Optimal Strategies for Severe Acute Respiratory Distress Syndrome

CrossMark

Jeremy W. Cannon, MD, SM[a],*, Jacob T. Gutsche, MD[b],
Daniel Brodie, MD[c]

KEYWORDS

- Acute respiratory distress syndrome • Lung protective ventilation
- High-frequency oscillatory ventilation • Neuromuscular blockade • Prone positioning
- Pulmonary vasodilators • Extracorporeal membrane oxygenation
- Physical conditioning

KEY POINTS

- Acute respiratory distress syndrome (ARDS) occurs in more than 10% of intensive care unit admissions and nearly 25% of ventilated patients.
- Low-volume, low-pressure lung protective ventilation remains the mainstay of ARDS management.
- In severe ARDS, early use of neuromuscular blockade and prone positioning improve survival.
- High-frequency oscillatory ventilation has no clear mortality benefit and may harm some patients.
- Extracorporeal membrane oxygenation consultation should be obtained early to permit initiation in appropriate patients before multisystem organ failure and severe musculoskeletal deconditioning occur.

[a] Division of Trauma, Surgical Critical Care & Emergency Surgery, The Perelman School of Medicine at the University of Pennsylvania, 51 North 39th Street, MOB Suite 120, Philadelphia, PA 19104, USA; [b] Department of Anesthesiology and Critical Care, The Perelman School of Medicine at the University of Pennsylvania, 51 North 39th Street, Philadelphia, PA 19104, USA; [c] Division of Pulmonary, Allergy, & Critical Care Medicine, Columbia University Medical Center, 622 West 168 Street, PH 8 East, Room 101, New York, NY 10032, USA
* Corresponding author.
E-mail address: jeremy.cannon@uphs.upenn.edu

INTRODUCTION

Much has transpired in the 5 years since a volume of this publication was dedicated to acute respiratory failure.[1] The most significant developments include:

- A new definition of acute respiratory distress syndrome (ARDS), termed the Berlin definition
- Numerous landmark clinical trials in ventilator and nonventilator management strategies for ARDS
- The reincarnation of the ARDS Network (ARDSNet) research network as the PETAL (Prevention and Early Treatment of Acute Lung Injury) Network
- A commitment by the European Society of Intensive Care Medicine to study ARDS globally

The consensus-based Berlin definition of ARDS (**Box 1**) has allowed investigators and clinicians to more readily identify patients with ARDS in order to optimize management and design impactful clinical trials.[2] This definition has been quickly and comprehensively applied across numerous intensive care unit (ICU) populations to further the understanding of this challenging clinical syndrome. It also provides a framework for matching treatment strategies to severity of ARDS (**Fig. 1**).

Concurrent with the development and dissemination of this new definition, several important clinical trials (**Table 1**) and systematic reviews on various aspects of ARDS management have been or will soon be published. The results of these trials and their practical application are discussed at length in this article.

In addition, the future of ARDS research in both the United States and abroad has been well funded, in keeping with the burdens of both morbidity and mortality that result from ARDS. The ARDSNet research network has transformed to include many of the original centers along with several new centers, and these have established a reputation for providing new insights into the diagnosis and management of ARDS. Funded by the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health (NIH), this new consortium has been termed the Prevention and Early Treatment of Acute Lung Injury (PETAL) Network.[3,4] Similarly, the European Society of Intensive Care Medicine (ESICM) has shown a commitment to supporting ARDS research, as manifested by the recently published LUNG SAFE (Large Observational Study to Understand the Global Impact of Severe Acute Respiratory Failure)

Box 1
Berlin definition of acute respiratory distress syndrome

Respiratory failure within 1 week of a known clinical insult or new/worsening respiratory symptoms

Bilateral opacities on CXR or chest CT not fully explained by effusions, lobar/lung collapse, or nodules

Respiratory failure not fully explained by cardiac failure or fluid overload (need objective assessment [eg, echocardiography] to exclude hydrostatic edema if no risk factor present)

Mild	PFR 201–300 mm Hg with PEEP or CPAP $\geq$5 cm H_2O
Moderate	PFR 101–200 mm Hg with PEEP $\geq$5 cm H_2O
Severe	PFR $\leq$100 mm Hg with PEEP $\geq$5 cm H_2O

Abbreviations: CPAP, continuous positive airway pressure; CT, computed tomography; CXR, chest radiograph; PEEP, positive end-expiratory pressure; PFR, Pao_2/fraction of inspired oxygen ratio.

From Ranieri VM, Rubenfeld GD, Thompson BT, et al. Acute respiratory distress syndrome: the Berlin definition. JAMA 2012;307(23):2526–33.