Yemeni International Congress on Infectious Diseases

16 - 18 December 2014
University Of Science & Technology Hospital

Sana`a - Yemen
VAP Prevention bundles

Dr. Shafiq A. Alimad  MD

Head of medical department at USTH
YICID workshop , 15-12-2014
“Care Bundles”

What are they & why use them?
What are Care Bundles?

Types of Care Bundles available
What are “Care Bundles”?

A Care Bundle is a collection of interventions (usually 3-5) that are evidenced based, when performed collectively and reliably, have been proven to improve patient outcomes.

All clinical staff know that these interventions are best practice but frequently their application in routine care is inconsistent.

A Care Bundle is a means to ensure that the application of all the interventions is consistent for all patients at all times thereby improving outcomes.
Types of Care Bundles

- **WHO Surgery Safety Checklist**
- **Urinary Catheter Care Bundle**
  - Insertion and Management
- **Clostridium difficile care bundle**
- **Ventilator assisted Pneumonia care bundle**
- Palliative care bundle
- Pressure area care bundle
- Sepsis care bundle
- **CVC care bundle**
- PVC care Bundle
VAP Prevention bundles

VAP prevention bundles involve the implementation of various measures in an attempt to reduce the incidence of VAP among patients at risk. Such measures often include educational programs, technical measures, surveillance, and feedback.

Aim of these bundles: to improve outcome in mechanically ventilated patients, but not all are associated with VAP prevention.
Ventilator-associated Pneumonia (VAP)

Definition:
Nosocomial pneumonia has developed in patient who are receiving mechanical ventilation

Classification:
Early-onset: within 48-72 hours after tracheal intubation, which complicates the intubation process
Late-onset: after 72 hours
Pathophysiology

Aspiration of pathogenic organisms from the oropharynx. Normal flora replaced by pathogenic organisms (S. aureus, P. aeruginosa, H. influenzae, and Enterobacteriaceae (e.g. E. coli, Proteus, Enterobacter, Klebsiella, Serratia))

This change directly related to the severity of illness

Mixed infection in 50%
Diagnosis

Temperature
Leucocyte (cells/µL)
PaO2/FiO2 (mmHg)
CXR
Tracheal secretions
Culture
BAL cultures have a high sensitivity and specificity, resulting in a high positive predictive value.
104 CFU/mL is usual threshold for BAL cultures
Ventilator associated Pneumonia (VAP) Care Bundle

1- Elevation of the head of the bed to between 30°-45°

2- Daily sedative interruption and daily assessment of readiness to extubate

3- Peptic ulcer disease prophylaxis

4- Deep venous thrombosis prophylaxis if not contraindicated
Strategies to prevent ventilator-associated pneumonia in acute care hospitals — Society for Healthcare Epidemiology of America/Infectious Diseases Society of America (SHEA/IDSA)

General strategies
Strategies to prevent aspiration
Strategies to reduce colonization of the aerodigestive tract
Strategies to minimize contamination of equipment used to care for patients receiving mechanical ventilation
Strategies to prevent ventilator-associated pneumonia in acute care hospitals — Society for Healthcare Epidemiology of America/Infectious Diseases Society of America (SHEA/IDSA)

<table>
<thead>
<tr>
<th>General strategies</th>
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<tbody>
<tr>
<td>Conduct active surveillance for VAP.</td>
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<tr>
<td>Adhere to hand-hygiene guidelines published by the CDC or the WHO.</td>
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<tr>
<td>Use noninvasive ventilation whenever possible.</td>
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<tr>
<td>Minimize the duration of ventilation.</td>
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<tr>
<td>Perform daily assessments of readiness to wean and use weaning protocols.</td>
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<tr>
<td>Educate healthcare personnel who care for patients undergoing ventilation about VAP.</td>
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### Strategies to prevent aspiration

<table>
<thead>
<tr>
<th>Strategy</th>
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<tbody>
<tr>
<td>Maintain patients in a semirecumbent position (30° to 45° elevation of the head of the bed) unless there are contraindications.</td>
</tr>
<tr>
<td>Avoid gastric overdistention.</td>
</tr>
<tr>
<td>Avoid unplanned extubation and reintubation.</td>
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<tr>
<td>Use a cuffed endotracheal tube with in-line or subglottic suctioning.</td>
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<tr>
<td>Maintain an endotracheal cuff pressure of at least 20 cm H₂O.</td>
</tr>
<tr>
<td>Strategies to reduce colonization of the aerodigestive tract</td>
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<tr>
<td>------------------------------------------------------------</td>
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<tr>
<td>Orotracheal intubation is preferable to nasotracheal intubation.</td>
</tr>
<tr>
<td>Avoid histamine receptor 2 (H2)-blocking agents and proton pump inhibitors for patients who are not at high risk for developing a stress ulcer or stress gastritis.</td>
</tr>
<tr>
<td>Perform regular oral care with an antiseptic solution. The optimal frequency for oral care is unresolved.</td>
</tr>
<tr>
<td>The appropriateness of selective digestive tract decontamination is an unresolved issue.*</td>
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</table>
Strategies to minimize contamination of equipment used to care for patients receiving mechanical ventilation

- Use sterile water to rinse reusable respiratory equipment.
- Remove condensate from ventilatory circuits. Keep the ventilatory circuit closed during condensate removal.
- Change the ventilatory circuit only when visibly soiled or malfunctioning.
- Store and disinfect respiratory therapy equipment properly.
This bundle was tested in 112 ICUs with 550,800 ventilator-days and showed that the VAP rate decreased from a median of 5.5 cases per 1000 ventilator-days at baseline to a median of 0 cases at 16 to 18 months after implementation.
Although a small prospective, randomized clinical study documented that the semirecumbent position was associated with a significant reduction in VAP, more recent studies have documented that the semirecumbent position is difficult to maintain in mechanically ventilated patients and may not impact VAP reduction.
Daily spontaneous awakening and breathing trials are associated with early liberation from mechanical ventilation and VAP reduction.

Prophylaxis for peptic ulcer disease and deep venous thrombosis do not directly impact VAP reduction. Other methods to reduce VAP, such as oral care and hygiene, chlorhexidine in the posterior pharynx, and specialized endotracheal tubes (continuous aspiration of subglottic secretions, silver-coated).
In one study, eight practices were chosen to prevent VAP: hand hygiene, glove and gown compliance, elevation of the head of the bed, oral care with chlorhexidine, maintaining an endotracheal tube cuff pressure >20 cm H_{2}O, orogastric rather than nasogastric feeding tubes, avoiding gastric overdistention, and eliminating nonessential tracheal suctioning.

After institution of the prevention bundle, the rate of VAP decreased from 23 to 13 VAP episodes per 1000 ventilator-days.
Role of gastric pH — Several studies have noted an increased incidence of HAP when the gastric pH is increased with the use of H2 blockers, antacids, or proton pump inhibitors (PPIs).

We should avoid agents that raise gastric pH in patients who are not at high risk of developing a stress ulcer or stress gastritis.
Subglottic drainage — Drainage of subglottic secretions may lessen the risk of aspiration and thereby decrease the incidence of VAP. Specially designed endotracheal tubes have been developed to provide continuous or intermittent aspiration of subglottic secretions (figure)
The same devices can also be used for intermittent aspiration of subglottic secretions. However, these devices cost more than standard endotracheal tubes and are not widely available. When available, they should be used for patients expected to require >48 or 72 hours of mechanical ventilation.
Decontamination of the digestive tract — Decontamination of the digestive tract represents an attempt to reduce the incidence of pneumonia in critically ill patients by decreasing colonization of the upper respiratory tract.
• The methods used include antiseptics (eg, chlorhexidine) in the oropharynx, selective decontamination of the oropharyngeal tract (SOD) with nonabsorbable antibiotics applied in the oropharynx, and selective decontamination of the digestive tract (SDD) with nonabsorbable antibiotics applied to the oropharynx and administered orally, with or without intravenous antibiotics.
Gingival and dental plaque rapidly becomes colonized with aerobic pathogens in ICU patients due to poor oral hygiene and lack of mechanical elimination.

Based upon the available data, it is favor to perform regular oral care with an antiseptic solution in patients receiving mechanical ventilation. Chlorhexidine has been best studied.
Although the optimal regimen has not been established, its worth to use chlorhexidine 0.12% oral solution (15 mL twice daily until 24 hours after extubation).

Use SOD or SDD is still not highly recommended due to concerns about promoting the growth of resistant bacteria.
Gastric volume monitoring — It has long been standard clinical practice to monitor the patient's gastric residual volume at regular intervals and/or prior to increasing the infusion rate of gastric tube feeding, with the hope of minimizing the risk of unrecognized gastric fluid accumulation and vomiting resulting in pneumonia. However, several studies have shown that measurement of gastric residuals correlates poorly with aspiration risk and is associated with a decrease in calorie delivery.
Furthermore, a randomized trial has shown that the rate of VAP was not higher in patients who did not undergo monitoring of gastric residuals.

Based on these findings, it's not recommended to routinely check of gastric residual volumes in asymptomatic patients receiving tube feedings.
Improving Quality of Care with the Plan-Do-Study-Act (PDSA) Cycle

**Plan**

- Set specific aims for what you are trying to accomplish.
- Create performance measures to determine the extent that the aims will be accomplished.
  - Numerical (quantitative) measures will illustrate whether efforts will "move the needle" from a baseline starting point.
  - Descriptive (qualitative) measures will illustrate beliefs and opinions about the value of the aims.

**Do**

- Since doing too many things at once can be overwhelming and frustrating, prioritize, select, and implement change on a small scale (pilot test).

**Study**

- Test and record change to learn about challenges, opportunities, and achievements. Gain feedback from diverse stakeholders and data sources.
- Create structural change objectives based on feedback to recommend adjustments to the original plan.

**Act**

- Implement structural change objectives to address challenges and opportunities for improvement. Standardize policies and procedures to support broad, systematic improvement.

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Quality has been defined by the Institute of Medicine (IOM) as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."

To help guide your quality improvement efforts, you can follow the Plan-Do-Study-Act (PDSA) cycle to continually refine changes.
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<tr>
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<tbody>
<tr>
<td>FV VAP Bundle (*SICS Bundle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* Patient at 30°-45°</td>
<td>54%</td>
<td>80%</td>
<td>94%</td>
</tr>
<tr>
<td>Subglottic ETDT</td>
<td>72%</td>
<td>92%</td>
<td>92%</td>
</tr>
<tr>
<td>* Oral chlorhex</td>
<td>8%</td>
<td>94%</td>
<td>100%</td>
</tr>
<tr>
<td>Tubing/HMEF</td>
<td>98%</td>
<td>98%</td>
<td>100%</td>
</tr>
<tr>
<td>* Daily weaning plan</td>
<td>52%</td>
<td>72%</td>
<td>72%</td>
</tr>
<tr>
<td>* Sedation stop</td>
<td>72%</td>
<td>86%</td>
<td>82%</td>
</tr>
<tr>
<td><strong>All elements</strong></td>
<td>0%</td>
<td>48%</td>
<td>54%</td>
</tr>
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Problem?

Passive Implementation  ?don’t work

Active Implementation
Active Implementation

• Education: workshops: definition, epidemiology, pathogenesis, risk factors, consequences of VAP, evidence-base for the bundle.
• Written material distributed.
• Over 90% of the unit’s medical and nursing staff by April 2007.
• Repeat cycles of process and outcome measurement and feedback.
<table>
<thead>
<tr>
<th></th>
<th>Passive</th>
<th>Active</th>
</tr>
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<tbody>
<tr>
<td><strong>Sept 2005 - Feb 2007</strong></td>
<td></td>
<td><strong>March – Dec 2007</strong></td>
</tr>
<tr>
<td>patients ventilated for &gt; 48hrs</td>
<td>374</td>
<td>215</td>
</tr>
<tr>
<td>Vent days</td>
<td>2556</td>
<td>1327</td>
</tr>
<tr>
<td>episodes of VAP</td>
<td>49</td>
<td>10</td>
</tr>
<tr>
<td>VAP/1000 vent days</td>
<td>19.17</td>
<td>7.5</td>
</tr>
<tr>
<td>Median LOS</td>
<td>4.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Mortality</td>
<td>(112/374) 30%</td>
<td>(49/215) 23%</td>
</tr>
</tbody>
</table>

rd=11.6 99% CI 2.3-21.0
rr=0.39 99% CI 0.16, 0.96

p=0.06

Mortality (112/374) 30% (49/215) 23%

p=0.06
• Passive interventions don’t work
• Educational interventions to reduce VAP
• Structure, Process, Outcome
Lessons

• Passive implementation of the VAP prevention bundle failed.
• Compliance improved during an active multimodal implementation.
• This was associated with a significant reduction in the occurrence of VAP.
VAP – Key points

- Evidence is the starting point
- Implementation is difficult – efficacy vs effectiveness
- Process measure identifies failings
- SPSP methodology leads to sustained process improvement
VAP – key points

• Education
• Feedback
• Process measurement / management
• You need the correct clinicians
• The result is outcome improvement
• Resources – without the above, bundles are “futile”
VAP - eliminated

• VAP still here
• So rare that we can now discuss the reasons for individual cases
• Huge reduction in the problem
• Effective healthcare does not need to cost more
THANK YOU
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