

Effectiveness of Education and Quality Control Work Group Focusing on Nursing Practices for Prevention of Ventilator-Associated Pneumonia

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Objectives: To evaluate the effectiveness of education and quality control work group focusing on nursing practices for prevention of ventilator-associated pneumonia (VAP).

Material and Method: A quasi-experimental study was performed to evaluate the effect of education and quality control work group on prevention of VAP by 18 nurses in the womens' medical ward, Surat Thani Hospital, Thailand. Pre-intervention nursing practices were observed in March, 2002, followed by interventions in April 2002 and two post-tests on nursing practices in May 2002 and July 2002. Interventions included education and quality control work group focusing on nursing practices on prevention of VAP. Each observation period lasted for one month. Research instruments included a demographic data collection form, a quality control circle teaching plan, an evaluation manual and an observational recording form.

Results: After the intervention, significant improvement on nursing practices for prevention of VAP was observed in the first (60% vs. 85%; $P < 0.001$) and the second month (60% vs. 91%; $P < 0.001$) post-intervention. Compliance to nursing practice guidelines among the participants were also increased in all practice categories (87% vs. 98%; $P < 0.001$).

Conclusion: The present study suggests the positive roles of education and quality control work group to improve nursing practices for preventions of VAP. Additional studies are needed to examine the long-term effects of these interventions.

Keywords: Education, Quality control work group, Prevention, Ventilator-associated pneumonia, Nursing practices

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With the estimated prevalence of 10%-65% of nosocomial pneumonia in ICU setting and associated case fatality rates greater than 20%, ventilator-associated pneumonia (VAP) specifically refers to pneumonia in mechanically ventilated patients that is not present at the time of airway intubation and usually resulting from the aspiration of contaminated secretions from the oropharynx or stomach⁽¹⁻⁸⁾. The median

excess length of stay (LOS) as a result of VAP in adults has been estimated at 7.7 days, and the attributable mortality at 10%⁽⁹⁻¹¹⁾. Thus, VAP is considered to be an important cause of infection related death in the adult, pediatric and neonatal intensive care units and is thought to have a negative influence on patients' outcome⁽¹²⁻¹⁴⁾.

In Thailand, the prevalence of VAP has been estimated to be 9.8-58.5% of all nosocomial infections, depending on hospital setting. At Surat Thani womens' medical ward, with the incidence of 56 per 1000 ventilator-days, VAP was a leading cause of nosocomially

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acquired infections accounting for 54-62% of all nosocomial infections. Several nursing practices, such as caring for the patient's oral hygiene, ventilator-assisted devices, equipments used for feeding and suction secretion have been shown to be associated with the occurrence of VAP⁽¹⁵⁻¹⁶⁾. The authors performed a quasi-experimental study to determine the effectiveness of education and quality control work group focusing on nursing practices for prevention of VAP at the women's medical ward at Surat Thani Hospital.

Material and Method

A quasi-experimental study was performed in the women's medical ward, Surasthane Hospital. Pre-intervention on nursing practices was observed in March, 2002, followed by an intervention in April 2002 and two post-tests on nursing practices in May 2002 and July 2002. Each period lasted for one month. Participants included 18 nurses at the women's medical ward. Research instruments included a demographic data collection form, a quality control circle (QCC) teaching plan which was derived from Ishikawa et al⁽¹⁷⁾, an evaluation manual and an observation recording form, which were modified from guidelines on the prevention of ventilator-associated pneumonia⁽¹⁸⁾ including the care for patient's oral hygiene, patient position, nasogastric tube feeding, suction of patient's secretion and respiratory equipment. The observation recording form were validated by four experts with content validity index from 0.94 to 1.0. The main outcome was the nursing practices observed during the post-intervention period.

The Centers for Diseases Control and Prevention/National Nosocomial Infection Surveillance (NNIS) definitions was used for nosocomial infections⁽¹⁸⁾. For diagnosing VAP, the patient was required to have received at least 48 hours of mechanical ventilation and develop new and persistent radiographic evidence of focal infiltrates 48 hours or more after the initiation of mechanical ventilation. In addition, the patient should meet one of the following criteria: positive pleural/blood cultures for the same organism as that recovered from the tracheal aspirate; radiographic cavitation; histopathologic evidence of pneumonia; or two of the following : fever ($>38^{\circ}\text{C}$), leukocytosis (white blood cell $>12,000/\text{mm}^3$), and purulent tracheal aspirate (>25 white blood cells/high powered field on tracheal aspirate Gram stain). Associated organisms were designated as those organisms recovered from tracheal aspirates from the patients with VAP.

Data analysis was performed using SPSS Ver-

sion 10.0 (SPSS, Chicago, IL). Categorical variables were compared using Chi Square Test or Fisher Exact Test, as appropriate. Continuous variables were compared using the Wilcoxon Rank Sum Test. All *P* values were two tailed; $P<0.05$ was considered statistically significant.

Results

The median age of the participants were 25 years (mean, 23-45). The majority of participants (12/18; 67%) graduated from nursing school and were qualified as nurse practitioners. Sixteen participants (16/18; 89%) worked in the women's medical ward for one to five years duration, and the majority (14/18; 78%) knew the principles and practices of nursing on prevention for VAP. During the pre-intervention observational period (March, 2002), 11 participants (11/18; 60%) followed the principles and practices of nursing on prevention for VAP. Observation process revealed several problems, such as, lack of knowledge on prevention of VAP, lack of awareness of the importance to prevent VAP, lack of practice guidelines and few sinks were available for handwashing. Multiple interventions, then, were implemented in April 2002 to help improve these suboptimal practices including education on nursing principles and practices for nurses to prevent VAP, distribution of VAP prevention guidelines to all participants, placement of alcohol hand rub beside the patient's bed-side and posters to promote handwashing and prevention of contamination of ambu-bags by proper covering. The QCC work group also assigned the group chief nurse to supervise and remind other nurses to improve these suboptimal practices periodically. Problems and their interventions during pre-intervention period are summarized in Table 1.

Data collections were repeated in May 2002 and July 2002. Increase in proper nursing practices to prevent VAP was observed in May 2002 (85% vs. 60%; $p<0.001$) and in July 2002 (91% vs. 60%; $p<0.001$), compared to the pre-intervention period. Compliance with nursing practice guidelines among the participants was increased in all practice categories (86% vs. 97%; $p<0.001$). Problems and their interventions during post-intervention periods are summarized in Table 2.

Discussion

The roles of education and QCC work group have been previously shown to be effective in reducing the incidence of VAP⁽¹⁹⁾. Zack et al first reported the effectiveness of an education program directed to-

Table 1. Pre-intervention problems and problem-solving from QCC focusing on nursing practice work group at the woman medicine ward, Surat Thani Hospital

Problems	Problem-solving from QCC Work Group
1. Lack of knowledge on principle and prevention of VAP.	Education to healthcare workers who care for patients on mechanical ventilation.
2. Lack of VAP prevention guidelines.	Provision of VAP prevention guidelines for participants.
3. Lack of awareness on the importance of VAP.	Feed-back on VAP rates and stimulation all participants.
4. Lack of evaluation process to reduce VAP rate.	Assignment of chief person to evaluate and follow VAP rates during the study period.
5. Lack of motivation to follow VAP prevention guidelines.	Posting the sign to stimulate participants to follow VAP prevention guidelines.
6. Inadequate sink for handwashing.	Provision of adequate alcohol hand rub at patient bed-side.
7. Improper care of feeding tube.	Provision of the correct nursing knowledge on feeding.
8. Lack of knowledge on the care and maintenance of respiratory equipment.	Provision the correct nursing knowledge on the care and maintenance of respiratory equipment.
9. Improper maintenance of tracheal suction equipment.	Assignment of a nurse to be responsible for provision of proper suction equipment.
10. Incorrect care of the ambu-bag in use.	Provision of routine covering the ambu-bag joint with a sterile gauze after use and replacing with a new one every 8 hours.
11. Too many unnecessary items around the patient bed-side	Advice to the patient's relatives to bring only necessary belongings when visiting the patient.

Table 2. Post-intervention problems and problem-solving from QCC focusing on nursing practice work group at woman medicine ward, Surat Thani Hospital

Problems	Problem-solving from QCC Work Group
1. Participants did not strictly follow VAP prevention guidelines	Continuous education and peer-feedback from QCC working group discussion and problem-solving on suboptimal processes among participants, increasing awareness and importance of hand-hygiene among healthcare workers (HCWs), and encouraging the involvement of physician and nursing leadership in supporting for these interventions.
2. Lack of continuous monitoring after interventions	
3. Inadequate equipment for handwashing	

ward respiratory care practitioners and intensive care unit nurses involved by multidisciplinary task force to highlight the correct practices for the prevention of VAP⁽¹⁹⁾. The program consisted of a ten-page self-study module on risk factors and practice modifications involved in VAP, in service staff meetings, and formal didactic lectures. Fact sheets and posters reinforcing the information in the study module were also posted throughout the intensive care units. These multidisciplinary interventions led to a 50% reduction in VAP rate in a tertiary care teaching hospital in the United States. Although limited by sample size and the long-term follow-up, the present study confirms this finding and supports the role of education and QCC work group in reducing VAP rates in developing countries. The presented data also emphasize that VAP rates

could be reduced by good nursing care practices. The authors believe that the important key to success of these interventions was attributed to the peer-feedback processes, discussion and problem-solving on suboptimal processes among participants, increased awareness of VAP and of the importance on hand-hygiene among healthcare workers, and the involvement of physician and nursing leadership in supporting these interventions⁽²⁰⁻²¹⁾.

There are some limitations to the present study. The study design did not allow the authors to compare VAP rates with other units that did not participate in the present study. Thus, further study should also include other units that were not involved in the experimental arm to help compare VAP rates. Because the post-intervention period of the present study lasted

only 2 months, the authors cannot make any conclusion in long-term outcomes of education and QCC work group program on VAP rates. The small sample size in the present study may limit the authors' capacity to identify other relevant nursing care processes that might be associated with VAP.

Given the significant results of the authors' preliminary study, education and QCC work group focusing on nursing practices seem effective in reducing VAP rates and should be considered as an intervention to reduce VAP. Additional studies with an adequate sample size and long term follow-up are needed to examine the long-term effect of these interventions on nursing practices for prevention of VAP in developing countries.

Conclusion

The education and quality control work group in Surat Thani Hospital improved nursing practices to prevent VAP.

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ผลของกลุ่มควบคุมคุณภาพต่อการปฏิบัติของพยาบาลเพื่อป้องกันปอดอักเสบจากการใช้เครื่องช่วยหายใจ

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วัตถุประสงค์ : เพื่อประเมินผลของการให้การศึกษาระดับปริญญาตรีและของหลักสูตรควบคุมคุณภาพต่อการปฏิบัติงานของพยาบาลเพื่อป้องกันปอดอักเสบจากการใช้เครื่องช่วยหายใจ

วัสดุและวิธีการ : ใช้วิธีการวิจัยแบบก่อน และหลังมาตรการเพื่อประเมินผลของการศึกษา และการใช้กลุ่มควบคุมคุณภาพ เพื่อป้องกันปอดอักเสบจากการใช้เครื่องช่วยหายใจแก่พยาบาล 18 คนในหอผู้ป่วยอายุรกรรมหญิงโรงพยาบาลสุราษฎร์ธานี โดยได้สังเกตพฤติกรรมและการดูแลผู้ป่วยของพยาบาลกลุ่มนี้ก่อนทำวิจัย ในช่วง 1 มีนาคม พ.ศ. 2545 และ 31 กรกฎาคม พ.ศ. 2545 และได้เริ่มทดลอง 1 ถึง 30 เมษายน พ.ศ. 2545 ติดตามผลหลังการวิจัย ในช่วง 1 พฤษภาคม พ.ศ. 2545 ถึง 31 กรกฎาคม พ.ศ. 2545 มาตรการที่ใช้ในช่วงทดลองวิจัยประกอบด้วย การให้การศึกษาระดับปริญญาตรีและการใช้กลุ่มควบคุมคุณภาพต่อการปฏิบัติงานของพยาบาล ในการป้องกันปอดอักเสบในผู้ที่ใช้เครื่องช่วยหายใจ โดยผู้วิจัยได้เก็บข้อมูลเกี่ยวกับผู้ป่วย แผนงานของกลุ่มควบคุมคุณภาพตลอดการวิจัย และข้อมูลเกี่ยวกับดูแลผู้ป่วย ของพยาบาล และติดตามผล

ผลการศึกษา : หลังจากได้มีการกำหนดมาตรการ พบว่าพยาบาลสามารถปฏิบัติหน้าที่ ในการป้องกันโรคปอดอักเสบจากการใช้เครื่องช่วยหายใจได้ถูกต้องเพิ่มขึ้นในเดือนแรก (60% vs. 85% ; $p < 0.001$) และเดือนที่ 2 (60% vs. 91% ; $P < 0.001$) หลังการกำหนดมาตรการอย่างมีนัยสำคัญ นอกจากนี้พยาบาลทุกคนปฏิบัติตามข้อแนะนำในการป้องกันโรคปอดอักเสบในผู้ป่วยที่ได้รับเครื่องช่วยหายใจเพิ่มขึ้นอย่างมีนัยสำคัญ (87% vs. 98% ; $p < 0.001$)

สรุป : การให้การศึกษาระดับปริญญาตรีและการใช้กลุ่มควบคุมคุณภาพได้ผลดีต่อการปฏิบัติงานของพยาบาลเพื่อป้องกันการเกิดปอดอักเสบในผู้ป่วยที่ได้รับเครื่องช่วยหายใจ