Interactive program of Mechanical Ventilation simulation with SimVA

SimVA application was designed to feat with an education program from basic to advance settings in mechanical ventilation. It is now a tool that we use to teach interactively each step of our program.

Material for MV simulation

- **SimVA application on iPad**
- **Classroom/online webinar/alone**

Program

Sessions	Contents
Step 1	Monitoring of respiratory mechanics at the bedside: Basics
Step 2	Setting the ventilator in different ventilation modes: pressure controlled and volume controlled ventilation
Step 3	Monitoring of respiratory mechanics at the bedside: Advance
Step 4	Ventilating passively a patient with obstructive lung disease
Step 5	Protective ventilation, alveolar recruitment, methods of selecting PEEP based on lung mechanics.
Step 6	Monitoring of patient-ventilator interaction during spontaneous breathing at the bedside
Step 7	Effort adapted modes: Proportional assisted ventilation PAV+ and Neurally Adjusted Ventilatory Assist NAVA

# Session's objectives + scenario

Session Step 1

Measurement of respiratory mechanics at the bedside in passively ventilated patient:

Step 1 is the simulation of basic respiratory mechanics at the bedside.

Learning Objectives

The purpose of this simulation scenario is to train attendees in the most important parameters that can be measured at the bedside in passively ventilated patients.
It includes the flow, peak and plateau pressure, compliance of the respiratory system and airway resistances.

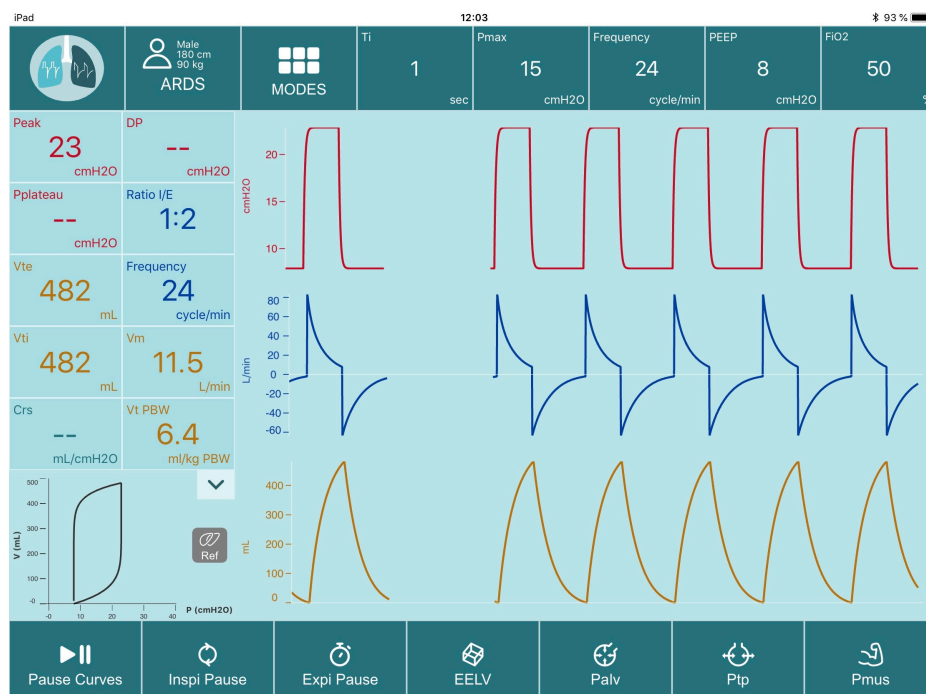The interaction of these parameters will be simulated.
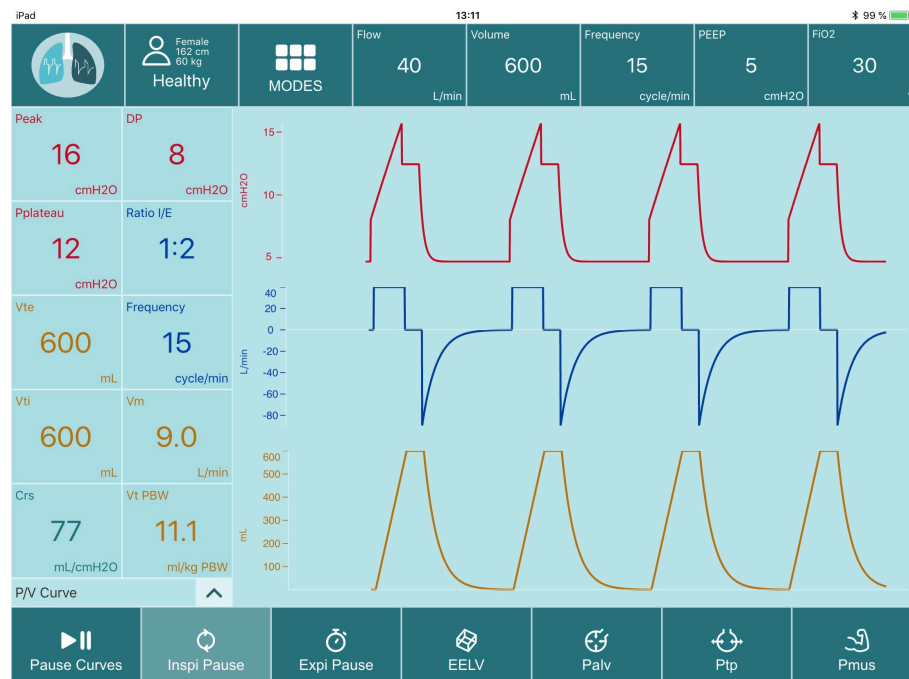
Session Step 2

Ventilators setting in pressure assist controlled and volume assist controlled ventilation, with the effect and interaction on monitoring.

Step 2 is the simulation of both modes in order to compare on simulated patient the differences.

Learning Objectives

What are the differences, what the key parameters? How do you start baseline ventilation with each mode? How do you adjust settings with each mode when compliance and resistance change?

The purpose of this simulation is to provide clinicians with the basic skills to set the ventilator in these modes and to give interaction with patient's simulation.
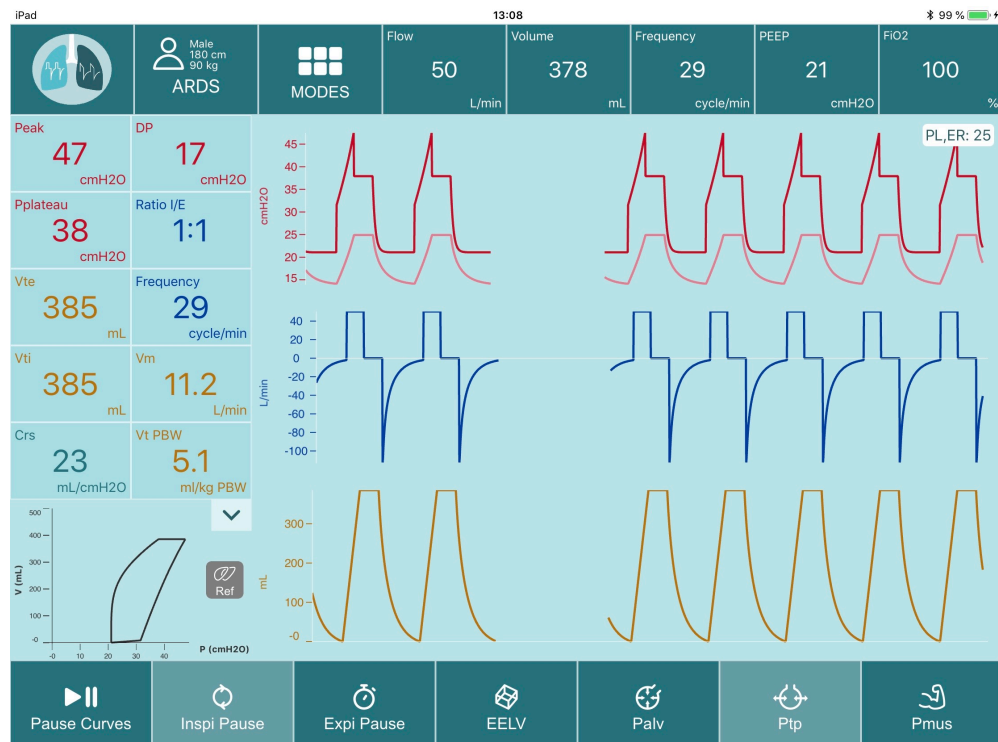
Session Step 3

Advanced respiratory mechanic, which include intrinsic PEEP, driving pressure, compliance of the chest wall, and transpulmonary pressures.

Step 3 will simulate the interaction of these parameters.

Learning Objectives

The purpose of this simulation scenario is to train attendees with these specific parameters that can be measured at the bedside in passively ventilated patients.
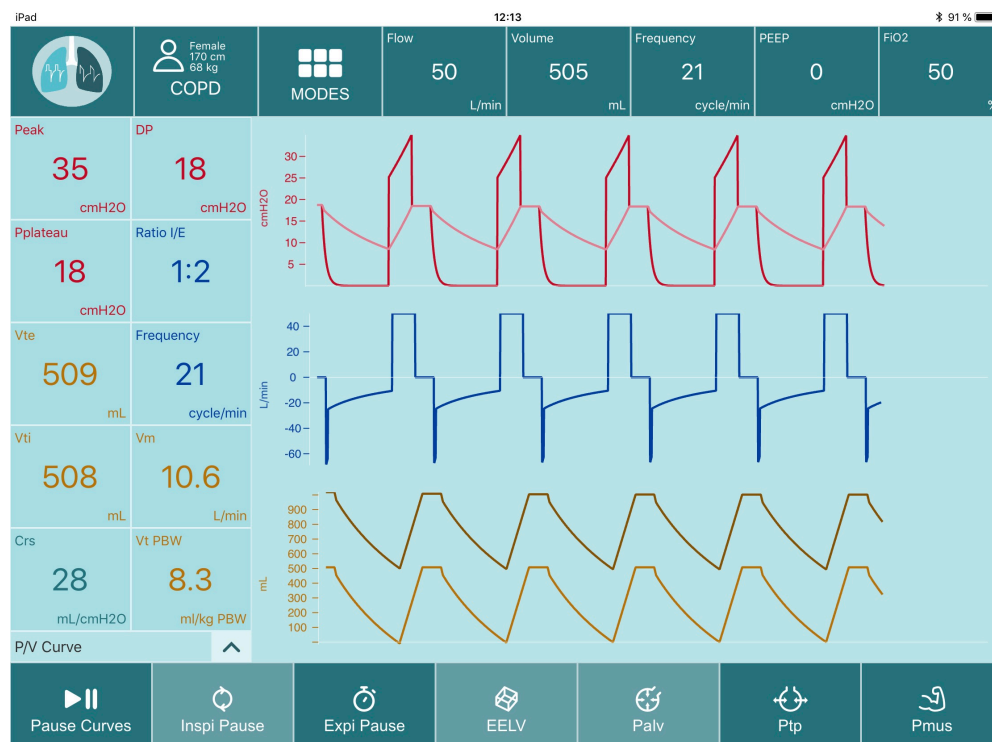
Session Step 4

Step 4 is the simulation of a passive ventilated patient with obstructive disease.

Learning Objectives

The purpose of this simulation scenario with SimVA is to train attendees on how to face the main challenges encountered when ventilating a patient with increased airway resistance and/or obstructive disease, such as severe asthma or COPD. The simulation will include detection and measurement of increased airway resistance and COPD flow limitation interpretation. How to measure intrinsic PEEP, assessment of hyperinflation with end expiratory lung volume. Simulated case in the menu will illustrate how to optimize different ventilatory settings (tidal volume, respiratory rate, external PEEP and inspiratory flow). Challenge on simulator between the use of volume or pressure controlled modes with intrinsic PEEP.

More advanced simulation with the Interaction between external and intrinsic PEEP.
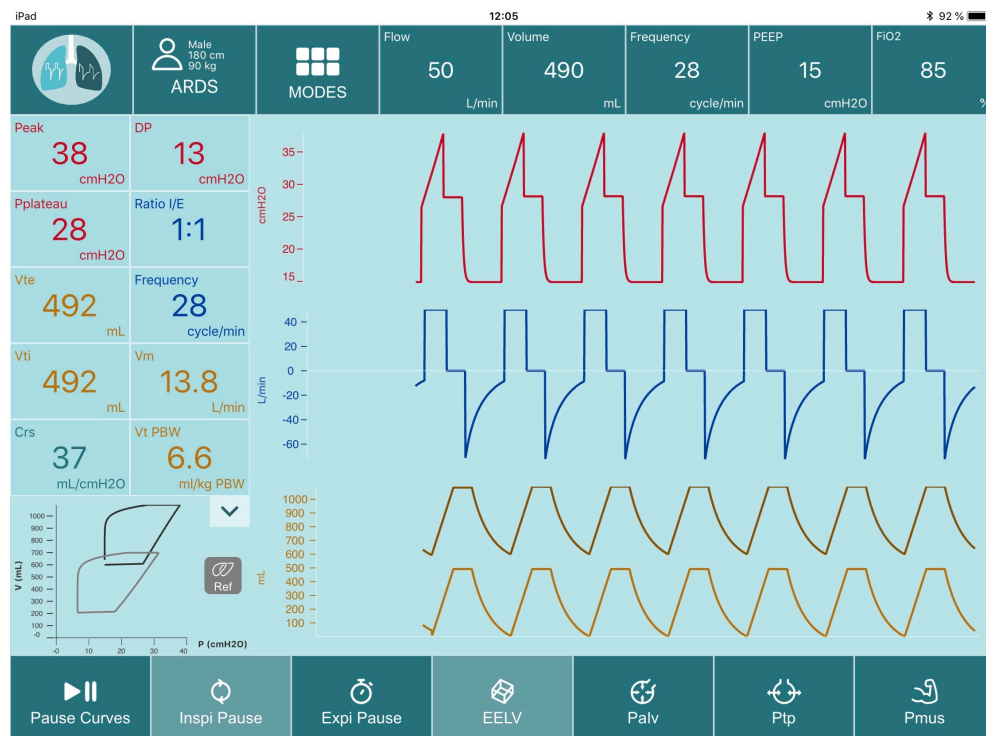
Session Step 5

Protective ventilation, alveolar recruitment and PEEP setting based on respiratory mechanics and published protocols.

Step 5 is the simulation of alveolar recruitment.

Learning Objectives

The purpose of this simulation scenario is to train attendees in the possible approaches to assess alveolar recruitment and to titrate PEEP while taking into account the data derived from respiratory mechanics. Simulation with the Pressure/Volume curve, End Expiratory Lung Volume, Elastance related Transpulmonary pressure. Several protocols on PEEP titration according to respiratory mechanics will be simulated, PEEP and plateau pressure, PEEP and Elastance related transpulmonary pressure, PEEP and end expiratory lung volume. PEEP titration and driving pressure.

The most relevant pathologic alterations of these parameters will be simulated with SimVA and their clinical implications will be demonstrated.

Session Step 6

Monitoring of patient-ventilator interaction during spontaneous breathing at the bedside (COPD, ARDS)

Learning Objectives

The purpose of this simulation scenario is to train attendees in the main parameters (numeric or derived from waveform observation), which allow monitoring of various aspects of patient-ventilator interaction with spontaneous breathing at the bedside, using volume or pressure assist ventilation and pressure support ventilation.
The simulator will propose patient with spontaneous activity and adaptive effort.
Patient Pmus will be displayed to explain the interaction with the ventilator (settings and asynchronies) and some aspects of the control of breathing.
Patients-ventilator synchrony and estimation of patient's effort will be explored and the most frequent abnormal findings (asynchronies) will be simulated and their clinical implications (trigger, assist, flow, PEEP settings) will be demonstrated.

The purpose of this simulation scenario with SimVA and spontaneous adaptive effort is to train attendees on how to face the main challenges encountered when ventilating a patient with increased airway resistance and/or obstructive disease, such as severe asthma or COPD. The simulation will include detection of flow limitation interpretation and trigger delay. How to measure intrinsic PEEP with pleural pressure, assessment of hyperinflation with end expiratory lung volume. Simulated case in the menu will illustrate how to optimize different ventilatory settings (tidal volume, ventilator and neural respiratory rhythm, expiratory trigger and PEEP).

The restricted patients with spontaneous breathings are those after severe ARDS with low thoracopulmonar compliance. The purpose of the simulation scenario with simVA is to train the attendees on how to settle inspiratory time, PEEP and level of assist with protective spontaneous breathing and limited driving pressure.
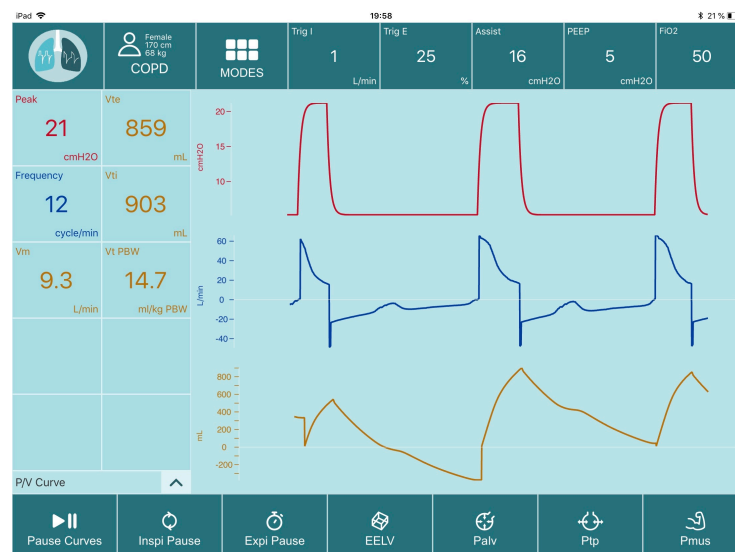
Session Step 7

Introduction to proportional assist modes PAV+ and NAVA

Learning Objectives

The purpose of this simulation scenario is to train attendees in the main settings and monitoring of patient under proportional assist modes with PAV+ and NAVA. How it works, and how to start. Patients-ventilator synchrony and estimation of patient's effort will be explored and the most frequent abnormal findings will be simulated and their clinical implications will be demonstrated.

The different existing protocols of NAVA level or % of Gain with PAV+ will be simulated.

The assessment of patient's effort through Pmus with PAV+ or pressure electricity index and neuro ventilatory efficiency with NAVA will be simulated. The simulator scenario will propose synchrony with PAV+ or NAVA in ARDS or COPD.