ESICM LIVES 2018
31ST ANNUAL CONGRESS
PARIS 20-24 OCTOBER
PALAIS DES CONGRES

For physicians, nurses, and other allied healthcare professionals

Asynchronies using a simulator of artificial ventilation (SimVA) in virtual COPD patients, effects of reducing pressure support or increasing expiratory trigger.

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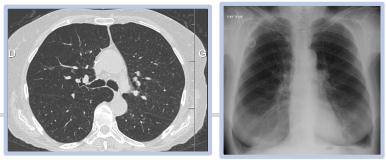
INTRODUCTION

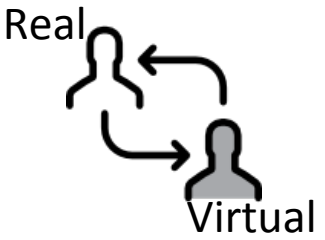


- Simulation in intensive care is an innovative method for teaching.
- Asynchronies in COPD may increase mortality of our patients (1).
- We create a simulator of artificial ventilation (SimVA)

- The goal of this study was to evaluate asynchrony index (AI) in virtual COPD patients according to pressure support (PS) level and Inspiratory time (Ti) and to compare the results to the clinical study of Thille et al (2).

1: Intensive Care Med. 2015;41:633-41.
2: Intensive Care Med. 2008;34:14773-1486.

Simulator of spontaneous breathing



Ventilator
x Assist modes

Control
of breathing

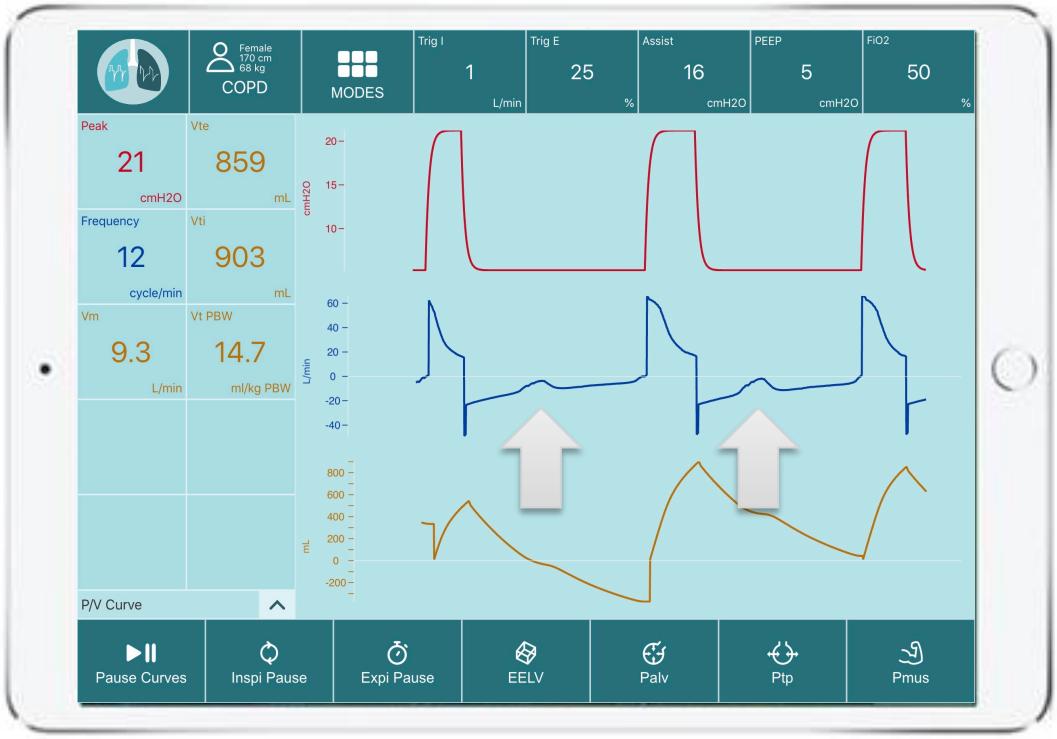
Pmus

Patient
X Pathologies &
Lung Morphologies

METHOD

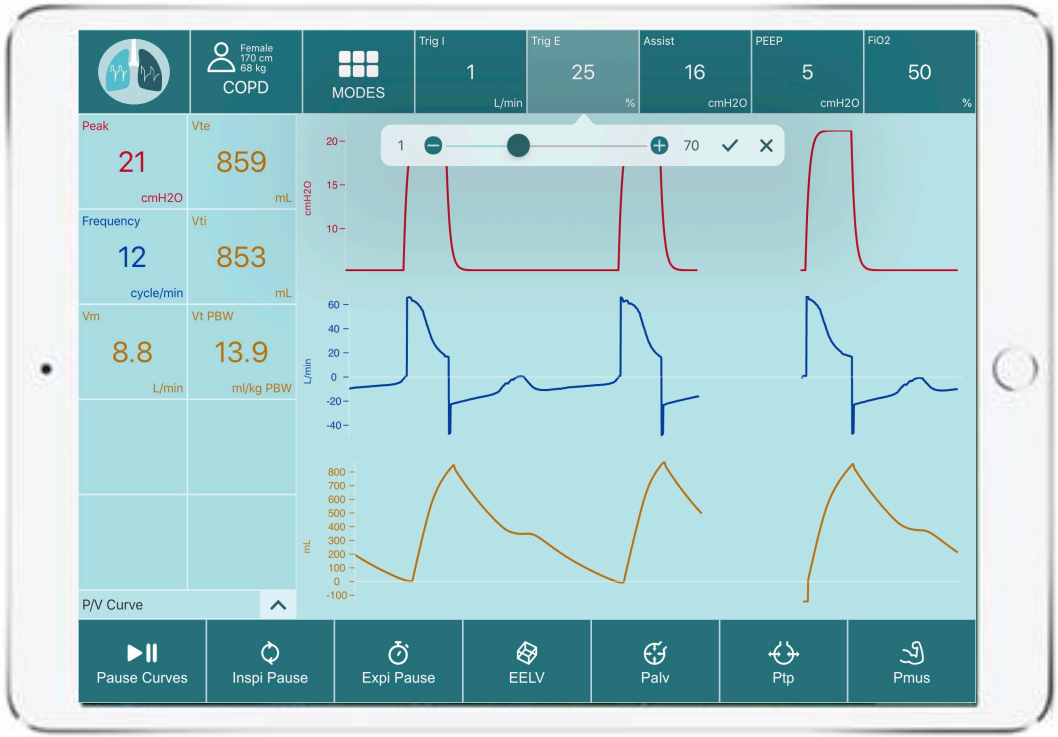
- Virtual COPD, defined by thoracic and pulmonar compliance, resistances, flow limitation, lung volumes, and inspiratory adaptive muscle pressure.
- Asynchrony Index was patient ineffective efforts (IE)/ (IE +Ventilator Respiratory Rate).
- Ventilatory protocols were Baseline-PS, Optimal-PS and Optimal-Ti (Optimal meant decreasing PS or Ti in order to reduce AI) as described by Thille et al (2).
- Each virtual case was titrated with each protocol. AI was recorded and compared to the results of Thille et al.

METHOD: Protocol expiratory trigger settings



Measure AI (%)

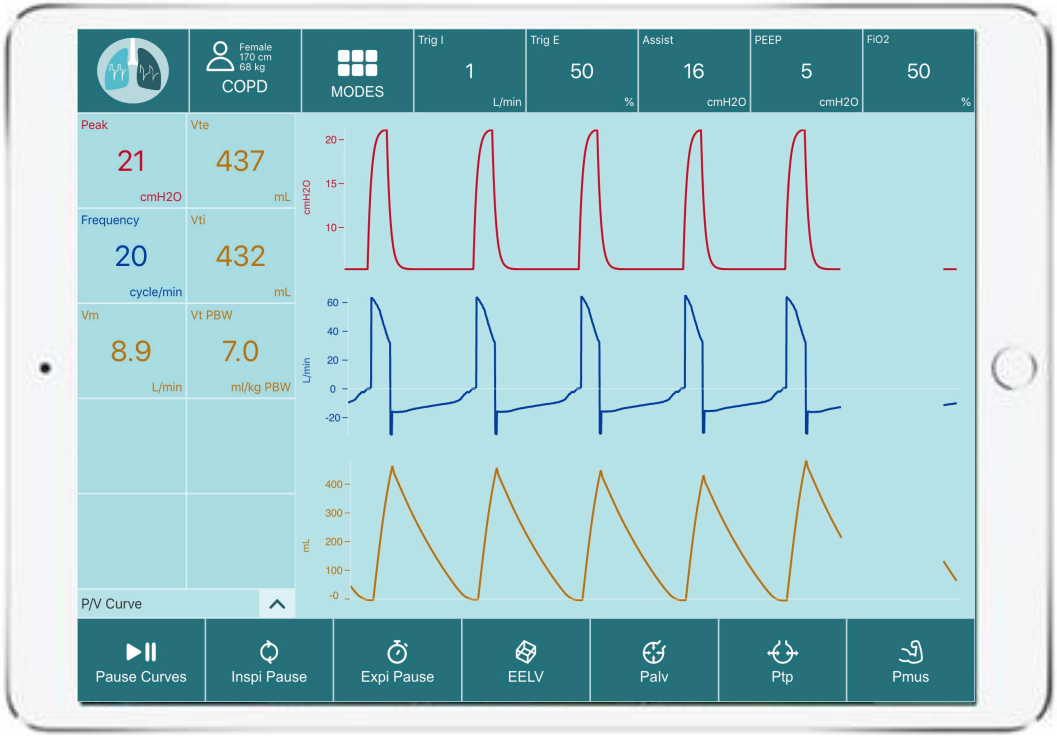
METHOD: Protocol expiratory trigger settings



Measure AI (%)

Change expiratory Cycling (%)

METHOD: Protocol expiratory trigger settings



Measure AI (%)

Change expiratory Cycling (%)

Measure AI (%)

RESULTS

Protocols	Baseline PS		Optimal PS		Optimal Ti	
Patients	**Real**	**Virtual**	**Real**	**Virtual**	**Real**	**Virtual**
V_T ml.kg^{-1} PBW	10,2 [7,2-11,5]	10,0[8,0-11,2]	5,9[4,9-6,7]	6,3[5,5-7,0]	7,0[5,9-7,9]	6,1[6,1-6,7]
PS cmH_20	20[19,5-20]	19,5[19,0-20,0]	13[12-14]	13,0[12,7-14,0]	20[19,5-20]	19[19-19,5]
PEEP cmH_20	5[5-5]	5[5-5]	5[5-5]	5[5-5]	5[5-5]	5[5-5]
RR ventilator breaths/min	16,1[12,4-17,2]	12,5[11,0-15]	22,4[22,0-31,3]	20,0[18,0-22,5]	22,6[20,1-30,1]	18,0[15,7-19,3]
RR patient breaths/min	26,6[23,1-31,9]	19,5[18,5-22,0]	29,4[24,6-34,5]	20,0[18,0-22,5]	28,3[23,3-34,3]	18[17,7-19,3]
Vm L/min	8,5[7,8-9,9]	10,5[8,1-14,0]	9,4[8,4-11,1]	9,3[8,4-10,7]	9,8[7,8-11,4]	9,7[8,7-10,2]
% Expiratory Trigger (%)	25[25-25]	25[25-25]	25[25-25]	25[25-25]		50[45-52]

- **The optimal protocols titrated PS or Ti in order to reduce AI, the software simulates the corresponding values of tidal volume and respiratory frequency and its effect on intrinsic PEEP and gas trapping. The difference in settings and respiratory mechanic between virtual cases and patients were not significant.**

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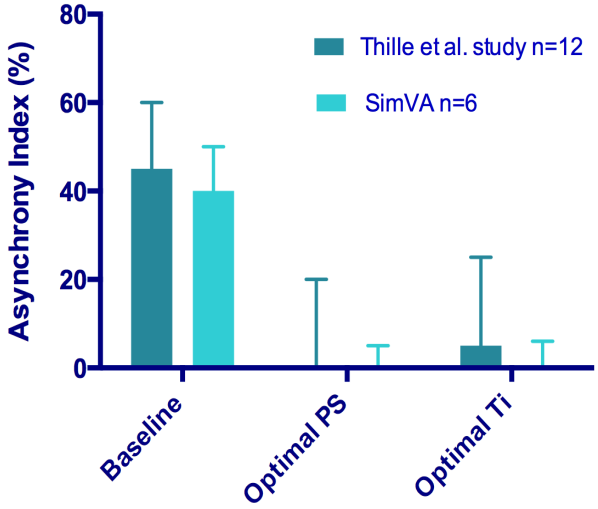

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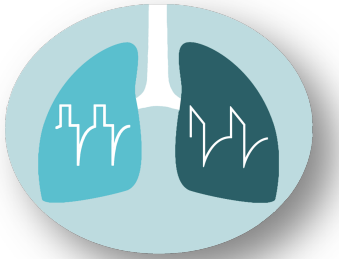
CONCLUSION

- AI with the virtual simulator was able to change according to PS or Ti settings within the same range as the clinical study from Thille et al.

- Simulation with the software SimVA is realistic and may help to teach interactively ventilatory settings and asynchronies in COPD patients under Pressure Support Ventilation anywhere online without any risk for the patient.



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