

Diaphragmatic Unloading: A Physiological Explanation for the Benefits of Armchair Positioning

Jan van Egmond^{1,2*} , Jan Paul Mulier^{3,4}

¹Department Anesthesiology, Radboud University Medical Centre, Nijmegen, The Netherlands.

²Donders Institute for Brain, Cognition and Behaviour, Donders Centre for Cognition, Radboud University, Nijmegen, The Netherlands

³Faculty of Medicine and Health Sciences, Basic and applied medical sciences, Ghent University, Ghent, Belgium

⁴Department of Anesthesiology and Pain clinic, Ghent University Hospital, Ghent, Belgium

*Correspondence author: Jan van Egmond, PhD, Clinical Physicist, Department Anesthesiology, Radboud University Medical Centre, Nijmegen, The Netherlands and Donders Institute for Brain, Cognition and Behaviour, Donders Centre for Cognition, Radboud University, Nijmegen, The Netherlands;

Email: Jan.vanEgmond.kf@gmail.com

Letter to Editor

Body position is one of the simplest interventions capable of substantially altering pulmonary gas exchange in spontaneously breathing Intensive Care Unit (ICU) patients, yet the responsible physiological mechanism remains incompletely understood. A recent randomized trial has shown that transferring patients from a semi-recumbent bed position to an out-of-bed armchair improves oxygenation, whereas remaining in bed may be associated with progressive deterioration [1]. We propose that these observations are best explained not by upright posture per se, but by diaphragmatic unloading [2]. By allowing abdominal contents to move caudally, armchair positioning may lower pleural pressure, increase end-expiratory lung volume, reduce peripheral airway closure and improve recruitment of dependent lung regions [3]. Conversely, semi-recumbent positioning may promote cranial displacement of the diaphragm, increase pleural pressure and contribute to progressive loss of aeration. A striking clinical observation supports this hypothesis. Patients with dyspnea rarely choose to lie flat. Individuals with pulmonary edema, Chronic Obstructive Pulmonary Disease (COPD) exacerbations, obesity-related respiratory failure or other forms of respiratory distress typically adopt upright or forward-leaning positions [4]. This consistent behavior suggests that body position itself substantially influences respiratory mechanics. When sitting upright, abdominal contents tend to move caudally, reducing diaphragmatic load and increasing thoracic space. Historically, rocking beds exploited the same principle: cyclic body tilting altered diaphragmatic position and thoracic volume, generating ventilation. Importantly, “upright” does not necessarily imply “unloaded.” In an armchair, abdominal contents may move caudally, but in some patients, particularly those with central obesity, 90° hip flexion, sliding or pelvic restraints may increase abdominal

Citation: Van Egmond J, et al. Diaphragmatic Unloading: A Physiological Explanation for the Benefits of Armchair Positioning. *Jour Clin Med Res.* 2026;7(2):1-2.

<https://doi.org/10.46889/JCMR.2026.7213>

Received Date: 06-07-2026

Accepted Date: 20-07-2026

Published Date: 27-07-2026



Copyright: © 2026 The Authors. Published by Athenaem Scientific Publishers.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

License URL:

<https://creativecommons.org/licenses/by/4.0/>

compression and offset this benefit. This is physiologically relevant, since we previously reported that 30° hip flexion during laparoscopy can reduce intra-abdominal pressure in obese patients, whereas 90° hip flexion has, to our knowledge, not been measured [5]. This may explain why exploratory BMI ≥ 35 kg/m² subgroup analyses showed less evident benefit from armchair positioning. Although underpowered, this observation remains physiologically plausible. Unchanged HFNO flow, positive end-expiratory pressure or pressure support does not exclude altered patient effort. If armchair positioning reduces diaphragmatic loading, the same level of respiratory support may be associated with lower inspiratory muscle pressure, lower work of breathing and improved regional ventilation. Future studies should therefore incorporate measurements of intra-abdominal pressure, oesophageal pressure as a surrogate for pleural pressure, diaphragmatic position and end-expiratory lung volume. Such measurements may clarify whether the physiological benefits of armchair positioning primarily reflect diaphragmatic unloading, reduced pleural pressure and prevention of peripheral airway closure.

Keywords: Armchair Positioning; Pulmonary Gas Exchange; Hip Flexion; Peripheral Airway Closure

Conflict of Interest

Apart from their university/hospital affiliations, both authors (JvE and JPM) are members of the Exovent Developing Group, which is a UK registered charity (no. 1189967:10 Queen St Pl, London EC4R 1BE, UK.) <https://exovent.org>. None of the authors is receiving any honoraria from this charity. On behalf of all authors, the corresponding author states that there is no conflict of interest. JPM reports payments or honoraria from Medec international outside the submitted work. JPM is a member of a Belgium registered charity ESPCOP vzw (no. 1030137921: Beukenpark 19, 9930, Lievegem, BE). <https://escop.eu> and co-founder of MT4L, <https://mt4l.com>, a company developing not related airway products.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Acknowledgement

The authors have no acknowledgments to declare.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement

The project did not meet the definition of human subject research under the preview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement

Not applicable.

Authors' Contributions

All authors contributed equally to this paper.

References

1. Fossat G, Muller L, Seguin A, Mathonnet A, Pinos S, Kamel T, et al. Effects of out-of-bed armchair positioning on oxygenation in spontaneously breathing ICU patients receiving respiratory support: A randomized controlled trial. *Intensive Care Med.* 2026;52:1222-34.
2. Pelosi P, Croci M, Calappi E, Cerisara M, Mulazzi D, Vicardi P, et al. The prone positioning during general anesthesia minimally affects respiratory mechanics while improving functional residual capacity and increasing oxygen tension. *Anesth Analg.* 1995;80(5):955-60.
3. van Egmond J, Booi LHDJ. The role of pleural pressure in inducing pneumothorax and other adverse effects of positive pressure ventilation. *J Thorac Dis.* 2024;16(11):8103-9.
4. Katz S, Arish N, Rokach A, Zaltzman Y, Marcus EL. The effect of body position on pulmonary function: A systematic review. *BMC Pulm Med.* 2018;18(1):159.
5. Mulier JP, Dillemans B, Van Cauwenberge S. Impact of the patient's body position on the intraabdominal workspace during laparoscopic surgery. *Surg Endosc.* 2010;24(6):1398-402.

About the journal



Journal of Clinical Medical Research is a peer-reviewed, open-access scholarly journal published by Athenaeum Scientific Publishers. The journal publishes original research articles, case reports, reviews, editorials, and commentaries within its defined scope, with the aim of supporting scientific research and clinical knowledge in clinical and medical research.

All manuscripts are evaluated through an independent peer-review process conducted in accordance with the journal's editorial policies and established publication ethics. Editorial decisions are made solely on the basis of academic merit.

Manuscript submission: <https://athenaeumpub.com/submit-manuscript/>