



POINT OF VIEW

Technological innovation in critical care and limits of the life



Innovación tecnológica en cuidados intensivos y los límites de la vida

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On April 30th, 2024, *The New Yorker* published an article entitled “How ECMO is redefining death,” which presented several cases of patients in intensive care units (ICUs) who received support with extracorporeal membrane oxygenation (ECMO) technology. One case involved a young woman with cystic fibrosis who spent 3 months at the ICU of a hospital in Orlando on ECMO, awaiting a lung transplant. After that period, due to associated complications, ECMO support had to be withdrawn. She was transferred home with a tracheostomy, where she passed away a few days later. Another case was that of a teenager in a New England hospital who had received a lung transplant for the same disease. While awaiting a 2nd transplant due to graft failure, he developed incurable cancer 2 months after being connected to ECMO. He, then, became trapped in a sort of “bridge to nowhere,” continuing his schoolwork online from the ICU. This precarious form of life had already been questioned by some

bioethical currents.¹ The medical team, in agreement with the family, decided to maintain respiratory support until the circuit failed. When that happened, the patient lost consciousness and passed away. The case was published in *The Lancet*² due to the complex ethical problem it posed.

The above-mentioned cases raise the dilemma of hope—for successful treatment—vs the experience—of suffering and inevitable death—of the necessary vs the impossible and highlight the impact of technology on both the patient and their family. They also underscore the need to recognize the limitations of future indications for technologies based on results published in the literature. The cases shared by the newspaper, besides generating public expectations, raised questions about the patients’ quality of life, their autonomy, and the emotional impact on families resulting from these advancements. Such issues reveal the need to consider other variables in the analysis of medical care.

The estimated mean cost of hospitalization for COVID patients on ECMO exceeds USD 800,000, and prolonged cases exceed USD 2 million.³ ECMO can radically transform care in our units. However, if there is no possibility of organ recovery, it can introduce greater difficulties and suffering. This technique creates expectations and, with them, new ethical

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dilemmas: When to use it or when not to? Who decides? Is it economically sustainable for society? And perhaps the most significant question: Is technology ahead of ethics?

It is estimated that nearly 50% of the growth in health care spending is due to the increase in technology costs, which exceeds the ordinary rise in the cost of living, malpractice claims, or administrative expenses. The causes of the rising costs of high technology are well-known.⁴ Spain has these technologies available in intensive care setting, such as ventricular assist devices (VAD) for patients who are ineligible for heart transplants or ECMO due to refractory cardiac or respiratory failure and organ preservation in donors.⁵ In the United States, the cost of VAD is estimated at around 18 billion dollars/year, while ECMO accounts for some 20 billion dollars.⁶ Various studies on mortality rates conclude that the benefit is doubtful.⁷ In patients with refractory out-of-hospital cardiac arrest, ECMO-assisted CPR and conventional CPR had similar survival rates.⁸ The EOLIA clinical trial revealed that ECMO as respiratory support did not significantly reduce mortality vs conventional mechanical ventilation strategies.⁹

At the heart of modernity lie medical progress and the notion of scientific control over nature. Moreover, the idea of progress does not admit final ends or purposes in its achievements, beyond public safety as an imperative to limit research. However, society needs to understand the nature of its commitment to medical progress as it stands today and reconsider whether it is acceptable for every technological innovation to be unequivocally good or for progress to be indefinite. We are learning that applying increasingly expensive technologies is an unsustainable and sometimes imprudent way to proceed, and that progress *per se* constantly raises the stakes for what is considered good health. The consequences are making the health care system unsustainable within a social framework that prioritizes the pursuit of health above anything else.

Technology is seductive but is irrevocably linked to the ethical and economic dimensions of medicine. Biotechnological progress increases uncertainty in medicine by expanding the possibilities of intervention as a response to disease, placing the challenge in learning to forgo high-tech interventions in individual cases when it is clear that death is inevitable. This would help sustain a system that can provide dignified medical benefits without compromising equity or neglecting other social needs.

The fight against death has enjoyed the highest priority in medicine, especially since the late 19th century, when it began to be effective in preventing it. Currently, it remains the top priority of progress. The U.S. National Institutes of Health (NIH) have spent most of their research budget fighting major lethal diseases, such as cancer or cardiovascular diseases,¹⁰ and much less on research into chronic non-lethal diseases, such as degenerative conditions that, collectively, afflict the majority of the adult population. These priorities have not only never been questioned, but the constant decline in mortality from the most lethal diseases has further encouraged their research. Although it is difficult to prove, much pressure on health care spending can be attributed to the fight against death, whether through the intensified use of diagnostic technology or the development of expensive treatment technologies. ICU admission can save lives—or not—but the bill for the effort is not triv-

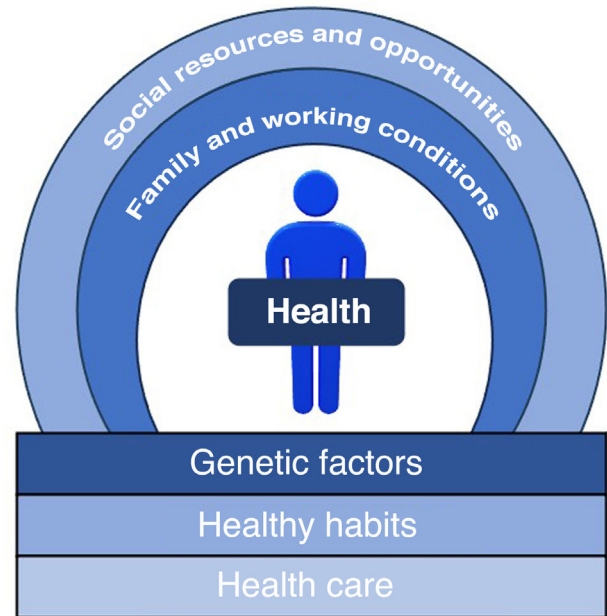


Figure 1 Initial and subsequent determinants influencing health.

ial. Experienced medical teams could estimate a patient's prospect of a healthy lifespan and conduct personalized risk/benefit assessments before indicating the use of an expensive device.¹¹ Ethics committees could propose a reasonable and equitable use of expensive technologies at the ICU setting, and help balance patient interests, community resources, and bioethical principles, thereby promoting fair, informed, and evidence-based decision-making. Manufacturers should provide robust information on the economic impact of new or improved products they introduce to the medical market.

The approach of modern medicine to death can lead to ostentatious forms of technological confinement. Ironically, as the drive for technological innovation in medicine strengthens, evidence grows that neither technological innovation nor medical progress are the main determinants of population health (Fig. 1). Best estimates attribute no more than 40% of the decline in mortality rates to organized health care. Socioeconomic and cultural conditions make the difference, with education level being the best predictor of a healthy life, which in turn is favored by general prosperity and societal organization.¹²

If technological innovation did not move another step forward, life expectancy would continue to grow parallel to the general standard of living, and even more so if accompanied by effective disease prevention strategies. Although technological innovation will continue, we could dream of different priorities for its development and resist costly and marginally effective therapies. Research *per se* is not the problem; however, using technological advancement as the sole rigorous path for useful research is a prodigality that advanced societies can no longer afford. It has been demographic—not biological—research, that has revealed the social determinants of health, and it will be ethical reflection—not new technologies—that will enable wiser use

of that knowledge. Devotion to progress should demand no less.

Declaration of competing interest

The authors declare that they have no conflicts of interest.

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