

# PVI Masterclass Booklet

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International Educational Initiative in Patient–Ventilator Interaction

**Organized by:** PVI Network

**Endorsed by:** Society of Mechanical Ventilation

**Hosted by:** Saving Lives Academy

## 1. Leadership Messages

### 1.1 Welcome Message from the Program Chairman

The PVI Masterclass represents a major milestone for the global critical care community. What began as a focused initiative to standardize waveform literacy has evolved into a comprehensive academic program designed to elevate patient-ventilator interaction practice worldwide. In every ICU, across all resource settings, synchrony between patient and ventilator directly influences comfort, safety, and outcomes. Yet formal training in this domain has historically been fragmented.

This Masterclass was created to close that gap. Through structured modules, rigorous assessment, and a blended learning approach, our goal is to equip clinicians with practical, evidence-informed skills that can be applied immediately at the bedside. The curriculum reflects the collective effort of international experts, educators, researchers, and clinicians who share a unified vision: to advance safe, individualized, and physiology-guided mechanical ventilation practice.

I welcome each participant to this journey and invite you to fully engage with the program, ask questions, analyze waveforms, challenge assumptions, and build confidence in applying PVI principles clinically. Together, we can shape the next era of mechanical ventilation and improve the care of critically ill patients globally.

Dr Ehab Daoud

## 1.2 Forward by Program Director

It is my pleasure to introduce the PVI Masterclass, a structured educational program built to address one of the most essential yet underserved areas of critical care practice. Patient-ventilator interaction is a dynamic physiological process, and optimizing it requires deep understanding, structured assessment, and consistent application of evidence-based strategies.

This program has been meticulously designed to bring together physiology, waveform interpretation, advanced monitoring, and practical management algorithms in a cohesive format. The incorporation of simulation, OSCE-based assessment, and live interactive discussions ensures that learning extends beyond theory into true clinical application.

I am grateful to the faculty and contributors who have shaped this program, and I am confident that the knowledge and skills you will gain will enhance your clinical practice. I encourage you to approach each module with curiosity and a commitment to mastery.

Ahmed El Masry

Abdelrahman Aboshady

## 2. About the Program

### 2.1 Introduction

The PVI Masterclass is a comprehensive, modular training program built by the PVI Network to standardize education, advance clinical skills, and elevate global competency in Patient-Ventilator Interaction (PVI). This booklet serves as the primary guide for all participants and faculty.

### 2.2 Program Overview

This structured program integrates recorded lectures, waveforms interpretation, AI-based detection tools, simulation-based training, and OSCE-style competency assessments. The program spans 10 weeks with 6 hours of weekly study time.

### 2.3 What Makes This Masterclass Unique

The PVI Masterclass is the first international program to deliver a standardized, competency-based curriculum dedicated entirely to Patient-Ventilator Interaction (PVI). Its uniqueness lies in its depth, structure, and emphasis on real-world clinical applicability. Several features distinguish it from traditional mechanical ventilation courses:

#### 1. Waveform-First Diagnostic Framework

The Masterclass places waveform interpretation at the core of clinical decision-making. Participants learn a structured, phase-based approach that strengthens pattern recognition, reduces diagnostic errors, and enhances bedside accuracy.

#### 2. Integrated Use of Advanced Monitoring Tools

The curriculum incorporates esophageal pressure monitoring, EAdi, diaphragm ultrasound, and automated PVI detection technologies, allowing clinicians to develop a modern, multi-signal understanding of patient effort and ventilator performance.

#### 3. Blended Learning with Real Clinical Scenarios

Each module combines recorded lectures, annotated waveform cases, simulation activities, and OSCE-style assessments. This multimodal design ensures that theoretical knowledge translates into reproducible clinical competency.

#### 4. Focus on Preventing P-SILI and VIDD

Prevention is woven into every module. Learners are trained to recognize early warning signs of harmful effort, implement protective ventilation strategies, and apply escalation algorithms that reduce risk and improve patient outcomes.

## **5. International, Multidisciplinary Faculty**

The program is developed by intensivists, anesthesiologists, respiratory therapists, and physiologists with global expertise in PVI. This diversity ensures balanced perspectives, broad applicability, and alignment with best international practices.

## **6. Standardized Competency Assessment**

Using quizzes, waveform interpretation tasks, simulations, and a final MCQ exam, the program ensures that learners achieve measurable competency rather than passive knowledge acquisition.

## **7. Technology-Enabled Learning Environment**

All content is delivered through a structured LMS with progressive release, interactive tools, downloadable resources, and continuous support, providing flexibility without compromising rigor.

## 2.4 Program Highlights

The PVI Masterclass delivers a comprehensive, clinically focused educational experience that bridges physiology, technology, and real-world bedside practice. The following highlights capture the core strengths of the program:

### 1. Comprehensive, Modular Curriculum

A structured 6-module design covering fundamentals, waveform interpretation, advanced monitoring, management strategies, and prevention. Content progresses logically from foundational principles to advanced clinical application.

### 2. Phase-Based PVI Classification

Learners develop mastery in analyzing patient-ventilator interaction across trigger, inspiratory, cycling, and expiratory phases, enabling precise diagnosis of abnormal patterns and targeted intervention.

### 3. Hands-On Waveform Mastery

The course emphasizes real ventilator waveforms, annotated examples, case-based tasks, and OSCE-style waveform interpretation stations—ensuring clinicians gain practical skills they can immediately apply in the ICU.

### 4. Integration of Advanced Monitoring

Participants learn how to incorporate:

- Diaphragm ultrasound
- Esophageal pressure monitoring
- EAdi and neural-drive assessment

This creates a multi-dimensional understanding of effort, mechanics, and synchrony.

### 5. Blended Learning Approach

A flexible combination of pre-recorded lectures, live webinars, interactive workshops, simulation sessions, quizzes, and a final MCQ exam. This format accommodates busy clinical schedules while maintaining academic rigor.

### 6. Competency-Based Assessment System

Each learner completes:

- Module quizzes
- Applied waveform interpretation tasks

- Simulation/OSCE checkpoints
- Final certification exam

This ensures measurable skill acquisition and evidence of competency.

## **7. International Expert Faculty**

The program is delivered by an interdisciplinary team of global leaders in mechanical ventilation, PVI, ultrasound, and advanced monitoring, offering diverse perspectives and globally relevant best practices.

## **8. AI-Enhanced Learning Elements**

Leveraging modern tools, the course introduces automated waveform and effort assessment technologies, preparing clinicians for the evolving landscape of intelligent ventilation.

## **9. Alignment with Global Standards**

Educational design and assessment frameworks align with recognized principles of professional certification programs and modern ventilatory-care competencies.

## **10. Certificate of Completion**

Participants who meet all learning requirements receive a formal certificate issued by the PVI Network, reflecting mastery of core competencies in PVI.

### 3. Admission & Target Audience

#### 3.1 Target Audience

- Intensivists, anesthesiologists, pulmonologists
- Critical care fellows/residents
- Respiratory therapists
- ICU nurses involved in mechanical ventilation
- Simulation educators

#### 3.2 Student Admission Requirements

The PVI Masterclass welcomes clinicians from diverse clinical backgrounds involved in mechanical ventilation management.

#### 3.3 Enrollment Pathway

- Online application through the registration portal
- Confirmation email with login credentials to the Learning Management System (LMS)
- Access to prerecorded lectures at course start date
- Enrollment in live sessions and simulation workshops

### 4. Learning Outcomes & Educational Design

#### 4.1 Learning Outcomes

At the end of the masterclass, you will be able to:

- Understand the physiology of patient-ventilator interaction
- Recognize and interpret waveform-based asynchrony
- Implement ventilator-first correction strategies
- Use advanced monitoring tools: EAdi, esophageal pressure, ultrasound
- Prevent P-SILI and VIDD through optimized synchrony
- Utilize AI and automated tools for PVA detection
- Apply PVI escalation algorithms and structured approaches

#### 4.2 Teaching Philosophy

The program is built on four pillars:

1. Waveform-first diagnosis
2. Integration of physiology with technology
3. Case- and simulation-based learning
4. Prevention-focused strategies over rescue interventions

#### 4.3 Total CME/CPD Hours

Module	Components Included	Estimated Hours	CME/CPD Eligibility
<b>Module 1</b>	Recorded lectures	6.0 hours	Yes
<b>Module 2</b>	Recorded lectures + Interactive Sessions	6.0 hours	Yes
<b>Module 3</b>	Recorded lectures + Interactive Sessions	6.0 hours	Yes
<b>Module 4</b>	Recorded lectures + Interactive Sessions	6.0 hours	Yes
<b>Module 5</b>	Recorded lectures + Interactive Sessions	6.0 hours	Yes
<b>Module 6</b>	Recorded lectures + Interactive Sessions	4.0 hours	Yes

#### 4.4 Program Structure & Timeline

**Components:**

- Recorded lectures (progressive release)
- Live webinars after each module
- Waveform interpretation workshops
- Simulation and virtual practice sessions
- Module quizzes and final certification exam

**Duration:** 10 weeks

**Weekly Effort:** 6 hours

**Program Launch:** March 1st, 2026

## 5. Curriculum

### 5.1 Modules Introductions

#### **Module 1 – Introduction to Mechanical Ventilation**

This module provides the foundational physiological and mechanical principles required for understanding the mechanical breath. It introduces essential concepts in lung mechanics, work of breathing, and ventilator variables that underpin all subsequent PVI analysis.

#### **Module 2 – Introduction to Patient-Ventilator Interaction**

This module defines the physiological basis of synchrony and explores how patient effort, ventilator settings, and disease physiology interact. It introduces P-SILI, VIDD, and the PVI taxonomy, creating the conceptual framework for later waveform interpretation.

#### **Module 3 – Diagnosis & Monitoring Using Waveform Analysis**

This module focuses on practical waveform interpretation and systematic diagnosis of PVI abnormalities. Through stepwise analysis, learners develop the ability to identify trigger, inspiratory, cycling, and expiratory abnormal patterns of PVI in real clinical waveforms.

#### **Module 4 – Advanced Monitoring**

This module covers advanced respiratory monitoring modalities including esophageal pressure, EAdi, and ultrasound assessment of effort. It prepares clinicians to integrate multiple physiological signals and use advanced tools to guide individualized ventilatory support.

#### **Module 5 – Management of Patient-Ventilator Interaction (PVI) Patterns**

This module translates diagnosis into action. It provides evidence-based strategies to correct specific PVI patterns using ventilator adjustments, sedation modulation, and advanced modes such as NAVA and PAV.

#### **Module 6 – Prevention of Asynchrony**

This module focuses on proactive strategies to minimize asynchrony. Participants learn preventive approaches including optimal ventilator setup, adaptive modes, and individualized configurations tailored to patient phenotype.

## 5.2 Detailed Curriculum (Modules 1–6)

### Module 1 – Introduction to Mechanical Ventilation

- 1.1 Fundamentals of Lung Mechanics and Work of Breathing
- 1.2 Physiology of the Normal vs. Mechanical Breath
- 1.3 Basic elements of mechanical ventilation
- 1.4 Ventilator system concepts
- 1.5 Essential variables of Mechanical breath
- 1.6 Types of Mechanical Breath
- 1.7 Taxonomy of Modes of Mechanical Ventilation
- 1.8 Basics of Ventilator Waveforms and Interpretation

### Module 2 – Introduction to Patient–Ventilator Interaction

- 2.1 Overview of Patient-Ventilator Interaction (PVI)
- 2.2 Assessing & Measuring Patient's Effort during Mechanical Ventilation
- 2.3 Understanding Patient Self-Inflicted Lung Injury (P-SILI) and Ventilator-Induced Diaphragmatic Dysfunction (VIDD)
- 2.4 Taxonomy for Patient-Ventilator Interactions (PVI)

### Module 3 – Diagnosis & Monitoring PVI using Waveform Analysis

- 3.1 Asynchrony Index (AI), calculation and clinical interpretation
- 3.2 Systematic Waveform Analysis for PVI Detection
- 3.3 Recognition and Interpretation of trigger phase asynchrony
- 3.4 Recognition and Interpretation of inspiratory phase asynchrony
- 3.5 Recognition and Interpretation of cycling phase Asynchrony
- 3.6 Recognition and Interpretation of expiratory phase Asynchrony
- 3.7 Putting It All Together" to address mixed asynchrony and strengthen overall understanding of PVI.

#### **Module 4 – Advanced Monitoring**

- 4.1 Assessment of Respiratory Effort by Ultrasound
- 4.2 Assessment of Respiratory Effort by Airway and Esophageal Pressure Monitoring
- 4.3 Assessment of Respiratory Effort by Neural Activity (EAdi)
- 4.4 Role of Automation in Optimizing Patient Ventilator Interaction
- 4.5 Automated Detection of PVI Patterns Using Integrated Monitoring Software

#### **Module 5 – Management of Patient–Ventilator Interaction (PVI) Patterns**

- 5.1 Strategies for managing trigger phase asynchrony
- 5.2 Strategies for managing inspiratory phase asynchrony
- 5.3 Strategies for managing Cycling phase asynchrony
- 5.4 Strategies for managing expiratory phase Asynchrony
- 5.5 Pharmacologic modulation and optimization of respiratory Drive
- 5.6 Advanced Strategies for PVI Optimization (NAVA and PAV modes)

#### **Module 6 – Prevention of Asynchrony**

- 6.1 Optimal Initial Ventilator Setup and Individualized Configuration
- 6.2 Application of Intelligent and Adaptive Ventilation Modes

## 6. Assessment & Certification

### 6.1 Module Quizzes

- Objective, single-best-answer questions
- Covers key physiological and mechanical concepts
- Must be completed before progressing to the next module

### 6.2 Applied Waveform Tasks

- Real waveform examples
- Pattern classification and management decision-making
- Contributes significantly to the final score

### 6.3 Simulation / OSCE

- OSCE-style stations
- Case-based asynchrony management
- Reinforces clinical integration

### 6.4 Final MCQ Quiz

- Comprehensive MCQ-based final quiz
- Includes scenario-based and waveform-focused multiple-choice items
- Covers all modules and key competencies taught in the Masterclass

### 6.5 Certification Requirements

To receive the Certificate of Completion:

- Complete all modules
- Pass each module quiz
- Achieve >70% average across assignments
- Pass the final exam
- Attend at least 50% of the live interactive sessions

## 7. Support & Communication

### 7.1 Academic Support

- Direct faculty Q&A through the Masterclass WhatsApp Group

### 7.2 Technical Support

- TBC

### 7.3 Administrative Support

- TBC

## 8. Fees & Registration

### 8.1 Program Fees

- Standard enrollment fee: TBC
- Early-bird registration: TBC
- LMIC (Low- and Middle-Income Countries) discounted rate: TBC
- Group registration discount (institutions / teams): available on request

### 8.2 Discount Policies

- TBC

### 8.3 Refund Policy

- TBC

## 9. Faculty & Governance

### 9.1 Program Leadership

#### Program Chairman

- Dr. Ehab Daoud

#### Program Director

- Dr. Ahmed El Masry
- Dr. Abdelrahman Abo Shady

### 9.2 Scientific Committee

- Dr. Mohammed Amin
- Dr. Nadir Kharma

### 9.3 Faculty Roster

- Dr Ehab Daoud
- Dr. Abdelrahman Abo Shady
- Dr. Mohammed Amin
- Dr. Nadir Kharma
- Dr. Ahmed Mady
- Dr. Ahmed Hegazy
- RT. Ariel Garnero
- Dr. Sateesh Chandra
- Dr. Ahmed El Masry
- Dr. Denise Battaglini
- Dr. Walid Al-Habashi
- Dr. Mauro Castro

- Dr. Faten Farid
- Dr. Juan Martin
- Dr. Ashraf Al Tayar
- Mr. Munir Karjaghlia
- Mr. Anton Balakirev

#### 9.4 Disclosure Statement

All faculty members participating in the PVI Masterclass have been required to disclose any relevant financial or non-financial relationships. All educational content is developed independently and free of commercial bias.

#### 9.5 Faculty Responsibilities

Faculty are responsible for delivering evidence-based content, participating in interactive educational activities, contributing to assessments, and maintaining educational independence through disclosure of relevant relationships.

#### 10. Accreditation Status

The PVI Masterclass is currently undergoing evaluation for international CME/CPD accreditation. Once approval is finalized, the accrediting body, credit designation statement, and accreditation number will be added to this booklet.

Pending accreditation may include:

- Category 1 CME Credits
- European CME Credits (ECMECs)
- Endorsement by recognized academic or professional bodies

Updates will be provided to all registered learners.