

PREFACE

Digital health is the concept of using technology, especially internet-based technologies, to diagnose, monitor, treat, and prevent diseases. Some examples of digital health include mobile health, electronic health records, wearable or implanted devices with wireless communication, smartphones installed with specific applications (apps), telehealth, telemedicine, artificial intelligence, and robotics. Digital health innovations have helped clinicians, medical staff, and caregivers to deliver better patient care. The 10 chapters in this book, contributed by a multidisciplinary team of clinicians and scientists, discuss the recent advances in the field of digital health, how these innovations have helped in delivering better patient care, and the challenges that lie ahead in achieving equity in health care.

Gathering and sharing by individuals of their health-related data to enhance their medical care or personal wellness are popular and growing rapidly. This is termed electronic patient-generated health data for healthcare. *Chapter 1* introduces the concept of patient-generated health data for healthcare and discusses the benefits and challenges along with the legal, regulatory, and ethical issues surrounding such practice. Early diagnosis is critical to improving survival rates of lethal cancers; however, there are no reliable screening tests for these cancers. *Chapter 2* presents the potential of readily available federated databases and electronic health records in developing risk prediction models for early, evolving cancers. Prior to the COVID-19 crisis, the opioid crisis was the major public health challenge ravaging economies and communities across the United States. Digital health offered new ways to reach, diagnose, and treat individuals with opioid use disorders. *Chapter 3* provides a historical analysis of NIH funding in five emerging technology categories: electronic health, mobile health, virtual reality, artificial intelligence, and biosensor.

Telehealth, the remote delivery of clinical services through electronic communication and other technological tools, has undergone rapid advances, especially since the COVID-19 pandemic. *Chapter 4* provides a comprehensive review of the application of telehealth in ophthalmology, known as teleophthalmology, with emphasis on remote screenings, treatment monitoring, post-operative care, and in some cases, for diagnosis and management. Population aging is a global trend. A major challenge is that older people after retirement tend to lose contact with society, leading to social isolation, which can promote the progression of frailty and disability. *Chapter 5* addresses the challenges of health care in the elderly in Japan, discusses the importance of digitization of medical care fields, and shares the implications and applications of information and communication technology to promote healthy aging in older people. Artificial intelligence has the potential to assist clinical decision-making. Stroke is a life-threatening condition, and there is a narrow time window for treatment. The prediction of functional outcomes after stroke is of paramount importance. *Chapter 6* gives examples of studies that apply artificial intelligence models to predict functional outcomes of ischemic stroke patients, evaluate existing models' predictive power, and discuss the challenges that limit their adaptation to the clinic.

Elderly residents in nursing homes usually have multiple comorbidities, including cognitive and psycho-behavioral pathologies, cardiac disorders, diabetes, chronic obstructive pulmonary disease, and kidney disease. *Chapter 7* considers the challenges of aging residents in nursing homes and introduces the GER-e-TEC (GERIATRICS and e-TECHNOLOGY) project in France that aims to provide these fragile elderly patients with telemedicine tools with non-invasive communication sensors, and artificial intelligence techniques, allowing daily monitoring with a major focus on falls, malnutrition, cognitive-behavioral disorders, and iatrogenic conditions. Transfusion of blood from human to human became a clinical reality around the turn of the 19th century with the discovery of the ABO blood group system. *Chapter 8* provides a consolidated history of transfusion medicine, from the first experimental therapy to the recent development of deep learning algorithms to predict transfusion needs and compatibility, contributing to improved safety of patient care.

Digital health technologies have the potential to improve healthcare access, utilization, and experience for patients; at the same time, their development and use can reinforce, exacerbate, and even create health disparities. *Chapter 9* addresses the issue of digital health equity, and highlights that the active participation of digital health corporate interests, advocacy groups, regulatory and policy bodies, and patients themselves is critical to creating a future of digital health that supports those who most stand to benefit from a more equitable, fair, and just healthcare system. Non-transmissible chronic respiratory diseases are very prevalent. Telerehabilitation, health education, telemonitoring, early detection of exacerbations, psychosocial support, and smoking cessation through telemedicine programs allow the delivery of quality healthcare to chronic obstructive pulmonary disease patients who have limited access to health services. *Chapter 10* focuses on the different dimensions through which telemedicine can be delivered and used in the management of patients with obstructive chronic pulmonary disease and asthma, the major obstructive chronic respiratory diseases.

Overall, the book provides a glimpse of the exciting advances made in delivering health care through digital health, the challenges that lie ahead in implementing digital health equity and security, and the potential solutions for these challenges. Authors of each chapter also provide diverse and global perspectives of how digital health can be implemented in different countries and regulatory frameworks. This book will be of value to healthcare professionals and researchers interested in digital health transformation.

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