Pressure Controlled Modes of Mechanical Ventilation

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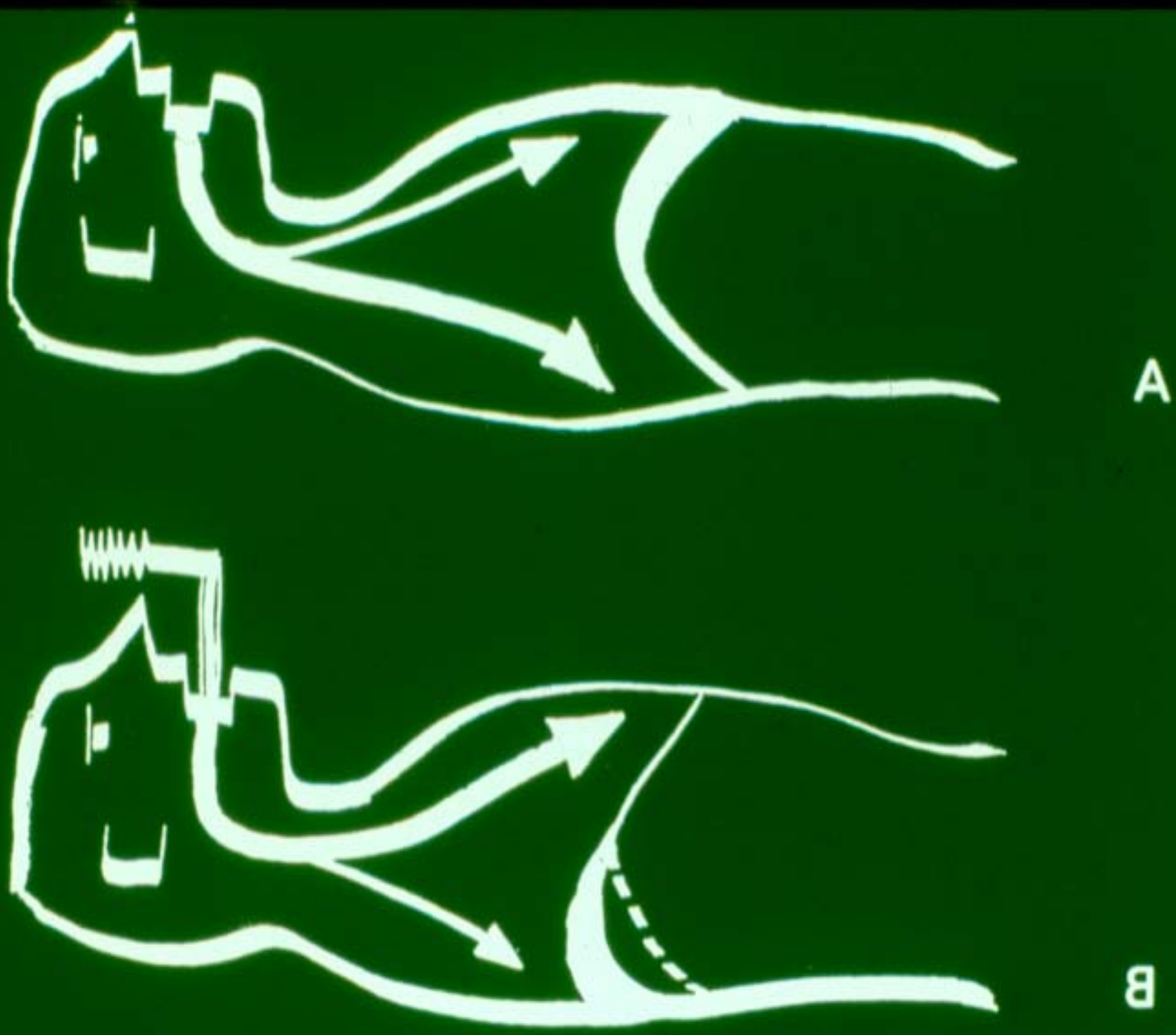
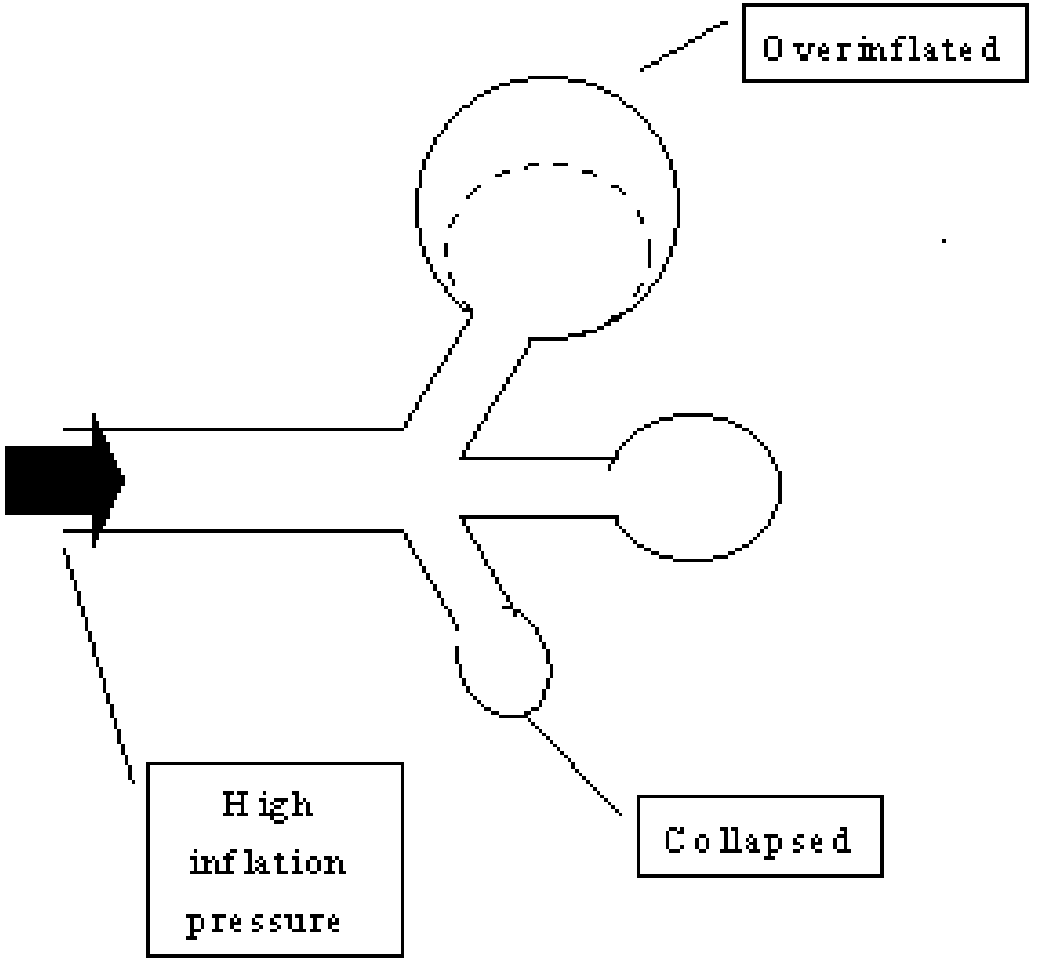
Saturday, August 20, 2011


A
B


Overinflated
High inflation pressure
Collapsed

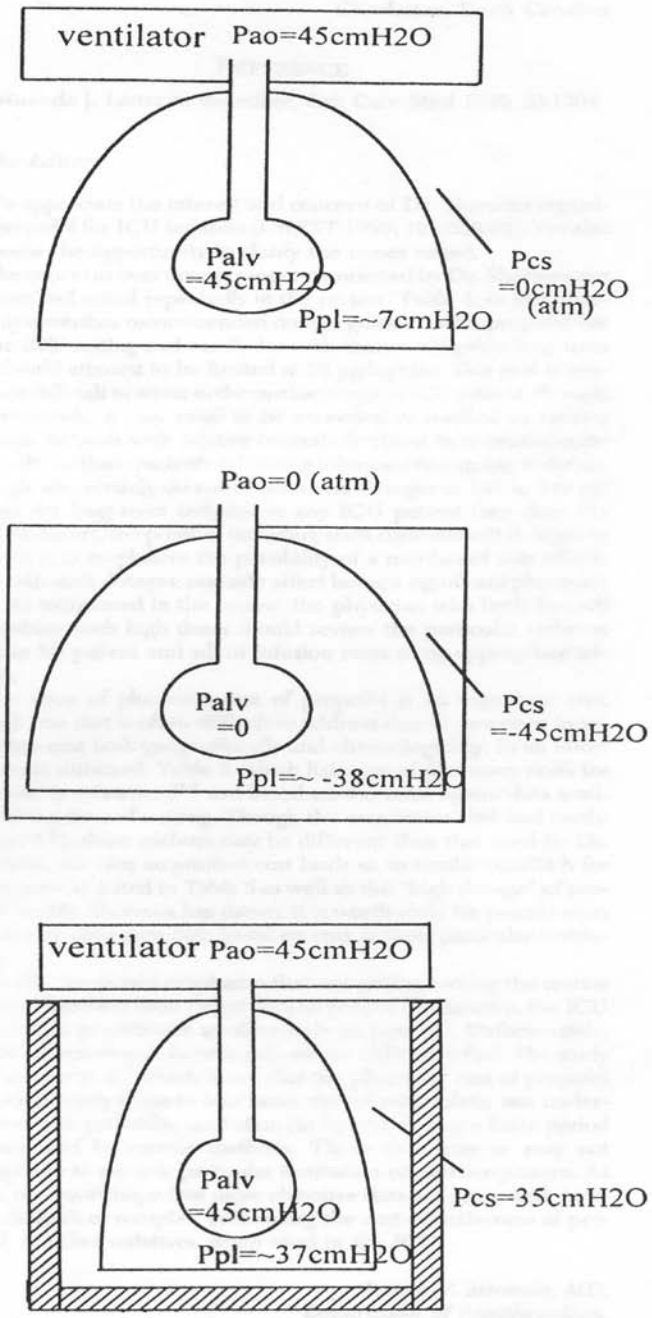


FIGURE 1. *Top:* High-pressure/high/volume. *Center:* Negative-pressure/high volume (iron lung). *Bottom:* High-pressure/low volume.

Assist Control Hypoxemic Options

- Oxygenation proportional to mean alveolar pressure
- Increase Tidal Volume
- Increase PEEP
- Rapid Acceleration of Flow
  - Pressure augmentation
- Inspiratory Pause

Conventional mechanical ventilation – Rotta AT & Steinhorn DM

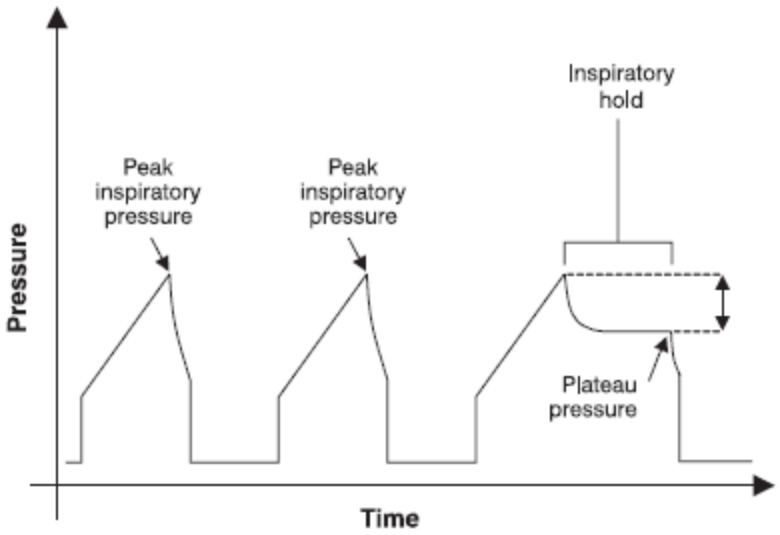
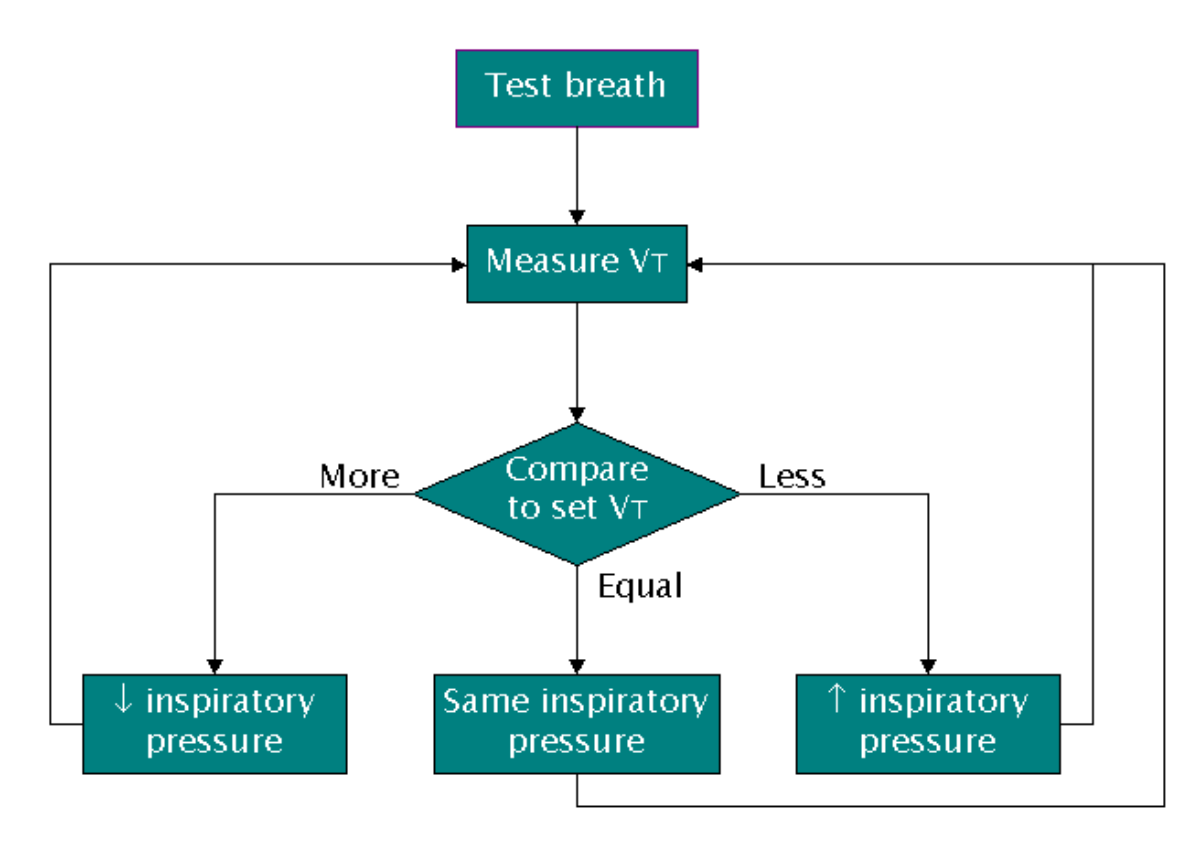
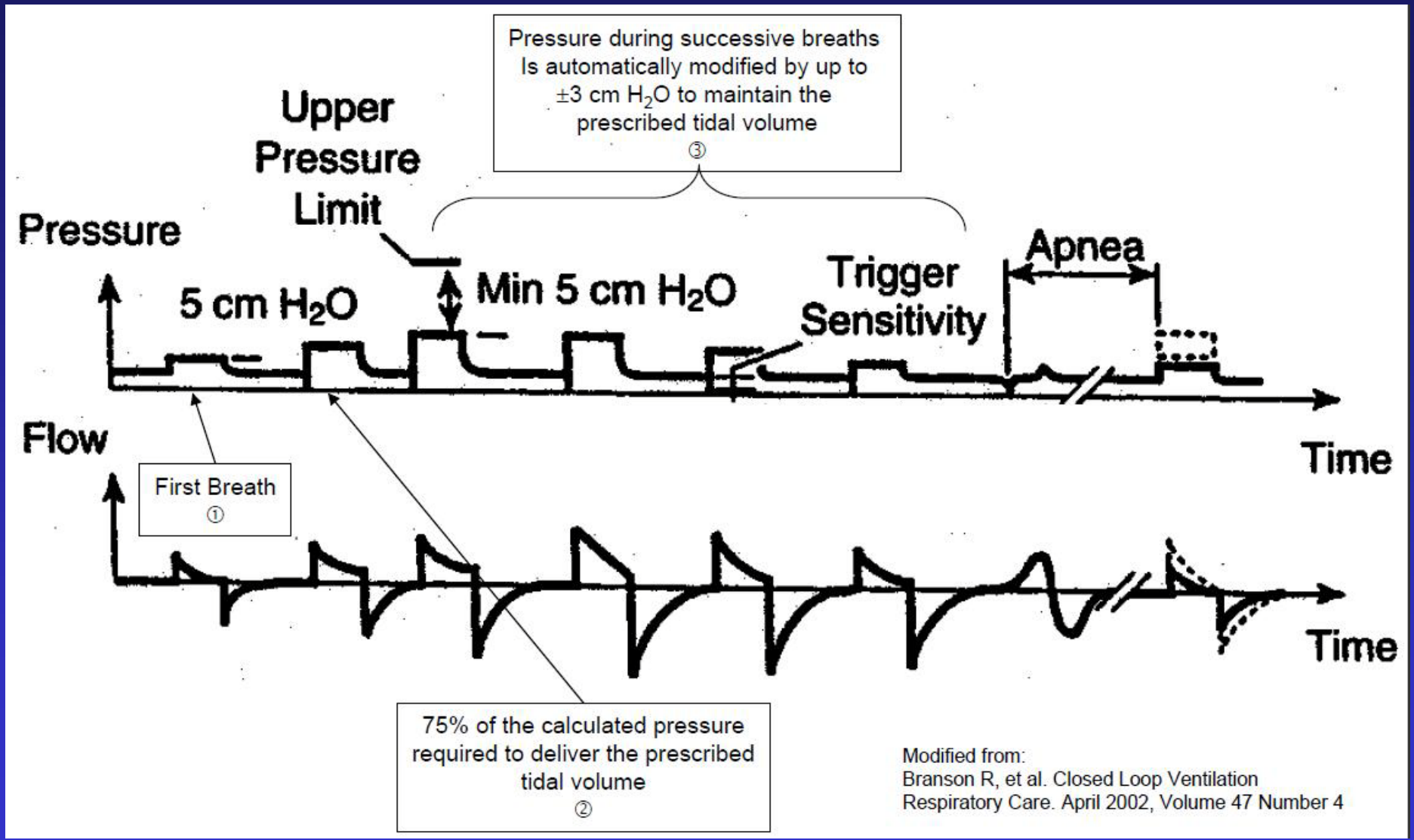


Figure 1 - Schematic representation of the airway pressure waveform over time during volume control ventilation. The peak-to-plateau pressure difference (double-headed arrow) is obtained after an inspiratory hold by comparing the peak pressure and the measured plateau pressure

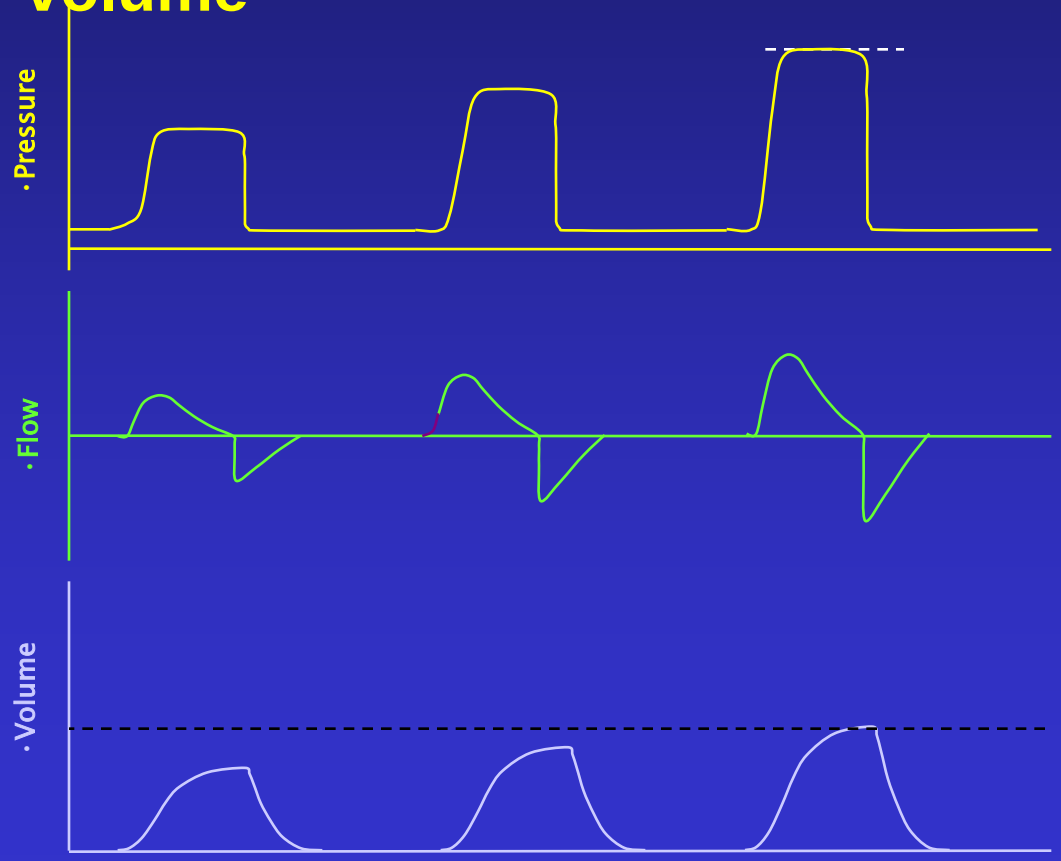
PRVC


Test breath
Measure VT
More
Compare to set VT
Less
Equal
↓ inspiratory pressure
Same inspiratory pressure
↑ inspiratory pressure

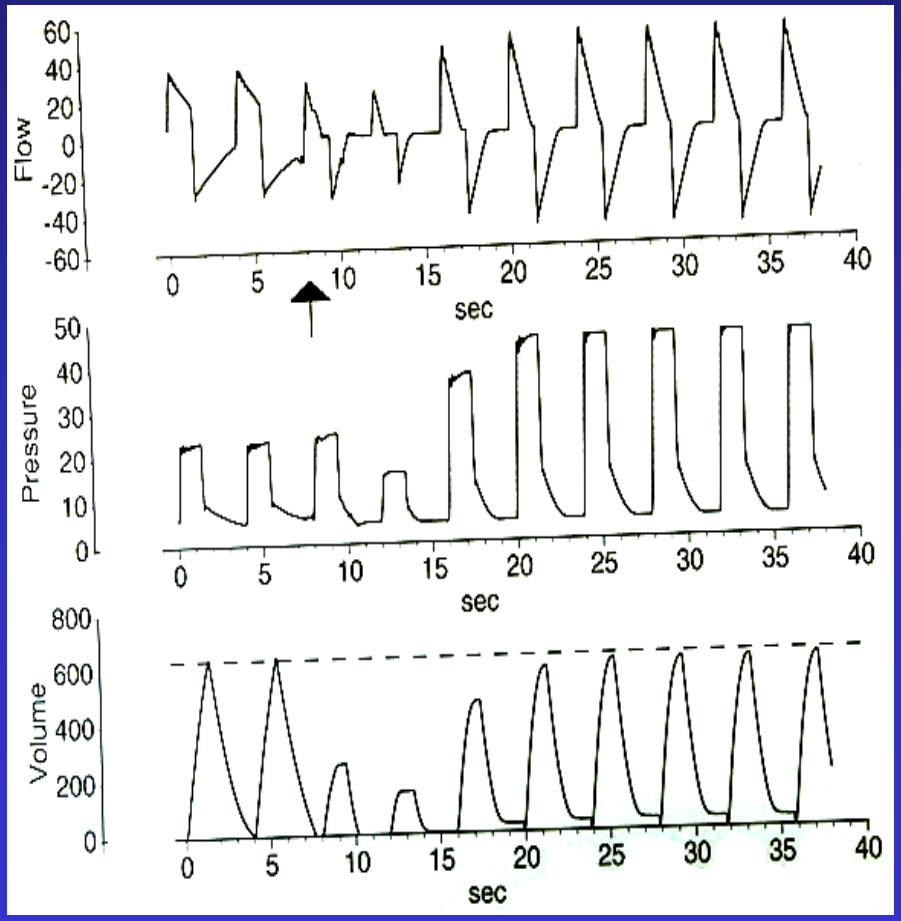


Modified from:
Branson R, et al. Closed Loop Ventilation
Respiratory Care. April 2002, Volume 47 Number 4

- **PRVC**
  - **Decelerating inspiratory flow pattern (square wave pressure build up)**
  - **Pressure automatically adjusted according respiratory mechanics to deliver set tidal volume**



PRVC Automatically Adjusts To Compliance Changes



Initial Settings on PRVC

Tidal Volume 8cc/kg and titrate down

Resp Rate estimated from minute ventilation previous setting or spontaneous rate

pre-intubation

Pressure limit 40

Inspiratory time 1 sec contingent on rate

PEEP as appropriate, probably not less than 10 if oxygenation difficult

Pressure Control

- FiO2
- Inspiratory time
- Resp Rate
- Inspiratory Pressure (pressure over PEEP)
- Rate of Pressure Rise
- PEEP

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Pressure Curves Comparison

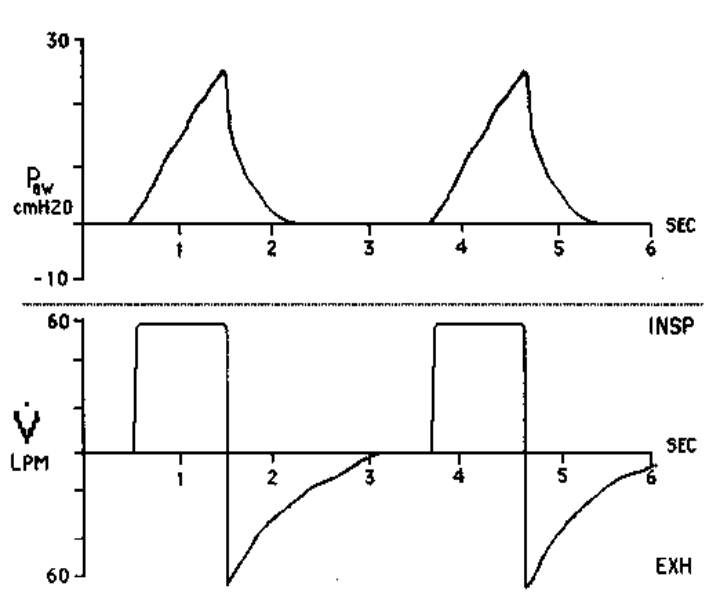


Figure 1. Typical Pressure and Flow Curves (Volume Ventilation)

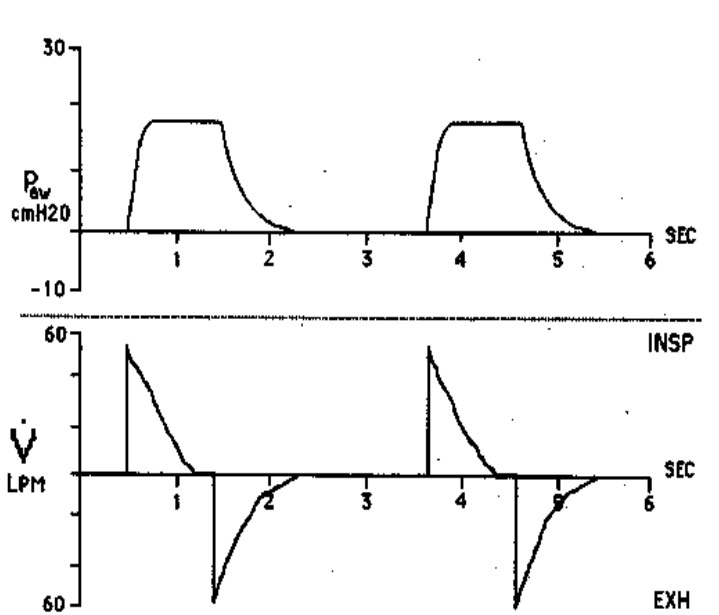
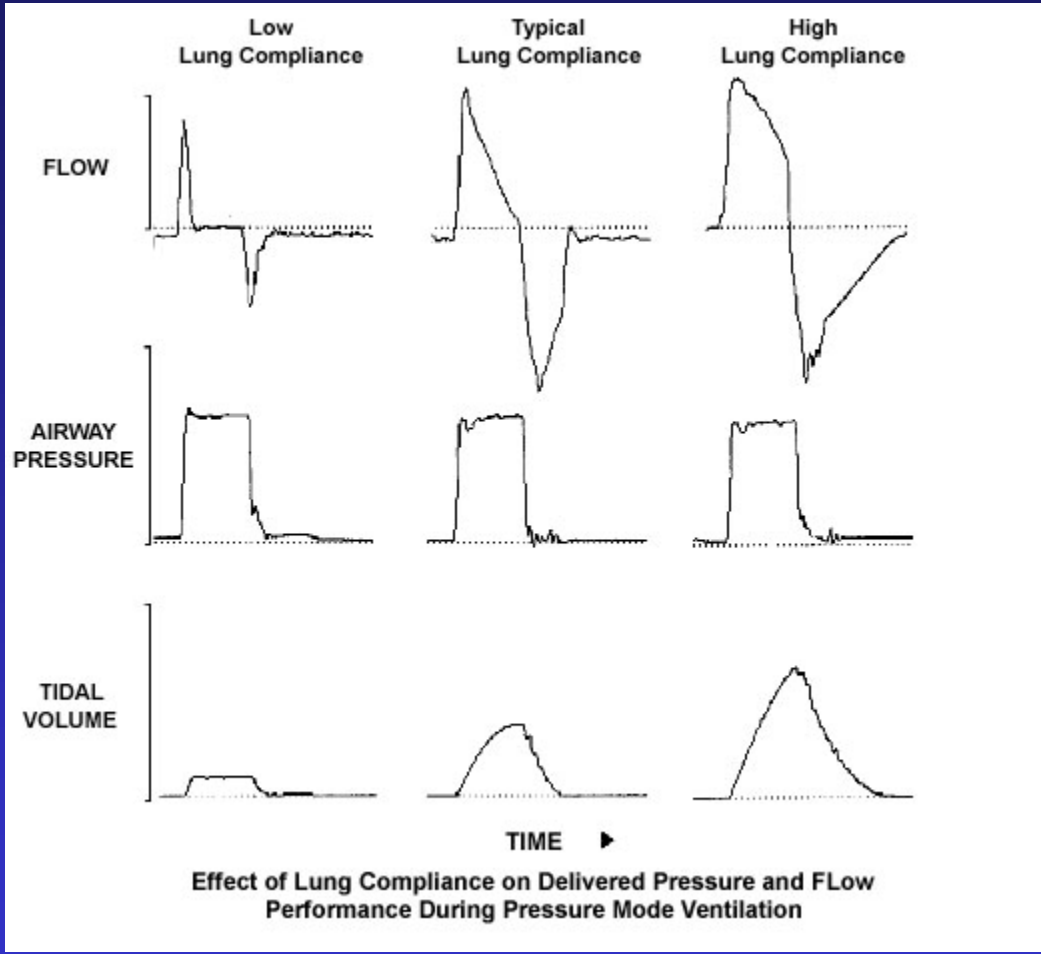
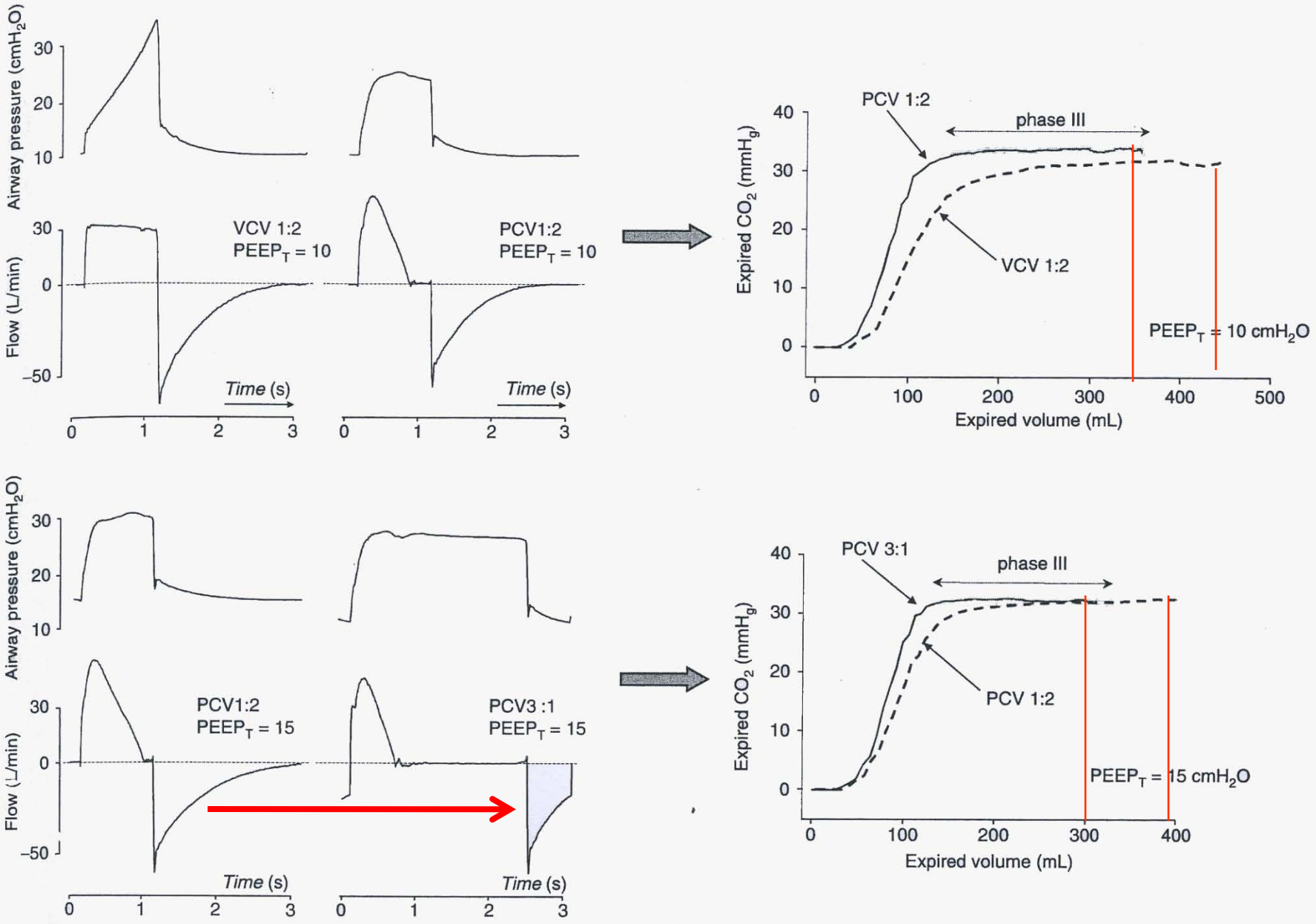


Figure 5. Pressure and Flow Curves in PCV



Effect of Lung Compliance on Delivered Pressure and FLow Performance During Pressure Mode Ventilation



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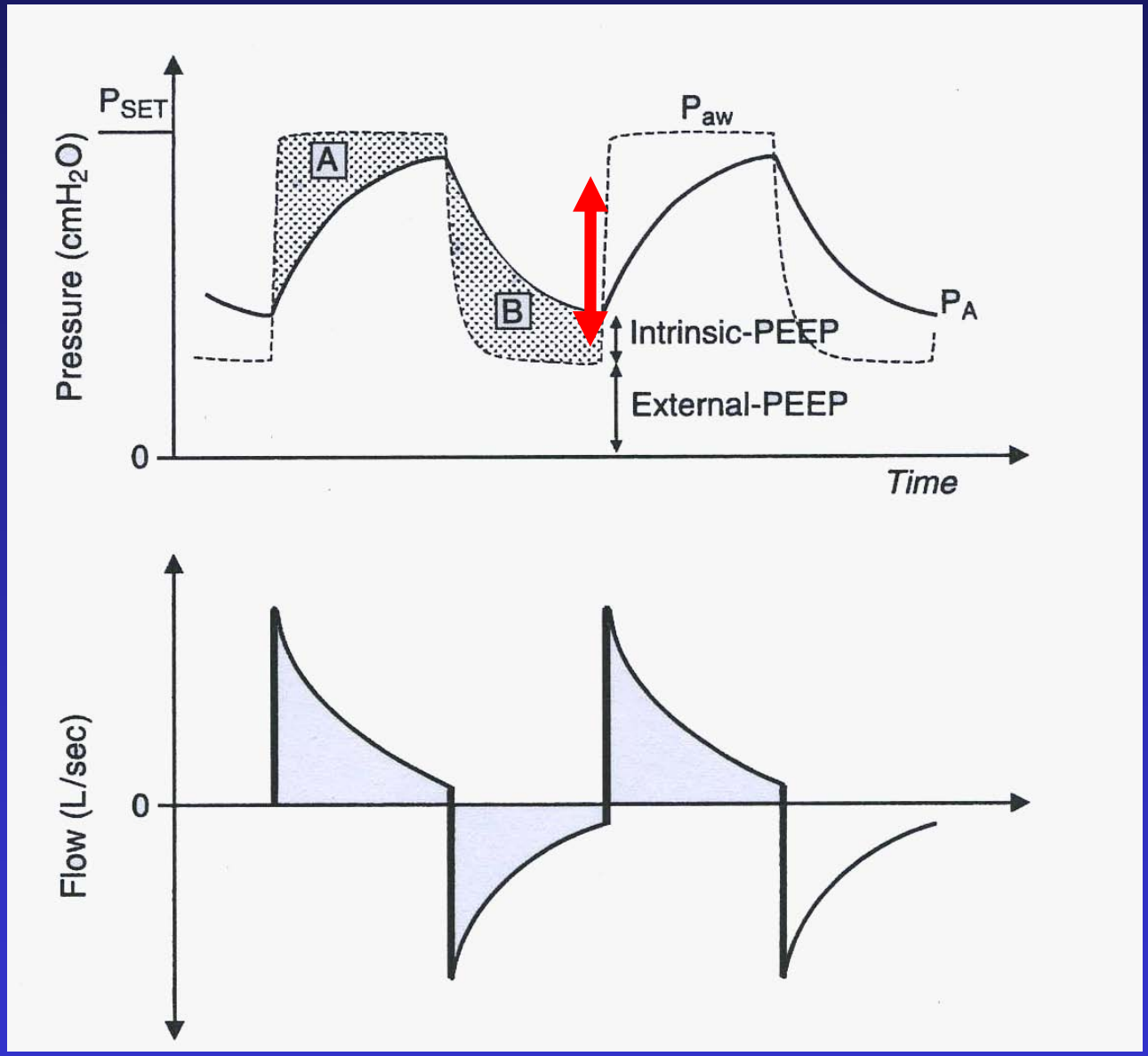
P_{aw} airway aw P_A alveolus A and Flow in PCV



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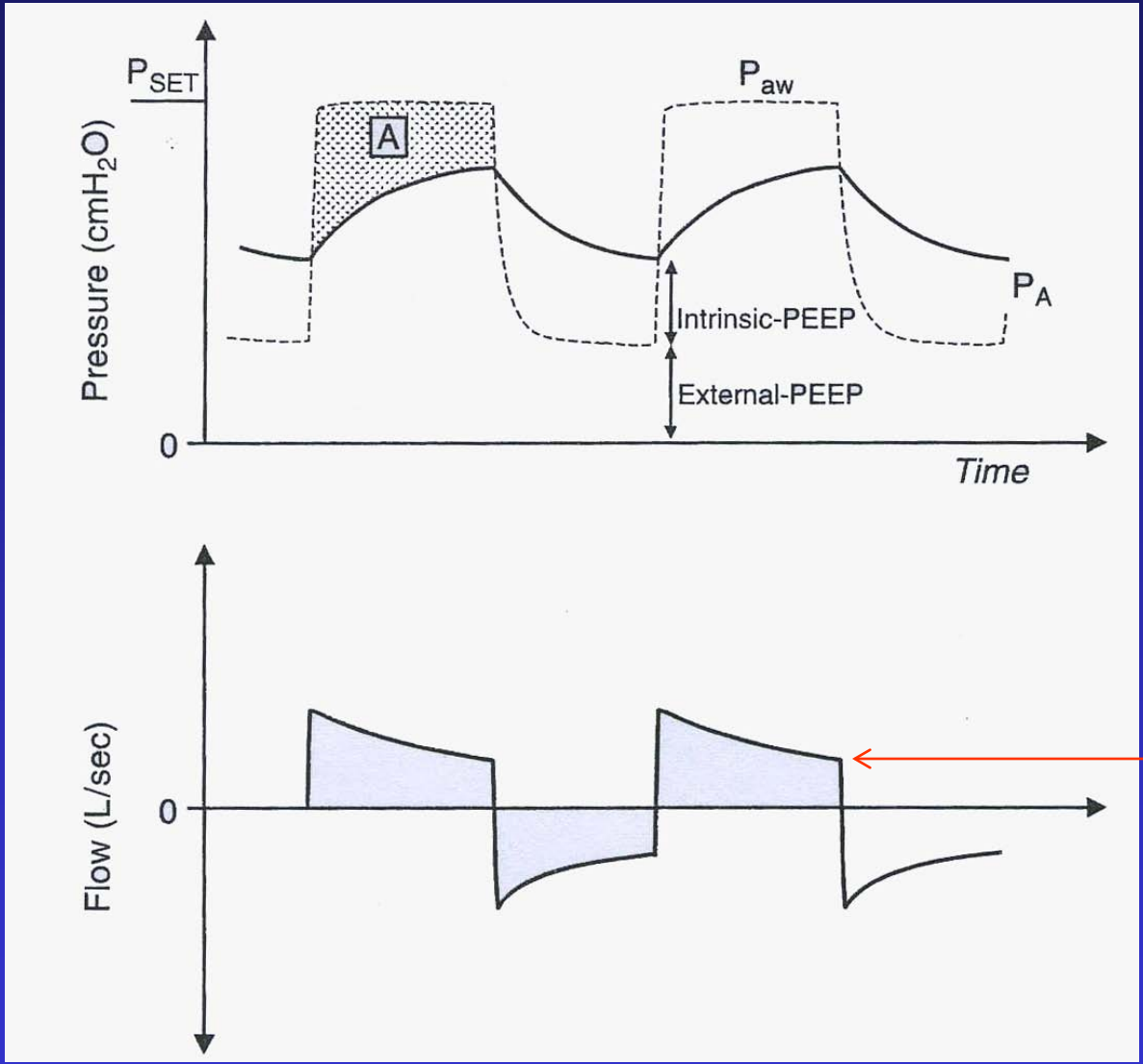
Pressure Control w/ Obstructive



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Initial Settings on Pressure Control

- Inspiratory time 1 second
- Resp Rate as with PRVC
- Inspiratory Pressure (pressure over PEEP) start at 30 and wean down to decrease TV as tolerated.
- Rate of Pressure Rise
- PEEP 10 and observe

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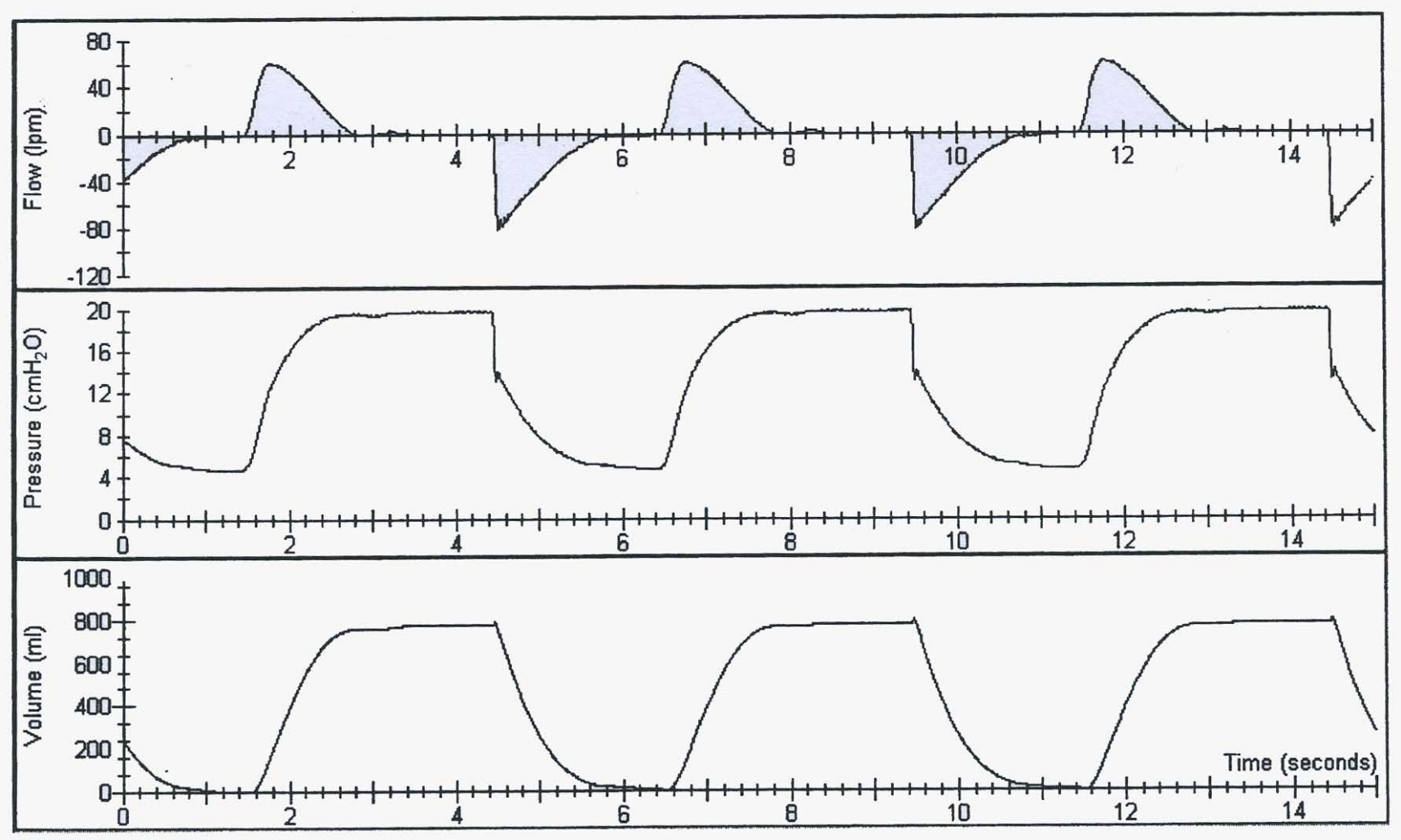
Pressure Control Inverse Ratio



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Airway Pressure Release Ventilation

- FiO2
- Pressure High (CPAP)
- Time High
- Pressure low (PEEP)
- Time Low

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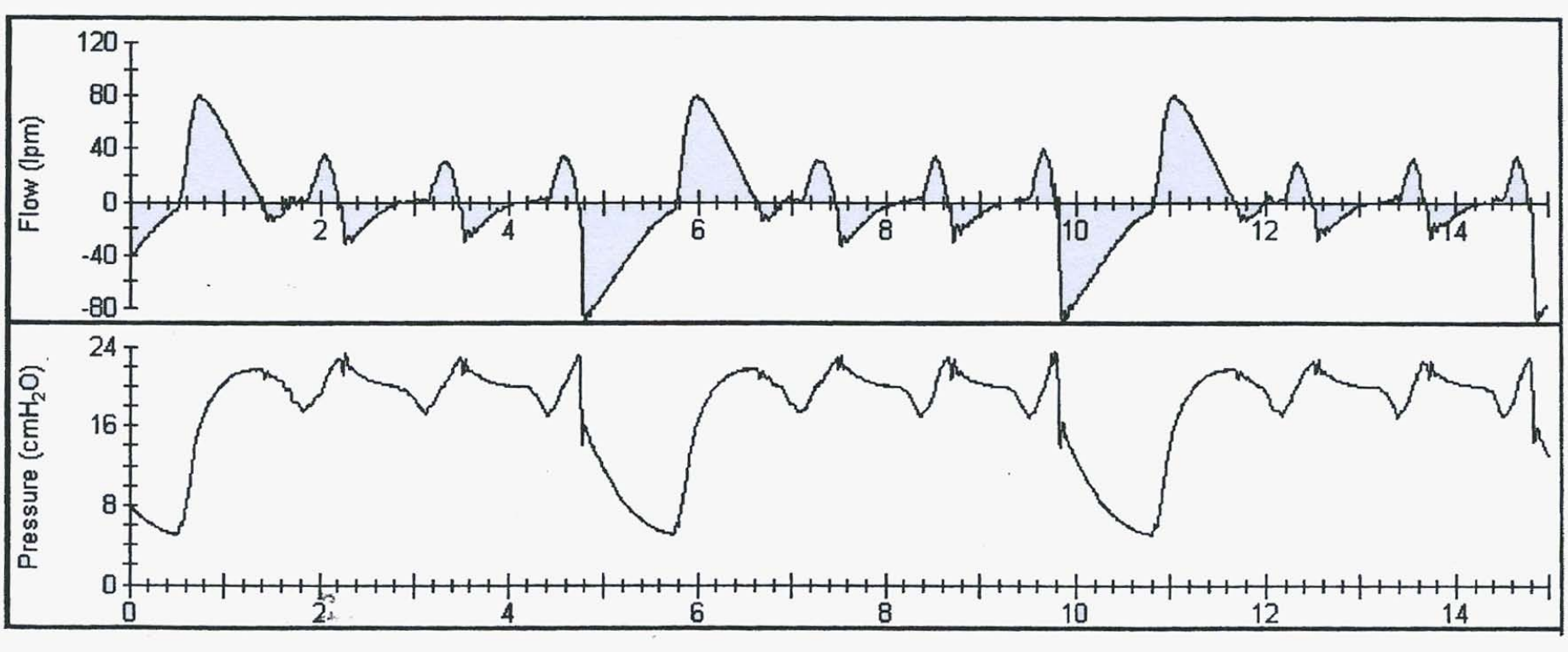
APRV



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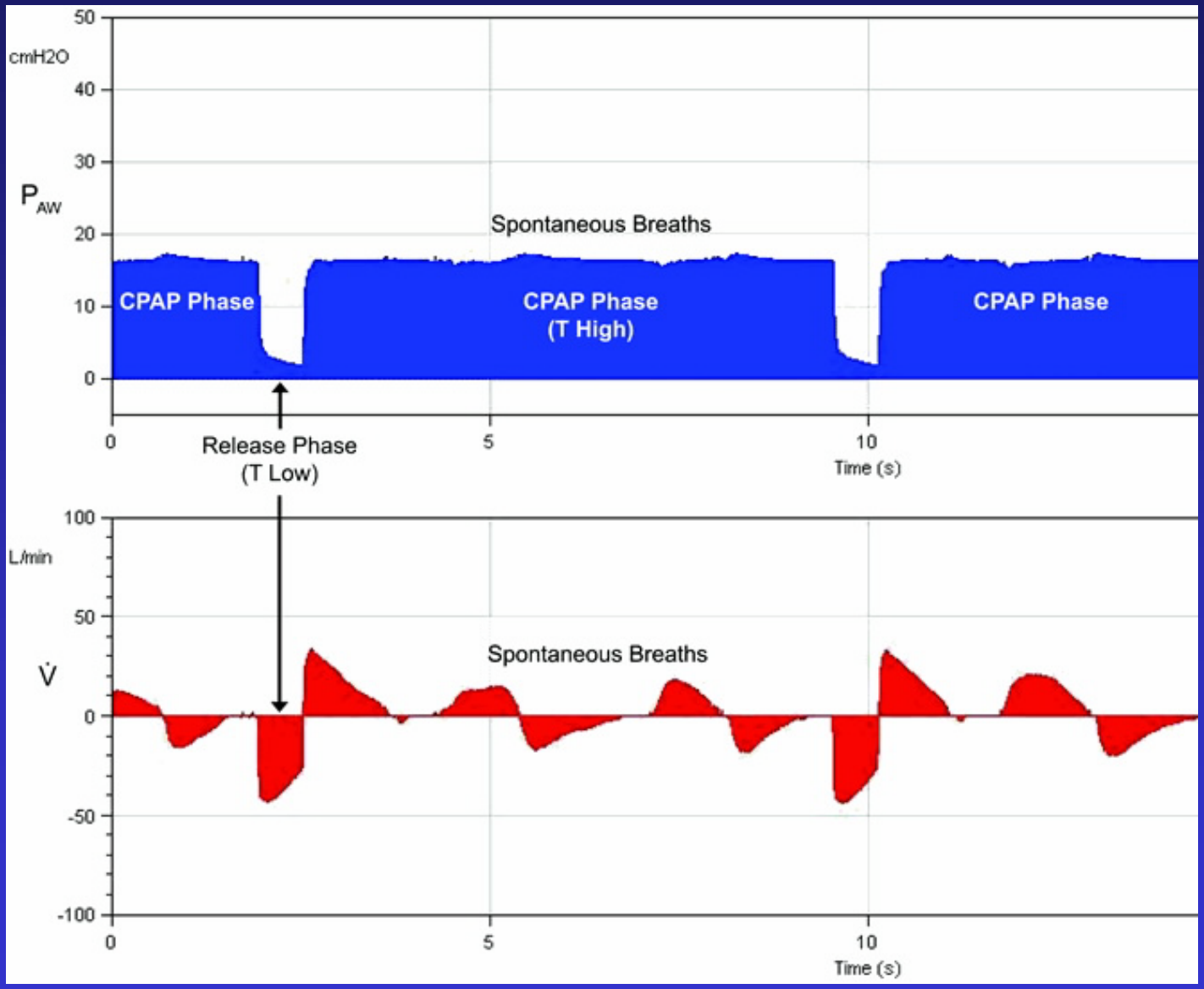
APRV


50
cmH2O
40
30
P_{AW}
20
10
0
Spontaneous Breaths
CPAP Phase
CPAP Phase
(T High)
CPAP Phase
0
Release Phase
(T Low)
5
10
Time (s)
100
L/min
50
$\dot{V}$
0
-50
-100
Spontaneous Breaths
0
5
10
Time (s)

Initial Settings on APRV

- Time High 2-6 seconds depending on CO2 production
- Pressure High 2/3 pressure of volume cycled requirement so about 20 - 30
- Time Low (PEEP) 0.5 seconds
- Pressure Low (PEEP) 0-5 titrate so it terminates in 75-25% PEF zone

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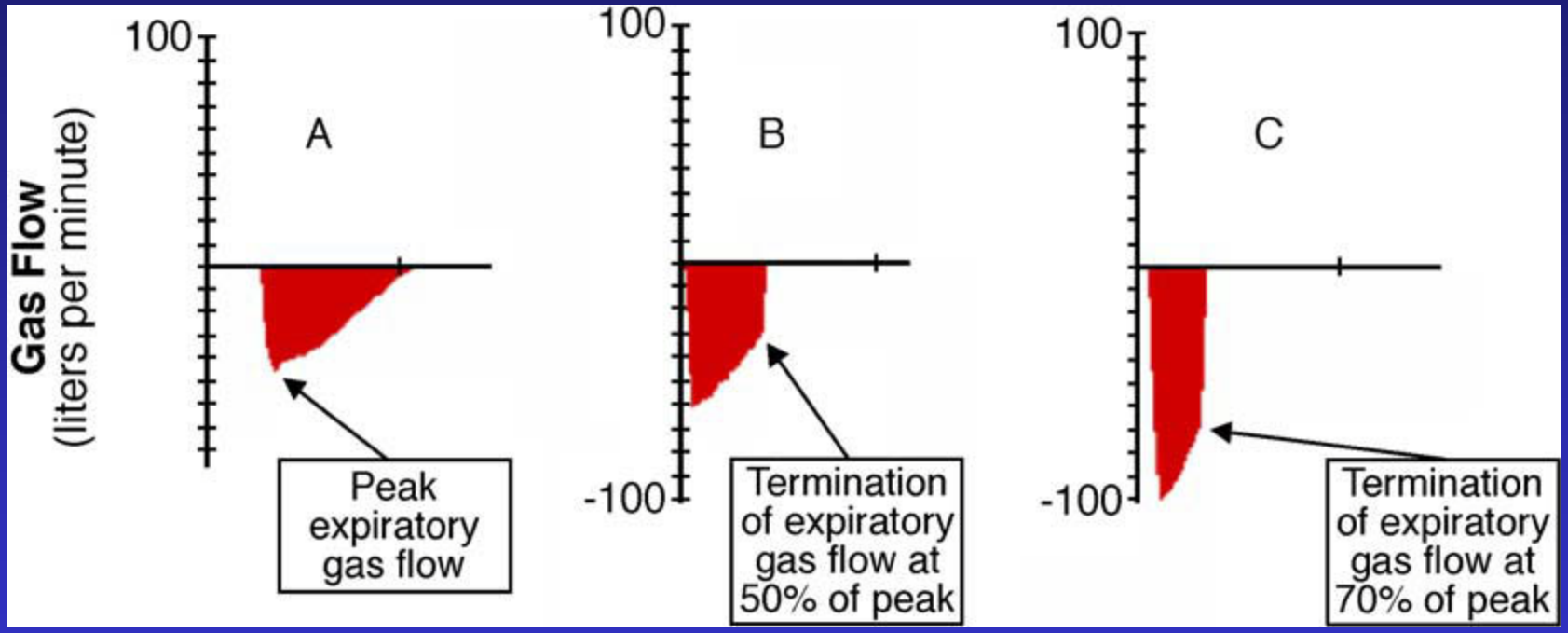
P/F	MAP
<250	15-20
<200	20-25
<150	25-28

T High (s)	T low (s)	Freq.
3.0	0.5	17
4.0	0.5	13
5.0	0.5	11
6.0	0.5	9

Expiratory Flow



BiVent

- FiO2
- Pressure High (CPAP)
- Time High
- Pressure low (PEEP)
- Time Low
- Pressure Support over High
- Pressure Support over PEEP

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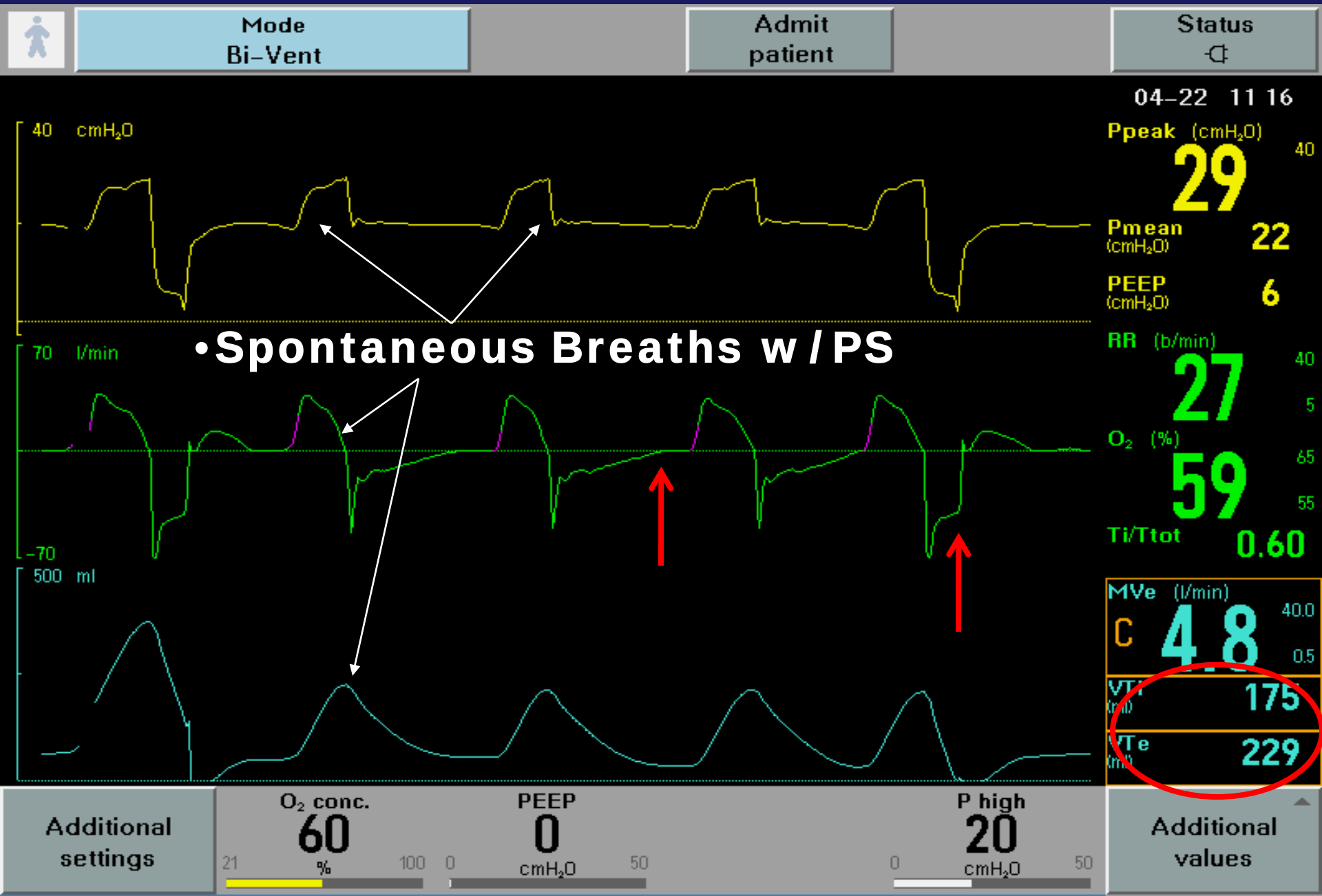
Spontaneous Breathing w/PS



- Spontaneous Breaths w/PS

Initial Settings on BiLevel

- Time High 2-6 seconds depending on CO2 production
- Pressure High 2/3 pressure of volume cycled requirement so about 20 - 30
- Time Low (PEEP) 0.5 seconds
- Pressure Low (PEEP) 0-5 titrate so it terminates in 75-25% PEF zone
- Pressure over High 5-10
- Pressure over PEEP 5-10

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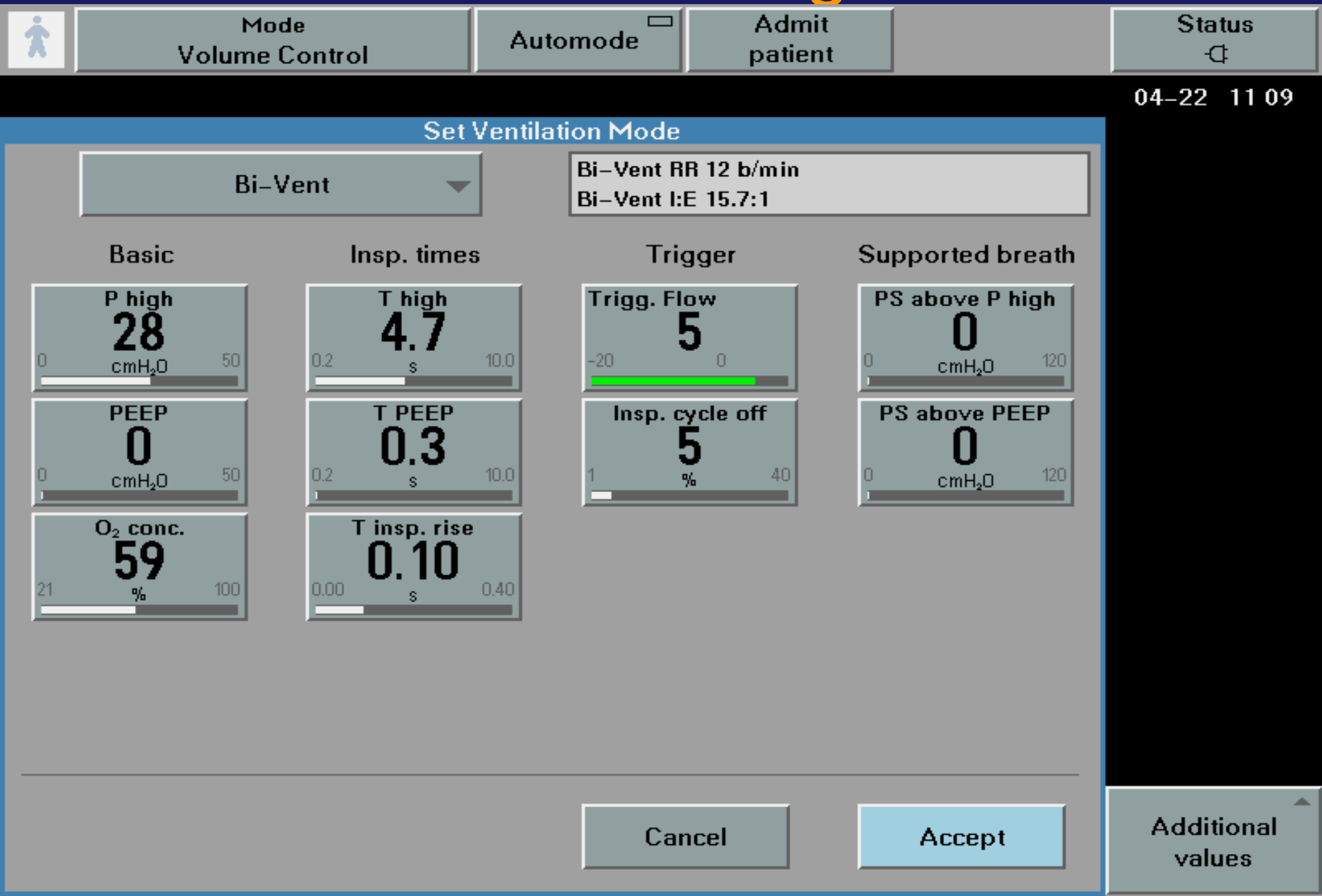
Bi-Vent Settings



P/F	MAP
<250	15-20
<200	20-25
<150	25-28

T High (s)	T low (s)	Freq.
3.0	0.5	17
4.0	0.5	13
5.0	0.5	11
6.0	0.5	9

To Decrease $PaCO_2$:

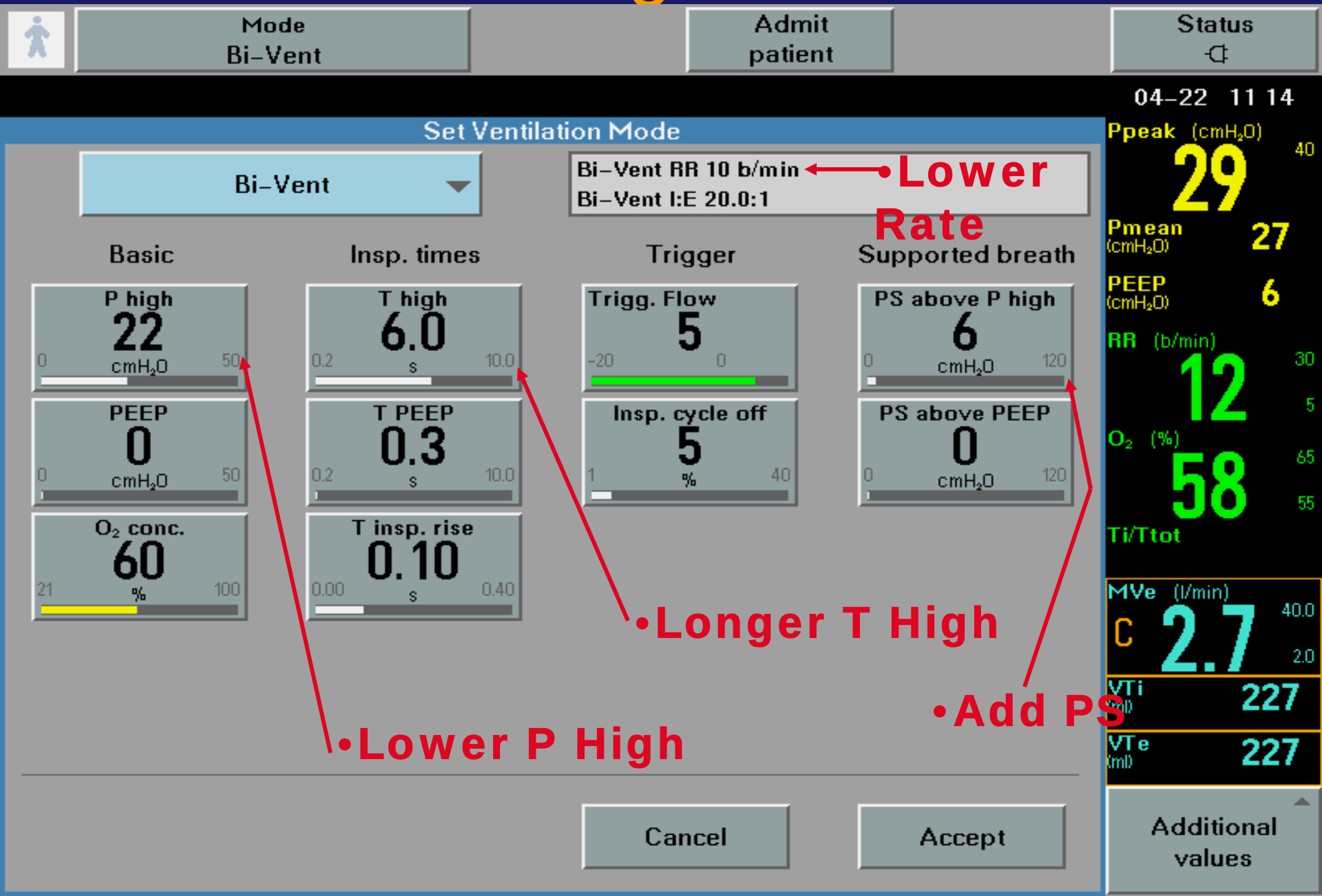
- Decrease T High.
  - Shorter T High means more release/min. i.e. increased RR
  - No shorter than 3 seconds (this just becomes inverse ratio pressure control
- Increase P High to increase ΔP and volume exchange. (2-3 cm H_2O/change)
  - Monitor Vt
  - PIP (best below 30 cm H_2O)
- Check T low. If possible increase T low to allow more time for exhalation.

Management of PaO_2

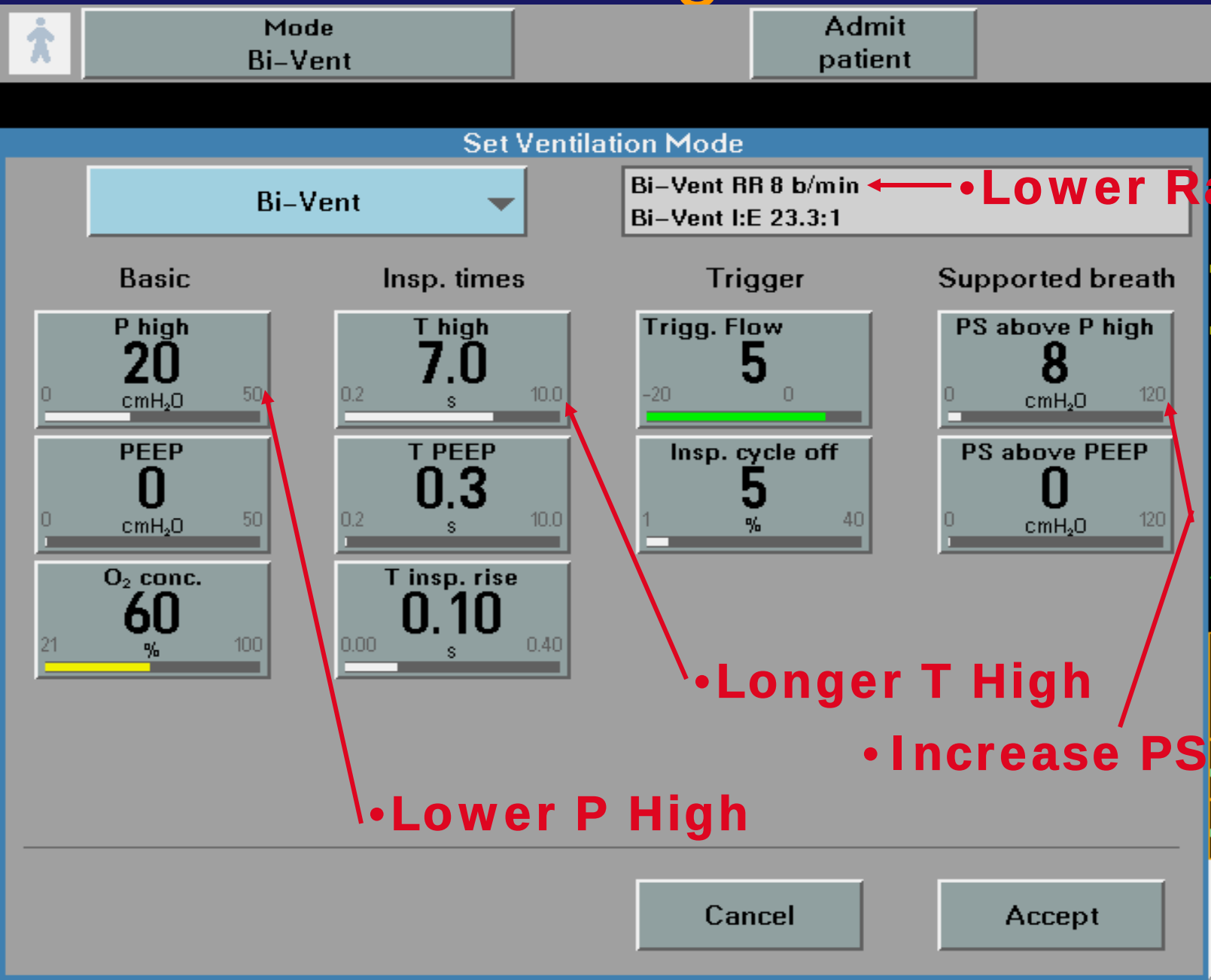
To Increase PaO_2

1. Increase F_IO_2
2. Increase MAP by increasing P High in 2 cm H_2O increments.
3. Increase T high slowly (0.5 sec/change)
4. Recruitment Maneuvers
5. *Shorten* T PEEP (T low) to increase PEEPi in 0.1 sec. increments (This may reduce V_T and affect $PaCO_2$)

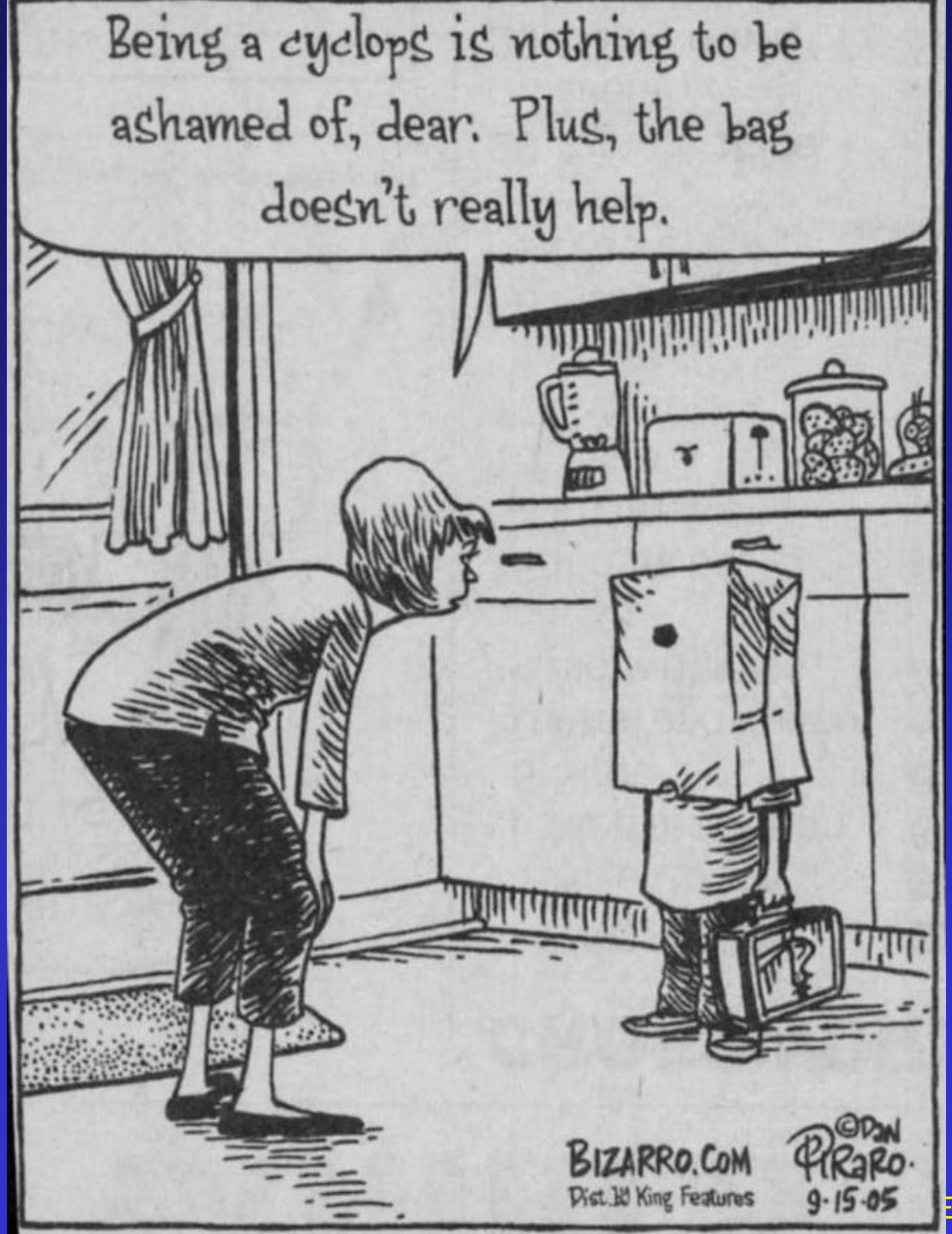
Weaning Bi-Vent



Weaning Bi-Vent



- Pressure controlled modes can deliver TV and MV equal to VC with lower peak pressures
- Play with the vents
- Pressure control is a perfectly good form of ventilation even in normal lungs
- All of these modes have increased mean alveolar pressure and potential for hypercarbia


Being a cyclops is nothing to be ashamed of, dear. Plus, the bag doesn't really help.
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