Implementation Of Ventilator Associated Events (VAE) Checklist Bundle To Decrease Ventilator Associated Pneumonia (VAP), Among Ventilated Patients In ICU KPJ Ampang Puteri Specialist Hospital.

ADAM LUTFI BIN ABDUL NASIR[1], MUHAMMAD AIMAN ROHIM [1], NORAZIMAH MD NORDIN [1]
KPJ AMPANG PUTERI SPECIALIST HOSPITAL, AMPANG, SELANGOR

1. INTRODUCTION

- VAEs is identified as any events that occur during ventilation including a decline in respiratory status following a period of stability or improvement on the ventilator, signs of infection or inflammation, and laboratory findings of respiratory infection.
- Ventilator-associated event (VAE) checklist bundle is a new surveillance paradigm for monitoring complications in mechanically ventilated patients in intensive care units (ICUs).
- A quasi-experimental study is conducted from January 2020 to December 2022 to determine the effectiveness of VAE bundle checklist in preventing VAE and its complications.

TERMINOLOGIES USED IN THIS RESEARCH

VAC	Ventilator Associated Condition
IVAC	Infection Related Ventilator Associated Events
PVAP	Probable Ventilator Associated Pneumonia
VAP	Ventilator Associated Pneumonia

2. OBJECTIVES

- The objective of this research is to determine the effectiveness of ventilator associated events bundle checklist in preventing VAE occurrences and its complications.
- To monitor VAE and VAP occurrences in ventilated patient in ICU.

3. PROBLEM STATEMENT

- One of the health and safety objectives for patients in ICU, especially mechanical ventilated patient is to reduce risk of Ventilator-Associated events.
- A retrospective cohort study examining 20,356 episodes of mechanical ventilation (MV) – VAEs, noted 1,141 ventilator-associated conditions (VACs), 431 infection-related VACs (IVACs) and 266 possible cases of ventilator-associated pneumonia (PVAP) (Klompas, 2019).
- VAE causes complications such as prolonged intubation, prolonged length of stay in ICU, increased morbidity and mortality, and increased cost. The mortality rate from VAEs reported to CDC in 2014 was around 31% (Klompas, 2019).
- Therefore, the Ventilator Associated Event bundle checklist is introduced to address the risk of VAE in mechanical ventilated patients.

4. METHODOLOGY

- A quasi-experimental with retrospective observational research design was used, and data were collected from 2020 to 2022 and comparison of number of VAE cases happen in each year.
- The data collected will involve whether the patients developed VAE and VAP.

The data of adult patients that developed VAE who are intubated and mechanically ventilated for more than 48 hours are collected from 2020 to 2022

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The data collected will exclude patients who are less than 18 years old, or previously ventilated prior to admission in ICU

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Implementation of the VAE bundle checklist is conducted starting from January 2021 until December 2022

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The data collected will then be compared to previous year in 2020 prior the implementation of VAE bundle checklist to analyze its effectiveness

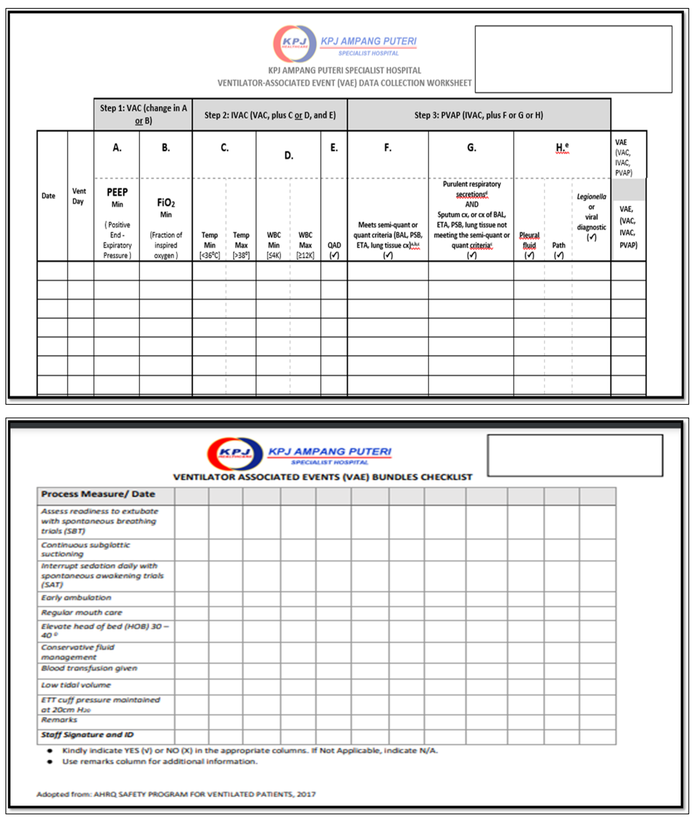
NUMERATOR AND DENOMINATOR

Numerator : **Total number of patients with VAC , IVAC and PVAP**

Denominator : **Total number of ventilator days**

VAE rates : $\frac{\text{The number of VAEs for a location X 1000}}{\text{The number of Ventilator Days for a location}}$

VAE MONITORING BUNDLE CHECKLIST



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VENTILATOR-ASSOCIATED EVENT (VAE) DATA COLLECTION WORKSHEET

		Step 1: VAC (change in A or B)		Step 2: IVAC (VAC, plus C or D, and E)			Step 3: PVAP (IVAC, plus F or G or H)				
		A.	B.	C.	D.	E.	F.	G.	H.*		VAE (VAC, IVAC, PVAP)
Date	Vent Day	PEEP Min (Positive End - Expiratory Pressure)	FiO_2 Min (Fraction of inspired oxygen)	Temp Min [<36°C] / Temp Max [>38°]	WBC Min [≤4K] / WBC Max [≥12K]	QAD (✓)	Meets semi-quant or quant criteria (BAL, PSB, ETA, lung tissue ca)**** (✓)	Purulent respiratory secretions* AND Sputum cx, or cx of BAL, ETA, PSB, lung tissue not meeting the semi-quant or quant criteria* (✓)	Pleural fluid (✓) / Path (✓)	Legionella or viral diagnostic (✓)	VAE, (VAC, IVAC, PVAP)

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VENTILATOR ASSOCIATED EVENTS (VAE) BUNDLES CHECKLIST

Process Measure/ Date											
Assess readiness to extubate with spontaneous breathing trials (SBT)											
Continuous subglottic suctioning											
Interrupt sedation daily with spontaneous awakening trials (SAT)											
Early ambulation											
Regular mouth care											
Elevate head of bed (HOB) 30 – 40 °											
Conservative fluid management											
Blood transfusion given											
Low tidal volume											
ETT cuff pressure maintained at 20cm H_2O											
Remarks											
Staff Signature and ID											

- Kindly indicate YES (√) or NO (X) in the appropriate columns. If Not Applicable, indicate N/A.
- Use remarks column for additional information.

Adopted from: AHRQ SAFETY PROGRAM FOR VENTILATED PATIENTS, 2017

INCLUSION & EXCLUSION CRITERIA

Inclusion	• Adult above 18 years old • Ventilated more than 48 hours
Exclusion	• Ventilated from outside hospital

VAE SURVEILLANCE ALGORITHM

VAC
Patient on mechanical ventilation > 2 days
Baseline period of stability followed by worsening of oxygenation

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IVAC
General evidence of infection and inflammation

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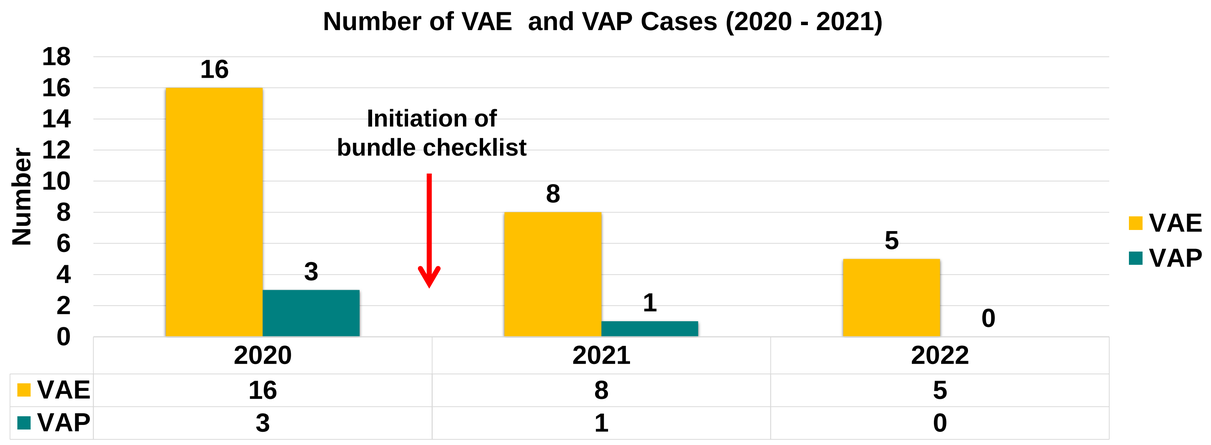
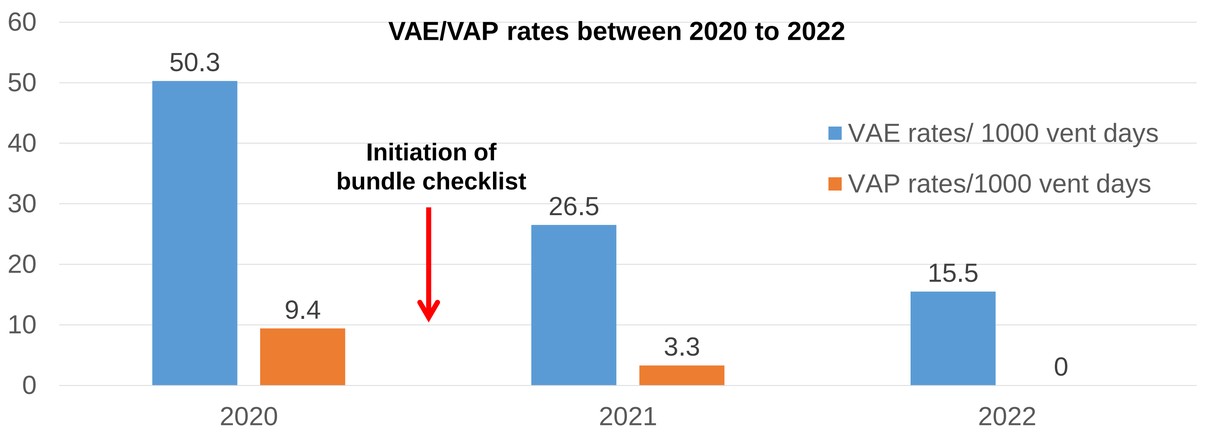
Possible or Probable VAP
Positive results of microbiological testing

5. RESULTS

GRAPH: Comparison of VAE and VAP occurrences in year 2020 (before bundle implementation) and year 2021 & 2022 (After bundle implementation)



YEAR	NO OF VENT PATIENT	TOTAL VENT DAYS	(VAE)	(VAP)
2020	76	318	16	3
2021	72	302	8	1
2022	81	322	5	0



YEAR	VAE RATES/1000 VENT DAYS	VAP RATES/1000 VENT DAYS
2020	50.3	9.4
2021	26.5	3.3
2022	15.5	0

The results signifies that adherence to the bundles allow for early detection of VAE and early treatment can be done to prevent complications and VAP.

6. CONCLUSION

- VAE bundles checklist is effective as a tool for early detection or recognition of the implications of ventilator-associated events.
- High adherence to VAE bundles and monitoring resulted in the good clinical outcomes that improved the VAE outcomes and VAP rate towards the end of 2022
- Special module on VAE was created to provide continous education and awareness among staff nurse.
- Adopted National Healthcare Safety Network (NHSN) Manual's – Ventilator Associated event module as reference.

7. REFERENCES

- Weinberger, J., Cocoros, N., & Klompas, M. (2021, December 1). Ventilator-Associated Events: Epidemiology, Risk Factors, and Prevention. Infectious Disease Clinics of North America. W.B. Saunders. https://doi.org/10.1016/j.idc.2021.07.005
- Cawcutt, K., Rupp, M., & Musil, L. (2021). COVID-19 and Ventilator-Associated Event Discordance. Antimicrobial Stewardship & Healthcare Epidemiology, 1(S1), s45-s45.
- Klompas, M. (2019). Ventilator-associated events: What they are and what they are not. Respiratory Care, 64(8), 953–961. https://doi.org/10.4187/respcare.07059