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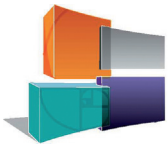

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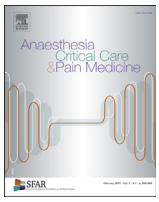

Editorial

Why should anaesthesiologists and intensivists care about climate change?

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Climate change is the greatest threat to global health of the 21st century.
WHO director-general, Dr Margaret Chan

Pour ce qui est de l'avenir, il ne s'agit pas de le prévoir, mais de le rendre possible.[1]
Antoine de Saint Exupéry, *Citadelle,* 1948. [1]

The past fifty years have seen unprecedented global improvements in life expectancy, maternal and child mortality, and education, coupled with falling poverty rates [2]. Despite these dramatic improvements in public health, the state of the natural systems on which we depend is eroding [3]. We are seeing our *planetary health* fail: climate change [1], mass marine and terrestrial extinctions, biodiversity and soil loss, ocean acidification, global deforestation, and water shortages [2]. Climate change is arguably the most pressing of these, undermining the years of improvement in humanity's health and development [4]. We are at the beginning of a new geological era, the Anthropocene, which began in the late 1800s when humanity began to have a significant impact on Earth's geology and ecosystems (carbon, water, nitrogen etc. cycles) [2]. Driving the fate of the Anthropocene and such planetary health failures has been the doubling of humanity's population since 1970 to more than seven billion in 2019, coupled with the increasing resource consumption patterns of individuals in the developed world.

More than any other medical specialists, anaesthesiologists have been calling for action on the looming climate crisis both as individuals and as medical societies for more than a decade [5,6]. There is now a growing body of literature quantifying the effects of climate change on human health, summarised by the Lancet Commission on Health and Climate Change [2,7]. These studies reveal that for all future scenarios of greenhouse gas (GHG) emissions, economic development and population growth, the financial cost of implementing GHG mitigation policies can be feasibly offset by the value of the associated health benefits [4]. The deadline, however, for action to avert some of the most catastrophic health outcomes of climate change has been estimated to be little over a decade away [1].

Scientists have clarified the connection between environmental decay and human health. Rising GHG concentrations result in increased average and extreme temperatures, changes in precipitation, increases in the frequency and intensity of extreme weather events and rising sea levels (https://climate.nasa.gov/[accessed 30 October 2019]). These impacts endanger our health by affecting our food and water sources, the air we breathe, our community infrastructure, and our housing and health systems [8]. The results: an increased transmission of important vector-borne and water-borne diseases, exposure to heat-related morbidity and mortality resulting from such conditions as heat stress, cardiovascular and renal disease and skin cancer. Devastating weather events will increase trauma admissions and weaken our health systems. The damaging effects of climate change on mental health are also increasingly recognised [7].

Coupled with climate change, air pollution is a major cause of morbidity and mortality worldwide [9], but particularly in major cities and in developing countries amongst the poor [7]. Air pollution increases the incidence and severity not only of pulmonary pathologies such as asthma, emphysema and allergies, but also of cardiovascular events such as myocardial infarction and stroke [9].

Additionally, climate change is a major contributing factor to the emigration of thousands of people worldwide. Such rapid and worldwide demographic dislocation will weaken and could overwhelm our health systems, generating large number of patients with significant ill health [7].

As health professionals working in critical care we are or will be on the front line of this health crisis. We shall face major increases in medical demand for severe diseases in young populations, we will be challenged by new pathologies, and we will have to respond to the medical needs of displaced populations. Moreover, we will have to modify the carbon footprint of our healthcare system itself, which contributes significantly to climate change (the health care

[1] As for the future, your task is not to foresee, but to enable it.

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sector accounts for 5 to 10% of GHG emissions in developed countries) [10–12].

Such changes require a profound and thoughtful evolution in our practices in order to lower the carbon footprint of healthcare delivery. This is now occurring in the UK under the leadership of the Sustainable Development Unit for healthcare [10]. We will require considerable further investment in research examining efficient healthcare delivery and a global rethink of our medical system with its excessive resource consumption [13].

Medical treatment limitation is an area of integral relevance to anaesthesia and intensive care, and one we will have to increasingly ponder in the coming years. Should we be undertaking therapies on increasingly frail, aged patients with multisystem diseases - therapies that are often shown to be ineffective? As doctors, is it our duty to consider our social advocacy responsibilities at the individual, societal, public, and now planetary level? The CanMeds Canadian Royal College of Physicians and Surgeons suggests so [14].

Since 2007, the number of published articles on health and climate change in scientific journals has increased by 182% [7]. The August issue of the *New England Journal of Medicine* marked the launch of a new topic page focused on climate change. The authors highlight an "Interactive Perspective" [15] along with several articles about the myriad effects of climate change on our health and health care systems [16]. In this issue, Liu et al. [17] reported a study on ambient particulate air pollution and all-cause daily mortality in 24 countries from 1986 to 2015. There was a significant and positive association of inhalable particulate matter with mortality from any cause and specifically from cardiovascular and respiratory diseases.

In the same issue, Sorensen et al. [18] address a "new era of climate medicine," describing chronic kidney disease of unknown origin (CKDu), a rapidly fatal nephropathy that first occurred in Central America in the 1990s. At that time, it was noted that unusually large numbers of agricultural workers in hot, humid environments had begun dying from irreversible renal failure. Sri Lanka and India also had reported similar patterns of renal disease. CKDu is related to heat exposure and dehydration. Exposure to agrochemicals such as glyphosate, to heavy metals, and to infectious agents may also contribute, as can genetic factors, to poverty and malnutrition. Other new pathologies influenced by climate change are currently emerging; we will need more research to better understand, prevent and treat them.

Our specialty will place us on the front line facing new climate-linked life-threatening pathologies. We will experience a massive influx of trauma patients due to extreme weather events, a large diffusion of infectious diseases and an increase in the cardiovascular and pulmonary consequences of rising air pollution. Meanwhile, more frequent heat waves will further increase our load of heat stress acute patients. We must also contemplate this dark picture in the context of the potential fragmentation and even destruction of our health infrastructure due to extreme climate events. Additionally, anaesthesiologists and intensive care physicians must consider what can be done now to reduce their carbon footprint [19,20]. Operating theatres and intensive care units are a resource-intensive sector of health care, with high-energy demands, consumable throughput, and large waste volumes. Moreover, the anaesthetic gases that we use are GHGs. The total median carbon intensity *per operation* was calculated to be 160 kg CO2e [21], and there are more than 200 million anaesthetic cases globally per annum. Emissions reduction strategies including avoiding anaesthetic gases with high global warming potential; preferential use of alternative anaesthetic strategies (regional techniques, total intravenous anaesthesia); reduction, recycling and better sorting of waste [22]; reduction and reprocessing of single-use medical devices; and occupancy-based ventilation of operating theatres all have the potential to lessen the climate impact of surgical services without compromising patient safety. We must prioritise research in life cycle analysis of medical devices, in the environmental impact of new practices and technologies and in development of green devices [23]. Moreover, we can reduce the chemical and environmental exposure of our patients and health professionals by influencing environmentally preferable purchasing.

The medical community has an illustrious and important history of improving health at the societal level, from addressing the cholera epidemic to influencing governments and the public about the dangers of tobacco smoke to recent Nobel recognition for reducing the risk of nuclear warfare. The march of climate change will similarly require physicians to mobilise, not only at the level of research and treatment but perhaps even at the level of political action. Medical ethics demands no less.

Consider that such ideas recently motivated UK doctors to peacefully protest against "government inaction that is costing countless lives" (Doctors for Extinction Rebellion). This action was documented in a blog hosted by Richard Smith, the former editor of The *British Medical Journal* (https://blogs.bmj.com/bmj/2019/09/30/richard-smith-why-are-doctors-sticking-themselves-to-government-buildings/[accessed 30 October 2019]) and the newly appointed Chair of the UK Health Alliance on Climate Change, a British organisation committed to reducing the harm to health from the climate emergency. One of Smith's projects is to encourage health professionals to make changes to reduce their carbon footprint in their private lives. Fly less, make 'meat a treat', consume less in general, cycle to work, enjoy being with family and friends at home and close by!

"Be the change you want to see in the world".

Mahatma Gandhi

Disclosure of interests

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The other authors declare that they have no competing interest.

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