

# Preface

The growth of an aging population, particularly those aged 80 and older, is pervasive across the globe, throughout advanced countries as well as less-developed countries. The extension of life expectancy is often associated with changes in people's lifestyles and health habits (P), health organization and medical care innovations (O), improved environmental conditions (E), and health technology applications (T). In their seminal work, *Vitality and Aging*, Fries and Crapo (1981) advocate that the phenomenon of compression of morbidity and mortality is occurring at the population level and the survival curve is approaching a rectangular shape.

The presence of chronic conditions often arrives with advanced age. Poly chronic conditions (PCC), also referred to as multimorbidities or multi-chronic conditions (MCC), occur when a person has more than one chronic disease (e.g., comorbid conditions such as hypertension, type 2 diabetes, and coronary heart disease). Population health management (PHM) is defined as a framework that guides treatment and management of patients through the identification of specific groups based on similar characteristics, such as disease, socioeconomic status, and region. Integration and coordination of care are important aspects that must be addressed in order to reach targeted populations, provide them with quality care, and reduce costs. Identifying the care and treatment patterns associated with higher risks and costs, and developing strategies and interventions to improve health outcomes for these patients, requires the involvement of patients, caregivers, providers, community entities, and other stakeholders. The adequacy of PHM is contingent on the integration of multiple tasks, such as wellness and lifestyle management, coordinated care or disease management, demand or utilization management, chronic care management, quality management, and health information and data management.

Little is known about how the patterns and trends of chronic conditions are influenced by contextual and personal factors that may directly and indirectly affect the trajectory changes of morbidity and mortality. Wan et al. (2016) conducted a large-scale, population-based study on contextual, organizational, and ecological determinants of health disparities and outcomes of chronic obstructive pulmonary disease (COPD) and asthma hospitalization. But, only a limited amount of the total variance

in the risk-adjusted hospitalization rate is attributable to these three predictor variables (determinants). In a systematic review on the literature of diabetes care education and research, Wan et al. (2017) document several personal factors, such as lack of adherence to medical regimens, inadequate medical knowledge about diabetes control, and poor attitudes and motivations for preventive behavioral changes and preventive practices, which may have contributed to the variations in patient-care outcomes and hospitalization associated with type 2 diabetes. Furthermore, there is a knowledge gap in understanding the epidemiological triad of time, person, and place associated with the presence of poly chronic conditions (Wan et al. 2016a, 2016b).

Evidence-based care management and practice is needed in order to enhance the design, implementation, and evaluation of effective and efficient care-delivery systems from a global research perspective. Due to the complexity of their healthcare needs, patients with poly chronic conditions utilize more health services and are the costliest to treat. The Agency for Healthcare Research and Quality reported that in 2010, patients with poly chronic conditions accounted for 71%, or 71 cents of every dollar, of healthcare spending. Only 8.7% of individuals had five or more chronic conditions, yet accounted for more than one-third (35%) of healthcare spending (Gerteis et al. 2014). Medicare spending is largely consumed by patients with poly chronic conditions as well. Beneficiaries with two or more chronic conditions accounted for 93% of Medicare spending in 2010, with 14% of patients who had six or more chronic conditions accounting for 46% of total Medicare spending (Centers for Medicare and Medicaid Services 2012).

Patients with multiple chronic conditions accounted for more than 70% of all inpatient hospital stays in 2010, with more than half of these stays (38.5%) for patients with more than five chronic conditions (Gerteis et al. 2014). Using claims data provided by the 2012 Agency for Healthcare Research and Quality, Healthcare Cost and Utilization Project, State Inpatient Databases, analysis of patients with multiple chronic conditions hospitalized for potentially preventable acute and chronic conditions showed that more than 90% of patients hospitalized for ambulatory care sensitive chronic conditions had two or more chronic conditions and more than 20% had six or more chronic conditions. Approximately 80% of patients hospitalized for potentially preventable acute conditions had multiple chronic conditions, and more than 10% had six or more chronic conditions (Skinner et al. 2016).

The number of hospitalizations per year and the rates of hospital readmission have been shown to increase as the number of chronic conditions increases among Medicare beneficiaries. In 2010, 4, 13, and 30% of Medicare patients with zero or one chronic condition, two to three chronic conditions, and four to five chronic conditions, respectively, were hospitalized. Among patients with six or more chronic conditions, 63% were hospitalized, with 16% of these patients having more than three hospitalizations (Centers for Medicare and Medicaid Services 2012). In 2011, the rate of readmission within 30 days for Medicare patients with zero or one chronic condition was 8.9%. This number rose to 10.3% for patients with two to three chronic conditions, 13.5% for patients with four to five conditions, and 25% for patients with six or more chronic conditions (Lochner et al. 2013).

As a result of the enactment of the Patient Protection and Affordable Care Act (ACA) in the United States, many aspects of healthcare have improved regarding access, quality, and value. However, many barriers to treatment for poly chronic conditions remain, including a gap in coordinated care and service delivery. Our research suggests that population health management programs should be incorporated into most healthcare sites, due to their effectiveness in containing costs, delivering high-quality care, and improving health outcomes. Future work can focus on the methods of integrating the population health management framework into the care of patients with chronic conditions. Thus, the value-based transformation of the delivery system can be achieved.

The primary objective of this book is to identify the knowledge gap in the design, implementation, and evaluation of care-management research for targeted population groups afflicted by poly chronic conditions. The field of chronic disease epidemiology could benefit from applying innovative multi-tiered interventions to promote primary, secondary, and tertiary prevention of chronic diseases. Furthermore, it is believed that the inter-sectorial collaboration among population health professionals, behavioral and social scientists, management experts, clinicians, and policy decisionmakers can work together and integrate multiple scientific domains into transdisciplinary strategies to optimize population health. This book hopes to help enlighten scientists and practitioners to share a common vision in reducing health expenditures and healthcare disparities through evidence-based practices and research. Ultimately, we will share practical, efficient, and sustainable solutions to target the right (high-risk) population groups amenable to a better coordinated and managed chronic care system.

More specifically, through our research and educational exchanges among multi-sectorial investigators, it may enable us to achieve the following aims:

1. Identify relatively homogenous population groups that can benefit from multi-level preventive and therapeutic interventions for chronic care.
2. Learn and share strategies that can reduce the gap in chronic care.
3. Conduct collaborative and longitudinal studies on population health management.
4. Redesign and transform chronic care to improve the performance, such as effectiveness and efficiency, of the delivery system.
5. Disseminate evidence-based research results and promote the design, use, and evaluation of clinical and administrative decision support systems or related health information technologies.

This book with three parts contains 10 chapters. Part 1 illustrates how population health management has evolved from health demography to population health management and explains how varying strategies are employed to improve population health management. Part 2 identifies evidence showing how human factors may modify the risk for hospital readmissions. Part 3 presents the design, implementation, and evaluation research relevant to person-centric care strategies via the use of health information technology.

Part 1 has four chapters. The first chapter identifies the evolution of research foci in population health from health demography to care management of targeted population groups. The second chapter illustrates health trends in population health management, mechanisms for cost containment, and mechanisms for integrating multiple domains of the population health approach, as each relates to poly chronic conditions. There are several mechanisms for cost containment, though we focused on pay-for-performance (P4P), diagnosis-related group (DRG), hospital readmission penalty program (HRPP), and the value-based payments for quality and performance. The third chapter documents the patterns and trends of chronic disease epidemiology and highlights a series of gaps in delivering cost-effective patient care for poly chronic conditions. The fourth chapter furthers the understanding of patient-centric care management with poly chronic conditions effectively, utilizing and optimizing a population health management framework.

Part 2 includes three chapters. Chapter 5 discusses preventive aspects of chronic conditions. Chapter 6 offers a systematic review and meta-analysis on heart failure hospitalization and readmission. Chapter 7 presents an empirical study on the contextual, organizational, and ecological factors influencing the variations in heart failure hospitalization of rural Medicare beneficiaries in eight southeastern states of the United States, using a longitudinal study design.

Part 3 advocates the need for employing person-centric care-management strategies to optimize better outcomes and efficiency of chronic care coupled with health information technology. Chapter 8 synthesizes the literature in care-management innovation and adoption, particularly related to heart failure, type 2 diabetes, and renal failure. Chapter 9 features the design and process of an integrated healthcare system via a federated information network design for elders (FINDER) or health FINDER. Chapter 10 demonstrates the use of theoretically grounded predictive analytics, developed by a systematic review and meta-analytic approach to heart failure hospitalization as an example, in formulating a cloud-based decision support system for patients to avoid or minimize the risk of heart failure readmissions.

Finally, the book ends with concluding remarks for promoting population health management practice and research. The prospects for implementing and evaluating a global health oriented to population health management are presented.

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