Chapter 25
Integrated System for Continuous Monitoring of COPD

Kostas Giokas
AiM Research Team, Biomedical Engineering Laboratory, National Technical University of Athens

Dimitra Iliopoulou
AiM Research Team, Biomedical Engineering Laboratory, National Technical University of Athens

Ioannis Makris
AiM Research Team, Biomedical Engineering Laboratory, National Technical University of Athens

Dimitris Koutsouris
National Technical University of Athens, Greece

ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a progressive pulmonary disease characterized by reduction in airflow and is not fully reversible. COPD is the major cause of mortality and increased levels of disability, particularly in the elderly. Symptoms vary among individuals and include breathlessness, dyspnea, abnormal sputum and chronic cough. Exposure to tobacco smoke is by far the most important risk factor in the development of COPD and is associated with high levels of morbidity and mortality. In this chapter the authors will present a system for the integrated care of COPD focusing on prevention and intervention.

INTRODUCTION

Our proposed system is aimed at the disease management and medical care of chronic obstructive pulmonary disease (COPD) patients.

It is aimed at providing medical management and medical care to these patients. COPD is a progressive pulmonary disease characterized by reduction in airflow and is not fully revers-ible. COPD is the major cause of mortality and increased levels of disability, particularly in the elderly. Symptoms vary among individuals and include breathlessness, dyspnea, abnormal sputum and chronic cough. Exposure to tobacco smoke is by far the most important risk factor in the development of COPD and is associated with high levels of morbidity and mortality.
The system’s main objective is to describe a system to be developed while at the same time assess long-term COPD management solutions based on innovative Information and Communication Technologies (ICT) that:

a. Allow early detection of COPD exacerbations through the use of a multifunctional biomedical system able to yield continuous and sporadic data on heart, breathing and physical activity. This helps to avoid hospitalization and enhances quality of life of elderly COPD patients.

b. Offer a user-friendly design for the elderly.

c. Provide remote monitoring and home-based care.

d. Integrate a technical solution with a holistic service approach.

e. Foster prevention and self-management through immediate comprehensive feedback and efficient personalized assistance.

f. Increase levels of therapy compliance providing effective incentive schemes such as health treatments abroad as an added bonus while it reduces public health care costs and provides business opportunities on the health tourism market.

CHALLENGES RELATED TO COPD MANAGEMENT

There are common known problems related to the care and disease management of COPD patients that influence progression of the disease and thus dramatically increase healthcare costs. In particular, these problems consist in inadequate patient education, lack of patient compliance to therapy guidelines (such as medication) and failure to detect early symptoms of exacerbations before the patient requires emergency treatment and / or hospitalization (Vitacca, Scalvini, Spanevello, & Balbi, 2006). Our proposed solution will support early detection of COPD exacerbations through a multifunctional monitoring system that provides complex information about heart, breathing and physical activity both continuously and sporadically. This helps to avoid hospitalization and thus to increase the quality of life of elderly COPD patients.

Using our platform will be easy done by elderly patients especially since it will be designed by addressing challenges in human-machine-interaction (HMI) especially assigned to elderly people. At the same time it will facilitate mobility of people with chronic conditions such as COPD by supporting long-distance monitoring (Iliopoulou et al., 2005; Mougiakakou et al., 2005).

Our proposed solution combines a technical solution with a holistic service approach for disease management and it encourages prevention and self-management of the situations and risks through immediate, comprehensive feedback and efficient case management services. It therefore improves therapy compliance by providing effective incentive mechanisms such as offering healthcare treatments abroad as bonus – leading to reduced healthcare costs while providing new business opportunities in the healthcare tourism market at the same time. In our proposed solution we will try to introduce and integrate sustainable business models for products and services based on existing healthcare market structures and regulations, in our effort to also give a commercial dimension.

MAIN PROGRESS

Medical and Socio-Economic Aspects

About 210 million people suffer from chronic obstructive pulmonary disease (COPD) worldwide. In 2012, an estimated 3 million people died of COPD which is equal to 6% of all deaths worldwide. Therewith COPD is the 4th frequent cause of death worldwide. According to World Health