Fundamental of Ventilator

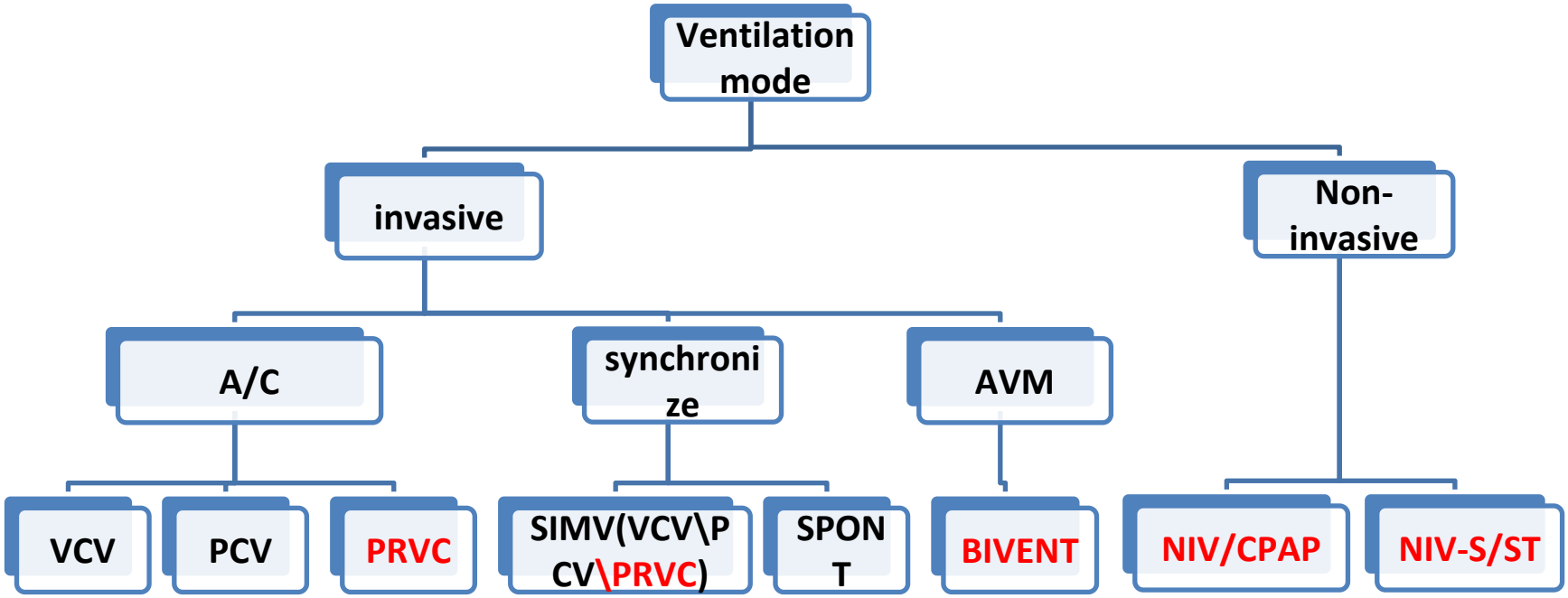
Clinical Perspective of Learning

Beijing Aeonmed Co., Ltd.

Tiffany Yang/ 2019.01.01

AEONMED 谊安

Ventilation Mode

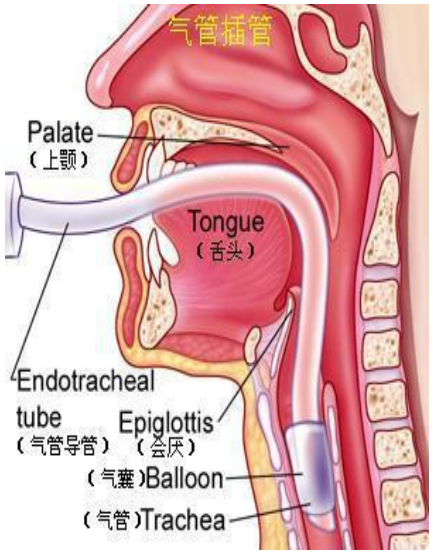


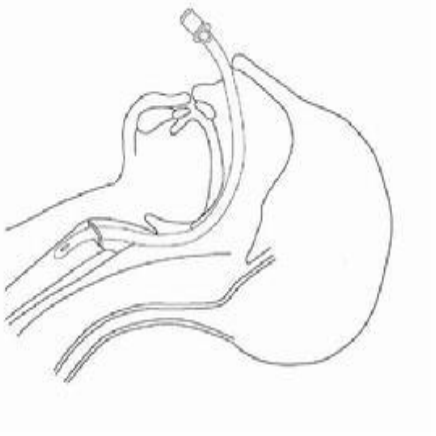
Type

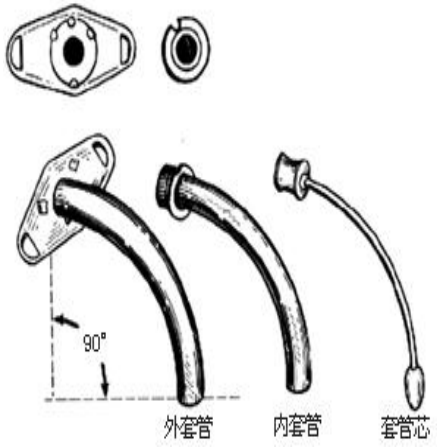
Non-invasive

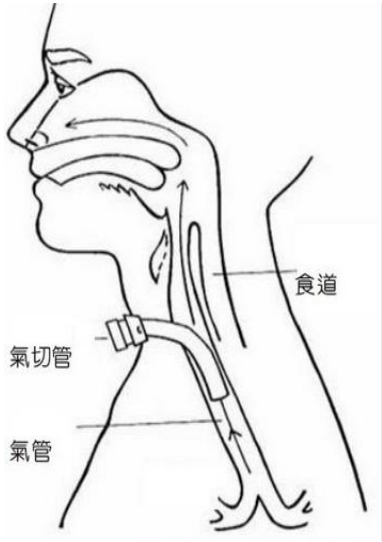
Type

Invasive









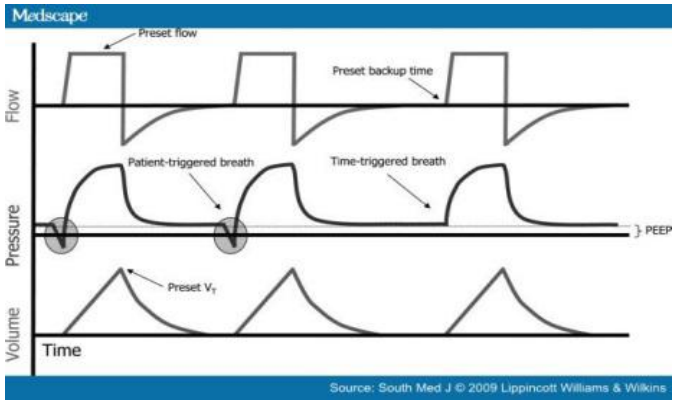
VCV

Volume controlled ventilation. Ventilator controls delivered volume. Volume stays constant breath to breath. Inspiratory pressure varies with change in the patient's lung compliance and airway resistance

VCV

Advantage:

- Guarantee VT;
- Allow resting of respiratory muscle

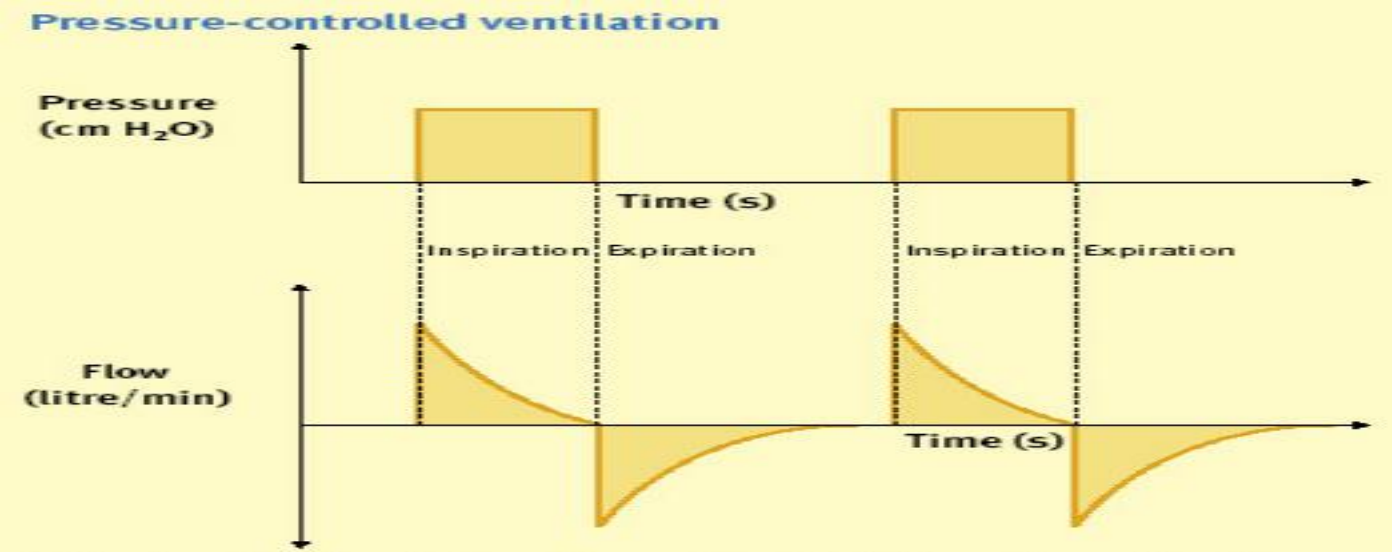


Disadvantage:

- Machine-patient asynchrony;
- Bad for muscle exercise;
- Hypoventilation or hyperventilation;

PCV: The ventilator controls the pressure throughout inspiration so there is basically one pressure pattern. Flow (volume) varies with patient's compliance and resistence.

Assist/Control: all machine breaths that patient may trigger or not. A backup breaths/min rate is set.



PCV


待机
Ppeak
cmH2O
PEEP
cmH2O
ftotal
主菜单
呼吸模式
报警限值
监测值
肺功能测量
日志
系统
VCV
SIMV
基本设置
触发方式
导管补偿
PCV
SPONT CPAP
PRVC
BIVENT
f
bpm
15
Tinsp
s
1.0
Pinsp
cmH2O
20
T slope
s
0.1
I:E = 1:3.0
Texp = 3.0
PEEP
cmH2O
5
O2
%
40
确定

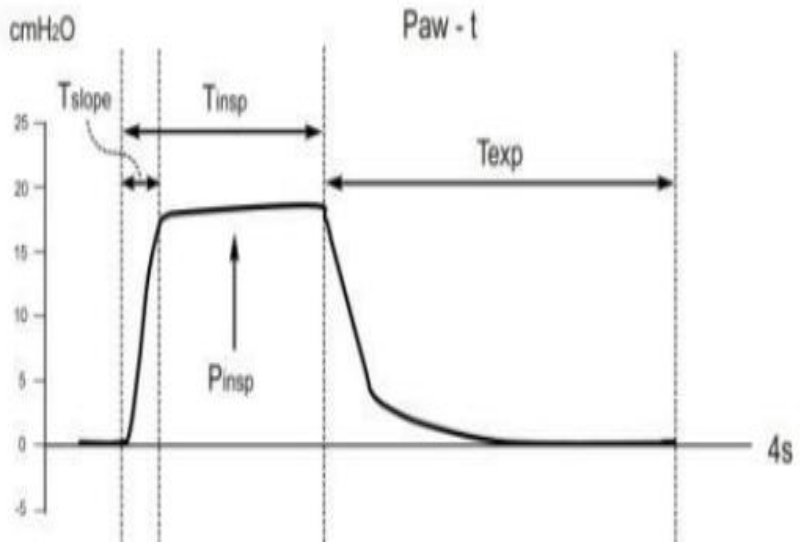
PCV

Advantage:

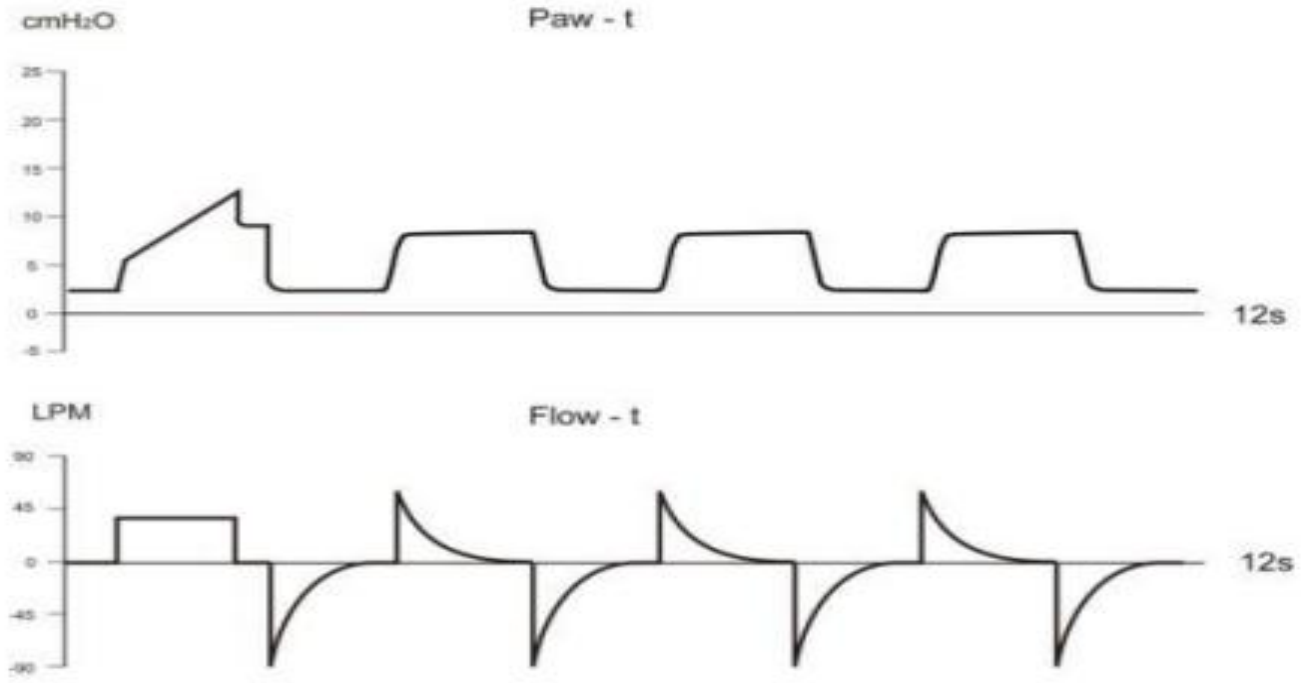
- With controlled Ppeak, prevent barotrama
- Improve gas distribution, promote gas exchange

Disadvantage:

- Frequent adjusting of pressure control level to meet demand VT;
- Cannot ensure VT when lung compliance level change



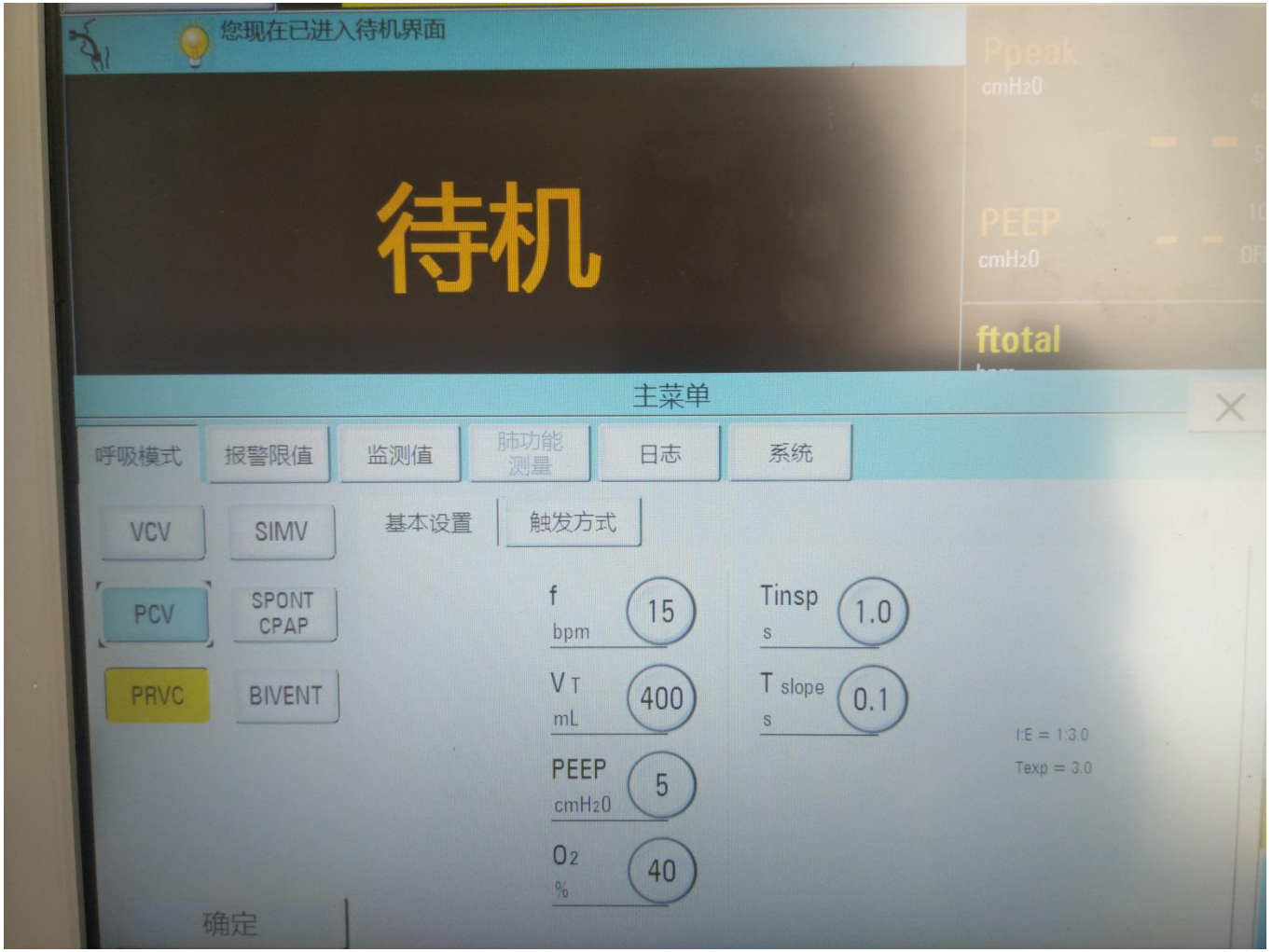
PRVC



VCV preset VT, safe guarantee ventilatory efficiency； PCV controlled Ppeak, prevent lung damage； PRVC combine the advantage of these two.

PRVC: Pressure regulation volume controlled (volume targeted pressure control): Dual-control modes of ventilation are auto-regulated pressure-controlled modes of mechanical ventilation with a user-selected tidal volume target. The ventilator adjusts the pressure limit of the next breath as necessary according to the previous breath's measured exhaled tidal volume.

PRVC

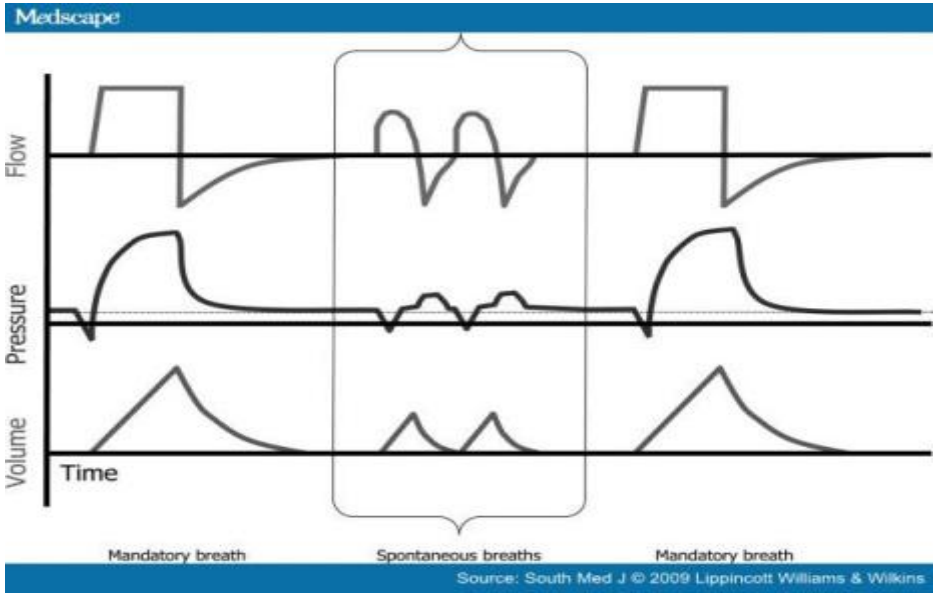

您现在已进入待机界面
待机
Ppeak
cmH2O
PEEP
cmH2O
ftotal
主菜单
呼吸模式
报警限值
监测值
肺功能测量
日志
系统
VCV
SIMV
基本设置
触发方式
PCV
SPONT CPAP
PRVC
BIVENT
f
bpm
15
Tinsp
s
1.0
VT
mL
400
T slope
s
0.1
I:E = 1:3.0
Texp = 3.0
PEEP
cmH2O
5
O2
%
40
确定

PRVC

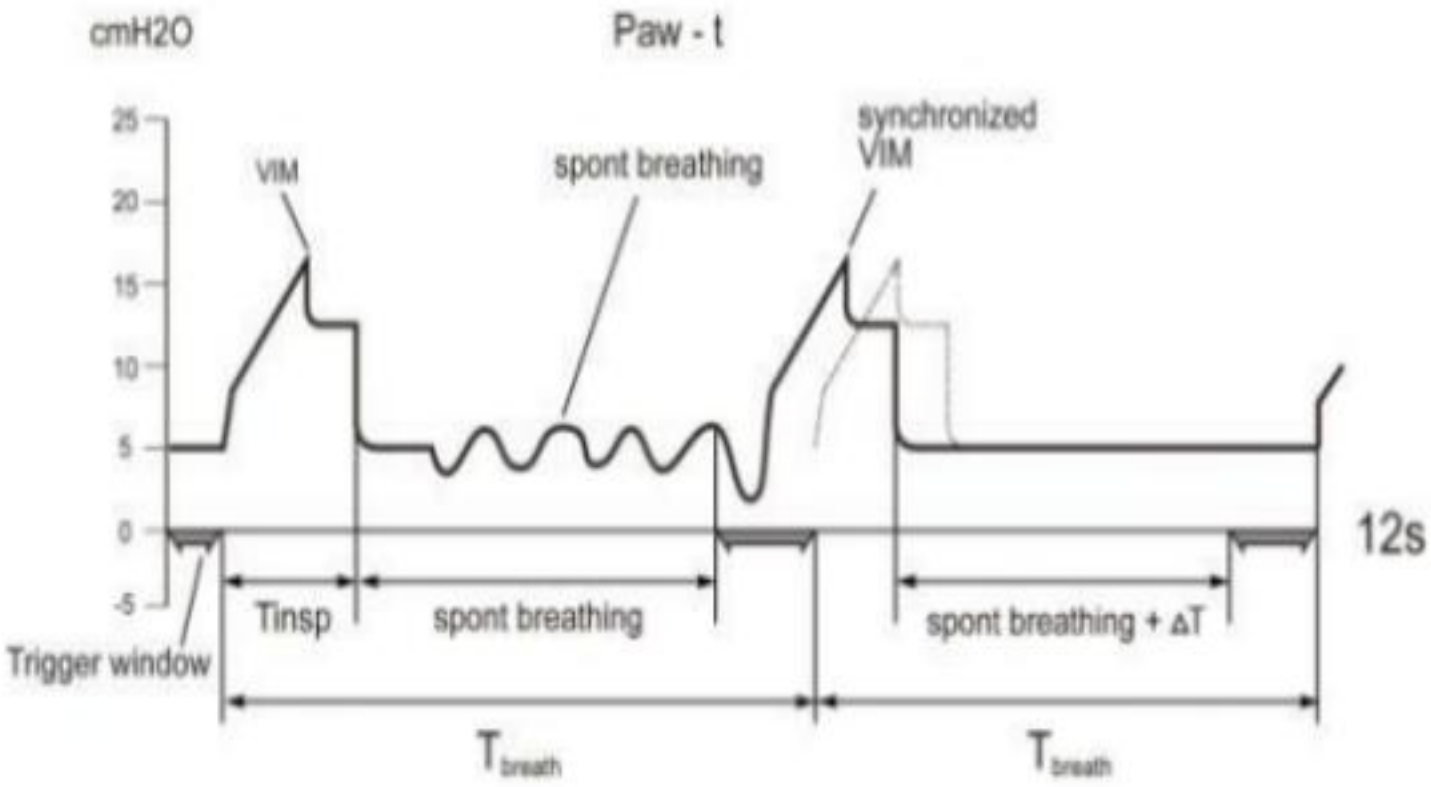
Clinical advantage:

- With fast and accurate pressure regulation, take no more than 3 breathing cycle to meet target VT
- Ventilate pt within safe airway pressure range, minimize chances of barotrauma
- Rdyn, Cdyn to monitor lung mechanics, make the pressure regulation more accurate.
- Promote machine-patient synchrony, increase patient comfort level.

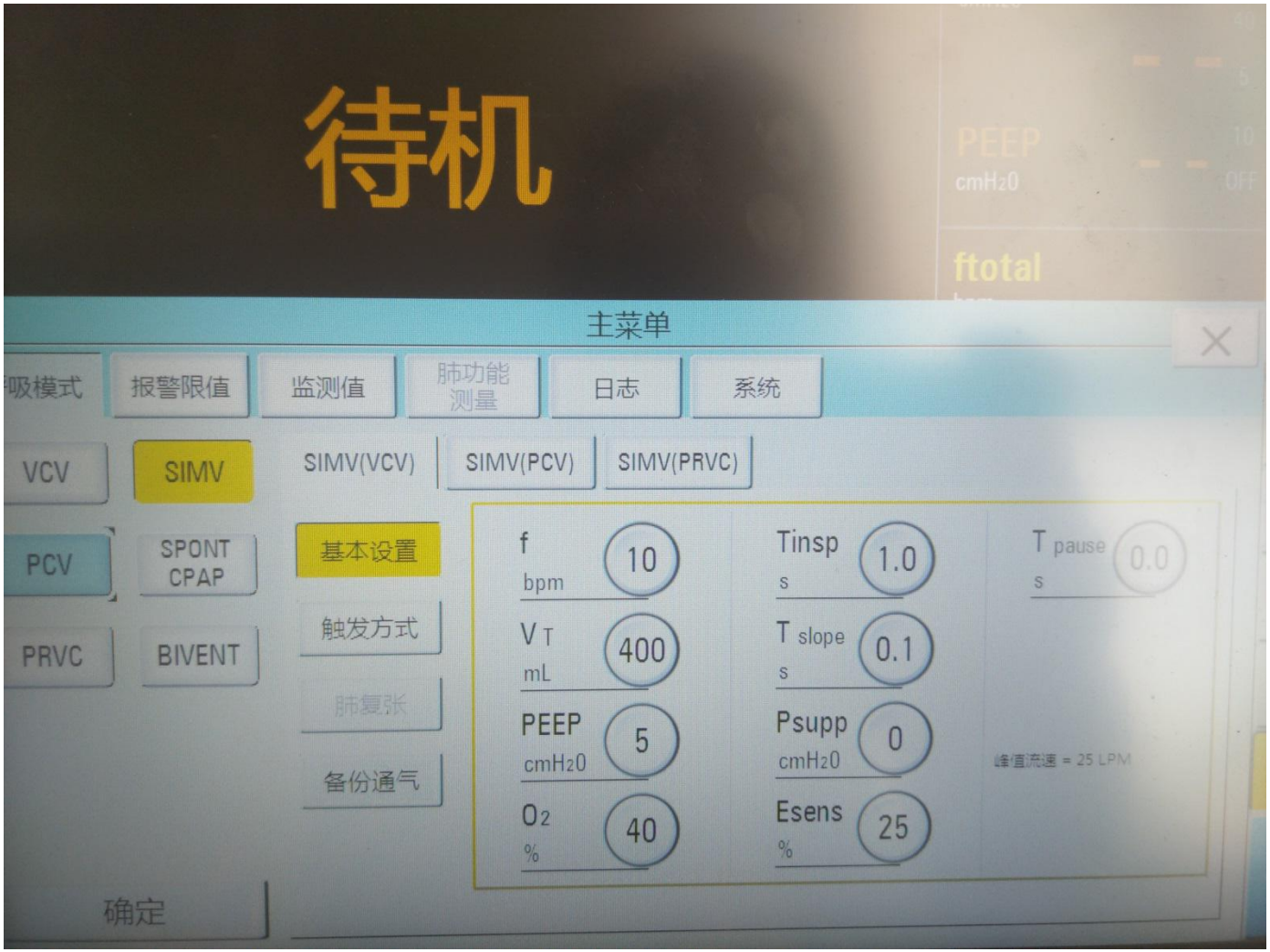
SIMV: Synchronized intermitted mandatory ventilation. Sets a fixed number of machine breaths and allows the patient to breath spontaneously in between machine breaths.



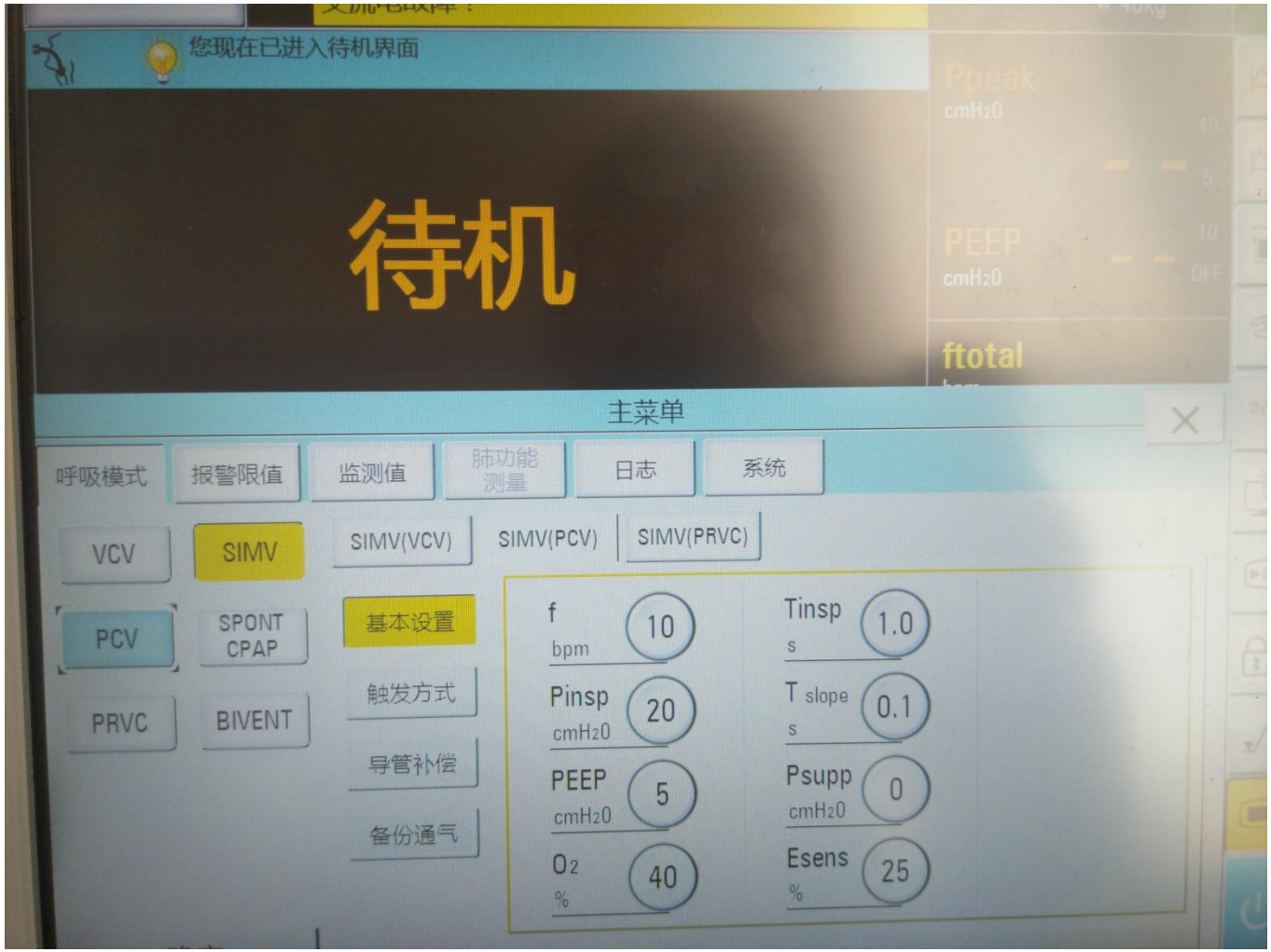
SIMV


cmH2O
Paw - t
25
20
15
10
5
0
-5
VIM
spont breathing
synchronized VIM
12s
Trigger window
Tinsp
spont breathing
spont breathing + ΔT
T breath
T breath

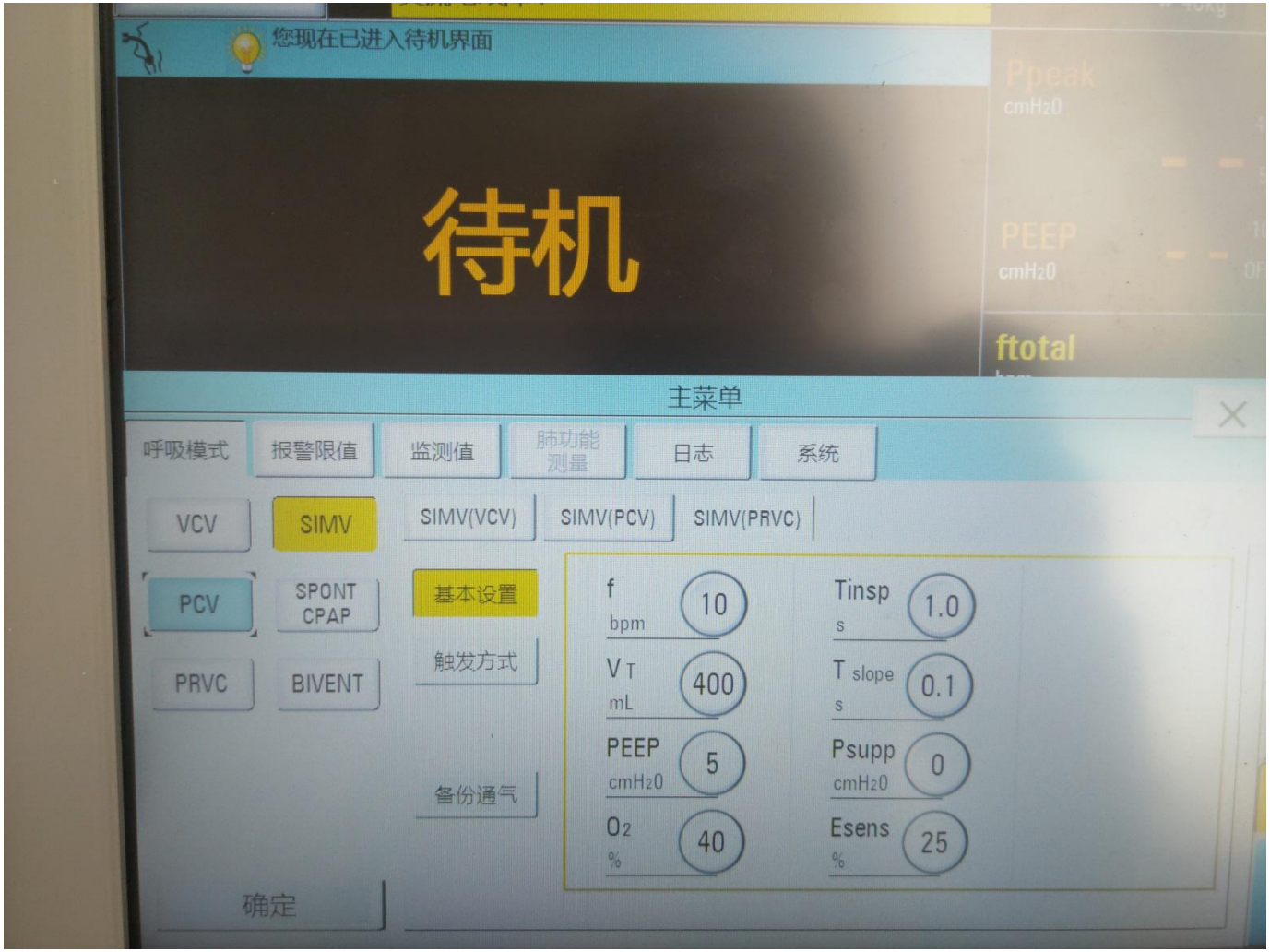
SIMV


待机
PEEP
cmH2O
ftotal
主菜单
报警限值
监测值
肺功能测量
日志
系统
VCV
SIMV
SIMV(VCV)
SIMV(PCV)
SIMV(PRVC)
PCV
SPONT CPAP
基本设置
触发方式
PRVC
BIVENT
肺复张
备份通气
f
bpm
10
VT
mL
400
PEEP
cmH2O
5
O2
%
40
Tinsp
s
1.0
T slope
s
0.1
Psupp
cmH2O
0
Esens
%
25
T pause
s
0.0
峰值流速 = 25 LPM
确定

SIMV


您现在已进入待机界面
待机
Ppeak
cmH2O
PEEP
cmH2O
ftotal
主菜单
呼吸模式
报警限值
监测值
肺功能测量
日志
系统
VCV
SIMV
SIMV(VCV)
SIMV(PCV)
SIMV(PRVC)
PCV
SPONT CPAP
基本设置
PRVC
BIVENT
触发方式
导管补偿
备份通气
f
bpm
10
Tinsp
s
1.0
Pinsp
cmH2O
20
T slope
s
0.1
PEEP
cmH2O
5
Psupp
cmH2O
0
O2
%
40
Esens
%
25

SIMV


您现在已进入待机界面
待机
Ppeak
cmH2O
PEEP
cmH2O
ftotal
主菜单
呼吸模式
报警限值
监测值
肺功能测量
日志
系统
VCV
SIMV
SIMV(VCV)
SIMV(PCV)
SIMV(PRVC)
PCV
SPONT CPAP
基本设置
触发方式
PRVC
BIVENT
备份通气
f
bpm
10
Tinsp
s
1.0
VT
mL
400
T slope
s
0.1
PEEP
cmH2O
5
Psupp
cmH2O
0
O2
%
40
Esens
%
25
确定

SIMV

SIMV（VCV）+PS

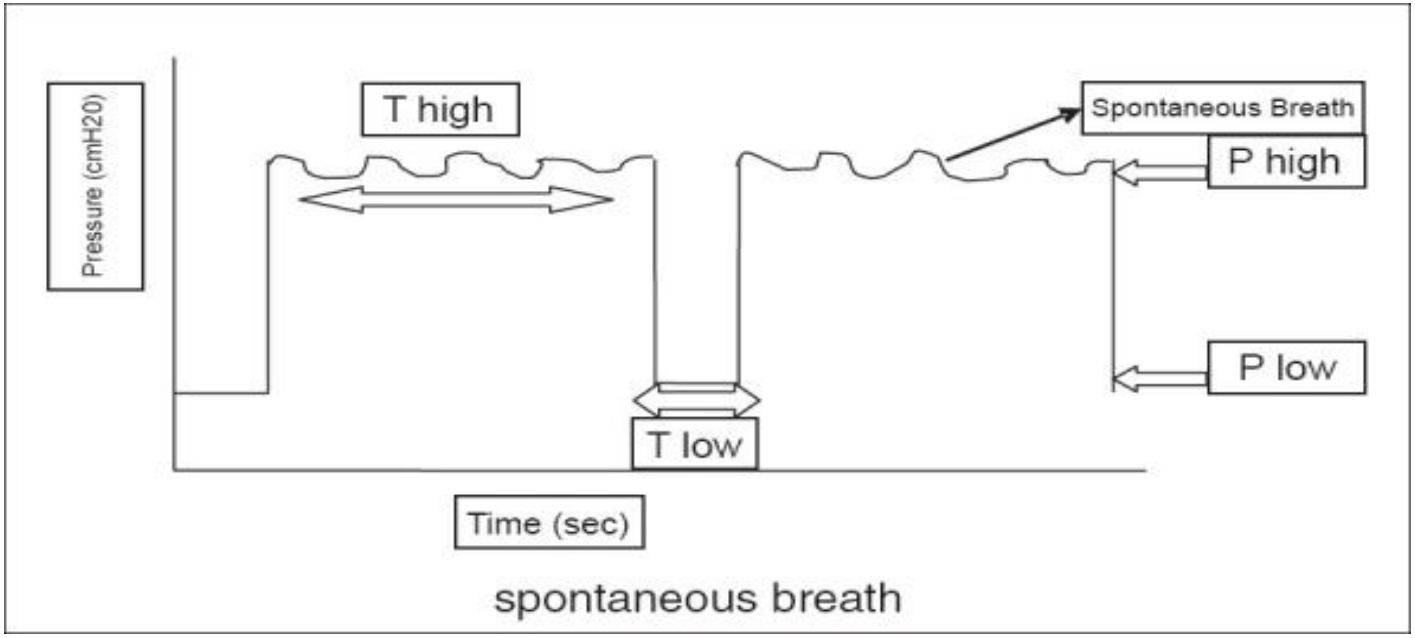
SIMV（PCV）+PS

SIMV（PRVC）+PS

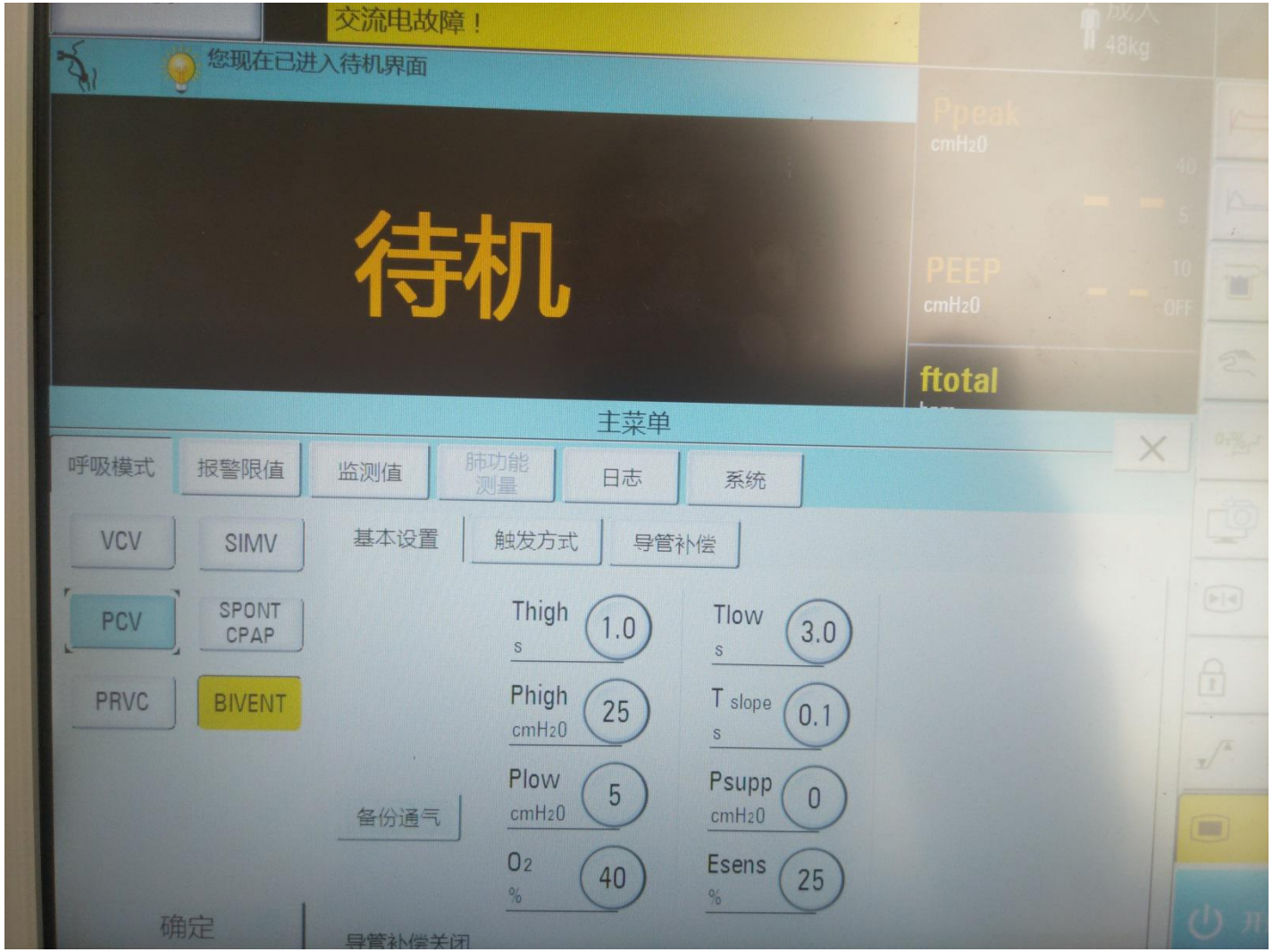
- Ensure patient adequate ventilation while allowing for SB
- Promote lung exercise and weaning process by proper usage
- Suitable for patient with SB or prepare for extubation

BIVENT

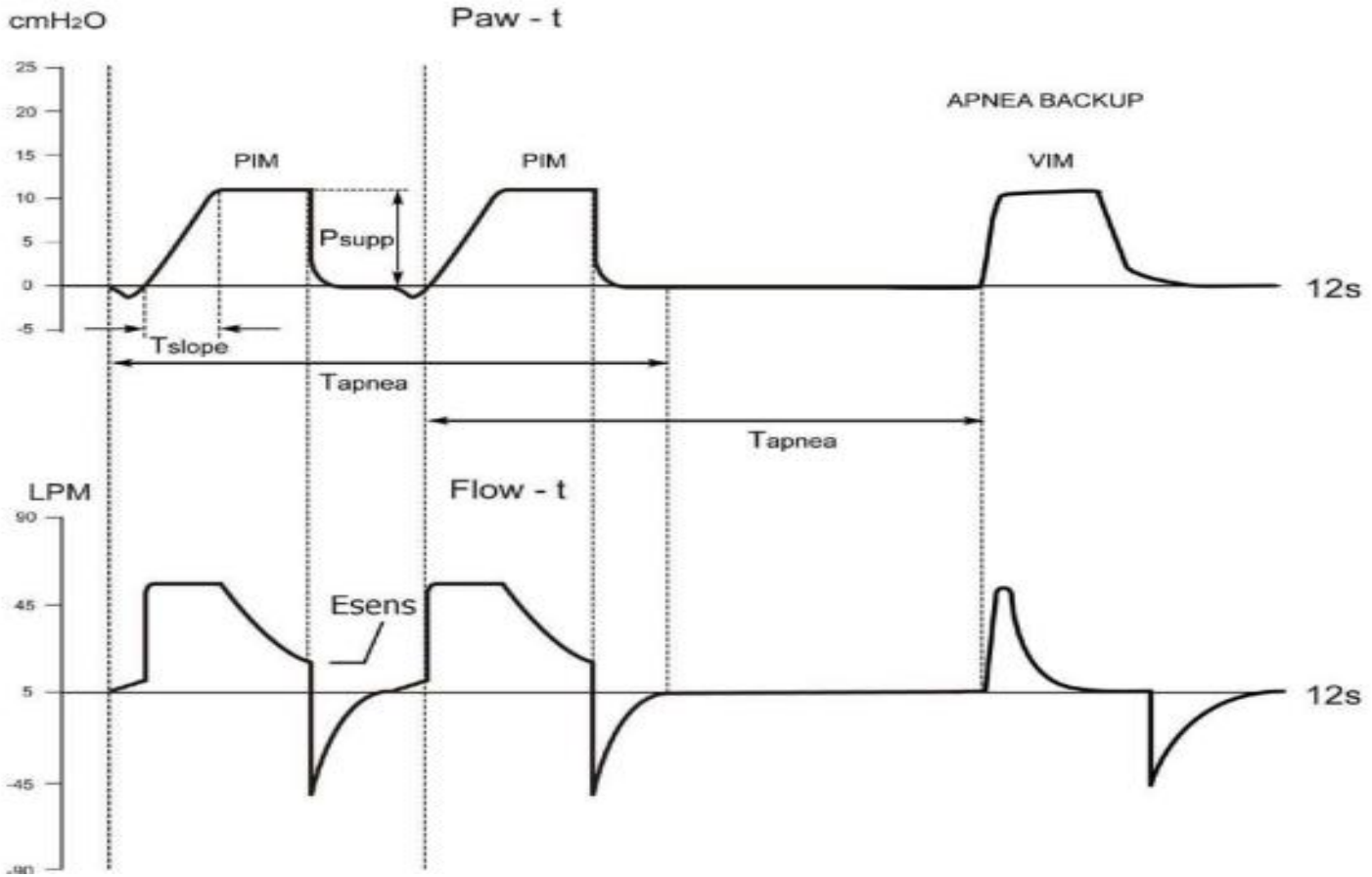
Basically two levels of CPAP. Pt able to breath spontaneously at the upper pressure with or without added PS. The drop from higher to lower pressure is the “release” to eliminate CO2.



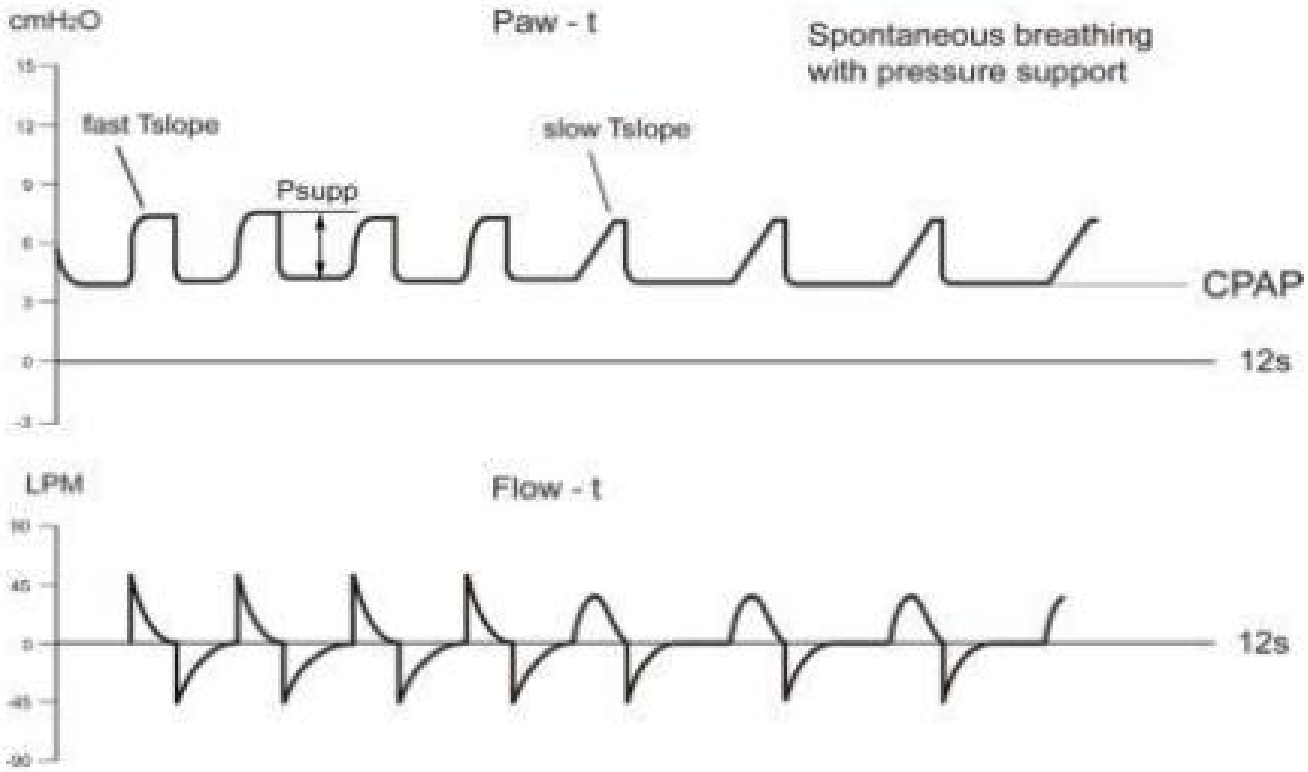
BIVENT


交流电故障！
您现在已进入待机界面
待机
Ppeak
cmH2O
PEEP
cmH2O
ftotal
主菜单
呼吸模式
报警限值
监测值
肺功能测量
日志
系统
VCV
SIMV
基本设置
触发方式
导管补偿
PCV
SPONT CPAP
PRVC
BIVENT
Thigh
s
1.0
Tlow
s
3.0
Phigh
cmH2O
25
T slope
s
0.1
Plow
cmH2O
5
Psupp
cmH2O
0
备份通气
O2
%
40
Esens
%
25
确定

SPONT


cmH2O
Paw - t
25
20
15
10
5
0
-5
PIM
PIM
APNEA BACKUP
VIM
Psupp
12s
Tslope
Tapnea
Tapnea
LPM
Flow - t
90
45
5
-45
-90
Esens
12s

CPAP


cmH2O
Paw - t
Spontaneous breathing
with pressure support
fast Tslope
slow Tslope
Psupp
CPAP
12s
LPM
Flow - t
12s

Initial ventilator settings:

Vt: 8-12 ml/ kg IBW

f: 8-12 breath/min

FiO2: 100%

I:E ratio: 1:2-1:4

PEEP: 3-5 cm H_2 O

Sensitivity: -1 to -2 cm H_2 O.

Alarm settings

MV: Low minute volume shall be maintained at 50% of the exhaled minute volume. High minute volume alarms shall be maintained at 50 to 100% above the exhaled minute volume.

Paw: 10 to 15 cmH2O above the peak inspiratory pressure generated on a consistent basis.

Vti: Low Exhaled Tidal Volume shall be maintained at 50% of the tidal volume delivered or spontaneous tidal volume.

F: 5-45 breath/min (set 10 to 15 above patients ACTUAL respiratory rate)

etCO2: 30-50 mm hg

Apnea automatic activate after 15sec

Non-invasive Ventilation

Indication：

1. COPD
2. OSA-obstructive sleep apnea
3. Neuromuscular disorder
4. Cardiogenic pulmonary edema
5. Refuse intubation

Non-invasive Ventilation

Contra-indication：

1. No absolute contraindications
2. Incorrect mask size and type
3. Too much airway secretions
4. Inadequate Cough reflex
5. Emesis or high chance of aspiration patient

Non-invasive Ventilation

Warning：

1. Pre-use education
2. Don't force silence breathing
3. Don't force mandatory breath
4. Minimize leakage

Enhancement

Inspiratory Hold

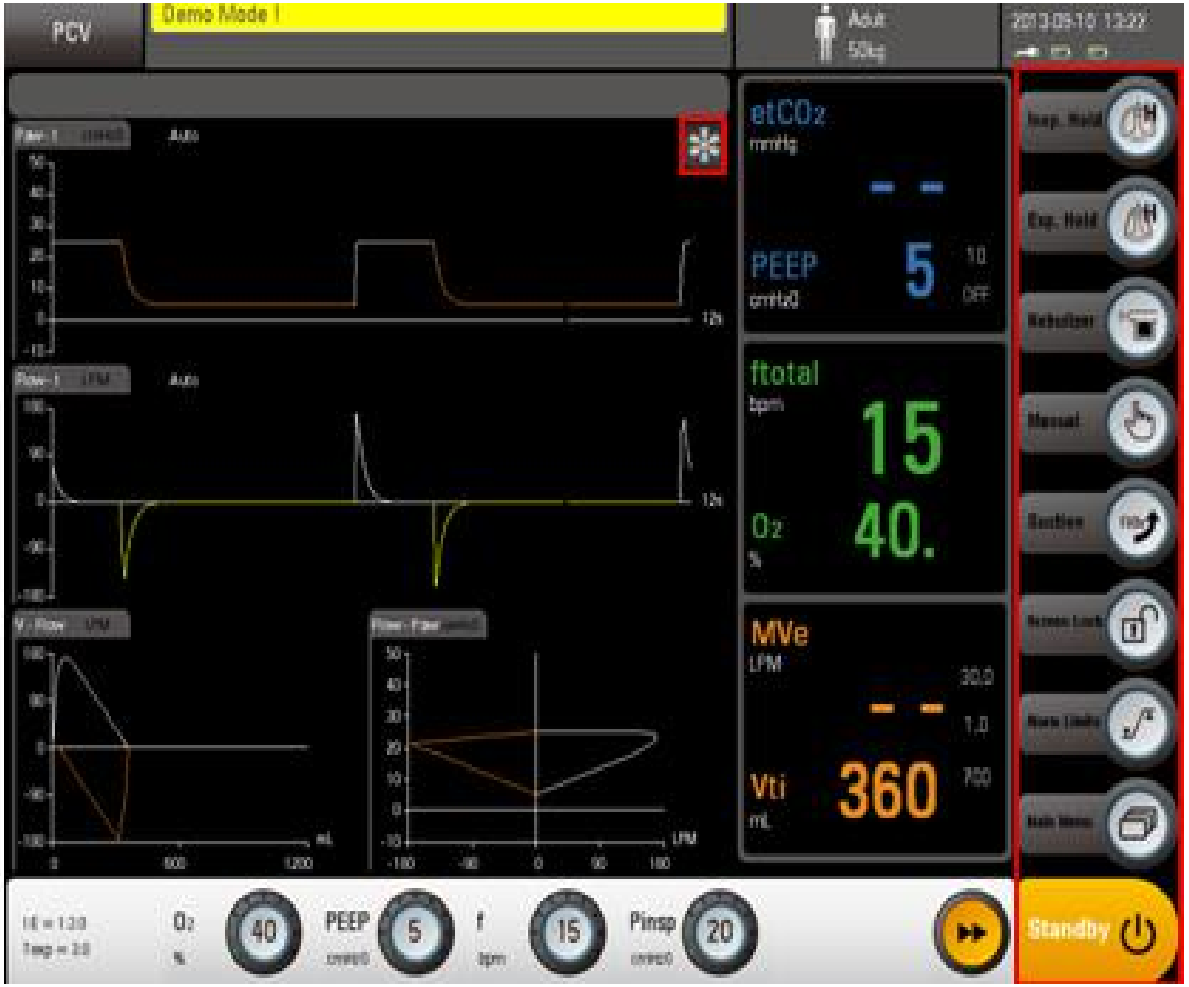
Expiratory Hold

Nebulizer

Manual

Suction

Freeze



Inspiration Hold

- Monitor Pplat
- Promote gas exchange
- Recruitment maneuvers
- Leakage testing

Application： All ventilation mode

except SPONT、 PSV、 NIV/CPAP

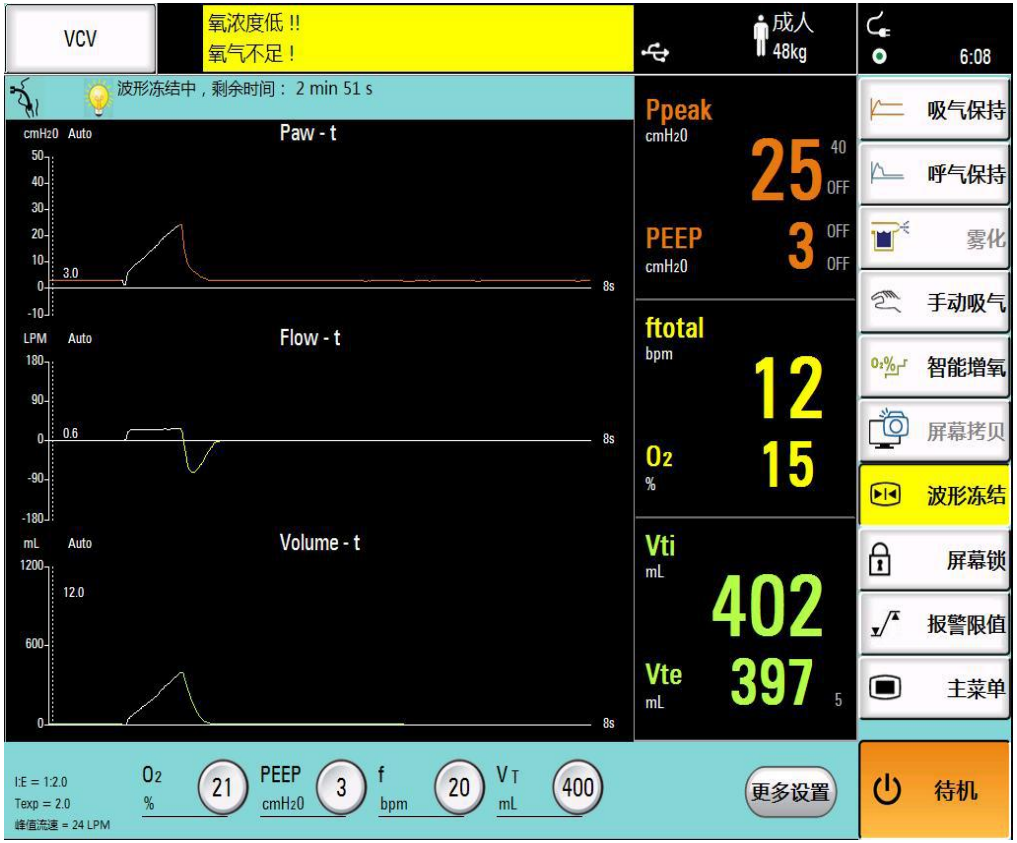
Duration： max 30S

Expiration Hold

- Monitor PEEP

Application：All ventilation mode

Duration：max 30S



临床干预工具的使用

Nebulizer

- Humidifying airway
- Dilute sputum, promote cough reflex
- Prevent airway infection
- Relieve bronchial spasm

Application： All ventilation mode except NIV

Duration： max 30min

在通气回路中使用

脱离呼吸机——配合面罩或插管使用

临床干预工具的使用

Nebulizer

Warning：

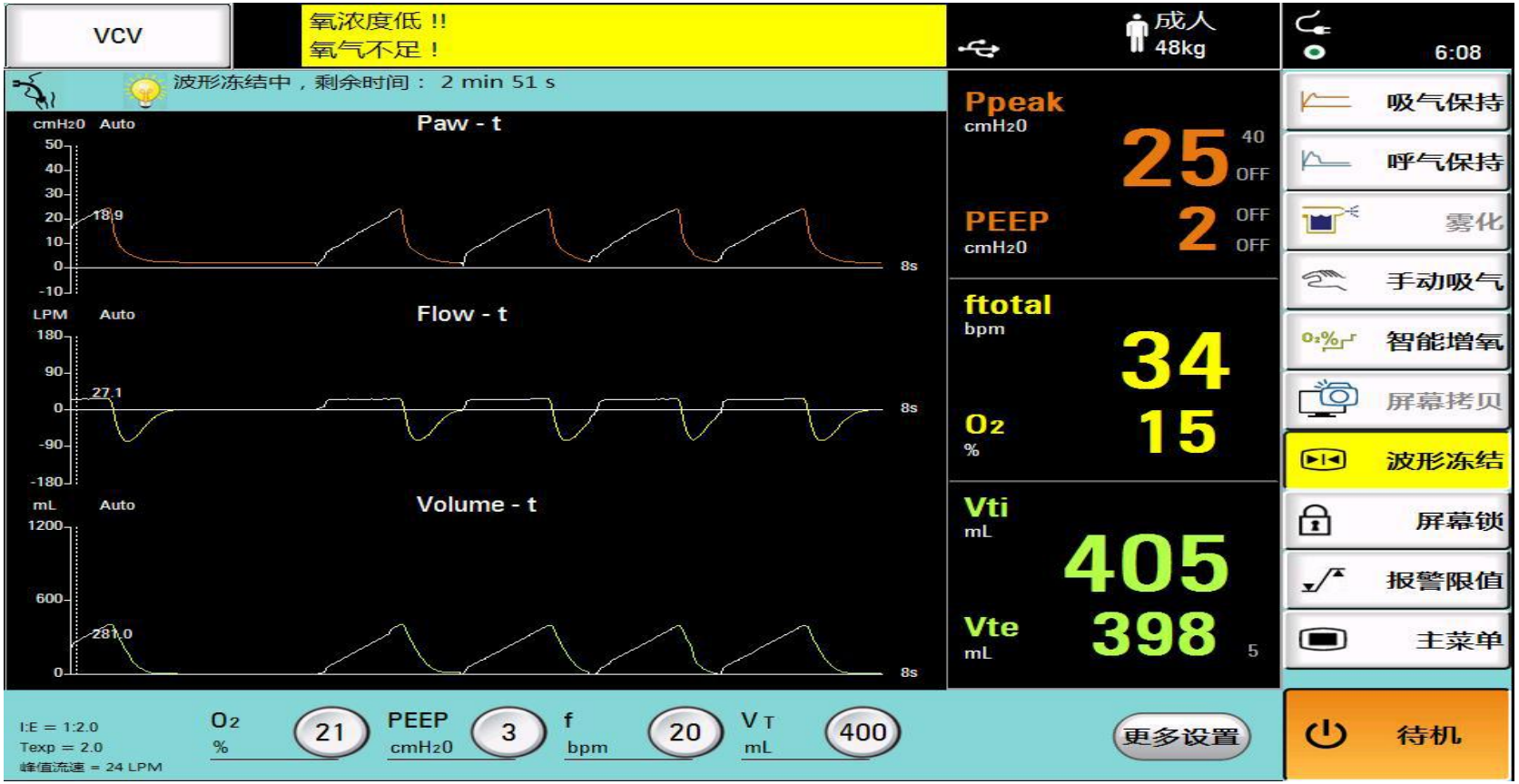
- Connect nebulizer in between inspiration port and Y piece
- Apply filter to expiation port
- Never apply nebulizer in front of Y piece
- Remove HME

在通气回路中使用

脱离呼吸机——配合面罩或插管使用

Manual

Application： All ventilation mode



Suction

Application： In all ventilation mode

Process：

- 3mins 100% O2 prior suction
- 2mins Suction in-progress
- 2mins 100% O2 post suction

Suction (close system)

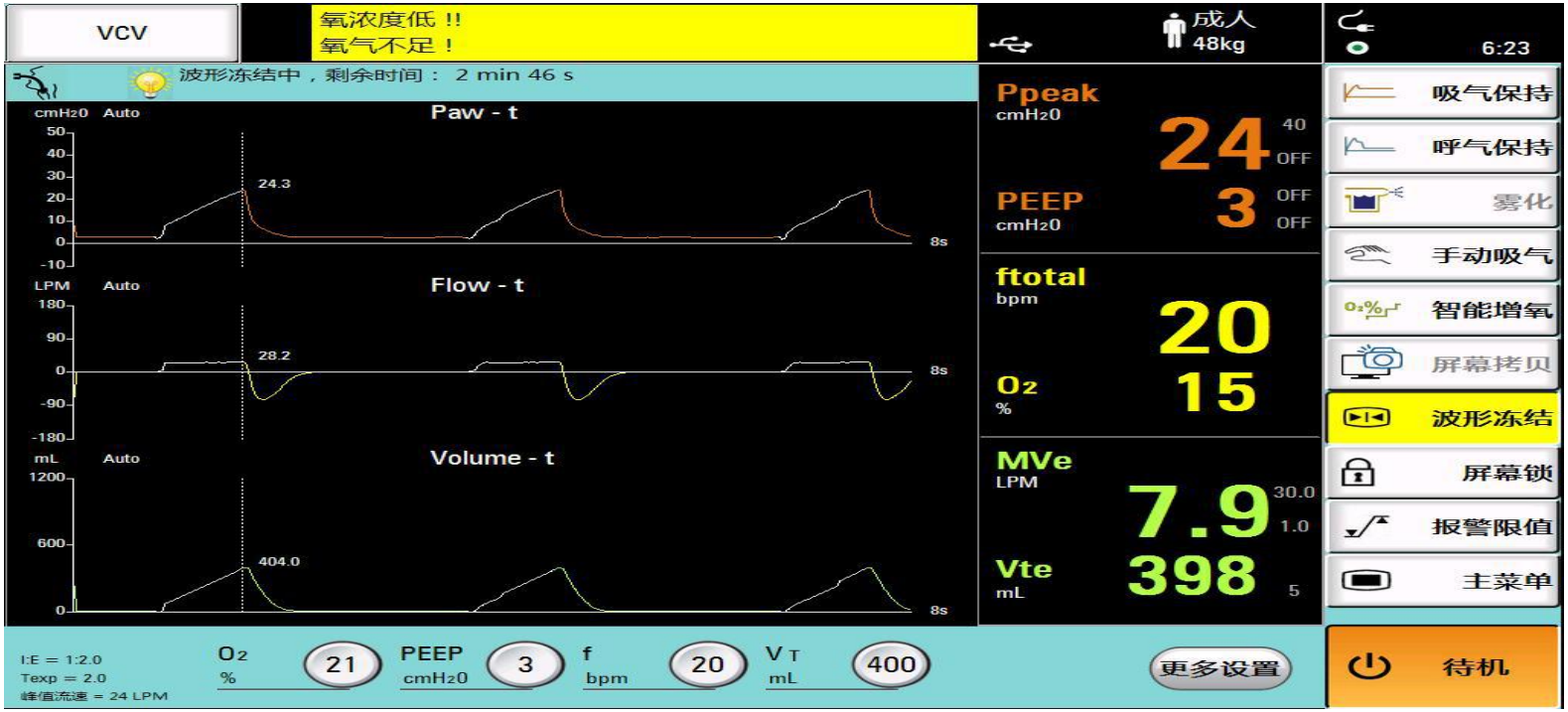
- For intubated patient require suction
- Fast and convenient
- Decrease workload
- No need to disconnect ventilator, decrease chances of infection

Waveform freeze

Application: All mode

Duration: 3mins max

- Monitor the value of every single point in the wave form
- Promote understanding of lung condition
- Combine with screen shot function, store real-time waveform



Screen shot

Plug USB，press button，to save waveform


AEOMED
谊安