Patient Safety Component
Pediatric Ventilator-Associated Events (PedVAE): Surveillance Guidelines and Protocol

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Learning Objectives

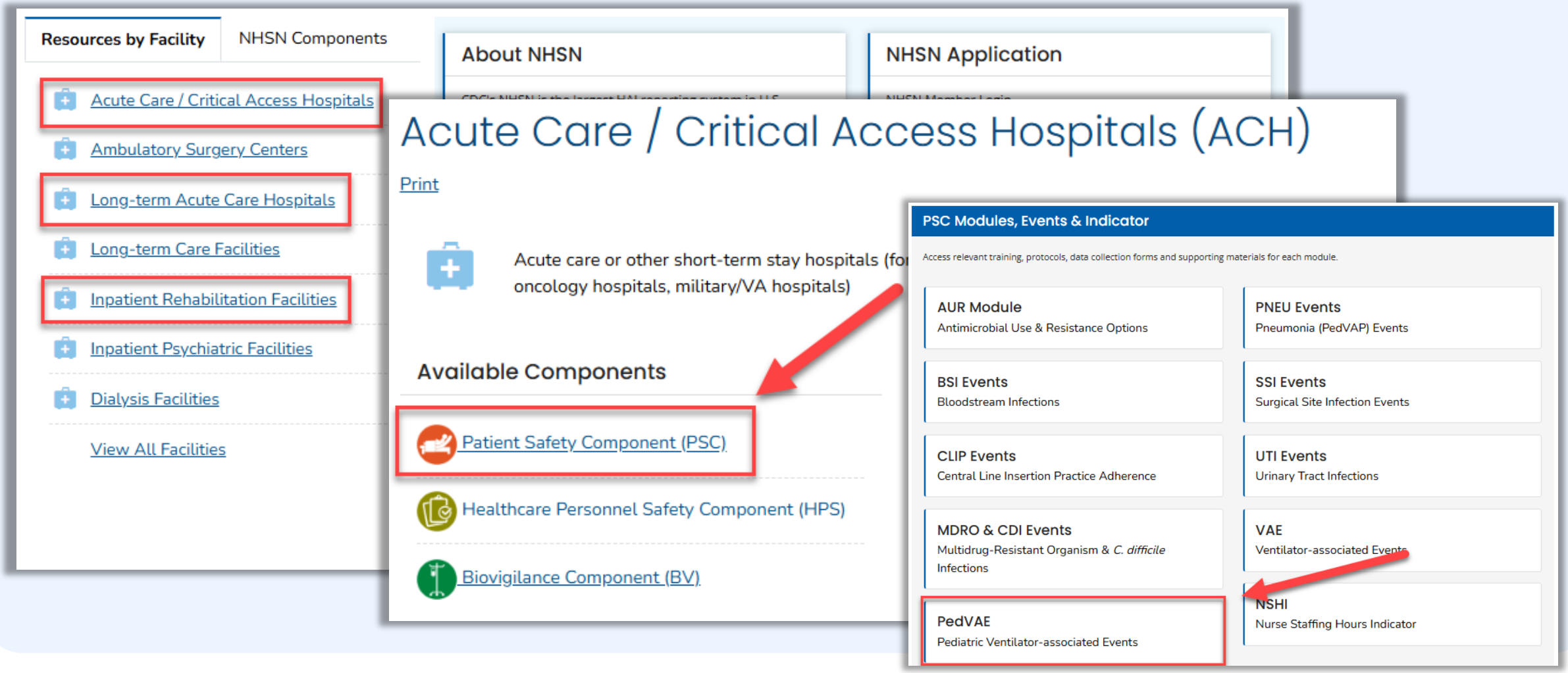
At the conclusion of this presentation, you will be able to:

- Explain PedVAE key terms
- Describe the PedVAE surveillance algorithm
- Apply the PedVAE surveillance algorithm
- Locate resources for PedVAE surveillance and reporting

PedVAE Surveillance – Resources

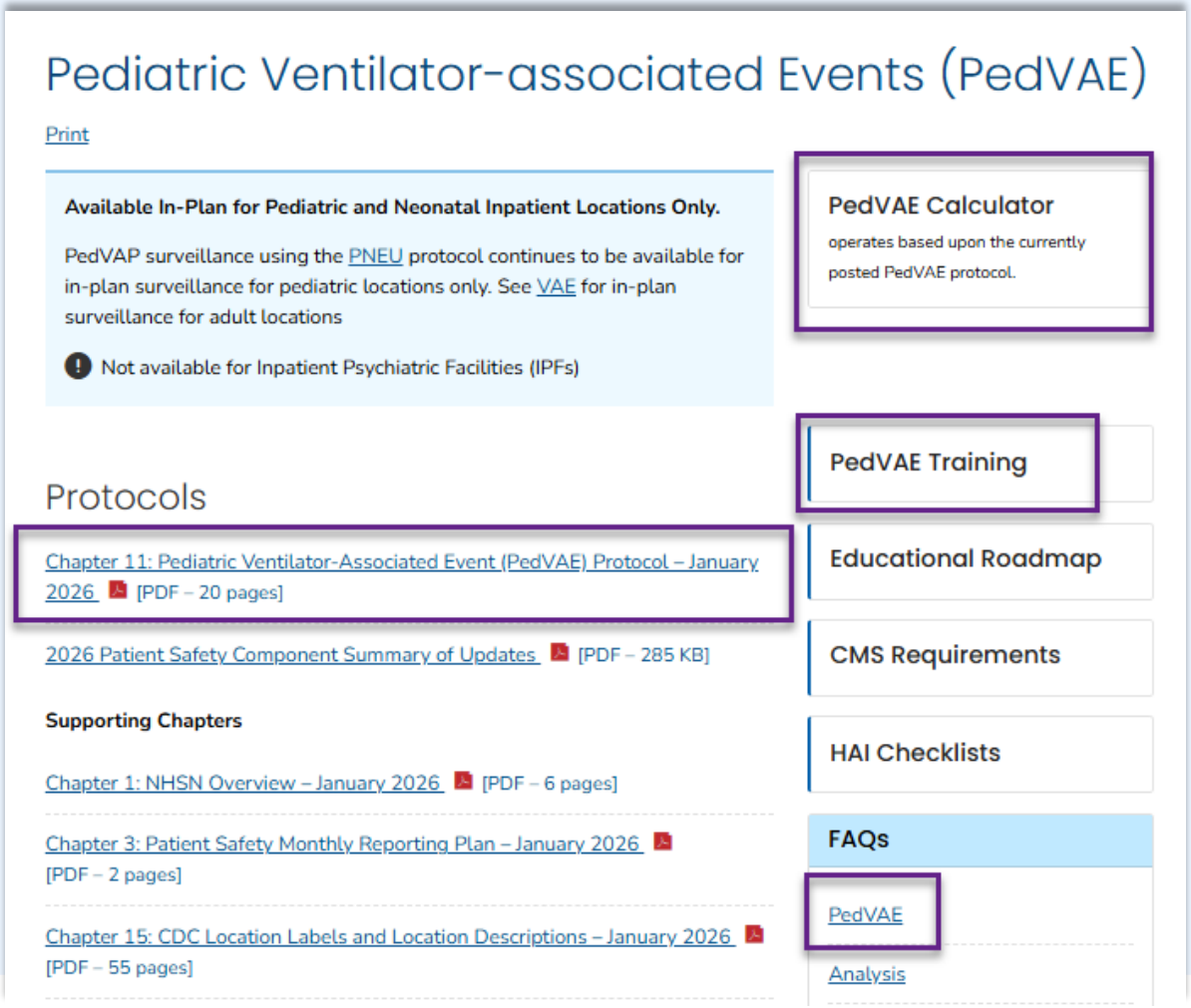
Where do I find the PedVAE Surveillance Guidance?

https://www.cdc.gov/nhsn/index.html



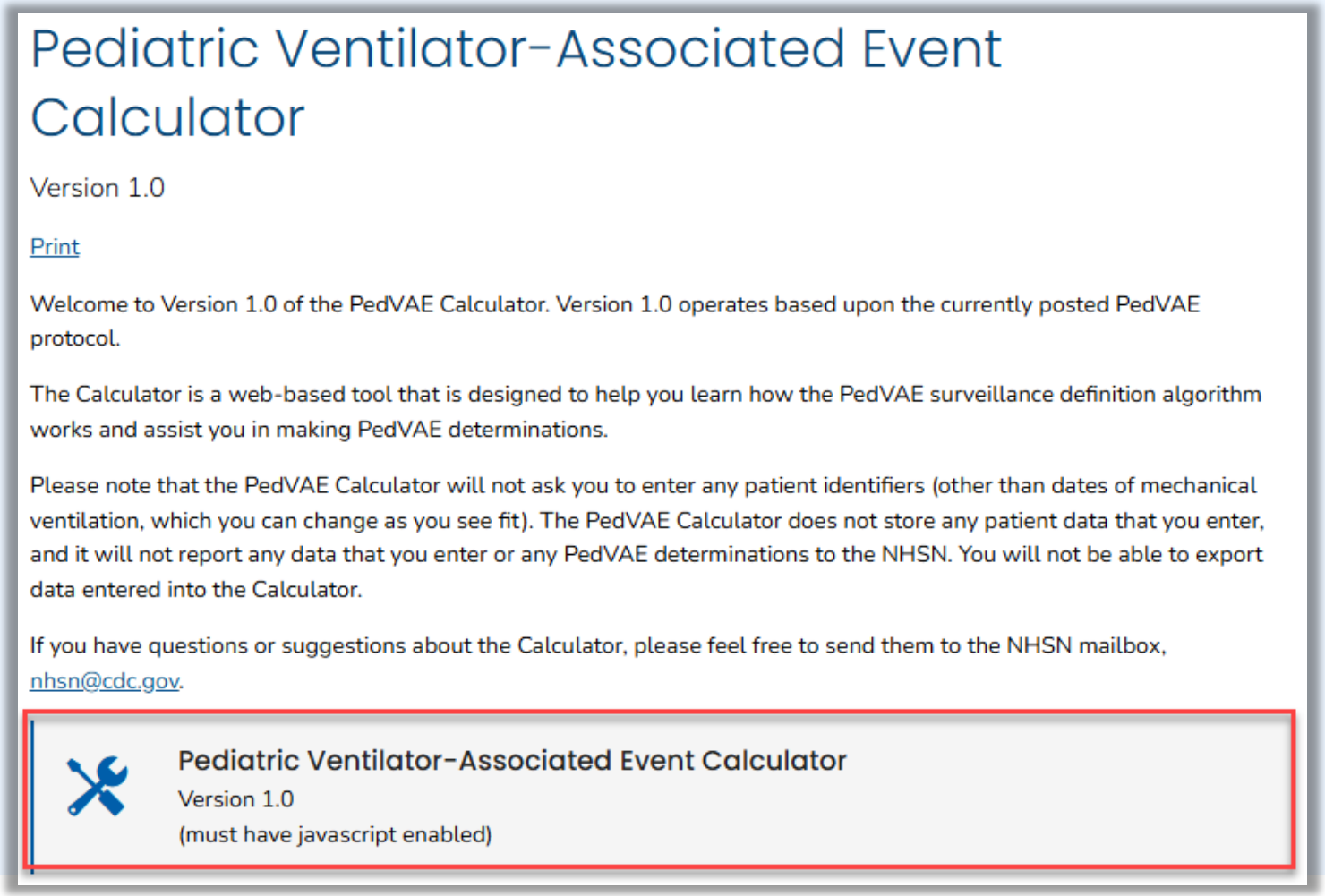
Where do I find the PedVAE Surveillance Guidance?

https://www.cdc.gov/nhsn/psc/pedvae/index.html



PedVAE Calculator

https://www.cdc.gov/nhsn/pedvae-calculator/index.html



Pediatric Ventilator-Associated Event Calculator

Version 1.0

Print

Welcome to Version 1.0 of the PedVAE Calculator. Version 1.0 operates based upon the currently posted PedVAE protocol.

The Calculator is a web-based tool that is designed to help you learn how the PedVAE surveillance definition algorithm works and assist you in making PedVAE determinations.

Please note that the PedVAE Calculator will not ask you to enter any patient identifiers (other than dates of mechanical ventilation, which you can change as you see fit). The PedVAE Calculator does not store any patient data that you enter, and it will not report any data that you enter or any PedVAE determinations to the NHSN. You will not be able to export data entered into the Calculator.

If you have questions or suggestions about the Calculator, please feel free to send them to the NHSN mailbox, nhsn@cdc.gov.

Pediatric Ventilator-Associated Event Calculator
Version 1.0
(must have javascript enabled)

PedVAE Calculator

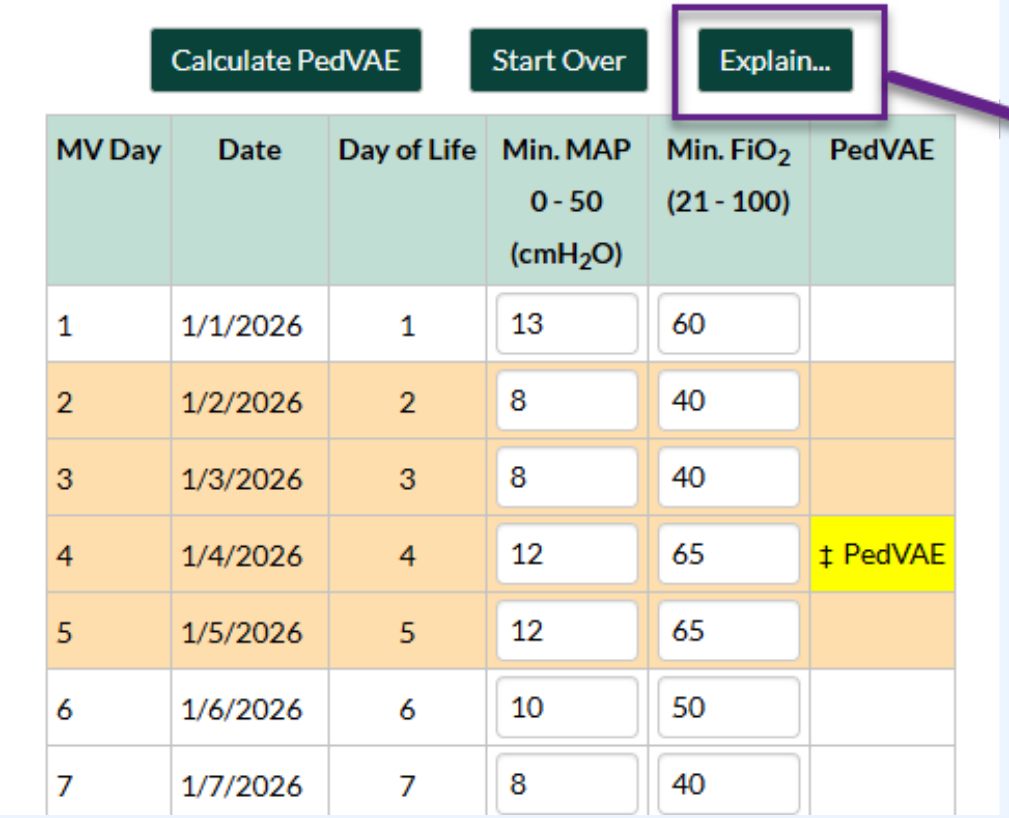
https://www.cdc.gov/nhsn/pedvae-calculator/index.html

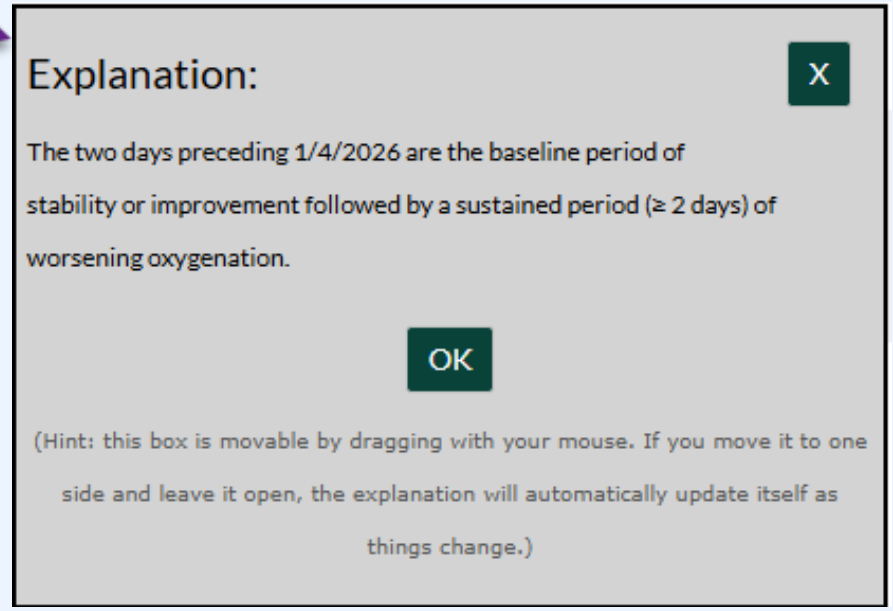
- Available as a tool to assist with making PedVAE determinations
- The calculator runs locally on your computer and none of the data you enter is reported, uploaded, or stored.
  - Experiment with it! Put in test scenarios to see what happens.
- Remember – the correct determination by the calculator is dependent upon the correct data being entered.
  - It is not a substitute for you knowing and understanding the rules for entering the values in the designated fields.

PedVAE Calculator

https://www.cdc.gov/nhsn/pedvae-calculator/index.html

- The “Explain” button in the calculator will display a pop-up message explaining how the “calculation” for the case determination was made.



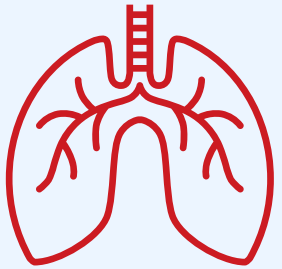


PedVAE Surveillance – Background

Ventilated Patients Risks

- Ventilated patients are at high risk for complications and poor outcomes.
  - Ventilator-associated pneumonia (VAP), sepsis, Acute Respiratory Distress Syndrome (ARDS), pulmonary embolism, barotrauma, and pulmonary edema

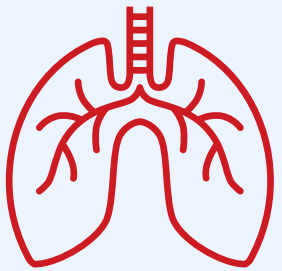
- Ventilator-associated complications can lead to:
  - Longer duration of mechanical ventilation
  - Longer stays in the intensive care unit (ICU) and hospital
  - Increased healthcare costs
  - Increased risk of morbidity and mortality



Neonatal Ventilated Patients Risks

- In preterm neonates, prolonged mechanical ventilation for respiratory distress syndrome can contribute to the development of chronic lung disease.

- Prolonged mechanical ventilation in extremely low birthweight infants is also associated with neurodevelopmental delay.



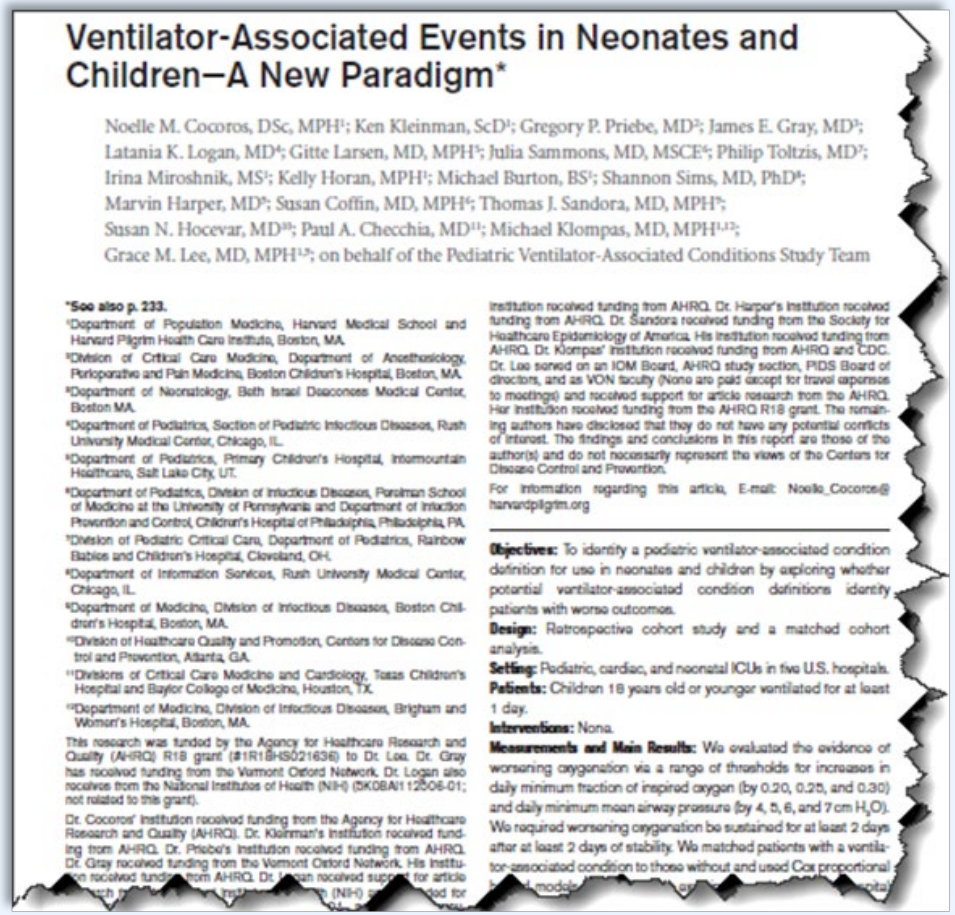
PedVAE Surveillance Development

- Pediatric and Neonatal VAE Surveillance Working Group first convened in 2012 to explore the use of the adult Ventilator-Associated Event (VAE) algorithm in pediatric and neonatal inpatient locations.

- Insufficient data available to inform development of a pediatric VAE definition.

Evidence Base for PedVAE Surveillance

- Publication* in 2016 on the use of a pediatric VAE-like definition demonstrated that the detection of events defined by changes in FiO_2 and Mean Airway Pressure (MAP) was associated with increases in lengths of stay and mortality.



Ventilator-Associated Events in Neonates and Children—A New Paradigm*

Noelle M. Cocoros, DSc, MPH[1]; Ken Kleinman, ScD[2]; Gregory P. Priebe, MD[3]; James E. Gray, MD[3]; Latania K. Logan, MD[4]; Gitte Larsen, MD, MPH[5]; Julia Sammons, MD, MSCE[6]; Philip Toltzis, MD[7]; Irina Miroshnik, MS[1]; Kelly Horan, MPH[1]; Michael Burton, BS[1]; Shannon Sims, MD, PhD[8]; Marvin Harper, MD[9]; Susan Coffin, MD, MPH[4]; Thomas J. Sandora, MD, MPH[9]; Susan N. Hocevar, MD[10]; Paul A. Checchia, MD[11]; Michael Klompas, MD, MPH[1,12]; Grace M. Lee, MD, MPH[1,2]; on behalf of the Pediatric Ventilator-Associated Conditions Study Team

*See also p. 233.

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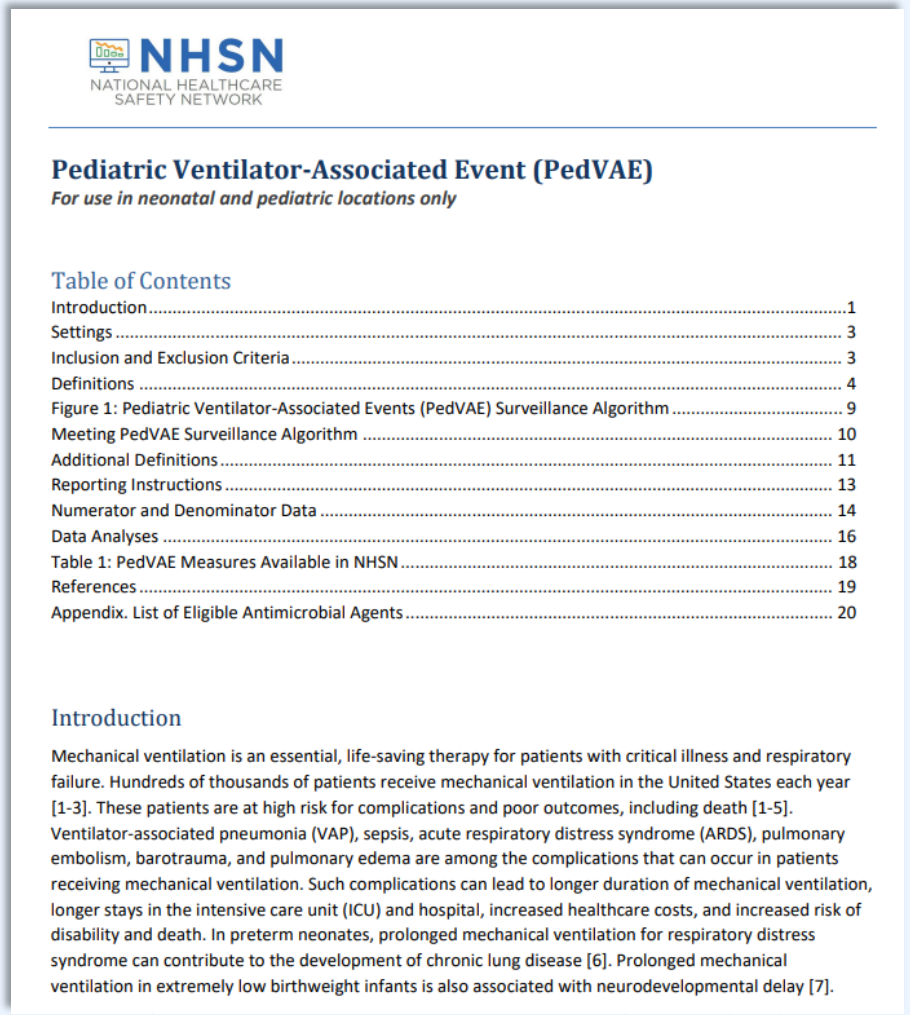
For information regarding this article, E-mail: Noelle_Cocoros@harvardpilgrim.org

Objectives: To identify a pediatric ventilator-associated condition definition for use in neonates and children by exploring whether potential ventilator-associated condition definitions identify patients with worse outcomes.
Design: Retrospective cohort study and a matched cohort analysis.
Setting: Pediatric, cardiac, and neonatal ICUs in five U.S. hospitals.
Patients: Children 18 years old or younger ventilated for at least 1 day.
Interventions: None.
Measurements and Main Results: We evaluated the evidence of worsening oxygenation via a range of thresholds for increases in daily minimum fraction of inspired oxygen (by 0.20, 0.25, and 0.30) and daily minimum mean airway pressure (by 4, 5, 6, and 7 cm H_2O). We required worsening oxygenation be sustained for at least 2 days after at least 2 days of stability. We matched patients with a ventilator-associated condition to those without and used Cox proportional [illegible]

*Cocoros NM, Kleinman K, Priebe GP, et al. Ventilator-Associated Events in Neonates and Children--A New Paradigm. Crit Care Med. 2016 Jan;44:14-22.

PedVAE Surveillance Implementation

- Pediatric and Neonatal VAE Surveillance Working Group consensus reached to begin development of PedVAE, with plans to implement as an available event in NHSN
- PedVAE field testing conducted in 2017
- PedVAE made available as a NHSN surveillance event starting January 2019



NHSN
NATIONAL HEALTHCARE SAFETY NETWORK

Pediatric Ventilator-Associated Event (PedVAE)
For use in neonatal and pediatric locations only

Table of Contents

Introduction

Mechanical ventilation is an essential, life-saving therapy for patients with critical illness and respiratory failure. Hundreds of thousands of patients receive mechanical ventilation in the United States each year [1-3]. These patients are at high risk for complications and poor outcomes, including death [1-5]. Ventilator-associated pneumonia (VAP), sepsis, acute respiratory distress syndrome (ARDS), pulmonary embolism, barotrauma, and pulmonary edema are among the complications that can occur in patients receiving mechanical ventilation. Such complications can lead to longer duration of mechanical ventilation, longer stays in the intensive care unit (ICU) and hospital, increased healthcare costs, and increased risk of disability and death. In preterm neonates, prolonged mechanical ventilation for respiratory distress syndrome can contribute to the development of chronic lung disease [6]. Prolonged mechanical ventilation in extremely low birthweight infants is also associated with neurodevelopmental delay [7].

PedVAE Surveillance – Introduction

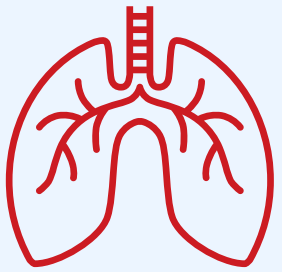
What is a Ventilator?

- **Ventilator:** Any device used to support, assist, or control respiration (inclusive of the weaning period) through the application of positive pressure to the airway when delivered via an artificial airway, specifically an oral/nasal endotracheal or tracheostomy tube

- **Note:** Ventilation and lung expansion devices that deliver positive pressure to the airway (for example, CPAP, BiPAP, Bi-level, IPPB, and PEEP) via noninvasive means (for example, nasal prongs, nasal mask, full face mask, total mask, etc.) are not considered ventilators unless positive pressure is delivered via an artificial airway (oral/nasal endotracheal or tracheostomy tube).

VAE = Ventilator "Associated" Event

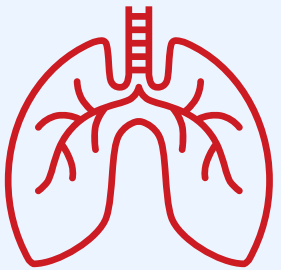
- An adverse event "associated" with the use of a mechanical ventilator
- Detection of PedVAE may be related to:
  - Infection – respiratory or another site
  - Fluid overload
  - Acute Respiratory Distress Syndrome (ARDS)
  - Provider preference in adjusting settings
  - Other
- "Surveillance is information for action"
  - Address duration of mechanical ventilation
  - Address issues found to be "associated" with PedVAE detection



Pediatric Ventilator-Associated Event (PedVAE)

- **PedVAEs** are identified by deterioration in respiratory status after a period of stability or improvement on the ventilator.

- PedVAEs are assessed by monitoring two key parameters that reflect oxygenation status in neonatal and pediatric ventilated patients:
  - Fraction of Inspired Oxygen = FiO_2
  - Mean Airway Pressure = MAP



PedVAE Surveillance Inclusion Criteria: Settings

- Ventilated inpatients in acute care hospitals, long term acute care hospitals, inpatient rehabilitation facilities

- Patients in **pediatric and neonatal locations** where denominator data (patient days and ventilator days) can be collected
  - Ventilated adults in pediatric locations are included in PedVAE surveillance, regardless of age

PedVAE Surveillance Inclusion Criteria: Adjunct Therapies or Alternative Modes of Mechanical Ventilation

- **INCLUDE** patients on:
  - High Frequency Oscillatory or Jet Ventilation
  - Airway Pressure Release Ventilation (APRV)
    - A mode of mechanical ventilation characterized by continuous application of positive airway pressure with an intermittent pressure release phase
    - Other names: BiLevel, Bi Vent, BiPhasic, PCV+, DuoPAP

- **INCLUDE** patients who are receiving a conventional mode of mechanical ventilation:
  - While in the prone position
  - While receiving nitric oxide therapy, helium-oxygen mixtures (heliox), or epoprostenol therapy

PedVAE Surveillance Exclusion Criteria

- Patients on extracorporeal life support or paracorporeal membrane oxygenation are **not eligible** for VAE surveillance.
  - Ineligibility only applies to periods of time while receiving this form of support.
- Patients in non-acute care locations in acute care facilities (such as a chronic care unit)
- Pediatric patients in adult inpatient locations
  - Ventilated pediatric patients in adult locations are included in adult VAE surveillance

Who is not eligible to *meet* PedVAE?

- Patients meeting inclusion criteria for PedVAE surveillance cannot meet PedVAE *criteria* if they have been ventilated less than 4 days.

Ineligible: <4 Days on MV

NO PedVAE possible

- The first two days of ventilation can be used to establish the baseline period of stability or improvement, but the earliest date of event for PedVAE is day 3 of mechanical ventilation.

MV Days 1 & 2 can establish baseline period

Earliest event = MV Day 3

PedVAE Algorithm Overview

Reminder: The PedVAE definition algorithm is for use in surveillance. It is not a clinical definition and is not intended for use in the clinical management of patients.

PedVAE Definition: Algorithm Summary

Patient initiated on mechanical ventilation

↓

Identification of a baseline period of stability or improvement, followed by a sustained period of worsening oxygenation

↓

Pediatric Ventilator-Associated Event

PedVAE Determination

- PedVAEs are determined by identification of deterioration in respiratory status after a period of stability or improvement on the ventilator.

- Assessed by monitoring two key parameters that reflect oxygenation status in neonatal and pediatric ventilated patients:
  - Fraction of Inspired Oxygen = FiO_2
  - Mean Airway Pressure = MAP

FiO_2: Fraction of Inspired Oxygen

- Fraction of Oxygen is inspired gas.
  - FiO_2 of room air is 0.21
  - Oxygen concentration of room air is 21%
- FiO_2 is a setting on the ventilator and is one of the key parameters that can be adjusted depending on the patient's oxygen requirements.
- FiO_2 values of 0.21, 21%, and 21 are used interchangeably.

MAP: Mean Airway Pressure

- Mean Airway Pressure = mean (average) pressure exerted on the airway and lungs from the beginning of inspiration until the beginning of the next inspiration (inspiratory cycle)
- MAP is a measured/calculated value (not a ventilator setting) that is determined by:
  - PEEP – Positive End-Expiratory Pressure
  - PIP – Peak Inspiratory Pressure
  - Inspiratory time
  - Frequency

Daily Minimum Values

- FiO_2 ventilator settings and MAP values documented during the calendar day are used to identify the **daily minimum FiO_2** and **daily minimum MAP** values.
- FiO_2 settings and MAP values are typically recorded in the paper or electronic medical record, on respiratory therapy and/or nursing flow sheets, in the section of the flow sheet that pertains to the respiratory status/mechanical ventilation.
- Use a calendar day (00:00-23:59) to determine, not any other ‘24-hour capture period’.

Daily Minimum Values, continued

- When determining daily minimum values for FiO_2 and MAP, you will use all documented values that are recorded throughout the calendar day during times when the patient is **receiving support from an eligible mode of mechanical ventilation**.
  - Include FiO_2 and MAP values documented during weaning/mechanical ventilation liberation trials as long as the patient is receiving ventilator support during those trials.
  - Exclude FiO_2 and MAP values documented during periods of time when the patient is on extracorporeal life support or paracorporeal membrane oxygenation.

Daily Minimum FiO_2

- The daily minimum FiO_2 is defined as the **lowest documented FiO_2 setting that was maintained > 1 hour during a calendar day.**

- If there is no setting that has been maintained for > 1 hour, then select the lowest setting regardless of period of time in which the setting was maintained.

Knowledge Check #1

Select the lowest value recorded for the calendar day that is maintained for > 1 hour:

	Thursday 00:00	04:00	08:00	12:00	16:00	20:00
FiO_2	0.70	0.60	0.60	0.60	0.50	0.60

A. FiO_2 of 0.70

B. FiO_2 of 0.60

C. FiO_2 of 0.50

Knowledge Check #1 - Rationale

Select the lowest value recorded for the calendar day that is maintained for > 1 hour:

	Thursday 00:00	04:00	08:00	12:00	16:00	20:00
FiO_2	0.70	0.60	0.60	0.60	0.50	0.60

A. FiO_2 of 0.70

B. FiO_2 of 0.60

C. FiO_2 of 0.50

Guidance for Determining Daily Minimum FiO_2

- **When settings are recorded every hour or more frequently:**
  - The PedVAE protocol provides examples of how > 1 hour is to be determined to ensure standardization across all facilities.
    - If documenting every 15 minutes, 5 consecutive recordings at the same setting are needed (for example, at 09:00, 09:15, 09:30, 09:45 and 10:00).
    - If documenting every 30 minutes, 3 consecutive recordings at the same setting are needed (for example, at 09:00, 09:30, and 10:00).
    - If documenting every hour, 2 consecutive recordings at the same setting are needed (for example, 09:00 and 10:00).

Identify the Daily Minimum FiO_2

Select the lowest value recorded for the calendar day that is maintained for > 1 hour:

	Thursday 00:00	02:00	03:00	08:00	12:00	16:00	20:00	23:00
FiO_2	0.70	0.40	0.60	0.50	0.60	0.60	0.60	0.60

0.40 is the lowest FiO_2 recorded during the calendar day – but it was not maintained for > 1 hour. 0.50 is the next lowest FiO_2 value that was maintained for > 1 hour.

Identifying the Daily Minimum FiO_2 – cont.

Ventilation is initiated late in the calendar day on Thursday:

	Thursday 23:00	23:30	Friday 00:00	04:00	08:00	12:00	16:00	20:00
FiO_2	0.70	0.50	0.50	0.50	0.50	0.40	0.50	0.50

FiO_2 of 0.50 is the lowest value for Thursday because no value was maintained for > 1 hour.

Daily Minimum MAP

- The daily minimum MAP is defined as the **lowest value documented during a calendar day regardless of how long the value is maintained.**

- When determining the daily minimum MAP, if MAP value includes a decimal place, then round the MAP value to the nearest whole number. For example:
  - A MAP of 10.00 through 10.49 is rounded to 10.
  - A MAP of 10.50 through 10.99 is rounded to 11.

Daily Minimum MAP, continued

- For **patients < 30 days old**, MAP values of 0-8 cmH_2O are considered equal to 8 cmH_2O.
  - Any day where daily minimum MAP is 0-8 cmH_2O will be assigned a daily minimum MAP value of **8 cmH_2O.**

- For **patients ≥ 30 days old**, MAP values 0-10 cmH_2O are considered equal to 10 cmH_2O.
  - Any day where daily minimum MAP is 0-10 cmH_2O will be assigned a daily minimum MAP value of **10 cmH_2O.**

Knowledge Check #2

Select the lowest MAP value recorded for a patient < 30 days old:

	Tuesday 00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00
MAP	10	8	8	6	5	8	10	10

A. MAP of 10

B. MAP of 8

C. MAP of 6

D. MAP of 5

Knowledge Check #2 - Rationale

Select the lowest MAP value recorded for a patient < 30 days old:

	Tuesday 00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00
MAP	10	8	8	6(8)	5(8)	8	10	10

A. MAP of 10

B. MAP of 8

C. MAP of 6

D. MAP of 5

Explanation: The lowest documented value is 5 cmH20; however, for **patients < 30 days old, MAP values 0-8 = 8**

Knowledge Check #3

Identify the Daily Minimum MAP for a patient ≥ 30 days old

	Tuesday 00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00
MAP	10	8	8	6	5	8	10	10

A. MAP of 10
B. MAP of 8
C. MAP of 5
D. MAP of 6

Knowledge Check #3 – Rationale

Identify the Daily Minimum MAP for a patient ≥ 30 days old

	Tuesday 00:00	02:00	04:00	06:00	08:00	10:00	12:00	14:00
MAP	10	8	8	6(10)	5(10)	8	10	10

The Daily Minimum MAP is <u>10 cmH_2O</u>

A. <u>MAP of 10</u>

B. MAP of 8

C. MAP of 6

D. MAP of 5

Explanation: The lowest documented value is 5 cmH_2O; however, for **<u>patients ≥ 30 days old, MAP values 0-10 = 10</u>**

Identify the Daily Minimum MAP

Select the lowest value recorded during the calendar day regardless of how long it was maintained:

	Tuesday 00:00	03:00	06:00	12:00	15:00	18:00	21:00	23:00
MAP	12.6	12.4	11.5	11.7	12.3	12.8	13.2	13.4
	13	12	12	12	12	13	13	13

The Daily Minimum MAP is 12 cmH_2O

Explanation: Remember to round MAP values as follows:

- MAP decimals of .00 - .49 are rounded down to the nearest whole number
- MAP decimals of .50 - .99 are rounded up to the nearest whole number

Knowledge Check #4

Daily minimum MAP is defined as the lowest MAP value that is maintained for > 1 hour during the calendar day.

A. True

B. False

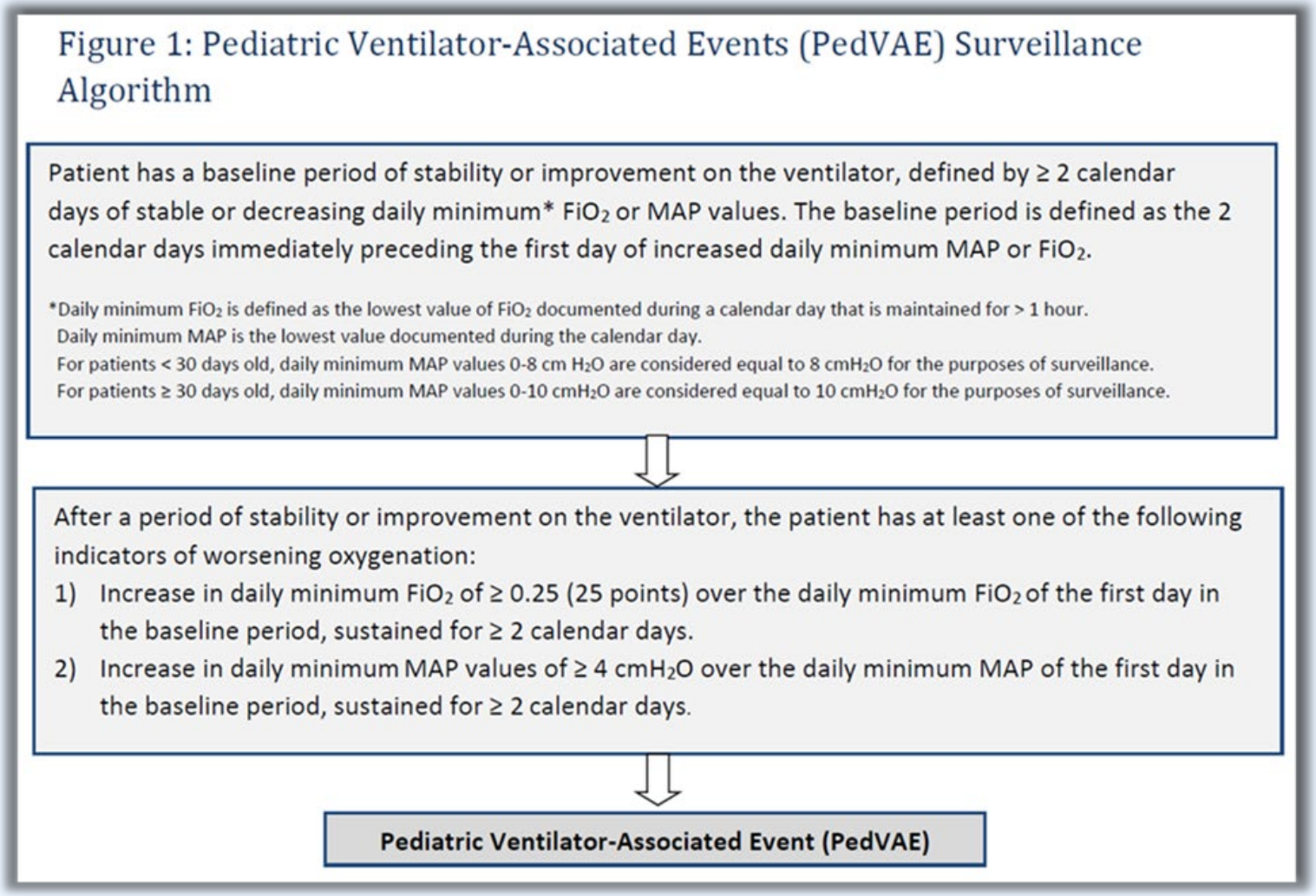
Knowledge Check #4 – Rationale

FALSE

- Daily minimum MAP is the lowest MAP value documented during the calendar day, regardless of how long the value is maintained.
- When determining the daily minimum MAP, keep the following in mind:
  - MAP values documented to the decimal place are rounded to the nearest whole number.
  - For patients < 30 days old, MAP values 0-8 cmH2O are assigned a MAP value of 8.
  - For patients ≥ 30 days old, MAP values of 0-10 cmH2O are assigned a MAP value of 10.

Applying the PedVAE Algorithm

PedVAE Surveillance Algorithm



PedVAE Protocol, pg. 11-9 - https://www.cdc.gov/nhsn/pdfs/pscmanual/pedvae-current-508.pdf

Baseline Period of Stability or Improvement

- A period of stability or improvement, defined by ≥ 2 calendar days of stable or decreasing daily minimum FiO_2 values or stable or decreasing daily minimum MAP values.

- The baseline period is defined as the two calendar days immediately preceding the first day of increased daily minimum FiO_2 or MAP (evidence of worsening oxygenation).

Period of Stability or Improvement, continued

- **Period of Stability or Improvement**: ≥ 2 calendar days of **stable or decreasing** daily minimum FiO_2 or MAP values

Stability

Vent Day	FiO_2
1	40
2	40
3	40

Improvement

Vent Day	FiO_2
1	50
2	40
3	30

- **Baseline Period**: the **2 calendar days** immediately preceding the first day of evidence of worsening oxygenation

Evidence of Worsening Oxygenation

- **Evidence of Worsening Oxygenation**: After a period of stability or improvement on the ventilator, the patient has at least one of the following indicators of worsening oxygenation:
  - Increase in the daily minimum FiO_2 of **≥ 0.25 (25 points)** over the daily minimum FiO_2 of the first day in the baseline period, sustained for ≥ 2 calendar days.

  OR

  - Increase in the daily minimum MAP values of **≥ 4 cmH_2O** over the daily minimum MAP of the first day in the baseline period, sustained for ≥ 2 calendar days.

Daily Minimum Values Application

- The daily minimum FiO_2 and daily minimum MAP values are used to determine both the baseline period of stability or improvement and the period that indicates worsening oxygenation.

- Stability or improvement and worsening are not identified by comparing FiO_2 settings and MAP values that occur during a calendar day but by **comparing the daily minimum values from calendar day to calendar day.**

Meeting PedVAE

- Use the daily minimum FiO_2 and MAP values when assessing for both the period of stability or improvement and the period that indicates worsening oxygenation.
- Do not compare values that occur within a calendar day to determine stability, improvement, or worsening.
- The baseline period and the evidence of worsening oxygenation must occur in the same parameter.
- Each parameter is assessed independently of the other – PedVAE may be met only in the FiO_2 parameter, only in the MAP parameter, or in both parameters.

Knowledge Check #4

PedVAE can be met with a baseline period of stability in the MAP parameter and a period of worsening oxygenation in the FiO_2 parameter.

A. True

B. False

Knowledge Check #4 – Rationale

FALSE

- When meeting the PedVAE definition the baseline period of stability or improvement and the period of worsening oxygenation must occur in the same parameter.
- The FiO_2 parameter and the MAP parameter are assessed independently of the other.
- PedVAE can be met in only the FiO_2 parameter, or in only the MAP parameter, or both parameters.

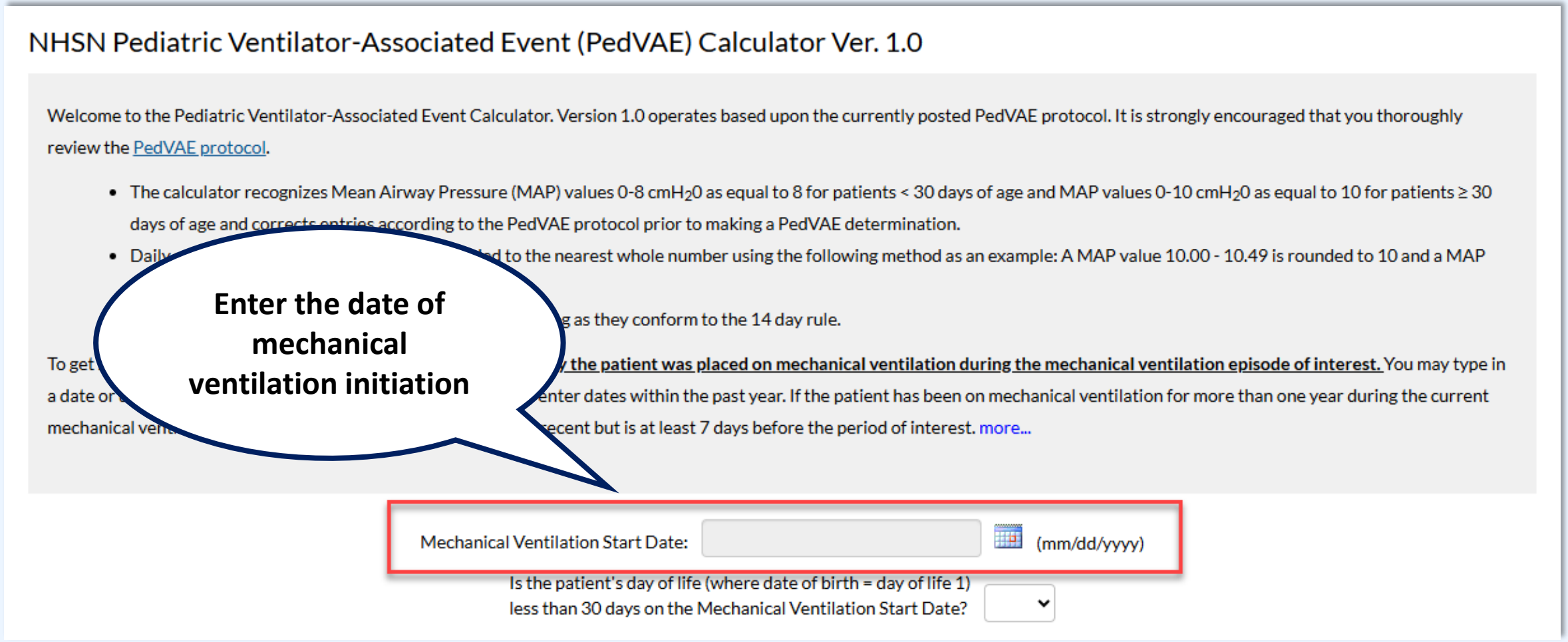
Meeting the PedVAE Definition

- Patients must be mechanically ventilated for some portion of the day for at least 4 consecutive calendar days to fulfill PedVAE criteria (where the day of intubation or initiation of mechanical ventilation is day 1):
  - At least **2 days** of stability or improvement
  - At least **2 days** of evidence of worsening oxygenation

Meeting PedVAE – Date of Mechanical Ventilation Initiation

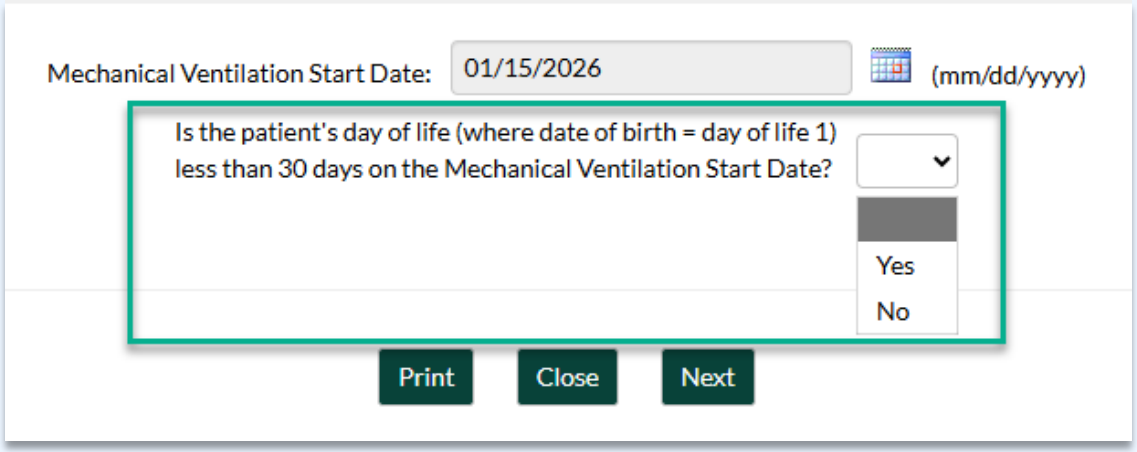
- Actual date of mechanical ventilation initiation, not the date of admission to the facility
- Estimate of the actual date of mechanical ventilation initiation can be used if needed
- Only if the actual date or an estimate of the actual date cannot be determined will the date of mechanical ventilation initiation default to the date of admission to the facility.

Meeting PedVAE Using the PedVAE Calculator – Date of Mechanical Ventilation Initiation

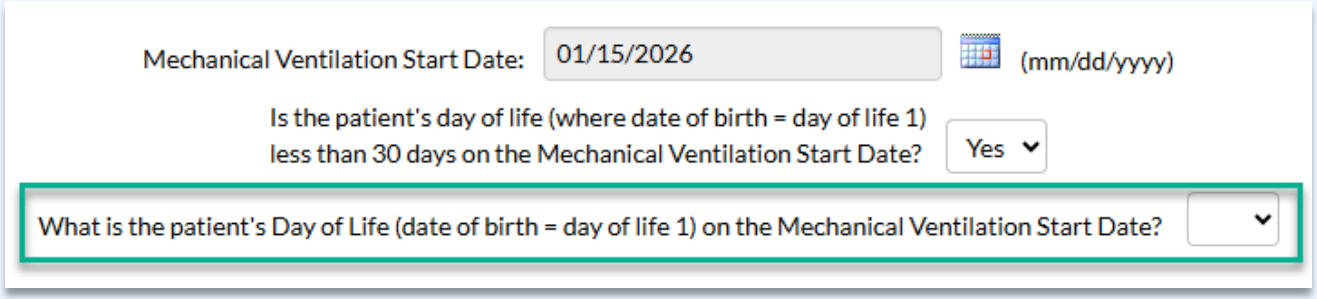


Day of Life

- Used to determine which daily minimum MAP value interpretation to apply

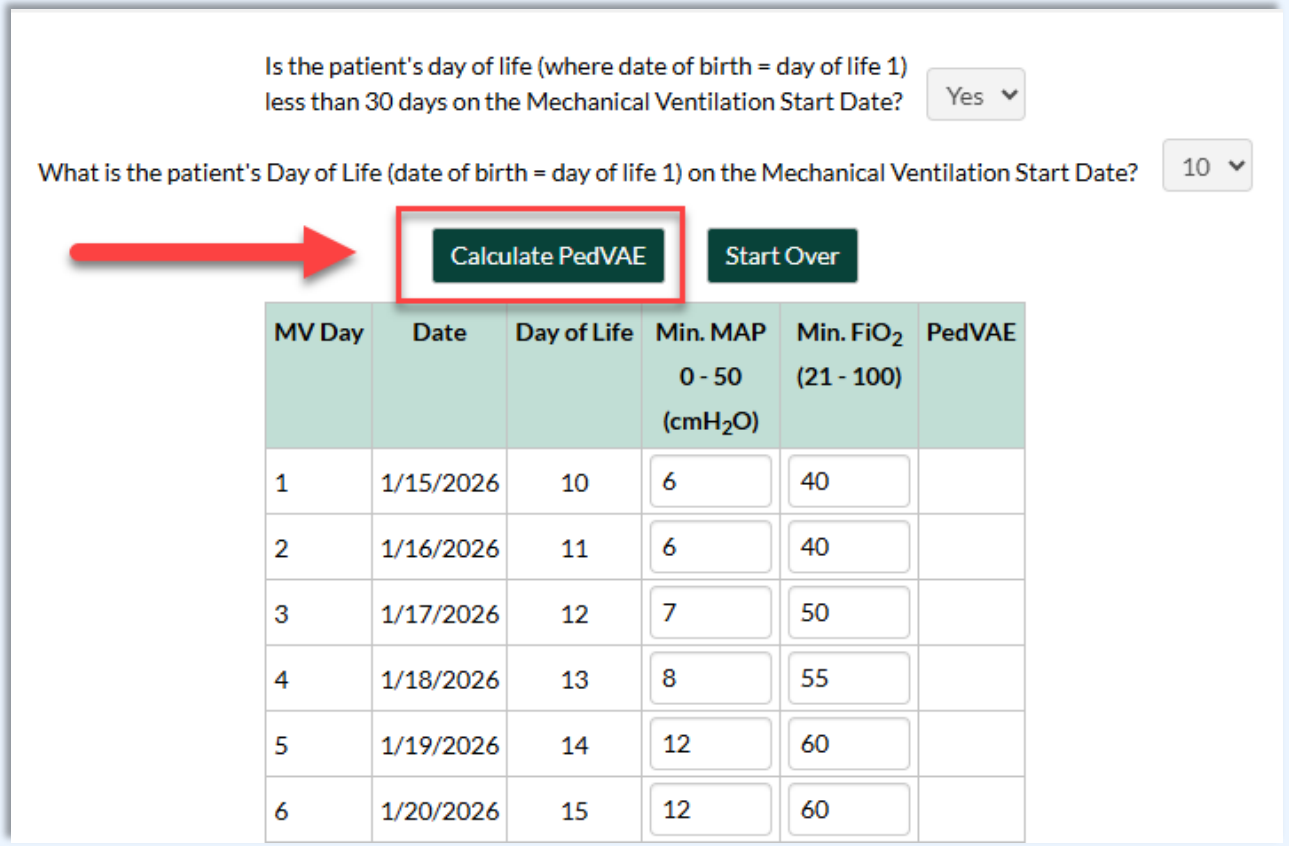


- If the patient is less than 30 days old, you will also answer the following:



PedVAE Calculator: Patient < 30 days old

- The patient is < 30 days old on the Mechanical Ventilation Start Date.
- Enter the Daily Minimum MAP and FiO_2 values and click on “Calculate PedVAE.”



MV Day	Date	Day of Life	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/15/2026	10	6	40	
2	1/16/2026	11	6	40	
3	1/17/2026	12	7	50	
4	1/18/2026	13	8	55	
5	1/19/2026	14	12	60	
6	1/20/2026	15	12	60	

PedVAE Determination: FiO_2 Parameter

A baseline period of stability or improvement in the **FiO_2 parameter** is immediately followed by an increase in the daily minimum FiO_2 of **≥ 0.25 (25 points)** over the daily minimum FiO_2 of the first day in the baseline period that is sustained for ≥ 2 calendar days.

Meeting PedVAE: FiO_2 Parameter

- 2-day period of **stability**
- 2-day period of **worsening**

Calculate PedVAE | Start Over

MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/15/2026		50	
2	1/16/2026		40	
3	1/17/2026		40	
4	1/18/2026		65	
5	1/19/2026		70	
6	1/20/2026		70	
7	1/21/2026		65	

Meeting PedVAE: FiO_2 Parameter

- **PedVAE is met**
  - Baseline period of ≥ 2 calendar days of stable daily minimum FiO_2 values
  - Increase in daily minimum FiO_2 values of ≥ 0.25 (25 points) over the daily minimum FiO_2 of the first day in the baseline period and sustained for ≥ 2 calendar days

Calculate PedVAE | Start Over | Explain...

MV Day	Date	Day of Life	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/15/2026	10		50	
2	1/16/2026	11		40	
3	1/17/2026	12		40	
4	1/18/2026	13		65	‡ PedVAE
5	1/19/2026	14		70	
6	1/20/2026	15		70	
7	1/21/2026	16		65	

Meeting PedVAE: FiO_2 Parameter

- **PedVAE is NOT met**
  - Baseline period of improvement
  - ≥ 0.25 (25 points) increase is not over the first day in the baseline period

Calculate PedVAE | Start Over | Explain...

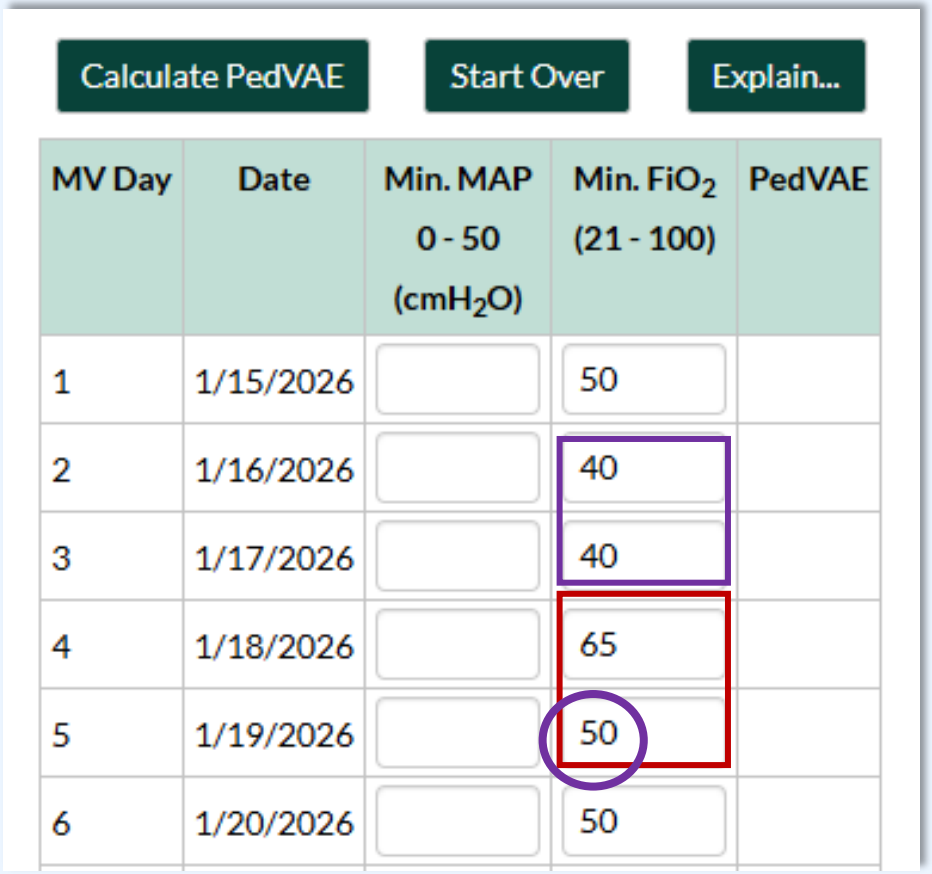
MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/15/2026		50	
2	1/16/2026		50	
3	1/17/2026		40	
4	1/18/2026		65	
5	1/19/2026		70	
			70	

NHSN Pediatric Ventilator-Associated Event (PedVAE) Calculator Ver. 1.0

No Pediatric Ventilator-Associated Event (PedVAE) detected. Click on the "Explain" button to see an explanation of the PedVAE definition.

Meeting PedVAE: FiO_2 Parameter

- **PedVAE is NOT met**
  - Baseline period of stability
  - ≥ 0.25 (25 points) increase over the baseline period <u>is not sustained for ≥ 2 calendar days</u>



MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/15/2026		50	
2	1/16/2026		40	
3	1/17/2026		40	
4	1/18/2026		65	
5	1/19/2026		50	
6	1/20/2026		50	

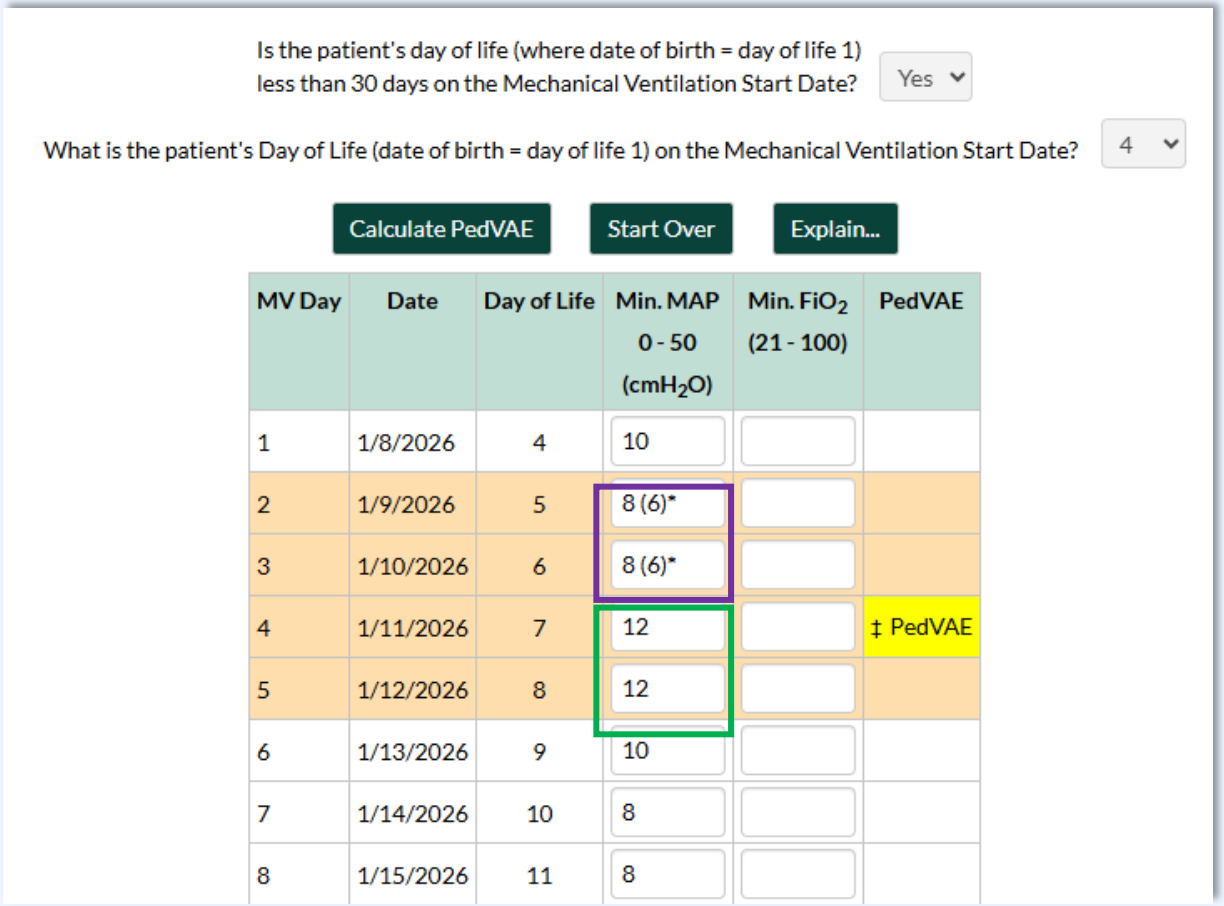
PedVAE Determination: MAP Parameter

A baseline period of stability or improvement in the **MAP parameter** is immediately followed by an increase in the daily minimum MAP of **≥ 4 cmH_2O** over the daily minimum MAP of the first day in the baseline period that is sustained for ≥ 2 calendar days.

Meeting PedVAE: MAP Parameter

*Patient < 30 days old – MAP values 0-8 = 8

- **PedVAE is met**
  - Baseline period of ≥ 2 calendar days of stable daily minimum MAP values
  - Increase in daily minimum MAP values of ≥ 4 cmH_2O over the daily minimum MAP of the first day of the baseline period and sustained for ≥ 2 calendar days



Is the patient's day of life (where date of birth = day of life 1) less than 30 days on the Mechanical Ventilation Start Date? Yes

What is the patient's Day of Life (date of birth = day of life 1) on the Mechanical Ventilation Start Date? 4

Calculate PedVAE | Start Over | Explain...

MV Day	Date	Day of Life	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/8/2026	4	10		
2	1/9/2026	5	8 (6)*		
3	1/10/2026	6	8 (6)*		
4	1/11/2026	7	12		‡ PedVAE
5	1/12/2026	8	12		
6	1/13/2026	9	10		
7	1/14/2026	10	8		
8	1/15/2026	11	8		

Meeting PedVAE: MAP Parameter

*Patient ≥ 30 days old – MAP value 0-10 = 10

- **PedVAE is NOT met**
  - Baseline period of stability
  - Increase in MAP parameter does not meet requirement of ≥ 4 cmH_2O over the first day of the baseline period

Is the patient's day of life (where date of birth = day of life 1) less than 30 days on the Mechanical Ventilation Start Date? No

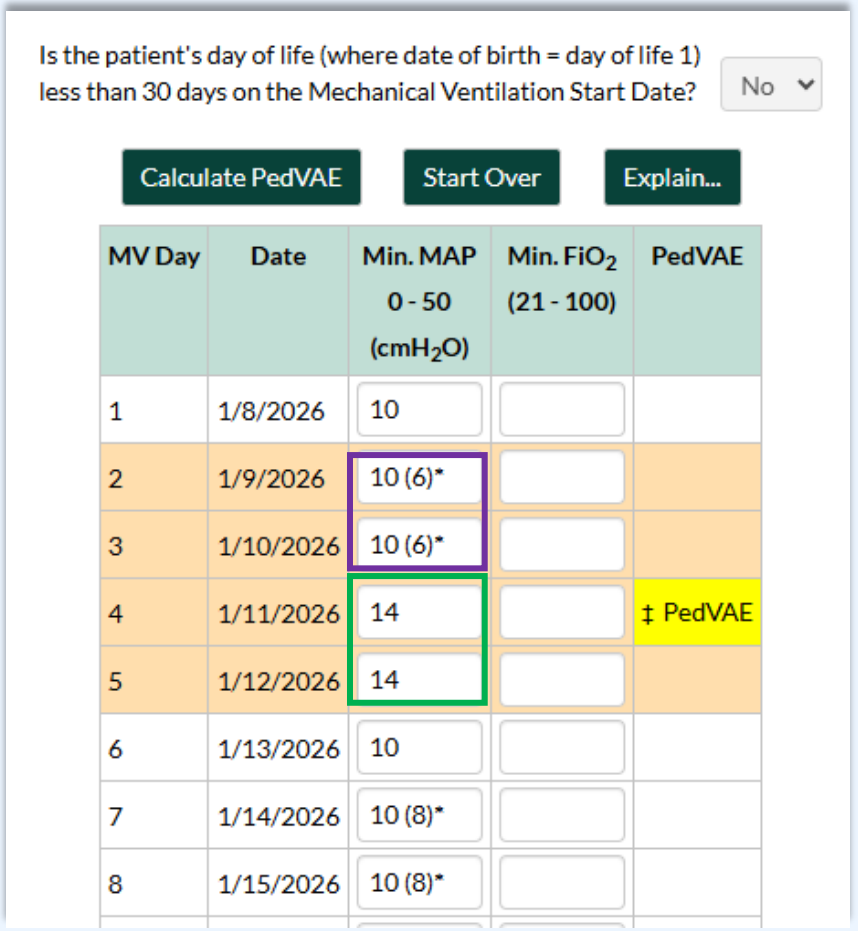
Calculate PedVAE | Start Over | Explain...

MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/8/2026	10		
2	1/9/2026	10 (6)*		
3	1/10/2026	10 (6)*		
4	1/11/2026	12		
5	1/12/2026	12		
6	1/13/2026	10		
7	1/14/2026	10 (8)*		
8	1/15/2026	10 (8)*		

Meeting PedVAE: MAP Parameter

*Patient ≥ 30 days old – MAP value 0-10 = 10

- **PedVAE met**
  - Baseline period of stability
  - Increase in daily minimum MAP value of ≥ 4 cmH_2O over the daily minimum MAP of the first day of the baseline period and sustained for ≥ 2 calendar days



Is the patient's day of life (where date of birth = day of life 1) less than 30 days on the Mechanical Ventilation Start Date? No

Calculate PedVAE | Start Over | Explain...

MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/8/2026	10		
2	1/9/2026	10 (6)*		
3	1/10/2026	10 (6)*		
4	1/11/2026	14		‡ PedVAE
5	1/12/2026	14		
6	1/13/2026	10		
7	1/14/2026	10 (8)*		
8	1/15/2026	10 (8)*		

Date of Event

- The date of onset of worsening oxygenation (day 1 of the required ≥ 2-day period of worsening oxygenation following a ≥ 2-day period of stability or improvement on the ventilator)
  - Earliest date of event for PedVAE is mechanical ventilation day 3 (first day of worsening oxygenation).
  - The first two days of mechanical ventilation can establish the baseline period.

Date of Event: Determination

*Patient < 30 days old

- Date of Event = Mechanical Vent (MV) day 4 (first day of worsening oxygenation)
- 14-day Event Period = MV day 4 – MV day 17

Calculate PedVAE | Start Over | Explain...

MV Day	Date	Day of Life	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	1/15/2026	10	10		
2	1/16/2026	11	8 (6)*		
3	1/17/2026	12	8 (6)*		
4	1/18/2026	13	12		‡ PedVAE
5	1/19/2026	14	12		
6	1/20/2026	15	10		
7	1/21/2026	16	8		
8	1/22/2026	17	8		

14-Day Event Period

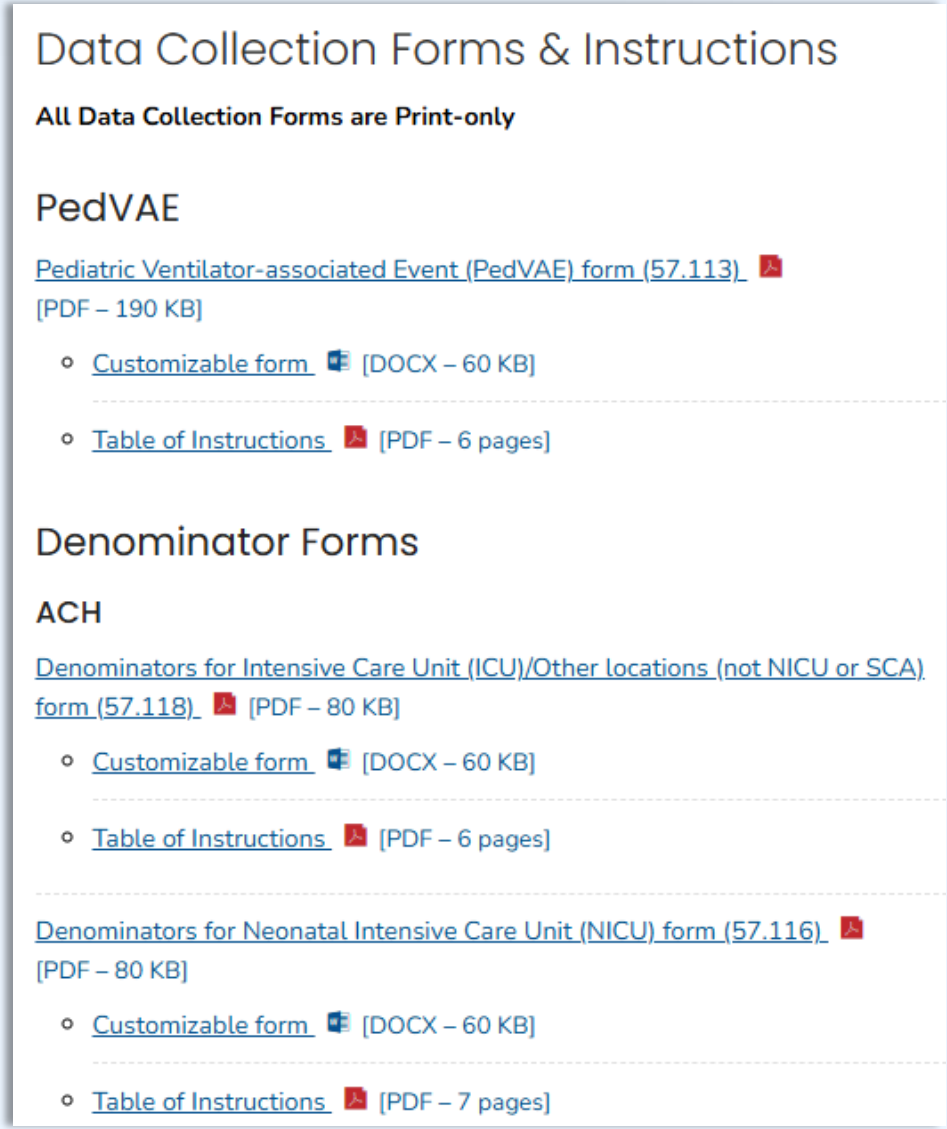
- PedVAEs are defined by a 14-day event period.
- The Date of Event is day 1 of the 14-day event period.
  - A new PedVAE cannot be reported until the 14-day period has elapsed.
  - For example, if a PedVAE is reported with a date of event March 1, this sets a 14-day event period of March 1 – 14, and the earliest date a new PedVAE can be detected and reported is March 15.
  - The 2 days of stability or improvement for a new PedVAE can occur during the previous 14-day event period.

Reporting PedVAE

PedVAE Data Collection Forms and Instructions

https://www.cdc.gov/nhsn/psc/pedvae/index.html

- Event form
- Denominator forms
  - ICU
  - NICU
- Tables of Instructions



Data Collection Forms & Instructions

All Data Collection Forms are Print-only

PedVAE

Pediatric Ventilator-associated Event (PedVAE) form (57.113) [PDF – 190 KB]

- Customizable form [DOCX – 60 KB]
- Table of Instructions [PDF – 6 pages]

Denominator Forms

ACH

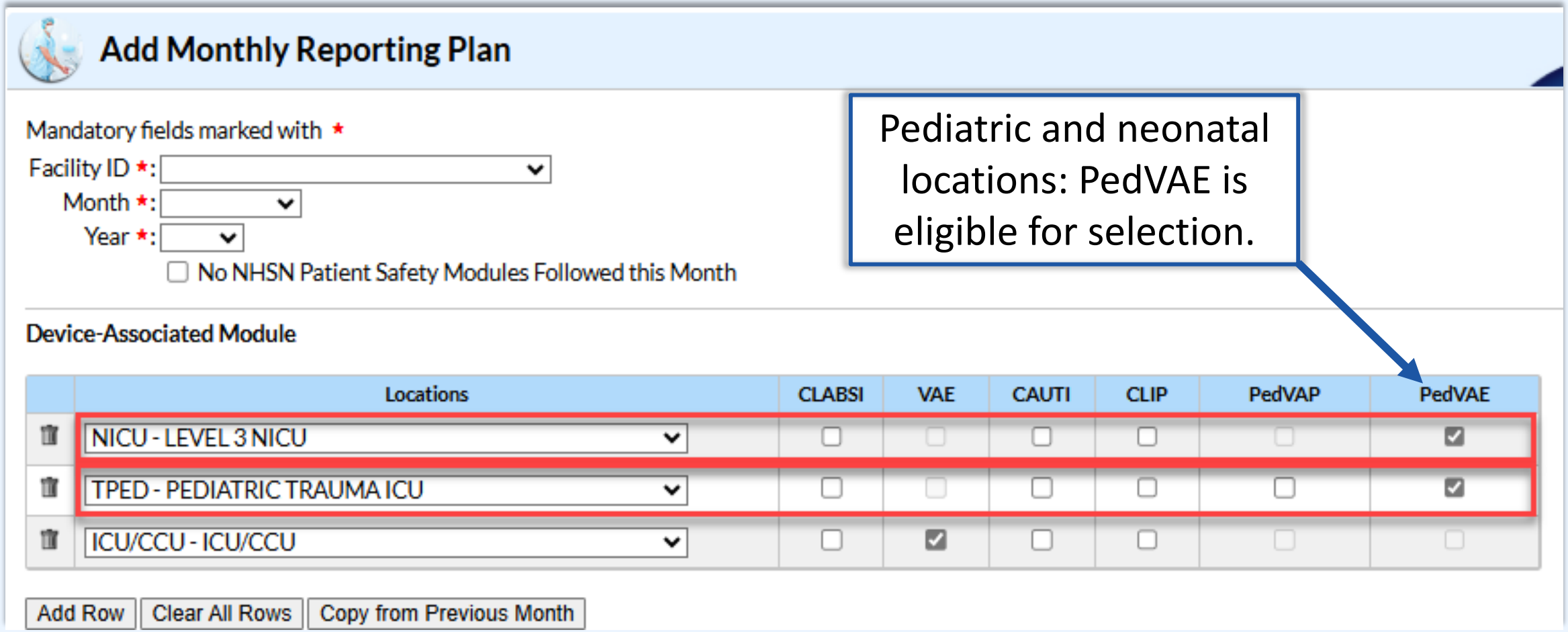
Denominators for Intensive Care Unit (ICU)/Other locations (not NICU or SCA) form (57.118) [PDF – 80 KB]

- Customizable form [DOCX – 60 KB]
- Table of Instructions [PDF – 6 pages]

Denominators for Neonatal Intensive Care Unit (NICU) form (57.116) [PDF – 80 KB]

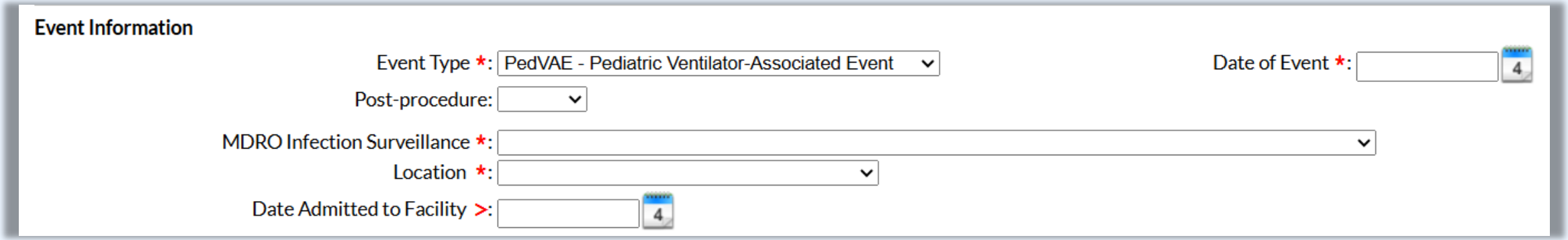
- Customizable form [DOCX – 60 KB]
- Table of Instructions [PDF – 7 pages]

PedVAE: Monthly Reporting Plan



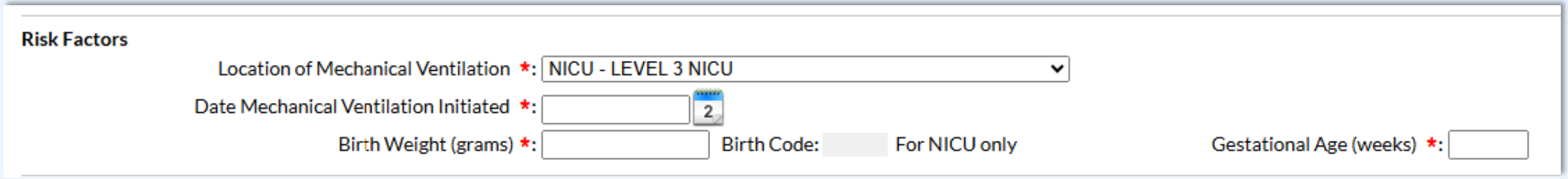
PedVAE: Event Information

- Select **Event Type**: PedVAE
- Fill in **Date of Event**
- Fill in patient's **Location** on the Date of Event
- Enter **Date Admitted to Facility**



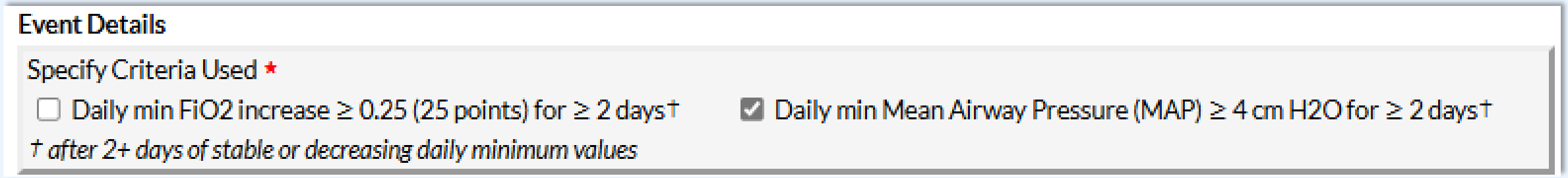
PedVAE: Risk Factors

- Enter **Location of Mechanical Ventilation.**
- Enter **Date Mechanical Ventilation Initiated.**
- For Neonatal Intensive Care Unit (NICU) patients enter:
  - **Birth Weight**
  - **Gestational Age**



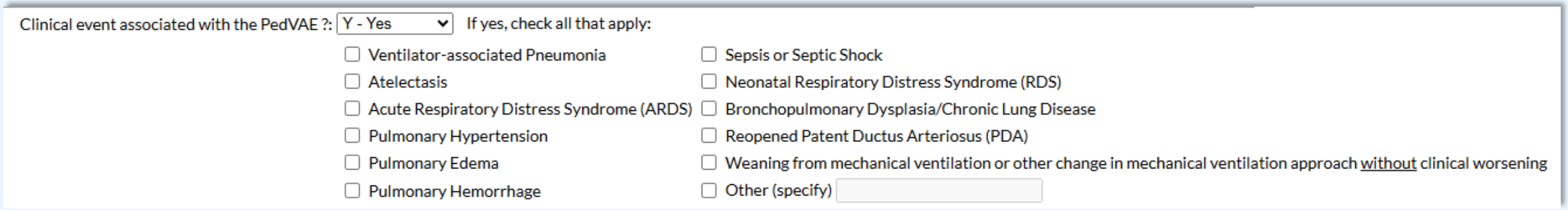
PedVAE: Event Details

- Select the specific criteria used to meet the PedVAE definition:
  - FiO_2
  - MAP



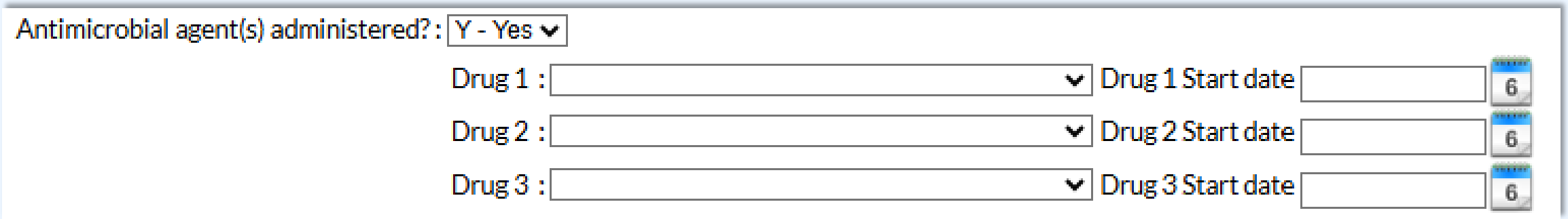
PedVAE: Clinical Event

- Select '**Yes**' if the PedVAE is associated with any clinical diagnoses or events.
- If '**Yes,**' check all that apply.
- If '**Other**' is checked, there is a 200-character limit.



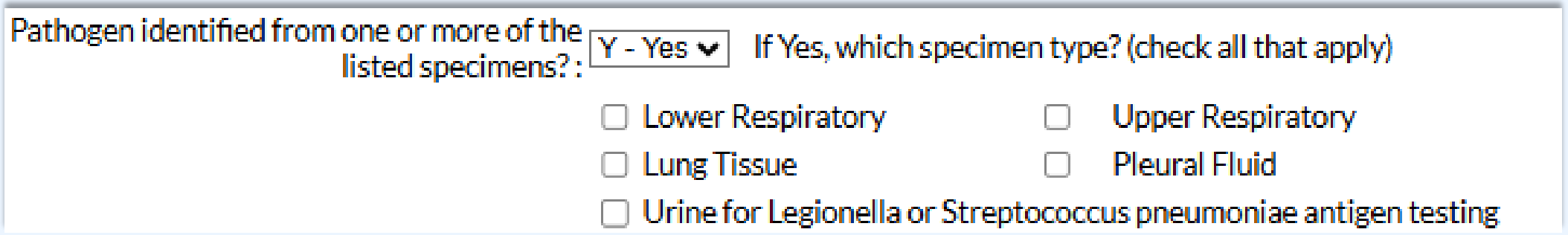
PedVAE: Antimicrobial Agents

- Select '**Yes**' if an antimicrobial agent listed in the PedVAE Appendix was administered on the Date of Event or within 2 days before or 2 days after.
- If '**Antimicrobial agent(s) administered?**' = **Y**, record drug(s) (up to 3) and enter the **Drug Start Date.**
  - Drug Start Date is limited to 1 year prior to current admission date.



PedVAE: Pathogens

- **Pathogen identified from listed specimens**: Select '**Yes**' if a pathogen was detected in any of the specimen types listed with collection dates on the Date of Event or within 2 days before or 2 days after.
- **Pathogen identified from BLOOD**: Select '**Yes**' if a pathogen was identified from blood with a specimen collection date within 2 days before or 13 days after the Date of Event.
- If 'Yes' to either, enter up to 3 pathogens.



Pediatric Location Summary Data

Denominators for Intensive Care Unit (ICU)/Other locations (not NICU or SCA)

Mandatory fields marked with *

Facility ID *:

Location Code *: PEDSURG - PEDIATRIC SURGERY UNIT

Month *:

Year *:

Denominator Data

		Report No Events
Total Patient Days *:		
Central Line Days :		CLABSI :
Urinary Catheter Days :		CAUTI :
Ventilator Days *:		VAE : / PedVAE : / PedVAP :
APRV Days :		
Episodes of Mechanical Ventilation :		

Sample Values For Estimating Denominator Data

		Check Box(es) if Sampling Used
Sample Patient Days :		
Sample Central Line Days :		
Sample Urinary Catheter Days :		

Total Patient Days and **Ventilator Days** are required fields.

Neonatal ICU Location Summary Data

Neonatal Intensive Care Unit

Mandatory fields marked with *

Facility ID *:

Location Code *: NICU - LEVEL 3 NICU

Month *:

Year *:

Birth Weights

Birth Weight	Patient Days *	CL Days	No CLABSI	Vent Days *	No PedVAE	No PedVAP	EMV	UrC Days
<=750								
751-1000								
1001-1500								
1501-2500								
>2500								

Total Patient Days and **Vent Days** by Birth Weight are required fields

Patient Days and **Vent Days** by Gestational Age are optional fields

Gestational Ages

Gestational Age	Patient Days	Vent Days	No PedVAE	EMV
Extremely preterm (<28 weeks)				
Very preterm (28 to <32 weeks)				
Moderate to late preterm (32 to <37 weeks)				
Term (>=37 weeks)				

Tips for PedVAE Surveillance and Reporting

PedVAE Surveillance Resources

- Familiarize yourself with the PedVAE webpage: https://www.cdc.gov/nhsn/psc/pedvae/index.html
- Read the PedVAE protocol: https://www.cdc.gov/nhsn/pdfs/pscmanual/pedvae-current-508.pdf
- Read the Tables of Instructions: https://www.cdc.gov/nhsn/pdfs/pscmanual/pedvae-current-508.pdf
- Review the PedVAE FAQs: https://www.cdc.gov/nhsn/faqs/faq-pedvae.html
- Use the PedVAE calculator: https://www.cdc.gov/nhsn/pedvae-calculator/index.html

Tips for PedVAE Surveillance

- Establish relationships with **Respiratory Therapy** and **Pediatric/Neonatal Critical Care** colleagues.
  - Share the protocol and FAQs.
  - Discuss options for collection of daily minimum FiO_2 and MAP for each MV day (IP, RT, electronically generated).

Questions

Thank you.

For any questions or concerns, contact the NHSN Helpdesk

- **NHSN-ServiceNow** to submit questions to the NHSN Help Desk.
- Access new portal at **https://servicedesk.cdc.gov/nhsncsp**.
- If you do not have a SAMS login, or are unable to access ServiceNow, you can still email the NHSN Help Desk at nhsn@cdc.gov.

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 https://www.cdc.gov/
Follow us on social **@CDCgov**

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U. S. Centers for Disease Control and Prevention.