

Innovation in healthcare with a focus on cancer care

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Abstract

Health is not characterized only by the absence of disease; nowadays, health can be perceived as a human right. Health policies all over the world aim to increase the life expectancy, the health and the quality of life of citizens, within the limits of the available resources. In this opinion paper, innovation aspects in medicine, healthcare, and health policy reforms are presented, with a special focus on cancer care, novel therapies and immuno-therapies that boost or restore the human immune system to help overcome disease, research trends and new developments.

Keywords: Innovation, medicine, health, health care, oncology

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1. Introduction

The tendency of humankind to combat disease is timeless, and it is a reaction stemming from self-preservation instinct, and the urge to enjoy health and longevity. In the “heart” of health lies medicine; a science that, from the era of Hippocrates (and not only), among others father of medicine, unites people under a common goal. We believe it becomes obvious that our entire life falls one way or another under the medical field and our overall health. It’s every single thing; it is not just whether we have heart disease, a form of cancer, or just a simple cough. Under this scope, hopefully, we are all well aware that health is not simply the lack of disease or disability, but can be defined as a condition of full physical, mental, and social well-being; and Medicine is both a broad science and a personal art at the same time.

2. Innovation in oncology care

As said times and times again, health is one of the highest human goods, and all citizens of all countries should be able to have access to high-quality health services. Still today, we are building, on some extent on prior knowledge that we inherited from worlds’ major ancient civilizations and medicine's most renowned scholars. However, the models of health care systems have changed to some extent, and economics have evolved along with technology and research, e.g., advances in microfluidics. It seems now that the future of healthcare lies in every day more and more extended use of technology (i.e., digitization and technological devices and applications) in every country’s medical system, and in every medical sector, e.g., the advances and improved technological knowledge are promising for successful dental therapies in the near future (Orsini, G. et al., 2018). Moreover, as the research findings can take time to become commercially available to the public and in cases never reach that stage, progress is being made in accelerating the time it takes for scientific advances to reach cancer patient. Sadly, at times, novel therapies require significant technical capabilities that are not widely present in oncology centers in many countries (Aitken, M. et al., 2019). Truly innovative technologies are highly expensive and given the requirement for efficiency and sustainability – it is of key importance to improve the quality, effectiveness, and efficiency of health systems. (European Commission, 2014).

However, it seems that this is not the case for all medical technological advancements. It is expected that soon it will cost about \$100 to map our genes, making it a part of routine medical practice. Additionally, using software-based medical prevention will mean that our vital signs and other personal health info will have suggestions to make for the improvement of our health status.

For the past few years we are stepping into a new exciting era in health care, medical research and innovation where some of the new trends of global health are Biotechnology, Personalized Medicine, Evidence-based medicine, Synthetic Biology, and Genetic Aristocracy. In addition, the number of users on social media in smartphones or medical applications is constantly increasing providing a wide base for the use of companion devices, platforms dedicated to health, e.g., Apple's

HealthKit, and not only.

Medicine includes both reactive medicine (drugs, treatment, medication, surgery, etc.) and preventive medicine (blood and other medical tests, exercise, diet, lifestyle, daily habits, psychology, etc.). Now, it also incorporates, and to a high degree, Artificial Intelligence (AI). AI has been reshaping and systematizing numerous fields, with healthcare being one of them, and it is expected that the AI market in healthcare will hit \$6 billion by 2021, having been at \$600 million in 2014 (Accenture, 2017). As an example, the Watson supercomputer can also be considered. The supercomputer is used in medical decision making; new amazons appear in the health and pharmaceutical sector. In addition, several leading companies have partnered with Watson's AI and make use of artificial intelligence to better their systems (WorldHealthNet 2016). A combination of artificial intelligence and human research is estimated to be the most powerful way to proceed in understanding biology, rather than relying solely on the human (Kitano H. 2017). Focus has been placed, among others, in utilizing AI for skin cancer as early detection is very important; projects such as AI-Skin of Chen M. et al. (2019) focus on the aforementioned aspects and using neural networks, or other AI classification methods, to detect malignant tumors and other related aspects, e.g., detect breast cancer nodal metastasis (Liu Y. et al., 2018). Of course, like any other technological gadget, AI does not aim to replace but to provide support to the medical practitioner. A key challenge in cancer control and prevention is the detection of the disease as early as possible, enabling effective interventions and therapies to contribute to a reduction in mortality and morbidity. Biomarkers are important as molecular signposts of the physiological state of a cell at a specific time. (Srinivas et al. 2001).

In the above context, we can visualize the future era of various specific subfields of health care and medicine. For example, we can imagine a future where free of geographical constraints diagnosis will be the everyday situation, and some not to say many of the basic examinations will be done with the "help" of our smartphone's sensors. Of course, the field of oncology, biomarker research, and related fields can't stay unaffected; the oncology drug sector is the largest segment in the global pharmaceutical and the pipeline of oncology drugs in clinical development has expanded by 45% over the past decade (QuintilesIMS Institute, 2017); new precision oncology tests have surfaced. Oral therapies are becoming increasingly common in cancer treatment (they make up a larger portion of costs than five years ago), personalized medicine with the use of genomic data makes it possible to identify subsets of patients that should respond to certain therapies. Genome analysis, nano-agents for the detection of diseases, precision oncology tests, Liquid biopsies, a new pipeline with novel drugs, biosimilars, novel therapies for cancer and immuno-therapies, treatments that boost or restore the ability of the immune system to fight cancer, infections, and other disease, are only some of the advancements to come. The new immuno-oncology drugs from various pharma companies, based on the role of specific biomarkers (i.o. a protein known as programmed death-ligand – or PD-L1, for short) is probably the greatest example

at this moment. This drug sector constitutes a new cancer treatment path, along with drugs that inhibit immune checkpoints (Athony F. et al., 2018).

Moreover, novel adoptive immunotherapy is the Chimeric antigen receptor T cell (CAR-T cell) therapy. The CAR-T cell is an effector T cell that recognizes and eliminates specific cancer cells, independent of major histocompatibility complex molecules; used predominantly in the treatment of hematological malignancies, including acute lymphoblastic leukemia, chronic lymphocytic leukemia, lymphoma, and multiple myeloma. Nowadays, research has also focused on applying this kind of treatment for solid tumors (Zhao Z. et al., 2018).

We could say that, in general, future trends in healthcare and especially in cancer care are shifting our focus to

- preventive care rather the reactive,
- mapping down all our genes for use in genomic medicine or, less formally, personalized medicine,
- monitoring our overall health with the help of phone applications,
- growing organs to effectuate transplants, and
- digitizing all medical information, from patient records and pharmacy inventory to MRIs and even electronically tracking people.

3. Conclusion

Medicine is not just a scientific field but the “idea” of a “higher purpose” that unites all under a common umbrella. People have been, and are still being collaborating, leaving their differences on the side, focusing on the common ground, and now with the evolution of technology, they are also breaking down the geographical barriers. In this paper, we have presented the basics of the near future of healthcare, medicine, and aspects of medicine, eg. Oncology. The basic future trends have been presented, and among others, they refer to being informed, healthy, and making careful choices daily. It is true that we can better our lives and prevent many diseases, either organic or psychological ones; however, in order to do that, we need the right education, efficient communication, and adequate information. For instance, how can I prevent cancer if I’m in the dark concerning the foods that are abundant in anticarcinogenic agents? The future of healthcare and especially of cancer care denotes the need for a holistic approach and health policy reforms paired amongst others with advanced research and cutting edge technology. (OECD, 2017). Research and development are promising new exciting results, but in order to unlock R&D productivity, it seems as the next generation of R&D talent need to be agile, digitally literate and open continuous learning, as technology and capabilities continue to evolve rapidly (Deloitte, 2018).

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