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IMPLEMENTATION OF INNOVATIVE NURSING CARE PROGRAM FOR RELIEVING DISCOMFORT IN MECHANICALLY VENTILATED PATIENTS: AN EXEMPLAR IN PRACTICE

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ABSTRACT

Background: Mechanical ventilator (MV) is a potential life-saving machine. However, receiving MV may create a discomfort experience, especially for conscious patients. This condition can be related to several circumstances such as pain and gagging from the endotracheal tube, sleep disturbance and inability to communicate. Therefore, nurses need to provide an appropriate nursing care program for mechanically ventilated patients in reducing discomfort and improving comfort.

Objective: This article aimed to present an exemplar of implementation of an innovative nursing program for relieving discomfort in mechanically ventilated patients from the experience in practice.

Methods: Updated evidence-based practice to develop innovative nursing care program to relieve discomfort in MV patients were reviewed, analyzed and synthesized following the recommendation of The Joanna Briggs Institute for Evidence-Based Nursing. The innovative program was divided into six sub-programs: 1) suctioning; 2) thirsty and dry mouth; 3) communication ability, 4) sleep disturbance; 5) limited movement; and 6) emotional discomfort. Before implementation, the program was proposed to the nurses in two medical wards and one medical intensive care unit to adjust the program to fit with contexts of the settings. Four patients who met the inclusion criteria were recruited for the program for three days. The level of discomfort and factors related to discomfort were assessed before and after the intervention.

Results: The level of discomfort on the first day before implementing the program was in the moderate level. Three common causative factors of discomfort were come from suctioning, thirst and dry mouth and difficulty in communication. The result showed that the level of discomfort on the third day after receiving the program had decreased from the first day.

Conclusion and Recommendation: From the authors' experience of the implementation of this innovative program in four patients, this program is an effective program to relieve patients discomfort during receiving MV. The program can be recommended to the nurses to be applied in practice. In addition, this exemplar confirmed that providing nursing care based on the evidences produced the good outcome of care. Nurses can improve and update their nursing care by valuing evidence-based practice as guided by this experience.

Keywords: Discomfort, Evidence-Based practice, Mechanical ventilation, Nursing care

INTRODUCTION

Mechanical ventilation (MV) is one of the most commonly used treatment modalities that help patient to recover from respiratory failure. Although it is potentially life-saving, but MV may create an experience of discomfort, especially in conscious patients. Previous study has estimated that 54% of the patients who have received mechanical ventilation, experience discomfort during their treatment (Pronovost *et al.*, 2003). Patients' discomfort may result from several circumstances associated with MV such as pain and gagging from the endotracheal tube and ineffective communication (Samuelson, 2011). Moreover, Ma *et al.*, (2010) reported that 79.1% patients with mechanical ventilation had severe discomfort experience attributable to the endotracheal tube and bedside care such as suctioning and turning. The environment of ICU also can be a detrimental factor related to patient's discomfort because of the excessive stimuli from machine noise, bright light, frightening alarm and loss of time orientation (Wang *et al.*, 2015). These sources of discomfort are often associated with feeling of panic, anxiety, fear, and agitation. If patients' discomfort is not adequately treated by the nurses and other healthcare providers, it may lead to unexpected impacts such as unplanned extubation or self-extubation (Grap *et al.*, 2002).

Management of discomfort in patients with MV typically involves the use of sedative therapy (Hamilton, 2014). Nevertheless, the use of sedative therapy has several untoward side effects including nausea and vomiting, respiration depression, depressed gut motility, pruritis, urinary retention, hypotension, venous stasis and pressure damage to soft tissue (Coyer *et al.*, 2007). On the other hand, non-pharmacologic intervention has been shown to be effective as complementary treatment in promoting comfort and decreasing discomfort in patient those who are receiving MV (Chlan *et al.*, 2013).

The essential part of nursing care to mechanically ventilated patients is to underpin and reduce the discomfort and improve patient comfort while receiving ventilation support. Therefore, following patient assessment and safety check, consideration of nursing care intervention to promote patient comfort during MV needs to be addressed. For this reason, nurses need to determine an innovative nursing care program that will positively impact on the mechanically ventilated patients and assist in the patient 's progress towards desired outcome.

RESEARCH METHODOLOGY

This study was aimed to share an experience of the implementation of an innovative nursing program for relieving discomfort in mechanically ventilated patients from the experience of practice. The program was developed from the updated evidence-based practice which was reviewed, analyzed and synthesized following the recommendation of The Joanna Briggs Institute for Evidence-Based Nursing (Joanna-Briggs, 2014). The authors proposed the program to the nurses in practice to adjust the program to fit with their settings. The implementation of program involved four mechanically ventilated patients who met the inclusion criteria and the program was provided for three days in each patient.

Participants and Setting

This nursing program was implemented in three wards; Medical Ward, Respiratory Care Unit and Cardiac Care. Four patients with MV who met the following inclusion criteria included; 1) intubated conscious patients receiving MV, 2) patients intubated for more than 24 hours, 3) patients who can communicate and 4) Age >18 years old. Exclusion criteria were; 1) patients with surgical procedures or intercostal drainage and 2) patients with cognitive disorders such as Alzheimer and Dementia.

Permission from patients and family caregivers were obtained before the procedure. Patients and their family caregivers were explained about the purpose, activity and plan. They also were confirmed that the data were recorded confidentiality.

Instruments

Two instruments were used to assess discomfort and factors related to discomfort in this study. The Discomfort Rating Scale was used to identify general discomfort of the patients. This tool was a visual analog scale that presented number 0 to 3 in the vertical line.

To rate general discomfort, the patients were asked to choose a number between 0-3, with 0=no discomfort, 1= mild discomfort 2 = moderate discomfort and 3= severe discomfort.

Moreover, the General Comfort Questionnaire by Kolcaba (2003) was modified by the authors to measure factors related to discomfort in this study. This instrument covered six causative factors of discomfort including discomfort from suctioning, discomfort from thirst and dry mouth; discomfort from ineffective communication ability, discomfort from sleep disturbance, discomfort from limited movement; and emotional discomfort which consisted of 13 negative statements which score in three responses (1 to 3) ranging from mild to severe.

Innovative Nursing Care Program

Innovative nursing care program for relieving discomfort in MV patients in this study that was developed based on the updated evidence-based nursing consisted of six sub-programs as presented in Table 1.

Table 1: Innovative Nursing Care Program for Relieving Discomfort

No.	Sub-program	Nursing interventions
1.	Suctioning	Before suctioning 1. Provide information, including: • The steps and purpose of suctioning, what patient's feel during suctioning such as discomfort, pain and difficulty in breathing (Marasinghe *et al.,*2015). • Explain how to communicate their feeling of pain or inadequate pain management when suctioning by facial expression, hand lift, or speak (Czarnecki *et al*., 2011). 2. Assessment of discomfort level • Assess discomfort using discomfort scale because suctioning increase pain (Pasero *et al*., 2009), if pain scale 0-2 start suctioning (Gerbeshagen *et al*., 2011). 3. Provide pain management • Pharmacological ▪ Give analgesics drug before suctioning. ▪ Analgesics drugs are the maximum duration of action most appropriate suctioning time and short action because of decrease side effect such as opioids. ▪ Recommend fentanyl (on set 1 -2 minutes, peak 3 -5 minutes and duration time (0.5 -1 hours) and morphine (on set 5 minutes, peak 10-20 minutes and duration time 3-4 hours) but morphine has long action and side effect more than fentanyl (Given, 2010). • Non-pharmacological; select easy, not train or not material ▪ The diameter of the suction catheter size should not ½ the inner diameter of ET-tube (Pedersen *et al.*, 2009) if ET –tube no.7 or 6.5 choose suction catheter no. 10 Fr and ET –tube No.7.5 or 8 choose suction catheter no.12 Fr (Faigeles *et al*, 2013). During suctioning 1. Indication of suctioning such as cough, secretion sound or at least every 8 hours. 2. Suctioning with softness technique. 3. In preparation for the suction event delivery of 100% oxygen 30-60 second prior. 4. Suction pressure: 80-120 mmhg and increase 200 mmhg if choose suction catheter appropriate et-tube. 5. Deep suctioning over 1-2 cm carina. 6. Duration of each event should be no more than 15 sec and the lest 2 time. 7. Pause suctioning if pain scale more than 5 or pain behavior. (AARC, 2010) After suctioning • Reassess discomfort using discomfort assessment tool if the score is more than 1 scale give an analgesic drug (Czarnecki *et al*., 2011).

2.	Thirsty and dry mouth	1. Examine the mouth and tongue for dry and cracking or infection, as indicators of thirst ordryness (Puntillo *et al*., 2014). 2. Use water-soaked gauzes, water sprays and ice chips frequently (Puntillo *et al*, 2014) . 3. Provide oral care every 2-4 hour by using soft toothbrushes (Coyer *et al*., 2007). 4. Provide thirst bundle for fifteen minutes. Thirst bundle consists of oral swabs and water sprays and menthol moisturizer to the patient's lips (Puntillo *et al*., 2014)
3.	Ineffective communication	1. Establish a friendly communication environment by adjusting nurse proximity and position to be visible to the patient, speak directly to the patient and ensure that the lighting is adequate for the patient to see the speaker and/or communication boards. 2. Assess functional skills that affect communication. 3. Facilitate lips reading. 4. Use alternative and augmentative communication devices. 5. Educate the patient, the patient's family and staff about communication strategies. 6. Use non-material techniques lip read, nod head up, down to yes/no question and blink eye (1 blink= yes, 2 blinks=no) for patient who is weak and paralyzed (Coyer *et al*., 2007). 7. Use material technique communication card having communication symbols and text, communication with writing (paper and pencil) (Grossbach *et al*., 2011).
4.	Sleep disturbance	1. Determine sleep problem by assessing causes of sleep disturbance, such as acute illness, stressful life events and changes in sleep environment. 2. Discourage pattern of daytime naps unless deemed necessary to meet sleep requirements because excessive napping can disrupt normal sleep patterns; if napping is necessary, keep duration to < 45 minutes and schedule early in the day when possible. 3. Assess ambient environmental stressors and provide an environment conducive to sleep (e.g., quiet periods, comfortable temperature, ventilation, dim light). Suggest use of earplugs or eye shades as appropriate to patient condition and wishes. 4. Promote relaxing activity before anticipated bedtime (e.g., back rub, massage, music, relaxation techniques). 5. When possible, schedule the timing of treatments and medications to normalize nocturnal sleep periods and minimize disruptions during sleep. 6. Schedule bed baths during daytime hours rather than at the convenience of nursing staff. 7. Organize nursing care and eliminate nonessential nursing activities. Prepare patient for necessary anticipated interruptions. 8. Allow sleep periods of at least 90 minutes to complete one sleep cycle(Matthews, 2011).
5.	Limited movement	1. Massage: Modified Thai massage on muscle fatigue and discomfort (Backus, 2016) - Assess the discomfort level of the patient - Assess whether patient like massage or not - Assessment point of muscle fatigue - Pressure 5 minutes duration 30 minutes 2. Turn position every 2 hours and beware of line, ET-tube or circuit not to hold (Timby, 2009). 3. Patient position that may be use supine, semi-recumbent, prone and side lying (Coyer *et al.,* 2007). 4. Encourage patient to perform active range of motion exercise every 6 to 8 hours but if the patient is unable then nurse should perform passive range of motion exercise every 8 hours (Smeltzer *et al* ., 2010).
6.	Emotional discomfort	1. Inform patient about the need of mechanical ventilator, endotracheal tube, environment, procedures and equipment (Gil-Perotin, 2012) 2. Provide music therapy - Assess patient's like and dislike about music (Bradt, Dileo & Grocke, 2010) - Ask whether patient prefer music or not then let the patient select the music (Bradt, Dileo & Grocke, 2010).

		- Music therapy should be provided during the afternoon or early evening (Saadatmand*et al*., 2013; Hetland, Lindquist & Chlan, 2015). - Use media player and headphone and adjust the volume of the sound according to the patient satisfaction (Bradt, Dileo & Grocke, 2010). - Patients were asked to close their eyes and listening to the music for 30 minutes with the rhythm of 60-80 bpm (Saadatmand *et al*., 2013; Hetland, Lindquist & Chlan, 2015). - Promote rest and minimize unnecessary disturbance by dimming the light, closing curtains, partially shutting the door (Saadatmand *et al*., 2013; Hetland, Lindquist & Chlan, 2015).

IMPLEMENTATION OF THE STUDY

Implementation of this study included recruiting patients who met the inclusion criteria, explaining the patients and caregivers about the purpose and confirming the patients and caregivers that their data recorded were kept confidential. First step, the general discomfort was assessed. Afterwards, factors related to discomfort was assessed to determine appropriate innovative nursing care program. In this study, the innovative nursing care program was provided for three days to each patient.

RESULTS

Patients' profile

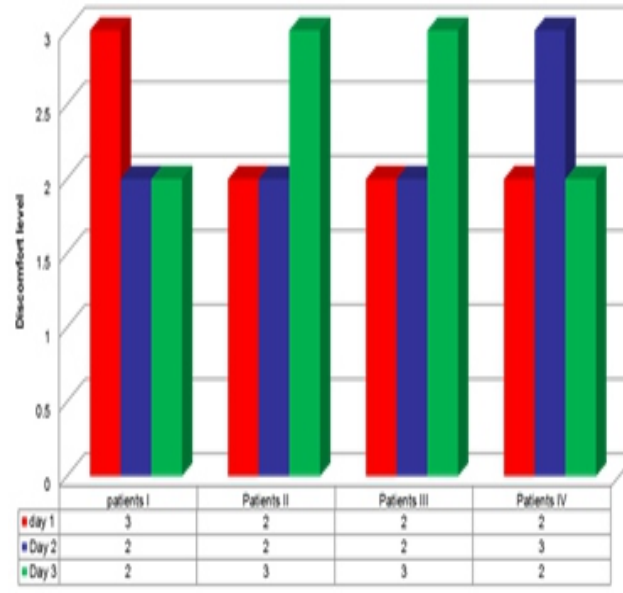
Patients' profile regarding age, gender, marital status, medical diagnoses, duration of using MV, cuff pressure and current medication are presented in Table 2. Most of the patients in this study was female and elderly (mean age 71.7 years old) and were intubated for more than 42 hours. Most of the patients were receiving analgesic drug (paracetamol), but one of them also combined it with anxiolytic drug (lorazepam).

Table 2: Patients' profile

Information	Patient I	Patient II	Patient III	Patient IV
Age	65	65	68	89
Sex	Male	Female	Female	Female
Marital status	Married	Married	Married	Married
Current medical diagnosis	Cancer pyriform	Aspiration pneumonia	NSTEMI with left sided heart failure	CHF with respiratory failure
Duration of using mechanical ventilation	36 hours	72 hours	32 hours	28 hours
Cuff pressure	20-22 cm H_2O	20-25 cm H_2O	20-25 cm H_2O	20-25 cm H_2O
Current medication (analgesic, anxiolytic drugs)	-	Paracetamol	Paracetamol	Paracetamol, lorazepam

General Discomfort

As shown on Figure 1, all of the patients had discomfort, 75% of the patients reported moderate discomfort and 25% of the patients reported severe discomfort.

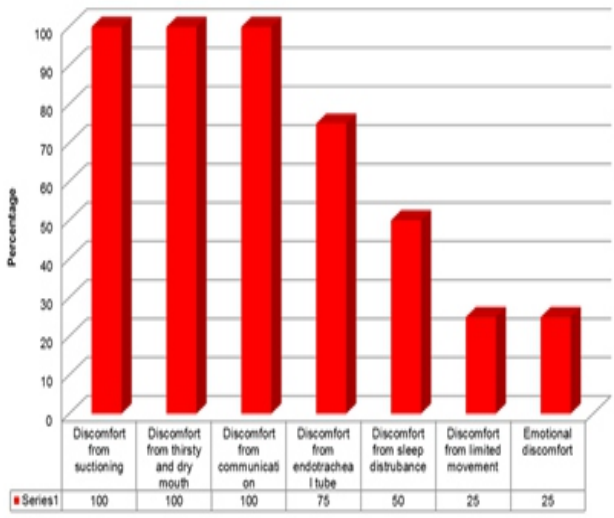


** Level of discomfort in patients with mechanical ventilation*

Figure 1: General discomfort level among four patients with mechanical ventilation

Causative Factors of Discomfort

The assessment of causative factors of discomfort in this study was classified into seven aspects including discomfort due to suctioning, discomfort from endotracheal tube, discomfort from thirst and dry mouth, discomfort in communication, discomfort due to limited movement, discomfort from sleep disturbance and emotional discomfort. Among four patients, all the patients with MV had many causative factors of discomfort. However, three common factors of discomfort were from suctioning, thirst and dry mouth, and ineffective communication.



**Percentage of causative factors of discomfort in patients with mechanical ventilation*

Figure 2: Percentage of causative factors of discomfort among four patients with mechanical ventilation

Comparison of Discomfort Score Before and After the Program

This study showed the comparison of discomfort score of the patients before and after the program that was provided for three days. Most of patients showed significant difference on the discomfort score for every causes of discomfort after receiving the program as presented in Table 3. Nevertheless, patient III showed no difference on the discomfort score due to suctioning and ineffective communication after receiving the program.

Table 3: Comparison of Discomfort Mean Score Before and After the Program Among Four Patients

Factors of Discomfort	Patient I		Patient II		Patient III		Patient IV	
	Before	After	Before	After	Before	After	Before	After
Discomfort from suctioning	1.6	1.3	2	1.6	2	2	2	1.3
Discomfort from thirsty and dry mouth	1.4	1.2	2	1.5	2	1	1.6	1
Discomfort from ineffective communication	1.3	1	2	1	1	1	1.6	1
Discomfort from sleep disturbance	0	0	2	1.5	0	0	2	2
Discomfort from limited movement	1.6	1	0	0	0	0	0	0
Emotional discomfort	0	0	2.3	2	0	0	0	0

DISCUSSION

The general discomfort level showed that all patients had discomfort that was reported from moderate to severe discomfort. Consistently, a study by Wang *et al.*, (2015) also found that 56.3% of the mechanically ventilated patients reported moderate discomfort and 24.2% of the patients reported severe discomfort (Wang *et al.*, 2015).

According to the assessment of causative factor of discomfort among four patients with MV in this study, it was found that there were different causative factors that contributed to discomfort during MV. Discomfort from suctioning, discomfort from thirst and dry mouth and discomfort from communication occurred as major causative factors of discomfort while receiving MV in this study. Wang *et al.*, (2015) identified causative factors for discomforts were communication barrier, dry mouth and thirst. These are similar with this study except discomfort from suctioning.

All patients were provided with innovative nursing care program based on the causes of discomfort which was divided into six sub-programs as described below:

Discomfort from suctioning: Most of the patients had decreased discomfort from suctioning, except in Patient III. It may be related to excessive secretion of Patient III which required frequent suctioning compared with the other patients and she had cord edema. Several studies also suggested that in managing discomfort from suctioning, nurses need to consider about providing information related to suctioning procedure (Gil-Perotin, 2012), employing standard suctioning technique as the practical guidance (AARC, 2010) and using pharmacological substances to reduce pain (Arroyo *et al.*, 2008). However, in this study, pharmacological intervention could not be applied as the physician did not prescribe.

Moreover, level of discomfort from endotracheal tube was decreased after receiving interventions. Except in patient III, endotracheal tube (ETT) discomfort was not reduced as the patient had sore throat and cord edema. Mechanical irritation usually develops in 48-72 hours. The cuff tracheal wall contact area also influences the incidence of sore throat (Khan *et al.*, 1996). Therefore, nursing interventions that focus on ETT stability will not

be sufficient to reduce discomfort, but one mustre-focus on nursing attention in reducing ETT movement as well as the movement of all ventilators tubing (Grap *et al.*, 2002).

Discomfort from thirsty and dry mouth: All the patients had decreased discomfort from thirst and dry mouth. Hence, the interventions related to discomfort from dry mouth and thirst was effective. A simple intervention including water-soaked gauzes, water sprays and ice chips may decrease the experience of discomfort from thirsty and dry mouth during MV (Puntillo *et al.*, 2014). Moreover, frequent mouth care also has been reported as significantly decreasing thirsty and dry mouth in MV patients and it suggested providing mouth care at two and four-hourly intervals (O'Reilly, 2006).

Discomfort from ineffective communication: In this study, non-technology (lip reading, gesture) and low technology (pen and paper, communication board) communication strategies were provided to reduce discomfort from ineffective communication. After providing the communication strategies for three days, most of the patients showed decreased discomfort level related to ineffective communication, except on Patient III. This may be because the patient was concerned with other source of discomfort such as hot environment and was uncooperative to use communication methods like pen and paper or communication board.

A study by Otuzoglu and Karahan (2014) reported that some factors of ineffective communication in mechanically ventilated patients related to patients' who are unable to write and nurses did not have enough ability to lip-read and could not understand patients' words. Effective communication for mechanically ventilated patients is an essential provision of quality care (Khalaila *et al.*, 2011). Therefore, it is important for nurses to assess communication needs; identify appropriate alternative communication strategies and create a customized care plan with the patient (Grossbach *et al.*, 2011; Magnus & Turkington, 2006).

Discomfort from sleep disturbance: In this study, 50% of the patients reported discomfort from sleep disturbance. After implementing sleep disturbance management for three days, patient IV showed unchanged on discomfort level from sleep disturbance. This condition may be related to the noise and light in ICU. Kamdar, Needham & Collop, (2012) found that noise was commonly reported by ICU patients as a significant disruptor of sleep due to staff conversations, alarms, overhead pages, telephones and televisions. Moreover, light played a vital role in synchronization of the circadian rhythm. High level of light was one of the cause for disturbing sleep. Additionally, nursing interventions that focus on reducing ambient stressors in the ICU (light, noise, interruptions) were found to enhance patients' sleep (Matthews, 2011). However, in this study we could not manage ICU's light and noise due to hospital regulations.

Discomfort from limited movement: We found that every patient in this study did not feel free to move due to the fear of ETT movement and discomfort from circuit. This condition will lead to muscle contraction and decreased blood flow (oxygen and nutrition). As the result, there is production of lactic which caused muscle fatigue and pain which lead to discomfort (Backus, 2016). The result of this study was congruent with other studies showed that massage (Backus, 2016), turning position and passive exercise Coyer *et al.*, (2007) and information Gil-Perotin, (2012) were the successful interventions to reduce discomfort in mechanically ventilated patients due to limited movement.

Emotional discomfort: Patient II reported emotional discomfort due to anxiety. Patient said that she felt anxious if the weaning program will succeed or not and physician would suggest tracheostomy. Thus, the anxiety level of patient II was decreased after receiving music therapy. A result of meta-analysis was undertaken to compare the effects of standard care together with music therapy and standard care only and it was concluded that the music listening may decrease the anxiety in patients receiving MV (Bradt, Dileo & Grocke, 2010).

CONCLUSION

All the patients of this study reported their feeling of discomfort in moderate to severe level during their MV treatment. The causative factors that related to their discomfort included suctioning, presence of endotracheal tube, thirst and dry mouth, communication, sleep disturbance, limited movement and emotional

discomfort.

Discomfort caused by suctioning, ineffective communication and thirst and dry mouth were present as the major causative factors in all patients. Nevertheless, external factor such as hot environment can enhance patient's discomfort during receiving MV and weaning process. Most of the interventions provided were helpful in decreasing discomfort in patients with MV. Furthermore, providing intervention based on the causes of discomfort was found effective on reducing general discomfort in this study. The willingness of the patients and patients preferred in choosing intervention found more effective in reducing discomfort and promote comfort in receiving MV treatment.

RECOMMENDATION FOR CLINICAL PRACTICE

This study was found that the causes of discomfort in patients receiving MV are various and different in each patient. Nurse needs to assess patients discomfort by using appropriate assessment tools to specific identification causes of discomfort and clearly investigate discomfort level of the patients. Moreover, assessment tool of discomfort should include information about factors that alleviate and exacerbate the discomfort. Hence, hospital should develop an assessment tool to assess the discomfort in patients with MV.

Effective nursing interventions should be provided to reduce discomfort and promote comfort during ventilator treatment, including patient position, oral care, and management of stressor such as communication, sleep disturbance and limited movement. Routine nursing care intervention in patients with MV should be maintained regularly and effectively. Nurses need to improve their skills to provide comfort to the patient that relieves the common causes of discomfort such as communication inability, sleep disturbance, pain and many others. In addition, patient's status and external environment should be considered while providing interventions.

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