Pediatric Ventilator-associated Event (PedVAE)

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Today's Training Goals

- Review the History and Development of PedVAE
- Review PedVAE Key Terms and How to Select Daily Minimum Values
- Review the PedVAE Surveillance Algorithm
- Review the Use of the PedVAE Calculator

Ventilated Patients and the Need for Surveillance

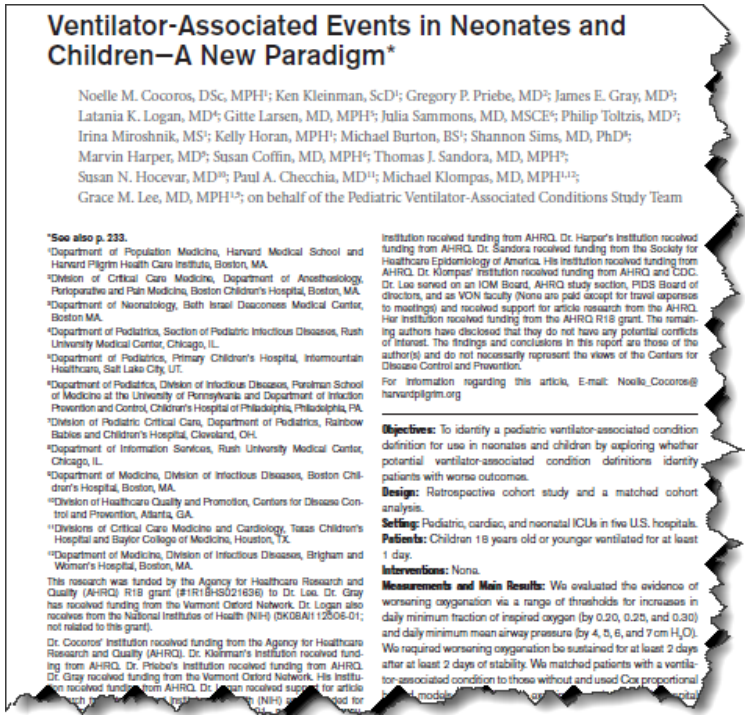
- Ventilated patients are at high risk for complications and poor outcomes
  - Ventilator-associated pneumonia (VAP), sepsis, Acute Respiratory Distress Syndrome (ARDS), pulmonary embolism, barotrauma, and pulmonary edema
- Such complications can lead to longer duration of mechanical ventilation, longer stays in the 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
- Prolonged mechanical ventilation in extremely low birthweight infants is also associated with neurodevelopmental delay

Pediatric Ventilator-associated Event Surveillance

- **Neonatal & Pediatric VAE Surveillance Working Group** convened 2012 to explore use of VAE (adult algorithm) in pediatric and neonatal inpatient locations
  - Insufficient data to use the same approach as used for adults
  - January 2014 *in-plan* surveillance for ventilator-associated pneumonia (PNEU/VAP) removed for neonatal locations.
  - PNEU/VAP surveillance only available in pediatric inpatient locations (pedVAP)

Pediatric Ventilator-associated Event Surveillance

- Publication* in 2016 on the use of a pediatric VAE-like definition demonstrated detection of events defined by changes in FiO_2 and Mean Airway Pressure were associated with increases in length of stay and mortality



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

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*See also p. 233.

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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] models [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.

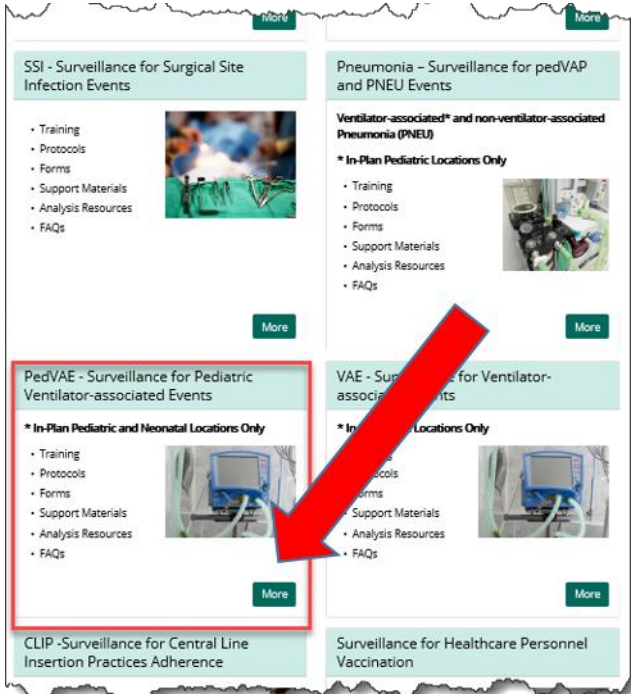
Pediatric Ventilator-associated Event Surveillance (cont'd)

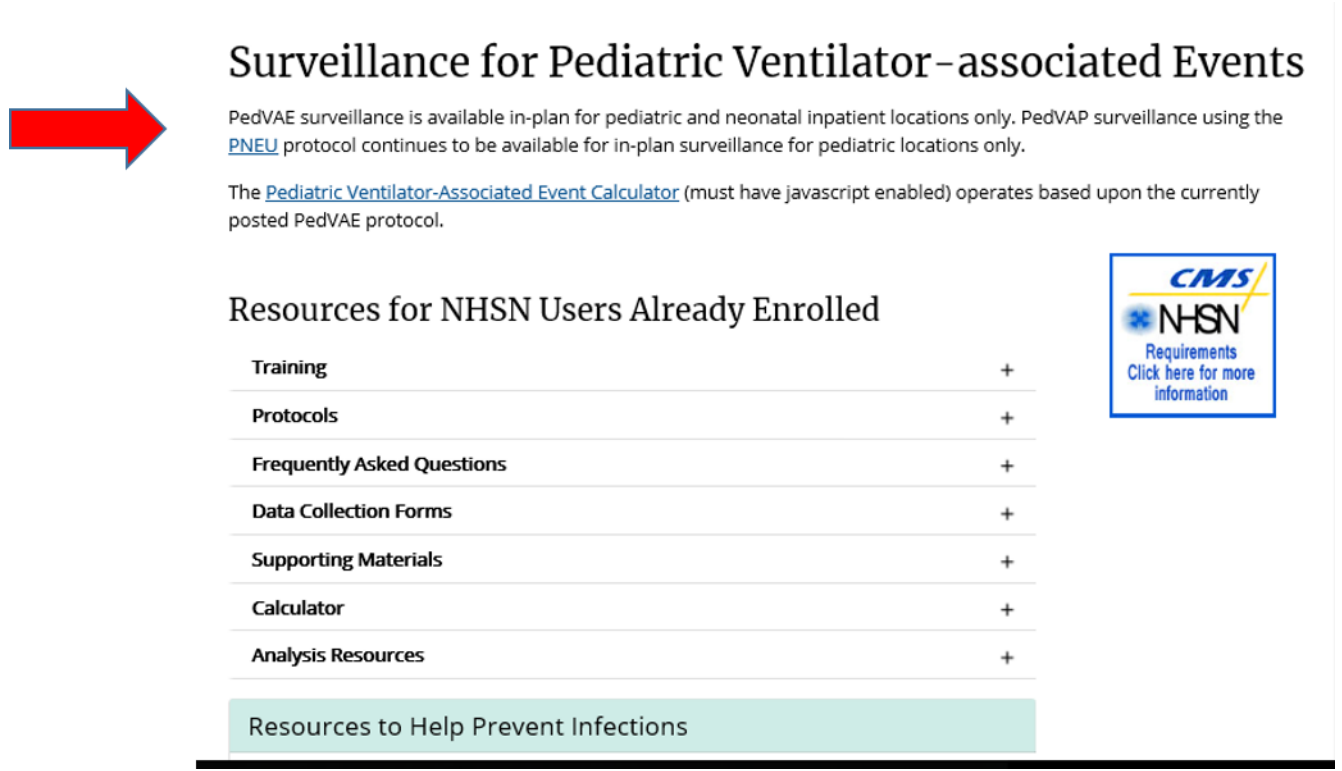
- Working Group consensus reached to begin development with a plan to implement PedVAE as an available event in NHSN
- PedVAE field testing conducted in 2017
- Available as an event beginning January 2019

PedVAE Surveillance

Where do I find the PedVAE Protocol?

Acute Care, Long-term Acute Care, Inpatient Rehabilitation…..





- https://www.cdc.gov/nhsn/acute-care-hospital/pedvae/index.html
- https://www.cdc.gov/nhsn/ltach/pedvae/index.html
- https://www.cdc.gov/nhsn/inpatient-rehab/pedvae/index.html

Resources for NHSN Users Already Enrolled

Training +

Protocols −

- Pediatric Ventilator-Associated Event (PedVAE) Protocol, January 2019 [PDF – 600 KB]
- NHSN Overview January, 2019 [PDF – 350 KB]
- Identifying Healthcare-associated Infections (HAIs) in NHSN, January 2019 [PDF – 1 MB]
- Patient Safety Monthly Reporting Plan, January 2019 [PDF – 250 KB]

Frequently Asked Questions −

New! 2019 FAQs:

- FAQs: Pediatric Ventilator-Associated Events (PedVAE)
- FAQs: Analysis
- FAQs: Annual Surveys
- FAQs: Locations
- FAQs: Miscellaneous
- FAQs: CDA

Data Collection Forms +

Supporting Materials +

Calculator −

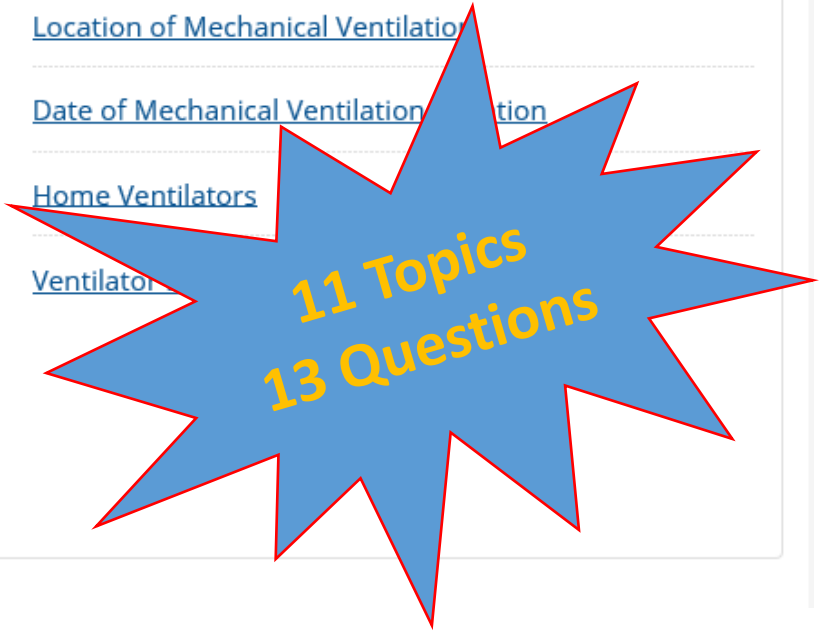
Pediatric Ventilator-Associated Event Calculator (javascript must be enabled)

Analysis Resources +

FAQs: Pediatric Ventilator-Associated Events (PedVAE)

On This Page

- Excluded Ventilator Modes
- Weaning/Mechanical Ventilation Liberation Trials and PedVAE
- Daily Minimum Values
- Pneumonia present on admission or prior to initiation of ventilation and PedVAE surveillance
- Lower Respiratory Tract Events
- Secondary BSI to lower respiratory events in locations performing PedVAE surveillance
- Episode of Mechanical Ventilation
- Location of Mechanical Ventilatio
- Date of Mechanical Ventilation tion
- Home Ventilators
- Ventilator



Who is eligible for PedVAE surveillance?

- Ventilated inpatients of acute care hospitals, long term acute care hospitals, inpatient rehabilitation facilities
- Patients in pediatric and neonatal locations only where denominator data (patient days and ventilator days) can be collected
  - Ventilated adults in pediatric locations are included in PedVAE surveillance – regardless of age

Who is NOT eligible for PedVAE surveillance?

- 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
- Non-acute care locations in acute care facilities are not eligible to participate in PedVAE surveillance.

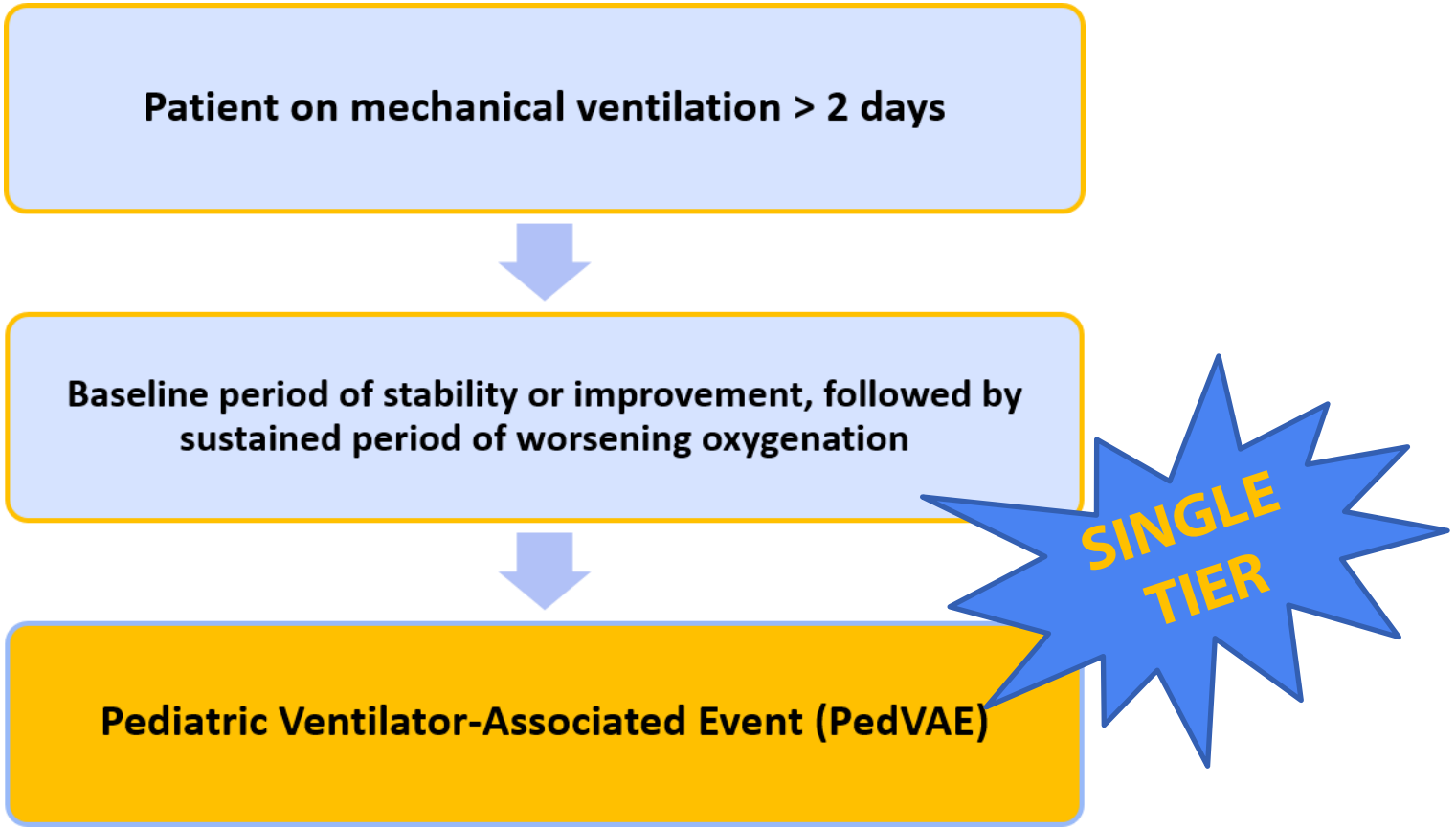
What about other specific modes of mechanical ventilation?

- INCLUDE patients on:
  - High Frequency Oscillatory or jet ventilation (HFO)
  - Airway Pressure Release Ventilation (APRV)
  - Volumetric Diffusive Respiration (VDR) – FiO_2 parameter only
- INCLUDE patients who are receiving a conventional mode of mechanical ventilation while receiving:
  - Surfactant
  - Corticosteroids
  - Prone positioning
  - Nitric oxide therapy
  - Helium-oxygen mixture
  - Epoprostenol therapy

PedVAE Algorithm Overview

****The PedVAE definition algorithm is for use in surveillance; it is not a clinical definition algorithm and is not intended for use in the clinical management of patients.****

PedVAE Definition Algorithm Summary



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

- Using either of two key parameters that demonstrate effective oxygenation in ventilated patients
  - FiO_2
  - Mean Airway Pressure (MAP)

FiO_2

- Fraction of Oxygen in 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 patients oxygenation requirement

MAP

- 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 - Peak End-Expiratory Pressure
  - PIP- Peak Inspiratory Pressure
  - Inspiratory time
  - Other parameters like flow or frequency
- MAP for purposes of PedVAE surveillance is **NOT** Mean Arterial Pressure

FiO_2 and MAP

- FiO_2 ventilator settings and MAP values documented across the calendar day are used to identify the daily minimum FiO_2 and daily minimum MAP values
- The daily minimum FiO_2 and daily minimum MAP values are used to determine both the period of stability or improvement and the period that indicates worsening oxygenation.
- Stability, improvement or worsening is not determined by comparing FiO_2 settings and MAP values that occur during a calendar day but by comparing the daily minimum values from calendar to calendar day
- Use a calendar day not any other “ 24 hour capture period”

Daily Minimum FiO_2 and MAP

- FiO_2 settings and MAP readings 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 respiratory status/mechanical ventilation
- When choosing the daily minimum FiO_2 and MAP, use all documented findings 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
  - Excludes FiO_2 and MAP values documented during periods of time when the patient is on extracorporeal 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 for > 1 hour during a calendar day**
- Protocol provides examples of how > 1 hour is to be determined to ensure standardization across all facilities
  - If tracking every 15 minutes, 5 consecutive recordings of a certain level would be needed (e.g., at 09:00, 09:15, 09:30, 09:45 and 10:00)
  - If tracking every 30 minutes, 3 consecutive recordings at a certain level would be needed (e.g., at 09:00, 09:30, and 10:00)
  - If tracking PEEP every hour, 2 consecutive recordings at a certain level (e.g., at 09:00 and 10:00)
- If there is no setting that has been maintained for > 1 hour then select the lowest setting regardless of the period of time in which the setting was maintained

Identify the Daily Minimum FiO_2 for Monday

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

	Monday 12am	3am	4am	6am	9am	12pm	3pm	9pm	11pm
FiO_2	0.80	0.70	0.90	0.80	0.80	0.75	0.75	0.75	0.75

Identify the Daily Minimum FiO_2

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

	Monday 12am	3am	4am	6am	9am	12pm	3pm	9pm	11pm
FiO_2	0.80	0.70	0.90	0.80	0.80	0.75	0.75	0.75	0.75

- **Monday:** 0.75 is Daily Minimum FiO_2 , the lowest value 0.70 was not maintained for > 1 hour

Identify the Daily Minimum FiO_2 for Monday and Tuesday

Ventilation is initiated late in the calendar day

	Monday 2300	2330	Tuesday 0030	0100	0300	0600	0900	1200 .....
FiO_2	0.70	0.80	0.80	O.80	0.80	0.75	0.75	0.80

Identify the Daily Minimum FiO_2

Ventilation is initiated late in the calendar day

	Monday 2300	2330	Tuesday 0030	0100	0300	0600	0900	1200 .....
FiO_2	0.70	0.80	0.80	O.80	0.80	0.75	0.75	0.80

- **Monday:** 0.70 is the Daily Minimum FiO_2 , there was no value maintained for > 1 hour
- Do not look to the next calendar day to determine if a setting was maintained > 1 hour
- **Tuesday:** 0.75 is the Daily Minimum FiO_2 , the lowest value maintained for > 1 hour

Daily Minimum MAP

- The daily minimum MAP is the **lowest value documented during a calendar day <u>regardless of how long the value is maintained</u>**

- When determining the daily minimum MAP, if MAP values include a decimal place then round the MAP value to the nearest whole number
  - A MAP of 10.00 – 10.49 is rounded to 10
  - A MAP of 10.50 – 10.99 is rounded to 11

Daily Minimum MAP

- For <u>patients < 30 days</u> MAP values of 0-8 cmH_2O are considered **equal to 8 cmH_2O**
  - Any day where daily minimum MAP is 0-8 cmH_20 will be assigned a daily minimum MAP value of 8 cmH20.
- For <u>patients ≥ 30 days</u> MAP values 0-10 cmH_2O are considered **equal to 10 cmH_2O**
  - Any day where daily minimum MAP is 0-10 cmH20 will be assigned a daily minimum MAP value of 10 cmH20.

Identify the Daily Minimum MAP for a Patient < 30 Days

	Monday 12am	3am	6am	9am	12pm	3pm	6pm	9pm
MAP	8	6	8	5	5	8	10	10

Identify the Daily Minimum MAP - < 30 Days

Select the lowest value recorded for each calendar day

	Monday 12am	3am	6am	9am	12pm	3pm	6pm	9pm
MAP	8	6	8	5 (8)	5	8	10	10

- Monday: The lowest value is 5 cmH_2O.
- For patients < 30 days values 0-8 = 8
- **Monday:** Daily Minimum MAP is 8 cmH_2O

Identify the Daily Minimum MAP for a Patient ≥ 30 Days

	Monday 12am	3am	6am	9am	12pm	3pm	6pm	9pm
MAP	8	6	8	5	5	8	10	10

Identify the Daily Minimum MAP for a Patient ≥ 30 Days

Select the lowest value recorded for each calendar day regardless of how long it was maintained

	Monday 12am	3am	6am	9am	12pm	3pm	6pm	9pm
MAP	8	6	8	5 (10)	5	8	10	10

- Monday: The lowest value is 5 cmH2O.
- For patients ≥ 30 days values 0-10 = 10
- **Monday:** Daily Minimum MAP is 10 cmH2O

Identify the Daily Minimum MAP

Select the lowest value recorded for each calendar day

Remember to round values

	Monday 12am	3am	6am	9am	12pm	3pm	6pm	9pm
MAP	12.4	12.1	12.9	11.8	12.4	12.0	12.7	12.7
	12	12	13	12	12	12	13	13

- **Monday:** Daily Minimum MAP is 12 cmH2O

Figure 1: Pediatric Ventilator-Associated Events (PedVAE) Surveillance Algorithm

Patient has a baseline period of stability or improvement on the ventilator, defined by ≥ 2 calendar days of stable or decreasing daily minimum* FiO_2 or MAP values. The baseline period is defined as the 2 calendar days immediately preceding the first day of increased daily minimum MAP or FiO_2.

*Daily minimum FiO_2 is defined as the lowest value of FiO_2 documented during a calendar day that is maintained for > 1 hour.
Daily minimum MAP is the lowest value documented during the calendar day.
For patients <30 days old, daily minimum MAP values 0-8 cm H_2O are considered equal to 8 cmH_2O for the purposes of surveillance.
For patients ≥30 days old, daily minimum MAP values 0-10 cmH_2O are considered equal to 10 cmH_2O for the purposes of surveillance.

↓

After a period of stability or improvement on the ventilator, the patient has at least one of the following indicators of worsening oxygenation:

1) Increase in 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.
2) Increase in 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.

↓

Pediatric Ventilator-Associated Event (PedVAE)

PedVAE

- Patient must be ventilated > 2 days to be eligible for PedVAE surveillance
  - However, the first two days of mechanical ventilation can establish a baseline period

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

PedVAE Definition Is Met IF:

FiO2- a baseline period of stability or improvement immediately followed by an increase over the baseline in the daily minimum FiO_2 of **≥ 0.25 (25%)** that is **sustained for ≥ 2 days**

OR

MAP–a baseline period of stability or improvement immediately followed by an increase over the baseline in the daily minimum MAP of **≥ 4 cmH2O** that is **sustained for ≥ 2 days**

Daily Minimum MAP

- For <u>patients < 30 days</u> MAP values of 0-8 cmH_2O are considered **equal to 8 cmH_2O**
  - Any day where daily minimum MAP is 0-8 cmH_20 will be assigned a daily minimum MAP value of 8 cmH20.
  - **Following a ≥ 2 day period of stability at 8 cmH20 an increase in daily minimum MAP to at least 12 cmH_20 sustained for at least 2 calendar days is required**
- For <u>patients ≥ 30 days</u> MAP values 0-10 cmH_2O are considered **equal to 10 cmH_2O**
  - Any day where daily minimum MAP is 0-10 cmH20 will be assigned a daily minimum MAP value of 10 cmH20.
  - **Following a ≥ 2 day period of stability at 10 cmH20 an increase in daily minimum MAP to at least 14 cmH20 sustained for at least 2 calendar days is required**

PedVAE Definition

- **Baseline:** ≥ 2 calendar days of **stable or decreasing** daily minimum FiO2 or MAP values and immediately precedes the first day of increased daily minimum MAP or FiO2.
- **Worsening:** 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 daily minimum FiO2 of **≥ 0.25 (25 points)** over the daily minimum FiO2 of the **first day in the baseline period,** sustained for ≥ 2 calendar days.

    OR

    - Increase in daily minimum MAP values of **≥ 4 cmH2O** over the daily minimum MAP of the **first day in the baseline period,** sustained for ≥ 2 calendar days.

Operationalizing PedVAE

(patient is <30 days - MAP values 0-8 = 8)

Vent Day	Daily Minimum MAP	Daily Minimum FiO_2
1	13	60
2	8 (7)	40
3	8 (7)	40
4	12	65
5	12	50
6	10	40
7	8	40
8	8	40

Operationalizing PedVAE

(patient is < 30 days)

≥ 2-day period of stability (MAP or FiO_2)

Vent Day	Daily Minimum MAP	Daily Minimum FiO_2
1	13	60
2	8 (7)	40
3	8 (7)	40
4	12	65
5	12	50
6	10	40
7	8	40
8	8	40

Operationalizing PedVAE

(patient is < 30 days)

Vent Day	Daily Minim MAP	
1	13	
2	8 (7)	40
3	8 (7)	40
4	12	65
5	12	50
6	10	40
7	8	40
8	8	40

≥ 2-day period of worsening in the MAP parameter with an increase of ≥ 4 cm H_2O over the baseline period

Operationalizing PedVAE

(patient is < 30 days)

Vent Day	MAP min	FiO_2 min
1	13	60
2	8 (7)	40
3	8 (7)	40
4	12	65
5	12	50
6	10	40
7	8	40
8	8	40

= PedVAC

Operationalizing PedVAE

(patient is ≥ 30 days - MAP values 0 -10 = 10)

Vent Day	Daily Minimum MAP	Daily Minimum FiO_2
1	13	60
2	10 (7)	40
3	10 (7)	40
4	12	65
5	12	50
6		
7		
8		

≠ PedVAC

≥ 2-day period of worsening in the MAP parameter with an increase of ≥ 4 cm H_2O over the baseline period is not identified

Operationalizing PedVAE

(patient is ≥ 30 days - MAP values 0 -10 = 10)

Vent Day	Daily Minimum MAP	Daily Minimum FiO_2
1	13	60
2	10 (7)	40
3	10 (7)	40
4	14	65
5	14	50
6		
7		
8		

= PedVAC

≥ 2-day period of worsening in the MAP parameter with an increase of ≥ 4 cm H_2O over the baseline period is identified

Operationalizing PedVAE – FiO_2

(patient is < 30 days or ≥ 30 days)

Vent Day	Daily Minimum MAP	Daily Minimum FiO_2
1	13	60
2	10 (7)	40
3	10 (7)	40
4	12	65
5	12	50
6	10	40
7	8	40
8	8	40

≠ PedVAC

≥ 0.25 (25%) increase over the baseline period is not sustained for ≥ 2 days

Operationalizing PedVAE – FiO_2

(patient is < 30 days or ≥ 30 days)

Vent Day	Daily Minimum MAP	Daily Minimum FiO_2
1	13	60
2	12	40
3	10	40
4	14	65
5	15	50
6	10	40
7	8	40
8	8	40

≠ PedVAC

Increase is not ≥ 4 cmH_2O over the daily minimum MAP of the first day in the baseline period.

Date of Event / Event Date

- The date of onset of worsening oxygenation (day 1 of the required ≥ 2 day period of worsening oxygenation)

  - Earliest date of event for VAE is mechanical ventilation day 3 (first day of worsening oxygenation)
  - First possible day that PedVAE criteria can be fulfilled is mechanical ventilation day 4

Date of Event

- Defines the period during which the antimicrobial and pathogen questions apply
- Sets the 14-day PedVAE Event Period
  - Each PedVAE is 14 days in duration (arbitrary—to standardize).
  - Day 1 is the Event Date—so if June 1 is date of onset of worsening oxygenation and a **PedVAE** is reported, a second **PedVAE** cannot be detected and reported until June 15.

Reporting Exception related to Date of Event

- If the date of event (date of onset of worsening oxygenation) is on or after the date of documentation of evidence of consent AND the patient is being supported for organ donation purposes, the event should not be reported as a PedVAE.

Operationalizing PedVAE

(patient is < 30 days)

Vent Day	MAPmin	FiO_2 min
1	13	60
2	8 (7)	40
3	8 (7)	
4	12	
5	12	50
6	10	40
7	8	40
8	8	40

Event Date = Vent Day 4 (first day of worsening oxygenation)
14 Day event period is Vent Day 4 – Vent Day 17

PedVAE Data Collection Form

Data Collection Form (* indicates a required field)

Pediatric Ventilator-Associated Event (PedVAE)

Page 1 of 4 *required for saving **required for completion

Facility ID:	Event #:
*Patient ID:	Social Security #:
Secondary ID:	Medicare #:
Patient Name, Last:	First: Middle:
*Gender: F M Other	*Date of Birth:
Ethnicity (Specify):	Race (Specify):
*Event Type: PedVAE	*Date of Event:
Post-procedure PedVAE: Yes No	Date of Procedure:
NHSN Procedure Code:	ICD-10-PCS or CPT Procedure Code:

*MDRO Infection Surveillance:

☐ Yes, this infection's pathogen & location are in-plan for Infection Surveillance in the MDRO/CDI Module

☐ No, this infection's pathogen & location are **not** in-plan for Infection Surveillance in the MDRO/CDI Module

*Date Admitted to Facility: *Location:

Risk Factors

* Location of Mechanical Ventilation Initiation: _____ *Date Initiated: __ /__ /_____

*If NICU: Birth Weight (grams): _____ *Gestational Age (weeks):_____

Event Details

*Specify Criteria Used:

☐ Daily min FiO_2 increase ≥ 0.25 (25 points) for ≥ 2 days†

OR

☐ Daily min Mean Airway Pressure (MAP) ≥ 4 cm H_2O for ≥ 2 days†

†*after 2+ days of stable or decreasing daily minimum values.*

Data Collection Form (optional data)

Clinical event associated with the PedVAE? ☐ Yes ☐ No ☐ Unknown If Yes, check all that apply:

☐ Ventilator-associated Pneumonia	☐ Sepsis or Septic Shock
☐ Atelectasis	☐ Neonatal Respiratory Distress Syndrome (RDS)
☐ Acute Respiratory Distress Syndrome (ARDS)	☐ Bronchopulmonary Dysplasia/Chronic Lung Disease
☐ Pulmonary Hypertension	☐ Reopened Patent Ductus Arteriosus (PDA)
☐ Pulmonary Edema	☐ Weaning from mechanical ventilation or other change in mechanical ventilation approach <u>without</u> clinical worsening
☐ Pulmonary Hemorrhage	☐ Other (specify) _____

Antimicrobial agent(s) administered?

☐ Yes ☐ No If Yes, select up to 3 antimicrobial agents:

Drug1:_____; Drug1 start date: __ /__ /_____

Drug2:_____; Drug2 start date: __ /__ /_____

Drug3:_____; Drug3 start date: __ /__ /_____

Pathogen identified from one or more of the listed specimens? ☐ Yes ☐ No If Yes, specify pathogen on pages 2-3

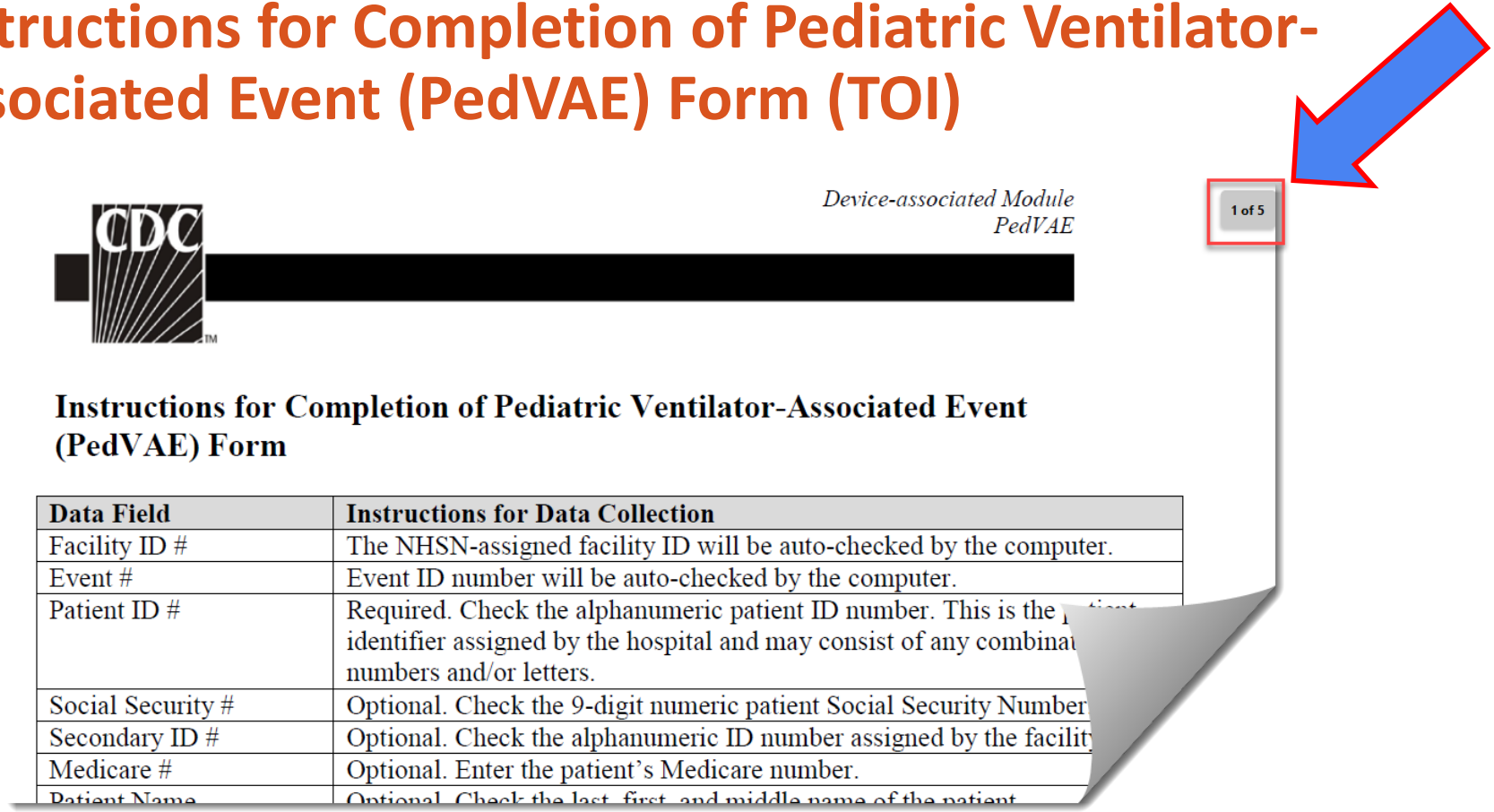
If Yes, which specimen type? (check all that apply)

☐ Lower Respiratory ☐ Upper Respiratory ☐ Lung Tissue ☐ Pleural Fluid

☐ Urine for *Legionella* or *Streptococcus pneumoniae* antigen testing

Pathogen identified from BLOOD? ☐ Yes ☐ No

Instructions for Completion of Pediatric Ventilator-Associated Event (PedVAE) Form (TOI)



Device-associated Module
PedVAE

1 of 5

Instructions for Completion of Pediatric Ventilator-Associated Event (PedVAE) Form

Data Field	Instructions for Data Collection
Facility ID #	The NHSN-assigned facility ID will be auto-checked by the computer.
Event #	Event ID number will be auto-checked by the computer.
Patient ID #	Required. Check the alphanumeric patient ID number. This is the identifier assigned by the hospital and may consist of any combinat numbers and/or letters.
Social Security #	Optional. Check the 9-digit numeric patient Social Security Number
Secondary ID #	Optional. Check the alphanumeric ID number assigned by the facilit
Medicare #	Optional. Enter the patient's Medicare number.
Patient Name	Optional. Check the last, first, and middle name of the patient

https://www.cdc.gov/nhsn/forms/instr/57_113-508.pdf

PedVAE Application

Event Details

Specify Criteria Used *

☐ Daily min FiO2 increase ≥ 0.25 (25 points) for ≥ 2 days†

☐ Daily min Mean Airway Pressure (MAP) ≥ 4 cm H2O for ≥ 2 days†

† after 2+ days of stable or decreasing daily minimum values

Clinical event associated with the PedVAE ?: [ ] If yes, check all that apply:

- ☐ Ventilator-associated Pneumonia
- ☐ Atelectasis
- ☐ Acute Respiratory Distress Syndrome (ARDS)
- ☐ Pulmonary Hypertension
- ☐ Pulmonary Edema
- ☐ Pulmonary Hemorrhage
- ☐ Sepsis or Septic Shock
- ☐ Neonatal Respiratory Distress Syndrome (RDS)
- ☐ Bronchopulmonary Dysplasia/Chronic Lung Disease
- ☐ Reopened Patent Ductus Arteriosus (PDA)
- ☐ Weaning from mechanical ventilation or other change in mechanical ventilation approach without clinical worsening
- ☐ Other (specify)

Antimicrobial agent(s) administered?: [ ]

Pathogen identified from one or more of the listed specimens?: [ ] If Yes, which specimen type? (check all that apply)

- ☐ Lower Respiratory
- ☐ Upper Respiratory
- ☐ Lung Tissue
- ☐ Pleural Fluid
- ☐ Urine for Legionella or Streptococcus pneumoniae antigen testing

Pathogen identified from BLOOD?: [ ]

Died **: [ ]

Discharge Date: [ ] 7

Custom Fields

Event Details

Specify Criteria Used *

☐ Daily min FiO2 increase ≥ 0.25 (25 points) for ≥ 2 days†

☐ Daily min Mean Airway Pressure (MAP) ≥ 4 cm H2O for ≥ 2 days†

† after 2+ days of stable or decreasing daily minimum values

Clinical event associated with the PedVAE ?: Y - Yes — If yes, check all that apply:

- ☐ Ventilator-associated Pneumonia
- ☐ Atelectasis
- ☐ Acute Respiratory Distress Syndrome (ARDS)
- ☐ Pulmonary Hypertension
- ☐ Pulmonary Edema
- ☐ Pulmonary Hemorrhage
- ☐ Sepsis or Septic Shock
- ☐ Neonatal Respiratory Distress Syndrome (RDS)
- ☐ Bronchopulmonary Dysplasia/Chronic Lung Disease
- ☐ Reopened Patent Ductus Arteriosus (PDA)
- ☐ Weaning from mechanical ventilation or other change in mechanical ventilation approach without clinical worsening
- ☑ Other (specify)

Antimicrobial agent(s) administered? :

Pathogen identified from one or more of the listed specimens? : — If Yes, which specimen type? (check all that apply)

- ☐ Lower Respiratory
- ☐ Upper Respiratory
- ☐ Lung Tissue
- ☐ Pleural Fluid
- ☐ Urine for Legionella or Streptococcus pneumoniae antigen testing

Pathogen identified from BLOOD? :

Died **:

Discharge Date :

Custom Fields

Event Details

Specify Criteria Used *

☐ Daily min FiO2 increase ≥ 0.25 (25 points) for ≥ 2 days†

☐ Daily min Mean Airway Pressure (MAP) ≥ 4 cm H2O for ≥ 2 days†

† after 2+ days of stable or decreasing daily minimum values

Clinical event associated with the PedVAE ?: Y - Yes — If yes, check all that apply:

- ☐ Ventilator-associated Pneumonia
- ☐ Atelectasis
- ☐ Acute Respiratory Distress Syndrome (ARDS)
- ☐ Pulmonary Hypertension
- ☐ Pulmonary Edema
- ☐ Pulmonary Hemorrhage
- ☐ Sepsis or Septic Shock
- ☐ Neonatal Respiratory Distress Syndrome (RDS)
- ☐ Bronchopulmonary Dysplasia/Chronic Lung Disease
- ☐ Reopened Patent Ductus Arteriosus (PDA)
- ☐ Weaning from mechanical ventilation or other change in mechanical ventilation approach without clinical worsening
- ☑ Other (specify)

Antimicrobial agent(s) administered?: Y - Yes

Drug 1 : — Drug 1 Start date

Drug 2 : — Drug 2 Start date

Drug 3 : — Drug 3 Start date

Pathogen identified from one or more of the listed specimens?: — If Yes, wl

- ☐ Lower Respirator
- ☐ Lung Tissue
- ☐ Urine for Legione

Pathogen identified from BLOOD?:

Died **:

Discharge Date :

Event Details: Antimicrobial Agent Administered Drug	Optional. Check Y if antimicrobial agent(s) listed in the Appendix was administered on the event date or within the 2 days before or 2 days after the event date. Otherwise check N If antimicrobial agent(s) administered = Y Record Drug (up to 3) and enter administration start date. Administration start date is limited to 1 year prior to current admission date.

Custom Fields

Event Details

Specify Criteria Used *

☐ Daily min FiO2 increase ≥ 0.25 (25 points) for ≥ 2 days†

☐ Daily min Mean Airway Pressure (MAP) ≥ 4 cm H2O for ≥ 2 days†

† after 2+ days of stable or decreasing daily minimum values

Clinical event associated with the PedVAE ?: Y - Yes If yes, check all that apply:

- ☐ Ventilator-associated Pneumonia
- ☐ Atelectasis
- ☐ Acute Respiratory Distress Syndrome (ARDS)
- ☐ Pulmonary Hypertension
- ☐ Pulmonary Edema
- ☐ Pulmonary Hemorrhage
- ☐ Sepsis or Septic Shock
- ☐ Neonatal Respiratory Distress Syndrome (RDS)
- ☐ Bronchopulmonary Dysplasia/Chronic Lung Disease
- ☐ Reopened Patent Ductus Arteriosus (PDA)
- ☐ Weaning from mechanical ventilation or other change in mechanical ventilation approach without clinical worsening
- ☑ Other (specify)

Antimicrobial agent(s) administered? : Y - Yes

Drug 1 : Dru

Drug 2 : Dru

Drug 3 : Dru

Event Details: Pathogen identified	Optional. Check Y if any pathogen was detected by culture or non-culture-based microbiological testing of upper or lower respiratory specimens and *Legionella* or *Streptococcus pneumoniae* detected by urine antigen testing on the date of event or within the 2 days before or 2 days after the event otherwise check N Specify pathogens on reverse form.

Pathogen identified from one or more of the listed specimens? : Y - Yes If Yes, which specimen type? (check all that apply)

- ☐ Lower Respiratory
- ☐ Upper Respiratory
- ☐ Lung Tissue
- ☐ Pleural Fluid
- ☐ Urine for Legionella or Streptococcus pneumoniae antigen testing

Pathogen identified from BLOOD? : Y - Yes

Died **: Y - Yes PedVAE contributed to death >: N - No

Discharge Date :

Pathogens

Pathogen 1: Search

Pathogen 2: Search

Pathogen 3: Search

Event Details: Pathogen identified	Optional. Check Y if any pathogen was detected by culture or non-culture-based microbiological testing of upper or lower respiratory specimens and *Legionella* or *Streptococcus pneumoniae* detected by urine antigen testing on the date of event or within the 2 days before or 2 days after the event otherwise check N Specify pathogens on reverse form.
Event Details: Source of Pathogen Identified	Optional. If pathogen identified = Y select all specimen sources that apply: Lower Respiratory (for example, sputum, tracheal aspirate, bronchial washing, bronchoalveolar lavage) , Upper Respiratory (for example, nasopharyngeal wash or swab), Lung Tissue, Pleural Fluid, Urine for *Legionella* or *Streptococcus pneumoniae* antigen testing otherwise check N
Event Details: Pathogen identified in Blood	Optional. Check Y if pathogen was identified from blood with a specimen collection date within 2 days before the event date to 13 days after the event date otherwise check N. Specify pathogens on reverse form.

Denominator Data

- Patient Days (required)
- Ventilator Days (required)
- NICU denominator data (patient days and ventilator days)
  - NICU Birthweight (required)

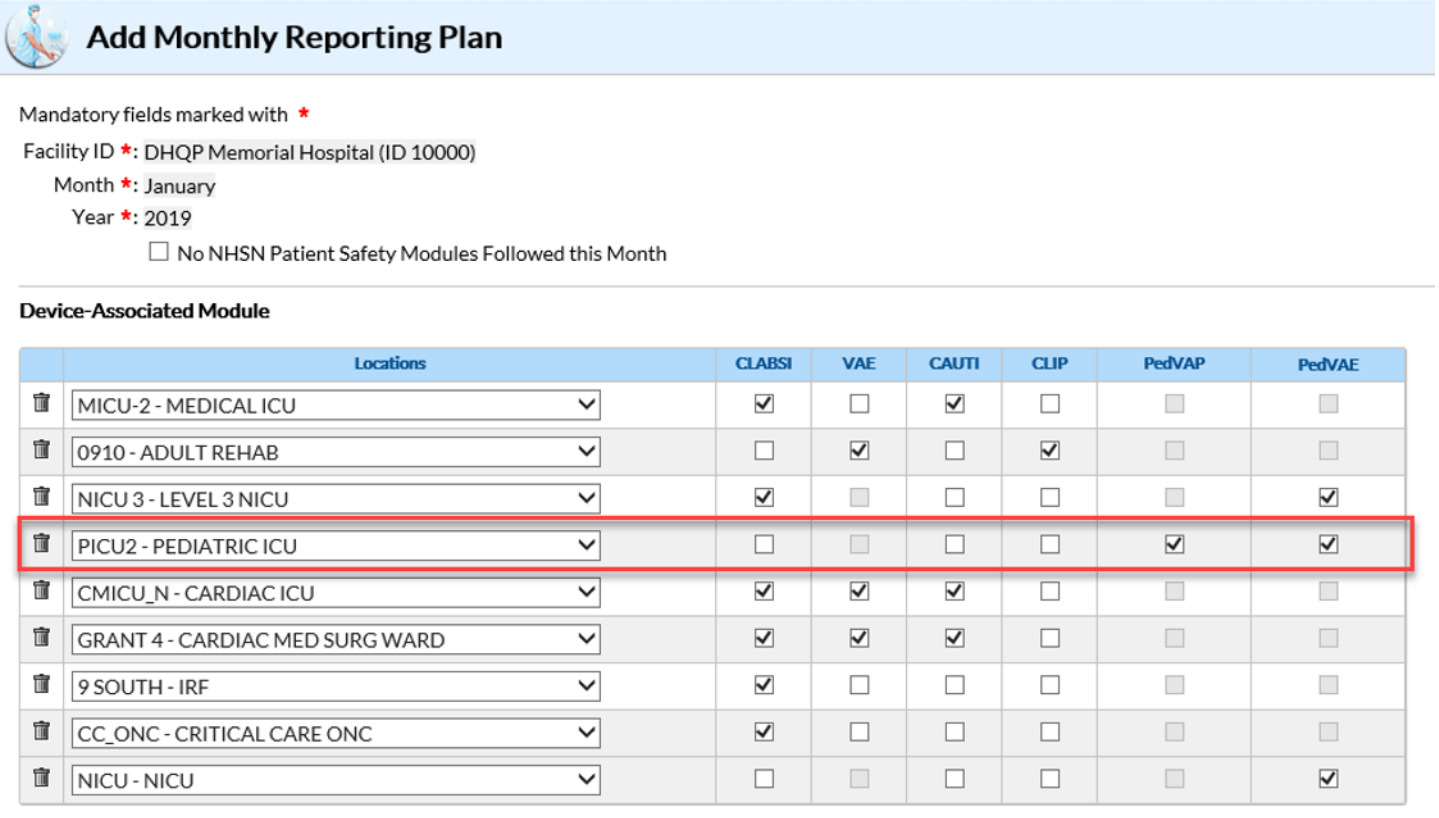
≤750 g	751-1000 g	1001-1500 g	1501-2500 g	>2500 g

  - NICU Gestational Age (optional)

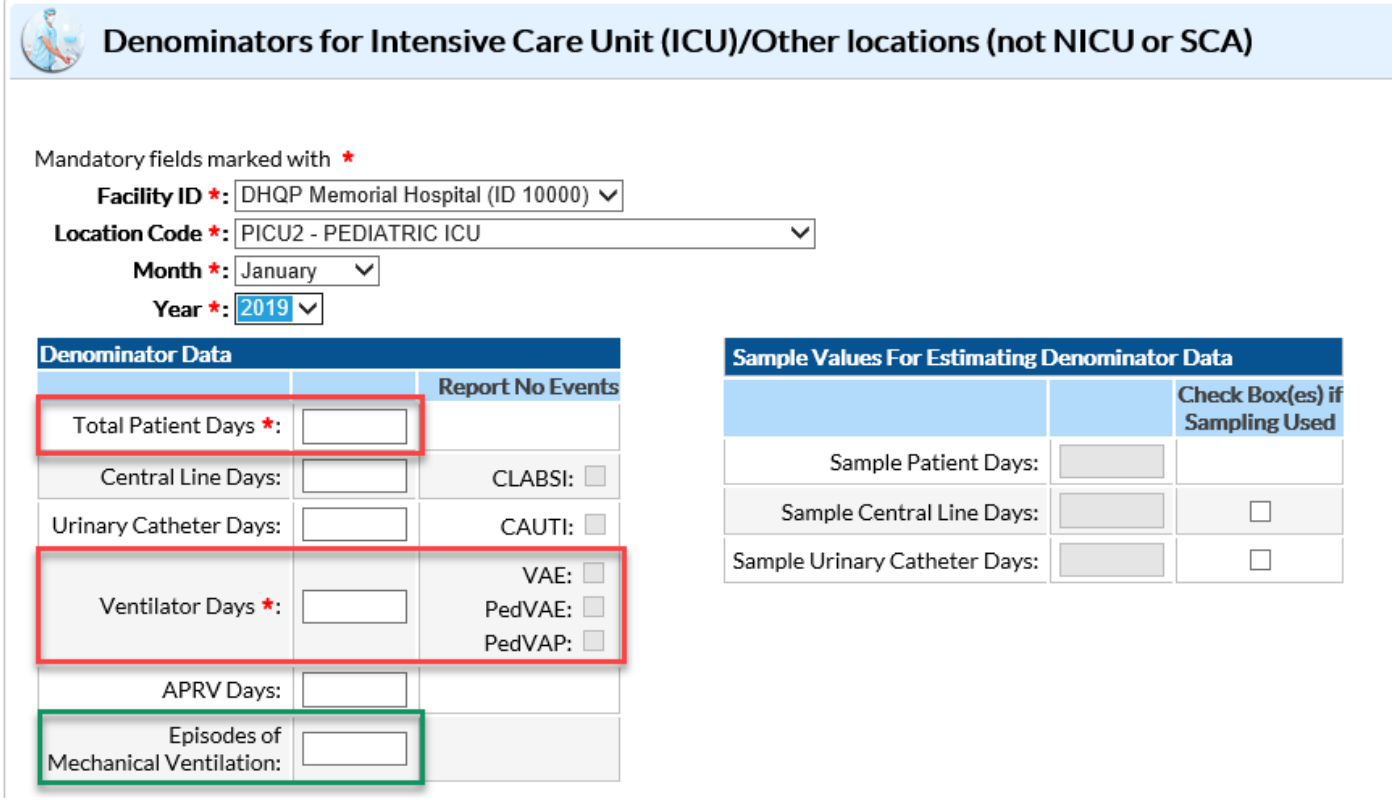
Extremely preterm (<28 weeks)	Very preterm (28 to <32 weeks)	Moderate to late preterm (32 to <37 weeks)	Term (≥37 weeks)

- Episodes of Mechanical Ventilation (optional)

Monthly Reporting Plan – Pediatric Location



Summary Data - Pediatric Location



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

Mandatory fields marked with *

Facility ID *: DHQP Memorial Hospital (ID 10000)

Location Code *: PICU2 - PEDIATRIC ICU

Month *: January

Year *: 2019

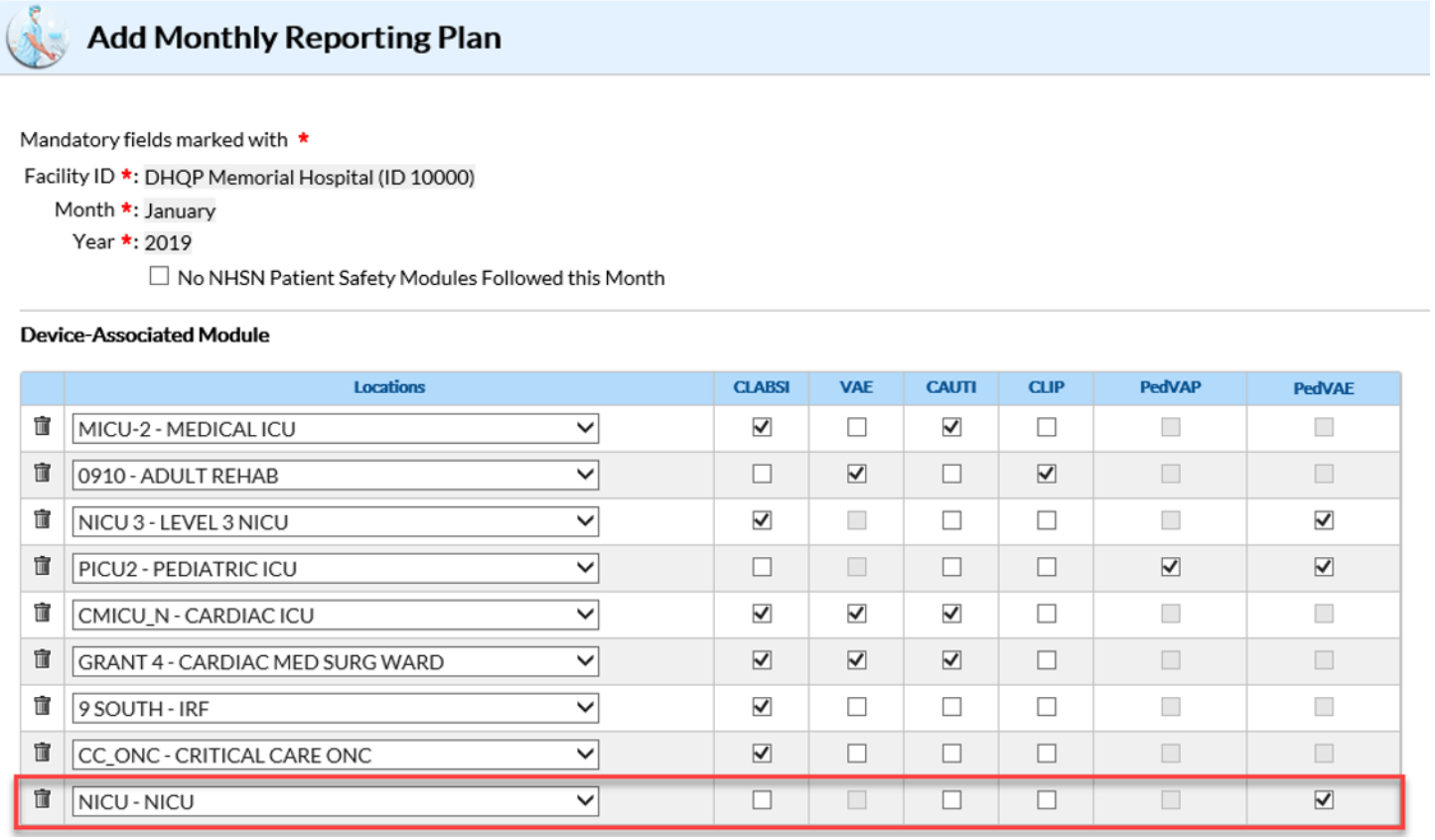
Denominator Data

		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:		

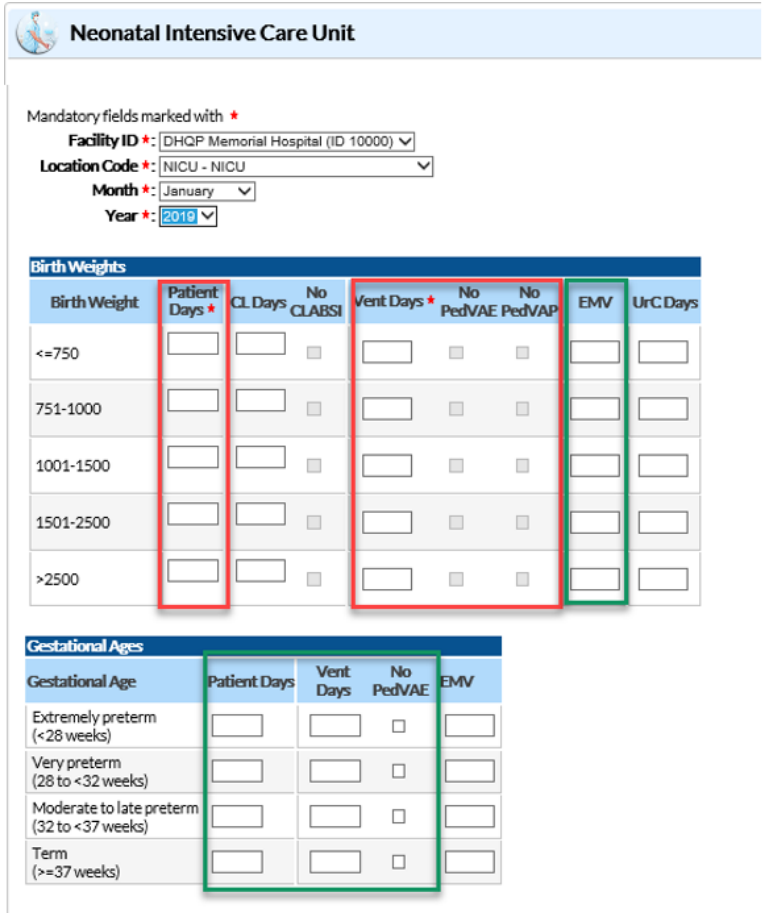
Sample Values For Estimating Denominator Data

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

Monthly Reporting Plan – NICU Location



Summary Data - NICU Location



Neonatal Intensive Care Unit

Mandatory fields marked with *

Facility ID *: DHQP Memorial Hospital (ID 10000)

Location Code *: NICU - NICU

Month *: January

Year *: 2019

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								

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)				

Summary Data - NICU Location

Neonatal Intensive Care Unit

Mandatory fields marked with *

Facility ID *: DHQP Memorial Hospital (ID 10000)

Location Code *: NICU - NICU

Month *: January

Year *: 2019

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								

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)				

PedVAE Calculator

PedVAE Calculator

Surveillance for Pediatric Ventilator-associated Events

PedVAE surveillance is available in-plan for pediatric and neonatal inpatient locations only. PedVAP surveillance using the PNEU protocol continues to be available for in-plan surveillance for pediatric locations only.

The Pediatric Ventilator-Associated Event Calculator (must have javascript enabled) operates based upon the currently posted PedVAE protocol.

Resources for NHSN Users Already Enrolled

- **Training** +
- **Protocols** +
- **Frequently Asked Questions** +
- **Data Collection Forms** +
- **Supporting Materials** +
- **Calculator** −
  - Pediatric Ventilator-Associated Event Calculator (javascript must be enabled)
- **Analysis Resources** +

CMS NHSN Requirements Click here for more information

Pediatric Ventilator-Associated Event Calculator

Version 1.0

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)

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

National Healthcare Safety Network (NHSN)

CDC > NHSN > Materials for Enrolled Facilities

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

Welcome to the Pediatric Ventilator-Associated Event Calculator. Version 1.0 operates based upon the currently posted PedVAE protocol. It is strongly encouraged that you thoroughly review the PedVAE protocol.

- The calculator recognizes Mean Airway Pressure (MAP) values 0-8 cmH_20 as equal to 8 for patients < 30 days of age and MAP values 0-10 cmH_20 as equal to 10 for patients ≥ 30 days of age and corrects entries according to the PedVAE protocol prior to making a PedVAE determination.
- Daily minimum MAP readings are to be rounded to the nearest whole number using the following method as an example: A MAP value 10.00 - 10.49 is rounded to 10 and a MAP value 10.50 - 10.99 is rounded to 11.
- The calculator finds multiple PedVAEs per patient as long as they conform to the 14 day rule.

To get started, **enter a date below that corresponds to the first day the patient was placed on mechanical ventilation during the mechanical ventilation episode of interest.** You may type in a date or use the popup calendar when it appears. You may only enter dates within the past year. If the patient has been on mechanical ventilation for more than one year during the current mechanical ventilation episode, choose a start date that is more recent but is at least 7 days before the period of interest. more...

Mechanical Ventilation Start Date: (mm/dd/yyyy)

Print Close

National Healthcare Safety Network (NHSN)

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

Welcome to the Pediatric Ventilator-Associated Event Calculator. Version 1.0 operates based upon the currently posted PedVAE protocol. It is strongly encouraged that you thoroughly review the PedVAE protocol.

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To get started, **enter a date below that corresponds to the first day the patient was placed on mechanical ventilation during the mechanical ventilation episode of interest.** You may type in a date or use the popup calendar when it appears. You may only enter dates within the past year. If the patient has been on mechanical ventilation for more than one year during the current mechanical ventilation episode, choose a start date that is more recent but is at least 7 days before the period of interest.

The calculator runs locally on your machine. Data that you enter are not stored, nor are they transmitted to NHSN. Feel free to enter or change as much data as you like. If you don't understand something, there are several mechanisms for getting help. Most of the buttons and table headings will give an expanded description if you hover your mouse over the item in question. Also the explain button will pop up an explanation of the reasoning behind the calculation. The explanation box is movable as are all the popup windows. That allows you to open one up and drag it to the side as you work. The explanation will automatically update itself as you work through the protocol.

less...

Mechanical Ventilation Start Date: (mm/dd/yyyy)

National Healthcare Safety Network (NHSN)

CDC > NHSN > Materials for Enrolled Facilities

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

Welcome to the Pediatric Ventilator-Associated Event Calculator. Version 1.0 operates based upon the currently posted PedVAE protocol. It is strongly encouraged that you thoroughly review the PedVAE protocol.

- The calculator recognizes Mean Airway Pressure (MAP) values 0-8 cmH_20 d MAP values 0-10 cmH_20 as equal to 10 for patients ≥ 30 days of age and corrects entries according to the PedVAE protocol prior tc
- Daily minimum MAP readings are to be rounded to the nearest whole num e: A MAP value 10.00 - 10.49 is rounded to 10 and a MAP value 10.50 - 10.99 is rounded to 11.
- The calculator finds multiple PedVAEs per patient as long as they conform

To get started, **enter a date below that corresponds to the first day the patient was e mechanical ventilation episode of interest.** You may type in a date or use the popup calendar when it appears. You may only enter dates within nanical ventilation for more than one year during the current mechanical ventilation episode, choose a start date that is more recent but is at least

January 2019

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Mechanical Ventilation Start Date: (mm/dd/yyyy)

Print Close

National Healthcare Safety Network (NHSN)

CDC > NHSN > Materials for Enrolled Facilities

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

Now enter MAP and/or FiO_2 values and when done, click the "Calculate PedVAE" button. **You do not need to enter data for every day.** Concentrate on the dates where you believe a PedVAE may be likely. If your values meet the PedVAE definition, the event day will be identified.

Is the patient's age less than 30 days? :

Yes
No

Calculate PedVAE Start Over

MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	12/30/2018	3	30	
2	12/31/2018	8	30	
3	1/1/2019	12	30	
4	1/2/2019	12	40	
5	1/3/2019	12	40	

Legend: † - PedVAE ‡ - PedVAE Date

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

A Pediatric Ventilator-Associated Event (PedVAE) based on MAP values occurred on 1/1/2019.

Click on the "Explain" button to see how this determination was made.

Is the patient's age less than 30 days? : Yes

Calculate PedVAE | Start Over | Explain...

MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	12/30/2018	8 (3)*	30	
2	12/31/2018	8	30	
3	1/1/2019	12	30	‡ PedVAE
4	1/2/2019	12	40	
5	1/3/2019	12	40	

Legend: † - PedVAE ‡ - PedVAE Date

- **Patient < 30 days**
- **MAP values 0-8 =8**
- **PedVAE identified**

* All values of MAP less than 8 cmH_2O (or less than 10 cmH_2O **) are considered to be 8 cmH_2O (or 10**) for purposes of the PedVAE definition. So for MAP values entered as less than or equal to 8 (or 10**) cmH_2O, an increase in the daily minimum MAP to at least 12 cmH_2O (or 14**), sustained for 2 or more calendar days, is required to meet the PedVAE definition.

** 10 for patients greater than or equal to 30 days

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.

Is the patient's age less than 30 days?: No

Calculate PedVAE | Start Over | Explain...

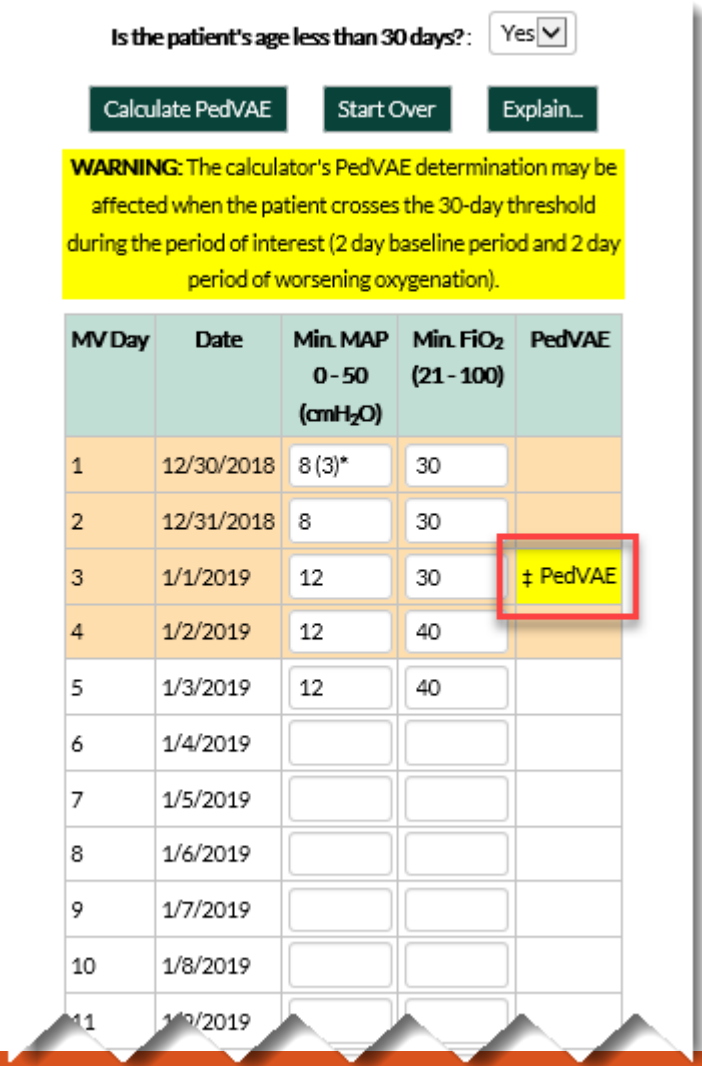
MV Day	Date	Min. MAP 0 - 50 (cmH_2O)	Min. FiO_2 (21 - 100)	PedVAE
1	12/30/2018	10 (3)*	30	
2	12/31/2018	10 (8)*	30	
3	1/1/2019	12	30	
4	1/2/2019	12	40	
5	1/3/2019	12	40	

Legend: † - PedVAE ‡ - PedVAE Date

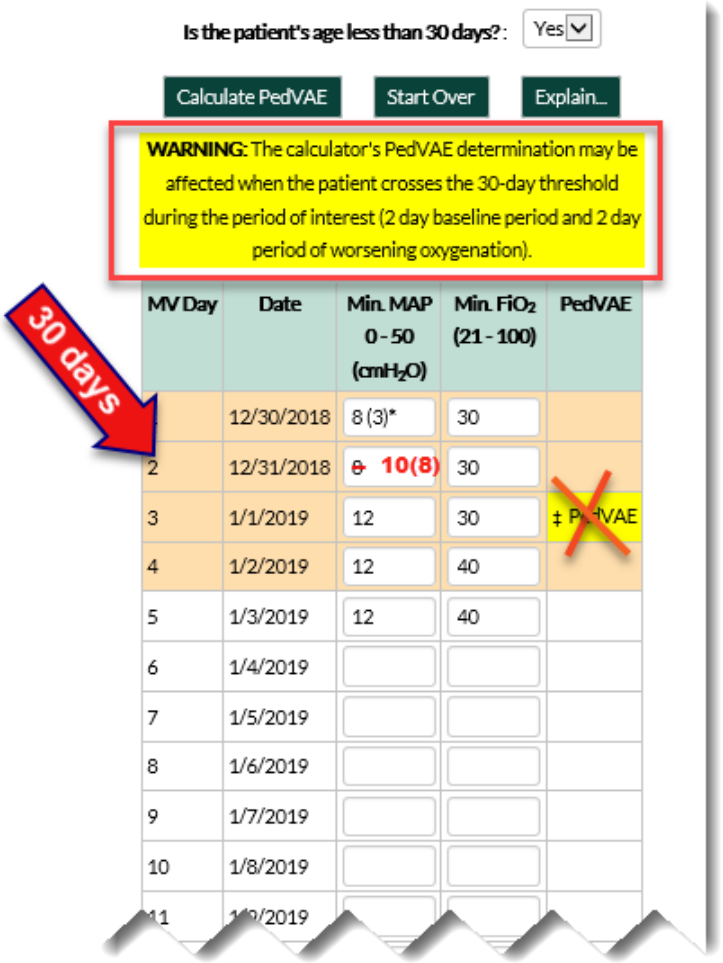
- **Patient ≥ 30 days**
- **MAP values 0-10 = 10**
- **No PedVAE**
- **Increase over baseline is not ≥ 4 cmH20**

* All values of MAP less than 8 cmH_2O (or less than 10 cmH_2O **) are considered to be 8 cmH_2O (or 10**) for purposes of the PedVAE definition. So for MAP values entered as less than or equal to 8 (or 10**) cmH_2O, an increase in the daily minimum MAP to at least 12 cmH_2O (or 14**), sustained for 2 or more calendar days, is required to meet the PedVAE definition.

** 10 for patients greater than or equal to 30 days



- **Warning Box**
- **To address change in age ≥ 30 during period of interest**
- **Update to PedVAE Calculator Version 1.0 to follow**



- **Additional fields**
- **Is Patient < 30 Days on date of MV initiation**
- **What is Day of Life on date of MV initiation**

Questions:

nhsn@cdc.gov

NHSN Website:

http://www.cdc.gov/nhsn/

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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