Short Communication

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2021.34.005603

Digital Transformation in Healthcare

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ARTICLE INFO

Received: March 08, 2021

Published: March 25, 2021

Citation: Ik Whan G Kwon, Sung Ho Kim. Digital Transformation in Healthcare. Biomed J Sci & Tech Res 34(5)-2021. BJSTR. MS.ID.005603.

ABSTRACT

Abbreviations: SDOH: Social Determinants of Health; AI: Artificial Intelligence; ML: Machine Learning; CAC: Computer-Assisted Coding; SDI: Social Deprivation Index

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As healthcare systems nationwide faced a surge of Covid-19 cases, providers and policy makers are under unprecedent pressure to find effective ways to manage the Covid-19 virus that we were unprepared. Urgent action is required to transform the healthcare delivery system by exploring the power of digital technologies. Digital transformation refers to the use of information and communication technologies to improve human health, healthcare services, and wellness for individuals across populations [1]. Adoption of technologies in the healthcare management area provides tools in two related areas of population health; a micro focus on precision medicine and a macro approach to population health using social determinants of health (SDOH) framework. The healthcare industry is ready for some major changes in the way services are delivered and managed. From chronic diseases and cancer to radiology and risk assessment, there are nearly endless opportunities to leverage technology to deploy more precise, efficient, and impactful interventions at exactly the right moment in a patient's care. Precision medicine is an emerging medical model where medical decisions and subsequent treatments are tailored to a specific group of patients. Precision medicine, therefore, requires massive computing power and algorithms that can learn at an unprecedented rate [2]. One of the tools is artificial intelligence (AI) that analyzes the growing amounts of data and taking action based on what it learns from the data.

AI analyzes the electronic documentation of patients and uses what it has learned and using coding rules and guidelines to assess the characteristics of diseases and search for "intelligent" diagnoses. The AI considers all written documentation within a patient record to build treatment protocols. It can understand when it is appropriate to combine codes, how to comprehend negations, and much more. The machine learning (ML) then learns suggested code patterns from each action performed by a coder within computer-assisted coding (CAC). The more data and information that is fed through CAC, the more it will learn, and the more accurate it will be for coders to review and validate [3]. AI offers a number of advantages over traditional analytics and clinical decision-making techniques. Algorithms can become more precise and accurate as they interact with training data, allowing humans to gain unprecedented insights into diagnostics, care processes, treatment variability, and patient outcomes [4]. In addition, AI could scan all available data along with corresponding attributes and preexisting conditions for a particular patient and help determine if the procedure does or does not seem medically necessary for any reason [5]. In addition, machine learning (ML) through AI allows creating a social deprivation index (SDI) where limited resources can be effectively deployed to the most vulnerable population in the community. Using seven indexes (income, education, employment, housing, household characteristics and transportation), SDI is a

composite measure of area level deprivation based on the above indexes. SDI is a part of social determinant of health (SDOH). The World Health Organization defines SDOH as the conditions in which people are born, grow, live, work, and age. These circumstances are shaped by the distribution of power, money, and resources at global, national, and local levels (World Health Organization, 2017). Using ML technologies, policy makers map cluster of SDI areas (communities) where resources can be effectively invested to improve the community health.

Accenture estimates that key clinical health AI applications can create $150 billion in annual savings for the U.S. healthcare economy by 2026 [6]. Factors that motivate investment and implementation in digital health include consumerism (Patient wants on-demand healthcare), healthcare reform (healthcare cost has been rising faster than consumer prices while health status measured by life expectancy and infant mortality in the United States is the lowest among advanced countries, Kim, et al. [7], efficiency (cost and process), and patient-clinician-caregiver relationship [8]. However, there are a host of barriers and challenges often associated with the adoption and scalability of digital heath: outdated technology and data infrastructure, uncertain outlook of the future return on investment, lack of budget to scale digital health initiative, resistance to change within the healthcare system especially by and among physicians, and the insufficient number of qualified personnel/ experts who manage and operate the digital system. Nevertheless, once the infrastructure is built and sufficient healthcare personnel are trained, digital transformation will be a frontier in improving individual as well as community health with return on investment to be a socially as well as medically acceptable level.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2021.34.005603

Ik Whan G Kwon. Biomed J Sci & Tech Res

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