

# McArthur Medical Sales Inc.

# Frank Fiorenza RRT, BHSc, FCSRT

## Product Development and National Sales Manager, McArthur Medical

Board of Directors, Canadian Society of Respiratory Therapists

Respiratory Therapy Program Advisory Council, Algonquin College

## Inventor of The Flusso Devices

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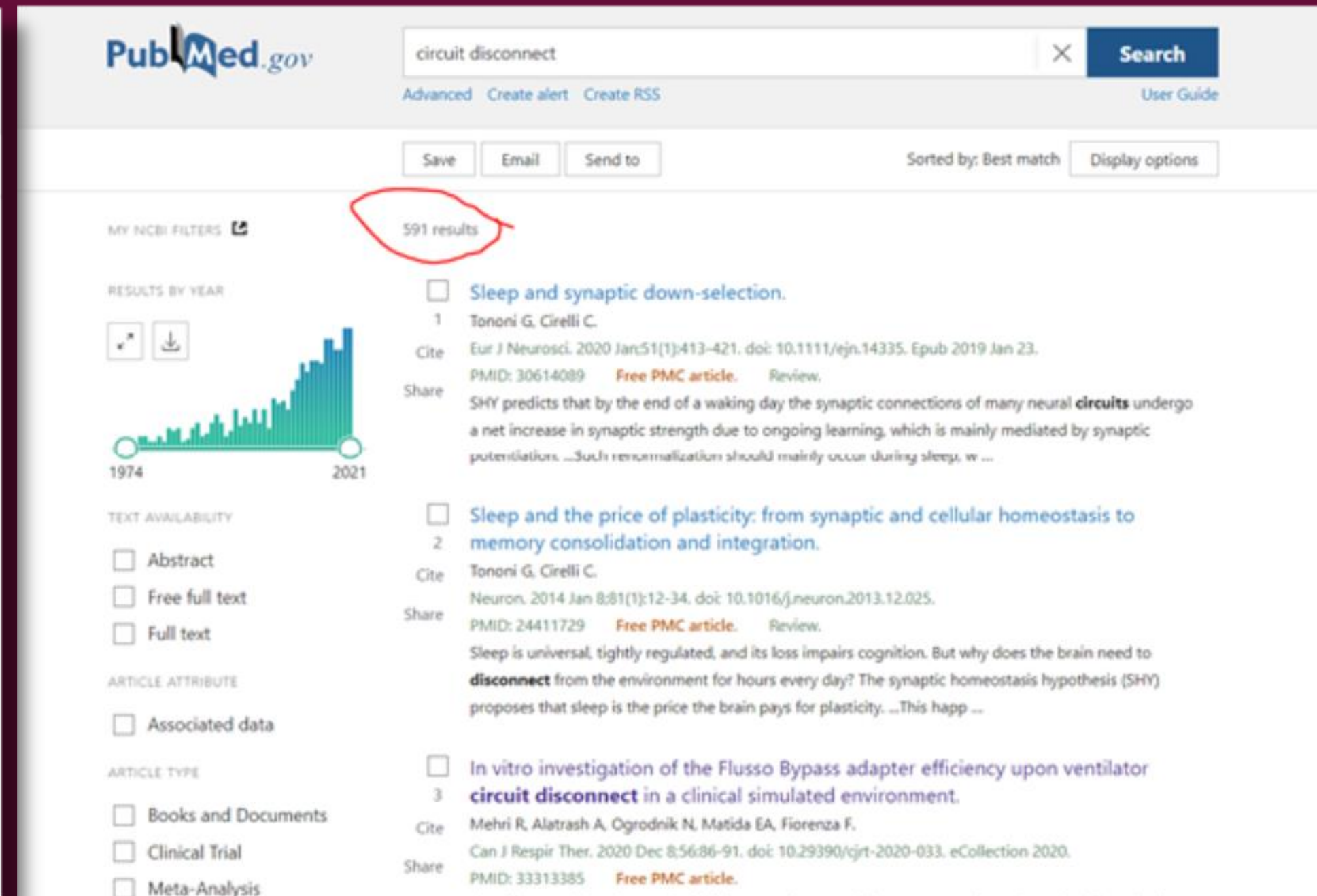
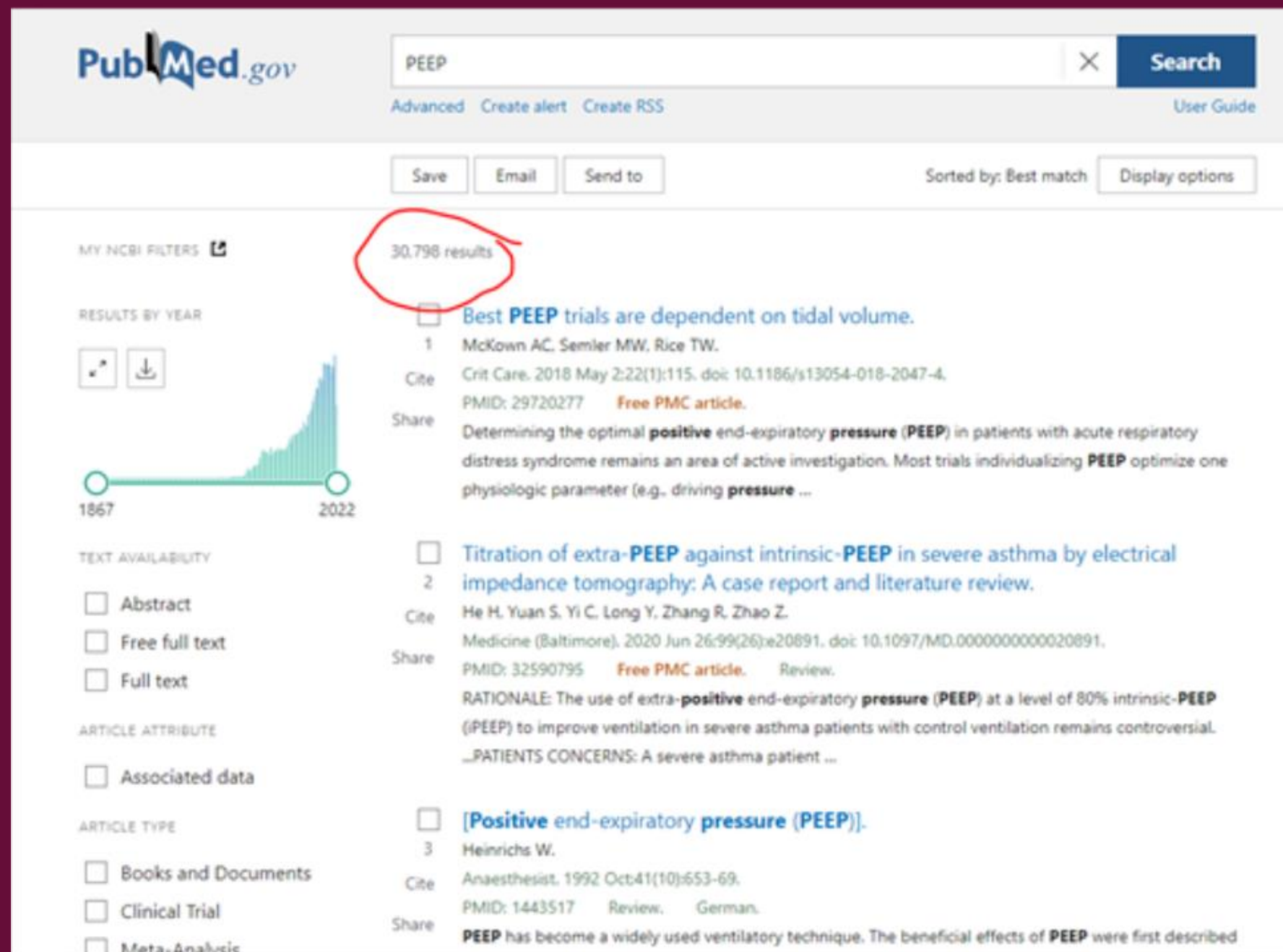


**McARTHUR**  
MEDICAL SALES INC.



# Focus on Optimizing PEEP not Keeping PEEP!

PEEP (30,798 articles) vs Circuit Disconnect (PEEP loss) (591 articles)



Setting PEEP appropriately is now recognized as an important aspect of a lung-protective ventilation strategy and not just a strategy to improve oxygenation.

# How often do you disconnect?

- Ventilator circuit change
- Add and remove Aerogen
- Patient transport
- Change ventilator flow sensor
- Replace in-line suction
- Add and remove nebulizer
- Addition of Anaconda
- Change expiratory filter on ventilator
- Change humidity systems
- Organize IV lines to other side of bed
- Add and remove MDI from circuit
- Add and remove Nitric Oxide from ventilator circuit
- Add and remove Flolan from circuit
- Bronchoscopy
- Lung recruitment maneuvers
- Add and replace HME
- Patient proning
- Manually bag-in inhaled medications





# Alveolar De-recruitment

Collapse and re-expansion occurs on every circuit disconnection

## Reduction of Ventilator Induced Lung Injury (VILI)

Repetitive alveolar over-distention of alveoli and collapse are the primary causes for alveolar injury during positive pressure

No PEEP



15 cmH2O PEEP

Disconnection

Reconnection

64 yo patient arrives to the ER with cardiac failure and fever and is intubated for respiratory failure. During the first 24 hours in hospital, they are disconnected from the ventilator for each of the following:

Transport to CT  
for CT Chest

4

MDI Adapter  
Placed In-Line

1

Transfer from ER  
to ICU

2

Nebulizer  
Placed  
In-Line

1

Transport to  
Cath Lab

4

Expiratory Filter  
Change Q4H  
(with heated wire circuit and  
tobramycin delivery)

4

Circuit Change from  
Dry Circuit to Heated  
Wire Circuit

2

Nitric Oxide  
Placed In-Line

2

20 Disconnections in a 24 Hour Period

# One Flusso can protect over 70 Healthcare workers.

- Respiratory Therapist
- Physicians
- Nurse (s)
- X-ray tech
- Physiotherapist
- Occupational Therapy
- Dietary Aid
- Porter
- Nursing Aid
- Cleaners
- Residents
- Medical Students
- Consulting Physicians
- Dietitian
- Dialysis technician
- Ultrasound
- Vascular Access Teams
- Biomedics
- Pharmacists
- Social Worker
- Pastoral Care

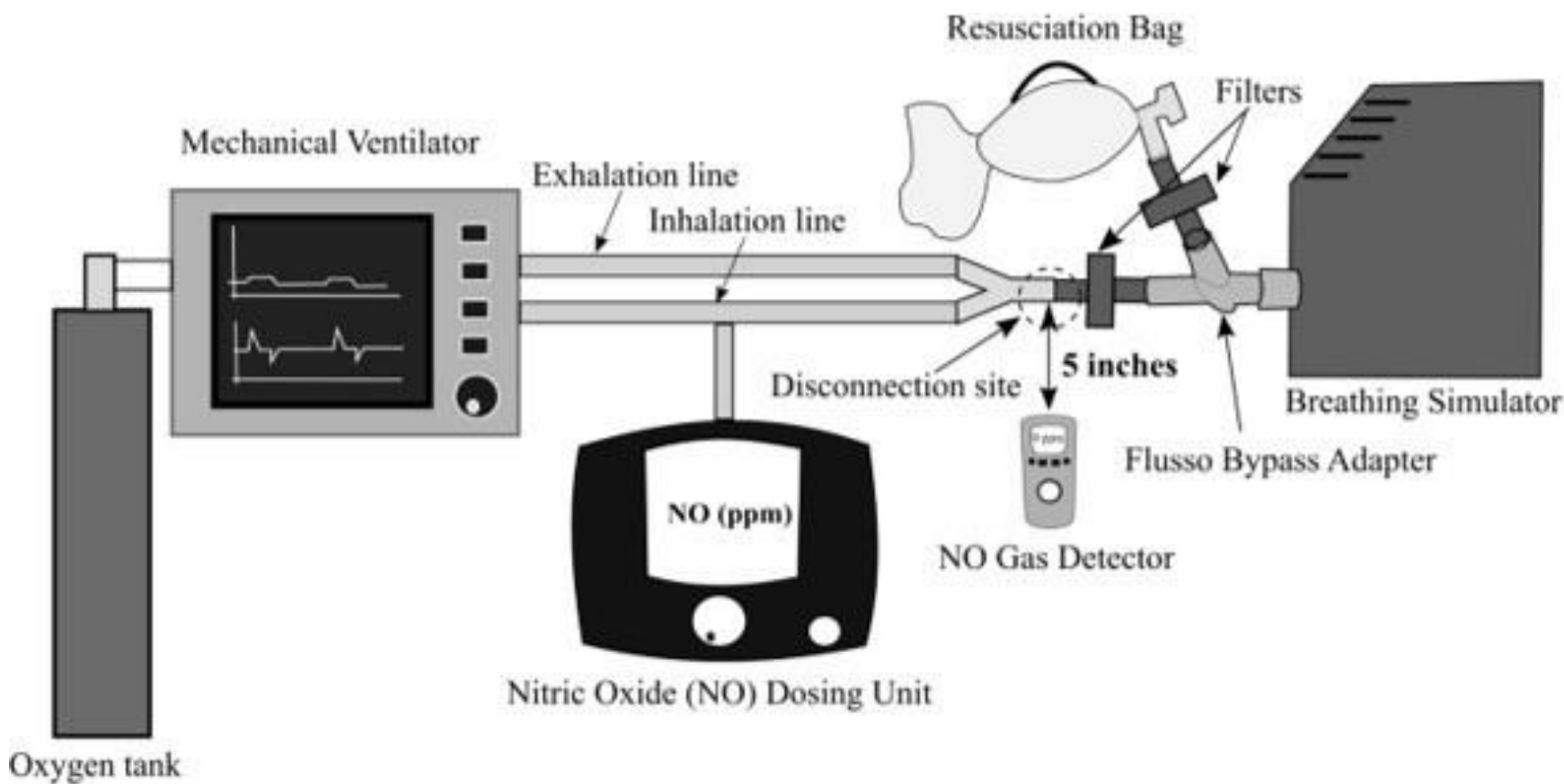
**An average of 10 Healthcare workers enter a patients room every day**

In Vitro Investigation on Staff Exposure upon Ventilator Disconnect in ICU Simulated Environment



Rym Mehri, PhD<sup>1\*</sup>, Abubakar Alatrash, PhD<sup>1</sup>, Nick Ogrodnik<sup>1</sup>, Edgar A. Matida, PhD<sup>1</sup>, and Frank Fiorenza, RRT, BHSc, FCSRT<sup>2</sup>

<sup>1</sup>Department of Mechanical & Aerospace Engineering, Carleton University, Ottawa, ON, Canada  
<sup>2</sup>Respiratory Therapy Department, University of Ottawa Heart Institute and Product Development, McArthur Medical Sales Inc., Ottawa, ON, Ca



	Volume Controlled		Pressure Controlled	
	Without Flusso Bypass Adapter		Without Flusso Bypass Adapter	
	Inhalation Average ± SD	Exhalation Average ± SD	Inhalation Average ± SD	Exhalation Average ± SD
Average NO detected (ppm)	10.2 ± 1.6	10.3 ± 1.8	11.5 ± 1.3	10.5 ± 0.8
Duration of NO detection (s)	37.2 ± 14.4	33.4 ± 18.8	79.2 ± 21.0	103.2 ± 11.0
Maximum NO detected (ppm)	16.8 ± 1.5	17.4 ± 3.0	18.2 ± 0.7	18.4 ± 1.2
	With Flusso Bypass Adapter		With Flusso Bypass Adapter	
	Inhalation Average ± SD	Exhalation Average ± SD	Inhalation Average ± SD	Exhalation Average ± SD
Average NO detected (ppm)	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Duration of NO detection (s)	0 ± 0	0 ± 0	0 ± 0	0 ± 0
Maximum NO detected (ppm)	0 ± 0	0 ± 0	0 ± 0	0 ± 0

Conclusion

With this work, an in vitro qualitative study was performed demonstrating the performance of the Flusso Bypass adapter in an environment mimicking clinical settings where a patient, under mechanical ventilation, is briefly disconnected and reattached to a portable mechanical ventilator to be transported. It was found that following the current standard procedures for patient transportation, with a three second disconnect, a leakage of 25% to 46% of particles emanating, such as bacteria, or delivered, such as pharmaceutical aerosols, to the patient were dispersed in the room within a 5 inch radius to which the clinical staff will be exposed. It was shown that this leakage was avoided when using the Flusso Bypass adapter.

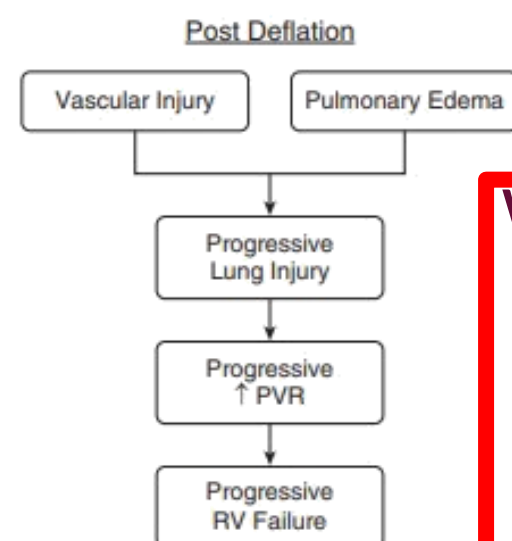
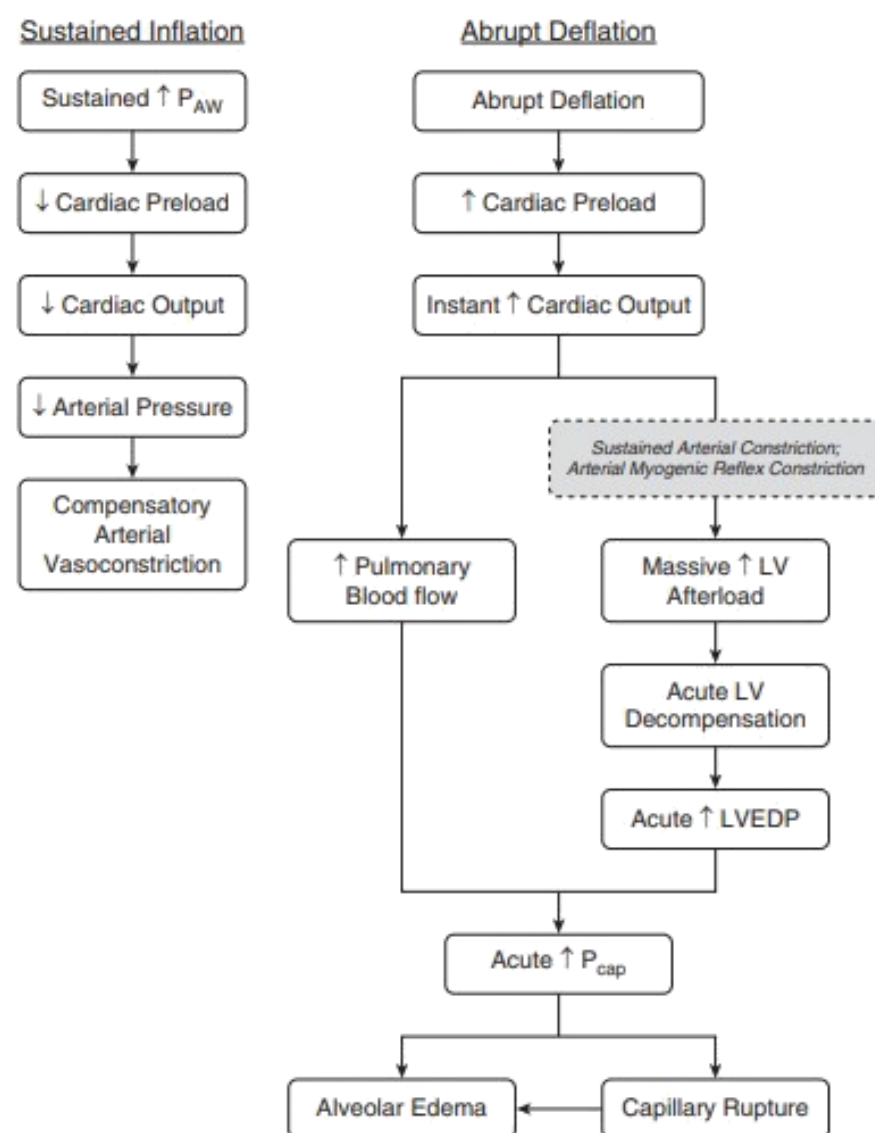




# Abrupt Deflation After Sustained Inflation Causes Lung Injury

Bhushan H. Katira<sup>1,2,3,4,5</sup>, Doreen Engelberts<sup>1</sup>, Gail Otulakowski<sup>1</sup>, Regan E. Giesinger<sup>1</sup>, Takeshi Yoshida<sup>1,2,3,4,5</sup>, Martin Post<sup>1</sup>, Wolfgang M. Kuebler<sup>6,7,8,9</sup>, Kim A. Connelly<sup>1</sup>, and Brian P. Kavanagh<sup>1,2,3,4</sup>

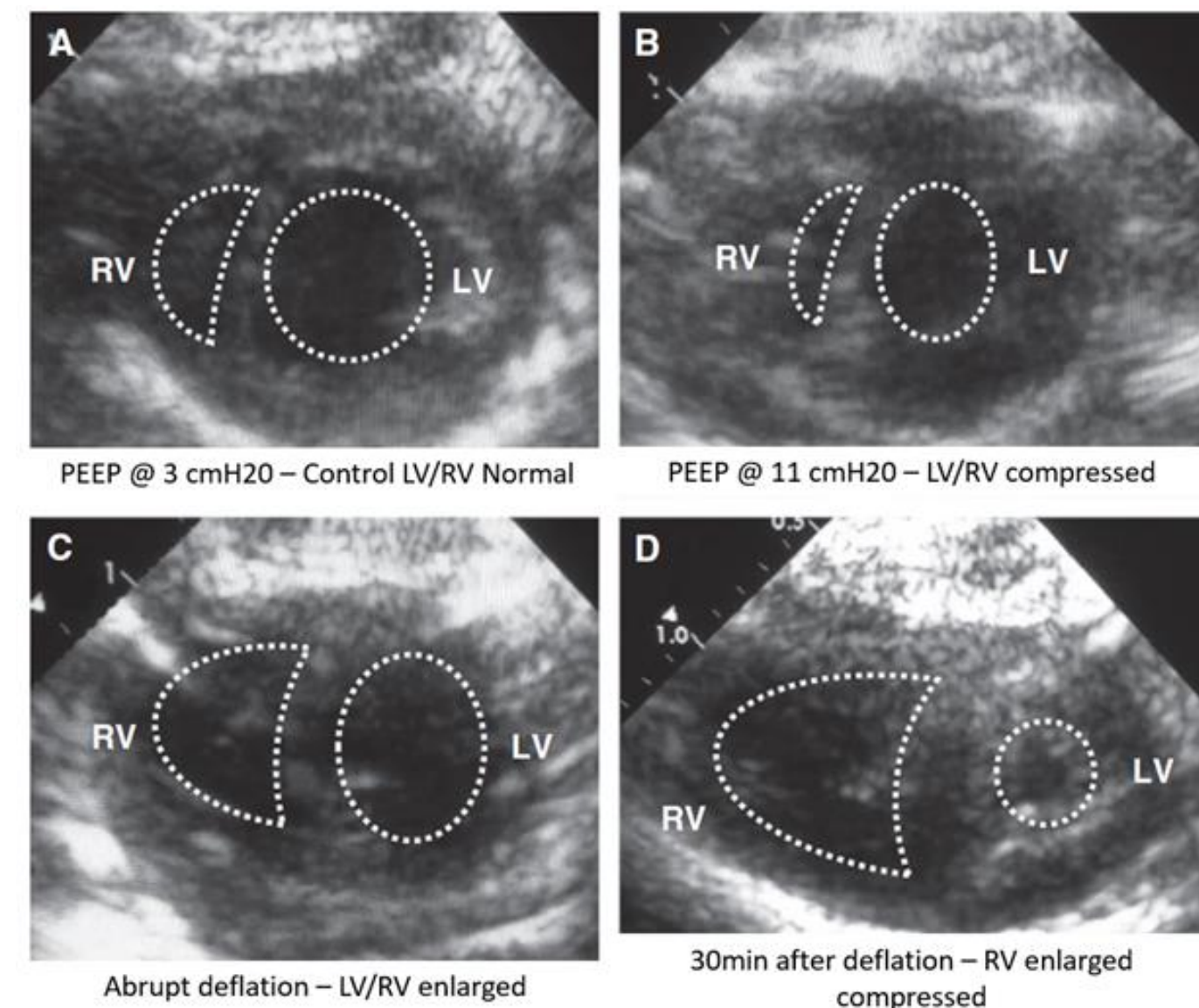
<sup>1</sup>Translational Medicine, The Research Institute, Department of Critical Care Medicine, Department of Anesthesiology, and Division of Neonatology, Department of Pediatrics, Hospital for Sick Children, University of Toronto, Toronto, Canada; <sup>2</sup>Interdepartmental Division of Critical Care Medicine, Department of Surgery, and Department of Physiology, University of Toronto, Toronto, Canada; <sup>3</sup>Keenan Research Centre for Biomedical Sciences, St. Michael's Hospital, Toronto, Canada; and <sup>4</sup>Institute of Physiology, Charité – Universitätsmedizin, Berlin, Germany



## What This Study Adds to the Field:

Abrupt deflation after sustained inflation can injure previously healthy lungs. The mechanism seems to be a surge of systemic cardiac output against vasoconstricted arteries, which causes acute left ventricular decompensation, pulmonary edema, and lung injury. If confirmed in patients with acute respiratory distress syndrome, this could have important implications

**Conclusions:** Abrupt deflation after sustained inflation can cause acute lung injury. It seems to be mediated by acute left ventricular decompensation (caused by increased left ventricular preload and afterload) that elevates pulmonary microvascular pressure; this directly injures the endothelium and causes edema, which is potentiated by the surge in pulmonary perfusion.





# Our Solution:

420-1978 Flusso By Pass Adapter



FLUSSO™  
BY PASS ADAPTER

420-1979 Flusso TFI



FLUSSO™  
TFI



There are no longer 'easy to ventilate' patients.

[www.keepthepeep.com](http://www.keepthepeep.com)

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