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# Critically ill patients with COVID-19: are they hemodynamically unstable and do we know why?

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Dear Editor,

More than 6 months after the inception of the coronavirus disease 2019 (COVID-19) pandemic, little has been published regarding the hemodynamic complications. We read with interest the multicenter case series published by Xie et al. [1]. Although they focused on the lungs, like most reports on COVID-19 critically ill patients published so far, they also shared new information about the hemodynamic status of these patients. Indeed, they mentioned that 20% had shock and 40% required vasopressor support.

These findings are somewhat contradictory since septic shock is classically defined by the need to administer vasopressors in sepsis, so that we expect a rate of “shock” at least as high as the rate of “vasopressor support”. Unfortunately, a clear definition of shock was missing in the manuscript. In the methods section, the authors simply mentioned that “individual organ failure was defined as a component SOFA score greater than 2”. The cardiovascular SOFA score of patients receiving dopamine (>5 µg/kg/min) or norepinephrine or epinephrine is 3 or 4. Therefore, in case shock was defined by a cardiovascular SOFA score greater than 2, the proportion of patients with shock should also be at least as high as the proportion of patients receiving vasopressors. Whether the retrospective nature of data collection may explain, at least in part, this apparent inconsistency may be clarified by the authors.

Table 1 summarizes the rate of vasopressor support reported so far in ICU patients. It ranges from 35 to

94%, with a weighted average at 66%. This average rate is consistent with the feedback of 1000 intensivists and anesthetists recently surveyed about the hemodynamic management of COVID-19 patients [2]. Indeed, a majority of them mentioned they had to administer vasopressors to ICU patients either frequently (>50% of the cases) or very frequently (>75%). Therefore, the rate of patients requiring vasopressor support reported by Xie et al. [1] was on the low end of previous findings reported in the literature (Table 1).

Although the need for vasopressor support seems pretty common in COVID-19 ICU patients, the hemodynamic profile or phenotype of these patients remains poorly documented. Patients with COVID-19 have multiple reasons to become hemodynamically unstable, from hypovolemia (fever, fluid restriction to prevent the development of pulmonary edema) to vasodilation (sepsis, deep sedation during mechanical ventilation), and right or/and left ventricular dysfunction (mechanical ventilation with high PEEP, pulmonary embolism, circulating cytokines decreasing contractility, myocarditis). A few ultrasound studies done in hospitalized patients have shown that echocardiographic evaluations are often abnormal, with signs of right or/and left ventricular dysfunction frequently observed [3, 4]. However, with the exception of a research letter including data from 18 patients only [5], we are not aware of any hemodynamic evaluation focusing on ICU patients.

In summary, as suggested by Xie et al. [1] and confirmed by Table 1, hemodynamic instability is common in COVID-19 ICU patients. However, the hemodynamic phenotype of patients receiving vasopressors remains poorly documented. Echocardiographic and hemodynamic evaluations are desirable to

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**Table 1 Proportion of COVID-19 ICU patients receiving vasopressors in observational clinical studies**

| Authors (Journal)                  | Location            | Proportion of ICU patients receiving vasopressors |
|------------------------------------|---------------------|---|
| Yang et al (Lancet Resp Med)       | Wuhan, China        | 18/52 = 35%                                       |
| Primmaz et al (Crit Care Explor)   | Geneva, Switzerland | 114/129 = 88%                                     |
| Auld et al (Crit Care Med)         | Atlanta, USA        | 143/217 = 66%                                     |
| Argenziano et al (BMJ)             | New York, USA       | 222/236 = 94%                                     |
| Azoulay et al (Intensive Care Med) | Paris, France       | 165/376 = 44%                                     |
| Total                              |                     | 662/1010 = 66%                                    |

better understand the cardio-vascular consequences of COVID-19 and, in clinical practice, to individualize hemodynamic therapy.

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**Compliance with ethical standard****Conflicts of interest**

FM is the founder and managing director of MiCo, a Swiss consulting and research firm. MiCo does not sell any medical products and FM does not own shares from any medtech company. AVB has nothing to declare.

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