nonlinear method—the Hilbert-Huang transform—Machado and Estevez-Baez (1) have shown that heart rate variability can also efficiently predict mortality in a cohort of comatose patients. This promising methodology may improve the use of heart rate variability as a predictor of mortality in critically ill children and needs to be validated in larger, prospective studies.

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The Role of Lung Ultrasound in Diagnosis and Follow-Up of Children With Coronavirus Disease 2019

To the Editor:

Since December 2019, starting from Wuhan, in the province of Hubei in China, a new pathogen called severe acute respiratory syndrome coronavirus 2 has spread all over the world. To date, have been reported 2,074,529 confirmed cases and 139,378 deaths attributable to coronavirus disease 2019 (COVID-19) (1).

In their recent article published in *Pediatric Critical Care Medicine*, Ong et al (2) confirm that children have milder forms than adults of COVID-19 and the use of CT scan should be limited and nonroutine.

During a pandemic, it is necessary to guarantee the highest standards of care for the patients and the maximum safety for healthcare workers, using the least number of healthcare workers and medical devices (3). Undoubtedly, this work is very important for the diagnosis and the clinical management of COVID-19 in childhood. Soldati et al (4) highlighted how lung ultrasound (LUS) patterns of subjects with COVID-19 pneumonia are quite characteristic.

In our opinion, LUS is helpful in diagnosis and in follow-up management of the COVID-19 children.

LUS is useful to complement the clinical evaluation and to monitor the evolution of lung disease until its resolution. In fact, the same operator can perform clinical examination and lung imaging bedside to the patient, thus reducing the risk of virus diffusion due to patient displacement from visit room in x-ray room when is in hospital or moving the patient from home to hospital after the discharge. The LUS is performed with an ultrasound pocket device and a probe put in a transparent,

single-use plastic cover (5). The pediatrician selects a convex or a linear probe according to the patient's body size. Ultrasound transmission gel in single use package is chosen to eliminate cross-contaminations. A single operator is required in order to reduce all possible contaminations. The pediatrician carries out the complete clinical check and performs the LUS in only 10 minutes.

For the analysis of the whole thorax, we suggest an ideal subdivision in 12 parts: anterior right and left (apical and basal), posterior right and left (apical and basal), and axillary right and left (apical and basal).

At the end of the procedure, in a dedicated area, the used cover will be easily removed, ultrasound pocket device will be disinfected and subsequently covered with a new plastic bag.

In conclusion, we believe that LUS can improve COVID-19 outcomes, allowing an adequate and safer management of the disease in emergency department and during follow-up.

The authors have disclosed that they do not have any potential conflicts of interest.

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The authors reply:

We thank Drs. Musolino and Supino (1) for their useful commentary on the role of lung ultrasound in the diagnosis and management of children with coronavirus disease 2019 (COVID-19) (2), recently published in *Pediatric Critical Care Medicine*. From a number of perspectives, ultrasound can be seen as a very valuable tool in the management of these patients. The ability to limit providers in patients' rooms is hugely important, so if valuable diagnostic information and management guidance can be obtained without new added machinery or individuals, this would be wonderful. One of the challenges in its wide-scale implementation is ensuring adequate training

of users and inter-operator standardization (3). Given the limited currently available data on its role in children with COVID-19, we look forward to seeing data emerge on its ability to discriminate severity and guide management in children with COVID-19.

Dr. Kim disclosed off-label product use of remdesivir, lopinavir/ritonavir, favipiravir, chloroquine, and a number of other agents. The remaining authors have disclosed that they do not have any potential conflicts of interest.

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Pediatric Sepsis Worldwide: Understand to Improve Outcomes

To the Editor:

We read with great interest the article published in a recent issue of *Pediatric Critical Care Medicine* by Xiao et al (1). Despite numerous advances in treatment and supportive care over the last years, sepsis remains the most important risk factor for child mortality worldwide, in both developing and developed countries, thus being a global health problem (2). However, as the authors put it well, most epidemiologic and clinical studies in pediatric sepsis come from developed/high-income countries.

Therefore, new epidemiologic studies in pediatric sepsis, especially from low-and middle-income countries, are most welcome. Still, when it comes to developing countries of continental proportions, such as China or Brazil, for example, where there is heterogeneity of health access, available resources and economic conditions (1, 3, 4), we believe that conducting regional studies or randomized observational studies with national representativeness and comparison between different regions are fundamental for the

situational understanding of pediatric sepsis and to improve septic patients outcomes.

Xiao et al (1) presented prevalence, treatment, and outcomes of pediatric severe sepsis in a prospective and multicenter study of eight tertiary PICU in Southwest China. Conducting such study in a populated region involving prior training of researchers would be worthy of great merit. But other strengths should also be recognized, such as high rate of culture collection prior to antibiotic therapy, as well as high rate of antimicrobial treatment (although we are not aware of time between diagnosis and antibiotic administration).

The results corroborate previous data of pediatric severe sepsis, such as higher prevalence in infants, respiratory tract as the main infection site, presence of multiple organ dysfunction syndrome as early as the diagnosis and consequent high early mortality in these patients (2, 4).

However, some points deserve further clarification. First, authors reported a low prevalence of PICU severe sepsis (2.3%), different from that reported in literature. Weiss et al (2) reported a global prevalence of 8.2% and 15.3% in Asia; Wang et al (3) in 2014 showed 5.5% in another China region. Might this result from the high number of excluded patients or health investment in primary/preventive care in this region?

Second, despite recommendations to use epinephrine as first-line therapy in fluid hypodynamic refractory shock (5), dopamine was used in 51.4% of patients. Current guidelines recommend dopamine only when epinephrine is not available, since studies have shown benefits of using epinephrine in pediatric shock, including safety in initial phase even in peripheral venous access (6). Was epinephrine available in these centers or just dopamine and dobutamine? Another point to be considered as the report of “prophylactic” use of vasoactive agents, a recommendation unknown to us.

Surprising attention was also drawn to the use of immunoglobulin in 88.3% of patients, although there is no guideline recommending its routine use in septic patients since there is no strong evidence for its use.

Finally, it caught our attention that 11 patients died after a parental decision to withdraw from further treatment because of treatment difficulties, including economic burden and severe sequela. At a time when end-of-life trajectories have been increasingly discussed in intensive care and considering that 31.4% of the patients studied had underlying diseases, we wondered if the participating centers had a palliative care service and if supportive weaning described was related only when there was financial reasons or if all these patients had no healing perspective and futility was a reality. Despite all the particularities, the mortality reported by the authors is compared to recent literature data.

Studies as these are very important to understand pediatric sepsis epidemiology in different scenarios with different approaches. Understanding the real status of pediatric sepsis worldwide will enable us to join efforts to improve (and standardize) treatment and reduce pediatric sepsis burden.