



VP Ned

Ventilation Practitioners Nederland

# Beademingsinstellingen

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# Inhoud

- Beademinstellingen
  - Oxygenatie
  - Ventilatie
- I:E ratio
- Drivingpressure
- Tubecompensatie

# Beademingsinstellingen (oxygenatie)

- Alveolaire druk en aanbod  $O_2$
- Parameters:
  - $FiO_2$
  - PEEP
  - I:E ?

# Beademingsinstellingen (ventilatie)

- $AMV = Teug \times Frequentie$
- Parameters
  - Inspiratiedruk ↔ Teugvolume
  - Frequentie
  - I:E ratio?

# I:E ratio (Ademcyclus)



# I:E ratio

- Mechanische ventilatie: 1:2
- I:E aanpassing kan invloed hebben op:
  - Mean Airway Pressure
  - Plateaudruk
  - Totale PEEP

# I:E ratio (MAP)

- Mean Airway Pressure

Freq:	20	<u>I:E</u>	<u>1:2</u>	<u>I:E</u>	<u>1:1</u>
I:E:	1:2 vs 1:1	<b>MAP</b>	<b>15 cmH<sub>2</sub>O</b>	<b>MAP</b>	<b>17,5 cmH<sub>2</sub>O</b>
PEEP:	<b>10 cmH<sub>2</sub>O</b>				
Peak:	25 cmH <sub>2</sub> O				

Freq:	20	<u>I:E</u>	<u>1:2</u>
I:E:	1:2	<b>MAP</b>	<b>17,6 cmH<sub>2</sub>O</b>
PEEP:	<b>14 cmH<sub>2</sub>O</b>		
Peak:	25 cmH <sub>2</sub> O		

- $$MAP = \frac{P_{insp} \times T_{insp} + PEEP \times T_{exp}}{T_{insp} + T_{exp}}$$

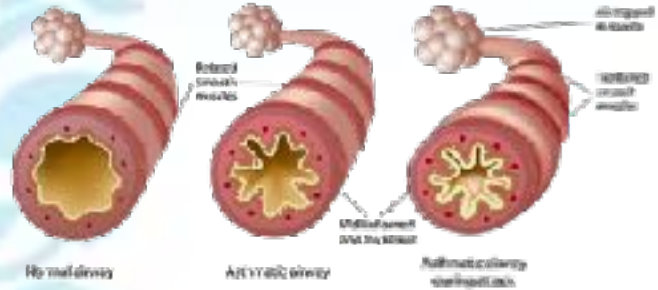
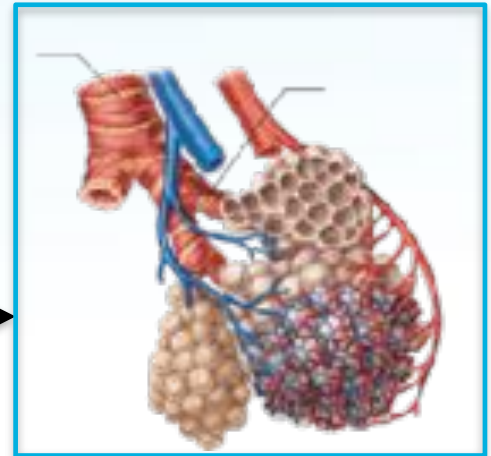
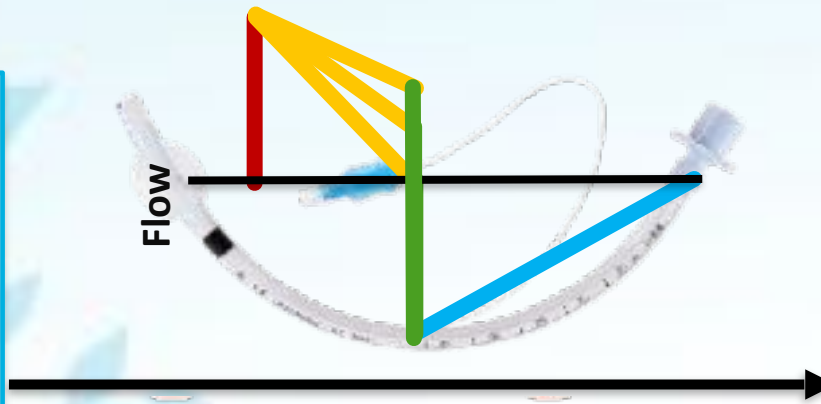
# I:E ratio

- Inspiratie → actief
- Expiratie → passief





# I:E ratio (weerstand)

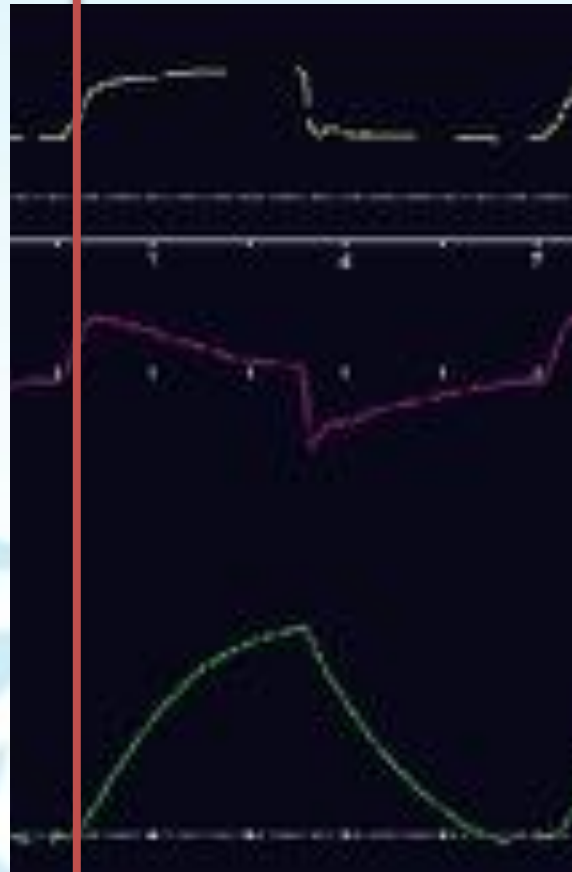


# I:E ratio (weerstand inspiratie)

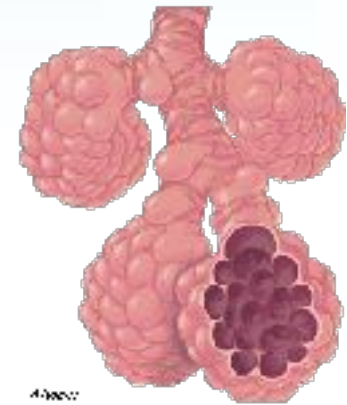
## Instellingen:

- P<sub>insp.</sub> 30cmH<sub>2</sub>O
- PEEP 10cmH<sub>2</sub>O

**30**cmH<sub>2</sub>O



**10**cmH<sub>2</sub>O

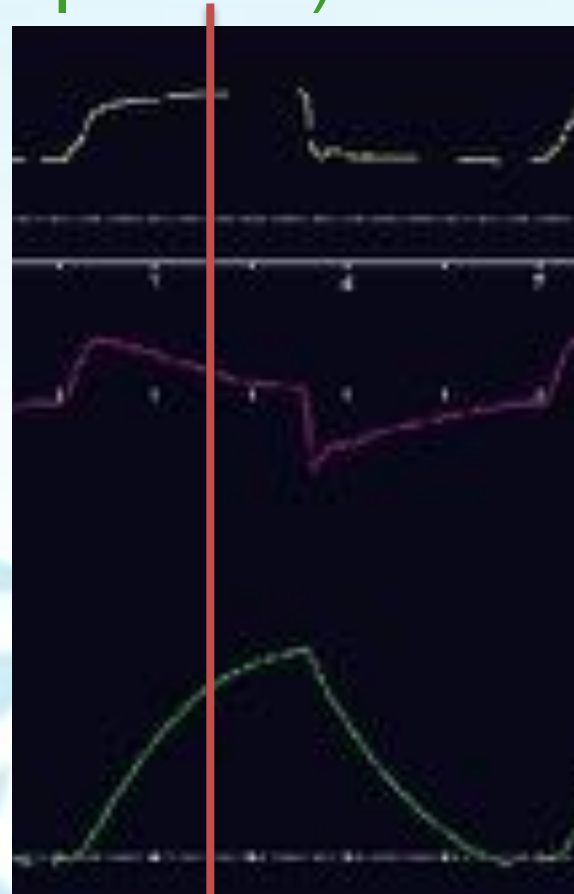


# I:E ratio (weerstand inspiratie)

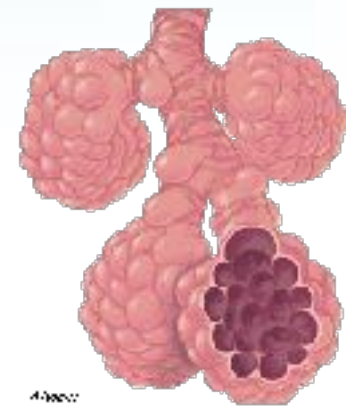
## Instellingen:

- P<sub>insp.</sub> 30cmH<sub>2</sub>O
- PEEP 10cmH<sub>2</sub>O

**30**cmH<sub>2</sub>O

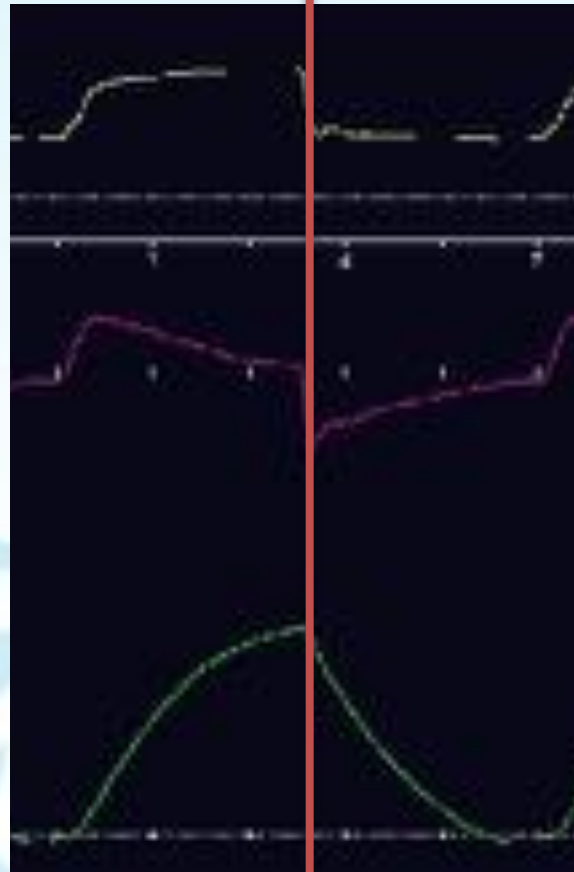


**20**cmH<sub>2</sub>O



# I:E ratio (weerstand inspiratie)

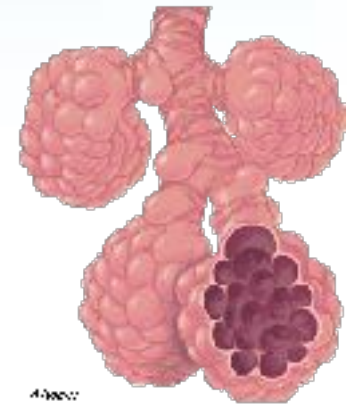
**30** cmH<sub>2</sub>O



## Instellingen:

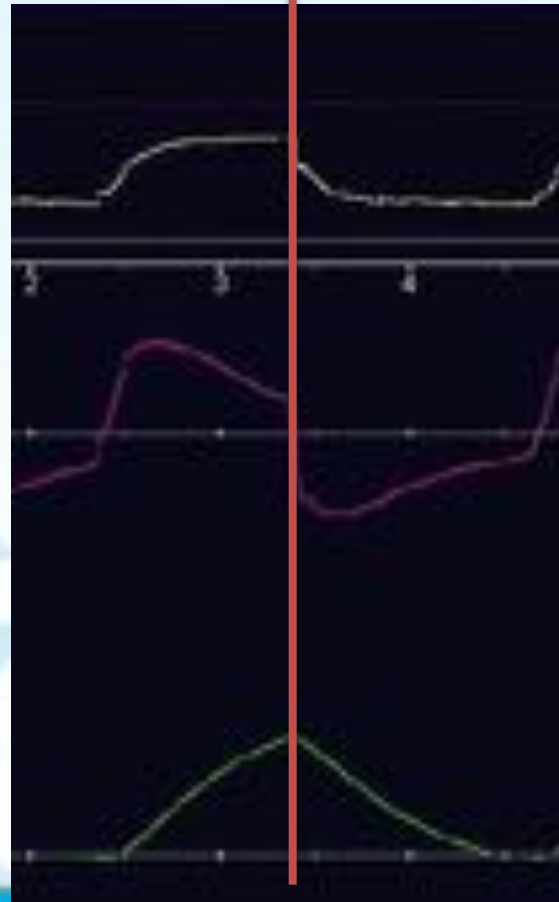
- P<sub>insp.</sub> 30cmH<sub>2</sub>O
- PEEP 10cmH<sub>2</sub>O

**30** cmH<sub>2</sub>O



# I:E ratio (weerstand inspiratie)

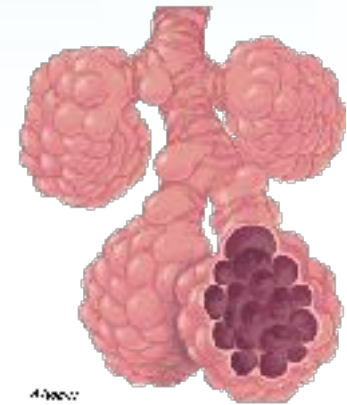
**30** cmH<sub>2</sub>O



## Instellingen:

- P<sub>insp.</sub> 30cmH<sub>2</sub>O
- PEEP 10cmH<sub>2</sub>O

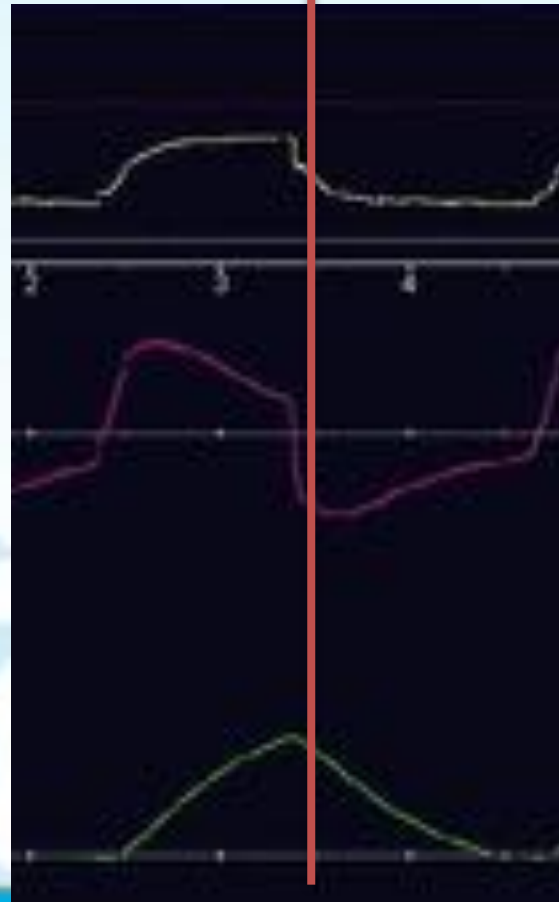
**≈28** cmH<sub>2</sub>O





# I:E ratio (weerstand expiratie)

$\approx 28$  cmH<sub>2</sub>O



## Instellingen:

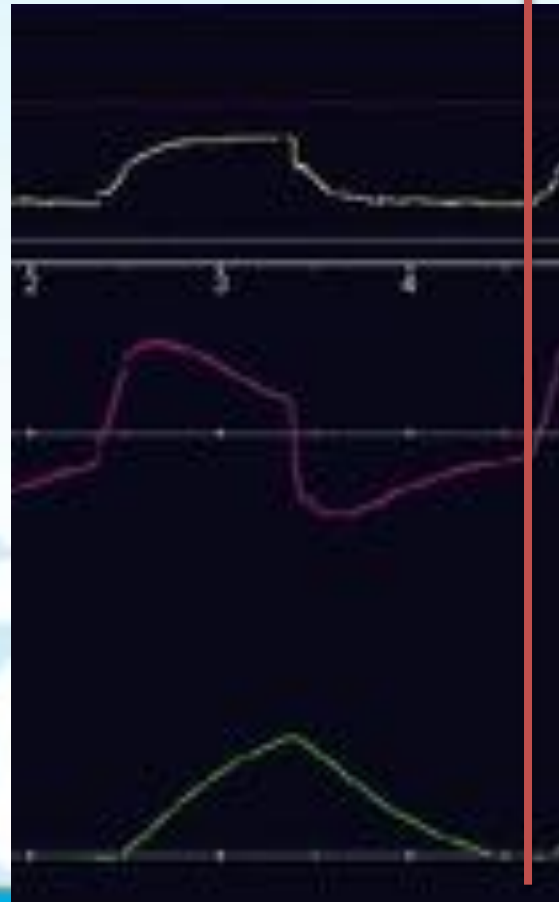
- P<sub>insp.</sub> 30cmH<sub>2</sub>O
- PEEP 10cmH<sub>2</sub>O

**10** cmH<sub>2</sub>O



# I:E ratio (weerstand expiratie)

≈ **12** cmH<sub>2</sub>O



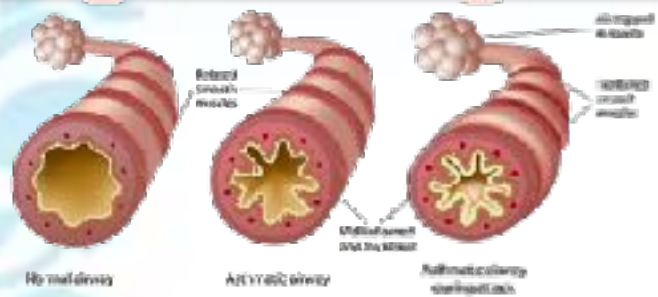
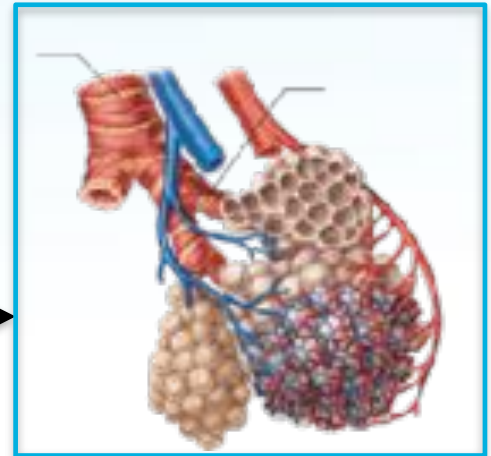
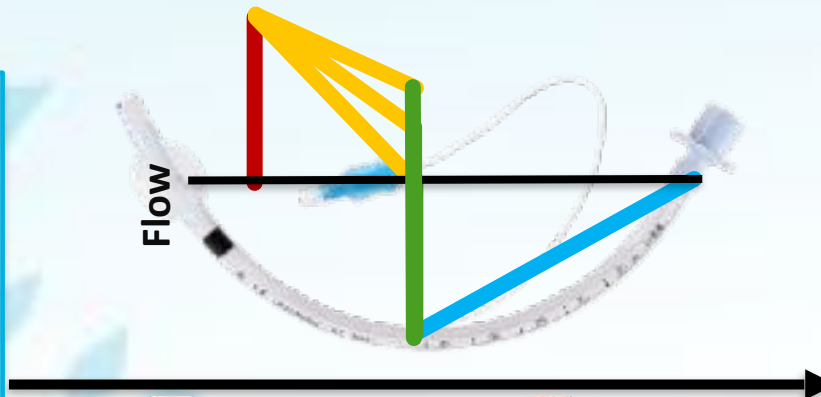
## Instellingen:

- P<sub>insp.</sub> 30cmH<sub>2</sub>O
- PEEP 10cmH<sub>2</sub>O

**10** cmH<sub>2</sub>O

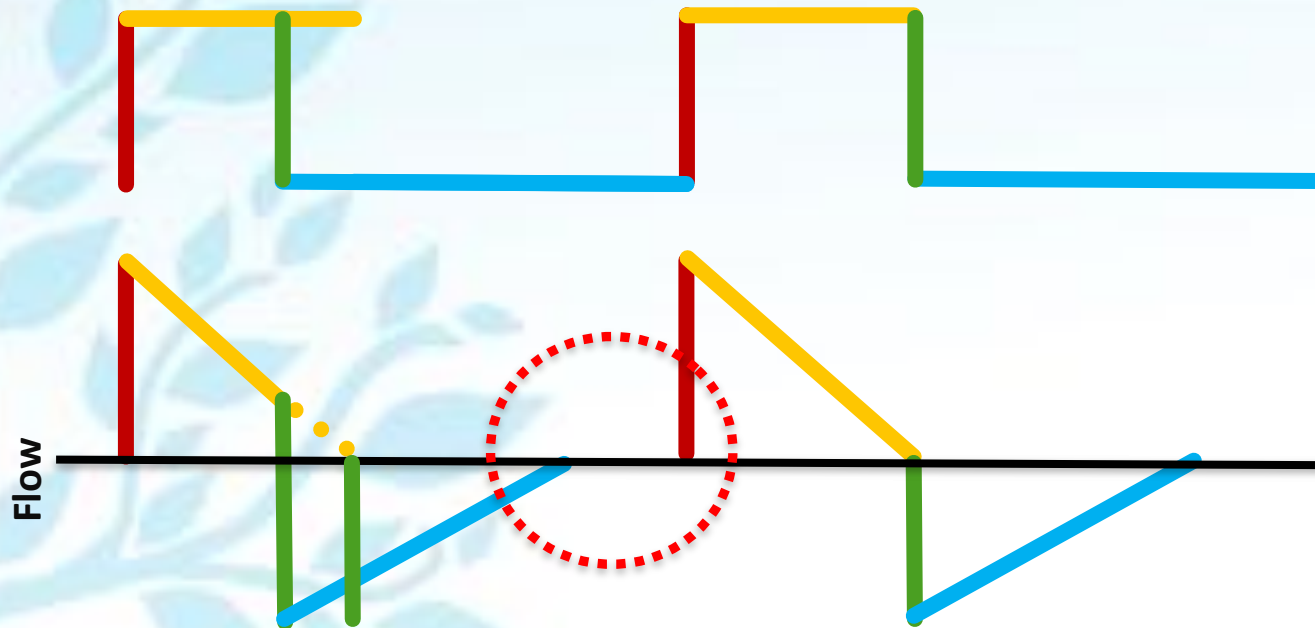


# I:E ratio (weerstand)





# I:E ratio (inspiratietijd)



# I:E ratio (expiratie tijd)



# Driving Pressure

THE NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

## Driving Pressure and Survival in the Acute Respiratory Distress Syndrome

Marcelo B.P. Amato, M.D., Maureen O. Meade, M.D., Arthur S. Slutsky, M.D., Laurent Brochard, M.D., Eduardo L.V. Costa, M.D., David A. Schoenfeld, Ph.D., Thomas E. Stewart, M.D., Matthias Briel, M.D., Daniel Talmor, M.D., M.P.H., Alain Mercat, M.D., Jean-Christophe M. Richard, M.D., Carlos R.R. Carvalho, M.D., and Roy G. Brower, M.D.

# Driving Pressure (formule)

- $C_{\text{resp}} = V_T / \Delta P$ 
  - $C_{\text{resp}}$  compliantie resp. systeem
  - $V_T$  teugvolume
  - $\Delta P$  drivingpressure

# Driving Pressure ( $\Delta P$ )

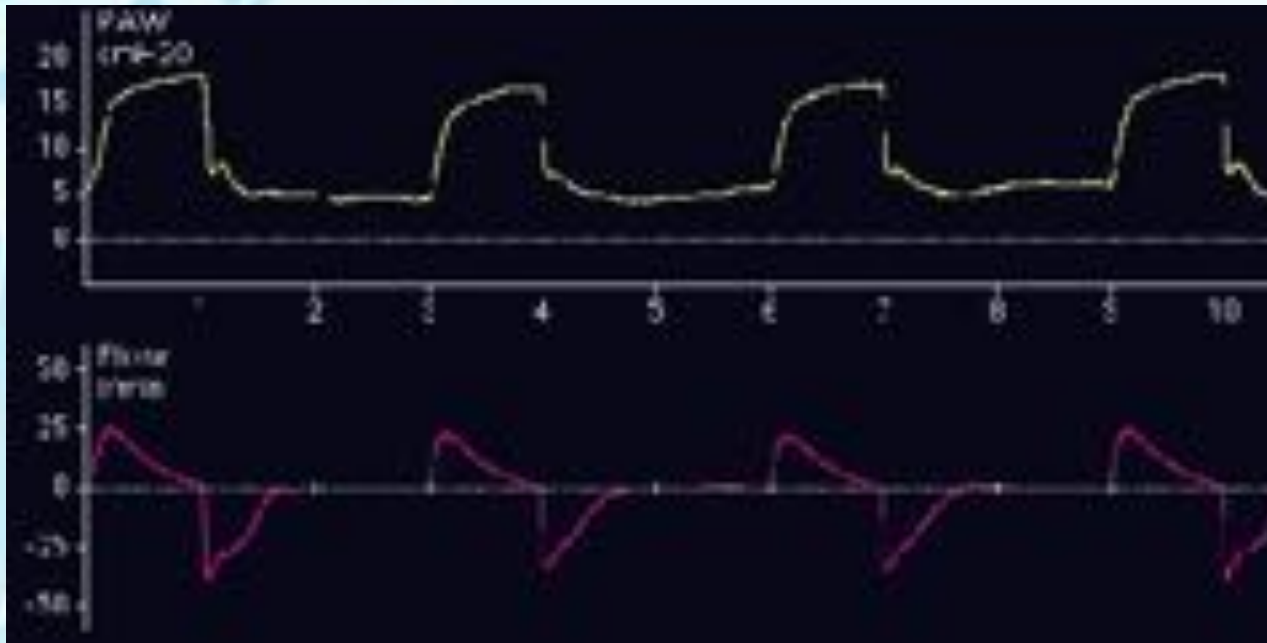
- $\Delta P$ 
  - Delta druk / driving pressure
  - Drukverschil in de long
  - $\Delta P = P_{\text{plat}} - \text{PEEP}_T$

# Driving Pressure (beïnvloeden)

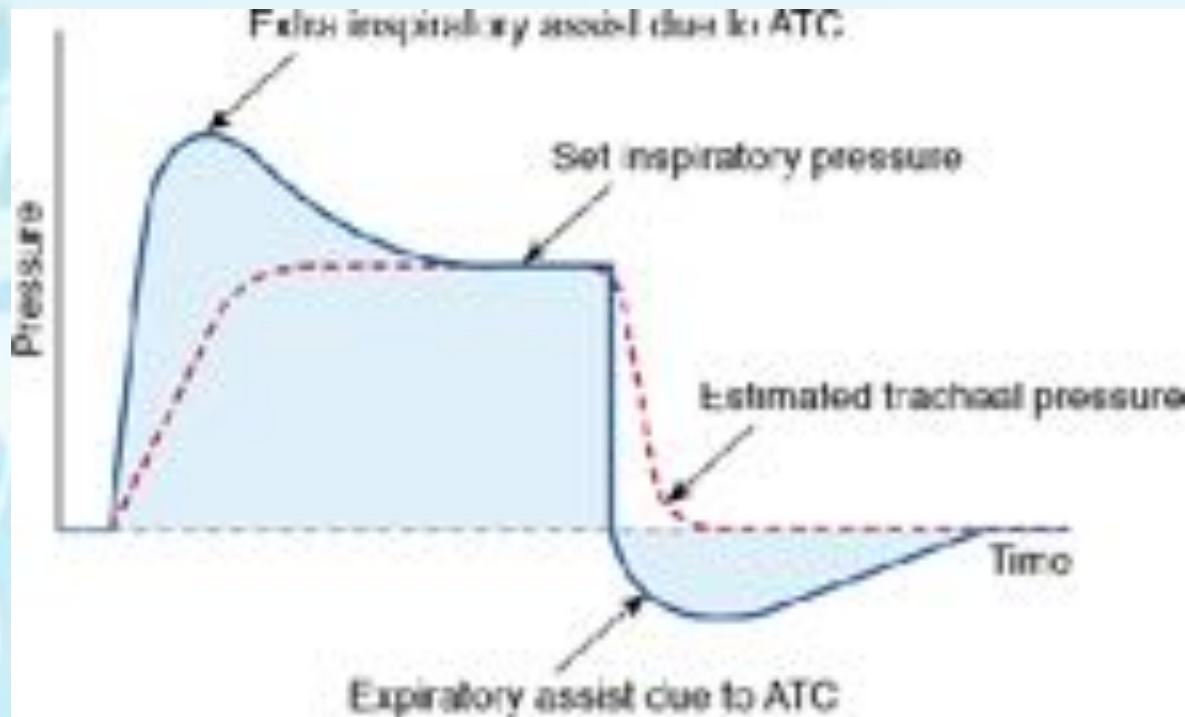
- Parameters:
    - Frequentie
    - I:E ratio
    - Inspiratie drukverschil / PC level
- Beïnvloed inspiratietijd

# Driving Pressure (beïnvloeden)

- Parameters:
  - Inspiratietijd



# Automatische tubecompensatie



Source: Textbook of Principles and Practice of Mechanical Ventilation, 2nd Edition, www.accessmedicine.com  
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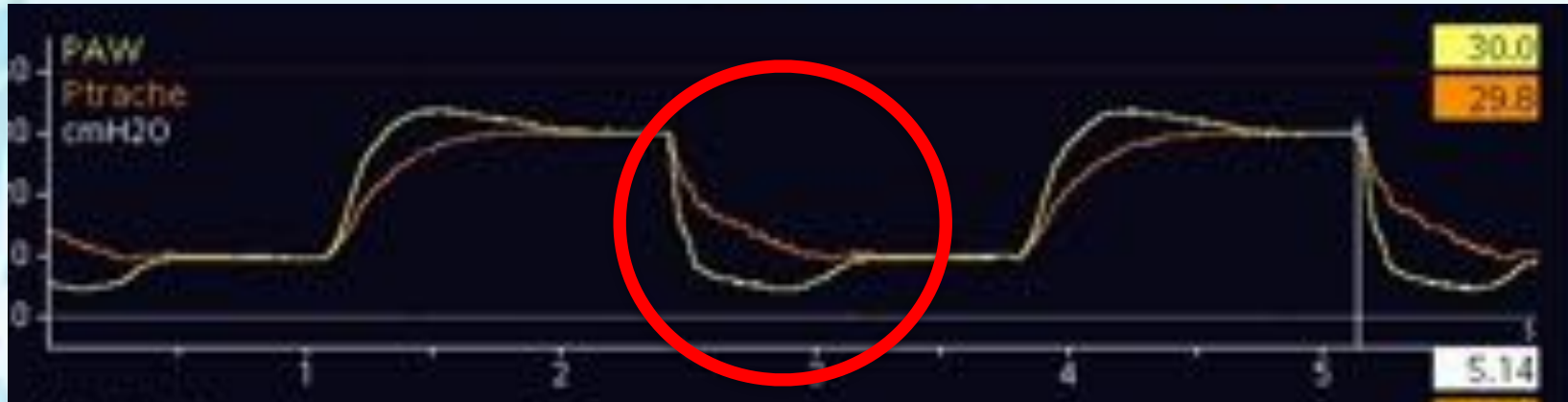
# Automatische tubecompensatie

- Berekend op basis van de flow en diameter tube
- Voordelen
  - Minder ademarbeid
  - PS kan afgebouwd worden tot nul
- Nadelen
  - Kan autoPEEP verlagen (COPD)
  - Onvolledige compensatie bij vermindering tubediameter door sputum of knikken

# Automatische tubecompensatie (inspiratie)



# Automatische tubecompensatie (expiratie)



# Automatische tubecompensatie (Pressure Control)

- Compensatie tubeweerstand
  - Verhoogd de flow inspiratoir en expiratoir
  - Eerder het volume bereikt in de long
  - Minder autoPEEP

# Take home message

I:E ook gebruiken voor de ventilatie

Peakdruk is geen plateaudruk

Driving pressure monitoren

Tube compensatie heeft voordelen bij support en control beademing

# Vragen



# Referenties

- Beademing een praktische handleiding op de IC, D. Gommers, J. van Rosmalen (2014)
- Mechanische beademing op de intensive care, H. ter Haar (2017)