Asynchronie patient-ventilateur : impact sur le sevrage de la ventilation mécanique

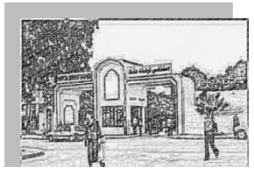
Mohamed Boussarsar, MD, Professor
Medical Intensive Care. Sousse

hamadi.boussarsar@gmail.com
Congrès ATR 28-30 Novembre 2024

Conflict of Interest

Head
Medical Intensive Care Unit

Farhat Hached Hospital
Medical Committee President
Quality Steering Committee President



Research Laboratory N° LR12SP09. Heart Failure
PLOSOne Academic Editor

Ethics and Research Committee
IORG 007439 President

ERC IORG 007439

AI Applied to Healthcare Postgraduate Certificate
NIV Master Co-Founder and Coordinator
ICCPC Conference Founder and President

IAAS
NIV AC
ICCPC

Medical Artificial Intelligence Association
Co-founder Member and President

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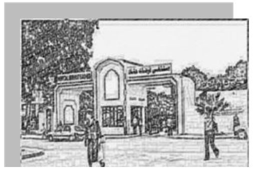

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ICCPC

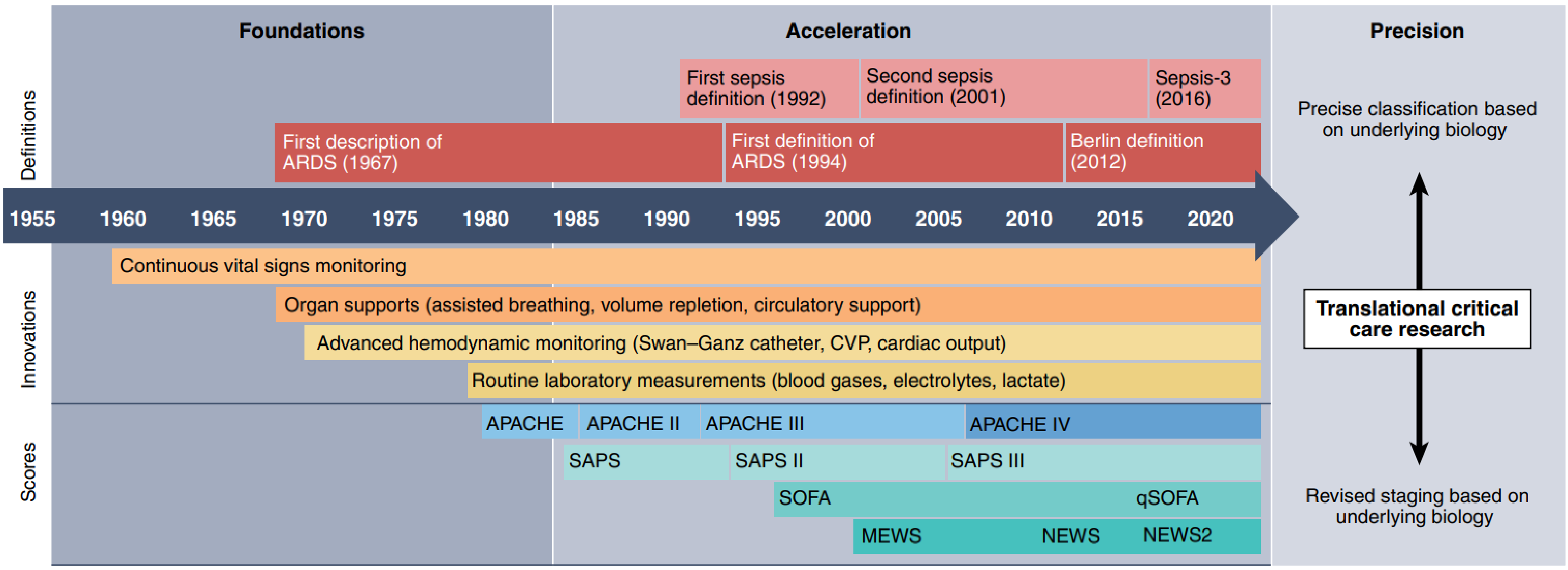
Medical Artificial Intelligence Association
Co-founder Member and President

Precision medicine

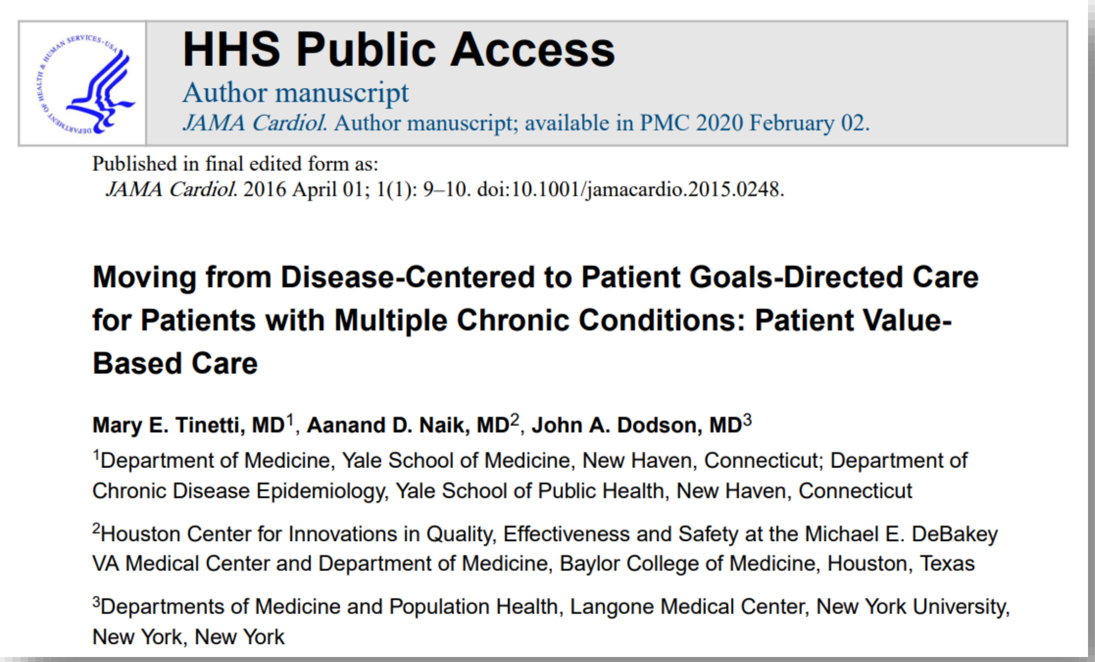
nature medicine
PERSPECTIVE
https://doi.org/10.1038/s41591-022-01843-x
Check for updates

Redefining critical illness

PERSPECTIVE
NATURE MEDICINE



Disease vs Patient-centered Care



HHS Public Access

Author manuscript

JAMA Cardiol. Author manuscript; available in PMC 2020 February 02.

Published in final edited form as:
JAMA Cardiol. 2016 April 01; 1(1): 9–10. doi:10.1001/jamacardio.2015.0248.

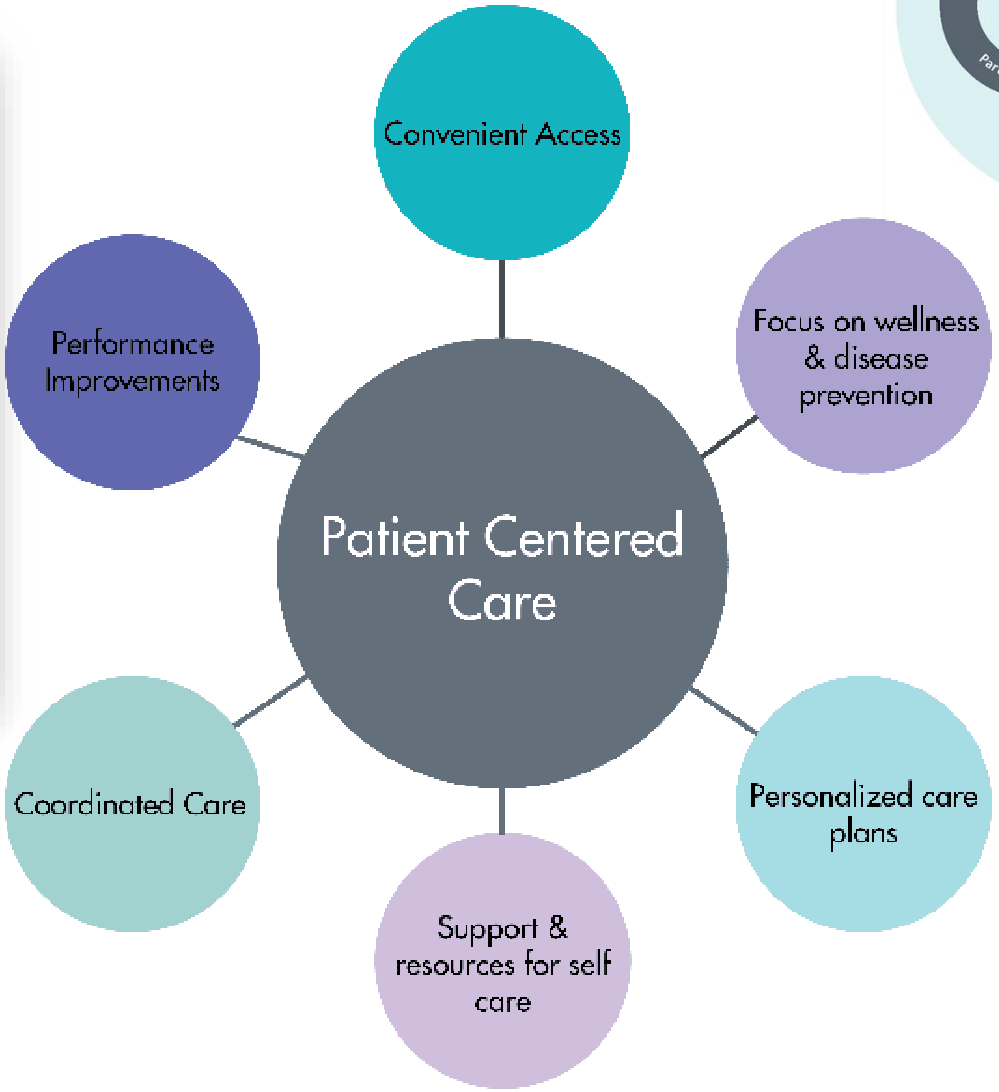
Moving from Disease-Centered to Patient Goals-Directed Care for Patients with Multiple Chronic Conditions: Patient Value-Based Care

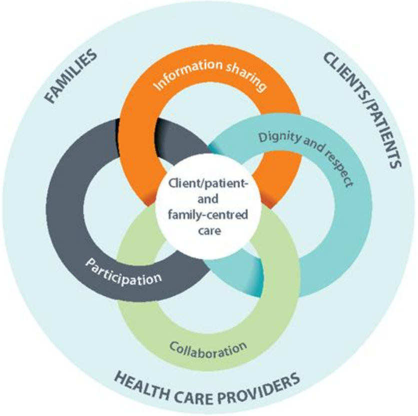
Mary E. Tinetti, MD[1], **Aanand D. Naik, MD**[2], **John A. Dodson, MD**[3]

[1]Department of Medicine, Yale School of Medicine, New Haven, Connecticut; Department of Chronic Disease Epidemiology, Yale School of Public Health, New Haven, Connecticut

[2]Houston Center for Innovations in Quality, Effectiveness and Safety at the Michael E. DeBakey VA Medical Center and Department of Medicine, Baylor College of Medicine, Houston, Texas

[3]Departments of Medicine and Population Health, Langone Medical Center, New York University, New York, New York





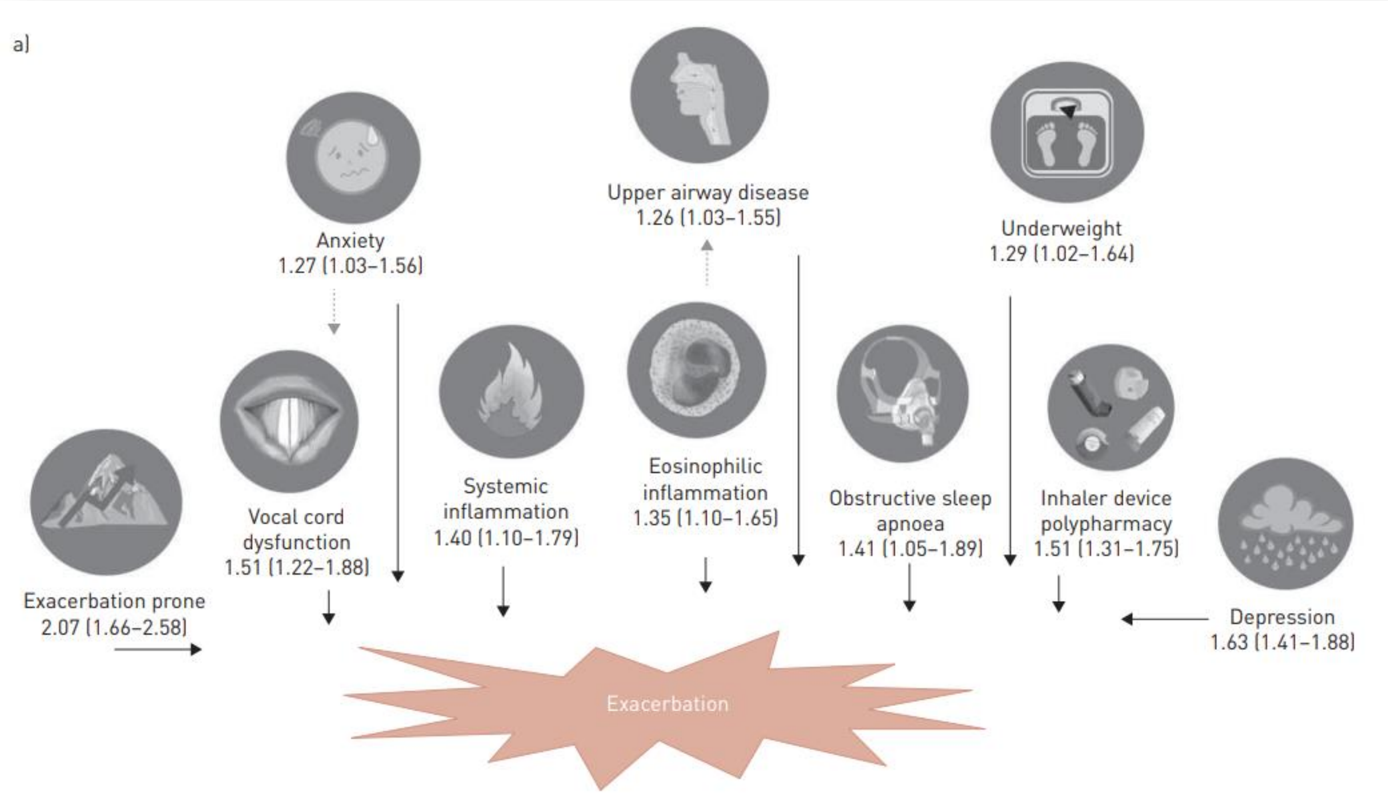
Search for treatable traits

REVIEW
TREATABLE TRAITS IN CHRONIC AIRWAY DISEASES

CrossMark

Treatable traits: a new paradigm for 21st century management of chronic airway diseases: Treatable Traits Down Under International Workshop report

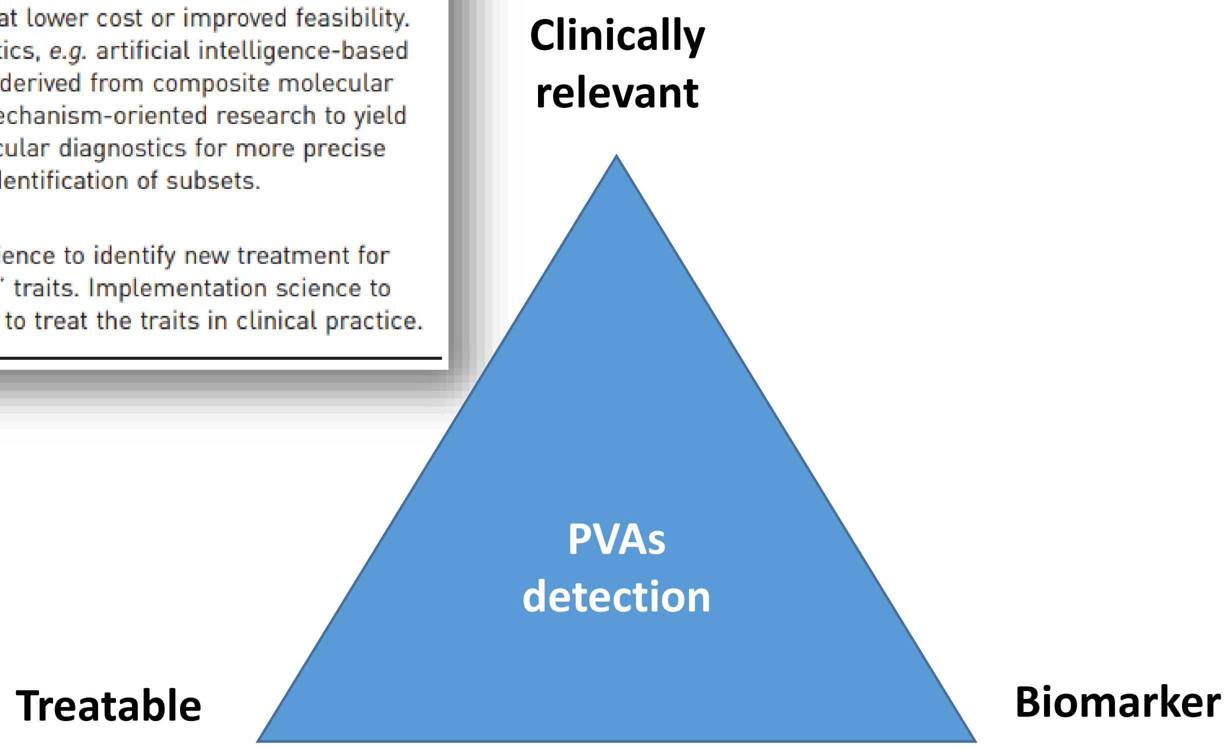
Vanessa M. McDonald[1,2], James Fingleton[3,4], Alvar Agusti[5], Sarah A. Hiles[1], Vanessa L. Clark[1], Anne E. Holland[6], Guy B. Marks[7,8], Philip P. Bardin[9], Richard Beasley[3,4], Ian D. Pavord[10], Peter A.B. Wark[1,2] and Peter G. Gibson[1,2] on behalf of the participants of the Treatable Traits Down Under International Workshop



Search for treatable traits

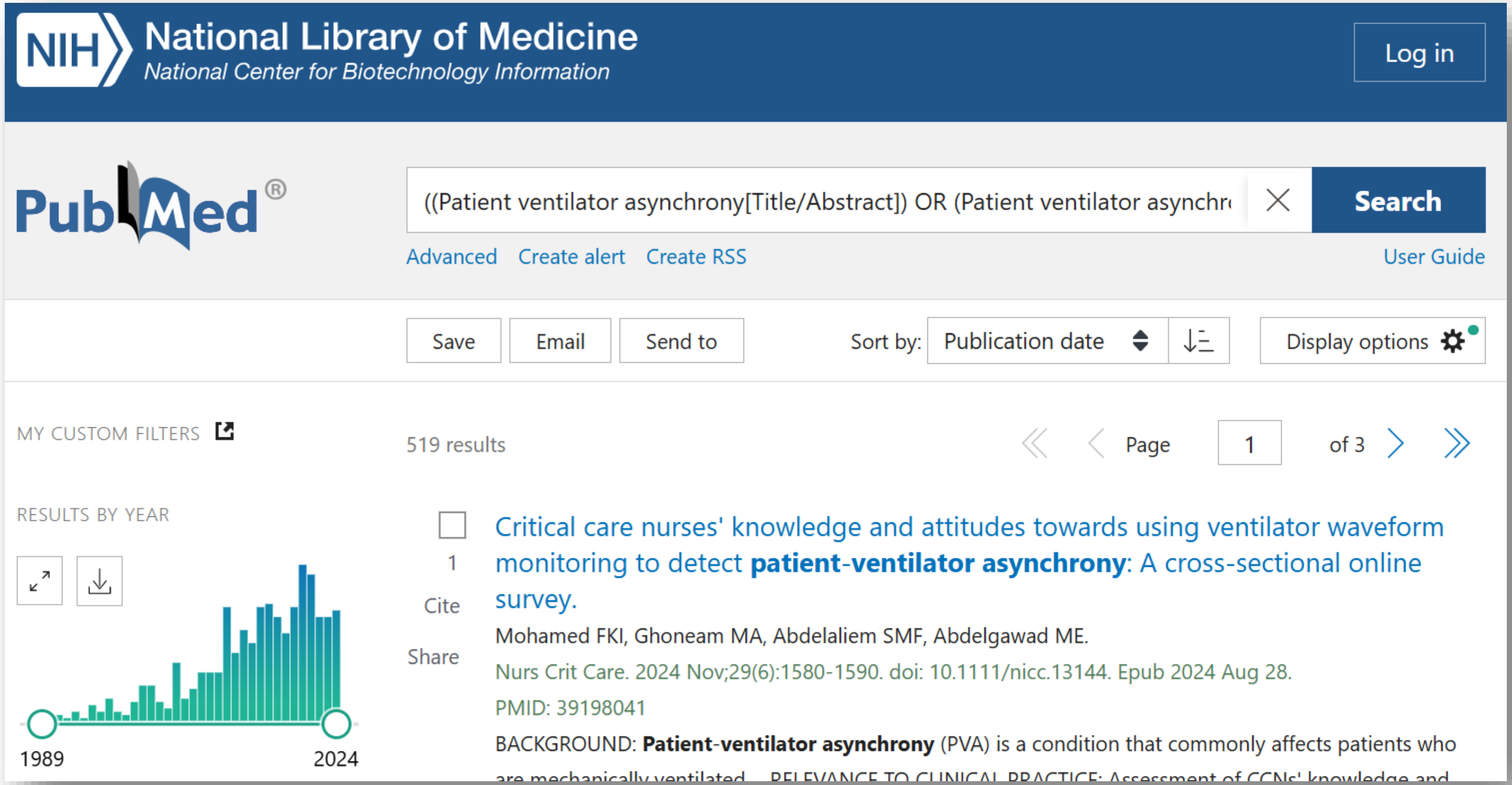
TABLE 1 Key components of treatable traits and research opportunities

Domain	Essential	Clinical application	Research opportunity
Clinically relevant	Yes	Trait predicts/associates with clinically important outcomes.	Identify and/or quantify clinical relevance.
Trait identification marker	Yes	Identifies the presence of a trait. Appreciation of the measurement characteristics of the test (*i.e.* sensitivity, specificity) is required for optimum use. A test with high specificity is required to "rule in" the presence of a trait. A highly sensitive test can be used to screen, or "rule out" the presence of a trait.	New markers at lower cost or improved feasibility. Novel diagnostics, *e.g.* artificial intelligence-based probabilities derived from composite molecular signatures. Mechanism-oriented research to yield better molecular diagnostics for more precise identification of subsets.
Treatable	Yes	Trait is responsive to a specific targeted therapy. Established *via* randomised controlled trials.	Discovery science to identify new treatment for "untreatable" traits. Implementation science to define best way to treat the traits in clinical practice.

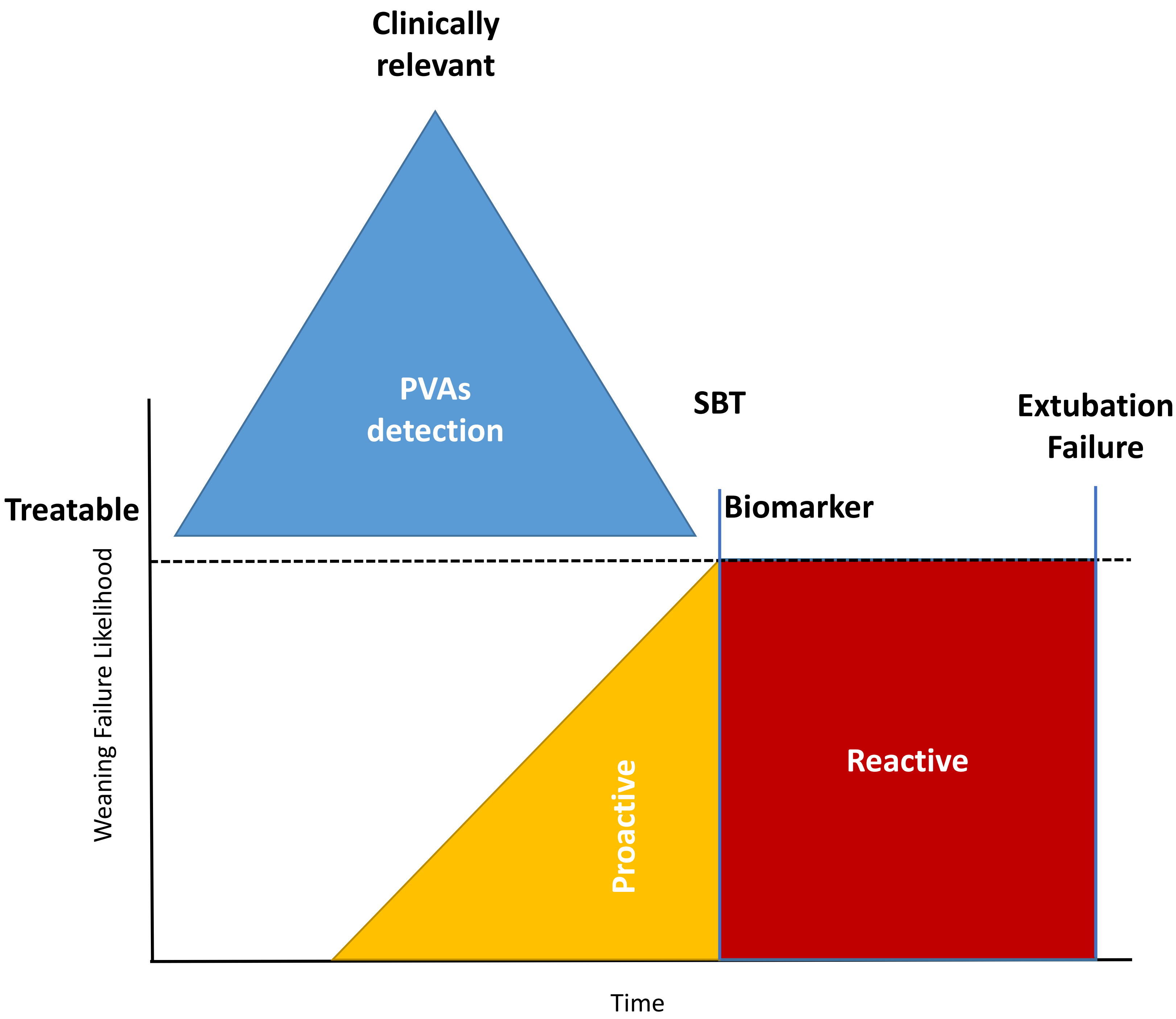


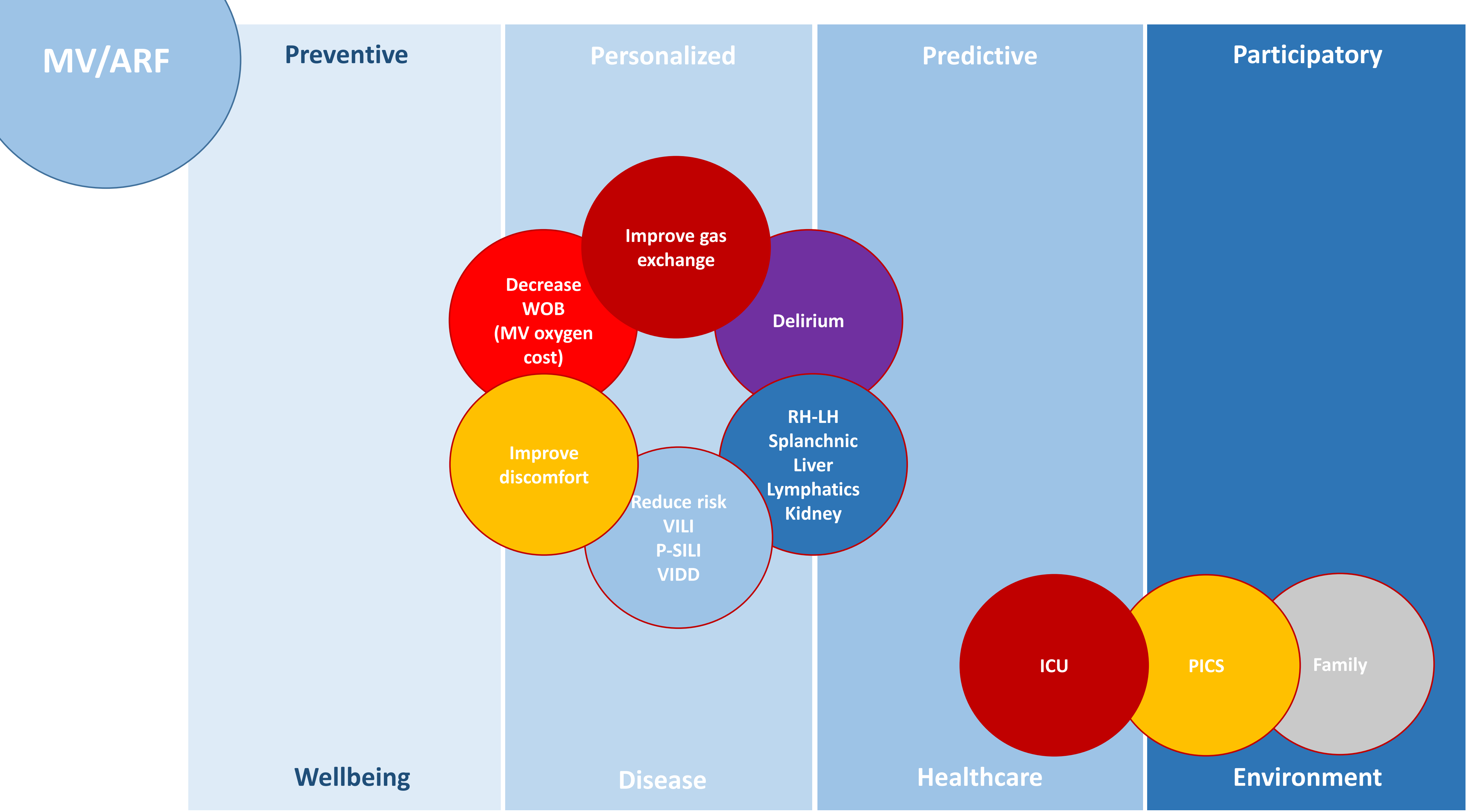
Patient-Ventilator Asynchrony:

A Treatable Trait, Signal in the Noise, or Icing on the Cake?



Can we move from a reactive to a proactive approach?



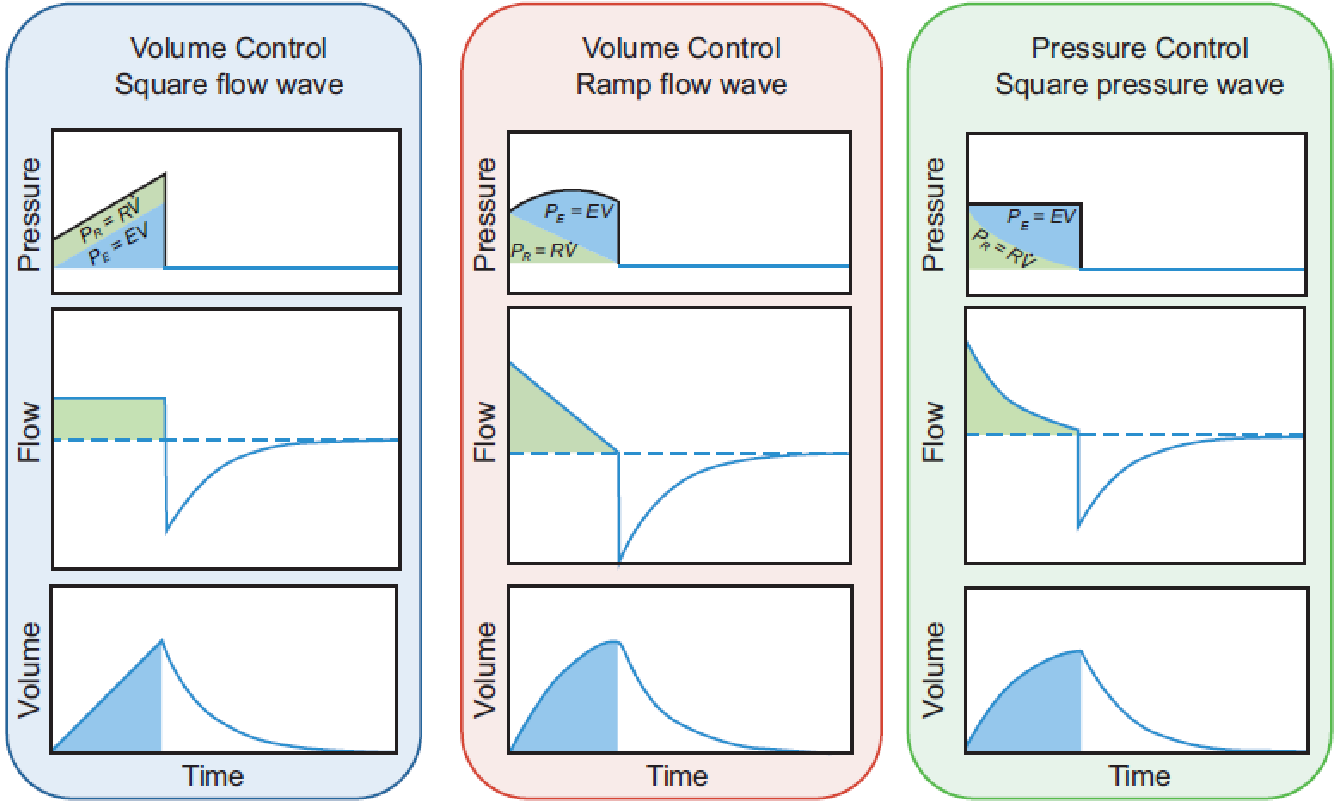


MV/ARF
Preventive
Personalized
Predictive
Participatory
Improve gas exchange
Decrease WOB (MV oxygen cost)
Delirium
Improve discomfort
RH-LH Splanchnic Liver Lymphatics Kidney
Reduce risk VILI P-SILI VIDD
ICU
PICS
Family
Wellbeing
Disease
Healthcare
Environment

Equation of motion

Ptot = Etot.V + Rtot.V' + I.V''

Ptot = Pmus + Pvm



Eur Respir J 2007; 29: 1033–1056
DOI: 10.1183/09031936.00010206

TASK FORCE

Weaning from mechanical ventilation

2007

J-M. Boles*, J. Bion[#], A. Connors[¶], M. Herridge[+], B. Marsh[§], C. Melot[ƒ], R. Pearl, H. Silverman[##], M. Stanchina[¶¶], A. Vieillard-Baron[++], T. Welte[§§]**

Statement of the Sixth International Consensus Conference on Intensive Care Medicine

Organised jointly by the European Respiratory Society (ERS), the American Thoracic Society (ATS), the European Society of Intensive Care Medicine (ESICM), the Society of Critical Care Medicine (SCCM) and the Société de Réanimation de Langue Française (SRLF), and approved by the ERS Executive Committee, February 2007

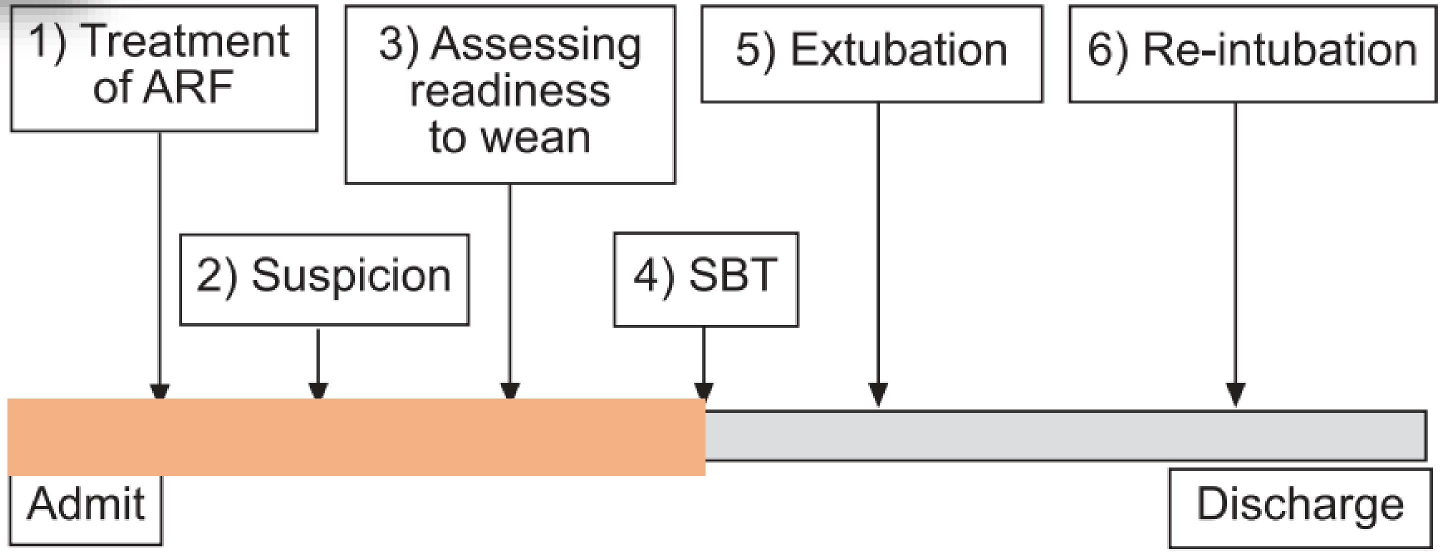


FIGURE 1. Schematic representation of the different stages occurring in a mechanically ventilated patient. ARF: acute respiratory failure; SBT: spontaneous breathing test.

TABLE 3 Classification of patients according to the weaning process

2007

Group/category	Definition
Simple weaning	Patients who proceed from initiation of weaning to successful extubation on the first attempt without difficulty
Difficult weaning	Patients who fail initial weaning and require up to three SBT or as long as 7 days from the first SBT to achieve successful weaning
Prolonged weaning	Patients who fail at least three weaning attempts or require >7 days of weaning after the first SBT

SBT: spontaneous breathing trial.

2007

TABLE 5 Considerations for assessing readiness to wean

Clinical assessment	Adequate cough
	Absence of excessive tracheobronchial secretion
	Resolution of disease acute phase for which the patient was intubated
Objective measurements	Clinical stability
	Stable cardiovascular status (*i.e.* $f_C \leqslant 140$ beats·min^{-1}, systolic BP 90–160 mmHg, no or minimal vasopressors)
	Stable metabolic status
	Adequate oxygenation
	$S_{a,O_2} > 90\%$ on $\leqslant F_{I,O_2}$ 0.4 (or $P_{a,O_2}/F_{I,O_2} \geqslant 150$ mmHg)
	PEEP $\leqslant 8$ cmH_2O
	Adequate pulmonary function
	$f_R \leqslant 35$ breaths·min^{-1}
	MIP $\leqslant$ -20– -25 cmH_2O
	$V_T > 5$ mL·kg^{-1}
	VC > 10 mL·kg^{-1}
	$f_R/V_T < 105$ breaths·min^{-1}·L^{-1}
	No significant respiratory acidosis
	Adequate mentation
	No sedation or adequate mentation on sedation (or stable neurologic patient)

Data taken from [5, 6, 13, 16–18, 22]. f_C: cardiac frequency; BP: blood pressure; S_{a,O_2}: arterial oxygen saturation; F_{I,O_2}: inspiratory oxygen fraction; P_{a,O_2}: arterial oxygen tension; PEEP: positive end-expiratory pressure; f_R: respiratory frequency; MIP: maximal inspiratory pressure; V_T: tidal volume; VC: vital capacity. 1 mmHg=0.133 kPa.

ORIGINAL ARTICLE

Epidemiology of Weaning Outcome according to a New Definition
The WIND Study

2017

Gaëtan Béduneau[1,2*], Tài Pham[3,4,5*], Frédérique Schortgen[6], Lise Piquilloud[7,8], Elie Zogheib[9,10], Maud Jonas[11], Fabien Grelon[12], Isabelle Runge[13], Nicolas Terzi[14,15,16,17], Steven Grangé[1], Guillaume Barberet[18], Pierre-Gildas Guitard[19], Jean-Pierre Frat[20,21,22], Adrien Constan[6], Jean-Marie Chretien[23], Jordi Mancebo[24], Alain Mercat[7], Jean-Christophe M. Richard[25], and Laurent Brochard[26,27]; for the WIND (Weaning according to a New Definition) Study Group and the REVA (Réseau Européen de Recherche en Ventilation Artificielle) Network[‡]

The First Separation Attempt

What This Study Adds to the Field: The WIND (Weaning according to a New Definition) classification is based on the duration of ventilation after the first separation attempt. This classification shows that prolongation of weaning has a direct and immediate impact on morbidity and mortality, by contrast with previous reports using the International Consensus Conference classification. The first separation attempt is a major milestone, and each additional day without a weaning success after this first attempt is associated with an increased crude mortality.

International Consensus Conference

2007

- International Consensus Conference weaning groups:
  - Group 1 (simple weaning): successful extubation after the first spontaneous breathing trial (SBT).
  - Group 2 (difficult weaning): successful extubation after two to three SBTs and taking less than 7 days.
  - Group 3 (prolonged weaning): successful extubation after more than three SBTs or taking more than 7 days.
- International Consensus Conference weaning success and failure definitions:
  - Weaning success is defined as extubation not requiring reinstitution of ventilatory support in the 48 hours after extubation.
  - Weaning failure is defined as one of the following: (*1*) failed SBT; (*2*) reintubation and/or resumption of ventilator support in the 48 hours after extubation; or (*3*) death within 48 hours after extubation.

2017

- WIND Groups
  - Group no weaning: patients never experienced any separation attempt.
  - Group 1 (short weaning): the first separation attempt resulted in a termination of the weaning process within 24 hours (succe separation or early death).
  - Group 2 (difficult weaning): weaning was terminated after more than 1 day but in less than 1 week after the first separation attempt (successful separation or death).
  - Group 3 (prolonged weaning): weaning was still not terminated 7 days after the first separation attempt (by success or death).

ORIGINAL ARTICLE

Epidemiology of Weaning Outcome according to a New Definition
The WIND Study

Gaëtan Béduneau[1,2*], Tài Pham[3,4,5*], Frédérique Schortgen[6], Lise Piquilloud[7,8], Elie Zogheib[9,10], Maud Jonas[11], Fabien Grelon[12], Isabelle Runge[13], Nicolas Terzi[14,15,16,17], Steven Grangé[1], Guillaume Barberet[18], Pierre-Gildas Guitard[19], Jean-Pierre Frat[20,21,22], Adrien Constan[6], Jean-Marie Chretien[23], Jordi Mancebo[24], Alain Mercat[7], Jean-Christophe M. Richard[25], and Laurent Brochard[26,27]; for the WIND (Weaning according to a New Definition) Study Group and the REVA (Réseau Européen de Recherche en Ventilation Artificielle) Network[‡]

2017

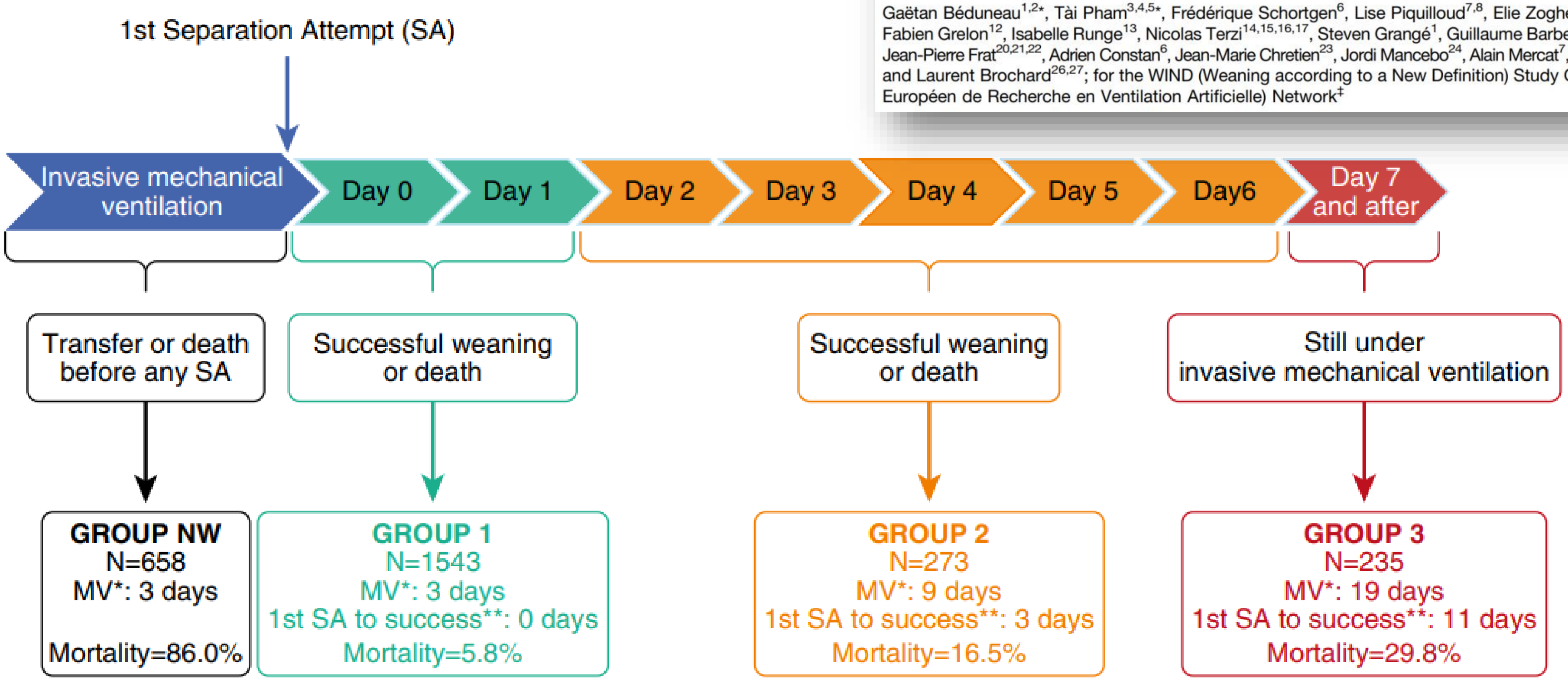
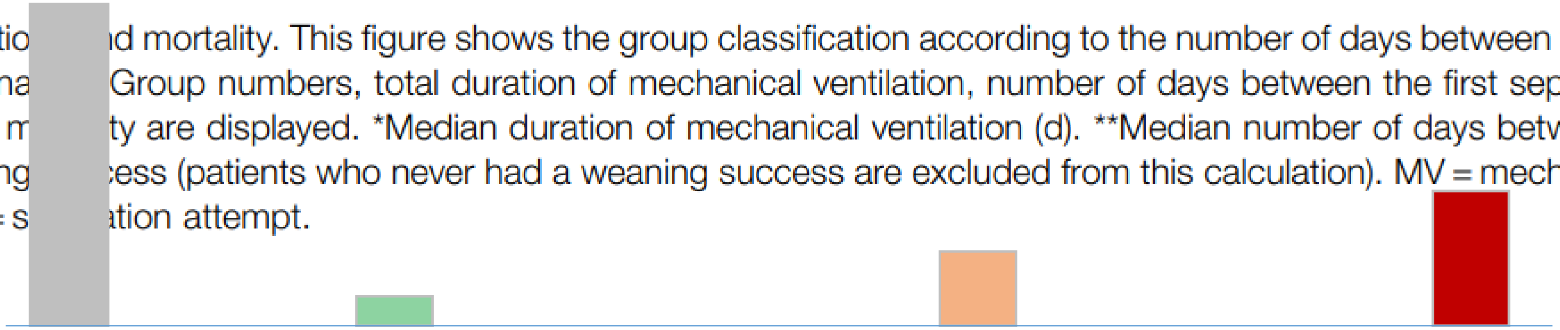


Figure 2. Group definitio ... d mortality. This figure shows the group classification according to the number of days between the first separation attempt and the weaning termina ... Group numbers, total duration of mechanical ventilation, number of days between the first separation attempt and the weaning success, and m ... ty are displayed. *Median duration of mechanical ventilation (d). **Median number of days between the first separation attempt and the weaning ... cess (patients who never had a weaning success are excluded from this calculation). MV = mechanical ventilation; NW = no weaning process; SA = s ... ation attempt.

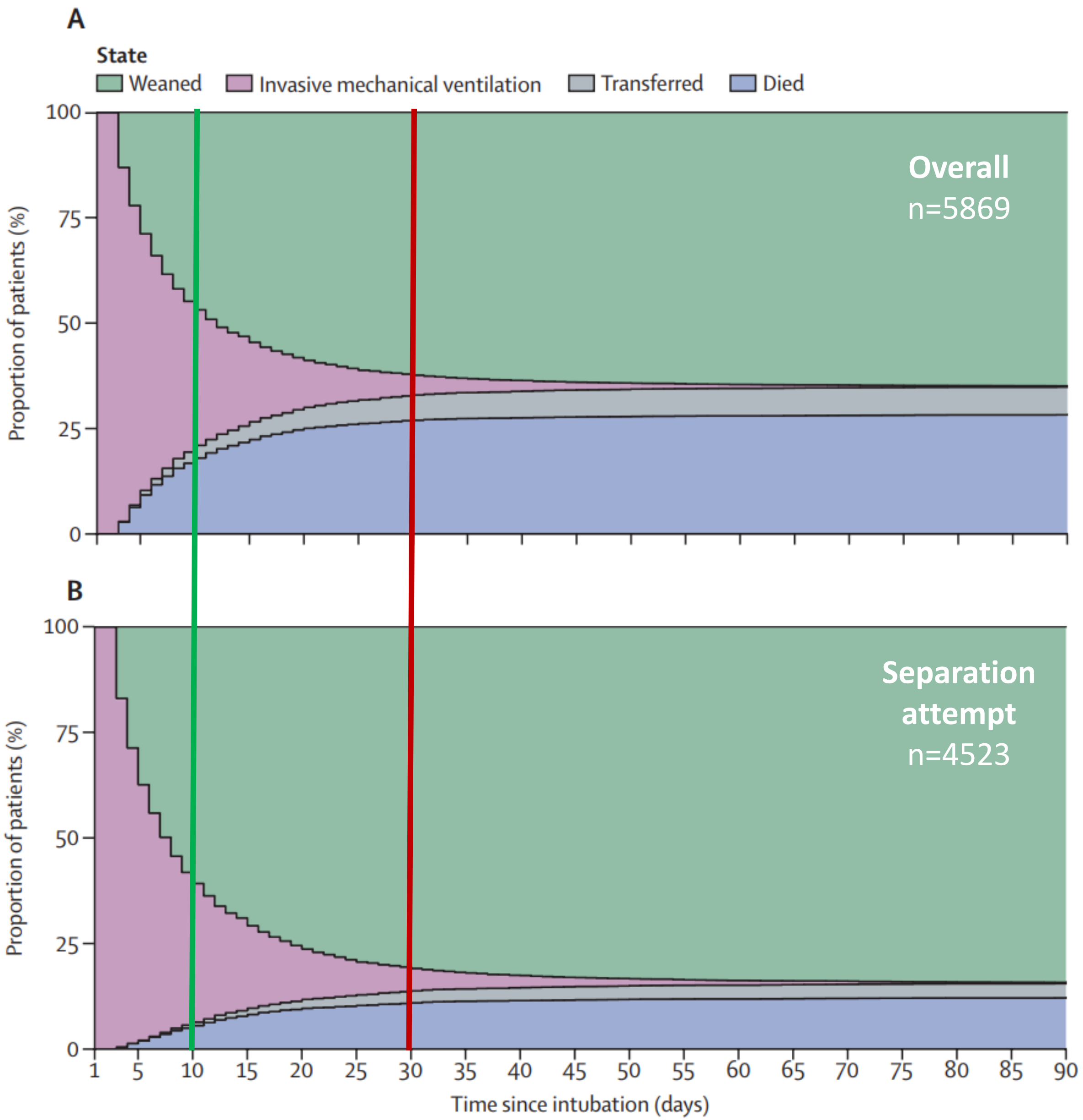


2023

Articles

Weaning from mechanical ventilation in intensive care units across 50 countries (WEAN SAFE): a multicentre, prospective, observational cohort study

Tài Pham, Leo Heunks, Giacomo Bellani, Fabiana Madotto, Irene Aragao, Gaëtan Beduneau, Ewan C Goligher, Giacomo Grasselli, Jon Henrik Laake, Jordi Mancebo, Oscar Peñuelas, Lise Piquilloud, Antonio Pesenti, Hannah Wunsch, Frank van Haren, Laurent Brochard*, John G Laffey*, for the WEAN SAFE Investigators†

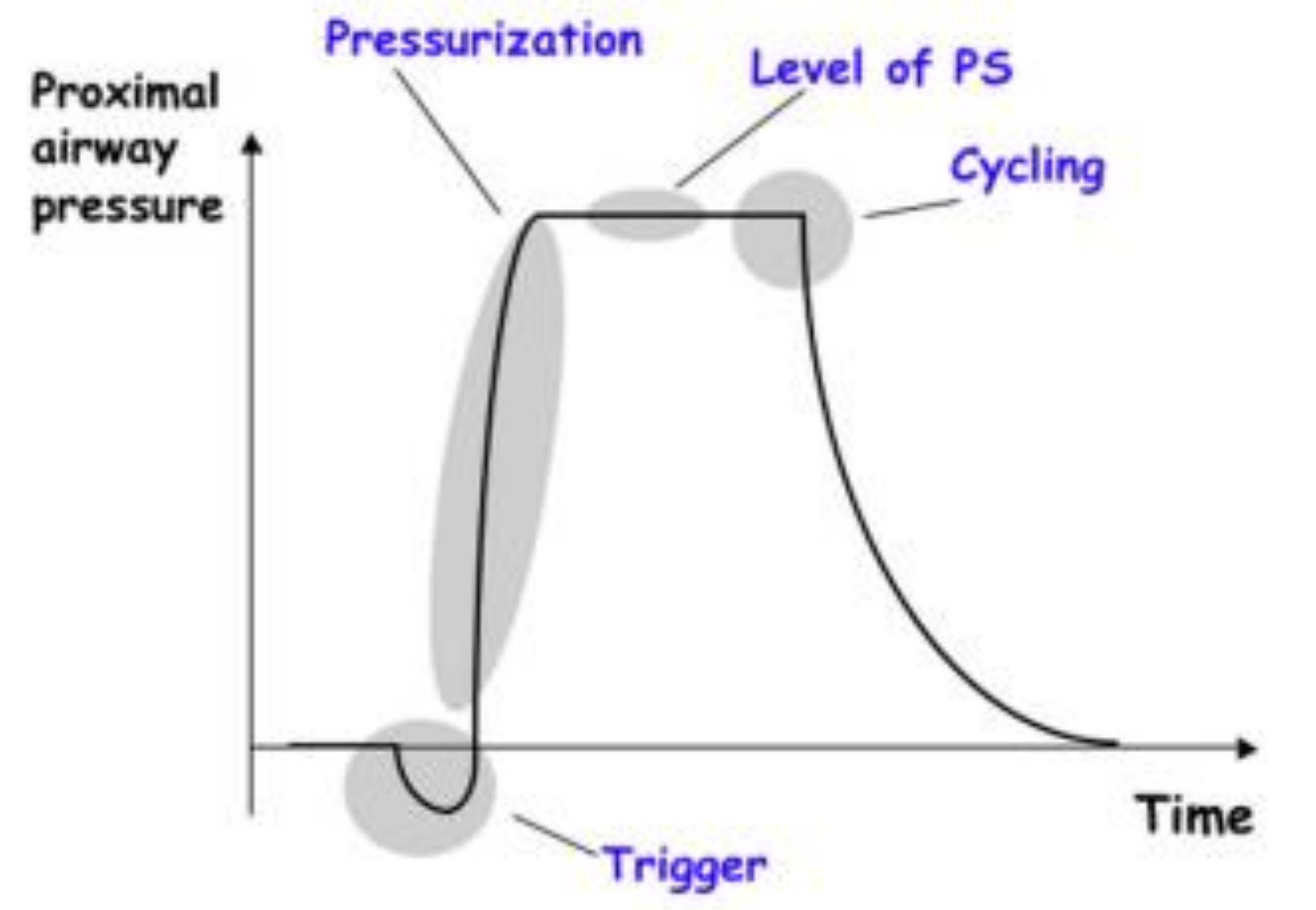


Interaction

Patient-Ventilateur

$$Ptot = Etot.V + Rtot.V' + I.V''$$

Ptot = Pmus + Pvm



Schematic tracing of a pressure support (PS) cycle, highlighting its four key phases.

www.nature.com/scientificreports

scientific reports

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OPEN

Etiology, incidence, and outcomes of patient–ventilator asynchrony in critically-ill patients undergoing invasive mechanical ventilation

Yongfang Zhou[2], Steven R. Holets[3], Man Li[4], Gustavo A. Cortes-Puentes[1], Todd J. Meyer[3], Andrew C. Hanson[5], Phillip J. Schulte[5] & Richard A. Oeckler[1]✉

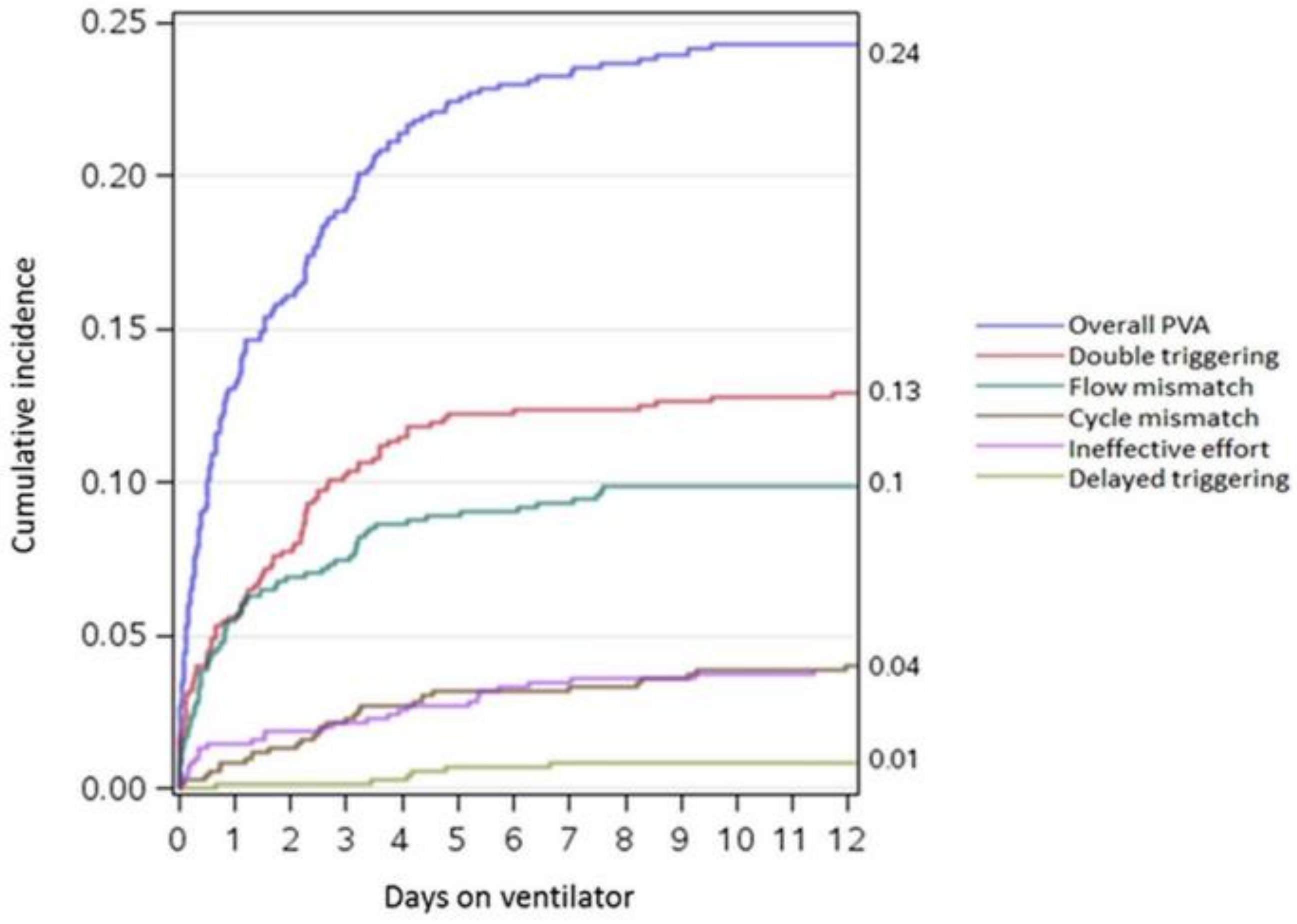


Figure1. Cumulative incidence of asynchrony over the first 12 days of mechanical ventilation.

How to diagnose Patient-Ventilator Asynchrony?

The Eyeball Test

I teach the residents—anyone who will listen to me—to

look at the patient,

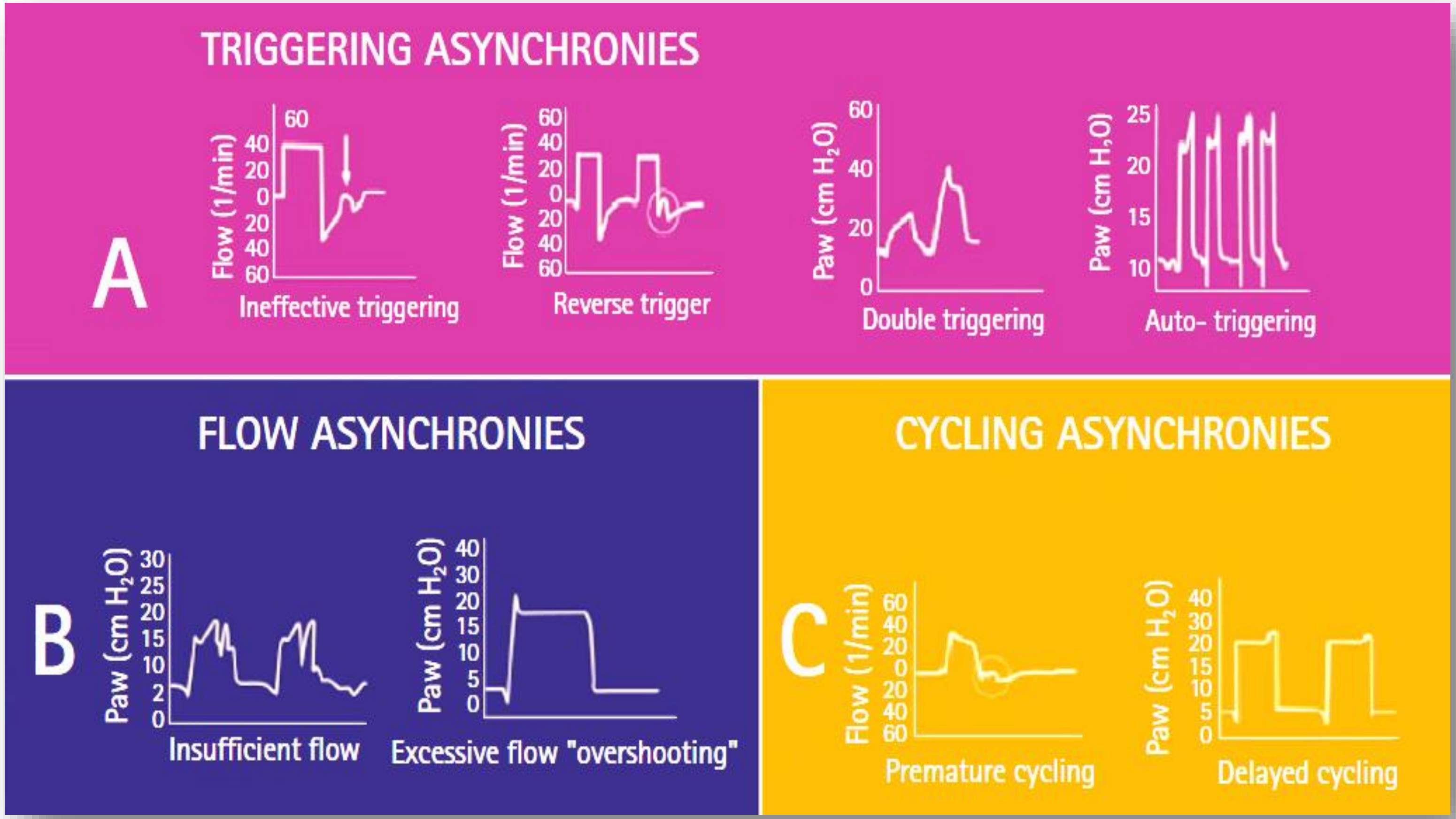
listen to the ventilator,

look at the graphics,

then understand the physiology…

Standardized Ventilator Waveform Analysis

1. **Define the Mode**
2. **Determine the Load**
3. **Diagnose the P-V Interaction**
4. **Intervention**



Standardized Ventilator Waveform Analysis

1. Define the Mode
2. Determine the Load
3. Diagnose the P-V Interaction
4. Intervention

Intensive Care Med (2006) 32:34–47
DOI 10.1007/s00134-005-2828-5

REVIEW

Dimitris Georgopoulos
George Prinianakis
Eumorfia Kondili

Bedside waveforms interpretation as a tool to identify patient-ventilator asynchronies

Using Ventilator Graphics to Identify Patient-Ventilator Asynchrony

Jon O Nilsestuen PhD RRT FAARC and Kenneth D Hargett RRT

ERJ open research

CrossMark

ORIGINAL ARTICLE
NONINVASIVE VENTILATION

Efficacy of ventilator waveform observation for detection of patient–ventilator asynchrony during NIV: a multicentre study

Federico Longhini[1], Davide Colombo[2], Lara Pisani[3], Francesco Idone[4], Pan Chun[5], Jonne Doorduin[6], Liu Ling[5], Moreno Alemani[7], Andrea Bruni[8], Jin Zhaochen[9], Yu Tao[10], Weihua Lu[10], Eugenio Garofalo[8], Luca Carenzo[2], Salvatore Maurizio Maggiore[11], Haibo Qiu[5], Leo Heunks[12], Massimo Antonelli[4], Stefano Nava[3] and Paolo Navalesi[8]

Poeso - Ventilator Waveform Analysis

The number of asynchronous events detected by waveform analysis was demonstrated to be closely correlated with those detected through esophageal pressure measurement.

CONCISE CLINICAL REVIEW

CME ATS

The Application of Esophageal Pressure Measurement in Patients with Respiratory Failure

Evangelia Akoumianaki[1], Salvatore M. Maggiore[2], Franco Valenza[3], Giacomo Bellani[4], Amal Jubran[5], Stephen H. Loring[6], Paolo Pelosi[7], Daniel Talmor[6], Salvatore Grasso[8], Davide Chiumello[9], Claude Guérin[10], Nicolo Patroniti[4], V. Marco Ranieri[11], Luciano Gattinoni[12], Stefano Nava[13], Pietro-Paolo Terragni[11], Antonio Pesenti[4], Martin Tobin[5], Jordi Mancebo[14], and Laurent Brochard[15]

Standardized Ventilator Waveform Analysis

1. Define the Mode
2. Determine the Load
3. Diagnose the P-V Interaction
4. Intervention

A Taxonomy for Patient-Ventilator Interactions and a Method to Read Ventilator Waveforms

Eduardo Mireles-Cabodevila, Matthew T Siuba, and Robert L Chatburn

Standardized Ventilator Waveform Analysis

1. Define the TAG

- ☐ PC-CMVs
- ☐ PC-CMVa
- ☐ VC-CMVs
- ☐ VC-CMVd
- ☐ PC-CSVs
- ☐ PC-IMVa,a
- ☐ PC-CSVa
- ☐ PC-CSVr
- ☐ VC-IMVs,s
- ☐ VC-IMVd,d
- ☐ PC-IMVs,s
- ☐ Other________

2. Define the load

Inspiration

- ☐ Elastic load
- ☐ Resistive load
- ☐ P_{mus}

Expiration

- ☐ Elastic load
- ☐ Resistive load
- ☐ P_{mus}

3. Define Patient-Ventilator Interaction

Trigger

- ☐ Normal
- ☐ Early
- ☐ Late
- ☐ False
- ☐ Failed

Inspiration

- ☐ Normal
- ☐ Work shifting
- ☐ Work shifting, severe

Cycle

- ☐ Normal
- ☐ Early
- ☐ Late

Expiration

- ☐ Normal
- ☐ Expiratory work

4. Interventions

What is the main goal (choose one only)?

☐ Safety ☐ Comfort ☐ Liberation.

- ☐ Adjusted Settings: which?__________________
- ☐ Changed mode: To what?__________________
- ☐ None
- ☐ Other________________________________

PV curves Analysis

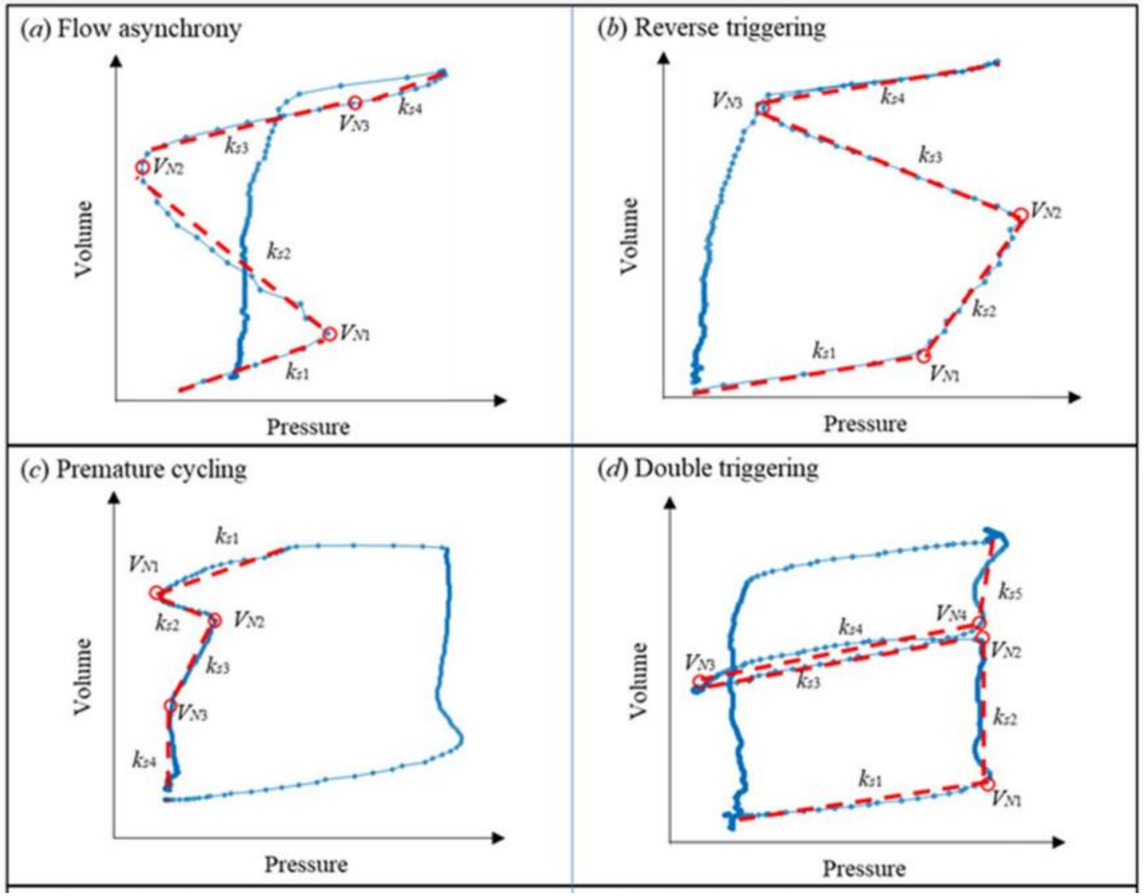
Chen *et al. BioMedical Engineering OnLine* (2023) 22:102
https://doi.org/10.1186/s12938-023-01165-0

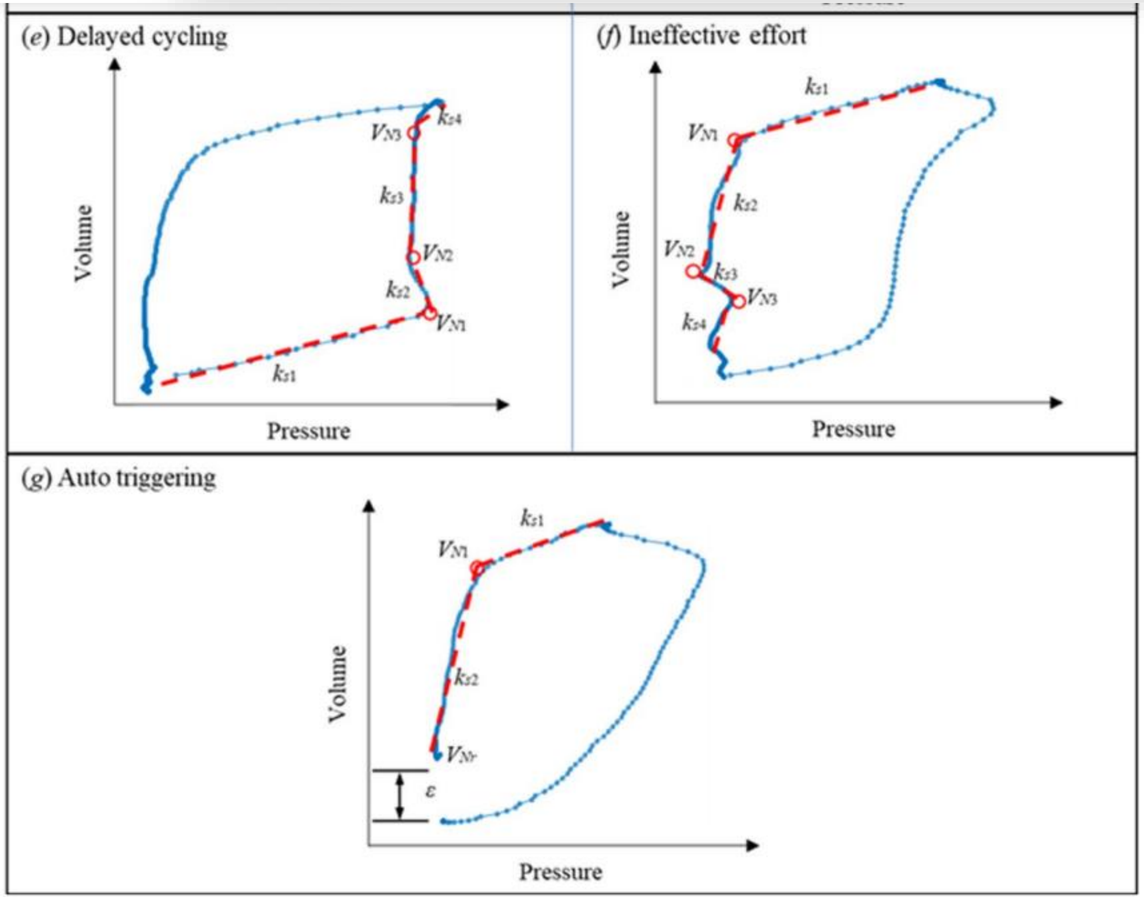
BioMedical Engineering OnLine

RESEARCH Open Access

Automated evaluation of typical patient–ventilator asynchronies based on lung hysteretic responses

Yuhong Chen[1], Kun Zhang[1], Cong Zhou[2,3*], J. Geoffrey Chase[2] and Zhenjie Hu[1]





The Ability of Critical Care Physicians to Identify Patient-Ventilator Asynchrony Using Waveform Analysis: A National Survey

Rym Chelbi, Farah Thabet, Emna Ennouri, Khaoula Meddeb, Radhouane Toumi, Marwa Zghidi, Imen Ben Saida, and Mohamed Boussarsar

QUICK LOOK

Current knowledge

Waveform analysis is an established and reliable bedside method to assess patient-ventilator asynchrony (PVA). However, the proficiency of health care professionals in accurately identifying PVA varies widely between disciplines and years of experience.

What this paper contributes to our knowledge

This study highlights the limitations in correctly identifying PVAs among critical care physicians. Prior inconsistent training on ventilator graphics may have hindered the accurate identification of PVAs, indicating the need for more comprehensive and standardized training in this area and/or the implementation of ventilator built-in software to recognize and correct PVAs.

RESPIRATORY CARE

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Closing the Gap in Patient-Ventilator Discordance Recognition

Alicia Liendo and Eduardo Mireles-Cabodevila

Respiratory Care February 2024, 69 (2) 272-274; DOI: https://doi.org/10.4187/respcare.11825

136 CCPs

72 (52.9%) responded

59 (81.9%) residents

13 (18.1%) senior physicians

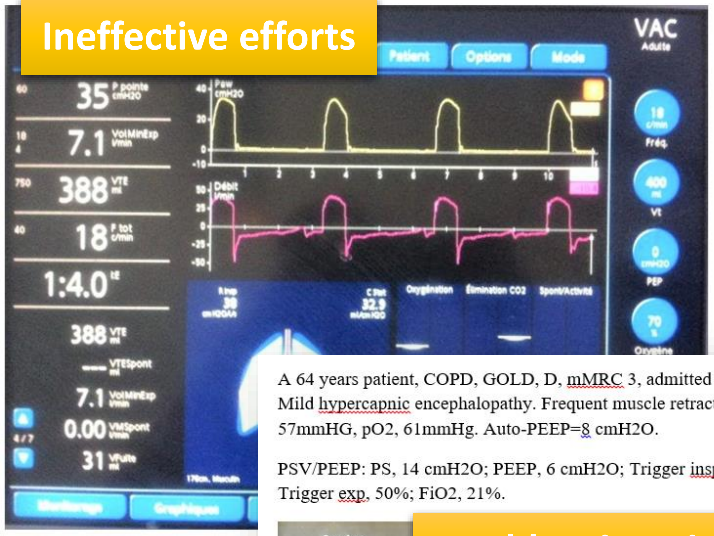
The Ability of Critical Care Physicians to Identify Patient-Ventilator Asynchrony Using Waveform Analysis: A National Survey

Rym Chelbi, Farah Thabet, Emna Ennouri, Khaoula Meddeb, Radhouane Toumi, Marwa Zghidi, Imen Ben Saida, and Mohamed Boussarsar

A. Ineffective efforts
B. Flow asynchrony
C. Auto-triggering
D. Premature cycling
E. Double triggering
F. No asynchrony

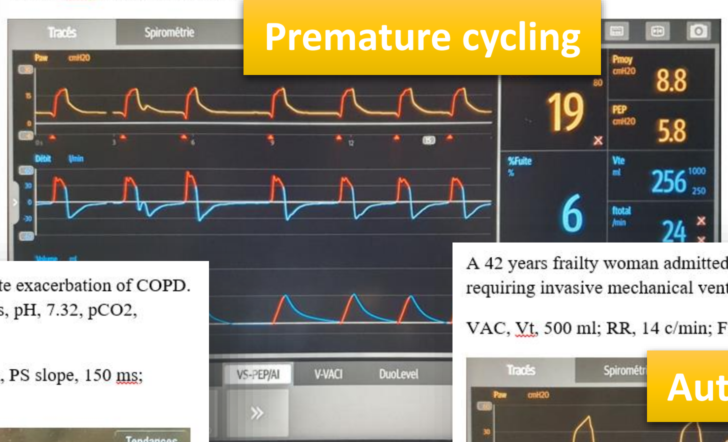
A 72 years patient, COPD, GOLD, D, mMRC 3, admitted for an acute exacerbation of COPD requiring invasive mechanical ventilation. A severe obstructive disorder highlighted by an auto-PEEP=12 cmH2O. Sedation, RASS, -1. Frequent muscle retraction.

VAC, Vt, 400 ml; RR, 18 c/min; Flow, 45l/min; PEEP, 0 cmH2O; FiO2, 70%; I:E, 1:4.0.



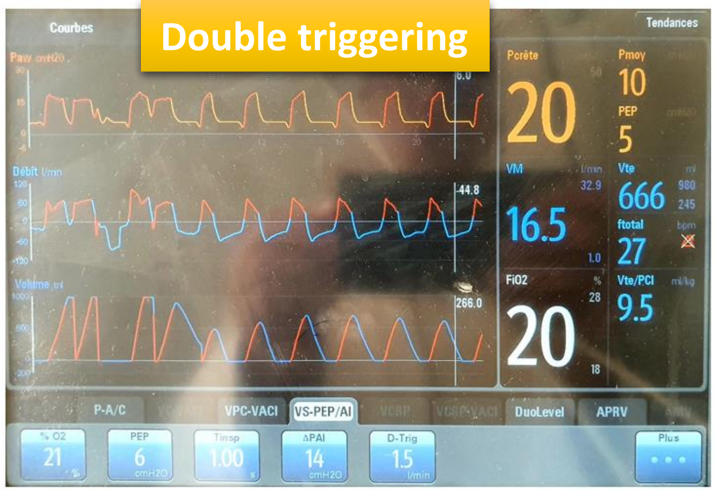
A 19 years patient, admitted for a severe acute hypoxemic respiratory failure, associated to a community acquired pneumonia. After a short course of invasive mechanical ventilation, a trial of weaning on pressure support ventilation was attempted.

PSV/PEEP: PS, 12 cmH2O; PEEP, 6 cmH2O; Trigger insp, -1 cmH2O; PS slope, 150 ms; Trigger exp, 50%; FiO2, 30%.



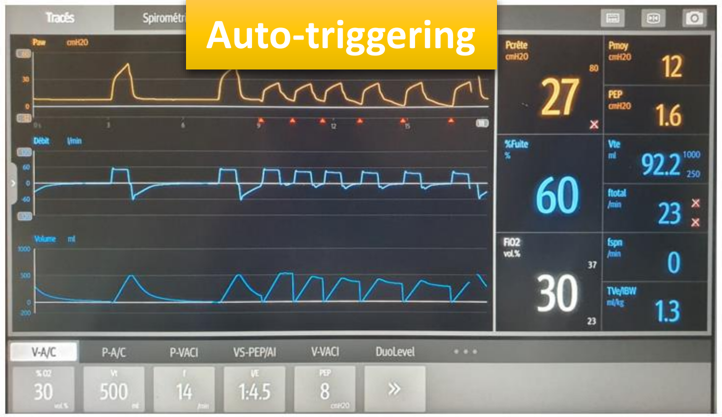
A 64 years patient, COPD, GOLD, D, mMRC 3, admitted for an acute exacerbation of COPD. Mild hypercapnic encephalopathy. Frequent muscle retraction. ABGs, pH, 7.32, pCO2, 57mmHG, pO2, 61mmHg. Auto-PEEP=8 cmH2O.

PSV/PEEP: PS, 14 cmH2O; PEEP, 6 cmH2O; Trigger insp, 1.5l/min, PS slope, 150 ms; Trigger exp, 50%; FiO2, 21%.



A 42 years frailty woman admitted to the ICU for coma associated to meningo-encephalitis requiring invasive mechanical ventilation, without any pulmonary consolidation.

VAC, Vt, 500 ml; RR, 14 c/min; Flow, 50l/min; PEEP, 8 cmH2O; FiO2, 30%; I:E, 1:4.5.



PVAs 4 cases

29.2%

correctly

identified PVAs

PATIENT-VENTILATOR ASYNCHRONY IDENTIFICATION

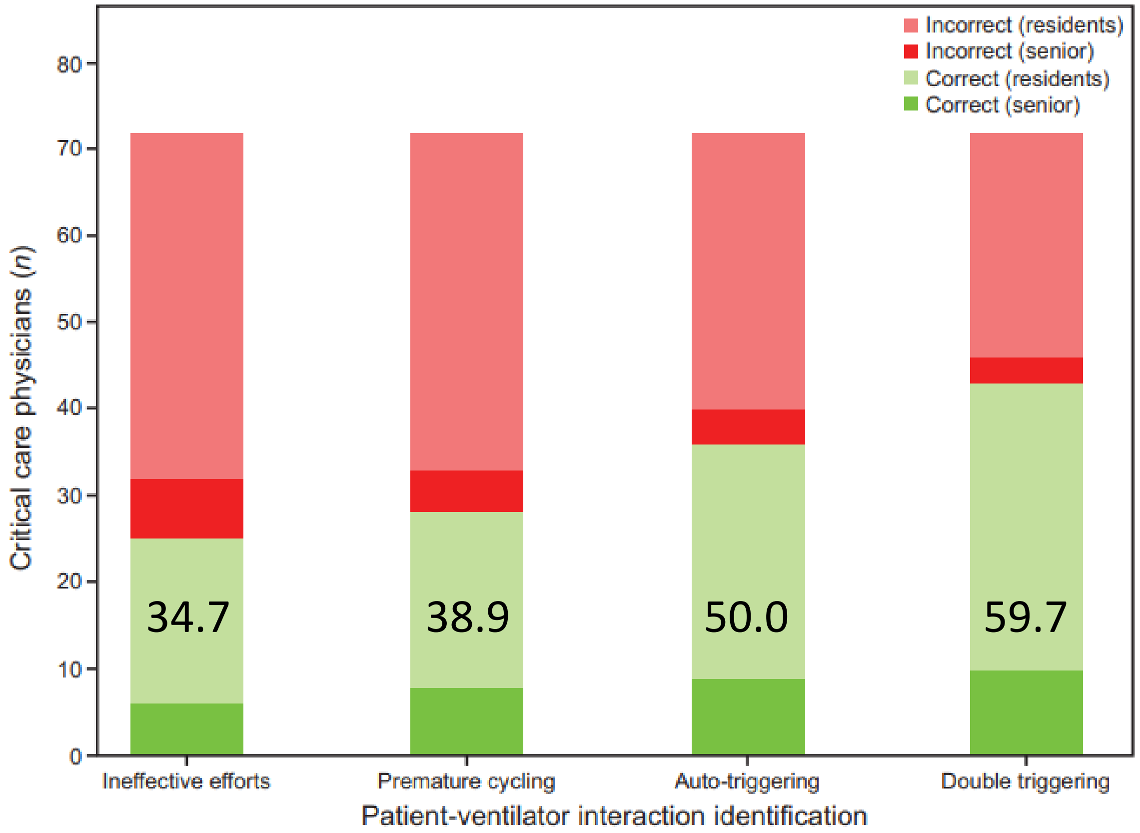


Fig. 1. Distribution of correct/incorrect identifications of patient-ventilator-asynchrony types among senior and residents critical care physicians. Double triggering was the most frequently identified patient-ventilator-asynchrony (PVA) type, followed by auto-triggering, premature cycling, and ineffective efforts. Seniors physicians demonstrated better identification skills among the respective PVA types.

Table 1. Factors That Affect Patient-Ventilator Synchrony

Ventilator Factors	
	Trigger variables: esophageal pressure, flow, or shape signal
	Sensitivity setting
	Rise-time capability
	Design, mode, and settings of the flow delivery system
	Flow pattern selected
	Design of the exhalation valve
	How positive end-expiratory pressure is generated by the software
	Extraneous flow (eg, from a nebulizer or added oxygen)
Patient Factors	
	Sedation level: pain, splinting
	Inspiratory effort/respiratory drive; neural timing
	Pathology of the respiratory system or abdomen; secretions
	Intrinsic positive end-expiratory pressure
	Size and type of airway
	Presence of leaks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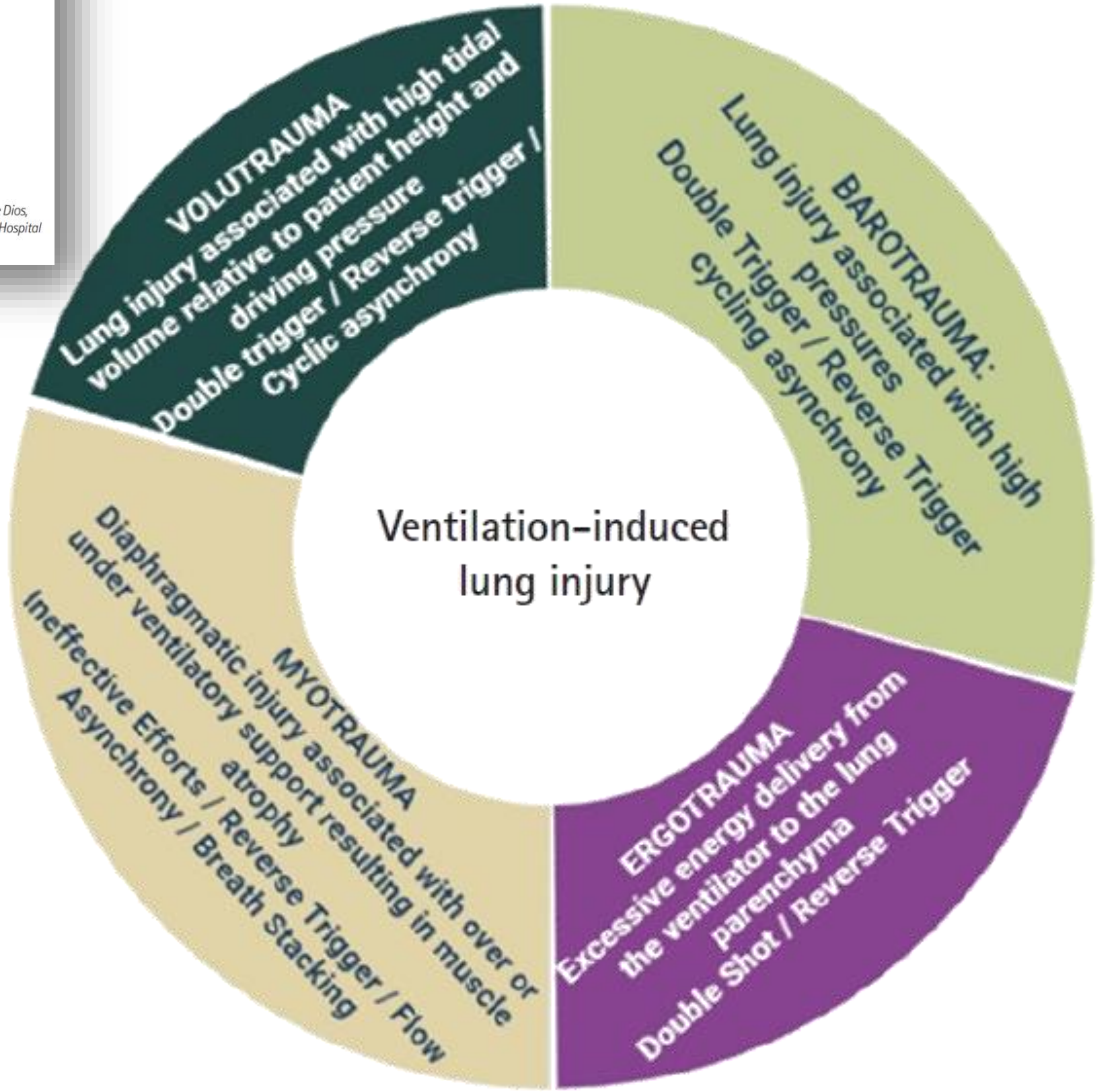
Asynchronies during invasive mechanical ventilation: narrative review and update

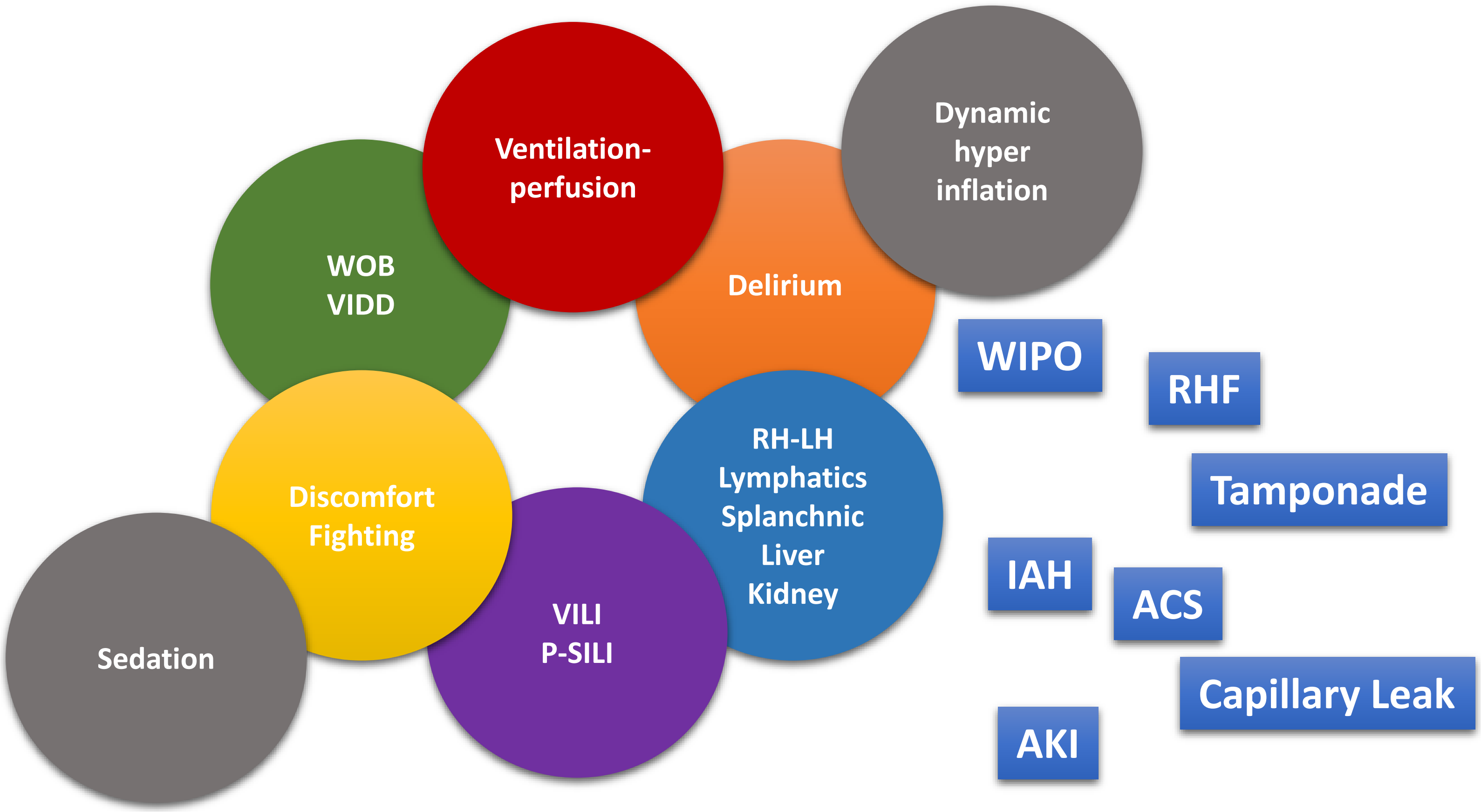
Santiago Nicolás Saavedra[1], Patrick Valentino Sepúlveda Barisich[2], José Benito Parra Maldonado[3], Romina Belén Lumini[4], Alberto Gómez-González[3], Adrián Gallardo[5]

[1]Servicio de Medicina Física y Rehabilitación, Hospital Alemán, Buenos Aires, Argentina; [2]Servicio de Medicina Física y Rehabilitación, Hospital San Juan de Dios, La Serena, Chile; [3]Servicio de Rehabilitación en UCI, Hospital General de México Dr. Eduardo Liceaga, Ciudad de México, México; [4]Servicio de Kinesiología, Hospital El Carmen, Godoy Cruz, Mendoza; [5]Servicio de Kinesiología, Sanatorio Clínica Modelo de Morón, Buenos Aires, Argentina

How do different types of PVAs contribute to the challenges in weaning patients from MV?



What specific mechanisms lead to prolonged MV as a result of PVAs?



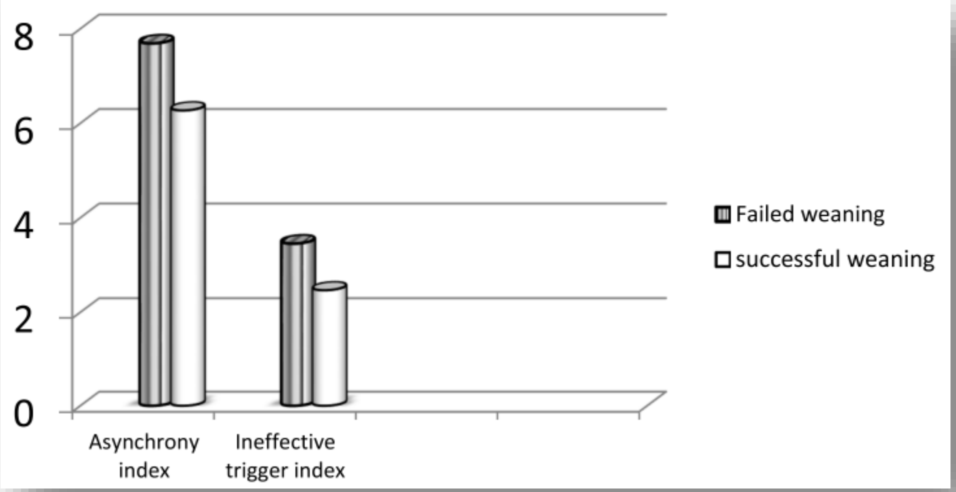
Sadek *et al. The Egyptian Journal of Bronchology* (2021) 15:30
https://doi.org/10.1186/s43168-021-00076-9

The Egyptian Journal of Bronchology

RESEARCH Open Access

Patient-ventilator asynchrony as a predictor of weaning failure in mechanically ventilated COPD patients

Samiaa H. Sadek*, Maha M. El-kholy, Marwa S. Abdulmoez and Reham M. El-Morshedy



In what ways can the early detection of PVAs influence the overall morbidity of critically ill patients?

Table 2 Patients' asynchronies in studied patients based on the outcome of weaning

Type of asynchrony	Successful weaning (*n* = 73)	Failed weaning (*n* = 27)	*P* value
Ineffective trigger	16.89 ± 10.60	30.81 ± 23.18	**< 0.001***
Double trigger	4.76 ± 3.79	6.25 ± 4.46	**0.02***
Auto trigger	1.71 ± 0.75	2.34 ± 1.55	0.06
Delayed cycle	11.79 ± 7.40	15.48 ± 7.57	**0.03***
Early cycle	8.08 ± 7.47	10.81 ± 8.97	0.07
Flow asynchrony	2.72 ± 0.98	3.60 ± 2.03	0.12
Total asynchronies	43.27 ± 20.27	70.11 ± 32.51	**< 0.001***

What are the implications of PVAs on the ICU LOS for patients undergoing MV?

Intensive Care Med (2017) 43:184–191
DOI 10.1007/s00134-016-4593-z

ORIGINAL

CrossMark

Clusters of ineffective efforts during mechanical ventilation: impact on outcome

Katerina Vaporidi[1], Dimitris Babalis[1], Achilleas Chytas[2,3], Emmanuel Lilitsis[1], Eumorfia Kondili[1], Vasilis Amargianitakis[1], Ioanna Chouvarda[2,3], Nicos Maglaveras[2,3] and Dimitris Georgopoulos[1*]

IE are associated with prolonged mechanical ventilation and increased mortality.

ONLINE CLINICAL INVESTIGATIONS

The Effect of Clusters of Double Triggering and Ineffective Efforts in Critically Ill Patients

Magrans, Rudys PhD[1]; Ferreira, Francini MSc[1]; Sarlabous, Leonardo PhD[2,3]; López-Aguilar, J
PhD[2]; Gomà, Gemma RN[2]; Fernandez-Gonzalo, Sol PhD[2,4,5]; Navarra-Ventura, Guillem MSc[2]
Fernández, Rafael MD, PhD[6]; Montanyà, Jaume MSc[1]; Kacmarek, Robert PhD[7,†]; Rué, Monts
PhD[8,9]; Forné, Carles PhD[8,10]; Blanch, Lluís MD, PhD[2,3]; de Haro, Candelaria MD, PhD[2]; Aquir
Esperanza, José MD[2,3,11]; For the ASYNICU group

Collaborators

Author Information

Critical Care Medicine 50(7):p e619-e629, July 2022. | *DOI:* 10.1097/CCM.0000000000005471

Although higher numbers of clusters might indicate better chances of survival, clusters with greater power and duration indicate a risk of worse clinical outcomes.

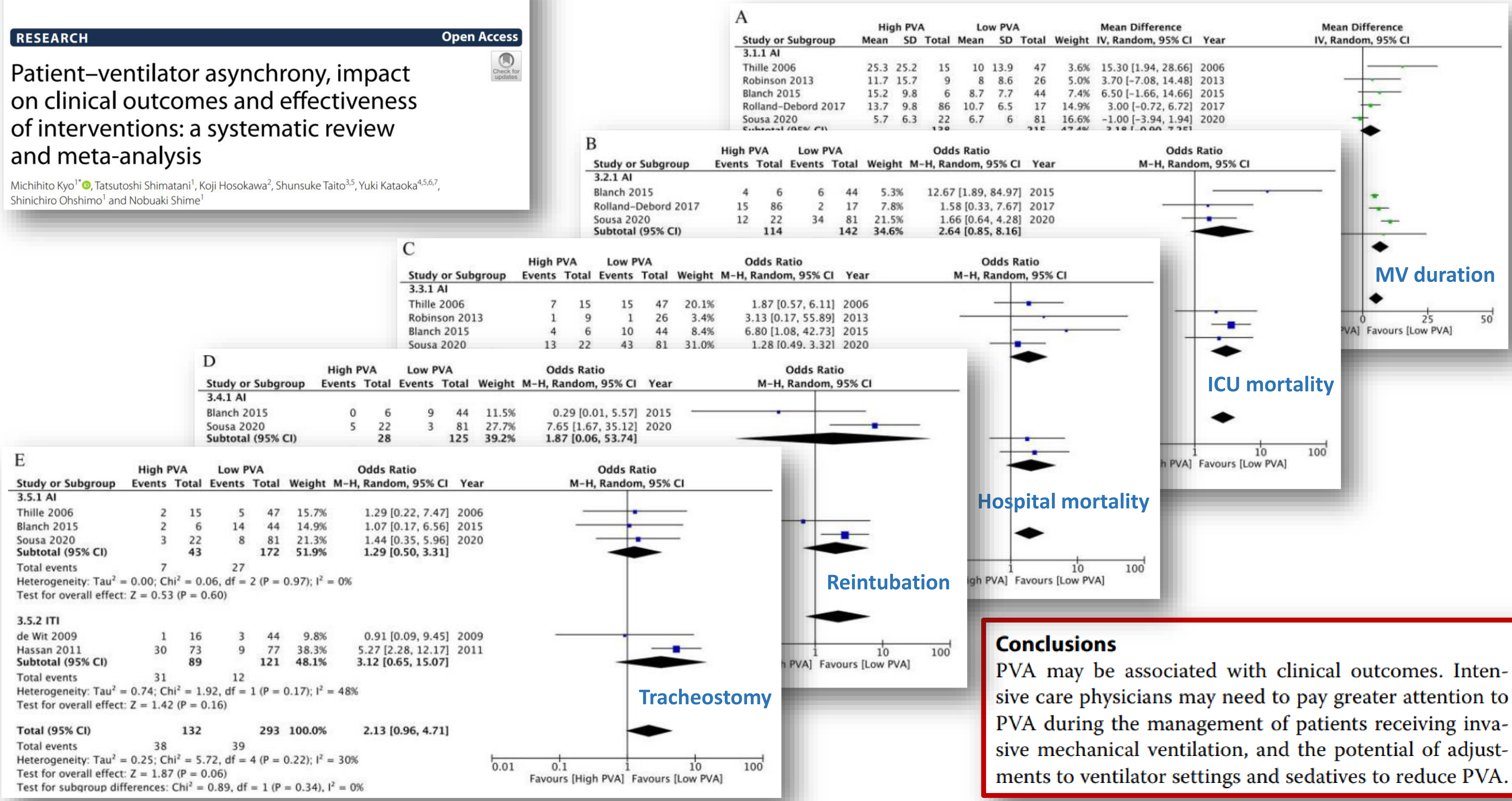
Kyo et al. j intensive care (2021) 9:50
https://doi.org/10.1186/s40560-021-00565-5

Journal of Intensive Care

RESEARCH Open Access

Patient–ventilator asynchrony, impact on clinical outcomes and effectiveness of interventions: a systematic review and meta-analysis

Michihito Kyo[1*], Tatsutoshi Shimatani[1], Koji Hosokawa[2], Shunsuke Taito[3,5], Yuki Kataoka[4,5,6,7], Shinichiro Ohshimo[1] and Nobuaki Shime[1]



Conclusions

PVA may be associated with clinical outcomes. Intensive care physicians may need to pay greater attention to PVA during the management of patients receiving invasive mechanical ventilation, and the potential of adjustments to ventilator settings and sedatives to reduce PVA.

REVIEW

Does patient-ventilator asynchrony really matter?

Docci, Mattia[a,b,c]; Rodrigues, Antenor[a,b]; Dubo, Sebastian[d]; Ko, Matthew[a,b]; Brochard, Laurent[a,b]

Author Information

Current Opinion in Critical Care ():10.1097/MCC.0000000000001225, October 24, 2024. | *DOI:* 10.1097/MCC.0000000000001225

Clinicians' ability to **recognize** asynchronies is typically low.

There is growing evidence that in susceptible patients, dyssynchrony may lead to **VILI (or P-SILI)** and that clusters of such dyssynchronous events have the highest association with **poor outcomes.**

Dyssynchrony may also be associated with harm indirectly when it reflects **over-assistance** or **over-sedation.**

Automatized softwares based on artificial intelligence have been trained to largely outperform human eyesight and are close to be implemented at the bedside.

How might advancements in ventilator technology address the issues of PVAs and improve patient outcomes during the weaning process?

IFAC Journal of Systems and Control 27 (2024) 100236

Contents lists available at ScienceDirect

IFAC Journal of Systems and Control

journal homepage: www.elsevier.com/locate/ifacsc

ELSEVIER

Automatic patient-ventilator asynchrony detection framework using objective asynchrony definitions

Lars van de Kamp[a,b,*], Joey Reinders[a], Bram Hunnekens[a], Tom Oomen[b,c], Nathan van de Wouw[b]

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[b] Department of Mechanical Engineering, Eindhoven University of Technology, Eindhoven, 5612 AZ, Noord-Brabant, The Netherlands
[c] Delft Center for Systems and Control, Delft university of Technology, Mekelweg 5, Delft, 2628 CD, Zuid-Holland, The Netherlands

Gutierrez et al. Critical Care 2011, 15:R167
http://ccforum.com/content/15/4/R167

CRITICAL CARE

RESEARCH Open Access

Automatic detection of patient-ventilator asynchrony by spectral analysis of airway flow

Guillermo Gutierrez*, Guillermo J Ballarino, Hulya Turkan, Juan Abril, Lucy De La Cruz, Connor Edsall, Binu George, Susan Gutierrez, Vinayak Jha and Jalil Ahari

Computer Methods and Programs in Biomedicine 230 (2023) 107333

Contents lists available at ScienceDirect

Computer Methods and Programs in Biomedicine

journal homepage: www.elsevier.com/locate/cmpb

ELSEVIER

Automated detection and classification of patient–ventilator asynchrony by means of machine learning and simulated data

Tom Bakkes[a,*], Anouk van Diepen[a], Ashley De Bie[b], Leon Montenij[b], Francesco Mojoli[c], Arthur Bouwman[b], Massimo Mischi[a], Pierre Woerlee[a], Simona Turco[a]

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[b] Catharina Ziekenhuis Eindhoven, Michelangelolaan 2, 5623 EJ Eindhoven, the Netherlands
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Chen et al. BioMedical Engineering OnLine (2023) 22:102
https://doi.org/10.1186/s12938-023-01165-0

BioMedical Engineering OnLine

RESEARCH Open Access

Automated evaluation of typical patient–ventilator asynchronies based on lung hysteretic responses

Yuhong Chen[1], Kun Zhang[1], Cong Zhou[2,3*], J. Geoffrey Chase[2] and Zhenjie Hu[1]

Conclusion: A bundle for weaning success

Modifiable factors

1. Daily screening for sedation wean (RASS=0)

2. Delirium prevention and management

3. PVAs detection, classification and correction

4. Daily screening for Early SBT