Commentary

# Mobile health and beyond

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## DESCRIPTION

Mobile Health (mHealth), the practice of medicine aided by mobile devices, has seen an exponential growth during the last decade. As of today, not only more than 259.000 health mobile apps can be found on major online application stores, but also more than 310 million wearable devices are globally available [1]. This exponential market growth has seamlessly permeated the medical field and clinicians have accordingly made use of their versatility for different purposes. These range from focused intraoperative neuromuscular monitoring apps, to ones allowing post-discharge acute myocardium infarct follow-up, and to more umbrella-like pandemic monitoring solutions such as COVID-19 tracking Apps [2-4].

Notwithstanding the benefits offered by such flexible solutions and the accompanying generalised positive disposition towards them, global receptivity is still subject to a justified degree of scepticism. Our research group has specifically surveyed the Belgian Anesthesia population for the acceptance of mHealth solutions and found that despite an overall positive tendency of anesthesiologists to think of mHealth as to be able to improve perioperative care, some are still reluctant to give them maximal confidence ratings [5].

Such reaction is more pronounced within the group of senior anesthesiologists. Among others, mobile peripheral's pricing and quality-control/certification issues of applications have been put forward as especially relevant issues. The latter are of particular relevance as these introduce at least an entry barrier to the market and filter out suboptimal solutions. At a European level this has received due attention on the MDD (93/42/EEC) to MDR (CR 2017/745) Medical device regulation switch. In fact, MDR directives clearly categorize not only mobile applications and peripherals, but also decision support systems as full medical devices subject to corresponding regulatory body scrutiny [6].

The sprouting of mHealth technology has brought with it a significant amount of data, generated both intra and extra-hospital. The parallelly increasing digitisation of healthcare has further allowed an attention shift to the potential of data to improve health care. This substantial increase of data though more advanced monitoring devices and mHealth also facilitates the arrival of clinical machine-learning. While much of the progress and advantages of machine-learning have been achieved in sectors such as online advertisement and image recognition, the domain of medicine is bound to benefit from this new and promising field. For instance, Hatib et al. trained a machine-learning algorithm to predict hypotension in surgical patients' records based on high-fidelity arterial waveforms [7]. In a different research effort, Lee et al. managed to train a deep neural network to predict in-hospital mortality based on automatically extractable intraoperative data [8].

Since machine-learning performance benefits of the amount of data that is available, specific fields within medicine that generate large amounts of data – such as anaesthesia – will benefit the most from the adoption of machine-learning techniques. This will lead to improved clinical monitoring and decision-making that will aid human intervention. As an example, our research group has developed a machine-learning algorithm that is capable of identifying anomalies during routine monitoring of depth of neuromuscular blockade. Adopting such algorithms will result in more reliable data on which caretakers can base clinical decisions – in this particular case the prevention of inadvertent incomplete neuromuscular recovery.

Besides improved clinical monitoring, the unique characteristics of machine-learning techniques to identify patterns within clinical data will alleviate our understanding of the human body's responses towards certain drugs and treatments and will eventually result in new predictive analytics that will enhance clinical decision-making. The possible advancements of machine-learning within the domain of medicine are perhaps best summarized by Antonio and Di: "Machines will not replace physicians, but physicians using AI will soon replace those not using it." [9].

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