

# TROUBLE SHOOTING

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I hate noise pollution and unnecessary sounds



But when it comes to alarms ringing.....

Hear the alarm



Ask for help  
if you are confused

See the alarm and patient  
What is the problem

# Connections



# Connections



Fully assembled, functioning sterilised AMBU  
at each ventilation station



## SST Setup

Patient Circuit Type  
**PEDIATRIC**

Humidification Type  
**Non-heated exp tube**

Humidifier Volume  
**320** mL

**EXIT SST**

Adjust settings as needed.

*Must match installed equipment!*

To apply: press ACCEPT.  
To cancel: touch EXIT SST.

# Self test

- ⦿ Run the prescribed tests and calibrations before using the ventilator on a patient
- ⦿ Ensure that the ventilators pass all the tests before putting them in to clinical use.
- ⦿ Machine checks
  - Leak
  - Compliance
  - Resistance of circuit
  - Sensors
- ⦿ Should be done
  - Before connecting to the patient,
  - Anytime circuit is changed



SPONT

PC  
Manual Insp only

PS

V-TRIG

70 kg

$P_i$   
20  $\text{cm H}_2\text{O}$

$T_i$   
0.80 s

$P_{\text{SUPP}}$   
14  $\text{cm H}_2\text{O}$

$\dot{V}_{\text{SENS}}$   
3.5  $\frac{\text{L}}{\text{min}}$

$\text{O}_2$   
40 %

$\int P$   
50 %

$E_{\text{SENS}}$   
25 %

PEEP  
8.0  $\text{cm H}_2\text{O}$

$\text{cm H}_2\text{O}$   
100

1/min  
110

OFF

L/min  
50

mL  
1500

mL  
1500

40

23

$P_{\text{PEAK}}$

16

$f_{\text{TOT}}$

17.5

5.28

$\dot{V}_{E \text{ TOT}}$

0.050

660

$V_{TE \text{ MAND}}$

85

605

$V_{TE \text{ SPONT}}$

59

VENT  
SETUP

APNEA  
SETUP

CURRENT  
ALARM



Adjust settings as needed.

To cancel: touch ALARM.

# Alarm settings

- ⦿ Fixed alarms
  - Disconnection
  - O<sub>2</sub> sensor
- ⦿ Set alarms
  - Volume
  - Pressure
  - Rate
  - Apnea

# Alarm Setting

## Volume

- ⦿ High Minute Ventilation
  - Set at 1-2 Lit or 10-15% above baseline/ observed MV
- ⦿ Low Minute Ventilation
  - Set at 1-2 Lit or 10-15% below minimum SIMV or A/C back up MV
- ⦿ Low exhaled TV
  - Set 100ml or 10-15% lower than expired mechanical TV

# Alarm settings

## Pressure

### ⦿ **High Inspiratory Pressure**

- Adults 10 to 15 cmH<sub>2</sub>O above the peak inspiratory pressure generated on a consistent basis
- Pediatrics 10 cmH<sub>2</sub>O above the peak inspiratory pressure generated on a consistent basis.
- Neonates 5 cmH<sub>2</sub>O above the peak inspiratory pressure generated on a consistent basis

### ⦿ **Low Inspiratory Pressure**

- Adults 10 to 15 cmH<sub>2</sub>O below the peak inspiratory pressure generated on a consistent basis
- Pediatrics 5 to 10 cmH<sub>2</sub>O below the peak inspiratory pressure generated on a consistent basis
- Neonates 3 cmH<sub>2</sub>O below the peak inspiratory pressure generated on a consistent basis.

### ⦿ **High/ low PEEP**

- Set 3-5 cm above/below set PEEP

# Alarm settings

## Rate

- High respiratory rate
  - Set 10 – 15 BPM over observed respiratory rate

# Alarm settings

## Apnea

- ⦿ Should be set to correspond to maximum acceptable apneic period.
- ⦿ Generally 15-20 secs interval

# When one hear an alarm...

- ⦿ Should look at patient and monitor first
  - How stable is the patient
    - Systolic BP/ saturation
  - How much time do you have to assess the situation, find out the cause and settle the issue
- ⦿ Look at ventilator then

# Patient is in danger zone....

- ⦿ Severe hypotension/ bradycardia
- ⦿ Severe hypoxemia
- ⦿ Disconnect patient from ventilator and start manual ventilation with 100% oxygen
- ⦿ Diagnostic as well as therapeutic
  - Feel the resistance
  - Look for unequal chest movements
  - Listen for leaks



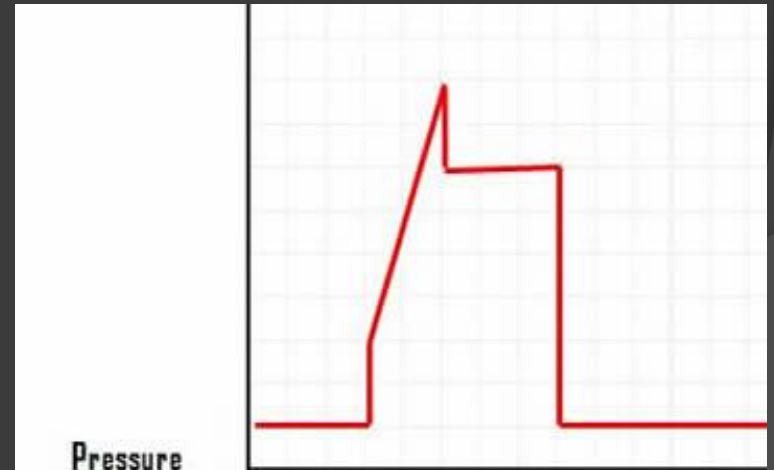
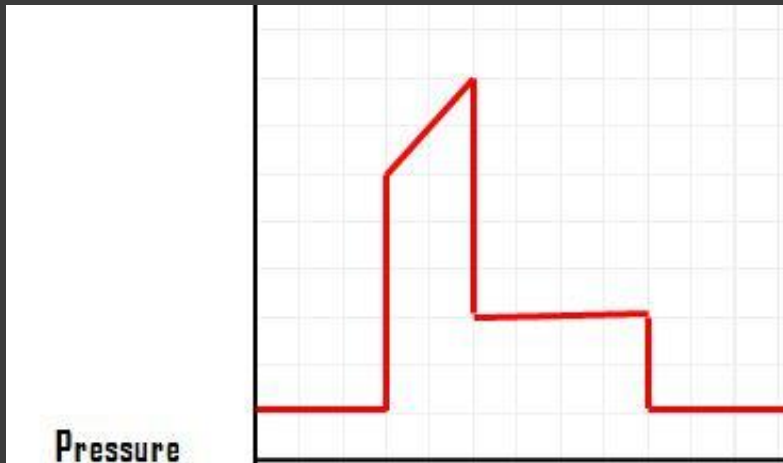
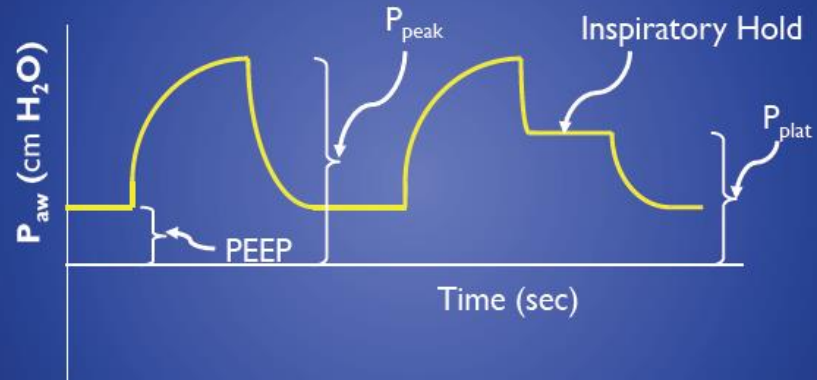
# Patient is in danger zone....

- ◎ Commonest causes
  - Auto PEEP
  - Patient ventilator dyssnchrony
  - Obstructed tube
  - Dislodged tube
  - Tension pneumothorax

# Stable patient....

- ⦿ Look at ventilator alarm
- ⦿ High peak pressure alarm
  - Many ventilators will switch to exhalation once upper pressure limit is reached- drastic reduction in TV
  - Some ventilators will hold this pressure for period of inspiration- smaller reduction in TV

# Pressures



# Possible causes of high airway pressures

- ⊙ **Machine**
- ⊙ Ventilator
  - Inappropriate settings- flow/ alarms
  - Ventilator malfunction
- ⊙ Circuit
  - Kinking
  - Pooling of condensed water vapour
  - Wet /blocked HME filters
- ⊙ Endotracheal tube
  - Displacement in bronchus
  - Obstruction with foreign material
- ⊙ **Man**
- ⊙ Bronchospasm
- ⊙ Decreased compliance
  - Lung (e.g. collapse, consolidation, pulmonary edema)
  - Pleural (e.g. pneumothorax, pleural effusion)
  - Chest wall (e.g. abdominal distention, kyhposcoliosis, obesity)
  - Patient -ventilator dysynchrony, coughing

# Trouble Shooting

- ⦿ Pass Suction catheter/ change of tube
- ⦿ Sedate
- ⦿ Auscultate
  - Bronchodilators
  - Change ventilatory settings
    - Increase absolute expiratory time
  - Reposition tube
- ⦿ Obtain X ray/ USG
- ⦿ Treat underlying cause
- ⦿ Reset pressure alarm

# Patient Ventilator Asynchrony

## ◎ Main reasons

- Improper mode selection
- Inappropriate trigger sensitivity setting
- Inappropriate inspiratory flow setting
- Inappropriate cycle variable
- Inappropriate PEEP

# Low Pressure Alarm

- ⦿ Will be with low exhaled TV alarm
  - Leak in ET cuff
  - Leak in circuit
    - Damaged ventilator tubings, cracked humidifiers, broken traps
  - Partial leaks especially check for open MDI ports, partially open catheter mount port
  - Increased Patients effort (without low exhaled TV alarm)
  - BPF with ICD in place
  - Alarm limit set too low

# Low tidal volume

- ⦿ Asynchronous breathing
- ⦿ Decreased compliance
- ⦿ Increased system resistance
- ⦿ Inadequate preset pressure
- ⦿ Gas leak



# High respiratory rate alarm

- ⊙ Tachypnoec patient
  - Pain/ distress
    - Analgesia/ sedation
- ⊙ Autocycling
  - Water condensation in the circuit
  - High sensitivity settings
  - Cardiogenic oscillations
  - Circuit leaks
  - Endotracheal cuff leaks
  - Chest tubes

# High RR management

- ⦿ Identify cause
- ⦿ Determine if patient truly breathing
  - Connect patient to a T-piece with capnograph and look for spontaneous breathing movements and a CO<sub>2</sub> waveform
- ⦿ Determine if the auto-triggering is due to cardiac oscillations
  - Evaluate if the ECG or SPO<sub>2</sub> waveform matches triggering
- ⦿ Prevent Auto-triggering
  - Minimize leaks
  - Remove condensation from the circuit
  - Make the trigger threshold less sensitive

# High exhaled TV

- ⦿ Not a common alarm
  - Increased compliance
  - Decreased resistance
  - Nebuliser/ aerosol delivery

# Apnoea Alarm

- ⦿ No breath delivered/ exhaled TV detected for the operator set apnoea time
  - Check the patient- Arouse if needed
  - Activate back up facility if it was not done already
  - Consider switching over to any mandatory mode
  - Set trigger level appropriately

# Air / O2 Blender alarm

- ⦿ Supply pressures are inadequate
  - Insert the gas hose fittings (air & O2) correctly into the wall outlets.
  - Ensure wall outlets has adequate pressure

# Points to remember

- ⦿ Never ignore an alarm
- ⦿ Never mute the alarm on regular basis
- ⦿ Troubleshooting should start with the patient and work back to the ventilator
  - Check the patient
  - Silence the alarm