Precision Medicine and its Changes in Oncology

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Medicina de Precisão e suas Mudanças na Oncologia

Medicina de Precisión y sus Cambios en Oncología

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The fourth industrial revolution, also known as Industry 4.0, is revolutionizing the world with consequences to healthcare. Some scholars even say it is a new era[1]. The synergy of the computational and physical components, called cyberphysics system, ended up in the implementation of the *Internet of Things* – IoT, defined as the meeting of the human communication network (the example is the Internet) with the actual world of the things[2].

These changes have already reached healthcare. There is an increasing number of smart software, devices, cloud software, electronic charts and applicative that monitor the health of the individuals that can be integrated to medical equipment and create a mass of data called *Big Data*, capable of revolutionizing medical treatments and promote analysis in real time. However, the proliferation of data sources brings the great challenge, which is to make these data purposeful[3].

The American government put billions of dollars in the last years to create a *database* containing information of medical records, genetic data and several health-related data from volunteers[4]. The investment vows to customize medical treatments to the molecular level, the true precision medicine. In this scenario, healthcare should be increasingly bespoke, grounded in results of researches with a substantial number of patients or in the interconnection of public existing database, which fosters a high-level external validity.

The crossing of IoT data associated to information of the systems titled *Machine to Machine* (M2M) and the cloud computing will grant the creation of models for identification, health treatment and prevention for each patient. The expectation is the creation of new more effective and personalized algorithms that will allow improving decision-making in the application of public resources in healthcare systems[5].

An example of this revolution in oncology was ASCO 2019, whose theme was "Care for each patient, learn with each patient". The Plenary Session had a presentation of Dr. Blythe J. S. Adamson, Ph.D., senior quantitative scientist of *Flatiron Health*, in New York, who brought data about the use of information in real time and its impact in the expansion of the American healthcare service. Data utilizing *Big Data* showed the importance of the access to the American system to reduce racial disparities in relation to time to cancer treatment (*Abstract* LBA1)[6].

The *Real World Data* (RWD) are studies that draw information about patients in general and assess the impact of new healthcare technologies. The RWD utilize information of different categories: 1) clinic, which considers the adherence to technology and rates of disease relapse and cure in real life; 2) economic, which address the associated costs with the medical resources utilized; and 3) humanist, which grants importance to information about health and quality of life of the patients[7].

Still in ASCO 2019, an excellent example of use of data of the real world was an observational, retrospective cohort study designed to evaluate the characteristics and outcomes of non-small cells lung cancer patients (NSCLC) with or without history of autoimmune disease. All the patients were treated with inhibitors of immune control in predominantly community-based oncology practices. The differential of the research was the use of non-identified *Electronic Health Records* – EHR in ASCO CancerLinQ® database, exploring the immune system-associated adverse events[8].

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The implementation of the precision medicine with the use of *Big Data* has the challenge of ensuring the safety and integrity of the medical information and the new solutions as *Blockchain* in health appear to be a promising response. *Blockchain* has been defined as a distributed ledger technology that targets the decentralization as a security measure, meaning, cryptography. In addition, essential ethics principles are not to be ignored such as privacy, confidentiality and prevention of harms to the individual[9].

Several worldwide healthcare investigators are investing in *Big Data*, IoT and RWD[10]. According to the *International Data Center* (IDC), for instance, the IoT market is expected to negotiate approximately US$ 13 billion until next year in Brazil. The investigation of these world health information favor the creation of financial, mortality, morbidity indicators and the analysis of survival. Yet, it is possible to compare data across public and private healthcare systems in our country[11].

The precision medicine is promising in oncology. Its use will allow the broadening of the research area with data in real time, what will enhance the dissemination of the scientific knowledge and safety when new drugs arrive to the market[12].

Brazil has several public database gathering information that can be useful for the development of oncology researches. The Population-Based Cancer Registry (PBCR), for instance, provides data on cancer incidence and is being implemented in Brazil since 1967[13]. Currently, they cover about ¼ of the Brazilian Population. The Cancer Hospital Registry (RHC) allows the evaluation of the quality of the healthcare provided[14]. Through a data tabulator – RHC Integrator – it is possible to access information of more than three million cancer cases attended in the country in the last years. On its turn, the Mortality Information System (*Sistema de Informação sobre Mortalidade* - SIM) has data available about cancer deaths since 1979 and has been widely utilized to analyze the tendencies of mortality in different topographies of the disease[15]. There are still information about cytopathologic tests and mammographies, both performed by the National Health System (*Sistema* **Único** *de Saúde* – SUS) that are available through the Cervix Cancer Information System (*Sistema de Informação do Câncer do Colo do* **Útero** - SISCOLO) and the Breast Cancer Information System (*Sistema de Informação do Câncer de Mama* – SISMAMA), respectively[16].

The Brazilian Journal of Cancerology has been publishing studies utilizing *Big Data* for the last years with the objective of supporting the technological innovations that widen the scientific knowledge, especially in oncology.

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