Chapter 59
Mobile Health Applications Assisting Patients With Chronic Diseases:
Examples From Asthma Care

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ABSTRACT

This chapter analyzes the role of m-health applications supporting patients with chronic diseases (based on examples from asthma care). The purpose of the chapter is to describe the mobile health application development cycle. The chapter begins with a presentation of asthma as a chronic disease and its prevalence and costs for society, as a determinant of the role and place of m-health applications in chronic disease management. Subsequent sections analyze trends in the development of health care, information systems, and health care payment systems as components of the environment for the implementation of m-health applications. The chapter focuses on prerequisites for the introduction of this type of solutions, presents existing applications, and discusses how to define the key functionalities and benefits for patients, payers, and doctors. The financing cycle, barriers to implementation, and future trends are also addressed.

INTRODUCTION

Based on data on morbidity, mortality, hospitalization, and social costs, one may select groups of chronic diseases for which mobile applications should be first developed to support patients, doctors, providers, and payers. The data quoted come from the World Health Organization, Organization for Economic Co-operation and Development, and, less often, from national sources. Assessments of asthma prevalence depend on the adopted criteria for clinical diagnosis (Masoli, Fabian, Holt, & Beasley, 2014). According

to the report "Global Burden of Asthma" published by the Global Initiative for Asthma, 300 million people suffer from asthma around the world today (Masoli et al., 2014). In turn, the Global Asthma Report 2014 gives an estimate of 334 million patients (Global Asthma Network, 2014). It is thought that by 2025, the number of asthma patients will increase by 1/3 (Masoli et al., 2014).

According to the Global Burden of Disease Study 2010, asthma ranks 34th among the leading causes of death (29th in developing countries and 60th in developed countries). Importantly, asthma-related mortality in children aged 1–4 years ranks 22nd (29th place in developed countries and 22nd in developing countries) and in persons over 70 years of age – 21st (17th in developing countries and 45th in developed countries). The above data delineate the target group of patients with asthma to be supported by mobile applications (in the case of children, the users will be their parents or caregivers). Morbidity and mortality vary greatly among countries. According to data from the European Lung White Book, mortality among adults with asthma in Europe, ranges from 8.7 per 100,000 in Portugal to 0.54 per 100,000 in the Netherlands (Gibson, 2013).

Risk factors in patients with asthma include air pollution, smoking, and others. The patients' health status is largely dependent on air pollution. A report by the European Environment Agency emphasizes that air quality in cities exerts a significant impact on the residents' health. However, despite some improvements in air quality, air and noise pollution continue to cause serious health impacts, particularly in urban areas. In 2011, about 430 000 premature deaths in the EU were attributed to fine particulate matter (PM2.5)" (European Environment Agency, 2015, p. 12). Reports by environmental agencies and asthma studies show a growing need for air monitoring to prevent asthma attacks.

The rising costs associated with this disease are a burden on health care systems, patients, their families, and governments. According to the US Centers for Disease Control and Prevention, "Asthma costs the United States $56 billion each year." (Center for Disease Control and Prevention, 2012). One way of cutting down these costs is better management of the disease, including self-management by patients. This may reduce the frequency of life-threatening asthma attacks that are often associated with expensive hospitalization. According to David Van Sickle, president of the company Propeller: "Despite all we know about asthma as a disease and how to treat it, the majority of people with asthma are poorly controlled" (Lawrence, 2014). In the process of disease self-management, an important role may be played by mobile solutions assisting patients with asthma.

The goal of this chapter is to analyze the development life cycle of m-health applications for supporting patients with chronic diseases on the example of asthma. This section presents the trends in health care, information technology, and health care system financing affecting the development of m-health applications, the prerequisites for their use in health care, the infrastructure facilitating their implementation, the objectives of mobile solutions for asthma care, the functionalities of selected m-health applications, the business model, and the financing and implementation of the application.

BACKGROUND

According to the World Health Organization, m-health is part of eHealth "supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices" (World Health Organization, 2011, p. 6). In turn, Zhenwei Qiang, Yamamichi, Hausman, Miller, and Altman in the paper "Mobile Applications for the Health Sector" define m-health as "any use of mobile technology to address healthcare challenges such as access, quality, affordability, matching to

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