English

Digital interventions to strengthen the health system: a cutout for chronic non-communicable diseases

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Abstract

Introduction:Reference entities and world leaders have intensified the agenda of discussions for the formatting of plans for attention to chronic diseases and for the promotion of research, technological applications, definition of strategies and use policies related to Digital Health Chronic. In view of this panorama, this article aims at presenting, through consultations to the strategic plans of health management entities and a brief review of the literature, the use of Digital Health aspects in the prevention, diagnosis or treatment of NCD's and their convergence relationship in helping to fulfill the worldwide goals inherent to Noncommunicable Chronic Diseases established by the WHO. Method: it was realized a bibliographical research having as source of periodic information indexed in the bases: PubMed, Scopus and Web of Science. Descriptors: health", "ehealth", "noncommunicable diseases" and "noncommunicable chronic diseases". The works published between 2000 and 2019 were prioritized, being also disregarded those without content aimed at the application of some form of Digital Health for NCDs. Results: It was possible to identify conceptual and practical studies of Digital Health applications directed to different purposes for some type of NCD´s. Conclusion:The development and expansion of Digital Health around the world have brought alternative solutions to the different phases of NCD´s care.
Keywords: Digital Health; Chronic Disease; Telehealth; Telemedicine.

Resumen

Intervenciones digitales para fortalecer el sistema de salud: un atajo para las enfermedades crónicas no transmisibles

Introducción: Las entidades de referencia y los líderes mundiales han intensificado el programa de debates para el formato de los planes de atención a las enfermedades crónicas y para la promoción de la investigación, las aplicaciones tecnológicas, la definición de estrategias y las políticas de uso relacionadas con la salud digital. Ante este panorama, el presente artículo pretende presentar, a través de consultas a los planes estratégicos de las entidades de gestión sanitaria y de una breve revisión de la literatura, el uso de los aspectos de la Salud Digital en la prevención, el diagnóstico o el tratamiento de las ECNT y su relación de convergencia para ayudar a cumplir los objetivos globales inherentes a las Enfermedades Crónicas No Transmisibles establecidos por la Organización Mundial de la Salud (OMS). Metodo: Fué desarrollada una investigación bibliográfica em las bases: PubMed, Scopus y Web of Science. Descriptores: "digital health", "e-health", "ehealth", "noncommunicable diseases" y "noncommunicable chronic diseases". Se dio prioridad a las obras publicadas entre 2000 y 2019, y se descartaron las que no tenían contenido destinado a aplicar alguna forma de Salud Digital para las ECNT. Resultados: fue posible identificar estudios conceptuales y prácticos de las aplicaciones de la salud digital dirigidas a diferentes propósitos para algún tipo de ECNT .Conclusiones: El desarrollo y expansión de la Salud Digital en todo el mundo ha traído soluciones alternativas para las diferentes fases del cuidado de las ECNT.
Palabras clave: Salud Digital; Enfermedades Crónicas; Telesalud; Telemedicina.

Resumo

Intervenções digitais para fortalecer o sistema de saúde: um atalho para as doenças crônicas não transmissíveis

Introdução: Entidades de referência e lideranças mundiais têm intensificado o programa de debates para a formatação dos planos de atenção às doenças crônicas e para o fomento à pesquisa, aplicações tecnológicas, definição de estratégias e políticas de uso relacionadas ao saúde digital. Neste contexto, este artigo tem como objetivo apresentar, por meio de consultas aos planos estratégicos das entidades gestoras da saúde e de uma breve revisão da literatura, a utilização de aspectos da Saúde Digital na prevenção, diagnóstico ou tratamento das DCNT e sua relação de convergência para ajudar a cumprir os objetivos globais inerentes às Doenças Crônicas Não Transmissíveis, estabelecidos pela Organização Mundial da Saúde (OMS). Método: Foi desenvolvida uma pesquisa bibliográgica nas bases: PubMed, Scopus y Web of Science. Descritores: "digital health", "e-health", "ehealth", "noncommunicable diseases" y "noncommunicable chronic diseases". Priorizou-se os trabalhos publicados entre 2000 y 2019, e se descartaram os que não tinha conteúdo relacionado a aplicação de alguma forma de saúde digital para as DCNT. Resultados:Foi possível identificar estudos conceituais e práticos das aplicações da saúde digital dirigidas a diferentes propósitos para algum tipo de DCNT. Conclusão: O desenvolvimento e expansão da saúde digital em todo o mundo tem trazido soluções alternativas para diferentes fases do cuidad das DCNT.
Palavras-chave: Digital Health; Doenças crônicas; Telessaúde; Telemedicina; Saúde Digital.

Introduction

According to WHO (2019)[1], the term Digital Health has its origins in eHealth, defined, in turn, as the use of information and communication technologies (ICTs) in support of health and its related areas. The Healthcare Information and Management Systems Society - HIMSS [2] and the International Telecommunication Union – ITU3 complement this definition by considering eHealth as any Internet application used in conjunction with other ICT's, focusing on improving service delivery and coordination of health systems in order to subsidize quality improvement in clinical processes, patient treatment and health system cost reduction. In the context of this conceptual model, there is a set of tools and services that can provide the necessary conditions to support care and improve treatment in an integrated manner via the web. Among other aspects, we can mention Big Data, Cloud Computing, Artificial Intelligence, Internet of Things (IOT), mHealth (health supported by mobile devices), Electronic Health Records and Telemedicine (HIMSS, 2019).

As an initiative to guide the use of the different applications in Digital Health, mainly concerning mobile devices and Telemedicine, the WHO (2019) issued a booklet with guidelines and recommendations on digital interventions for health system strengthening. Through careful evaluations of technical, financial, and social impact, the aim was to present recommendations for the use of emerging technological interventions and provide implementation considerations for the resulting investments in digital applications by those responsible for designing health policies. In all, there were ten recommendations for intervention in Digital Health related to the following topics:

- Acceptability and feasibility of interventions for health professionals;
- Birth notification;
- Death notification;
- Stock and merchandise notification;
- Telemedicine patient to provider (complementary and not a substitute to the provision of on-site services and insurance);
- Telemedicine provider to provider;
- Communication directed to the customer for behavior change;
- Decision support for health professionals;
- Digital tracking of patient and service health status;
- Digital provision of training and educational content to health professionals.

Regarding Chronic Non-Transmissible Diseases, these are the result of a combination of genetic, physiological, environmental and behavioral factors. The main types of NCD are chronic cardiovascular and respiratory diseases, diabetes and neoplasms. In the world, about 41 million people die annually due to NCD, the equivalent of 71% of all deaths.

A state of alert is consolidated from the high number of deaths between 30 and 69 years of age, with prevalence in low- and middle-income countries like Brazil, which corresponds to 15 million people per year. Added to the increasingly large elderly population, for whom these illnesses are more frequent, a worrying liability of people with some chronic disease is created. According to PAHO (2015), it was estimated that the costs of chronic diseases would lead to the loss of US$ 7 trillion in low- and middle-income countries, either in health costs or the loss of the labor force. For WHO4, it is expected that by 2050, 1/5 of the world population (about 2 billion people) will be over 60 years old. It is also important to highlight that the lack of control of the so-called risk factors, modifiable behavioral and metabolic, are the main triggers of problems with NCD. In this classification, modifiable behavioral factors are considered: sedentarism, unhealthy diet, smoking and harmful use of alcohol. As for metabolic factors, one can mention: high blood pressure, overweight and obesity, hyperglycemia (high levels of glucose in the blood) and hyperlipidemia (high levels of fat in the blood) [4].

To combat the advance of NCD's, since 2011 high level meetings of the General Assembly of the United Nations are held to discuss the issue (editions in 2011, 2014, 2015 and 2018). In 2013, the Global Plan of Action for the Prevention and Control of Chronic Noncommunicable Diseases 2013-2020 was presented, in which the World Health Organization consolidated projections on mortality and incidence of risk factors to NCDs in 194 countries and established nine voluntary global goals for 2025[5]. The proposed targets are presented in sequence:

- Target 1 - Relative reduction of overall mortality from cardiovascular diseases, cancer, diabetes or chronic respiratory diseases by 25%;
- Target 2 - Relative reduction of harmful alcohol use by at least 10%, as appropriate, in the national context;
- Target 3 - Relative reduction of the prevalence of insufficient physical activity by 10%;
- Goal 4 - Relative reduction of the population average of salt or sodium ingestion in 30%;
- Goal 5 - Relative reduction of the prevalence of current tobacco consumption in 30%, in people with 15 years or more;
- Target 6 - Relative reduction of 25% in the prevalence of hypertension or containment of the prevalence of hypertension, depending on the circumstances of the country;
- Goal 7 - Prevent the increase of diabetes and obesity;
- Goal 8 - Pharmacological treatment and counseling (including glycemic control) of at least 50% of people who need it to prevent heart attacks and cerebrovascular accidents.
- Target 9 - 80% availability of basic technologies and essential drugs, including generics, needed to treat major NCD's, accessible in public and private centers.

In the meeting held in 2018, the World High Level Independent Commission of the WHO requested urgent treatment of chronic diseases and also for mental disorders. In this sense, new political commitments were signed with state leaders to intensify actions to confront and achieve the goals set to control the evolution of NCDs [6,7] . The importance given to the promotion of emerging technologies, either through academic research and/or private sector products, that promote disease prevention and access to essential care, drugs and services to combat NCDs is highlighted here.

In view of the above scenario, the focus of this study is on research and reporting examples of applications in Digital Health beneficial for the attention to Chronic Non-Transmissible Diseases. The objectives of this work are based on the characterization of Digital Health and its application; the presentation of the main aspects of the Guideline of Recommendations on Digital Interventions for the Strengthening of the Health System and the targets of the Global Plan of Action for the Prevention and Control of Chronic Noncommunicable Diseases 2013-2020, both proposed by the WHO; and an analysis, based on a brief review of the literature, of the use of Digital Health aspects in the attention to NCDs, with their potential to contribute to the achievement of the goals of the World Health Organization's respective action plan.

Method

This article is the result of a bibliographical research having as source of periodic information indexed in the bases: PubMed, Scopus and Web of Science. The search of the material was made in English, by the terms "digital health", "e-health", "ehealth", "noncommunicable diseases" and "noncommunicable chronic diseases", applying the classification of relevance of the material. The works published between 2000 and 2019 were prioritized, being also disregarded those without content aimed at the application of some form of Digital Health for NCDs.

Results and Discussion

TFrom the literature review, it was possible to identify conceptual and practical studies of Digital Health applications directed to different purposes for some type of NCD. In the following paragraphs, the description and analysis of articles chosen to elucidate the use of Digital Health via Big Data, Cloud Computing, Artificial Intelligence, Internet of Things (IOT), mHealth, Electronic Medical Records and/or Telemedicine is made, in order to introduce the practices performed and their potential benefit, not addressing, in this opportunity, the restrictions, limitations and risks inherent to each one.

Associating applications in Big Data, Artificial Intelligence and Electronic Medical Records Rajkomar et al[8] worked with predictive modeling with information from Electronics Health Records (EHR's) of two American academic medical centers with more than 200,000 adult patients hospitalized for at least 24 hours, with total data volume of approximately 47 billion, including clinical notes. From the initiative to use computer systems to "learn" from the database through Artificial Intelligence, the models resulting from machine learning have achieved high accuracy in predicting length of hospital stay, discharge diagnoses, unplanned readmission of patients within thirty days of discharge and hospital mortality rates.

Regarding the use of Internet of Things, Basatneh et al [9] studied its application in patients with diabetic foot ulcer through health sensors, such as shoe sensors to monitor adherence to prescribed footwear, carpets to monitor the risk of wounds and activity monitor to plan daily activities ideas, all with the ability to transmit data via cloud (Cloud Computing) and connect patients, caregivers and service providers. The results allowed to stimulate patient involvement, personalized care and disease management. In addition to this application the article makes reference to other possible resources with IOT for chronic patients such as wearables for glucose monitoring, skin conditions and vital signs.

In analyzing Mobile Health (mHealth) through the use of portable devices, primarily cell phones, Kahn et al [10] proposes a conceptual model that addresses the potential contributions of mobile technology to the challenges of health service delivery for chronic diseases in developing countries. As noted during the study period, the presence of these devices was already massive in the developed world, with about 90% diffusion, and growing in developing countries, with more than 33% of the public reached, including a large part of high-risk urban populations in some nations. In a universe of 3.3 billion people on the planet, one in every two inhabitants of the earth owned at least one cell phone. As a result, the author lists a number of mHealth tools that have benefits in promoting healthier living habits, sharing experiences about the local health care system, and creating learning environments for professionals responsible for the care of NCDs and other diseases.

In line with this perspective Holeman et al[11] highlights the transformative potential of mHealth, considering the population's reach at the cellular signal vastly exceeds the proportion of people with access to basic health care. It also points out that mobile technology can reduce costs, improve access to services, and strengthen health systems to meet the challenges related to cancer and other non-communicable diseases even in very poor and remote communities. This consideration stems from experiences such as that in Malawi, a country located in Central Africa, with scarce resources in terms of primary prevention, screening and basic cancer treatments.

Through the partnership of a non-profit technology company and a hospital in the region, cell phones were made available to a group of lay health professionals, enabling the exchange of text messages with a nurse at the hospital, in order to assist patients in need of care. As reported in the text, after a retrospective analysis of the first six months of operation, it was found that the most frequent use referred to requests for help and supplies, requests for advice and reports of symptoms in patients. Other applications present in the same work refer to data collection on and statistics of services for preventive work and the provision of palliative care guidance in cases where the curative treatment of cancer is not accessible.

Another study, conducted by Widmer et al [12] aimed at a systematic review of the literature and meta-analysis evaluated the digital health interventions for prevention of cardiovascular diseases going through changes in risk factors such as blood pressure, weight, body mass index, cholesterol and glucose levels, and the events of myocardial infarction, stroke and revascularization. The results of the analysis revealed that the use of web-based strategies, email reminders, cell phones, text messages and sensors, and data monitoring showed benefits compared to usable care. These gains had a higher incidence among patients at higher risk, such as heart failure and secondary prediction of cardiovascular diseases (care approaches to avoid worsening of the disease), in addition to suggesting potential positive impacts associated with improving risk factors in primary prevention studies (measures prior to the occurrence of the disease).

In the case of Telemedicine, its application can be exemplified by the initiative of Ganapathy et al 13 who worked with online teleconsultations (between doctors and patients) in specific communities in India in order to provide preventive care for diabetes, dyslipidemia, obesity, hypertension and anemia, to raise awareness about NCD's and identify early risk factors in the region. The experience has been through a team organized in fields with internet access providing on-site diagnosis from a virtual connection to a Medical Response Center. Specific software was created to record details of the participants and assist in the decisions of the field team, which was useful to the real time care of a little more than [13] thousand people, who, almost in their totality, positively evaluated the initiative carried out.

Conclusion

Analyzing the examples presented in this section from the perspective of the targets proposed in the Global Plan of Action for the Prevention and Control of Chronic Noncommunicable Diseases 2013-2020, it is possible to identify actions that are more direct to targets 1, 2, 3, 6 and 7. However, in view of the flexibility and propagation potential observed in the articles for the different forms of Digital Health, it is possible to envisage applications for the other established targets.

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