Different Modes Of Mechanical Ventilation

Presented By

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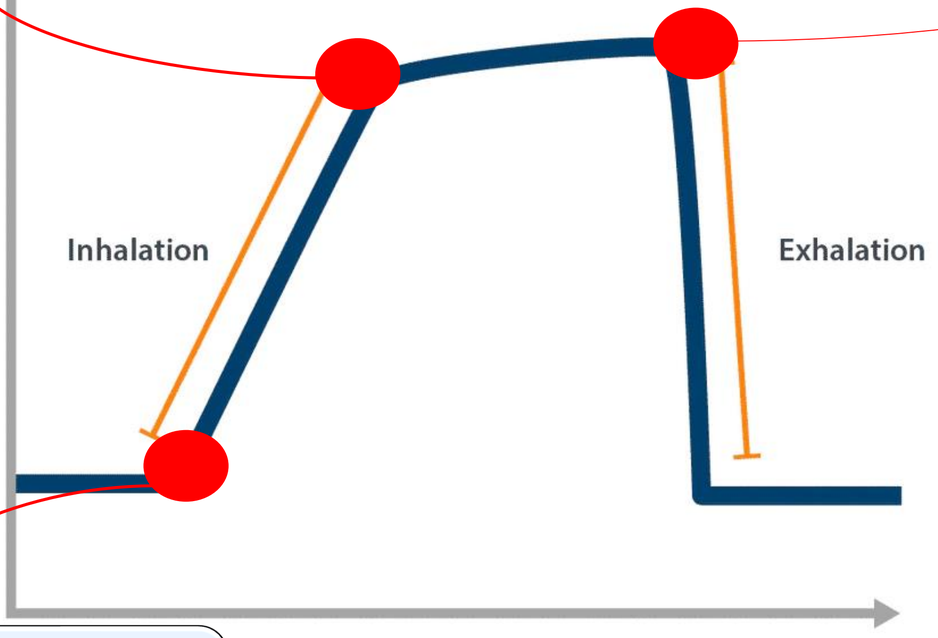
Trigger, Limit, Cycle

Limit

What determine when to stop pushing gas flow into the lung

Cycle

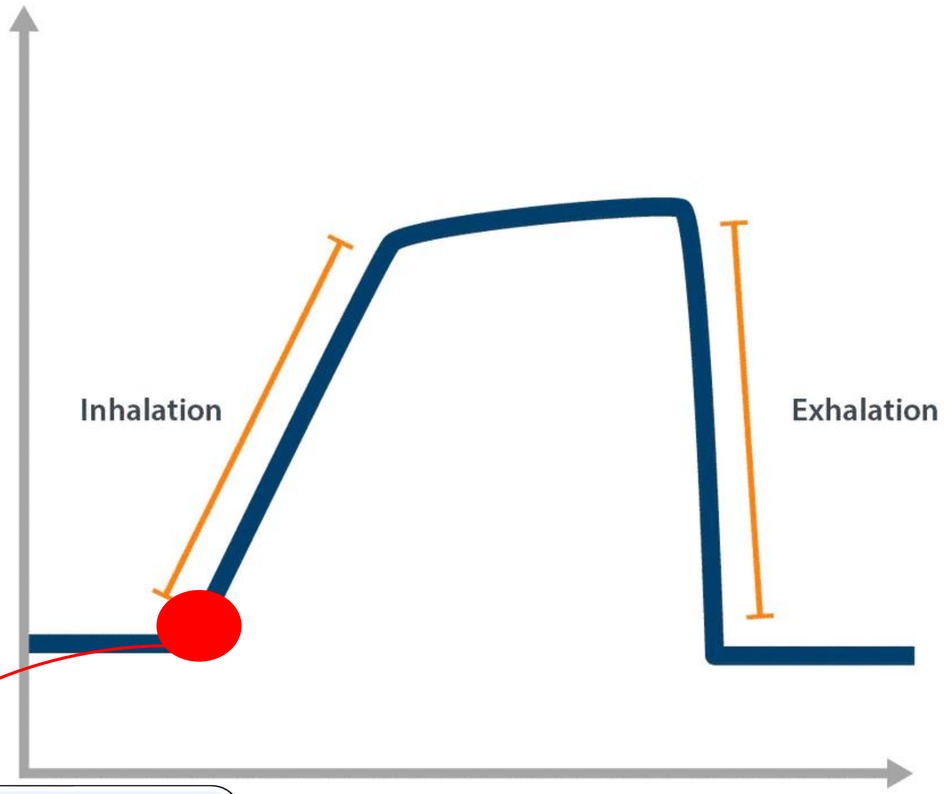
How the ventilator cycle from inspiration to expiration



Trigger

How the breath is signaled to start

Trigger

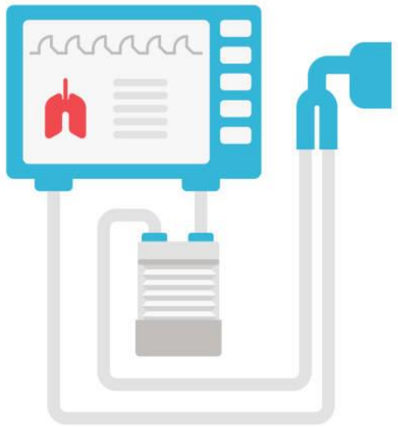


Trigger

How the breath is signaled to start

Trigger

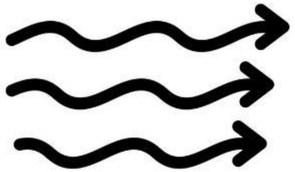
Machine triggered



Time triggered

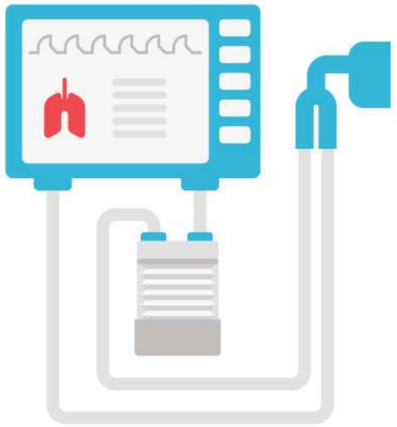
Patient triggered

Pressure triggered

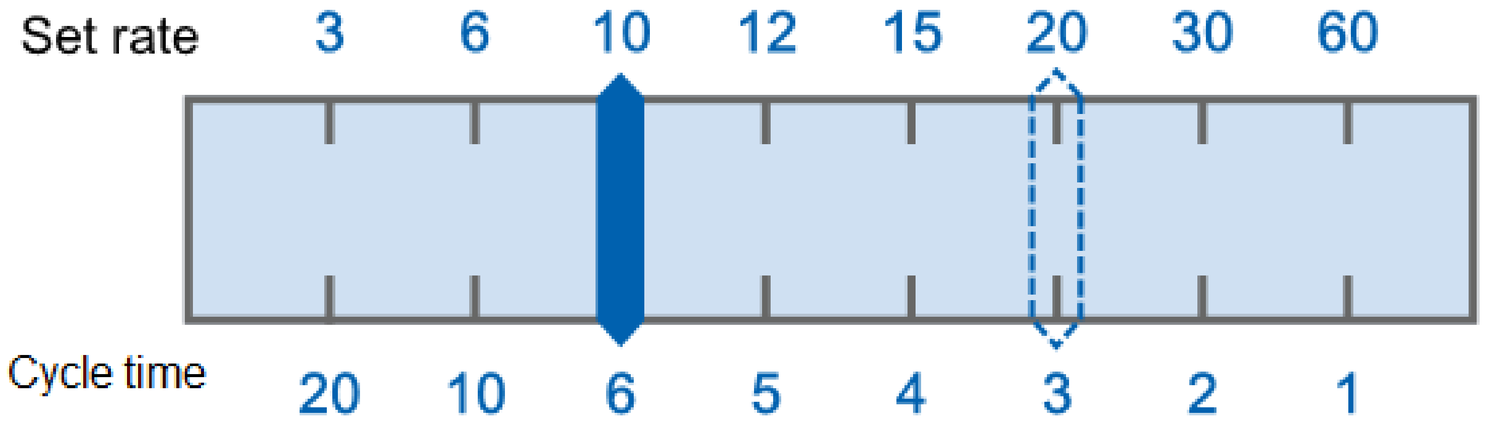


Flow triggered

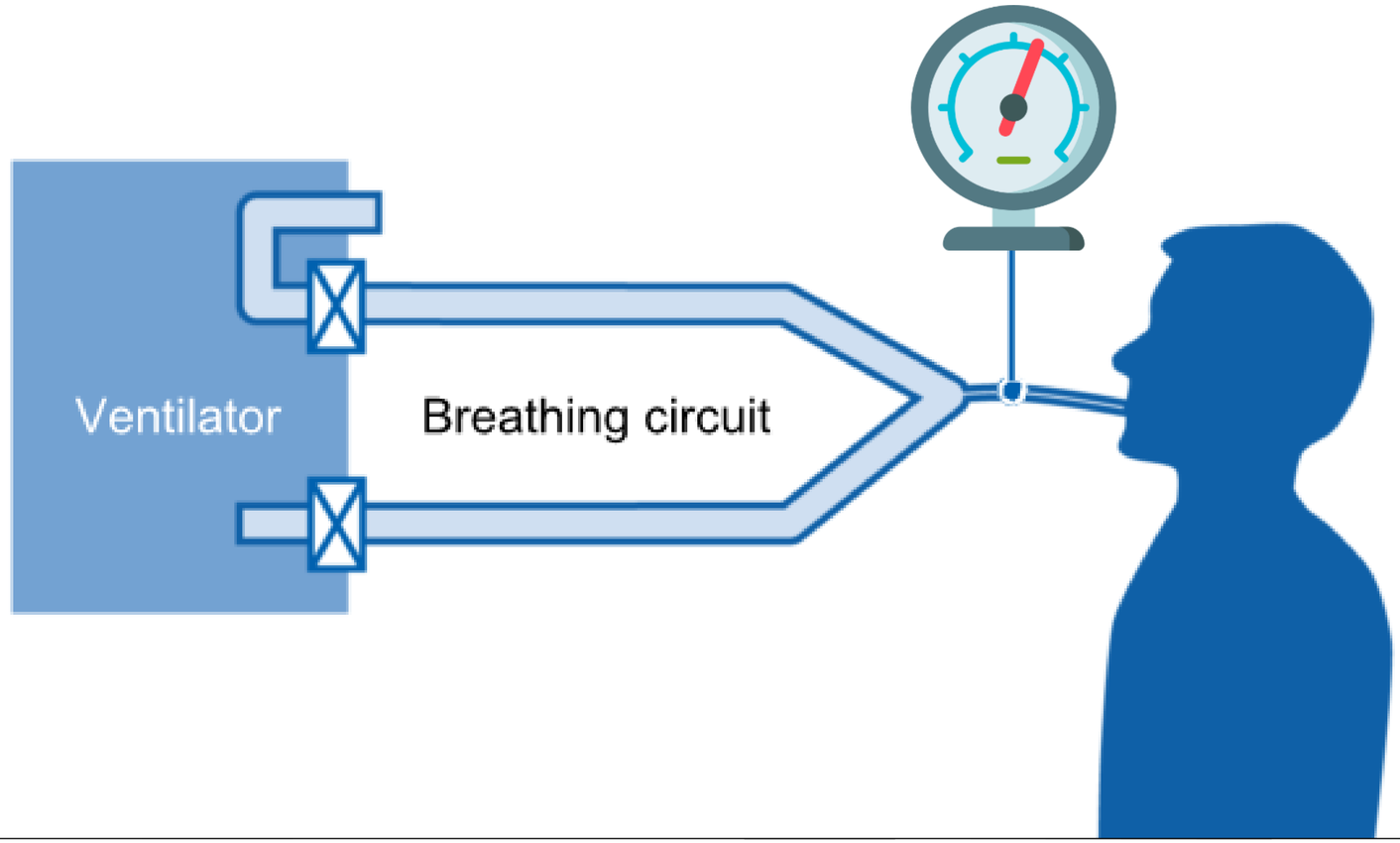
Time trigger



$$\text{Cycle time} = \frac{60}{\text{Resp rate}}$$

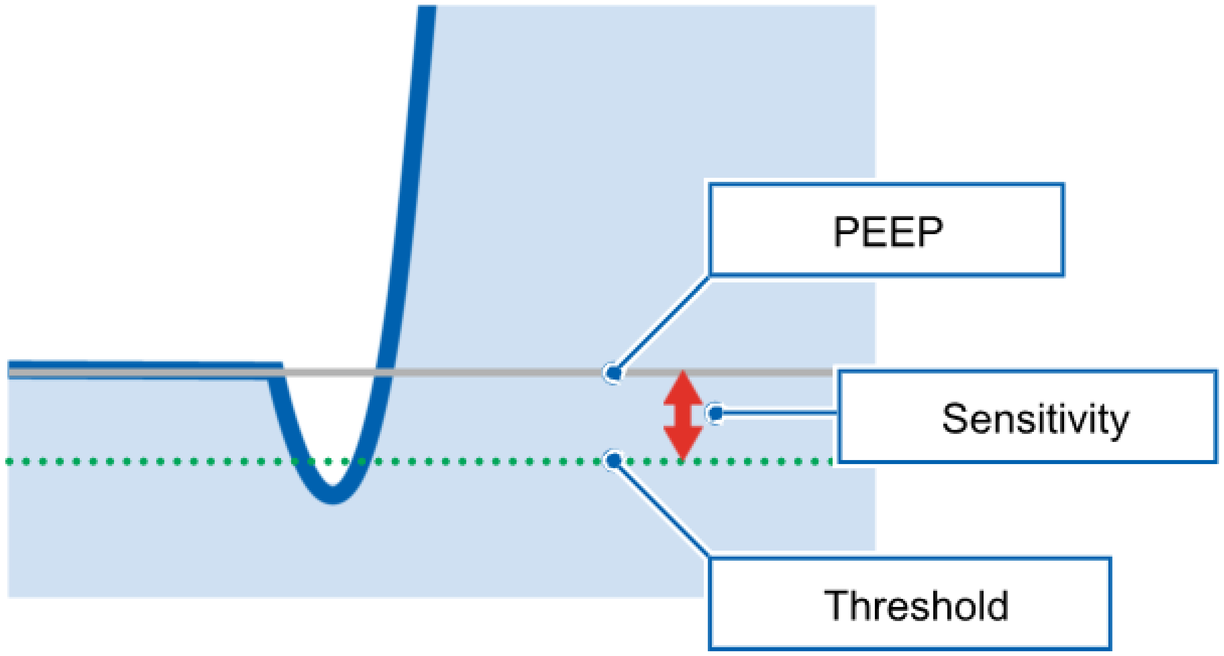


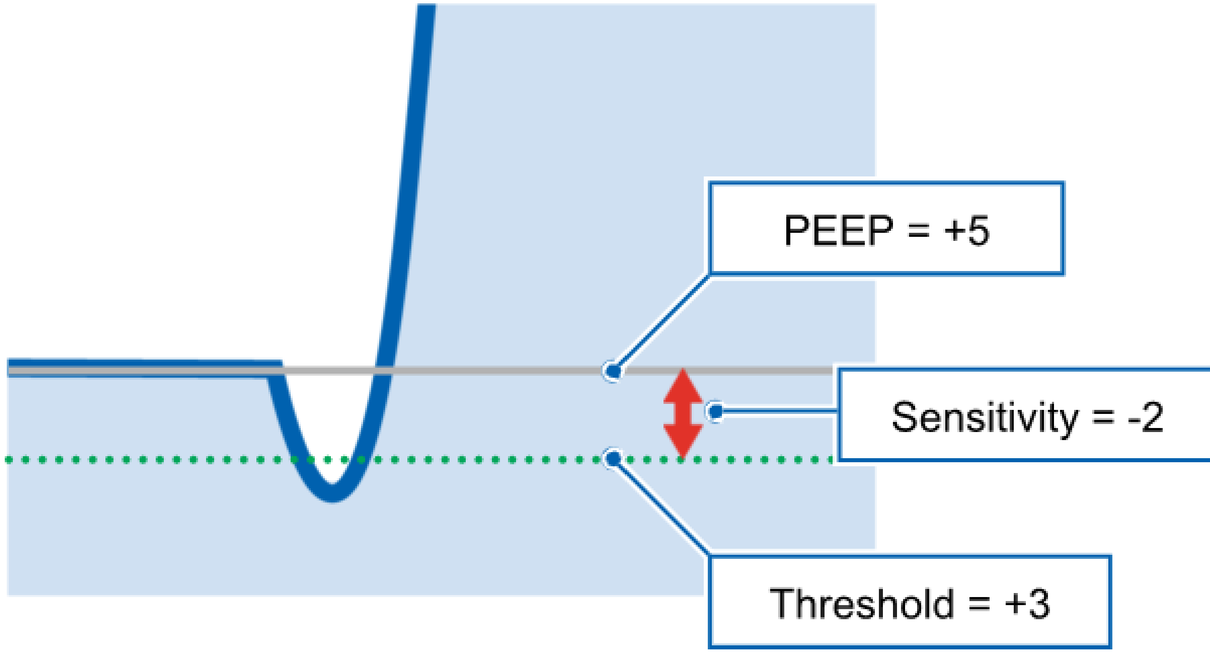
Pressure trigger



Patient trigger ventilator when a predetermined negative pressure is reached

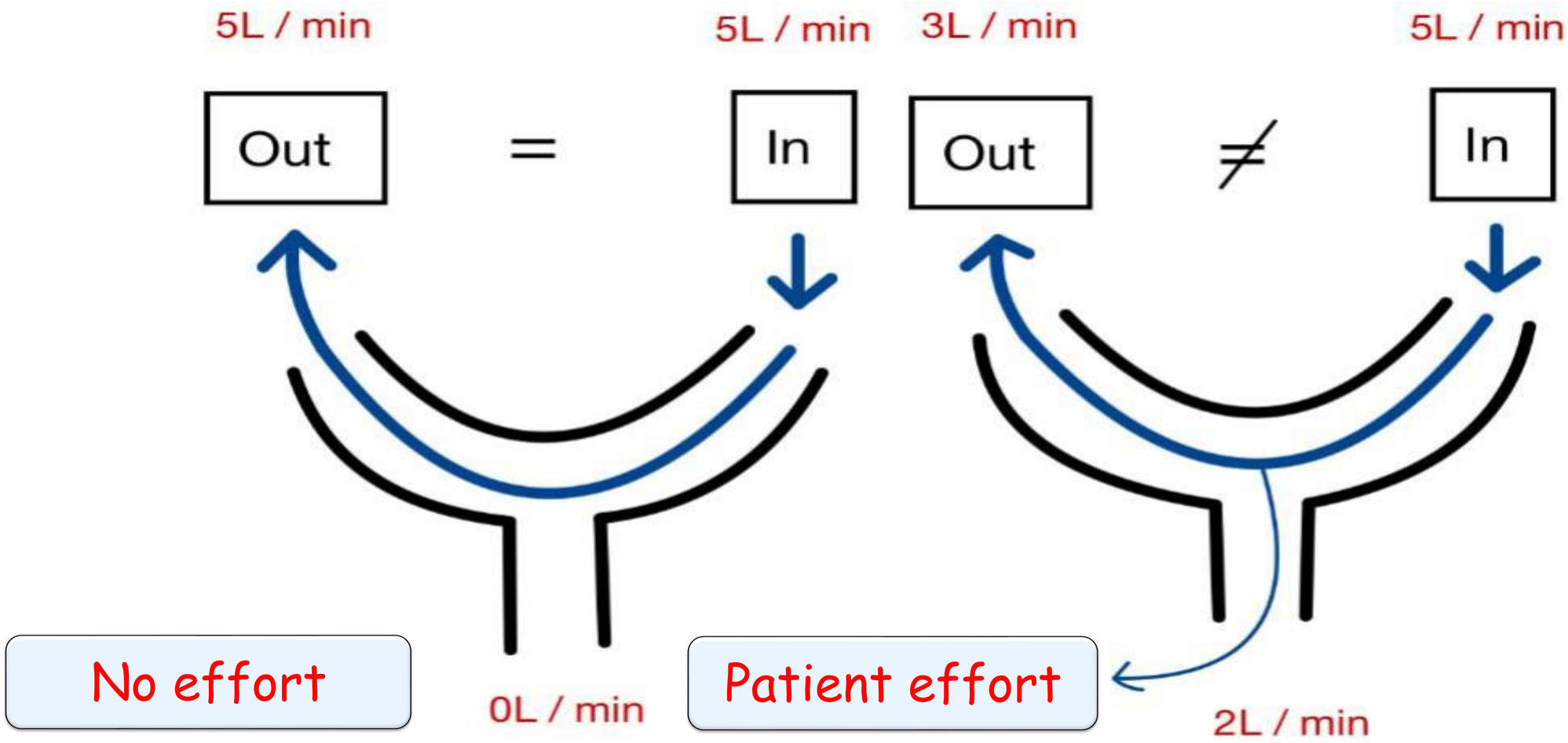
Pressure trigger





Patient trigger ventilator when a predetermined negative pressure is reached

Flow trigger

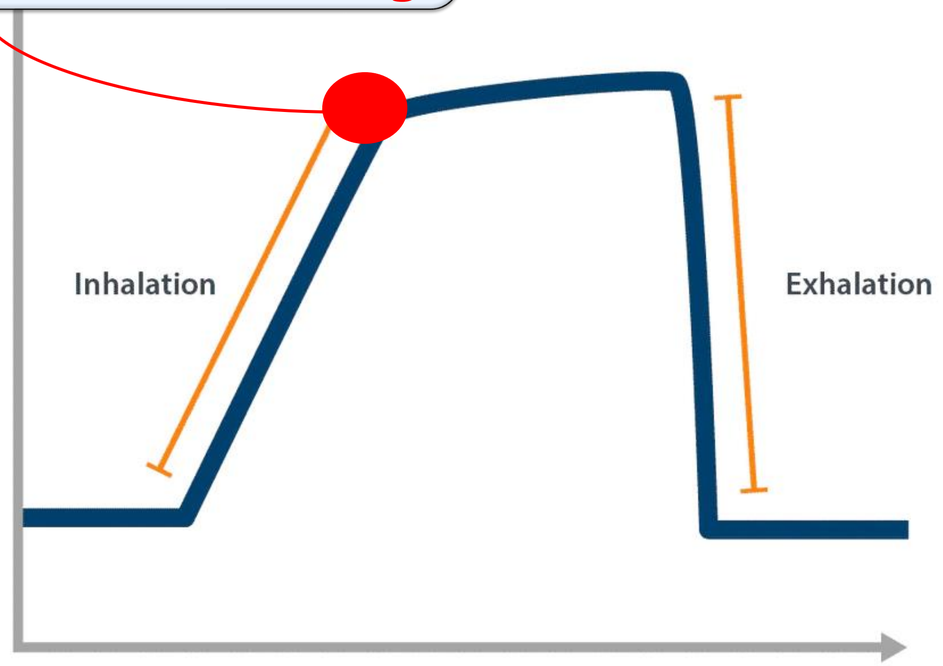


Patient trigger ventilator when a predetermined flow target is reached

Limit/Control

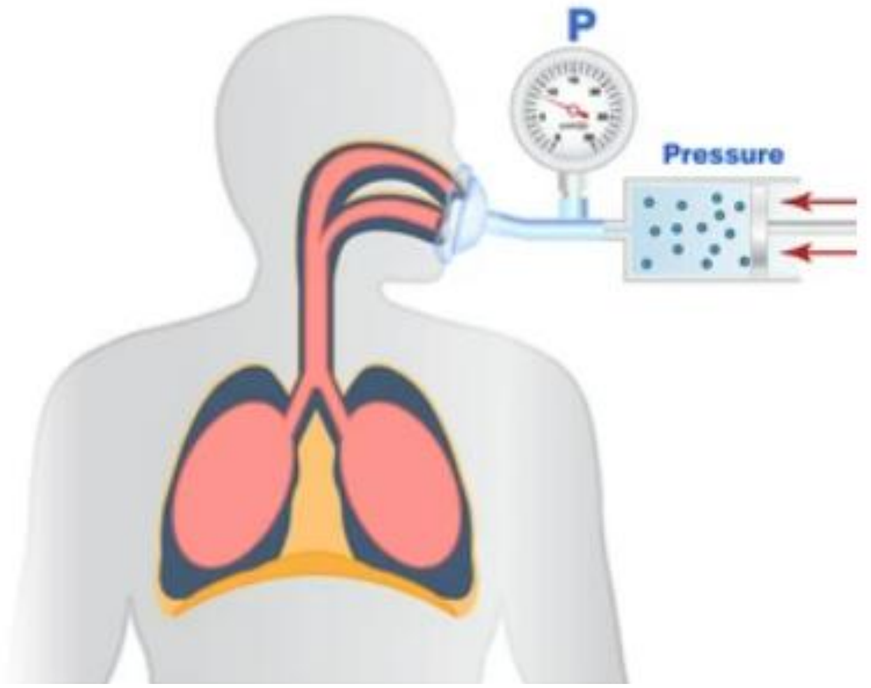
Limit

What determine when to stop pushing gas flow into the lung



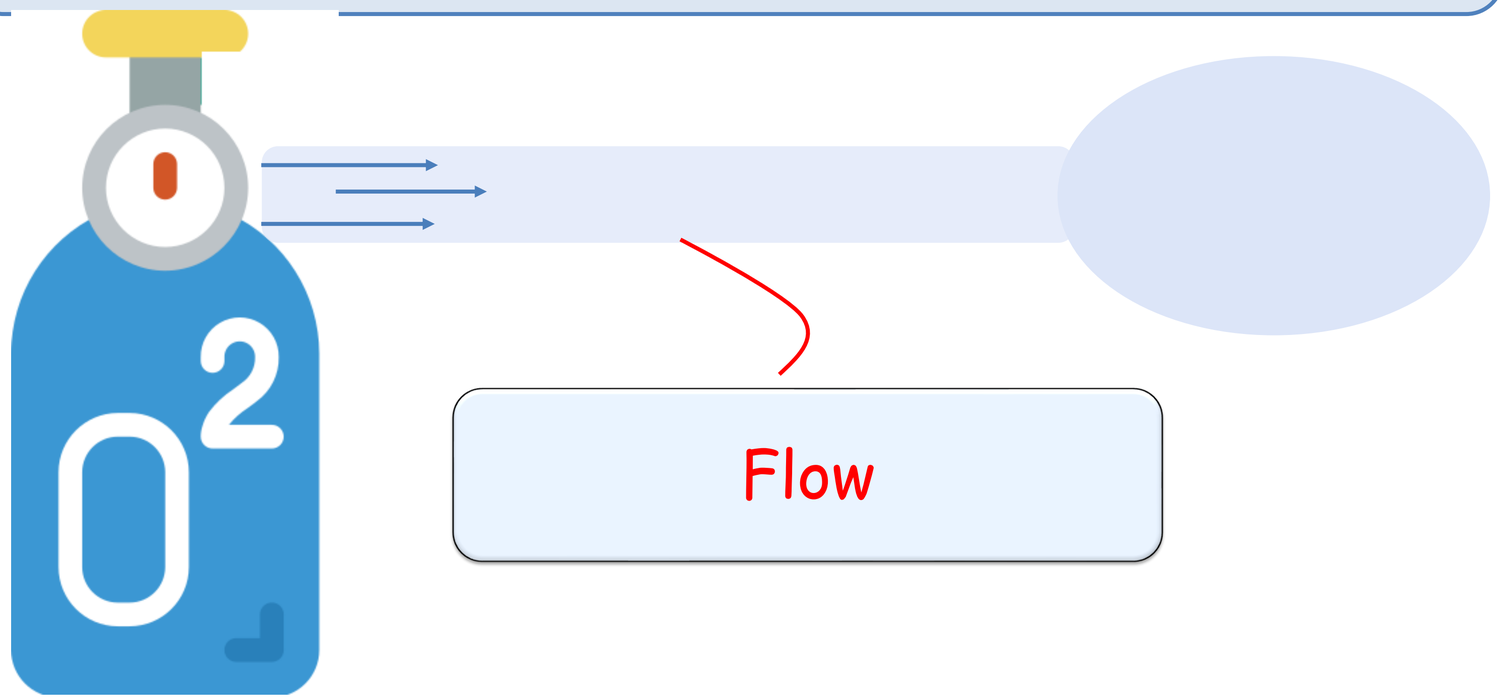
Limit/Control

Volume control



Pressure control

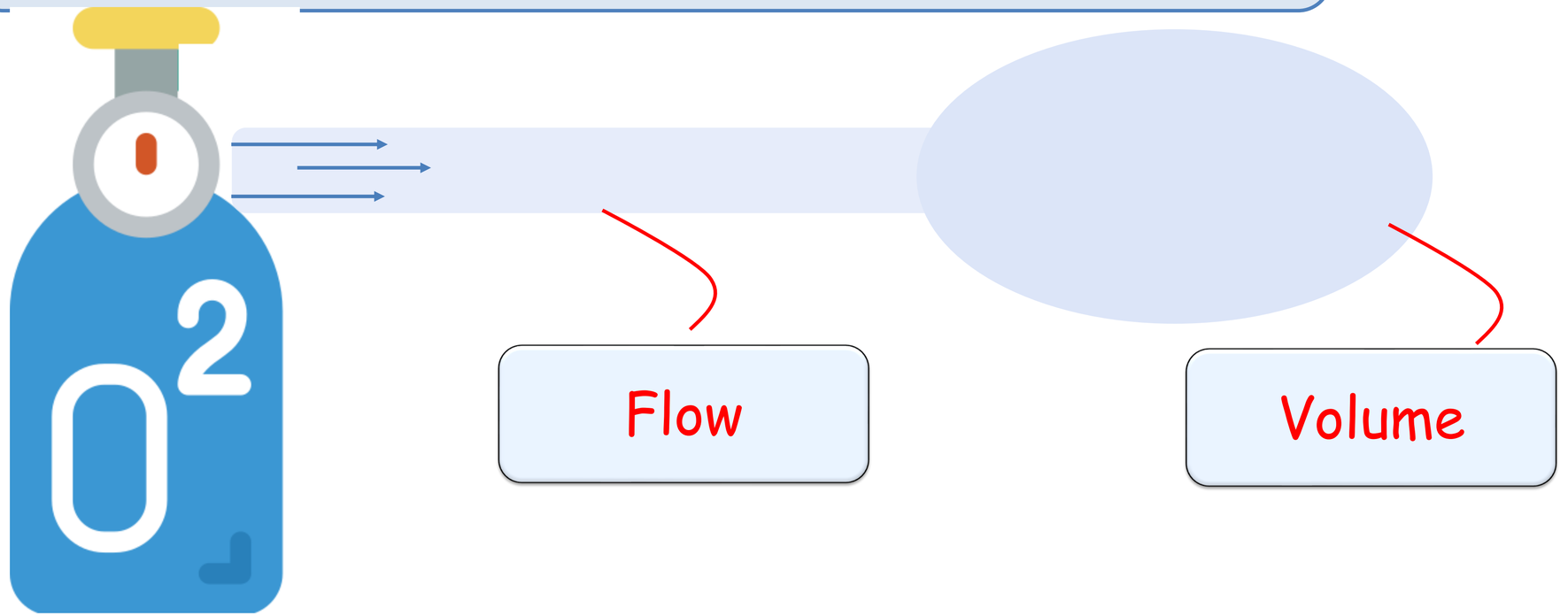
Volume control



The ventilator controls the flow to reach the target tidal volume

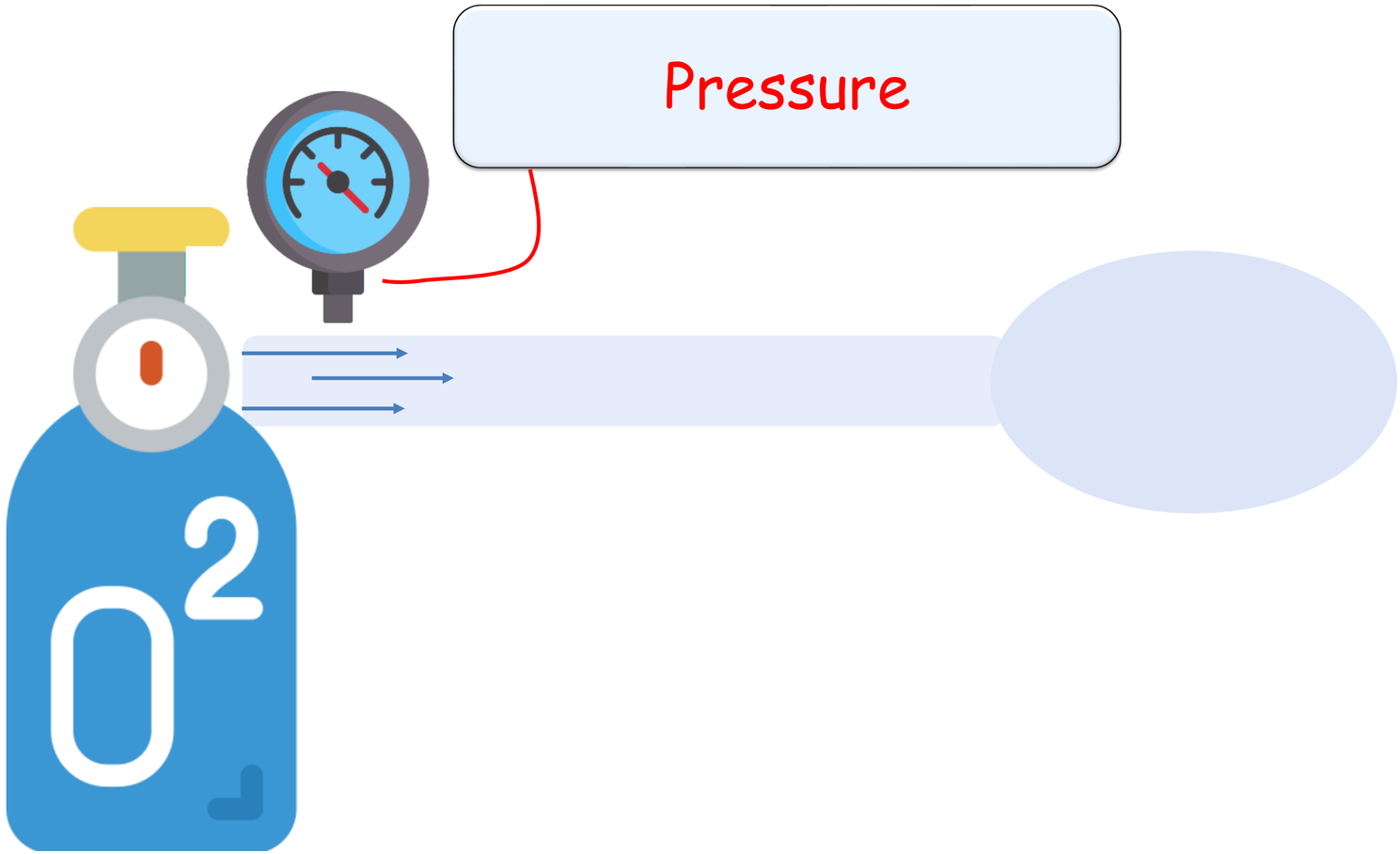
So it is called flow controlled NOT volume controlled

Volume control



Volume = Flow × Time

Pressure control

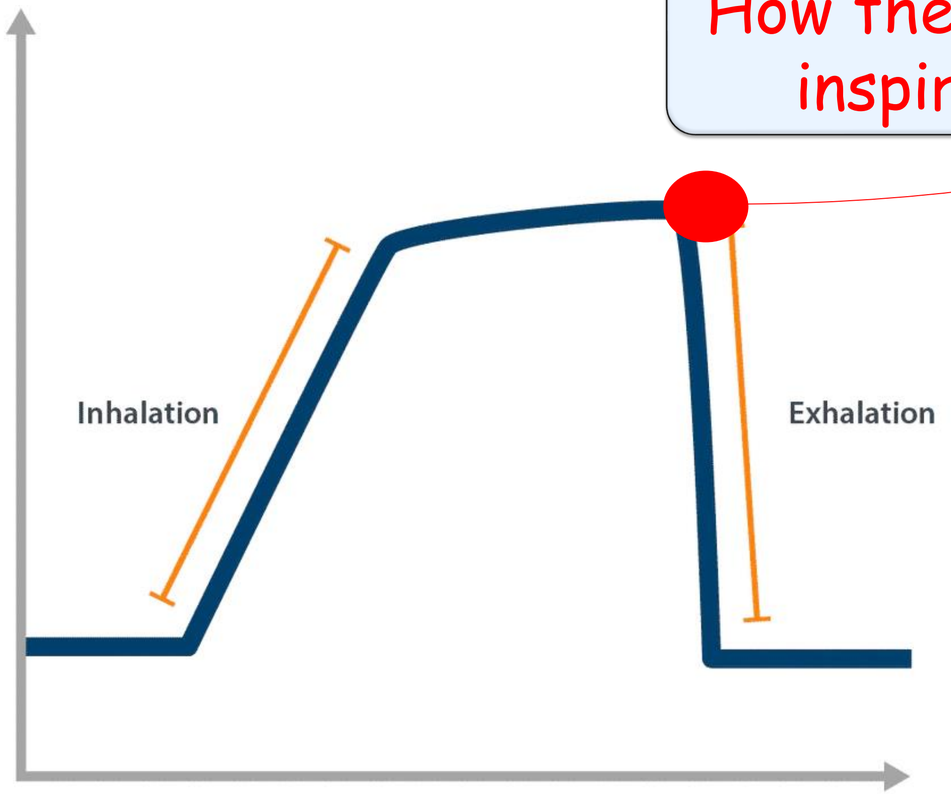


The ventilator controls the pressure set by ventilator

Cycle

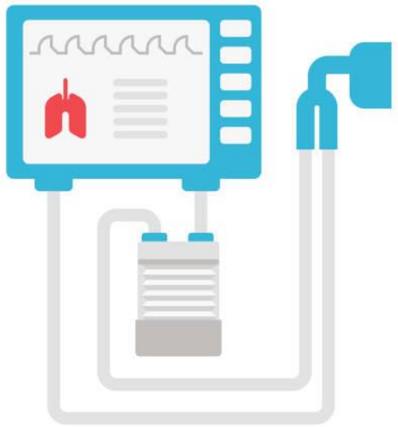
Cycle

How the ventilator cycle from inspiration to expiration



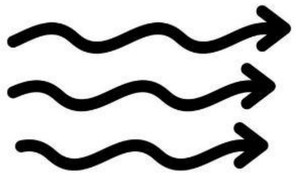
Cycle

Machine Cycled



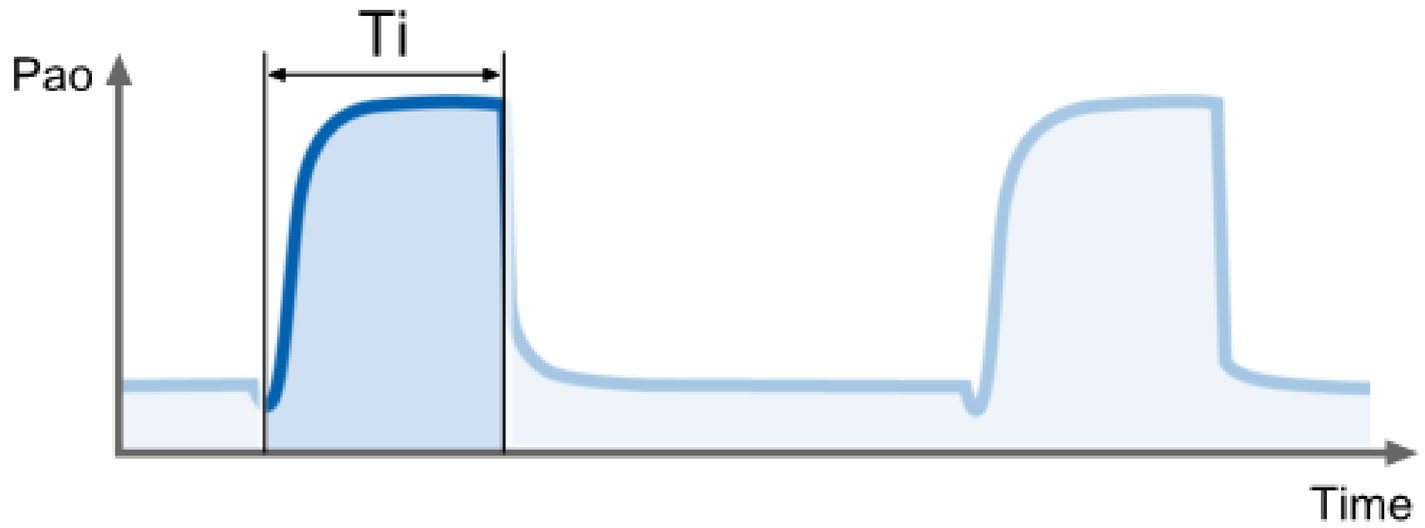
Time cycled

Patient Cycled



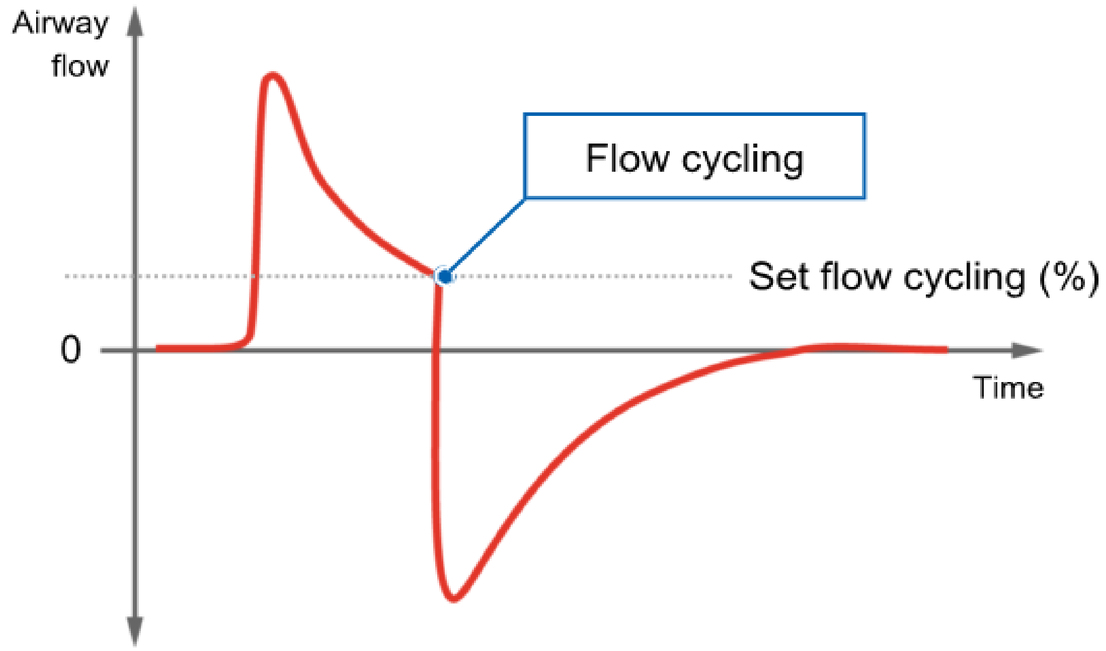
Flow cycled

Time cycle



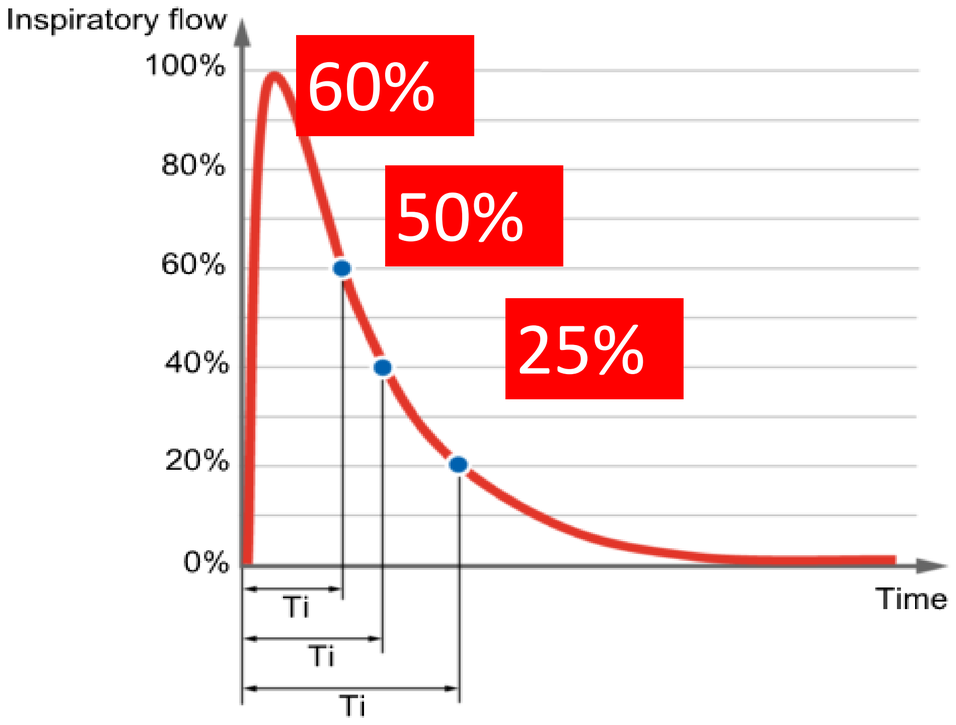
Machine will cycle after predetermined inspiratory time

Flow cycle



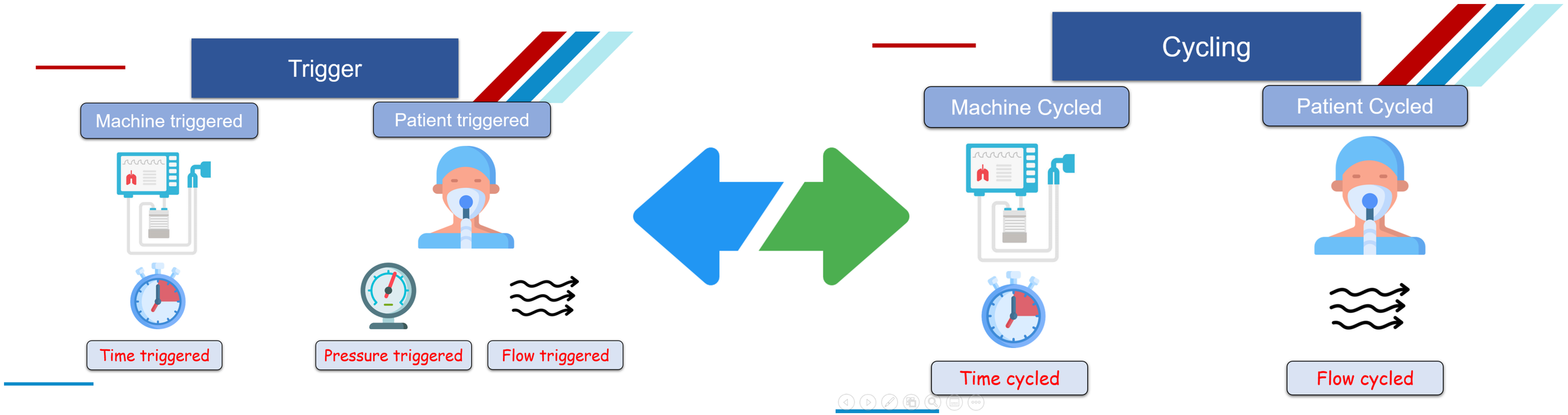
Ventilator switches from inspiration to expiration if inspiratory flow dropped to preset percentage level (Default: 25%)

Flow (patient) cycle



Increase the percentage decreases the inspiratory time and delivered tidal volume

Breaths types



Mandatory

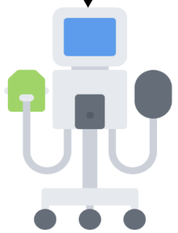
Assisted

Spontaneous

Ventilator modes

Breath phases

T Triggering



Machine trigger

Patient trigger

Breath Types

L Limit

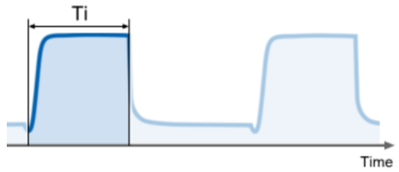
VT

Volume limit

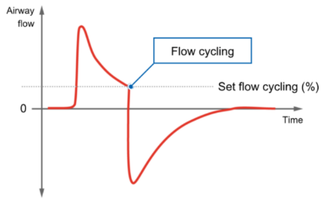
Pressure limit

Breath setting

C Cycling



Time cycle



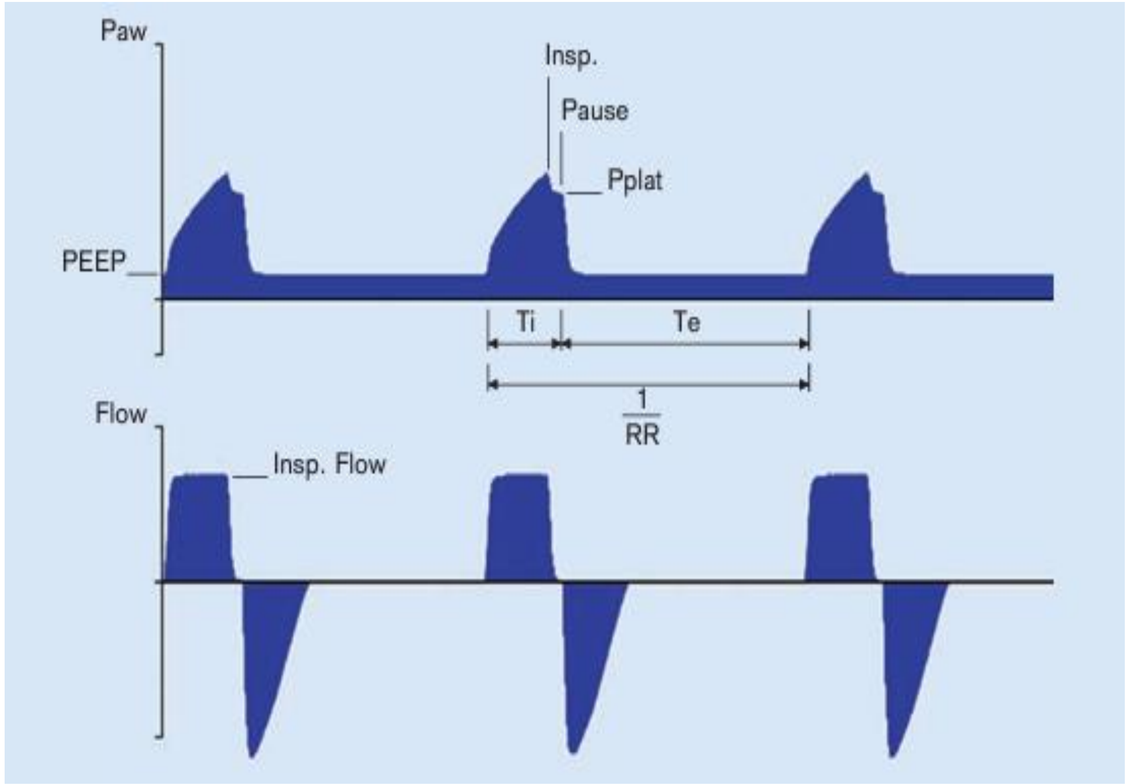
Flow cycle

I. Volume-Controlled Modes

- These modes deliver a set volume with each breath, ensuring tidal volume remains consistent.

1. Volume-Controlled Ventilation (VCV)

- **Mode:** Fully controlled; set tidal volume (VT) and respiratory rate (RR).
- **Indication:** ARDS, acute respiratory failure.
- **Limitation:** Risk of high airway pressures in stiff lungs.

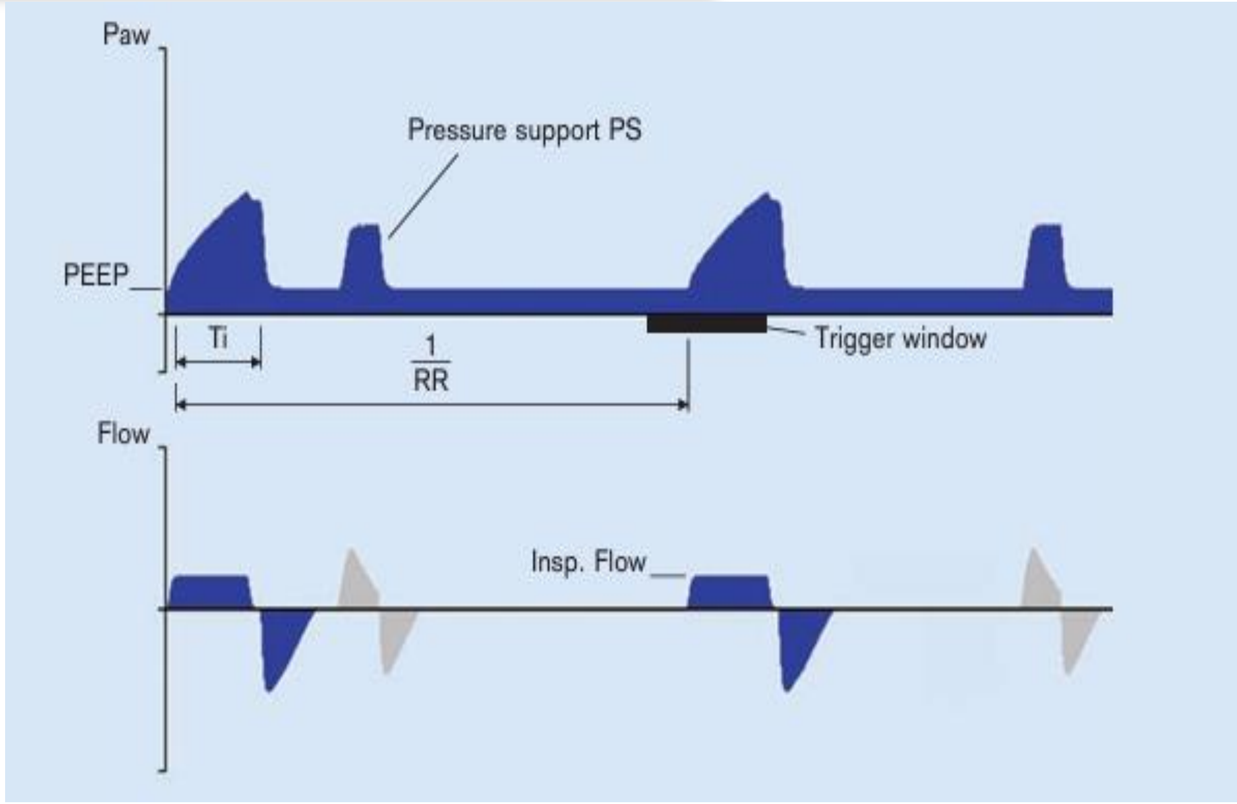


I. Volume-Controlled Modes

- These modes deliver a set volume with each breath, ensuring tidal volume remains consistent.

2. Synchronized Intermittent Mandatory Ventilation (SIMV - Volume Mode)

- **Mode:** Delivers mandatory breaths with set VT while allowing spontaneous breathing between cycles.
- **Benefit:** Useful for weaning; supports patient effort.
- **Challenge:** Can result in patient-ventilator dyssynchrony.

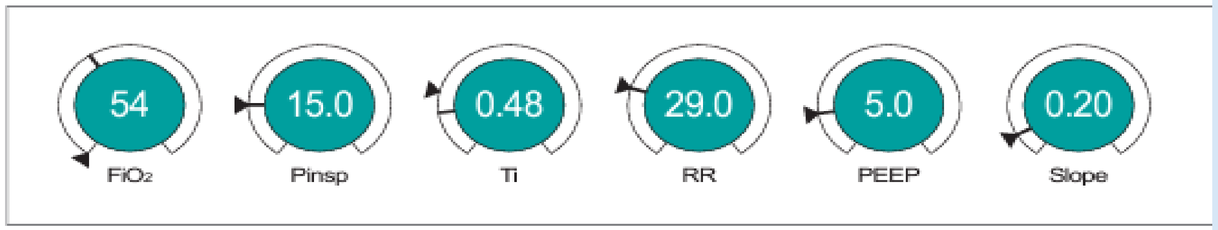


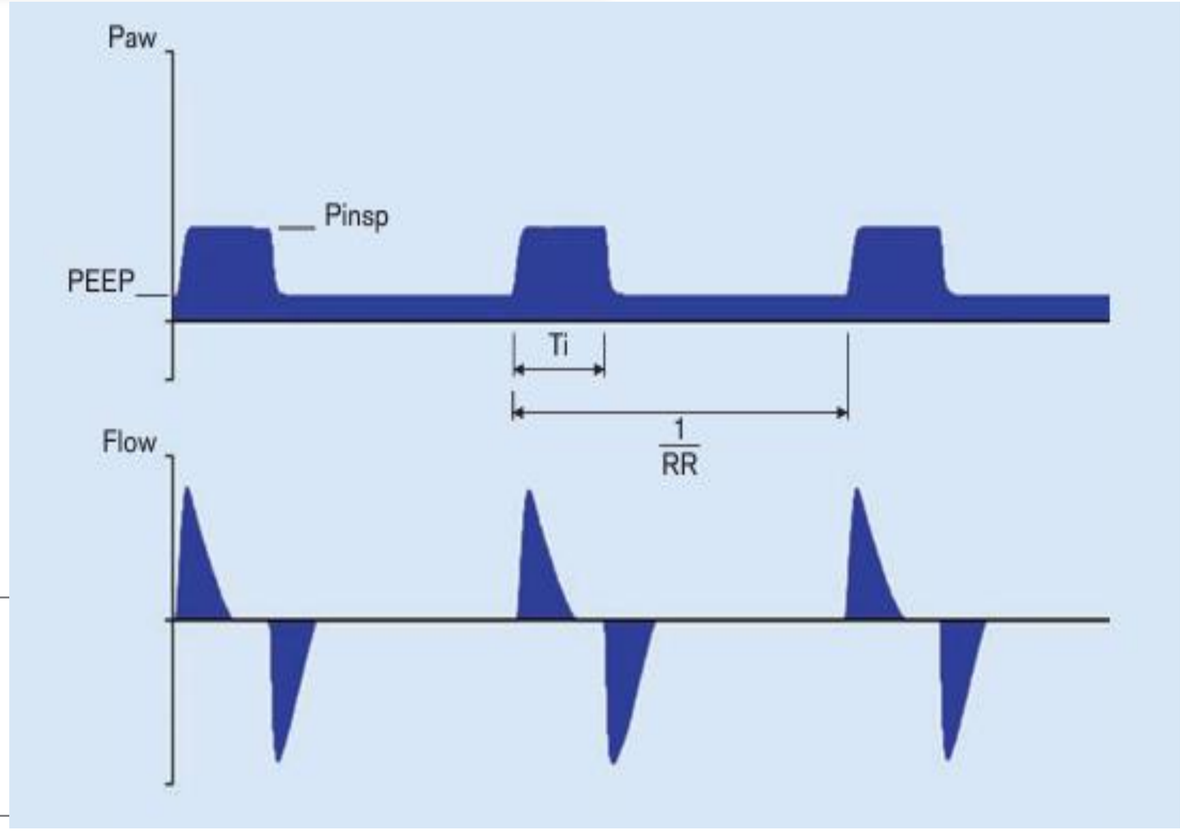
II. Pressure-Controlled Modes

- These modes ensure each breath reaches a set pressure, with tidal volume varying based on lung compliance.

1. Pressure-Controlled Ventilation (PCV)

- **Mode:** Set peak inspiratory pressure (PIP) and inspiratory time; VT varies.
- **Indication:** ARDS or situations requiring lung-protective strategies.
- **Limitation:** VT may fluctuate with changes in compliance or resistance.





II. Pressure-Controlled Modes

- These modes ensure each breath reaches a set pressure, with tidal volume varying based on lung compliance.

2. Synchronized Intermittent Mandatory Ventilation (SIMV - Pressure Mode)

- **Mode**: Delivers mandatory pressure-controlled breaths with spontaneous breathing in between.
- **Usage**: Common in weaning; reduces ventilator dependence.

III. Spontaneous Breathing Modes

- These modes allow patients to control their breaths, with the ventilator assisting to reduce effort.

1. Continuous Positive Airway Pressure (CPAP)

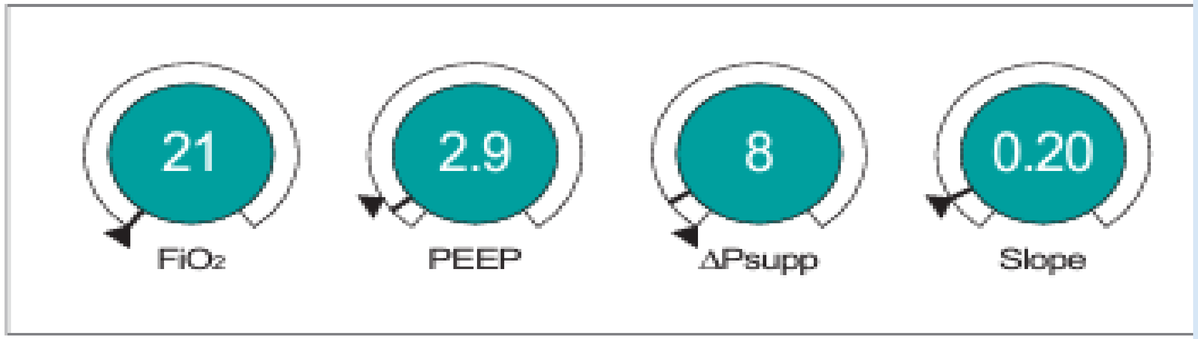
- Mode: Provides constant positive pressure.
- **Indication**: Obstructive sleep apnea, mild respiratory failure.
- **Benefit**: Keeps alveoli open and reduces atelectasis.

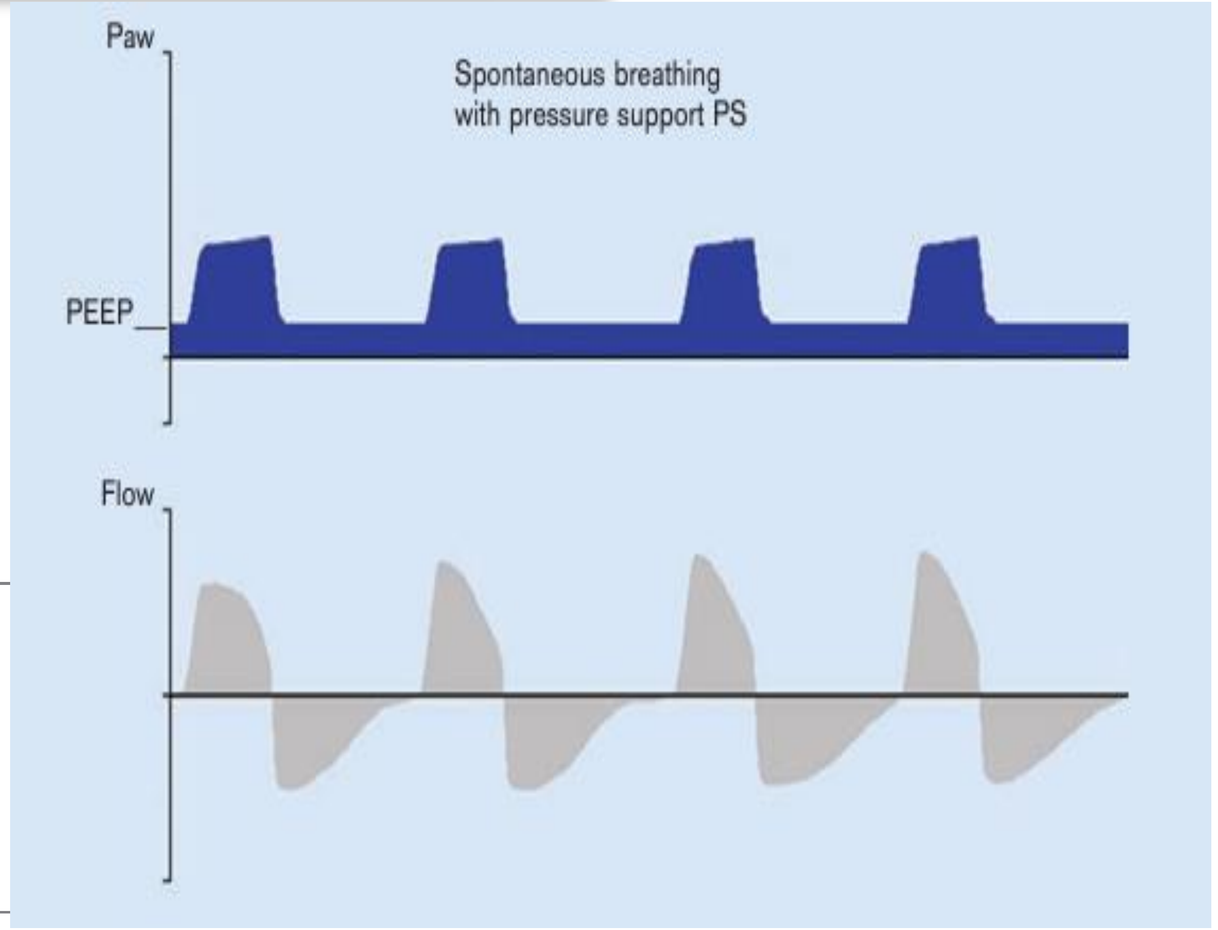
III. Spontaneous Breathing Modes

- These modes allow patients to control their breaths, with the ventilator assisting to reduce effort.

2. Pressure Support Ventilation (PSV)

- **Mode:** Augments patient-triggered breaths with a set pressure.
- **Usage:** Often used for weaning from mechanical ventilation.
- **Limitation:** Ineffective if the patient is not making spontaneous efforts.



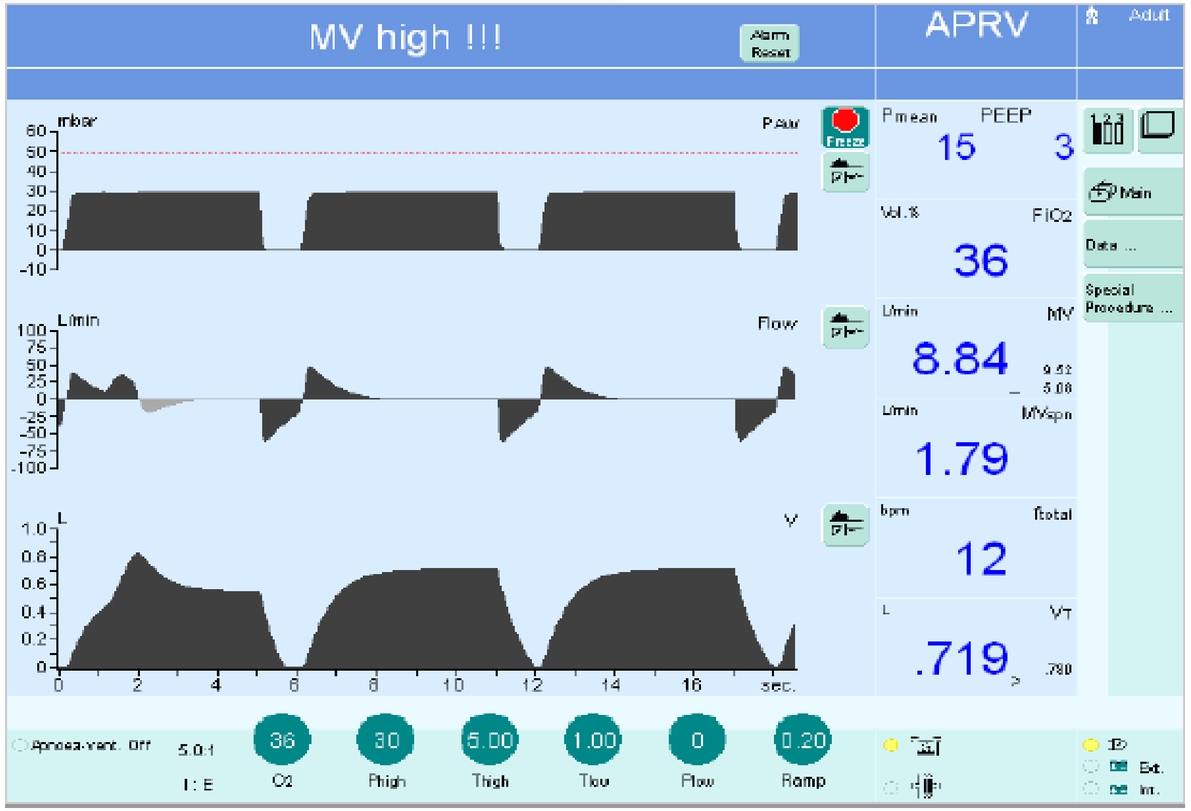


IV. Advanced Modes

- These offer better synchronization and more adaptive features, optimizing the patient-ventilator interaction.

1. Airway Pressure Release Ventilation (APRV)

- Mode: Alternates between two levels of CPAP, allowing spontaneous breathing at both levels.
- **Indication:** ARDS with poor oxygenation.
- **Benefit:** Promotes alveolar recruitment while preserving spontaneous breathing.

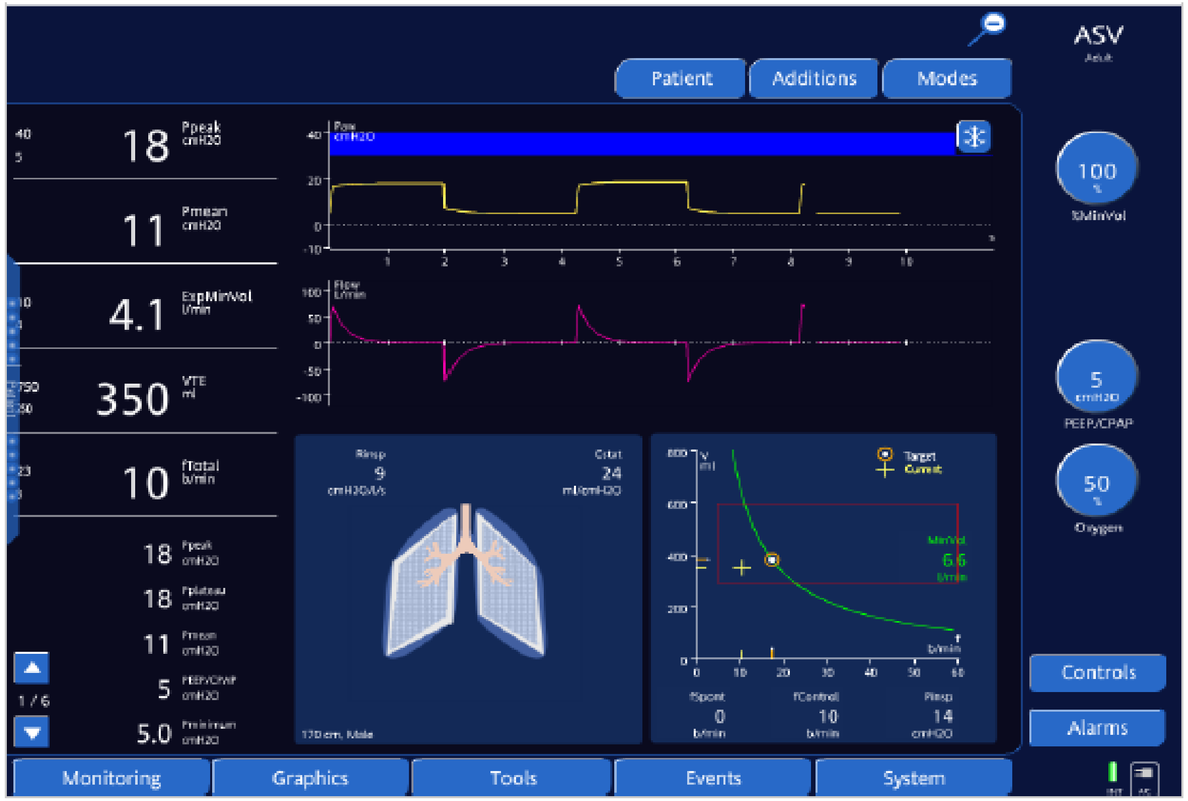


IV. Advanced Modes

- These offer better synchronization and more adaptive features, optimizing the patient-ventilator interaction.

2. Adaptive Support Ventilation (ASV)

- **Mode**: Automatically adjusts VT and RR based on patient's mechanics and ventilation requirements.
- **Benefit**: Useful across different phases—full support to weaning.



V. Hybrid Modes

- These modes combine pressure and volume controls for optimized ventilation.

1. Pressure-Regulated Volume Control (PRVC)

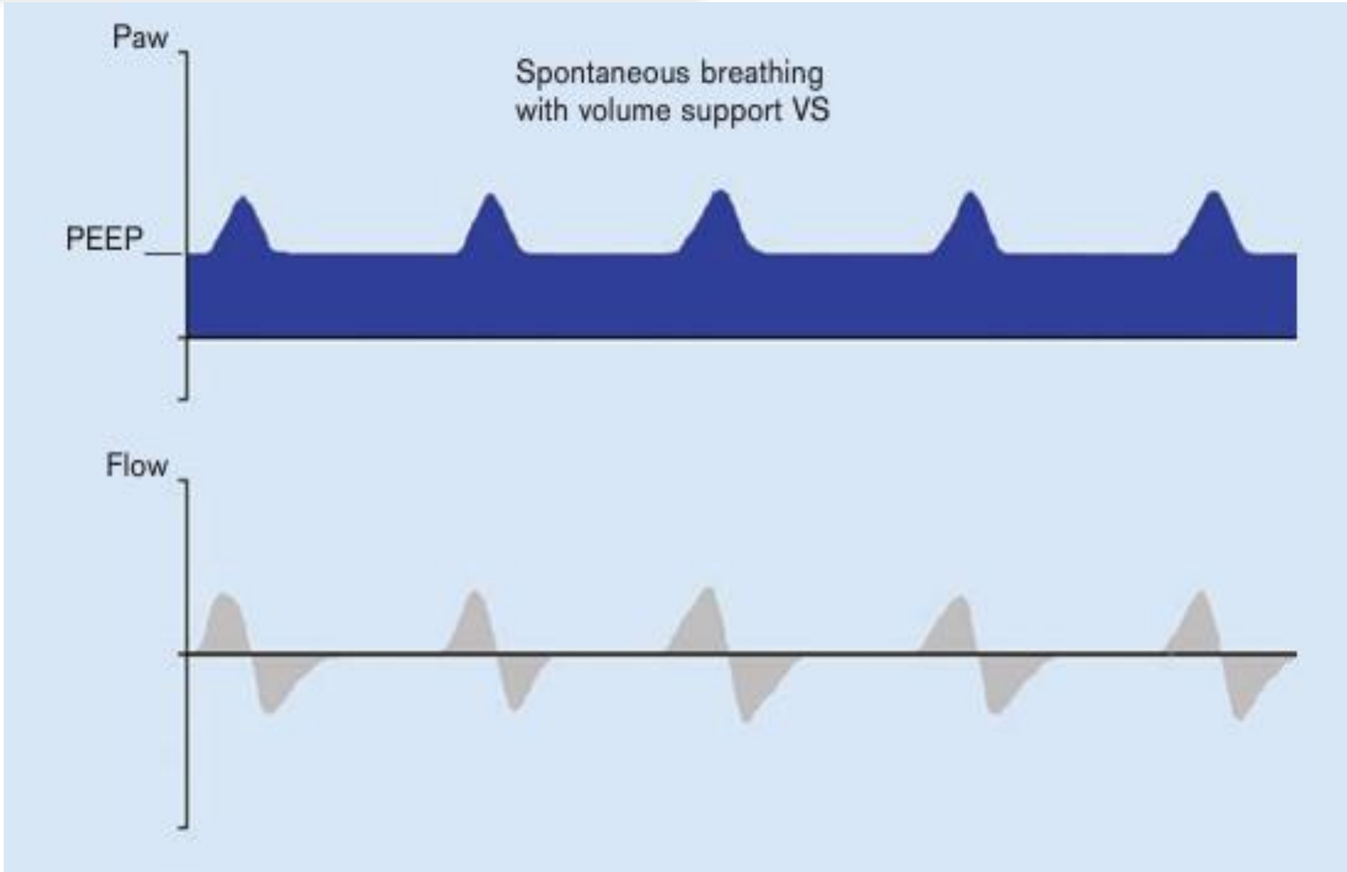
- **Mode**: Aims to deliver a set VT but adjusts the pressure to minimize barotrauma.
- **Usage**: Offers advantages of both volume and pressure modes.

V. Hybrid Modes

- These modes combine pressure and volume controls for optimized ventilation.

2. Volume Support Ventilation (VSV)

- **Mode**: A spontaneous breathing mode targeting a set VT with pressure adjustments.
- **Benefit**: Ensures a consistent tidal volume during weaning.




Thank
You!