


**ThinkAskLearn**  
Health Professional Education

## Modes of Ventilation

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### Massive Hat Tip

# EMCrit Blog

A Discussion of the Practice of ED Critical Care

You are here: [Home](#) > [archive podcasts](#) > EMCrit Lecture – Dominating the Vent: Part I

## EMCrit Lecture – Dominating the Vent: Part I



2

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### Only 2 strategies in ED for Adults

- Probably use the same strategies for kids
- Ventilation of the Injured Lung
  - Used this strategy for non injured lungs
- Ventilation of the Obstructive Lung
- Maybe one more - Adaptive Supportive Solution
  - ASV



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EVP for Ventilation


ARDSnet





LITFL 2024

NIH NHLBI ARDS Clinical Network  
Mechanical Ventilation Protocol Summary



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Vt

RR

FiO<sub>2</sub>

PEEP



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Vt

Low Tidal Volumes

- 6-8 ml kg (7ml/kg) rather than 10mls/kg
- Less damage
- No increase use of sedation or vasopressors
- Not higher PEEP or FiO<sub>2</sub>
- Less likely to develop ARDS from the start



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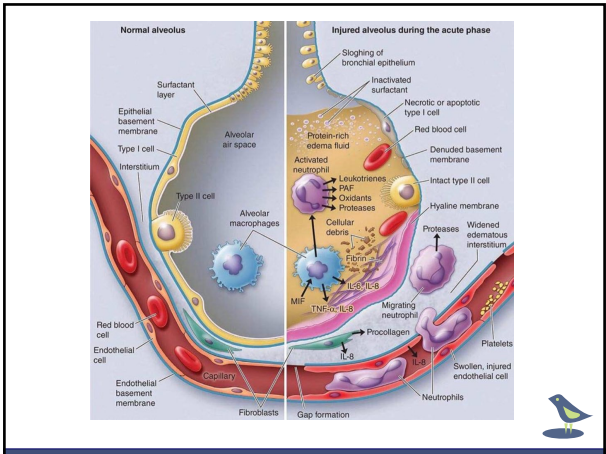
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### Low Volumes for All

Ventilation with lower tidal volumes as compared with conventional tidal volumes for patients without acute lung injury: a preventive randomized controlled trial

Rogier M Determann<sup>1,2</sup>, Annick Royakkers<sup>3,4</sup>, Esther K Wolthuis<sup>1,5</sup>, Alexander P Vlaar<sup>1</sup>, Goda Choi<sup>1,2</sup>, Frederique Paulus<sup>1</sup>, Jorrit-Jan Hofstra<sup>1,4</sup>, Mart J de Graaff<sup>1</sup>, Johanna C Korevaar<sup>6</sup> and Marcus J Schultz<sup>1,7</sup>

Determann *et al. Critical Care* 2010, **14**:R1  
<http://ccforum.com/content/14/1/R1>



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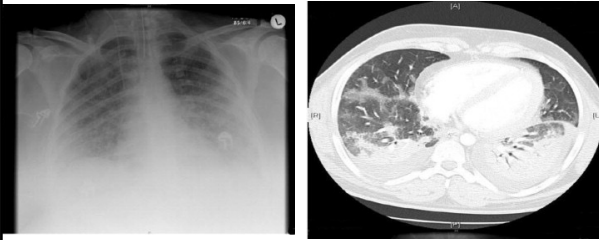
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### “Injured Lungs are Baby Lungs”



Smaller amount of lungs available for gaseous exchange



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Vt = Protection

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**RR**

Respiratory Rate

60ml/kg/min

Intubation

120ml/kg/min

Dead Space

70kg x 120ml = 8400ml/min

8400/500ml(7ml/kg) = 17 bpm

Adjust from Blood Gas



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RR = Ventilation

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FiO<sub>2</sub>


PEEP

FiO<sub>2</sub>/PEEP

- Start at 100%
- Wait 5 mins then ABG
- Drop to 40% - No titration
- Then use PEEP scale to titrate their Saturations

FiO <sub>2</sub>	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	10	12

FiO <sub>2</sub>	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	14	14	14	16	18	18-24



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Aim for 90-95%

FiO <sub>2</sub>	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.7
PEEP	5	5	8	8	10	10	10	12

FiO <sub>2</sub>	0.7	0.8	0.9	0.9	0.9	1.0
PEEP	14	14	14	16	18	18-24



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Myths of PEEP


- Causes Pneumothorax
- Raise ICP

Higher PEEP/lower FiO<sub>2</sub>

FiO <sub>2</sub>	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.5
PEEP	5	8	10	12	14	14	16	16

FiO <sub>2</sub>	0.5	0.5-0.8	0.8	0.9	1.0	1.0
PEEP	18	20	22	22	22	24

ARDS Net



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# PEEP/FiO<sub>2</sub> = Oxygenation

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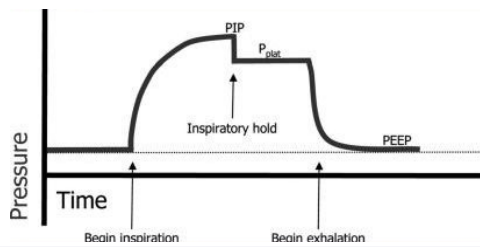
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## Ventilator Related Pneumothorax

- Plateau pressure – Alveoli are safe from barotrauma
- Peak pressure means nothing



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## Plateau Pressure

- Plateau pressure keep at 30cmH<sub>2</sub>O
- Find inspiratory hold button
- Measure every 20 mins or so
- Over 30cmH<sub>2</sub>O alveoli at risk
- At risk - Not protected



18

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**Vt = Protection**

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### Obstructive Strategy

- Asthma/COPD patients
- Goal:  
Give patient time to breathe out

Type II Respiratory Failure

Ventilator Failure

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Settings

- TV = 6-8ml/kg
- FiO<sub>2</sub> = .4 – 1.0 Keep Sats >90%
  - Not really a oxygenation problem
- PEEP = ZEEP- Zero PEEP
  - Maybe a little benefit 5cmH<sub>2</sub>O PEEP
- RR = Set Low 10bpm
  - RR is Protective



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RR = Protection

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IE Ratio

- Inspiration : Expiration Ratio
- Normal – ~1:2
- Getting air out is important
- Looking for 1:4 or 1:5



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# Permissive Hypercapnia

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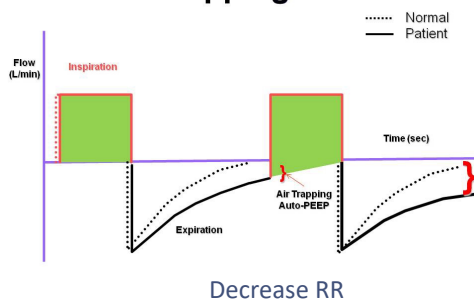
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## Air Trapping & AutoPEEP

### Air Trapping



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## Adaptive Supportive Ventilation

- Hamilton Product – Others on market
- Closed loop system
- Automated lung protective strategies
- Set Minute Ventilation only
- Machine adjust to patients needs
- Applied on breath by breath basis
- Changes rate and tidal volumes as per compliance



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Conclusion

- Know the 2 strategies well
- INJURED LUNG or about to be
- OBSTRUCTIVE LUNG



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The difficult to ventilate patient

- \* You are caring for a 26 year old asthmatic that had a respiratory arrest and was intubated on scene?
- \* Explain how this patient is likely to be ventilated?
- \* How does PEEP work in this situation?
- \* What can you do if they go into cardiac arrest?



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Difficult to Ventilate

- \* You are caring for a 26yo trauma patient who becomes extremely difficult to ventilate
- \* What is the likely cause?
- \* What are the clinical signs?
- \* What is your immediate intervention(s)?



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### Ahhh the head injury!!!

- \* You are caring for a 26 yo isolated head injury that is intubated and ventilated 12 x 500 5cm PEEP
- \* Suddenly the patient is biting on the tube and you notice the following parameters
- \* ETCO2 - 55, P 136 BP 86/42
- \* How do you treat this and why?



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### OH no – not again

- 65 Male with COVID
- Worsening SOB over 2/7
- Intubated in ED/Waiting for ICU - 8 hrs
- TV 500
- RR 14
- Sats 87%
- FiO<sub>2</sub> - .4
- PEEP 5 cmH<sub>2</sub>O
- P<sub>aw</sub> 22 cmH<sub>2</sub>O
- CO2 - 51
- PPlat 25
- What would you change?



Case courtesy of Mohammad Al-Tibi, Radiopaedia.org, rID: 7537

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