


**ThinkAskLearn**  
Health Professional Education

## Modes of Ventilation

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## Overview

- Positive pressure ventilation
- Understanding types of ventilators
- A quick look at I:E ratios
- As well as PEEP
- Then CMV
- And SIMV
- and then reboot our brains



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## Positive Pressure Ventilation

- Spontaneous ventilation draws air into the lungs after –ve pressure is created in the chest
- Boyles Law- pressure and volumes of gases
  - $P \times V = K$
- Ventilators drive air into the lungs, expiration occurs passively
- Compare Iron lungs



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### August 1882 - Vacuum Jacket



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### The respiratory cycle

- The ventilator must be told what each part of the cycle must be.
  - Inspiration
  - Inspiratory-expiratory changeover
  - Expiration
  - Expiratory- Inspiratory changeover
- Each of these parameters may be varied



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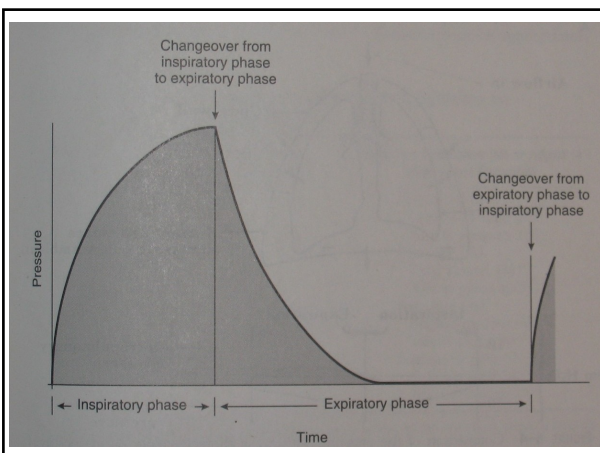
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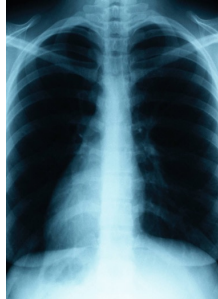
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### Variables of Ventilation

- Time
- Volume
- Pressure
- Flow



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### Volume Cycled Ventilation

- Ventilator cycles end inspiration and begins expiration when a certain volume of gas has been delivered
- Other variables are changed accordingly



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### Time Cycled Ventilator

- Inspiration ends after a predetermined time interval has been reached
- Varying the flow will allow the set volume to be delivered within the allocated time.
- 'basically means it chops up the gas flow column into constant volume as determined by your time and pressure settings'
- 12 breaths per minute then 1 breath every 6 second
- Oxylog is a time-cycled volume constant pressure controlled ventilator



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### Pressure Cycled Ventilator

- This is where gas flow into the lung until a preset airway pressure is reached
- The volume, flow rate and inspiratory time all vary from breath to breath
- Not commonly used but good for poorly compliant lungs such as kids and seriously ill



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### Flow-cycled ventilators

- Inspiration ends when the flow deteriorates to a predetermined level of peak flow
- As lungs fill, pressure is created and flow decreases – then expiration occurs
- Maybe more comfortable the Pressure cycled ventilation
- Not seen in ED



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### I:E ratios

- Inspiration: Expiration Ratio
- 1:2 that is 33% of time in Inspiration and 66% of time in Expiration
- 12 bpm = 1 every 6 seconds
- I:E ration of 1:2 = inspiration of 2 seconds and expiration of 4 seconds



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### I:E ratios

- Often used for asthmatics to increase expiration time eg 1:3
- As inspiration time is shortened the Peak Airway Pressure is increased increasing risk of compromise
- Inverse ratios 1:1, 2:1 are used for noncompliant lungs – Uncommon to see used in ED



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### Peak End Expiratory Pressure

- PEEP useful for preventing and treating atelectasis,
- Improves oxygenation by splinting alveoli open and decreasing shunting allow better oxygenation
- Contraindications of PEEP is related to raised intrathoracic pressure
- Do you know what they are? Similar to BIPAP



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### Controlled Mechanical Ventilation

- CMV – is also seen IPPV on Oxylog screen
- The patient receives a preset number of breaths per minute of a predetermined volume
- Patient is unable to breath for themselves



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Advantages of CMV

- Good for:
  - Flail chest – when little inspiratory effort is not good,
  - Completely paralysed and sedated pt
- Not good for:
  - Awake/lightly sedated pt – fight machine,
  - Increases WOB,
  - Weaken muscle use for long term ventilator
- Good for ED patients- Bad for ICU patients



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Synchronised Intermittent Mandatory Ventilation SIMV

- Pt receives a preset number of breaths
- The pt may also initiate spontaneous breaths
- May use pressure support (high or low levels) if WOB not effective
- Trigger sensitivity can be varied
- Good for long term, lightly sedated or the patient that needs to be weaned.



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Overview

- Oxylog is a time-cycled volume constant pressure controlled ventilator
- Controlled Mandatory Ventilation is only appropriate for fully sedated and paralysed patients in the ED
- PEEP of 5mbar is nearly always applied unless contraindicated
- Ventilator observations are important!



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