A Multi-pronged Strategic Approach to Prevent Ventilator-Associated Pneumonia in ICU

SO Hang Mui
Nurse Consultant (Intensive Care), HKEC
8 May 2014
Ventilator Associated Pneumonia (VAP)

Definition:

Pneumonia that occurs in a patient who was intubated and ventilated at time of or within 48 hours before onset of pneumonia.

VAP

Incidence & Impact

• 10-20% of MV patients

• Highest in Neurosurgical, trauma & burn ICU


• 0-5.8 per 1000 ventilator days

  Dudeck & Horan, et al. NHSN Report 2010

• 1 to 12.5 per 1000 device-days, attributable mortality: 13%

  (n=6284, Nelson WG et al, Lancet Infect Dis 2013)

Aware

↑↑↑↑ VAP rate in ICU of PYNEH
(40-70 per 1000 ventilator days
In 2010)
Revisit the VAP Process

Pathogenesis of VAP

• Bacteria enter the lower respiratory tract via two pathways:
  – Aspiration of organisms from the oropharynx and GI tract (most common cause)
  – Via ventilatory circuit & tracheal tube
Review Evidences

- Head of bed at 30º
- Antiseptic oral rinse
- Perform hand hygiene
- Assess patient’s readiness to wean and to extubate
- Prevent condensate from entering patient’s airway
- Maintain proper care to respiratory consumables
- Conduct ongoing VAP surveillance

Getting Started Kit: Prevent Ventilator-Associated Pneumonia
How-to Guide
How did we deal with a high VAP & bring it down?

Multi-pronged Strategic Approach

A. Aware
B. Basic
C. Clinical Practice Innovation & Compliance Audit
D. Documentation & Departmental Effort
E. Evaluation & Sharing
Multi-pronged Strategic Approach

Started from late 2010

1. Refresher lectures on VAP prevention
2. ETT cuff pressure at 30cmH₂O
3. Compliance audits to basic clinical care
4. Research on novel ETT comparison
5. Continuous monitoring of VAP rate
Staff Education: Do the Basics

- Reinforce Hong Kong ventilator bundle through repeated educational talks to
  - Doctors, nurses, physiotherapists and
  - Health Care Assistants

- Included in orientation of new staff

Visual display for better promotion

Refresher lecture on VAP
Brief talk at bedside

- Included in orientation of new staff
Compliance of HOB > 30°

The compliance on titration of sedation

The compliance on oral suction

Process audit on staff compliance to VAP prevention measures, ICU PYNEH
Try New Tricks:
(1) Promote HOB with Visual Indicators

Innovative home-made HOB indicator

Green light showed HOB at 30-45°

Reverse trendelenberg
(2) Minimize Micro-aspiration with New ETT designs

- Promote trial use of TaperGuard Evac ETT with subglottic drainage port

Novel Microcuff ETT
(3) Results of a recent research of our group on novel ETT

Results: Microcuff ETT provide the best protection against microaspiration
(4): Minimize Micro-aspiration with New Cuff Monitoring Device

- Promote use of continuous cuff monitoring device

- ↓ VAP when compared with intermittent pressure control device.

Lorente, et al. (2014). Critical Care, 18: R77
(5) To do more ..... 

• Promote minimal disconnection of ventilator circuit
  – Use of heated humidification instead of HME
  – Perform ETT suction only as needed
  – Perform oropharyngeal suction at regular interval and before disconnection of ventilator circuit
2012: VAP rate similar, rising?

VAP rate per 1000 ventilator days, ICU PYNEH

- Conduct refresher lectures on prevention
- Start to keep ETT cuff pressure
- Conduct compliance audits
  - proper oral care
  - HOB
  - Checking of ETts

20/1000 ventilator days

Are you satisfied?
Departmental Effort: A Quality Improvement Project

**Quality Improvement Project: Prevention of Ventilator-associated Pneumonia (VAP) in Critical Care Areas, HKEC**

A. **Aims:**
   - to decrease the rate of VAP by implementing all elements of the ventilator bundle to more than 95% of ventilator patients in critical care areas within 2 years

B. **Objectives:**
1. To determine the baseline VAP rate
2. To determine the VAP after the enforcement of ventilator bundle
3. To look for reasons why some preventive measures of VAP cannot be carried out
4. To conduct ongoing outcome surveillance for VAP and process surveillance to ventilator bundle.

C. **Scope of project:**
   - This is a Hong Kong East Cluster based project.

D. **Phases of Project**
1. Phase I: Pilot the tool for monitoring patient incident of VAP and pilot the audit tool for current practice to prevent VAP (complete before 15 Dec 2012)
2. Phase II: Clinical audit to determine baseline VAP rate x 2 months (Period: 1 Jan 2013 – 28 Feb 2013)
3. Phase III: Review ventilator bundle and conduct training to all staff on VAP prevention program (complete before 1 Mar 2013)
4. Phase IV: Enforcement of ventilator bundle (start time: on 1 Mar 2013) Duration: 2 year

**Set up a task force**

Notes:
- **Key Members as at 26 Nov. 2012**

**Quality Improvement Project:**

<table>
<thead>
<tr>
<th>Project Champions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Lau Yuk Kong</td>
</tr>
<tr>
<td>Ms. Monica Ng</td>
</tr>
<tr>
<td>Dr Yan Wing Wa</td>
</tr>
<tr>
<td>Ms. Nora Kwok</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Sponsors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Cecilia Chan</td>
</tr>
<tr>
<td>Ms. Civ-Leung</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Managers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Raymond Liu</td>
</tr>
<tr>
<td>So Hang Mui</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Leaders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Tang Sui Lan</td>
</tr>
<tr>
<td>Ms. Lau Lan</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Team members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ms. Chan Yuen Shan</td>
</tr>
<tr>
<td>Ms. So Yuk Lan</td>
</tr>
</tbody>
</table>

Consultant, C/CICU, DOM, C/ICU, COS, ICU, DOM, ICU

RHTSK, RHTSK, PYNEH, PYNEH

SMO, C/ICU, Intensive Care, Nurse Consultant

RHTSK, RHTSK

RN, C/ICU, Associate Consultant, ICU, Resident, ICU, Associate Consultant, ICU

APN, ICU, RN, ICU, RN, ICU

WM, C/ICU, WM, ICU, WM, ICU

RHTSK, RHTSK, PYNEH, PYNEH

Nursing Officer, C/ICU, C/ICU, C/ICU

RHTSK, PYNEH, PYNEH
Structured Surveillance on VAP

CDC surveillance criteria 2009-Pneumonia flow diagram

Quality Improvement Project:
Prevention of Ventilator-associated Pneumonia (VAP) in Critical Care Areas, HKEC

Data collection form (updated on 24th Jan 2013)

Fill in, circle or put a √ where it is appropriate. Details of admission... Date of intubation... Date of extubation...

Affix patient label here

Daily round to capture any VAP

Refer to the flowchart overhead for different criteria (PNU1, PNU2, PNU3) used in defining VAP.

Continue to fill in the form and monitor for VAP until 48 hours after extubation (include those patients having extubation in OT & being transferred to ICU post-op)

Access patient for VAP and fill in the form daily by case MO preferably before 1 pm.
### Design an Ventilator Bundle Checklist

**Quality Improvement Project: Prevention of Ventilator-associated Pneumonia (VAP) in Critical Care Areas, HKEC**

**Ventilator Bundle Checklist updated on 28 Feb 2013**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Ventilator Bundle</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Elevate HOB (30° - 45°) &amp; patient not sliding down</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Perform regular oral care with antiseptic oral rinse if needed</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Perform hand hygiene before and after each respiratory care</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Review sedation target daily</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Assess readiness to wean and to extubate daily</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Drain condensate of the ventilator circuit before repositioning of patient</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Carry out disinfection of the respiratory consumables and equipment a/c to protocol</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Check &amp; maintain appropriate ETT cuff pressure (25-30 cm H2O)</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Verify correct placement of the feeding tube at regular interval</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Regular assessment of patient’s tolerance to NG feeding</td>
<td></td>
</tr>
</tbody>
</table>

Signed by nurse

**Specific reason if “not applicable” is selected**

<table>
<thead>
<tr>
<th>Date</th>
<th>Item No.</th>
<th>Reason</th>
<th>Date</th>
<th>Item No.</th>
<th>Reason</th>
</tr>
</thead>
</table>

---

Get familiar with the ventilator bundle
Process Evaluation

• Obtain baseline compliance rate on ventilator bundle
• Conduct compliance audit at regular period to monitor the sustainability of the good practice
2013: VAP rate

VAP rate per 1000 ventilator days, ICU PYNEH

- Conduct refresher lectures on prevention of VAP
- Start to keep ETT cuff pressure at 30 cmH2O
- Conduct compliance audit to
  - proper oral care with tooth brushing
  - HOB
  - Checking of feeding tolerance

Start use of heated humidifier since 18 March 2013

Start prevention of VAP Quality Improvement Project in Jan 2013
- Use of CDC pneumonia flowchart for surveillance of VAP
- Use of VAP bundle checklist

Start use of micro-cuff ETT
Reinforce good practice: feedback to staff

✓ Report monthly VAP rate
✓ Eye catching display board
✓ Disseminate compliance results
Share Good Practices

• Articles on Prevention of VAP
  – An Old Topic with New Tricks. SO HM Jan 2013
  – CICO’s Biweekly Update (June 2013)

• Can access the articles via web
  – Hong Kong Resp Med: www.hkresp.com
  – Hong Kong Society of Critical Care Medicine: www.hksccm.org
  – Hong Kong Medical Journal www.hkmj.org
Conclusion:
Multi-pronged Strategic Approach: ABCDE

A - Aware
B - Do the Basic Properly
C - Clinical Practice Innovation & Compliance Audit
D - Documentation & Departmental Effort
E - Evaluation & Sharing

Multi-pronged Strategic Approach
Thanks to all staff involved

On behalf of the team, ICU PYNEH

Chiu Mei Chun, APN
Mok Chi Man, RN
Wong Po Man, RN
Dr Lam Sin Man, AC
Dr Lau Chun Wing, AC
Lau Lan, WM
Nora Kwok, DOM
Dr Yan Wing Wa, COS

Thank You