

## ACUTE RESPIRATORY FAILURE AND ACUTE RESPIRATORY DISTRESS SYNDROME



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Respiratory failure is a clinical condition that happens when the respiratory system fails to maintain its main function, which is gas exchange, in which PaO<sub>2</sub> lower than 60 mmHg and/or PaCO<sub>2</sub> higher than 50 mmHg.

Respiratory failure is classified according to blood gases abnormalities into type 1 and type 2. Type 1 (hypoxemic) respiratory failure has a PaO<sub>2</sub> < 60 mmHg with normal or subnormal PaCO<sub>2</sub>. In this type, the gas exchange is impaired at the level of alveolo-capillary membrane. Examples of type I respiratory failures are cardiogenic or non-cardiogenic pulmonary edema and severe pneumonia.

Type 2 (hypercapnic) respiratory failure has a PaCO<sub>2</sub> > 50 mmHg. Hypoxemia is common, and it is due to respiratory pump failure. Also, respiratory failure is classified according to its onset, course, and duration into acute or chronic.

The acute respiratory distress syndrome (ARDS) was first defined in 1967 in acute hypoxemia, non-cardiogenic pulmonary edema, reduced lung compliance, increased work of breathing, and the need for positive pressure ventilation in association with several clinical disorders like trauma, pneumonia, sepsis and aspiration cases [1]. In 1992, a consensus conference established specific diagnostic criteria for the syndrome; and these criteria were updated in 2012 in Berlin [2].

Common causes of type 1 (hypoxemic) respiratory failure	Common causes of type 2 ( hypercapnic) respiratory failure
Chronic bronchitis and emphysema	Chronic bronchitis and emphysema
Asthma	Asthma
Pneumonia	Drug overdose
Pulmonary edema	Poisoning
Pulmonary fibrosis	Myasthenia gravis Polyneuropathy Poliomyelitis
Pneumothorax	Primary muscle disorders Porphyria
Pulmonary embolism	Cervical cord disorders
Thromboembolic pulmonary hypertension Lymphatic carcinomatosis Pneumoconiosis	Primary alveolar hypoventilation Sleep apnea syndrome
Granulomatous lung disease	Pulmonary oedema
Cyanotic congenital heart disease	Acute respiratory distress syndrome Laryngeal oedema
Acute respiratory distress syndrome	Foreign body
Fat embolism	
Pulmonary arteriovenous fistulae	

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## REFERENCES:

1. Ashbaugh DG, Bigelow DB, Petty TL & Levine BE. Acute respiratory distress in adults. *Lancet* 2, 319–323 (1967).
2. Ranieri VM, Rubenfeld GD, Thompson BT, Ferguson ND et al. Acute respiratory distress syndrome: the Berlin Definition. *JAMA* 307, 2526–2533.
3. Pham T, Rubenfeld GD. Fifty Years of Research in ARDS. The Epidemiology of Acute Respiratory Distress Syndrome. A 50th Birthday Review. *Am J Respir Crit Care Med* 195, 860–870.
4. Mangialardi RJ, Martin GS, Bernard GR, Wheeler AP et al. Hypoproteinemia predicts acute respiratory distress syndrome development, weight gain, and death in patients with sepsis. Ibuprofen in Sepsis Study Group. *Crit Care Med* 28, 3137–3145 (2000).
5. Calfee CS, Matthay MA, Eisner MD, Benowitz N et al. Active and passive cigarette smoking and acute lung injury after severe blunt trauma. *Am J Respir Crit Care Med* 183, 1660–1665.
6. Bhattacharya J & Matthay MA. Regulation and repair of the alveolar-capillary barrier in acute lung injury. *Annu Rev Physiol* 75, 593–615.
7. Matthay MA. Resolution of pulmonary edema. Thirty years of progress. *Am J Respir Crit Care Med* 189, 1301–1308.
8. Matthay MA, Ware LB & Zimmerman GA. The acute respiratory distress syndrome. *J Clin Invest* 122, 2731–2740.
9. Katzenstein AL, Bloor CM, Leibow AA. Diffuse alveolar damage--the role of oxygen, shock, and related factors. A review. *Am J Pathol* 85, 209–228 (1976).
10. Zemans RL, Briones N, Campbell M, McClendon J et al. Neutrophil transmigration triggers repair of the lung epithelium via beta-catenin signaling. *Proc Natl Acad Sci U S A* 108, 15990–15995.
11. Quantius J, Schmoldt C, Vazquez-Armendariz AI, Becker C et al. Influenza Virus Infects Epithelial Stem/Progenitor Cells of the Distal Lung: Impact on Fgfr2b-Driven Epithelial Repair. *PLoS Pathog* 12, e1005544.
12. Ware LB, Koyama T, Billheimer DD, Wu W et al. Prognostic and pathogenetic value of combining clinical and biochemical indices in patients with acute lung injury. *Chest* 137, 288–296.
13. Rubenfeld GD, Caldwell E, Granton J, Hudson LD et al. Interobserver variability in applying a radiographic definition for ARDS. *Chest* 116, 1347–1353 (1999).
14. Ware LB, Fremont RD, Bastarache JA, Calfee CS et al. Determining the aetiology of pulmonary oedema by the oedema fluid-to-plasma protein ratio. *Eur Respir J* 35, 331–337.
15. Kao KC, Chiu LC, Hung CY, Chang CH et al. Coinfection and Mortality in Pneumonia-Related Acute Respiratory Distress Syndrome Patients with Bronchoalveolar Lavage: A Prospective Observational Study. *Shock* 47, 615–620.
16. Kor DJ, Carter RE, Park PK, Festic E et al. Effect of Aspirin on Development of ARDS in At-Risk Patients Presenting to the Emergency Department: The LIPS-A Randomized Clinical Trial. *JAMA* 315, 2406–2414.
17. Levitt JE, Bedi H, Calfee CS, Gould MK et al. Identification of early acute lung injury at initial evaluation in an acute care setting prior to the onset of respiratory failure. *Chest* 135, 936–943.
18. Brower RG, Matthay MA, Morris A, Schoenfeld D et al. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. *New England Journal of Medicine* 342, 1301–1308 (2000).
19. Parsons PE, Eisner MD, Thompson BT, Matthay MA et al. Lower tidal volume ventilation and plasma cytokine markers of inflammation in patients with acute lung injury. *Crit Care Med* 33, 1–6; discussion 230–232 (2005).
20. Thille AW, Esteban A, Fernandez-Segoviano P, Rodriguez JM et al. Comparison of the Berlin definition for acute respiratory distress syndrome with autopsy. *Am J Respir Crit Care Med* 187, 761–767.
21. Gattinoni L, Marini JJ, Pesenti A, Quintel M et al. The concept of “baby lung”. *Intensive Care Med* 31, 776–784.
22. Webb HH, Tierney DF. Experimental pulmonary edema due to intermittent positive pressure ventilation with high inflation pressures. Protection by positive end-expiratory pressure. *Am Rev Respir Dis* 110, 556–565.
23. Gattinoni L, Taccone P, Carlesso E, Marini JJ et al. Prone position in acute respiratory distress syndrome. Rationale, indications, and limits. *Am J Respir Crit Care Med* 188, 1286–1293.
24. Papazian LI, Aubron C2, Brochard L3, Chiche JD4 et al. Formal guidelines: management of acute respiratory distress syndrome. *Ann Intensive Care*. 2019 Jun 13;9(1):69.
25. National Heart L et al. Comparison of two fluid-management strategies in acute lung injury. *N Engl J Med* 354, 2564–2575.