็วขึ้น					
2. ฉันพึงพอใจที่มีส่วนในการป้องกันภาวะแทรกซ้อนที่เกิดจากการใส่เครื่องช่วยหายใจ					
.....					
5.ฉันพึงพอใจที่ได้รับความไว้วางใจจากแพทย์และเจ้าหน้าที่ทีมสุขภาพอื่นๆ ในการดูแลผู้ป่วยที่หย่าเครื่องช่วยหายใจ					
.....					
9. ฉันพึงพอใจที่ตนเองได้รับการพัฒนาให้มีความรู้และความสามารถในการดูแลผู้ป่วยที่หย่าเครื่องหายใจ					
10 ฉันพึงพอใจที่ฉันต้องใช้ความรู้ ความสามารถและทักษะอย่างเต็มที่ในการพยาบาลผู้ป่วยที่หย่าเครื่องช่วยหายใจ					
.....					
14.ฉันพึงพอใจที่ฉันสามารถปรึกษาหรือขอคำแนะนำในการให้การพยาบาลเพื่อหย่าเครื่องช่วยหายใจจากผู้ร่วมงานได้					
15. ฉันพึงพอใจที่ตนเองมีส่วนร่วมรับผิดชอบในการหย่าเครื่องช่วยหายใจของผู้ป่วย					

APPENDIX H

APPENDIX H

THE PATIENT PROFILE FORM

แบบบันทึกข้อมูลของผู้ป่วย

เลขที่ .....

[ ] กลุ่มควบคุม

[ ] กลุ่มทดลอง

ส่วนที่ 1 ข้อมูลส่วนบุคคล

เพศ [ ] ชาย [ ] หญิง

อายุ ..... ปี

สถานภาพสมรส [ ] คู่ [ ] โสด [ ] ม่าย/หย่า/แยก

อาชีพ [ ] เกษตรกร [ ] ข้าราชการ

[ ] รับจ้าง [ ] ค้าขาย

[ ] รัฐวิสาหกิจ [ ] นักศึกษา

[ ] งานบ้าน

ส่วนที่ 2 ข้อมูลเกี่ยวกับการรักษาพยาบาล

1. การวินิจฉัยโรคที่เป็นสาเหตุของระบบหายใจล้มเหลว

   [ ] โรคปอดและระบบหายใจ ระบุ .....

   [ ] โรคระบบหัวใจและหลอดเลือด ระบุ .....

   [ ] โรคระบบประสาทและกล้ามเนื้อ ระบุ .....

   [ ] โรคอื่นๆ ระบุ .....

2. ชนิดท่อหลอดลมคอ

   [ ] Endotracheal tube วันที่ได้รับการใส่ ..... วันที่ได้รับการถอด .....

   [ ] Tracheostomy tube วันที่ได้รับการใส่ ..... วันที่ได้รับการถอด .....

3. ประเภทของเครื่องช่วยหายใจ

   [ ] Bennett 7200 วันที่ ..... ถึงวันที่ .....

   [ ] MAI วันที่ ..... ถึงวันที่ .....

   [ ] Bird' s respirator วันที่ ..... ถึงวันที่ .....

4. วิธีการหย่าเครื่องช่วยหายใจ

[ ] SIMV วันที่ ..... ถึงวันที่ .....

[ ] PS วันที่ ..... ถึงวันที่ .....

[ ] CPAP วันที่ ..... ถึงวันที่ .....

[ ] External CPAP วันที่ ..... ถึงวันที่ .....

[ ] O_2 T-piece วันที่ ..... ถึงวันที่ .....

5. ผลลัพธ์ของการหย่าเครื่องช่วยหายใจ หลังจากทำการหย่าเครื่องช่วยหายใจนาน 2 สัปดาห์

[ ] สำเร็จ ใช้ระยะเวลาในการหย่าเครื่องช่วยหายใจ ..... วัน

[ ] ไม่สำเร็จ

6. ภาวะแทรกซ้อนที่เกิดขึ้นระหว่างการศึกษา

[ ] Pneumothorax ครั้งที่ 1 ระยะเวลา ..... วัน ventilator mode .....

ครั้งที่ 2 ระยะเวลา ..... วัน ventilator mode .....

[ ] Atelectasis ครั้งที่ 1 ระยะเวลา ..... วัน ventilator mode .....

ครั้งที่ 2 ระยะเวลา ..... วัน ventilator mode .....

[ ] Respiratory distress ครั้งที่ 1 ระยะเวลา ..... วัน ventilator mode .....

ครั้งที่ 2 ระยะเวลา ..... วัน ventilator mode .....

[ ] ท่อหลอดลมคอเลื่อนหลุด ครั้งที่ 1 ..... สาเหตุ .....

ครั้งที่ 2 ..... สาเหตุ .....

[ ] ผู้ป่วยดึงท่อออกเอง

[ ] Tracheal obstruction (diameter .....)

[ ] Post extubation laryngeal edema

[ ] Reintubation

APPENDIX I

APPENDIX I

ADDITIONAL FINDING

Table 8. Comparison of weaning time before and after the nurses' participation in the program by grouped t- test.

Group	n	Mean	SD	t	p
Before	17	4.24	2.11	1.372	> .05
After	19	3.21	2.35		

Table 8 shows that the mean weaning time of successful weaning patients in the "after" group (3.21) was lesser than the "before" group (4.24). However, there was no statistically significant difference in weaning time between the two groups of patients (p> .05).

APPENDIX J

APPENDIX J

LIST OF EXPERTS

The content validity of the questionnaire were determined by three experts including:

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