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EDITORIAL

Climate responsibilities in intensive care medicine—let's go green!
An introduction to a new series in Intensive Care Medicine

Thomas Bein[1*] and Forbes McGain[2]

Alongside species mass extinction and biodiversity loss, climate change signifies humanity's burdened entry into the Anthropocene [1]. During the past two centuries, humanity has burned increasing amounts of fossil fuels, producing greenhouse gases (GHGs) and leading to atmospheric pollution and global warming [1]. Such pollution has resulted in the current climate crisis and in natural disasters including worsening storms, flooding, droughts, fires, heat waves, and crop failures leading to starvation/mass migration. For intensive care physicians climate change will have increasingly recognisable effects upon health across all organ systems, particularly respiratory and cardiovascular [2].

And yet, like the rest of our economy, healthcare itself pollutes Earth's air [3], land, and water. Healthcare contributes approximately 5% of worldwide anthropogenic GHGs [4]. If healthcare were a nation it would be the fifth largest nation by GHG contribution [4]. Modern medicine has offered an increasing range of diagnostic and therapeutic procedures, with an associated gradual increase in mean life expectancy. On the other hand, some high-cost, high-tech healthcare contributes to GHGs without necessarily improving the longevity nor wellbeing of citizens. In the USA healthcare's spend as a proportion of Gross Domestic Product (GDP) is >17%, a far greater percentage than other nations. This spending on US healthcare leads to high GHG emissions (10% of US national total [5]). Yet, these $ and GHG emissions do not flow to better national outcomes, witness that the average life expectancy for US citizens is certainly not higher than many high income European and Asian nations. Currently an ethical dilemma exists between the Hippocratic principles of 'beneficence' (promotion of health) and of 'non-maleficence' (avoiding reinforcement of the climate crisis).

In the United States, the carbon footprint of the health care system is approximately 10% of national GHG emissions [5], whilst in Australia this is approximately 7% [6] similar to that of the European nations that have undertaken such studies, e.g. United Kingdom (UK), Austria, Netherlands. In all such carbon footprint studies, the hospital and pharmaceutical sectors have the combined largest footprint (approximately 60%). In the UK, 20% of the carbon footprint is attributed to buildings, electricity, and gas, while 80% results from clinical care [7]. Importantly, approximately 10% of healthcare is harmful, and 30% is low value care [8]. It is likely (though currently unknown) that the GHG contributions from harmful and low value care form similar percentages (10% and 30% respectively) to the total GHG emissions from healthcare activities. Reducing harmful and low value care reduces burdens on: the patient, our finances, and the environment (Fig. 1).

Critical care medicine is a hospital carbon hotspot: it has continuous staff activity, resource use, and energy demands. The precise contribution of the intensive care unit (ICU) to hospital GHG emissions is unclear, but

*Correspondence: thomas.bein@ukr.de
[1] Faculty of Medicine, University of Regensburg, 93042 Regensburg, Germany
Full author information is available at the end of the article

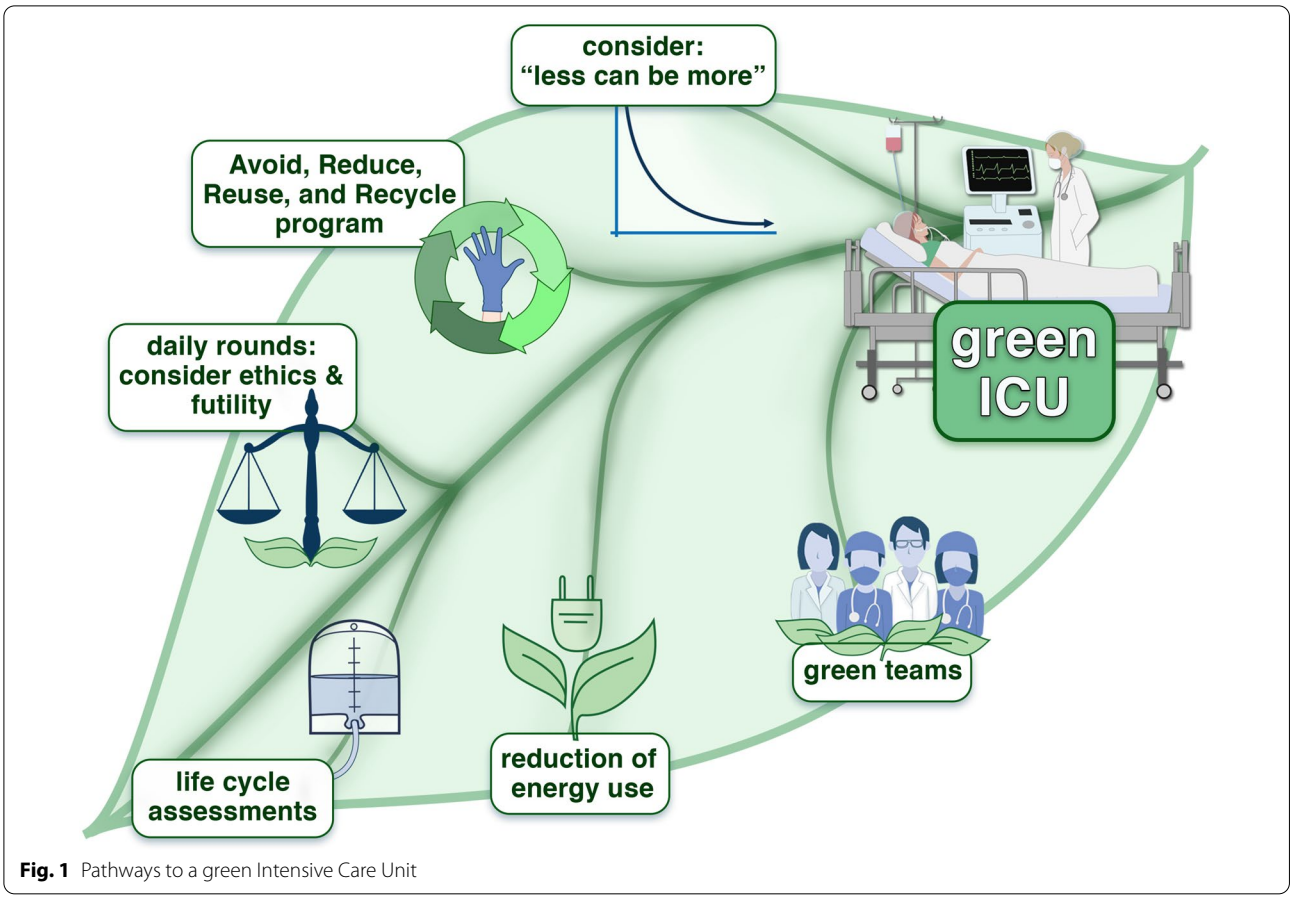

Fig. 1 Pathways to a green Intensive Care Unit

several studies provide valuable insights. These studies and suggestions from intensive care societies (e.g. the ANZICS Sustainability Toolkit [9]) provide helpful guidance for critical care physicians keen to commence with practical measures to reduce their ICU carbon footprint. We complement such guidance with a suite of sustainability strategies to be introduced by expert contributors in future issues of Intensive Care Medicine:

1. *Green teams.* Examines how multifaceted, collegial ICU/hospital ‘green teams’ are integral to sustainability. Such initiatives—like all movements, best start where an individual clinician has agency (e.g. gloves worn per shift, safe cessation of intravenous antibiotics), expanding to ICU teams, and up to intensive care directors, hospital administrations, and thus to health departments (“bottom up”). All of physicians, nurses, allied health, et al. can be ‘champions of change’.
2. *Reduction of energy use from heating, lighting, ventilation and air-conditioning.* ICUs as individual hospital’s departments can be provided with regular information on their energy expenditure, quantifying their power-saving initiatives the objective of reducing energy (and water) use, and of discussing corresponding strategies with technicians and administrators [10]. Is it reasonable to power-up and down ICU air exchange rates according to differing ICU patient numbers, and to power down unoccupied single use/negative pressure rooms?
3. *Life cycle assessments as important tools for ICU procurement, including reusable versus single-use equipment, medications,* etc. Life cycle assessments (LCAs) or ‘cradle to grave’ analyses are a scientific method to analyse the environmental and financial footprints of products and processes [11]. LCAs exist for several ICU devices, e.g. face masks, breathing circuits, linens, and for several ICU medications. However, such analyses are always influenced by regional factors (e.g. local carbon intensity of energy or transportation, level of salaries, etc.) and thus their generalizability needs to be scrutinised.
4. *Introducing ICU recycling.* Quantification of ICU waste has not been systematically investigated, though approximately 50% could be recyclable [12]. Always be cognizant though of the waste manage-

ment 'mantra': 'Reduce waste first, reuse if possible, and then recycle (if all else is impossible!)'.

5. *Less is more for sustainability—tests, drugs, consumables, equipment.* After an era of unlimited (and often imprudent) use of the intensivist's 'armamentarium', in recent years a 'choose wisely' initiative or the promotion of a 'less is more' philosophy has become visible, including daily consideration of useful measures often in concordance with guidelines, sensible therapeutic goals, and with the patient's will [13]. We can now add a 'sustainability lens' to careful and prudent care of the critically ill.
6. *Medical and environmental ethics forgather—avoidance of futility is climate protective.* Critical care interventions that prolong life without achieving effective patient-centred care are futile. Futile treatment brings harm for patients and their caregivers, for the payer/taxpayer, and for our environment. Indication-based and ecological ethical principles are often synonymous, and can be achieved if there is careful collaboration between well trained ICU staff with a strong interprofessional teamwork. By avoiding futility we are alert to human dignity and ecological ethics.

A radical and immediate engagement of all healthcare staff, particularly those who work in the ICU is necessary to join the race to zero carbon emissions [3, 14]. The following aspects will be crucial: prevention of chronic and acute (e.g. Pandemic) diseases to decrease the need for ICU care, avoidance of futile treatment, and the 'green management' of energy, waste and consumables. We introduce a new series: *'My green ICU'*, anticipating that contributions to appear in the near future will spur the reader's interest, and stimulate them to work—step by step—towards environmental sustainability in intensive care medicine. It's time to promote planetary health as a framework for sustainable health systems [15]. Our earth is approaching malignant hyperthermia—let intensive care medicine go green and join the Race to Zero!

Author details
[1] Faculty of Medicine, University of Regensburg, 93042 Regensburg, Germany.
[2] Anaesthetist and Intensivist, Western Health, Melbourne, Australia.

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