

Daniele De Luca<sup>a,b,\*</sup>, Martin Kneyber<sup>c,d</sup>,  
Peter C. Rimensberger<sup>e</sup>

<sup>a</sup> *Division of Pediatrics and Neonatal Critical Care, Department of FAME, South Paris University Hospitals, Medical Center "A.Béclère" – APHP, Paris, France*

<sup>b</sup> *Institute of Anesthesiology and Critical Care, Catholic University of the Sacred Heart, Rome, Italy*

<sup>c</sup> *Department of Pediatrics, Division of Pediatric Intensive Care, Beatrix Children's Hospital, University Medical Center Groningen, Groningen, The Netherlands*

<sup>d</sup> *Peri-operative Medicine and Emergency Medicine (CAPE), University of Groningen, Groningen, The Netherlands*  
<sup>e</sup> *Service of Neonatology and Pediatric Critical Care, Department of Pediatrics, University Hospital of Geneva, Geneva, Switzerland*

\* Corresponding author.

E-mail: [dm.deluca@icloud.com](mailto:dm.deluca@icloud.com) (D. De Luca).

<http://dx.doi.org/10.1016/j.jpmed.2013.12.003>

## ARDS definitions in children: one step forward<sup>☆</sup>

### Definições da SDRA em crianças: um passo adiante

Dear Sir,

It was with great interest and pleasure that we read the Letter to the Editor entitled "International collaborative research for pediatric and neonatal lung injury: the example of an ESPNIC initiative to validate definitions and formulate future research questions" by Daniele De Luca et al.<sup>1</sup> The authors commented that the European Society for Pediatric and Neonatal Intensive Care (ESPNIC) published the first validation of the acute respiratory distress syndrome (ARDS) Berlin Definition (BD) in early childhood.<sup>2</sup> Members of the ESPNIC Respiratory Section performed a retrospective international (Italy, Spain, France, Austria, and the Netherlands) multicenter study including children aged between 30 days and 18 months with ARDS according to the American-European Consensus Conference (AECC) criteria.<sup>3</sup> It elegantly addresses our concerns on the applicability of BD in pediatrics when we described the evolution of ARDS definitions.<sup>4</sup>

A time lapse between the two publications prevented exact connections between them; now is the opportunity to do so. The BD<sup>5</sup> for adults and children is an advance, in the sense that ARDS stratification is important for diagnosis and treatment. However, it was obvious that pediatricians working in clinical or basic research needed to validate the new data in children. The work performed by The Respiratory Section of ESPNIC<sup>2</sup> enrolled 221 children, median age 6 months (range 2-13 months), which were categorized according to the two definitions. The authors found very interesting and important results. Applying AECC, 36 children were classified as ALI and 185 as ARDS, with mortality rates of 13.9% and 17.8%, respectively. Conversely, 36 were classified as mild, 97 as moderate, and 88 as severe ARDS

when applying the BD. The BD described the clinical situation better than AECC, with similar results published in adults. Also, the main outcomes were significantly different only for severe ARDS; mortality was 13.9% for mild ARDS, 11.3% for moderate ARDS, and 25% for severe ARDS. They did not find significant differences between mild and moderate classes. However, the inclusion of a severe category in the BD helped to increase its validity. Despite not aimed at identifying risk factors and their association with ARDS, some were presented (sepsis, near-drowning, congenital immunodeficiencies, thoracic trauma, etc.). As expected, they are different than those in the adult population. A properly designed study is therefore necessary to address this issue. The authors concluded that the new ARDS definition correctly adjusts and is able to define the syndrome in its population, subdividing it into mild/moderate and severe ARDS.

Some limitations were addressed. Firstly, the number of patients included was not large. This is a difficulty in all pediatric studies, as populations of children in intensive care are much smaller than those of adults. Secondly, clinical data was not correlated with lung morphology. However, lung biopsy is not commonly performed in critically ill children.

The Brazilian Pediatric ARDS Study Group<sup>6</sup> performed a prospective, multicentre cohort study from March to September of 2013, which aimed: (1) to evaluate the prevalence of ARDS; (2) to determine risk factors for ARDS; and (3) to evaluate whether the use of BD in critically ill children can better discriminate the severity of the disease compared with the AECC definition. The distribution and outcomes of the patients according to the AECC and BD are shown in [Table 1](#).

The BD better discriminates the severity of ARDS in children when compared to the AECC definition, as shown by the incremental increase in mortality rates and reduced number of ventilation-free days in patients with severe ARDS.

In summary, we congratulate De Luca et al.<sup>2</sup> for their timely study, and thank them for their comments. From now on, the pediatric community involved in critical care and emergency medicine, of which we are members, has specific parameters to compare when studying such a serious disease as ARDS in children. Moreover, we look forward to the authors taking a similar initiative in Latin America and other future projects.

DOI of refers to article: <http://dx.doi.org/10.1016/j.jpmed.2013.12.003>

<sup>☆</sup> Please cite this article as: Fioretto JR, de Carvalho WB. ARDS definitions in children: one step forward. *J Pediatr* (Rio J). 2014;90:211-2.

**Table 1** Distribution and outcomes of the patients according to the American European Consensus Conference (AECC) and the Berlin Definition.

	AECC (n = 58)		Mild	Berlin Definition (n = 57)	
	ALI	ARDS		Moderate	Severe
Number of patients (%)	10 (17)	48 (82.7)	9 (15.7)	21 (36.8)	27 (47.3)
MV only (%)	9 (90)	48 (100)	9 (100)	21 (100)	17 (100)
Received additional NIV	4 (40)	16 (33.3)	4 (44.4)	7 (33.3)	9 (52)
Ventilator free days (median, IQR)	22 (20-24)	14 (0-20)	22 (0-25)	20 (0-27)	5 (0-23)
PICU LOS	10	12.5	11 (8-20)	12 (8.7-15.2)	15 (11-20)
Hospital LOS	16.5	26	19 (13-25.5)	19.5 (17.5-35.5)	26 (14.7-37)
Mortality n (%)	0 (0)	14 (30.4)	0 (0)	3 (14.3)	11 (42.3)

ALI, acute lung injury; ARDS, acute respiratory distress syndrome; LOS, length of stay; MV, mechanical ventilation; NIV, noninvasive mechanical ventilation; PICU, pediatric intensive care unit.

## Conflicts of interest

The authors declare no conflicts of interest.

## References

- De Luca D, Kneyber M, Rimensberger PC. International collaborative research for pediatric and neonatal lung injury: the example of an ESPNIC initiative to validate definitions and formulate future research questions. *J Pediatr (Rio J)*. 2014;90:209–11.
- De Luca D, Piastra M, Chidini G, Tissieres P, Calderini E, Essouri S, et al. The use of the Berlin definition for acute respiratory distress syndrome during infancy and early childhood: multi-center evaluation and expert consensus. *Intensive Care Med*. 2013;39:2083–91.
- Bernard GR, Artigas A, Brigham KL, Carlet J, Falke K, Hudson L, et al. The American-European Consensus Conference on ARDS. *Am Rev Respir Dis*. 1994;149:818–24.
- Fioretto JR, de Carvalho WB. Temporal evolution of acute respiratory distress syndrome definitions. *J Pediatr (Rio J)*. 2013;89:523–30.
- ARDS Definition Task Force, Ranieri VM, Rubenfeld GD, Thompson BT, Ferguson ND, Caldwell E, et al. Acute respiratory distress syndrome: the Berlin Definition. *JAMA*. 2012;307:2526–33.
- Barreira ER, Shieh HH, Suzuki AS, Ortega G, Degaspere N, Cavalheiro P, et al. Epidemiology and outcomes of ARDS in critically ill children according to the Berlin definition: a prospective study. (unpublished data).

José R. Fioretto<sup>a,\*</sup>, Werther B. de Carvalho<sup>b</sup>

<sup>a</sup> Department of Pediatrics, Universidade do Estado de São Paulo (UNESP), Botucatu, SP, Brazil

<sup>b</sup> School of Medicine, Universidade de São Paulo (USP), São Paulo, SP, Brazil

\* Corresponding author.

E-mail: [jrf@fmb.unesp.br](mailto:jrf@fmb.unesp.br) (J.R. Fioretto).

<http://dx.doi.org/10.1016/j.jpmed.2013.12.004>