Foreword

# Building a Chronic Diseases Prevention and Rehabilitation System Throughout the Life Span to Proactively Respond to the Challenges of Accelerated Population Aging

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Population aging has emerged as one of the most pressing global demographic issues. Rapid population aging is being caused by a sharp drop in fertility rates over time, as well as a significant increase in life expectancy in the past decades. The World Health Organization (WHO) estimates that the proportion of those aged 60 years and older in the world's population will almost double from approximately 12% in 2015 to 22% in 2050, with an absolute increase of 900 million to a total of 2 billion older adults (*1*). At the same time, the burden of global disease has changed greatly and the main diseases affecting human health have switched from acute and chronic infectious diseases to chronic non-communicable diseases (NCDs) (*2*). Such changing demographics and disease spectrum will profoundly affect all aspects of human society.

Aging is a decisive risk factor for many chronic diseases. Most NCDs, such as cancer, cardiovascular disease (CVD), Alzheimer's disease, Parkinson's disease, arthritis, diabetes, and obesity, are becoming leading causes of disability and death worldwide. These diseases usually emerge in middle age after long exposure to an unhealthy lifestyle involving tobacco use, alcohol use, stress, lack of regular physical activity, and consumption of a high-fat diet or red meat (*3*). It has been well established that the incidence of chronic diseases rises sharply with age and the majority of patients with a chronic ailment are over the age of 65 years. In China, four major chronic diseases, including CVDs, cancers, chronic respiratory diseases (CRDs), and diabetes, caused most of the deaths. Ample evidence shows that the lack of medical personnel, especially the nursing shortage, has become a problem in China. In the face of an aging population, increasing chronic diseases, anticipated shortages of many types of health care workers, and soaring health care costs, new models of health care delivery are inevitable.

Rehabilitation is also central to geriatric medicine. The WHO defines healthy aging in terms of maintaining functional ability. Disease prevention and early aggressive treatment of conditions such as hip fracture and stroke are important, but multi-professional remedial therapy is also effective when disability is manifest. Rehabilitation has evolved, from being primarily hospital-based to outpatient and community settings, the development of pre-surgical "pre-habilitation," and efforts to reverse frailty and sarcopenia. According to an analysis of data from the Global Burden of Diseases, Injuries, and Risk Factors Study (GBD) 2019, there were 2.41 billion people (95% uncertainty interval 2.34–2.50 billion) worldwide who would benefit from rehabilitation services in 2019 (*4*). As for China, rehabilitation needs are increasing rapidly due to the accelerated aging of the population and the rising incidence rate of chronic diseases. Health and social systems face huge challenges in meeting the growing rehabilitation needs, and more systematic and comprehensive solutions are needed.

The prevalence of coronavirus disease 2019 (COVID-19) has also brought new challenges to the cause of human health. It has been widely reported that there is a clear association between COVID-19 severity and NCDs. COVID-19 deaths also occur in older people who often have existing comorbidities (*5*). Body-mass index (BMI) might also be associated with the severity of COVID-19; in China, patients with severe COVID-19 and non-survivors typically had a high BMI (>25 kg/m$^2$) (*6*). These research results remind us that we cannot ignore the new challenges brought by the COVID-19 pandemic when responding to population aging.

Systematic research on aging and health to block the accumulation of health risks in all aspects of life span to the outbreak of old age is one of the most important ways to actively respond to aging. In this special issue, we invited colleagues from the School of Population Medicine and Public Health at the Chinese Academy of Medical Sciences/Peking Union Medical College, Center for Health Statistics and Information at National Health Commission, Department of Cardiology and Institute of Vascular Medicine at Peking University Third Hospital, and School of Public Health at Ghent University to report their latest findings on the system of chronic disease

prevention and rehabilitation.

Zheng et al. created an advanced and evolving conceptual framework including the definition, goal, discipline, and scope of human aging omics (HAO) based on the theories and methods of omics science (*7*). Cai et al. described changes in the mortality rates of major chronic diseases among the population aged over 60 years and their contributions to life expectancy increases in China (*8*). Guo et al. presented scientific data and quantitative evaluation of the current state and challenges of rehabilitation needs for the elderly (aged 60 and above) in China (*9*). Finally, Zhang et al. reported the current situation and projections of the population aging in Europe and identified the limited access to healthcare among older adults in Europe due to COVID-19 (*10*).

These findings further expounded the pressures and challenges brought by the accelerated aging of the global population, especially when the COVID-19 pandemic is spreading all over the world. For China, the mortality rate of the four major chronic diseases mentioned above is decreasing, while the incidence rate of chronic diseases is rising. And the rehabilitation needs of the population are also increasing rapidly with the deepening of population aging. At the same time, we also pay attention to the development of foreign medical practice, and the accessibility of healthcare among the European elderly population was found affected by the COVID-19 outbreak in this issue. In addition, we put forward a more comprehensive concept and framework of HAO, which provides a clear direction for further future research and exploration of elderly health.

With the active preparedness for the population aging being elevated to a national strategy in China, the prevention and control of chronic diseases in the elderly and the optimization of the supply of rehabilitation services are topics that we cannot avoid. Aging is a complex and multifactorial process during which molecules, cells, and organs undergo damage over time, resulting in loss of function, increased morbidity, and, eventually, death. Therefore, in addition to research and analysis at the population and macro level, it is also urgent to further explore the mechanism of human aging from the perspective of omics and propose more precise intervention strategies for healthy aging achievement.

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