NURSING CARE IN THE PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA

N Ania, MA Margall, MC Asiain, J Elorza, M Ágreda, M del Barrio.

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INTRODUCTION

Most patients in Intensive Care Units require invasive mechanical (MV). This treatment, however, is not without risk and one associated complication is ventilator-associated pneumonia (VAP).

The risk is greater the longer the period of MV, and increases between 6- and 21-fold in periods of ventilation lasting more than 24 hours.¹

INTRODUCTION

- Risk factors that favour broncoaspiration and lead to pneumonia:
  - Lying in a supine position
  - Nasogastric or orogastric tubes in place
  - Low level of consciousness
  - Depth of sedation
INTRODUCTION

Risk factors that favour colonization:

- Medical condition of the patient.
- Immunosupression.
- Reintubation.

Staff related

- Improper hand washing.
- Failure to change gloves between contacts with patients.
- Poor maintenance of the patient’s oral hygiene.
- Lack of compliance with evidence based recommendations on the maintenance of ventilatory support equipment.
BACKGROUND

Incidence VAP

- The International Nosocomial Infection Control Consortium (INICC) 2008, 78 ICUs in 13 countries across the world:
  **18.6 VAPs per 1.000 days of MV.**

- The National HealthCare Safety Network (NHSN) in the USA, 2006-2007 (large number of ICUs): 5400 VAPs with a incidence density of between **2.1 and 11 per 1.000 days of MV.**

- The Hospital in Europe Link for Infection Control through Surveillance (HELICS), 2006, 724 ICUs: **3.3-9.4 per 1.000 days of MV.**
VAP PREVENTION

Institute for Healthcare Improvement (IHI) USA, 2004. Ventilator bundle includes:

- Elevation of the head of the bed by 30-45°
- Daily “sedation vacations” and assessment to readiness to wean
- Prophylaxis for gastric ulcers
- Deep venous thrombosis prophylaxis

Safer Healthcare Now from SHN Canada, 2009 and Canadian Critical Care Trials Group:

- Oral hygiene protocol
- Subglottic suctioning tubes
- Oropharyngeal aspiration
- Postural changes or use of rotating beds
- Vigilance of gastric residual volume
- Maintenance of appropriate endotracheal tube cuff pressures
AIMS

- To analyse in patients with more than 24 hours of invasive mechanical ventilation how frequently oral hygiene, oropharyngeal suction, turning and evaluation of the tolerance of enteral nutrition were performed according to established protocols.

- To record in these same patients endotracheal tube cuff pressures and the degrees of elevation of the head of the bed (HOB).

- To determine the incidence density of VAP over the 6 months of the study
METHODS

- Descriptive and prospective study.

- General, 12-bed ICU in a Spanish university hospital.

- Sample: 47 patients who underwent MV for more than 24 hours.

- Data were collected between October 2009 and March 2010.
DATA COLLECTION

Research team collected daily from the electronic patient records data on the following care:

- oral hygiene
- oropharyngeal suction
- postural changes
- tolerance of enteral nutrition

Nursing interventions which were not recorded were considered as not having been carried out.
**DATA COLLECTION**

- Three times a day:
  - The degree of elevation of the head of the bed was recorded.

  ![Total Care®](image1)
  ![Evolution®](image2)

- The endotracheal tube cuff pressures were measured using a manometer.

  ![Portex®](image3)

- Monitoring of the six measures was continuous up to complete withdrawal of ventilation.
DATA COLLECTION

- **Patient data:** sex, age, reason for admission, SAPS 3 on admission, length of stay, days with MV, and reason for discharge from the Unit.

- **Other data:**
  - The type of endotracheal tube with or without subglottic aspiration.
  - Open or closed system of suction of secretions.
  - Method of airway humidification.
  - If patients had a nasogastric tube in place and if they received enteral nutrition.
  - If the patients needed to be reintubated or tracheostomised.
  - Ramsay scale values to measure the degree of sedation or Glasgow scale values if the patient was in coma.
  - If sedation was interrupted daily.
DATA ANALYSIS

- Descriptive statistics.
- CDC\(^1\) formulas to calculate:
  - Incidence density, the VAP rate per 1,000 ventilator days:
    \[
    \frac{\text{number of VAPs}}{\text{number of ventilator days}} \times 1000
    \]
  - Ventilator utilisation ratio:
    \[
    \frac{\text{number of ventilator days}}{\text{number of patient days}}
    \]

RESULTS AND DISCUSSION

- Number of patients, 47: 31 male and 16 female.
- Mean age: 64.17 years.
- Mean length of stay: 12.21 days.
- Reason for admission:
  - Respiratory failure: 11
  - Gastrointestinal diseases: 6
  - Brain injury: 6
  - Neurosurgical: 5
  - Emergency heart surgery: 5
  - Cardiac arrest: 4
  - Septic shock: 4
  - Massive hemoptysis: 3
  - Liver transplantation: 2
  - Oral & Maxillofacial surgery: 1

- Average SAPS 3 score on admission: 61.66
- Likelihood of in hospital death: 41.26%.
RESULTS AND DISCUSSION

- Reason for discharge: 29p were discharged to hospital wards, 4 to other hospitals and 14p died (sample mortality 29.8%).

- Patients were on MV a mean of 6.62 days.

- Ventilator utilisation ratio: 0.43.

- Other data:
  - Endotracheal tube with subglottic suction: Yes, 12p - No, 35p
  - Airway humidification: Heat-and-moisture exchangers filters, 38p
    Active humidification, 9p
  - System of aspiration of secretions: open, 45p – closed, 2p
  - Nasogastric tube: yes 43p - no, 4p
  - Enteral nutrition: yes 34p – no 9p
RESULTS AND DISCUSSION

Sedation:
- Ramsay scoring ≤ 3 - 28p
- Ramsay scoring 4-6 - 15p
- No sedation (coma) - 4p

Daily sedation interruption: 41p

Reintubation: 16p

Tracheostomy: 8p
### Oral Hygiene
- Compliance 80-100%: 39 patients, 4-6 times/day
- Compliance <80%: 8 patients, 1-3 times/day

### Oropharyngeal aspiration
- Compliance 80-100%: 27 patients, 9-16 times/day
- Compliance <80%: 20 patients, 3-8 times/day

### Postural changes
- Compliance 80-100%: 33 patients, 8-12 times/day
- Compliance <80%: 14 patients, 3-7 times/day

### Tolerance EN
- Compliance 80-100%: 34 patients, 5-7 times/day
DEGREE OF ELEVATION OF HOB

607 OBSERVATIONS

ENDOTRACHEAL TUBE CUFF PRESSURE

607 MEASUREMENTS
VAP INCIDENCE

- Over the 6-month study period two new cases of VAP were recorded.

- To calculate the density incidence we included all the 250 patients who received MV during the study period, which gave us a final number of 3.89 VAPs per 1000 days of MV.

\[
\frac{2 \text{ cases}}{514 \text{ days of MV}} = \frac{3.89}{1000 \text{ days of MV}}
\]
PATIENTS WHO DEVELOPED VAP

The onset of VAP in the two patients who developed it, was between 48 and 96 hours after intubation. Isolated microorganisms: *Enterobacter aerogenes*, *Morganella morgannii* y *Haemophilus influenzae*.

Reason for admission:
- Lower digestive bleeding
- Neurosurgery postoperative care

Risk Factors:
- Period of MV: 3 and 2 days, respectively.
- Patients were not deeply sedated, Ramsay ≤ 3.
- Neurosurgical patient had to be reintubated and had a feeding tube.
PATIENTS WHO DEVELOPED VAP

Nursing care:

- Compliance with the care protocols 80-100%
- Degrees of elevation of the head of the bed <30°
- Endotracheal tube cuff pressures:
  - patient with a digestive bleeding >20cmH₂O
  - neurosurgical patient < 20cm H₂O

These two patients progressed favourably with the anti-infectious treatment and with the care measures received could be discharged from the ICU.
CONCLUSIONS

- Levels of compliance with established protocols were satisfactory. The incidence density of VAP was low and well within internationally established ranges.

- The incidence of VAP could be further reduced with a better control of cuff pressures and by elevating the head of the bed to between 30° and 45°.
Thank you

Clínica Universidad de Navarra