to high levels of oxygen. Precise monitoring of gas exchange is not yet easily feasible in the prehospital setting. As an alternative, pulse oximetry (SpO_2) can help to monitor gas exchanges until hospital arrival. The trend is therefore moving toward a more conservative approach regarding oxygenation management. The aim is to maintain a SpO_2 target at 95–97%, although the optimal PaO_2 level has not yet been defined [13]. Nevertheless, it is important to keep in mind that SpO2 target might also change during the course of patient's management, and consecutively re-evaluation appears to be the rule.

Finally, we thank Karim et al. [1] for their letter. Indeed, communication between research teams is a key tool to improve our clinical practices. As clearly summarized, none of the potential methods toward a feasible monitoring of gas exchange are perfect when it comes to the prehospital field. Further well-designed randomized controlled trials in critically ill patients with septic shock may help to provide some definitive answers to these questions and uncover the precise characteristics of the unwanted company.

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Pre-hospital invasive ventilation in patients with septic shock: Is hyperoxemia an unwanted company?

To the Editor,

Hyperoxemia presents a dangerous association with short outcome, by complex pathways [1]. In this line, we read with great interest the article of Jouffroy R et al. suggesting the association between hyperoxemia in septic shock patients who needed ventilator support in the prehospital setting and short term mortality [2]. The study reiterates the fact that hyperoxia might be dangerous for critically ill patients [1, 3], and also suggests that a PaO_2 between 100 and 150 mm Hg might be harmful in these patients. However, in our opinion, the authors open a hot controversial topic in their study which needs some more information of key determinants.

Firstly, hyperoxemia and its complication are associated with time effect. Although the retrospective studies show a deleterious effect of short term hyperoxemia, this is particularly pronounced during long-term administration, i.e., beyond 12–24 h [4]. Time period of hyperoxemia is unknown from the study. Moreover, the ventilator management was left up to the discretion of emergency physician without any protocol driven strategy, which itself has inherent bias which can affect the fraction of oxygen concentrations (FiO_2) used and arterial partial pressure of oxygen (PaO_2). The information on the use of noninvasive ventilation and the FiO_2 also becomes very pertinent.

Secondly, the data of Jouffroy R, et al. are hypothesis generating for the time being and it would be useful for the scientific community to know the information regarding how many patients had conditions associated with ischemia/reperfusion injury, such as post-cardiac arrest or stroke etc. as they all determine the short and short and long term outcome as well as relations with hyperoxemia [5].

Thirdly, the disease severity at the admission/starting of medical care is also important. Although the data from table 1 of the study with context to blood pressure, need of norepinephrine doses and number of patients required norepinephrine supports were not different; the patients were not similar in terms of severity of diseases. The patients who survived were having significantly lower sequential organ failure assessment score; p 0.007, and higher PaO_2/FiO_2; p 0.01 (two tailed p from *t*-test analyzed by Graphpad). This indicates that the patients compared were not similar rather the patients who had hyperoxemia were more severely diseased. Therefore, the conclusion of the study will not be much more acceptable after ruling out the contributing factors for patients' inherent conditions at the time of admission, which can contribute to mortality.

Finally, monitoring gas exchange by pulse oximetry and capnography is easier and more general approach and even well feasible in patients with septic shock. Although pulse oximetry cannot detect hyperoxemia by exact values, it can give an idea of hyperoxemia when SpO_2 is >95% [6]. The arterial blood gases (ABG)

Abbreviations: PaO_2, arterial partial pressure of oxygen; FiO_2, fraction of oxygen concentration; ABG, arterial blood gas.

can give the exact PaO_2 value, but is a difficult procedure in prehospital setting; as the authors rightly mention while raising the issue of the need of ABG in pre-hospital care by their study. A tightly managed PaO_2 to minimize hyperoxemia is also justified in many of the critically ill situations [7]. But, we feel that the main question is whether we can rigidly control hyperoxemic conditions or not as suggested by Jouffroy R et al. data, or what is the outcome of doing so in such pre-hospital patients requiring mechanical ventilation? More prospective, randomized study will be required to answer this question as well as confirm the findings of the present study.

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Conflicting interest

Authors declare no conflict of interest.

Authors' contributions

All the authors have contributed in literature search, manuscript preparation and editing.

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Health care utilization following motor vehicle collision is poorly stratified by chronic pain risk: Lessons from the CRASH study☆

Over four million patients present to U.S. Emergency Departments (EDs) annually with acute musculoskeletal pain (MSP) following a motor vehicle collision (MVC) [1]. Epidemiologic studies indicate that more than 30% of MVC patients discharged home after ED evaluation still experience significant MSP six weeks post-MVC [2]. Interventions are available to prevent [3-5] and treat [6-8] chronic MSP, including analgesics, physical rehabilitation, psychotherapy, and multidisciplinary approaches. However, it is unknown if patients utilize health care services in the weeks following MVC ED visit. Low rates of health utilization among patients at high risk of chronic MSP, or non-trivial rates among those at low risk of chronic MSP, would suggest a need for improved triaging of post-MVC care as stratified approaches to MSP management may improve outcomes and reduce costs [9].

We evaluated health care utilization in the six weeks following MVC stratified by risk for chronic MSP (health outcomes after six weeks are relatively stable) [10-12]. The data were from a large multi-center prospective cohort study of non-Hispanic white adults (18–65 years-old) who presented to an ED within 24 h of a MVC and were subsequently discharged home. This cohort, which was followed for one year post-MVC, is predominantly young (mean = 36-years old; *SD* = 13), female (61%), and with at least a high school education (76%). Participants were enrolled from eight EDs in four states between February 2009 and October 2011. Health care utilization for MVC-related problems was assessed via self-report survey six weeks after MVC. Data were available from 793 patients. Details of the study methodology are described elsewhere [2, 13]. The study was approved by the Institutional Review Board at each site; all participants provided written informed consent.

Individual-level risk of chronic MSP was calculated using a previously validated prediction tool [14] based on 26 risk factors (assessed in the ED) for chronic axial MSP. Chronic MSP was defined as self-reported MVC-related MSP of moderate to severe intensity in at least one body region (neck, shoulders, upper back, and lower back) at the 6 week follow-up *and* at 6 *or* 12 month follow-up. Our participants were divided into tertiles of low, medium, or high risk for chronic MSP based on the calculated risk score. Roughly three-quarters (74%) of participants in the high risk tertile ultimately developed chronic MSP (positive predictive value) compared to 40% of medium risk and 20% of low risk participants.

A larger proportion of participants at high risk for chronic MSP had a visit to at least one provider (69%) compared to medium (52%) and low risk (38%) participants (Table 1). Manual therapy was the most common type of health care utilization by high risk participants (48%), with roughly one-third receiving physical therapy (33%). Primary care utilization was slightly less common (43%) than manual therapy. Visits to primary care providers were the most common utilization among medium (37%) and low risk (28%) participants. Very few (3%) low risk participants utilized medical specialists (i.e., spinal surgeons or neurologist). Only 1 in 20 (6%) high risk participants and 1–2% of medium and low risk participants utilized mental health services.

Several conclusions may be drawn from the above findings. First, the fact that less than half of high risk patients received appropriate MSP health services in the weeks following MVC suggests that there is great opportunity to improve access to care for the secondary prevention [3-5] or treatment of chronic MSP [6-8]. This is particularly the case, given the critical need for expert early care to avoid improper early treatment of chronic MSP and/or MSP development in the current opioid epidemic. Second, the very low rates of mental health treatment observed suggest that improving early access to mental health services may provide an opportunity to prevent or improve chronic MSP

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