FAKULTAS KEDOKTERAN
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PRESENTATION

UPDATE MECHANICAL VENTILATOR PROTOCOLS FOR VAP PREVENTION

dr. Lira Panduwaty SpAn-TI, Subsp.TI (K)

AGENDA

- Background
- Introduction of VAP
- Risk Factors
- Strategies to Prevent VAP
- Implementation of VAP Prevention Strategies

VAP

Why is it important?

- High Risk
- High Mortality
- High Cost

BACKGROUND

- Healthcare-associated infection (HAI) prevention is the quintessential patient safety issue.
- HAIs are the fifth leading cause of death in acute care hospitals.
- Up to 15% of patients develop an infection while hospitalized → VAP incidence in ICU patients receiving mechanical ventilation was approximately 30%.
- In the United States, this accounts for approximately 1.7 million HAIs and 99,000 deaths annually.
- A recent report estimated US healthcare system costs attributable to the five most common HAIs → central line-associated bloodstream infections [CLABSI], catheter-associated urinary tract infections [CAUTI], ventilator associated pneumonia [VAP], surgical site infection [SSI], and Clostridium difficile infection [CDI]) to be $9.8 billion, even without considering the sizable societal costs.

Infect Control Hosp Epidemiol 2014;35(5):460-463 https://doi.org/10.1086/S0195941700095333 Published online by Cambridge University Press

BACKGROUND

- VAP rates in the USA, as reported by the CDC National Healthcare Safety Network (NHSN), show a median VAP rate of 1.1 per 1,000 mechanical ventilator (MV)-days in medical-surgical intensive care units (ICUs).
- VAP rates in LMICs exceed those in the USA. The International Nosocomial Infection Control Consortium (INICC) observed consistently higher VAP rates in LMICs over the past two decades. The INICC report from 2002 to 2005 indicated a VAP rate of 24.1/1,000 MV-days, gradually reducing to 11.96 in the report covering data from 2015 to 2020, but still far above CDC/NHSN. Consequently, there is a need to assess strategies to address this critical situation, particularly in LMICs.
- A surveillance study by the International Nosocomial Infection Control Consortium (INICC) in several countries used clinical, radiological, and microbiological criteria and concluded that more VAP cases occurred in low-middle-income countries, such as India (36.2%), compared to upper-middle-income countries, such as Italy (6.6%) in PICU.

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INTRODUCTION

Many studies have investigated the causative organisms as Pseudomonas spp., Acinetobacter spp., Escherichia

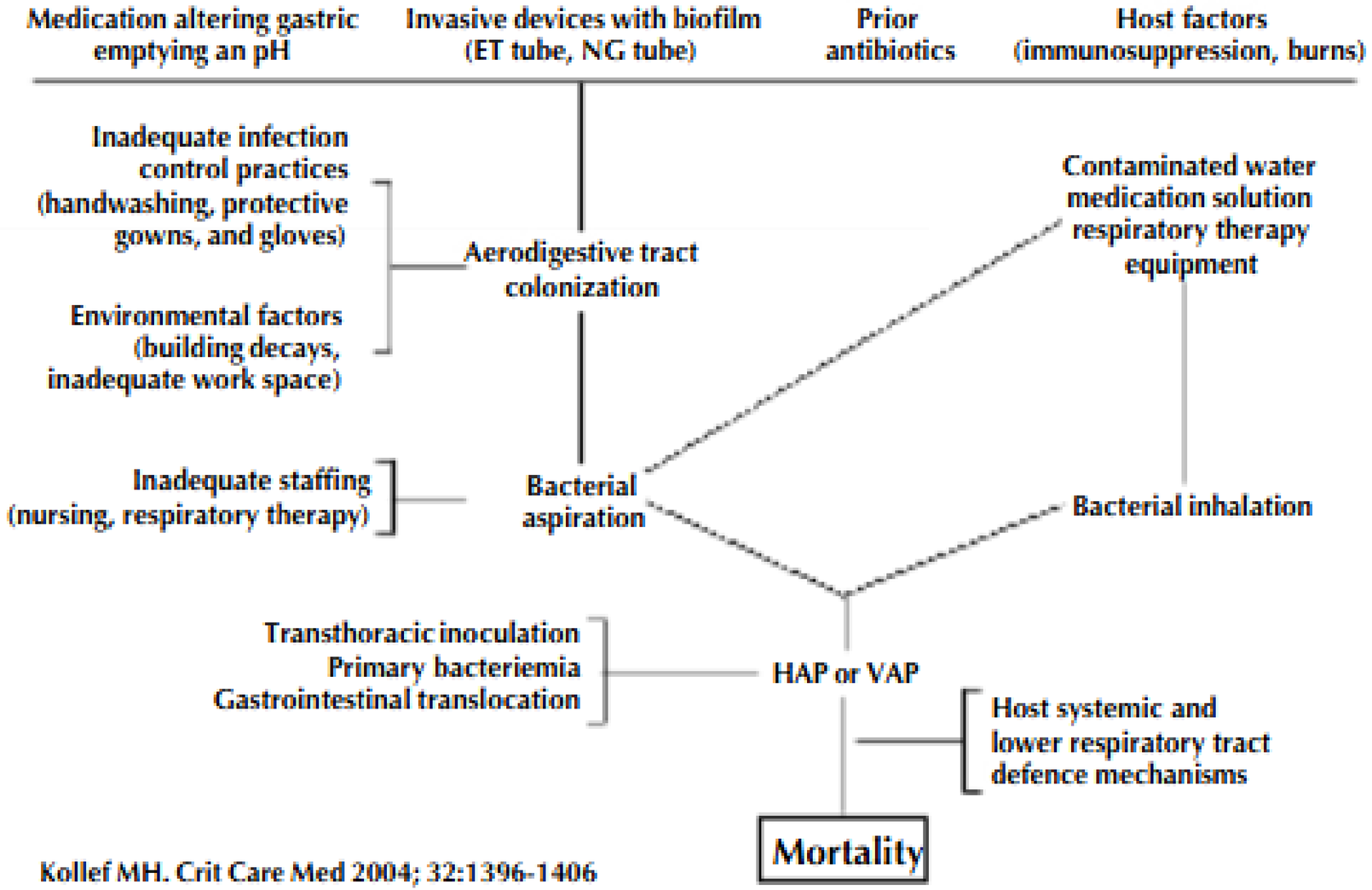
Comparative overview of the main attributes of early- vs. late-onset VAP.

	Early-onset VAP	Late-onset VAP
Time of occurrence	2–4 days post intubation/MV	≥ 5 days post intubation/MV
MV days	14	23
ICU/Hospital length of stay	13–20/26.5 days	20–26.5/35.5 days
Incidence	11–16%	81–84%
Hospital mortality rate	16–23%	31–44%
Microbial etiology	Antibiotic sensitive bacteria: • MSSA • *Streptococcus pneumoniae* • *Haemophilus influenzae* • *Klebsiella pneumoniae* • *Escherichia coli* • *Proteus* spp. • *Serratia* spp.	Antibiotic-resistant or MDR bacteria: • *Pseudomonas aeruginosa* • MRSA • *Acinetobacter* spp. • *Enterobacter* spp. • VRE

requirement of the ventilator.

Thakur et al | Article 8845 J Pure Appl Microbiol. 2024;18(2):772-796. doi: 10.22207/JPAM.18.2.10 Received: 12 July 2023 | Accepted: 22 March 2024 Published Online: 27 April 2024

Patogenesis



Kollef MH. Crit Care Med 2004; 32:1396-1406

CDC Definition of VAP

Radiographic criteria—two or more chest x-rays showing any of the following
1. New or progressive and persistent infiltrate
2. Consolidation
3. Cavitation

Systemic criteria—at least one of the following
1. Fever (>38 °C or >100.4 °F)
2. Leukopenia (4,000 WBC/mm^3) or leukocytosis (>12,000 WBC/mm^3)
3. For adults >70 years old, altered mental status with no other recognized cause

Pulmonary criteria—at least two of the following
1. New onset of purulent sputum, or change in character of sputum, increased respiratory secretions or increased suctioning requirements
2. Worsening gas exchange (e.g., desaturations, increased oxygen requirements, or increased ventilator demand)
3. New onset or worsening cough, or dyspnea, or tachypnea
4. Rales or bronchial breath sounds

BMJ Open

Antimicrobial Stewardship for Ventilator Associated Pneumonia in Intensive Care (the ASPIC trial): study protocol for a randomised controlled trial

Arnaud Foucrier ,[1] Antoine Roquilly,[2] Delphine Bachelet,[3] Ignacio Martin-Loeches,[4,5] Adrien Bougle,[6] Jean-François Timsit,[7] Philippe Montravers,[8] Jean-Ralph Zahar,[9] Philippine Eloy,[3] Emmanuel Weiss,[10] ASPIC study group

Definitive diagnosis of VAP is defined, in accordance with international guidelines, by the association of:

- Mechanical ventilation (MV) requirement for more than 48 hours.
- New pulmonary infiltrate of strongly suspected infectious origin.
- Worsening oxygenation.
- Purulent tracheal secretions and at least 1 of the following criteria within the 24 hours prior to the first dose of antibiotic therapy: (1) fever (body temperature >38.3°C) or hypothermia (body temperature <35°C), (2) white blood cell count >10 000 cells/mm^3 or <4000 cells/mm^3.
- microbiological criteria (positive quantitative culture of a lower respiratory tract (LRT): bronchoalveolar lavage fluid (positivity threshold ≥10^4 colony-forming units/mL) or plugged telescopic catheter (PTC) (threshold ≥10^3 colony-forming units/mL) or quantitative endotracheal aspirate distal pulmonary secretion samples (significant threshold ≥10^5 colony-forming units/mL).

CPIS criteria

Ventilator-associated pneumonia was considered to be established for CPIS score >6.

CPIS	Skor
Temperature (°C)	
> or equal to 36.5 and < or equal to 38.4	0
> or equal to 38.5 and < or equal to 38.9	1
> or equal to 39 and < or equal to 36	2
Blood leukocytes, mm3	
> or equal to 4,000 and < or equal to 11,000	0
< 4,000 or > 11,000	1
+ band forms > equal to 50%	Add 1 point
Tracheal secretions	
Absence of tracheal secretions	0
Presence of non-purulent tracheal secretions	1
Presence of purulent tracheal secretions	2
Oxygenation: PaO2/FIO2, mmHg	
> 240 or ARDS	0
< or equal to 240 and no ARDS	2
(ARDS defined as PaO2/FIO2 , < or equal to 200, pulmonary arterial wedge pressure < or equal to 18 mmHg and acute bilateral infiltrates)	
Pulmonary radiography	
No infiltrate	0
Diffuse (or patchy) infiltrate	1
Localized infiltrate	2
Progression of pulmonary infiltrate	
No radiographic progression	0
Radiographic progression (after CHF and ARDS excluded)	2
Culture of tracheal aspirate	
Pathogenic bacteria cultured in rare or light quantity or growth	0
Pathogenic bacteria cultured in moderate or heavy quantity	1
Same pathogenic bacteria seen on Gram stain	Add 1 point

RISK FACTORS FOR VAP

- Tracheostomy
- Length of stay (LOS)
- Older age
- Trauma patients
- Post-surgical patients
- Burns patients
- Longer duration of surgery
- History of smoking
- Low serum albumin concentration
- High score on the American Society of Anesthesiologists Physical Status Classification System
- Enteral feeding
- Multiple central venous line insertions
- Presence of catheter-related infection
- Paralytic agents
- P/F ratio < 200
- APACHE II score >20
- Acute respiratory distress syndrome
- Lung injury
- Chronic obstructive pulmonary disease
- Upper respiratory tract colonization
- Sinusitis
- Oropharyngeal colonization
- Biofilm on the surface and within lumen of the endotracheal tube
- Duration of mechanical ventilator (MV)
- Frequent change in ventilator circuit
- Lack of use of heat and moist exchange humidifiers
- Supine position
- Frequent reintubation
- Previous use of broad-spectrum antibiotics
- Patients transported out of ICU

Recommendations for The Prevention of Ventilator-Associated Pneumonia Authors Victor Daniel Rosenthal, MD, PhD; Ziad A. Memish, MD, FRCPC, FACP; Gonzalo Bearman, MD, MPH, FACP, FSHEA, FIDSA.

RISK FACTORS FOR VAP

Original Article

Incidence and risk factors of ventilator-associated pneumonia in the intensive care unit: a systematic review and meta-analysis

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Contributions: (I) Conception and design: W Li, J Cai, H Xu; (II) Administrative support: L Ding, Y Chen, H Xu; (III) Provision of study materials or patients: L Ding, Y Chen; (IV) Collection and assembly of data: Y Chen, X Wang; (V) Data analysis and interpretation: W Li, J Cai, X Wang; (VI) Manuscript writing: All authors; (VII) Final approval of manuscript: All authors.

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Three potential risk factors were identified, including gender, smoking, and APACHE II score.

Recommendations for The Prevention of Ventilator-Associated Pneumonia Authors Victor Daniel Rosenthal, MD, PhD; Ziad A. Memish, MD, FRCPC, FACP; Gonzalo Bearman, MD, MPH, FACP, FSHEA, FIDSA.

SHEA/IDSA/APIC Practice Recommendation

Strategies to prevent ventilator-associated pneumonia, ventilator-associated events, and nonventilator hospital-acquired pneumonia in acute-care hospitals: 2022 Update

Michael Klompas MD, MPH[1,2], Richard Branson MSc, RRT[3], Kelly Cawcutt MD, MS[4], Matthew Crist MD[5], Eric C. Eichenwald MD[6,7], Linda R. Greene RN, MPS, CIC[8], Grace Lee MD[9], Lisa L. Maragakis MD, MPH[10], Krista Powell MD, MPH[5], Gregory P. Priebe MD[11], Kathleen Speck MPH[12], Deborah S. Yokoe MD, MPH[13] and Sean M. Berenholtz MD, MHS[12,14,15]

Recommendation Category

Essential practices → that should be adopted by all acute-care hospitals

(in 2014 these were “basic practices”)

Additional approaches → that can be considered for use in locations and/or populations within hospitals when these HAIs are not controlled after implementation of essential practices

(in 2014 these were “special approaches”)

Not recommended

Quality of Evidence

Category	Definition
HIGH	Highly confident that the true effect lies close to that of the estimated size and direction of the effect. Evidence is rated as “HIGH” quality when there are a wide range of studies with no major limitations, there is little variation between studies, and the summary estimate has a narrow confidence interval.
MODERATE	The true effect is likely to be close to the estimated size and direction of the effect, but there is a possibility that it is substantially different. Evidence is rated as “MODERATE” quality when there are only a few studies and some have limitations but not major flaws, there is some variation between studies, or the confidence interval of the summary estimate is wide.
LOW	The true effect may be substantially different from the estimated size and direction of the effect. Evidence is rated as “LOW” quality when supporting studies have major flaws, there is important variation between studies, the confidence interval of the summary estimate is very wide, or there are no rigorous studies.

ADULT

Recommendations to Prevent VAP and/or VAE in Adult Patients

Category	Rationale	Intervention	Quality of Evidence
Essential practices	Good evidence that the intervention decreases the average duration of mechanical ventilation, length of stay, mortality, and /or costs. Benefits likely outweigh risks.	Avoid intubation and prevent reintubation • Use high-flow nasal oxygen or noninvasive positive pressure ventilation (NIPPV) as appropriate whenever safe and feasible[91–93,96,99]	HIGH
		Minimize sedation[105,106] • Avoid benzodiazepines in favor of other agents[106] • Use a protocol to minimize sedation[110] • Implement a ventilator liberation protocol[113]	**HIGH**
		Maintain and improve physical conditioning[113,120–123]	MODERATE
		Elevate the head of the bed to 30–45°[125,388–390]	LOW[a]
		Provide oral care with toothbrushing but *without* chlorhexidine[126,127]	MODERATE
		Provide early enteral vs. parenteral nutrition[131]	HIGH
		Change the ventilator circuit only if visibly soiled or malfunctioning (or per manufacturers' instructions)[391–394]	HIGH

Infection Control & Hospital Epidemiology (2022), 43, 687–713 doi:10.1017/ice.2022.88

Recommendations to Prevent VAP and/or VAE in Adult Patients

Additional approaches	Good evidence that the intervention improves outcomes in some populations, but may confer some risk in others.	Use selective oral or digestive decontamination in countries and ICUs with low prevalence of antibiotic-resistant organisms[128,134,135]	HIGH[a]
	May lower VAP rates but insufficient data to determine impact on duration of mechanical ventilation, length of stay, or mortality.	Utilize endotracheal tubes with subglottic secretion drainage ports for patients expected to require >48–72 hours of mechanical ventilation[395]	MODERATE
		Consider early tracheostomy[144]	MODERATE
		Consider postpyloric rather than gastric feeding for patients with gastric intolerance or at high risk for aspiration[131,147]	MODERATE

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Recommendations to Prevent VAP and/or VAE in Adult Patients

Generally not recommended	Inconsistently associated with lower VAP rates and no impact or negative impact on duration of mechanical ventilation, length of stay, or mortality.	Oral care with chlorhexidine[75,128–130,150]	MODERATE
		Probiotics[153–156]	MODERATE
		Ultrathin polyurethane endotracheal tube cuffs[165–167]	MODERATE
		Tapered endotracheal tube cuffs[169]	MODERATE
		Automated control of endotracheal tube cuff pressure[170,171,174,175]	MODERATE
		Frequent cuff-pressure monitoring[176]	MODERATE
		Silver-coated endotracheal tubes[178]	MODERATE
		Kinetic beds[180]	MODERATE
		Prone positioning[181,183,a]	MODERATE
		Chlorhexidine bathing[184–186,a]	MODERATE
	No impact on VAP rates, average duration of mechanical ventilation, length of stay, or mortality.[a]	Stress-ulcer prophylaxis[190,191,193]	MODERATE
		Monitoring residual gastric volumes[194]	MODERATE
		Early parenteral nutrition[195]	MODERATE
No recommendation	No impact on VAP rates or other patient outcomes, unclear impact on costs.	Closed endotracheal suctioning systems[197–199]	MODERATE

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NEONATE

Recommendations to Prevent VAP and/or VAE in Preterm Neonate Patients

Category	Rationale	Intervention	Quality of Evidence
Essential practices	May lower VAP and/or PedVAE rates and have minimal risks of harm. Benefits likely outweigh potential risks.	Use non-invasive positive pressure ventilation in selected populations[62,205,206]	HIGH
		Minimize the duration of mechanical ventilation	HIGH
		Use caffeine therapy to facilitate extubation[396,397]	HIGH
		Assess readiness to extubate daily	LOW
		Manage patients without sedation whenever possible[209,210]	LOW
		Avoid unplanned extubations and reintubations[212]	LOW
		Avoid reintubation by using nasal CPAP, non-invasive positive pressure ventilation (NIPPV), of high flow nasal cannula in the post-extubation period[396]	HIGH
		Provide regular oral care with sterile water	LOW
		Change the ventilator circuit only if visibly soiled or malfunctioning[259] (or per manufacturer's instructions)	LOW

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Recommendations to Prevent VAP and/or VAE in Preterm Neonate Patients

Additional approaches	Unknown impact on VAP and VAE rates but risk of harm likely minimal. Reasonable to consider implementing if rates remain elevated despite essential practices.	Lateral recumbent positioning[215]	LOW
		Reverse Trendelenberg positioning	LOW
		Closed/in-line suctioning systems[216,217]	LOW
		Oral care with maternal colostrum[218]	MODERATE

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Recommendations to Prevent VAP and/or VAE in Preterm Neonate Patients

Generally not recommended	Unknown impact on VAP rates and inadequate data on risks.	Regular oral care with an antiseptic or Biotene[219]	LOW
	May be harmful. Risk-benefit balance does not favor intervention, unless specifically indicated for reasons other than VAP prevention	Histamine-2 receptor antagonists[220,221]	MODERATE
		Prophylactic broad-spectrum antibiotics[222–225]	MODERATE
		Daily spontaneous breathing trials[398,399]	LOW
		Daily sedative interruptions	LOW
		Prophylactic probiotics or synbiotics[228,229]	LOW
	Not recommended because appropriate products are not available or approved for use in this population.	Endotracheal tubes with subglottic secretion drainage ports	NA
		Silver-coated endotracheal tubes	NA

Infection Control & Hospital Epidemiology (2022), 43, 687–713 doi:10.1017/ice.2022.88

PEDIATRIC

Recommendations to Prevent VAP and/or VAE in Pediatric Patients

Category	Rationale	Intervention	Quality of Evidence
Essential practices	Interventions with minimal risk of harm and some data that they may lower VAP rates, PedVAE rates, and/or duration of mechanical ventilation.	Avoid intubation if possible. Use non-invasive positive pressure ventilation for selected populations[240–242]	MODERATE
		Assess readiness to extubate daily in patients without contraindications[244–248]	MODERATE
		Take steps to minimize unplanned extubations and reintubations[249]	LOW
		Avoid fluid overload[251,253,254]	MODERATE
		Provide regular oral care (i.e., toothbrushing or gauze if no teeth)[234,256,257]	LOW
		Elevate the head of the bed unless medically contraindicated[234]	LOW
		Change ventilator circuits only if visibly soiled or malfunctioning[259] (or per manufacturer's instructions)	MODERATE
		Prevent condensate from reaching the patient[234,266]	LOW
		Use cuffed endotracheal tubes[262–264]	LOW
		Maintain cuff pressure and volume at the minimal occlusive settings	LOW
		Suction oral secretions before each position change	LOW

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Recommendations to Prevent VAP and/or VAE in Pediatric Patients

Additional approaches	Risk of harm likely minimal with some evidence of benefit in adult patients, but data in pediatric populations are limited. Reasonable to consider implementing if rates remain elevated despite essential practices.	Interrupt sedation daily[267]	MODERATE
		Utilize endotracheal tubes with subglottic secretion drainage ports for older pediatric patients expected to require >48 or 72 hours of mechanical ventilation[395]	LOW
		Consider early tracheostomy[268-270]	LOW

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Recommendations to Prevent VAP and/or VAE in Pediatric Patients

Generally not recommended	Unknown impact on VAP rates and inadequate data on risks.	Prolonged systemic antimicrobial therapy for ventilator-associated tracheitis[272]	LOW
		Selective oropharyngeal or digestive decontamination[274]	LOW
		Prophylactic probiotics[163]	LOW
	No impact on VAP rates.[a]	Oral care with antiseptics such as chlorhexidine[280,284,285]	MODERATE
		Stress-ulcer prophylaxis[286–288]	LOW
	Lowers VAP rates in adults but no impact on duration of mechanical ventilation, length of stay, or mortality.	Silver-coated endotracheal tubes	LOW
No recommendation	Limited data on pediatric patients, no impact on VAP rates or outcomes in adults, unclear impact on costs	Closed or in-line suctioning[293]	LOW

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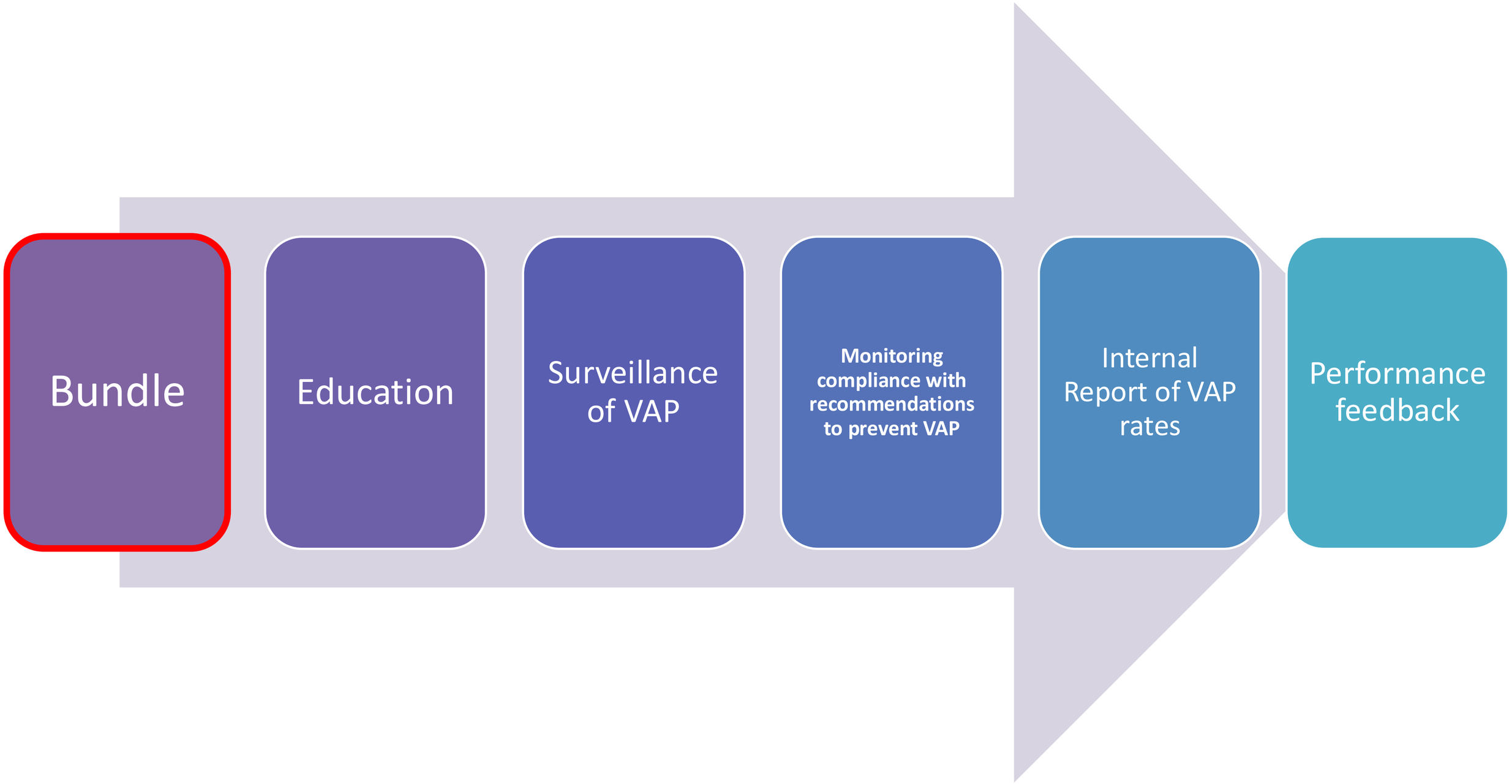
IMPLEMENTATION OF VAP PREVENTION STRATEGIES



BUNDLE

This approach was implemented in 374 ICUs across 35 LMICs in Latin America, Asia, Eastern Europe, and the Middle East

In a NICU in Egypt, a study demonstrated a significant reduction in VAP rate from 36.4 to 23.0 VAPs per 1000 MV-days

1. Hand hygiene compliance
2. Daily readiness assessment for extubation in patients without contraindications
3. Maintaining cuff pressure at minimal occlusive settings (typically 20 cm of water)
4. Minimizing the duration of MV
5. Minimizing the ICU stay
6. Elevating the head of the bed to 30°-45°
7. Providing oral care with toothbrushing
8. Preventing condensation from reaching the patient

1. Head-of-bed elevation of 30°-45°
2. Hand hygiene practices
3. Sterile suction and handling of respiratory equipment
4. Adherence to the unit protocol for intubation, re-intubation, and ETT suction
5. Changing ventilator circuit if visibly soiled or mechanically malfunctioning
6. Proper timed mouth care with normal saline and suction of oropharyngeal secretions
7. Daily evaluation for readiness for extubation to nasal continuous airway pressure during morning rounds along with sedation vacation for sedated patients

HAND HYGIENE

WHO Moments	CDC Indication
1	Immediately before touching a patient
2	Before performing an aseptic task (eg, placing an indwelling device or handling invasive medical devices)
3	After contact with blood, body fluids, or contaminated surfaces
4	After touching a patient
5	After touching the patient environment
	Before moving from work on a soiled body site to a clean body site on the same patient
	Immediately after glove removal
In addition, wash hands when visibly soiled, before eating, and after using the restroom.[a]	

Note. WHO, World Health Organization; CDC, US Centers for Disease Control and Prevention.
[a]Hand sanitizing with an alcohol-based hand sanitizer is preferred unless handwashing is specifically indicated, or during outbreaks of *C. difficile* or norovirus.

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Major article

The impact of a ventilator bundle on preventing ventilator-associated pneumonia: A multicenter study

Joong Sik Eom MD [a], Mi-Suk Lee MD [b], Hee-Kyung Chun RN [b], Hee Jung Choi MD [c], Sun-Young Jung RN [c], Yeon-Sook Kim MD [d], Seon Jin Yoon RN [d], Yee Gyung Kwak MD [e], Gang-Bok Oh RN [e], Min-Hyok Jeon MD [f], Sun-Young Park RN [f], Hyun-Sook Koo RN, MPH [g], Young-Su Ju MD [h], Jin Seo Lee MD [a,*]

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VAP incidence before and after intervention

	Before intervention (July 2010-February 2011)	After intervention (March 2011-June 2011)
VAP cases	57	7
Ventilator-days	13,937	6,025
VAP incidence rate	4.08	1.16

Incidence density rate, 0.28; 95% CI, 0.275-0.292.

Implementation of the VAP bundle reduced the VAP rate from a mean of 4.08 cases per 1,000 ventilator-days to 1.16 cases per 1,000 ventilator-days. The incidence density ratio (rate) was 0.28 (95% confidence interval, 0.275-0.292).

MAJOR ARTICLE · Volume 44, Issue 3, P320-326, March 01, 2016 Download Full Issue

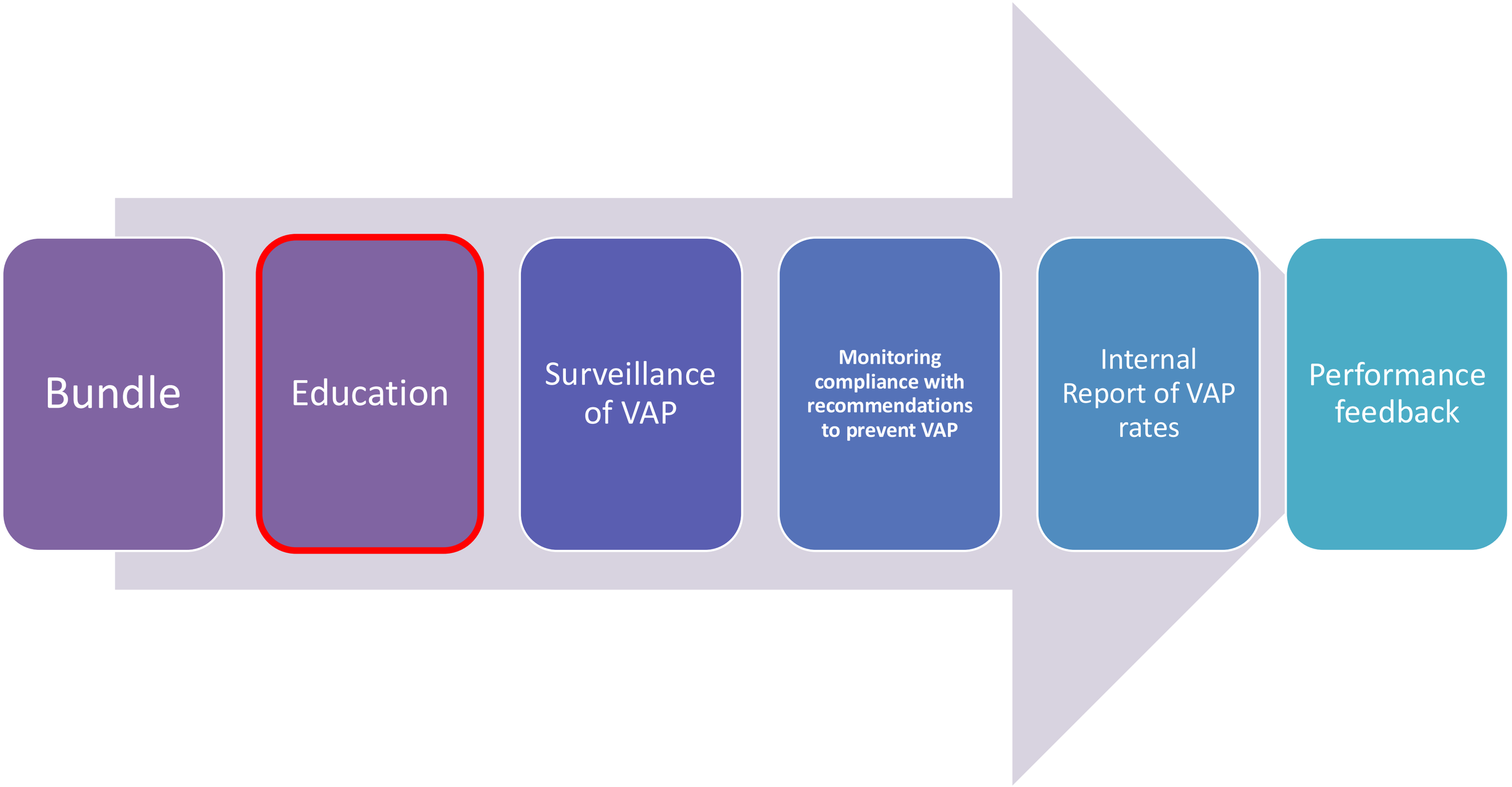
The impact of implementing multifaceted interventions on the prevention of ventilator-associated pneumonia

Raymond Khan, MD [a,b,c] · Hasan M. Al-Dorzi, MD [a,b,c] · Khalid Al-Attas, MD [d.] ... · Dianne Mannion, RN [e] · Hani M. Tamim, MPH, PhD [h] · Yaseen M. Arabi, MD, FCCP, FCCM [a,b,c,i] ... Show more

Affiliations & Notes Article Info

The number of VAP episodes decreased from 144 during 2008-2010 to only 14 during 2011-2013 ($P < .0001$). The rate of VAP decreased from 8.6 per 1000 ventilator-days to 2.0 per 1000 ventilator-days ($P < .0001$) after implementation of the care bundle.

IMPLEMENTATION OF VAP PREVENTION STRATEGIES

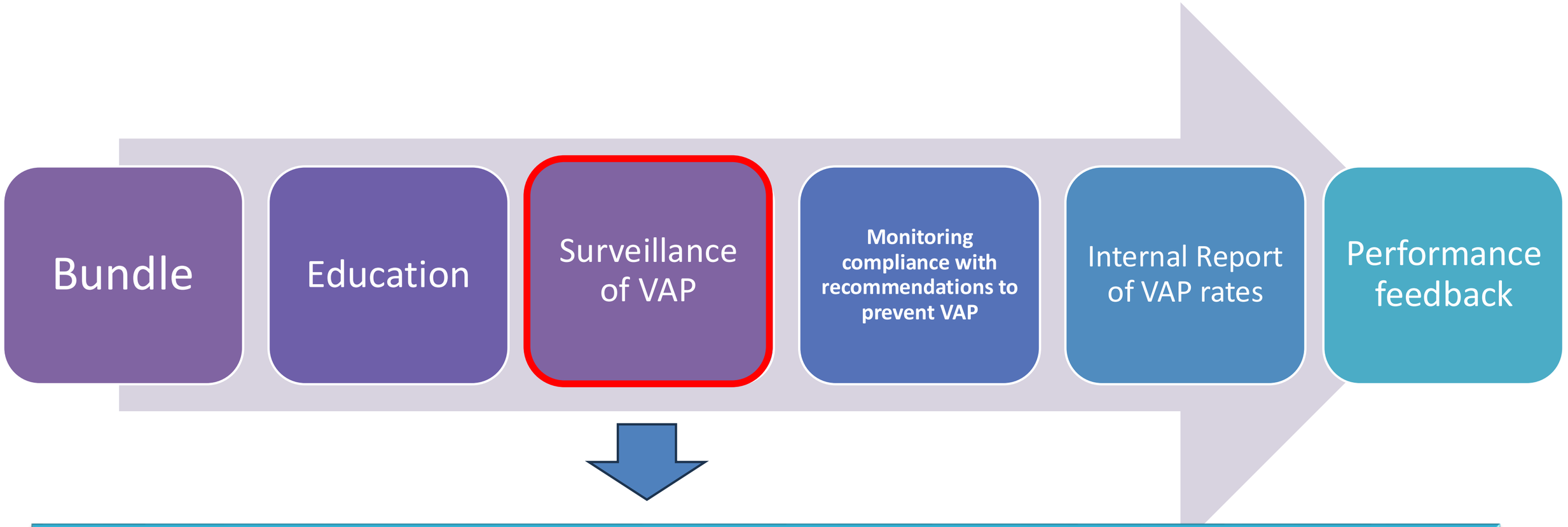


Healthcare providers (HCPs) → should receive training and demonstrate competence according to their roles → this training should ensure understanding and proficiency in implementing recommendations to prevent VAP.

Alfano et al. conducted a quality improvement project aimed at reducing the incidence of VAP through nursing education. The project targeted registered nurses. MVdays decreased from 17.45 to 13.42 days (P = 0.085), and ICU LOS reduced from 24.77 to 17.62 days (P = 0.035).

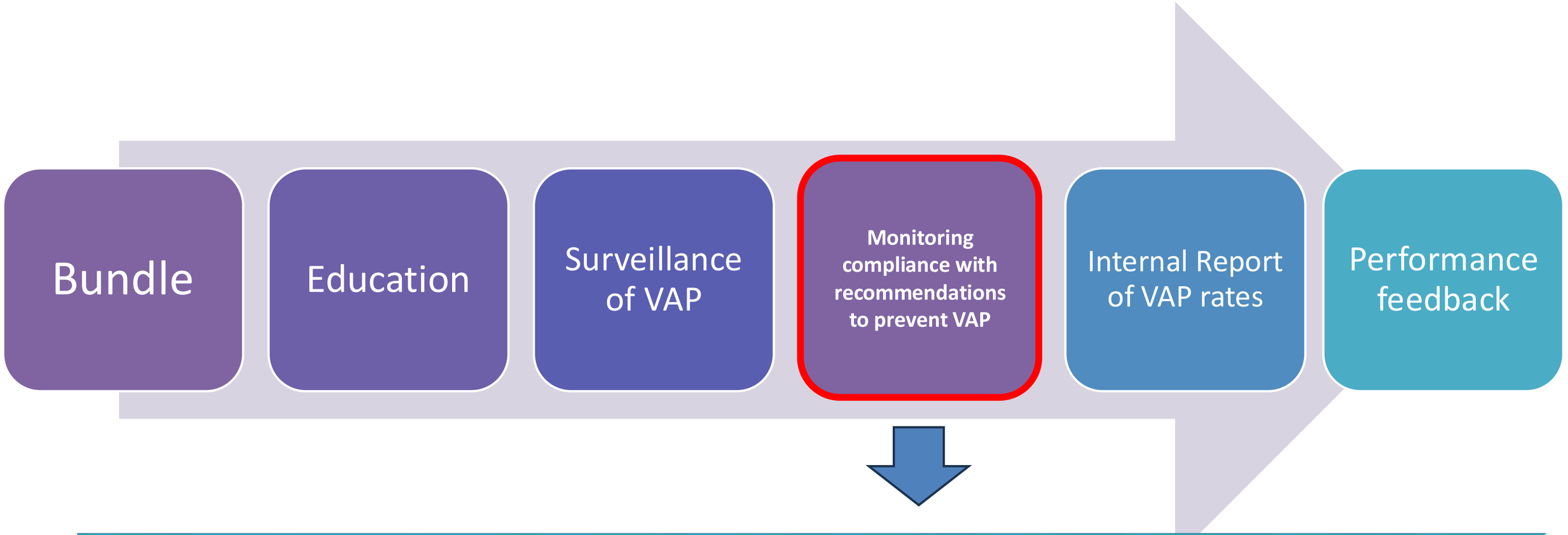
A study explored the knowledge of ICU nurses regarding VAP prevention in Ethiopian referral hospitals. Data analysis revealed a mean knowledge score of 10.1 ± 2.41 out of 20 questions, with 48.04% demonstrating good knowledge and 51.96% showing poor knowledge of VAP prevention.

IMPLEMENTATION OF VAP PREVENTION STRATEGIES



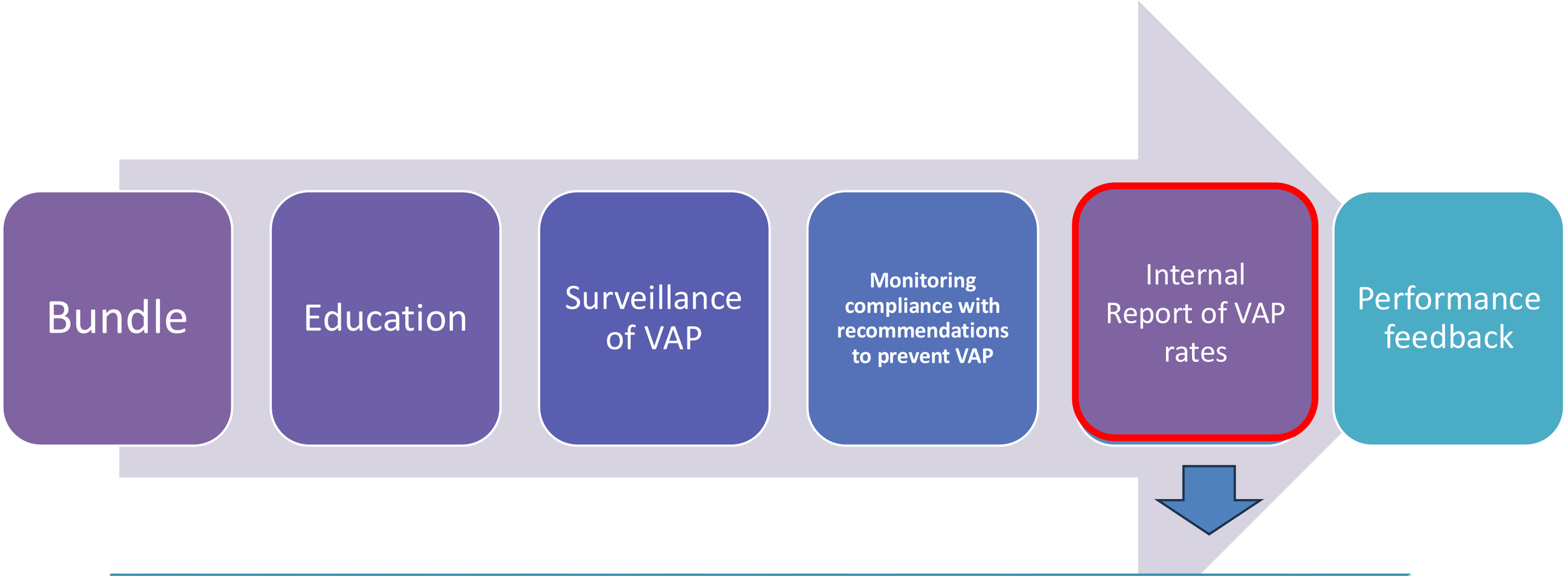
- Employ uniform surveillance methods and definitions, such as those published by the CDC/NHSN, to facilitate the comparison of data with benchmark standards.
- The VAP rate is calculated using CDC/NHSN definitions by dividing the number of VAPs by the total MV-days in each unit and multiplying by 1000 to express the measure as VAPs per 1000 MV-days.

IMPLEMENTATION OF VAP PREVENTION STRATEGIES



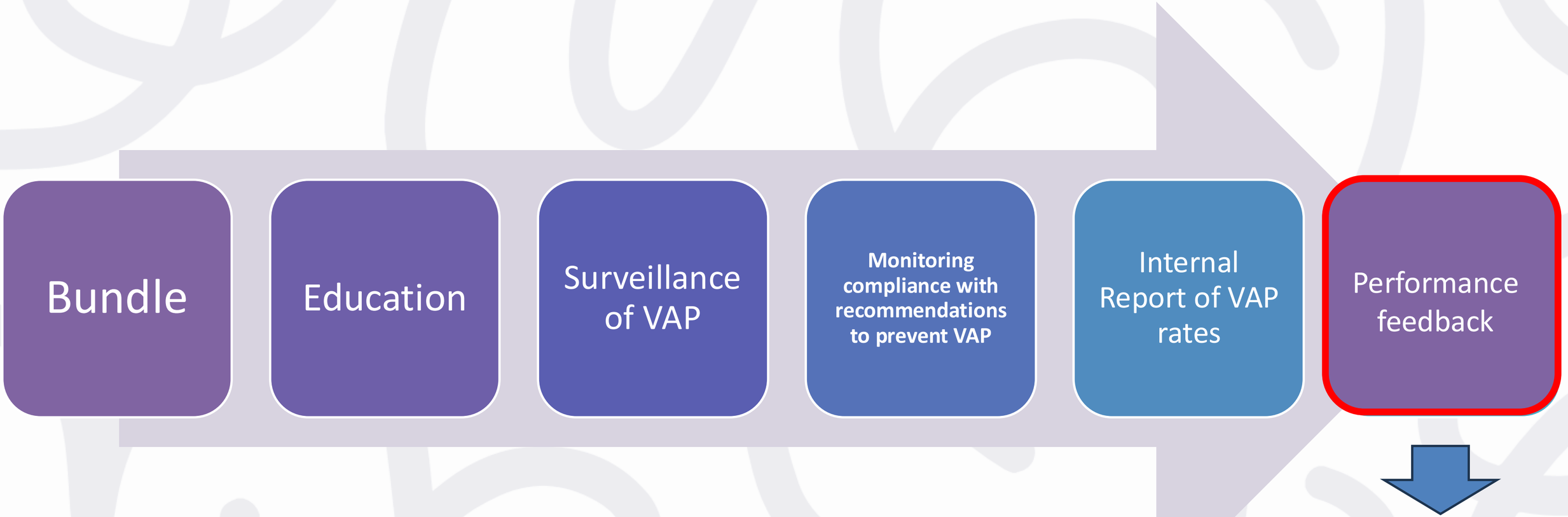
- Assess compliance and maintenance guidelines by implementing a documented insertion paper or online checklist across all hospital settings and assigning knowledgeable HCPs to oversee this task.
- The checklist ensures compliance with procedural steps → identifying and addressing any gaps.

IMPLEMENTATION OF VAP PREVENTION STRATEGIES



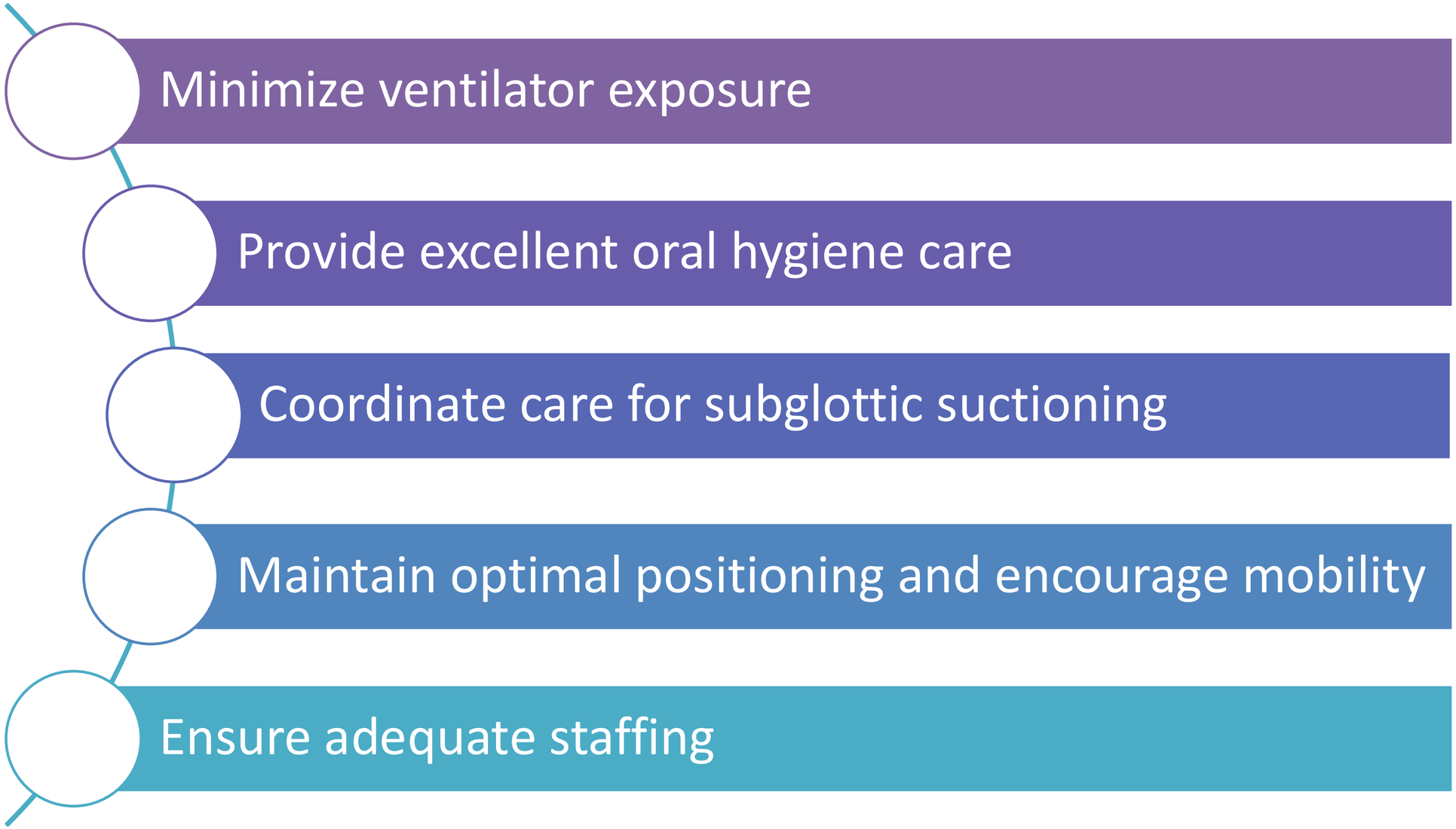
- Emphasizing the importance of communicating them to senior leadership and clinicians involved in caring for patients at risk for VAP.
- Providing internal reporting as a benchmark, compare the VAP rates of the given hospital against data from the CDC/NHSN , and the INICC international data.

IMPLEMENTATION OF VAP PREVENTION STRATEGIES



- For performance feedback → charts displaying data on attending HCPs' monthly compliance with infection prevention practices .
- Leveraging the "observer effect" on HCPs' behavior, this method's strength lies in influencing their practices to enhance efficiency.

5 Nursing strategies to prevent ventilator-associated pneumonia



CONCLUSIONS

- Ventilator-associated pneumonia is an important cause of hospital acquired infection these infections are serious and may be life threatening.
- Implementation of a ventilator-associated pneumonia prevention bundle was associated with a statistically significant reduction in ventilator-associated pneumonia.
- Care “bundles” in infection prevention and safety are simple sets of evidence-based practices that, when implemented collectively, improve the reliability of their delivery and improve patient outcomes.

THANK YOU