

- Comte Hospital, France. *Microorganisms*. 2021;9:1719, <http://dx.doi.org/10.3390/microorganisms9081719>.
2. Belletti A, Palumbo D, Zangrillo A, Fominskiy EV, Franchini S, Dell'Acqua A, et al. Predictors of pneumothorax/pneumomediastinum in mechanically ventilated COVID-19 patients. *J Cardiothorac Vasc Anesth*. 2021;35:3642–51, <http://dx.doi.org/10.1053/j.jvca.2021.02.008>.
  3. Nasa P, Juneja D, Jain R. Air leak with COVID-19 – a meta-summary. *Asian Cardiovasc Thorac Ann*. 2021;11, <http://dx.doi.org/10.1177/02184923211031134>.
  4. Yang F, Shi S, Zhu J, Shi J, Dai K, Chen X. Analysis of 92 deceased patients with COVID-19. *J Med Virol*. 2020;92:2511–5, <http://dx.doi.org/10.1002/jmv.25891>.
  5. Ozsoy IE, Tezcan MA, Guzeldag S, Ozdemir AT. Is spontaneous pneumomediastinum a poor prognostic factor in Covid-19? *J Coll Physicians Surg Pak*. 2021;31:132–7, <http://dx.doi.org/10.29271/jcsp.2021.02.132>.
  6. Lund LC, Hallas J, Nielsen H, Koch A, Mogensen SH, Brun NC, et al. Post-acute effects of SARS-CoV-2 infection in individuals not requiring hospital admission: a Danish population-based cohort study. *Lancet Infect Dis*. 2021;21:1373–82, [http://dx.doi.org/10.1016/s1473-3099\(21\)00211-5](http://dx.doi.org/10.1016/s1473-3099(21)00211-5).
  7. Macedo A, Gonçalves N, Febra C. COVID-19 fatality rates in hospitalized patients: systematic review and meta-analysis. *Ann Epidemiol*. 2021;57:14–21, <http://dx.doi.org/10.1016/j.annepidem.2021.02.012>.
  8. Pandit RA, Gagana B, Vaitya C, Mulakavalupil B, Choudhary JS, Jain V, et al. Clinical characteristics and outcomes of COVID-19 patients hospitalized in intensive care unit. *Indian J Crit Care Med*. 2021;25:992–1000.
  9. Sabharwal P, Chakraborty S, Tyagi N, Kumar R, Taneja A. Spontaneous air-leak syndrome and COVID-19: a multifaceted challenge. *Indian J Crit Care Med*. 2021;25:584–7, <http://dx.doi.org/10.5005/jp-journals-10071-23819>.
  10. Mallick T, Ramcharan MM, Dinesh A, Hasan M, Engdahl R, Ramcharan A. Clinical course of mechanically ventilated COVID-19 patients with pneumothoraces. *Cureus*. 2021;13:e16704, <http://dx.doi.org/10.7759/cureus.16704>.

D. Juneja\*, A. Goel, O. Singh, S. Kataria, A. Gupta, A. Singh

*Institute of Critical Care Medicine, Max Super Speciality Hospital, Saket, New Delhi 110017, India*

\*Corresponding author.

E-mail address: [devenjuneja@gmail.com](mailto:devenjuneja@gmail.com) (D. Juneja).

0210-5691/ © 2022 Elsevier España, S.L.U. y SEMICYUC. All rights reserved.

## Gastric residual volume management in pediatric intensive care units in Spain and Latin America



### Manejo del volumen gástrico residual en las unidades de cuidados intensivos pediátricos de España y Latinoamérica

Dear Editor:

The measurement of residual gastric volume (RGV) is often used as a marker of digestive intolerance in critically ill patients.<sup>1</sup> However, the most recent evidence available reveals that this practice does not reduce pneumonia<sup>2</sup> and leads to unnecessary interruptions of enteral nutrition (EN).<sup>3,4</sup> For this reason, it is ill-advised in some of the most recent clinical practice guidelines that do not recommend it on a routine basis in critically ill patients.<sup>4</sup>

To understand the management of RGV in Spanish and Latin American pediatric intensive care units (PICU) and check their compliance to the new recommendations established, we conducted a multicenter, prospective study through an electronic survey that was submitted to the different scientific societies. The final survey included 16 questions divided into the following sections: location and type of pediatric intensive care unit (PICU), personnel dedicated to the management of nutrition, route of administration of EN, measurement and management of RGV, and use of prokinetic drugs.

Statistical analysis was conducted using the SPSS 25 statistical software package (SPSS Inc, Chicago, IL, United States). Categorical variables were expressed as frequency and percentage and compared using the chi-square test.  $P$  values  $\leq .05$  were considered statistically significant.

A total of 21 PICUs from 5 different countries participated, 76.2% of which were Spanish PICUs and 23.8% Latin American PICUs; 18 (85.7%) were pediatric intensive care units only and 3 of them (14.3%) were mixed care units (pediatric and neonatal).

Two of the PICUs (9.5%) had between 1 and 5 beds, 12 (57.1%) between 6 and 10 beds while 7 PICUs (33.4%) had >10 beds. Only 38.1% of all PICUs said they had somebody in charge of handling nutrition; the participation of this person was much more common in PICUs > 10 beds (71.4% vs 21.4%;  $P = .026$ ).

Mixed teams were responsible for the management of nutrition in 62.5% of all PICUs and they included an intensivist plus a gastroenterologist, and less commonly a gastroenterologist plus a nutritionist. In the remaining 37.5%, the person responsible for EN was an intensivist (25%) or a gastroenterologist (12.5%).

The most common route of administration of EN was continuous nasogastric tube (47.7%), then discontinuous nasogastric tube (38%) followed by transpyloric tube (14.3%). The process of selecting the route of administration of EN had nothing to do with the number of beds.

Most PICUs (71.4%) measured gastric remains without any significant differences being reported between Spanish and Latin American PICUs or among the PICUs that had someone

in charge of nutrition and those that did not. However, statistically significant differences were found when this practice was analyzed in association with the number of beds in such a way that 100% of PICUs with >10 beds measured the RGV vs 57.1% of PICUs  $\leq$  10 beds ( $P = .04$ ).

Fifty per cent of the units that measured the RGV did so only once per shift while 50% measured it more than just once.

The measurement of the RGV was used as a marker of digestive intolerance and led to changes in the administration of EN in 11 of the PICUs being surveyed (52.4%) with shorter times of EN in 42.9% of the PICUs, nutrition withdrawal in 4.8% of the PICUs, and changes to the route of administration in 4.8% of the cases. A total of 47.6% of the PICUs did not change EN due to presence of large gastric remains unless there were more data indicative of other type of digestive intolerance.

The person responsible for stopping or reducing EN was the doctor (85.7%) and, to a lesser extent, the nursing team (4.8%). In 9.5% of the PICUs this decision had nothing to do with the healthcare professional in charge.

The RGV considered as an indicator of digestive intolerance that was used as a threshold to change EN was a RGV  $\geq$  50% of the volume administered in 57.1% of the PICUs and  $\geq$  75% in 9.5% of the PICUs.

Regarding the approach towards the type of gastric remains, 33.3% of the PICUs got rid of the gastric remains, 9.5% reintroduced it after measurement, and 57.1% acted based on the type of remains found.

A total of 57.1% of the PICUs used prokinetic drugs on a routine basis. Prokinetic drugs most commonly used were erythromycin (35.7%) and metoclopramide (35.7%) followed by domperidone (14.3%). A total of 14.3% of the PICUs used these 3 drugs independently.

Out of all the PICUs were the measurement of the RGV meant an interruption or reduction of the administration of EN it was seen that, though most of them (70%) used these drugs, a significant percentage of these (30%) did not use prokinetic drugs for the management of excessive gastric remains.

Our study shows that, same as it happens in other countries,<sup>5</sup> the measurement of RGV is still a common practice of Spanish and Latin American PICUs. Also that, on many occasions, it leads to less EN and, as a consequence, to the administration of a lower caloric intake.<sup>3</sup> Although prokinetic drugs can improve digestive intolerance in critically ill patients<sup>6</sup> their use is not a common thing in PICUs and even a significant percentage of these PICUs that drop or reduce EN if the RGV is high do not even use them.

We should mention that both the measurement of RGV and the availability of expert personnel in the management of EN were more common in PICUs with more beds available, which could be explained by the fact that the largest PICUs often have more resources available.

## Funding

None whatsoever.

## Conflicts of interest

None reported.

## Acknowledgement

We wish to thank the participation of all Spanish and Latin American PICUs that responded to this survey.

## References

- Solana MJ, López-Herce J, López J. Feed intolerance and postpyloric feeding in the critically ill child. *Pediatric Med.* 2020;3:19.
- Faramarzi E, Mahmoodpoor A, Hamishehkar H, Shadvar K, Iranpour A, Sabzevari T, et al. Effect of gastric residual volume monitoring on incidence of ventilator-associated pneumonia in mechanically ventilated patients admitted to intensive care unit. *Pak J Med Sci.* 2020;36:48–53.
- Tume LN, Bickerdike A, Latten L, Davies S, Lefèvre MH, Nicolas GW, et al. Routine gastric residual volume measurement and energy target achievement in the PICU: a comparison study. *Eur J Pediatr.* 2017;176:1637–44.
- Tume LN, Valla FV, Joosten K, Jotterand Chaparro C, Latten L, Marino LV, et al. Nutritional support for children during critical illness: European Society of Pediatric and Neonatal Intensive Care (ESPNIC) metabolism, endocrine and nutrition section position statement and clinical recommendations. *Intensive Care Med.* 2020;46:411–25.
- Tume L, Carter B, Latten L. A UK and Irish survey of enteral nutrition practices in paediatric intensive care units. *Br J Nutr.* 2013;109:1304–22.
- Peng R, Li H, Yang L, Zeng L, Yi Q, Xu P, et al. The efficacy and safety of prokinetics in critically ill adults receiving gastric feeding tubes: a systematic review and meta-analysis. *PLoS One.* 2021;16:e0245317.

M.J. Solana<sup>a,\*</sup>, G. Manrique<sup>a,b,c</sup>, J. López<sup>a,b,c</sup>, M. Slocker<sup>a,b,c</sup>, J. López-Herce<sup>a,b,c</sup>

<sup>a</sup> Hospital General Universitario Gregorio Marañón, Madrid, Spain

<sup>b</sup> Red de Salud Materno-Infantil del Desarrollo (Red SAMID)

<sup>c</sup> Instituto de investigación, Hospital General Universitario Gregorio Marañón, Madrid, Spain

Corresponding author.

E-mail address: [mjsolana@hotmail.com](mailto:mjsolana@hotmail.com) (M.J. Solana).

2173-5727/ © 2022 Published by Elsevier España, S.L.U.