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Mortality in mechanically ventilated patients in middle-income countries: a call for action

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Both before and during the current COVID-19 pandemic, differences in access to health-care systems between different populations and countries were well known.[1] However, there are still few data that can demonstrate whether, once admitted into an intensive care unit (ICU), a patient intubated on mechanical ventilation will be more or less likely to survive just by being in a higher-income or lower-income country.

In *The Lancet Global Health*, Luigi Pisani and colleagues[2] present a study comparing patients without acute respiratory distress syndrome (ARDS) in ICUs in middle-income countries (MICs) and higher-income countries (HICs). The authors did a pooled analysis of four large prospective observational studies (published between 2013 and 2021) through the cooperation of different study centres and their coordinators. With the data from individual patients grouped together it was possible to reassess associations between epidemiological, interventions (particularly ventilatory strategies), and outcome variables in patients admitted to the ICU and submitted to mechanical ventilation without ARDS.

Interestingly, the authors found that the use of low tidal volumes (<8 mL/kg predicted weight) was similar in MICs and HICs (42·4% *vs* 44·2%; absolute difference −1·69% [95% CI −9·58 to 6·11]; p=0·67), as were most ventilatory parameters (except for a small decrease in positive end expiratory pressure in the ICUs in MICs than in HICs (5 [IQR 5–8] *vs* 6 [5–8] cm H2O; p=0·0011). However, ICU mortality was much greater in MICs than in HICs (30·5% *vs* 19·9%; p=0·0004; adjusted effect 16·41% [95% CI 9·52–23·52]; p<0·0001). A higher mortality in MICs has been found in other acute clinical entities, such as sepsis and cardiovascular diseases.[3–5] However, given the heterogeneity of these clinical conditions, an assessment of patients with more severe disease (such as those undergoing invasive mechanical ventilation) allows a better filter to compare strategies and outcomes between MIC and HIC ICU teams.

Several highlights deserve to be pointed out in relation to the data presented by Pisani and colleagues. First, although pooled analyses test hypotheses better than meta-analysis from individual studies, they cannot assess data that are not available in the original studies. The study by Pisani and colleagues could assess demographic, clinical, and intervention data (related to mechanical ventilation itself) and correlate them with outcome. But mechanical ventilation is a procedure whose outcome depends a lot on how it is conducted (process), how complications are prevented and treated, and on co-interventions. These variables could not be analysed by Pisani and colleagues. Why mortality in patients in MICs is higher than in patients in HICs is a question that needs to be answered for the gap to be corrected.

Second, it is important to emphasise that the evaluated patients, despite being submitted to invasive mechanical ventilation, did not have ARDS (the most devastating respiratory condition and with the highest mortality in intensive care) at admission, although several patients were at high risk of developing ARDS.

Third, due to the characteristics of the studies and the lack of data on patients from low-income countries (LICs), the authors could only assess the MIC data. Even so, it is impressive that there was a big difference in mortality compared with HICs. It can be speculated, therefore, that patients' outcomes in LICs could be even worse.

Fourth, it is noteworthy that, despite relatively similar mechanical ventilation strategies (the main focus of the study), MICs had higher ICU mortality. This finding could lead to a false idea that the choice or implementation of a ventilatory strategy does not have such a significant impact on the mortality of these patients. In fact, the findings by Pisani and colleagues show that the challenge of improving urgent and emergency care in MICs is even greater than and that other (possibly multiple) factors must have influenced this higher mortality. Some of these factors have already been shown in previous analyses in MIC hospitals: worse outpatient health care, fewer (and perhaps lesser qualified) health professionals (particularly nursing), greater number of comorbidities, and lower availability of hospital and ICU beds (thus selecting patients with more severe conditions and more advanced clinical conditions).[6–8] All of these factors are probably related to socioeconomic conditions per se, perhaps more than to the ventilatory strategy.

Finally, it should be noted that, despite the fact that this study did not find differences in outcomes (mortality) between MICs and HICs directly related (or attributed) to mechanical ventilation, it should not be forgotten that the careful strategy of mechanical ventilation, minimising stress and strain of the alveolar parenchyma, in addition to allowing adequate patient and machine interaction and reducing diaphragmatic injury and dys-synchrony, are among the most revolutionary advances in the care of critically ill patients.

Pisani and colleagues make an important contribution to filling the knowledge gap about the care and outcomes of patients with mechanical ventilation, particularly in MICs. However, the authors reveal a more complex issue: the in-hospital and pre-hospital care for acute illnesses in MICs. We hope this spurs the international community to find solutions for an equitable commitment to better care for critically ill patients globally.

We declare no competing interests.

*Pericles A D Duarte, Alvaro Rea-Neto
pericles.duarte@uol.com.br

UNIOESTE, CEPETI Center for Study and Research in Intensive Care Medicine, Hospital Evangélico Mackenzie, Curitiba 80730-150, Brazil (PADD); Federal University of Paraná, CEPETI Center for Study and Research in Intensive Care Medicine, Curitiba, Paraná, Brazil (AR-N)

1 Dieleman JL, Templin T, Sadat N, et al. National spending on health by source for 184 countries between 2013 and 2040. *Lancet* 2016; **387:** 2521–35.
2 Pisani L, Algera AG, Serpa Neto A, et al. Geoeconomic variations in epidemiology, ventilation management, and outcomes in invasively ventilated intensive care unit patients without acute respiratory distress syndrome: a pooled analysis of four observational studies. *Lancet Glob Health* 2021; published online Dec 13. https://doi.org/10.1016/S2214-109X(21)00485-X.
3 Katan M, Luft A. Global burden of stroke. *Semin Neurol* 2018; **38:** 208–11.
4 Rudd KE, Kissoon N, Limmathurotsakul D, et al. The global burden of sepsis: barriers and potential solutions. *Crit Care* 2018; **22:** 232.
5 Roth GA, Mensah GA, Johnson CO, et al. Global burden of cardiovascular diseases and risk factors, 1990-2019: update from the GBD 2019 Study. *J Am Coll Cardiol* 2020; **76:** 2982–3021.
6 Salluh JIF, Soares M, Singer M. Spreading the knowledge on the epidemiology of sepsis. *Lancet Infect Dis* 2017; **17:** 1104–06.
7 Murthy S, Leligdowicz A, Adhikari NK. Intensive care unit capacity in low-income countries: a systematic review. *PLoS One* 2015; **10:** e0116949.
8 Guérin C, Lévy P. Easier access to mechanical ventilation worldwide: an urgent need for low income countries, especially in face of the growing COVID-19 crisis. *Eur Respir J* 2020; **55:** 2001271.