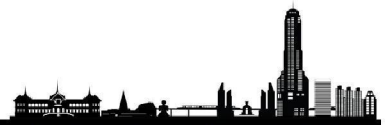
COVID–19 pandemic
Training Anesthesiology
Amsterdam University Medical Centers, location 'AMC'
March 16, 2020

Protective Ventilation for ARDS

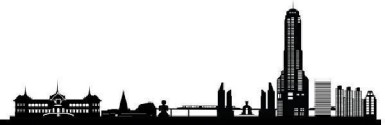
5 do's and 5 don'ts





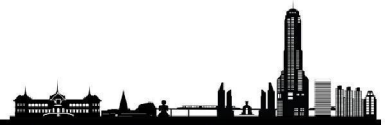
Do's

- low V_T
- PEEP as a rescue
- driving pressure/mechanical power
- prone positioning
- lung morphology



Don'ts

- targeting 'best oxygenation'
- preventive high PEEP
- targeting the lowest possible driving pressure
- paralysis for 48 hours
- 'other' or special modes than standardly used



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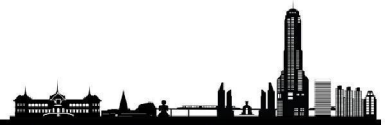
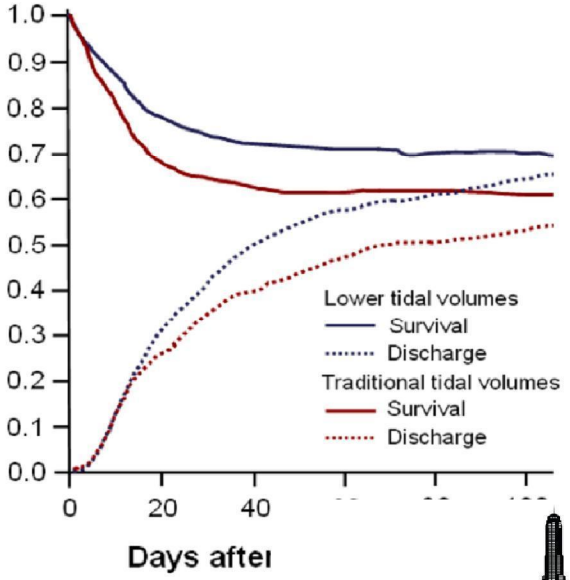


WITH ARDS

Ventilation with a low V_T Benefits Patients with ARDS (ARMA)

1

- RCT, USA
- 821 patients
- 6 (to 8) *vs* 12 ml/kg PBW
- **lower mortality, earlier liberation from ventilator**



ARDS Network investigators *New Eng J Med* 2000; **342**:1301

WITH ARDS

Ventilation with a low V_T Benefits Patients with ARDS (ARMA)

- titrate to PBW, function of height
- V_T < 350 ml (females) and 450 (males)
- high(er) respiratory rate
- *maybe* more sedation
- permissive hypercapnia, permissive hypoxemia

Schultz M. *Beademingsprotocol ICU*

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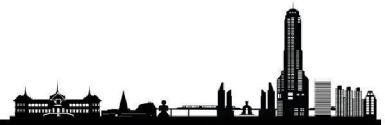
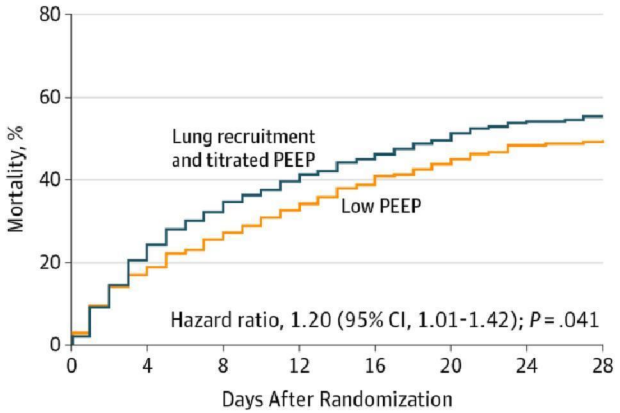


WITH ARDS

Ventilation with High PEEP + RM Harms ICU Patients with ARDS

2

- RCT, SA + EU Europe
- 1,010 patients
- LRM + PEEP *vs* standard PEEP
- **better oxygenation, but higher mortality – more barotrauma**



ART investigators *JAMA* 2017; **318**:1335

WITH ARDS

Ventilation with High PEEP + RM Harms ICU Patients with ARDS

- PEEP is used to rescue
- PEEP may recruit, but also overdistends
- RM is a dangerous intervention
- RM affect hemodynamics

Schultz M. *Beademingsprotocol ICU*

Do's

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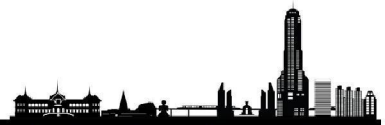
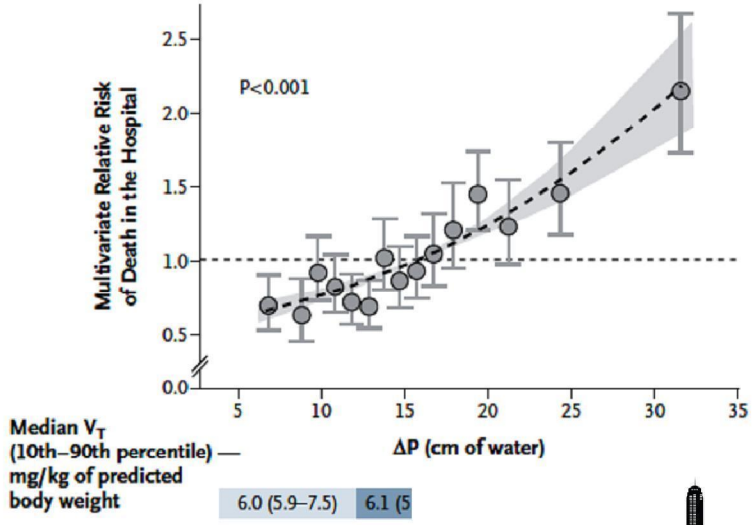


WITH ARDS

Driving Pressure is Associated with Outcome in Patients with ARDS

3

- IPD metaanalysis
- 3,562 ARDS patients
- 9 trials of diverse MV strategies
- **increased mortality with higher ΔP**



Amato M *N Engl J Med* 2015; **372**:747

WITH ARDS

Driving Pressure is Associated with Outcome in Patients with ARDS

- driving pressure = biomarker
- no RCTs
- caution! some studies that partially used this approach showed harm

Schultz M. *Beademingsprotocol ICU*

Do's

- low V_T
- PEEP as a rescue
- driving pressure/mechanical power
- prone positioning
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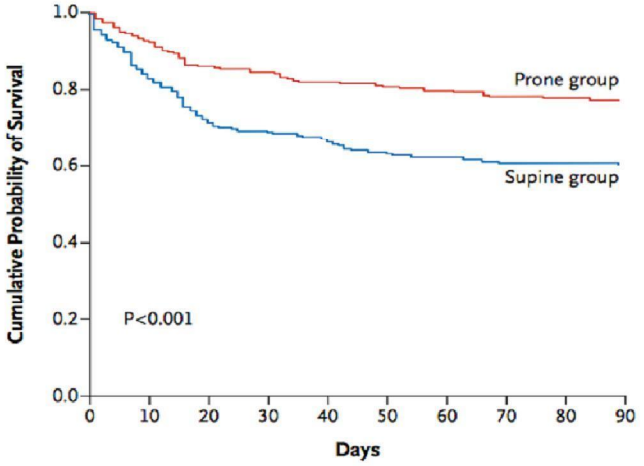
WITH ARDS

Prone Positioning Benefits Patients with Severe ARDS (PROSEVA)

4

- RCT, France
- 466 patients
- at least 16 hours prone
- **better outcomes, and better oxygenation**



PROSEVA investigators *N Engl J Med* 2013; **368**:2159

WITH ARDS

Prone Positioning Benefits Patients with Severe ARDS (PROSEVA)

- at least 16 hours, longer may be better
- safe in experienced hands
- no need for additional sedation (or sedation at all)
- forget the words ‘responder’ and ‘non–responder’

Schultz M. *Beademingsprotocol ICU*

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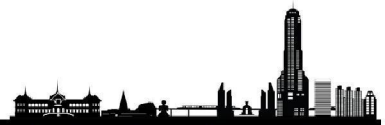
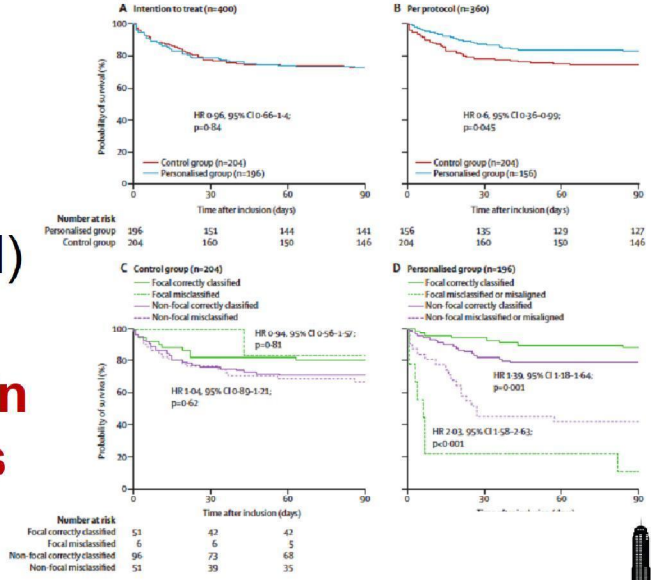


WITH ARDS

Morphology Approach – Focal *vs* Non–focal ARDS

5

- RCT; France
- 420 patients with ARDS
- low PEEP *vs* low PEEP (focal) or high PEEP (non–focal)
- **did not decrease mortality in ITT–, *but* did in PP–analysis**



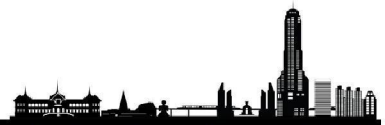
LIFE investigators *Lancet RM* 2019; **7**:870

WITH ARDS

Morphology Approach – Focal *vs* Non–focal ARDS

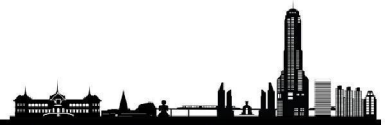
- if 'focal', i.e., not recruitable: low V_T, standard PEEP without RM, ASAP prone positioning
- if 'non–focal', i.e., recruitable: lower V_T, higher PEEP, prone positioning as a rescue

Schultz M. *Beademingsprotocol ICU*



Don'ts

- targeting 'best oxygenation'
- preventive high PEEP
- targeting at lowest possible driving pressure
- paralysis for 48 hours
- 'other' or special modes than standardly used



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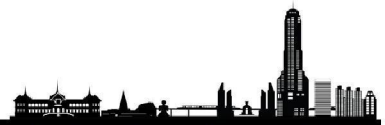

WITH ARDS

Targeting 'Best Oxygenation' (A.K.A. targeting 'physiology')

1

- PaO_2 > 8 kPa is enough, really!
- permissive hypercapnia
- if PaO_2 < 8 kPa, rescue … PEEP, maybe RM, prone positioning

Schultz M. *Beademingsprotocol ICU*



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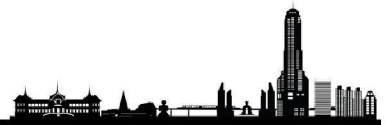


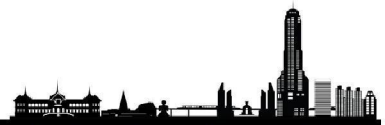
WITH ARDS

Preventive High PEEP

2

- is ‘old school’, forget the adage ‘open up the lungs and keep the lung open’

Schultz M. *Beademingsprotocol ICU*



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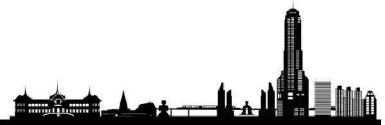


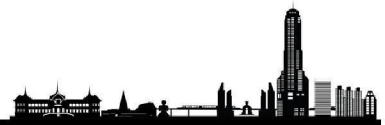
WITH ARDS

Preventive High PEEP

3

- driving pressure = biomarker
- accept high driving pressure in patients with non–recruitable lungs

Schultz M. *Beademingsprotocol ICU*



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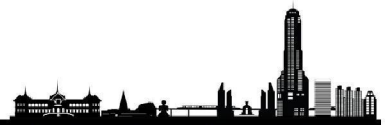
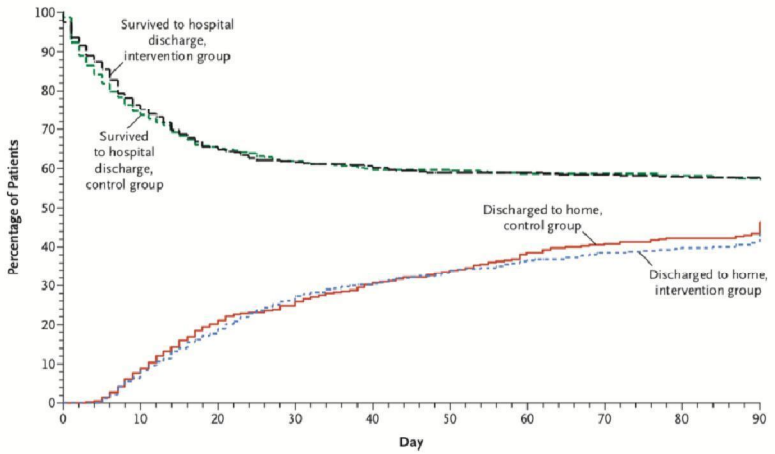


WITH ARDS

Early Neuromuscular Blockade in Moderate–to–severe ARDS

4

- RCT, USA
- 1,006 patients
- 48 h cisatracurium cont. vs usual care
- **no difference in mortality**



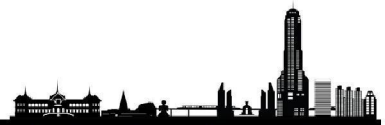
ROSE investigators *N Eng J Med 2019*

WITH ARDS

Early Neuromuscular Blockade in Moderate–to–severe ARDS

- rejects findings of earlier studies
- simply no added value
- (asynchronies can be solved in other ways)

Schultz M. *Beademingsprotocol ICU*



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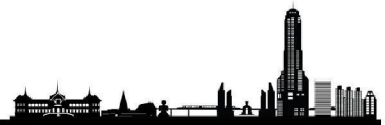

Conclusions

BENEFIT

- low V_T
- rescue PEEP
- low driving pressure
- prone positioning
- lung morphology

NO BENEFIT

- physiology targets
- preventive high PEEP
- lowest possible driving pressure
- paralysis
- 'special mod