Introduction

Chronic obstructive pulmonary disease (COPD) has been a major public health problem and will remain a challenge for clinicians within the twenty-first century. Worldwide, COPD is in the spotlight because of its high prevalence, morbidity, and mortality. The burden of the disease is great both for those directly affected and for society **(Ghattas, Dai, Gemmel, & Awad, 2013).**

Chronic obstructive pulmonary disease (COPD) is a common, preventable, and treatable disease characterized by progressive airflow limitation. COPD is the third leading cause of death in the United States (US) and has an estimated worldwide prevalence of 10% in people over 40 years. COPD disproportionately afflicts those of lower socioeconomic status and older adults, creating reluctance to diagnose and treat patients **(Ghattas, et al., 2013).**

Chronic obstructive pulmonary disease is a type of obstructive lung disease in which chronic incompletely reversible poor airflow (airflow limitation) and inability to breathe out fully (air trapping) exist. The poor airflow is the result of breakdown of lung tissue (known as emphysema) and small airways disease (known as obstructive bronchiolitis) **(Ignatavicius & Workman, 2012).**

The major risk factor for developing COPD is **cigarette smoking**; COPD is more than four times as prevalent among smokers as non-smokers. It affects about 15% of smokers and just 3% of nonsmokers. **Occupational chemicals and dusts:** prolonged exposure to various dusts, vapors, irritants or fumes in the workplace. **Air pollution,** high levels of urban air pollution are harmful to people with existing lung disease. A host risk factor for COPD is **a deficiency of α-1 antitrypsin,** an enzyme inhibitor that protects the lung parenchyma from injury. **Infection** and **aging** are risk factors for developing COPD **(Lewis, Dirksen, Heitkemper, Bucher & Camera, 2011).**

Chronic Obstructive Pulmonary Disease (COPD) is a debilitating and progressive disease that primarily affects the respiratory system. In many patients, it also has detrimental extra-pulmonary effects, such as weight loss and skeletal muscle dysfunction/wasting. The pulmonary and skeletal muscle abnormalities limit the pulmonary ventilation and enhance the ventilatory requirements during exercise resulting in exercise-associated symptoms such as dyspnea and fatigue. These symptoms make exercise an unpleasant experience, which many patients try to avoid, and along with a depressive mood status (in up to 30% of patients), further accelerates the process, leading to an inactive life-style. Muscle deconditioning, associated with reduced physical activity, contributes to further inactivity and as a result patients get

trapped in a vicious cycle of declining physical activity levels and increasing symptoms with exercise **(Trooster et al., 2013).**

Complications of COPD include respiratory infections, people with COPD are more susceptible to colds, the flu and pneumonia. Heart problems, COPD increases the risk of heart disease, including heart attack. Lung cancer, smokers with chronic bronchitis have a greater risk of developing lung cancer than do smokers who don't have chronic bronchitis. Pulmonary hypertension, difficulty breathing contribute to development of depression **(Smeltzer, Bare, Hinkle & Cheever, 2010).**

The primary nursing goals of care protocol for the COPD patient are to (1) prevent disease progression, (2) relieve symptoms and improve exercise tolerance, (3) prevent and treat complications, (4) promote patient participation in care, (5) prevent and treat exacerbation, and (6) improve quality of life and reduce mortality risk **(Lewis et al., 2011).**

Significance of the study:

Worldwide, more than 52 million suffering from (COPD) **Juvelekian & Stoller (Center for continuing education), 2012.** In Egypt, the number of patients admitted with COPD to chest ward at Ain Shams University hospitals in year 2012 was approximately 150 patients according to Ain Shams University hospital medical records. Realistic aims for COPD management include slowing or halting disease progression, relieving symptoms to reduce disability, and decreasing the frequency and severity of exacerbations; therefore the aim of this study is to evaluate the effect of care protocol on improving COPD patient's knowledge, practice and clinical outcomes.

Aim of the Study

This study aims to evaluate the effect of care protocol on knowledge, practice and clinical outcomes of patients with COPD through the following:

1- Assessment of knowledge, practice and clinical outcomes of patients with COPD.

2- Developing and implementing care protocol.

3- Evaluating the effect of care protocol on knowledge, practice and clinical outcomes of patients with COPD.

Research hypothesis:

The current study hypothesized that:

The implementation of care protocol will affect positively the knowledge, practice and clinical outcomes of patients with chronic obstructive pulmonary disease.

Literature review

Anatomy and Physiology of Respiratory System

In order to survive the body needs a constant supply of oxygen, which it obtains from the air. The respiratory system is composed of various structures and organs that ensure that the body is able to maintain its internal environment through the exchange of air between the lungs and the atmosphere. The body also needs to dispose of carbon dioxide, made as a waste product from the process of cell metabolism. The ingestion of oxygen and the discarding of carbon dioxide occur through the process of respiration or breathing **(Khurana & Arushi, 2010)**.

The respiratory system contains the upper and the lower respiratory tracts. The upper respiratory tract contains the respiratory organs located outside the chest cavity: the nose and the nasal cavities, pharynx, larynx and upper trachea. The lower respiratory tract consists of organs located in the chest cavity; the lower trachea, bronchi, bronchioles, alveoli and the lungs. The lower parts of the bronchi, the bronchioles and alveoli, are all located in the lungs. The alveoli are the point at which gas exchange takes place. The pleura are a membrane that covers the lungs. The muscles that form the chest cavity are also part of the lower respiratory tract. The respiratory centre in the

brain, which is located in the medulla oblongata, regulates breathing **(Timby & Smith, 2010).**

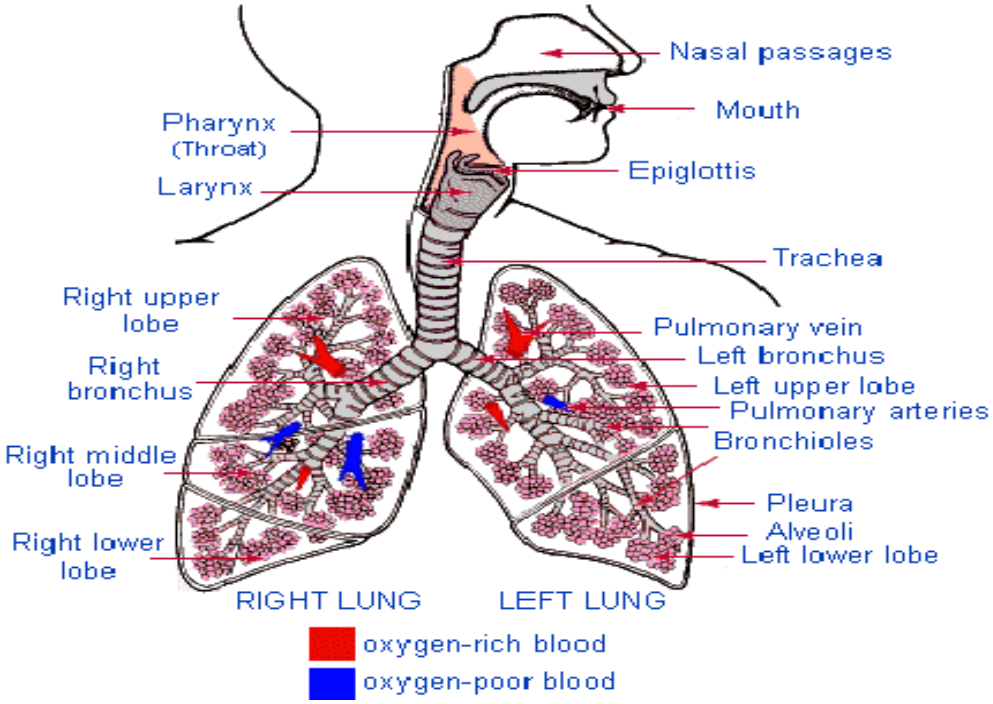

Figure (1) Anatomy of the respiratory system (Smeltzer, et al., 2010)

Function of the respiratory system:

Certain vital tissues, such as those of the brain and the heart, cannot survive for long without a continuing supply of oxygen which is required to drive the energy they need from the oxidation of carbohydrates, fats and proteins. However, as a result of oxidation in the body tissues, carbon dioxide is

produced and must be removed from the cells to prevent the buildup of acid waste products. The respiratory system performs this function by facilitating life-sustaining processes such as oxygen transport, respiration and ventilation, and gas exchange **(*Khurana & Arushi, 2010*).**

Oxygen Transport

Oxygen diffuses from the capillaries through the capillary wall to the interstitial fluid. At this point, it diffuses through the membrane of tissue cells, where it is used by mitochondria for cellular respiration. The movement of carbon dioxide occurs by diffusion in the opposite direction—from cell to blood ***(Osborn, Wraa & Watson, 2010).***

Respiration

After these tissue capillary exchanges, blood enters the systemic veins and travels to the pulmonary circulation. The oxygen concentration in blood within the capillaries of the lungs is lower than in the alveoli. Because of this concentration gradient, oxygen diffuses from the alveoli to the blood. Carbon dioxide, which has a higher concentration in the blood than in the alveoli, diffuses from the blood into the alveoli. Movement of air in and out of the airways (ventilation) continually replenishes the oxygen and removes the carbon dioxide from the airways in the lung **(Smeltzer, et al., 2010).**

Ventilation

During inspiration, air flows from the environment into the trachea, bronchi, bronchioles and alveoli. During expiration, alveolar gas travels the same route in reverse. Physical factors that govern air flow in and out of the lungs are collectively referred to as the mechanics of ventilation and include air pressure variance, resistance to air flow and lung compliance **(Cary & Bihm, 2010).**

Resistance is determined chiefly by the size of the airway through which the air is flowing. Any process that changes the bronchial diameter or width affects airway resistance and alters the rate of airflow for a given pressure gradient during respiration. With increased resistance, greater-than-normal respiratory effort is required to achieve normal level of ventilation **(West, 2012).**

Compliance is a measure of the elasticity, expandability and distensibility of the lungs and thoracic structures. Surface tension of the alveoli is factors that determine lung compliance. High or increased lung compliance occurs if the lungs have lost their elasticity and thorax is over-distended (i.e, in emphysema). Low or decreased compliance occurs if the lungs and thorax are stiff (difficult to stretch) **(Lemone & Burke, 2008).**

Gas exchange

Inhaled oxygen enters the lungs and reaches the alveoli. Carbon dioxide passes from the blood into the alveoli and is then exhaled. Oxygenated blood travels from the lungs through the pulmonary veins and into the left side of the heart, which pumps the blood to the rest of the body. Oxygen-deficient, carbon dioxide-rich blood returns to the right side of the heart through two large veins, the superior vena cava and the inferior vena cava. Then the blood is pumped through the pulmonary artery to the lungs, where it picks up oxygen and releases carbon dioxide **(Clancy & Mcvicar, 2010).**

Three processes are essential for the transfer of oxygen from the outside air to the blood flowing through the lungs; ventilation, diffusion, and perfusion. *Ventilation* is the process by which air moves in and out of the lungs. *Diffusion* is the spontaneous movement of gases, without the use of any energy or effort by the body, between the gas in the alveoli and the blood in the capillaries of the lungs. *Perfusion* is the process by which the cardiovascular system pumps blood throughout the lungs **(Sharp & Corp, 2013).**

Definition of chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease state characterized by chronic airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases **(Daniels, Nosek & Nicoll, 2011)**.

Chronic lower respiratory disease, primarily COPD, was the third leading cause of death in the United States in 2011. Fifteen million Americans report that they have been diagnosed with COPD. More than 50% of adults with low pulmonary function were not aware that they had COPD; therefore the actual number may be higher. The following groups were more likely to report COPD; people aged 65–74 years, non-Hispanic whites, women, individuals who were unemployed, retired, or unable to work, individuals with less than a high school education, people with lower incomes, individuals who were divorced, widowed, or separated, current or former smokers and those with a history of asthma **(Center for Disease Control (CDC), 2013)**.

Types of Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease **(COPD)** encompassed two types of obstructive airway diseases, chronic bronchitis and emphysema. **Chronic bronchitis** is the presence of chronic productive cough for at least 3 months in each of 2 consecutive years in a patient in whom other causes of chronic cough have been excluded. **Emphysema** is an abnormal permanent enlargement of the air spaces distal to the terminal bronchioles, accompanied by destruction of their walls and without obvious fibrosis. Only about 10% of patients with COPD have pure emphysema (**Lewis et al., 2011).**

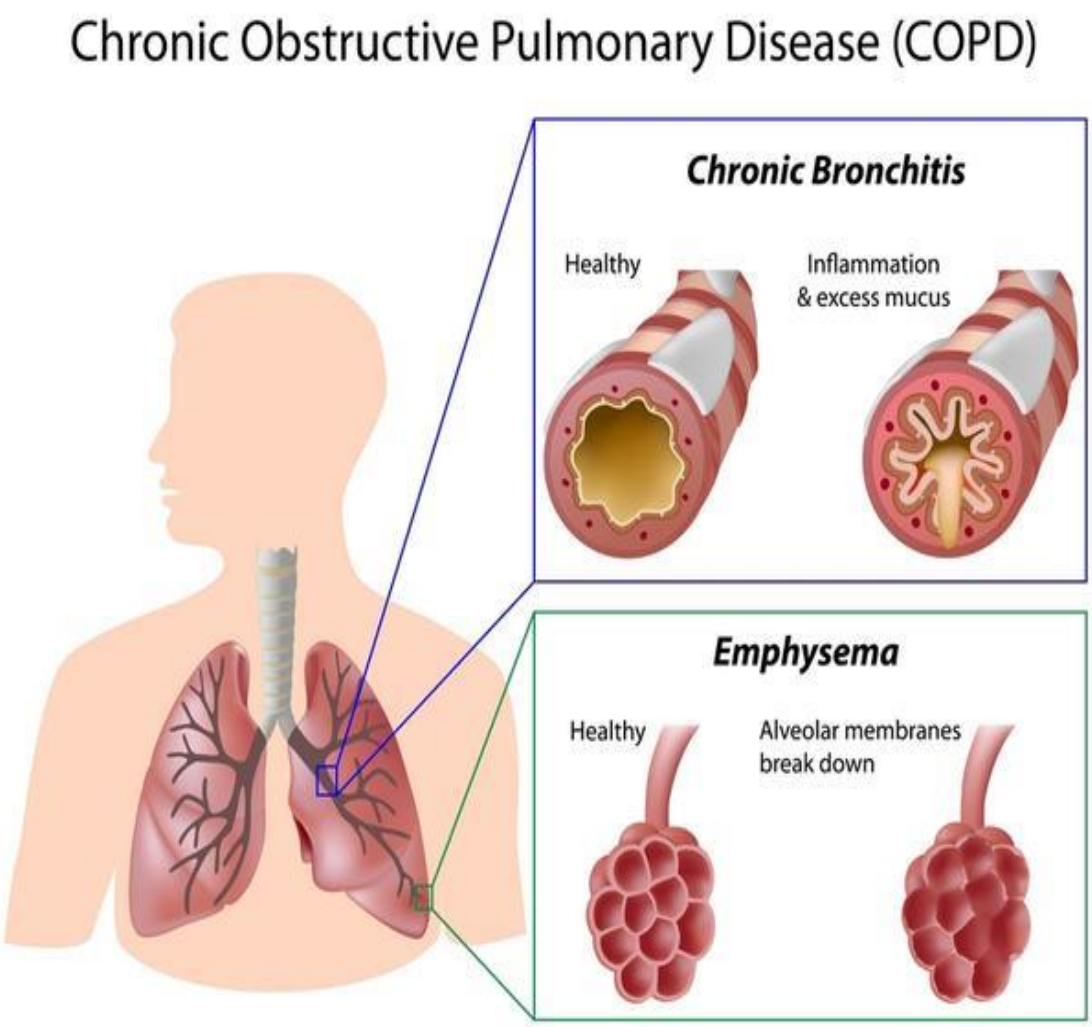

Figure (2) Types of Chronic obstructive pulmonary disease (Smeltzer, et al., 2010)

Pathophysiology of Chronic Obstructive Pulmonary Disease

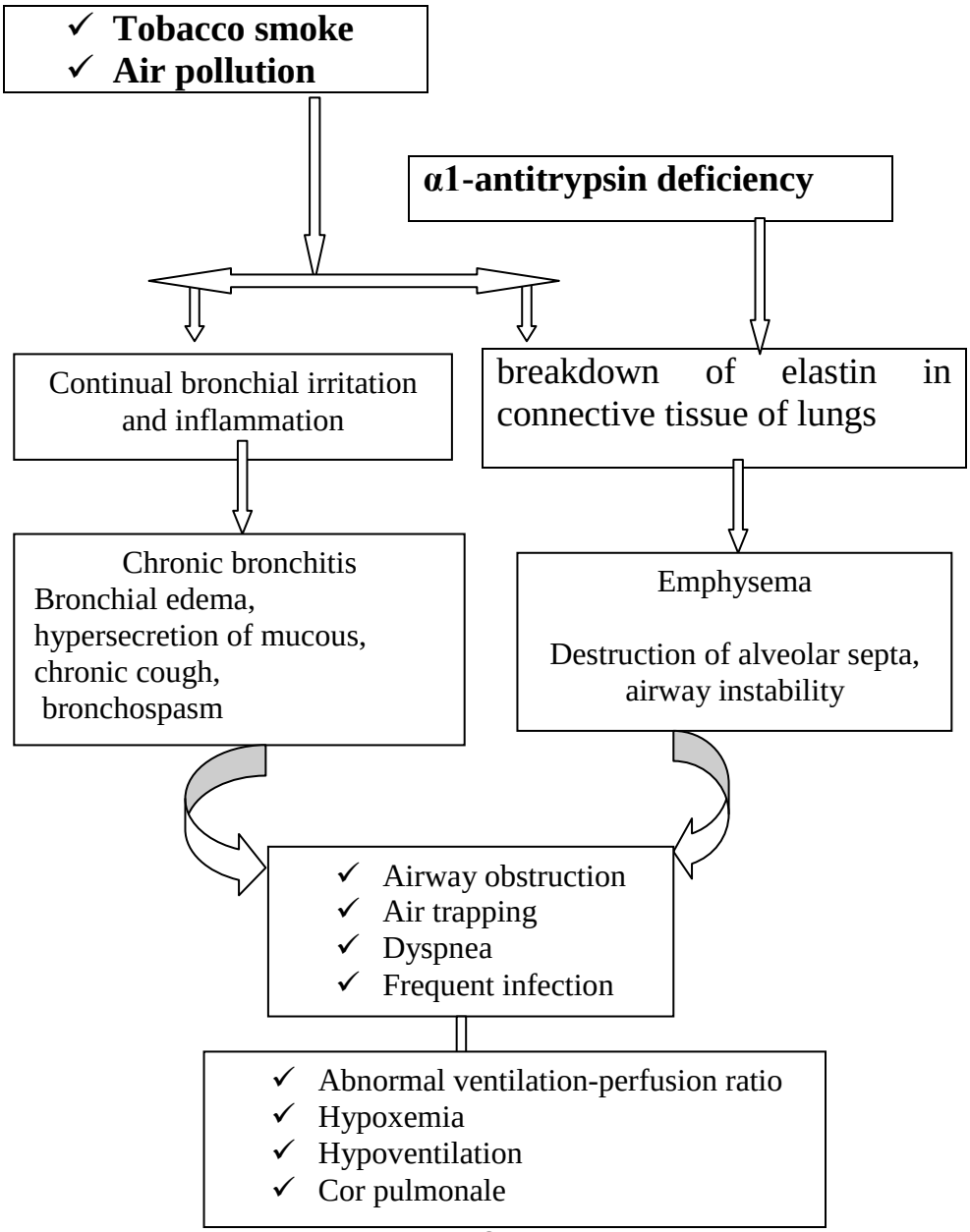

Figure (3) The pathogenesis of chronic obstructive pulmonary disease (Lemone and Burke, 2008)

In COPD, the airflow limitation is both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases. The inflammatory response occurs throughout the airways, parenchyma, and pulmonary vasculature. Because of the chronic inflammation and the body's attempts to repair it, narrowing occurs in the small peripheral airways. Over time, this injury-and-repair process causes scar tissue formation and narrowing of the airway lumen. Airflow obstruction may also be due to parenchymal destruction as seen with emphysema, a disease of the alveoli or gas exchange units **(Smeltzer, et al., 2010).**

In addition to inflammation, processes relating to imbalances of proteinases and antiproteinases in the lung may be responsible for airflow limitation. When activated by chronic inflammation, proteinases and other substances may be released, damaging the parenchyma of the lung. The parenchymal changes may also be consequences of inflammation, environmental, or genetic factors (eg, α-1 antitrypsin deficiency). Early in the course of COPD, the inflammatory response causes pulmonary vasculature changes that are characterized by thickening of the vessel wall. These changes may occur as a result of exposure to cigarette smoke or use of tobacco products or as a result of the release of inflammatory mediators **(Smeltzer, et al., 2010).**